



TEST REPORT

Application No.: BTEK231016006AE
Applicant: Always Promotion, Inc.
Address of Applicant: 210 Parrott Road, West Nyack, New York, USA
Manufacturer: Always Promotion, Inc.
Address of Manufacturer: 210 Parrott Road, West Nyack, New York, USA
Factory: NA
Address of Factory: NA
Equipment Under Test (EUT):
EUT Name: Wireless Mini Speaker
Model No.: BT2301
Trade Mark: NA
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2023-10-16
Date of Test: 2023-10-16 to 2023-11-14
Date of Issue: 2023-11-14

Test Result:

Pass*

* In the configuration tested, the EUT complied with the standards specified above.

Damon Su
EMC Laboratory Manager



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023-11-14		Original

Authorized for issue by				
				
		Carl Yang/ Project Engineer		
				
		Keven Tan/ Reviewer		



2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence		N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



3 Contents

	Page
1 Cover Page	1
2 Test Summary	3
3 Contents	4
4 General Information	6
4.1 Details of E.U.T.	6
4.2 Description of Support Units	6
4.3 Measurement Uncertainty	6
4.4 Test Location	7
4.5 Deviation from Standards	7
4.6 Abnormalities from Standard Conditions	7
5 Equipment List	8
6 Radio Spectrum Technical Requirement	10
6.1 Antenna Requirement	10
6.1.1 Test Requirement:	10
6.1.2 Conclusion	10
6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	11
6.2.1 Test Requirement:	11
6.2.2 Conclusion	12
7 Radio Spectrum Matter Test Results	14
7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)	14
7.1.1 E.U.T. Operation	14
7.1.2 Test Mode Description	14
7.1.3 Test Setup Diagram	15
7.1.4 Measurement Procedure and Data	15
7.2 Conducted Peak Output Power	18
7.2.1 E.U.T. Operation	18
7.2.2 Test Mode Description	18
7.2.3 Test Setup Diagram	18
7.2.4 Measurement Procedure and Data	19
7.3 20dB Bandwidth	20
7.3.1 E.U.T. Operation	20
7.3.2 Test Mode Description	20
7.3.3 Test Setup Diagram	20
7.3.4 Measurement Procedure and Data	20
7.4 Carrier Frequencies Separation	21
7.4.1 E.U.T. Operation	21
7.4.2 Test Mode Description	21
7.4.3 Test Setup Diagram	21
7.4.4 Measurement Procedure and Data	21
7.5 Hopping Channel Number	22
7.5.1 E.U.T. Operation	22
7.5.2 Test Mode Description	22
7.5.3 Test Setup Diagram	22
7.5.4 Measurement Procedure and Data	22
7.6 Dwell Time	23
7.6.1 E.U.T. Operation	23



7.6.2	Test Mode Description	23
7.6.3	Test Setup Diagram	23
7.6.4	Measurement Procedure and Data	23
7.7	Conducted Band Edges Measurement	24
7.7.1	E.U.T. Operation	24
7.7.2	Test Mode Description	24
7.7.3	Test Setup Diagram	25
7.7.4	Measurement Procedure and Data	25
7.8	Conducted Spurious Emissions	26
7.8.1	E.U.T. Operation	26
7.8.2	Test Mode Description	26
7.8.3	Test Setup Diagram	26
7.8.4	Measurement Procedure and Data	27
7.9	Radiated Emissions which fall in the restricted bands	28
7.9.1	E.U.T. Operation	28
7.9.2	Test Mode Description	28
7.9.3	Test Setup Diagram	29
7.9.4	Measurement Procedure and Data	29
7.10	Radiated Spurious Emissions (Below 1GHz)	31
7.10.1	E.U.T. Operation	31
7.10.2	Test Mode Description	31
7.10.3	Test Setup Diagram	32
7.10.4	Measurement Procedure and Data	32
7.11	Radiated Spurious Emissions (Above 1GHz)	35
7.11.1	E.U.T. Operation	35
7.11.2	Test Mode Description	35
7.11.3	Test Setup Diagram	36
7.11.4	Measurement Procedure and Data	37
8	Test Setup Photo	40
9	EUT Constructional Details (EUT Photos)	40
10	Appendix	41



4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.7V by rechargeable lithium-ion battery(300mAh) and recharged by DC 5V.
Cable(s):	/
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	Bluetooth 5.0
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Hopping Channel Type:	Adaptive Frequency Hopping systems
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels:	79
Sample Type:	Portable device
Antenna Type:	PCB Antenna
Antenna Gain:	1.7dBi
Hardware Version	BT2301-V1.0
Software and Firmware Version	V1.0
Remark: The information in this section is provided by the applicant or manufacturer, BANTEK is not liable to the accuracy, suitability, reliability or/and integrity of the information.	
Sample No.:	BTEK231016006AE-01

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
adapter	JW	4441	/

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	$\pm 0.76\text{dB}$
20dB Bandwidth	$\pm 3\%$
Carrier Frequencies Separation	$\pm 7.3 \times 10^{-8}$
Hopping Channel Number	$\pm 7.3 \times 10^{-8}$
Dwell Time	$\pm 0.4\%$
Conducted Band Edges Measurement	$\pm 0.8\text{dB}$
Conducted Spurious Emissions	$\pm 0.8\text{dB}$
Radiated Emissions which fall in the restricted bands	$\pm 5.1\text{dB}$ (1GHz-6GHz); $\pm 5.2\text{dB}$ (above 6GHz)
Radiated Spurious Emissions (Below 1GHz)	$\pm 5.1\text{dB}$
Radiated Spurious Emissions (Above 1GHz)	$\pm 5.1\text{dB}$ (1GHz-6GHz); $\pm 5.2\text{dB}$ (above 6GHz)



4.4 Test Location

All tests were performed at:

Shenzhen BANTEK Testing Co., Ltd.,

A5&A6, Building B1&B2, No.45 Gangtou Road, Bogang Community, Shajing Street, Bao'an District,
Shenzhen, Guangdong, China 518104

Tel:0755-2334 4200 Fax: 0755-2334 4200

FCC Registration Number: 264293

Designation Number: CN1356

No tests were sub-contracted.

4.5 Deviation from Standards

None

4.6 Abnormalities from Standard Conditions

None



5 Equipment List

Conducted Test					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Shielding Room	YIHENG ENELECTRONIC	9*5*3.3	YH-BT-220304-04	2022-03-03	2025-03-02
EMI Test Receiver	Rohde&Schwarz	ESCI	101021	2023-06-12	2024-06-11
Measurement Software	Fara	EZ EMC Ver. FA-03A2	N/A	N/A	N/A
LISN	Rohde&Schwarz	ENV216	101472	2023-06-12	2024-06-11
LISN	Schwarzbeck	NSLK 8128	05127	2023-06-12	2024-06-11

RF Conducted					
Equipment	Manufacturer	Model No	Serial No	Cal Date	Cal Due Date
Shielding Room	YIHENG ENELECTRONIC	5.5*3.1*3	YH-BT-220304-03	2022-03-03	2025-03-02
EXA Signal Analyzer	KEYSIGHT	N9020A	MY54230486	2023-06-12	2024-06-11
DC Power Supply	E3632A	E3642A	KR75304416	2023-06-12	2024-06-11
Attenuator	RswTech	SMA-JK-6dB	N/A	2023-06-12	2024-06-11
Attenuator	RswTech	SMA-JK-3dB	N/A	2023-06-12	2024-06-11
RF Control Unit	Techy	TR1029-1	N/A	2023-06-12	2024-06-11
RF Sensor Unit	Techy	TR1029-2	N/A	2023-06-12	2024-06-11
WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	141258	2023-06-12	2024-06-11
MXG Vector Signal Generator	Agilent	N5182A	US46240522	2023-06-12	2024-06-11
Programmable Temperature&Humidity Chamber	GRT	GR-HWX1000	GR22051001	2023-06-12	2024-06-11
Measurement Software	TACHOY	RF TestSoft	N/A	N/A	N/A

RSE					
Equipment	Manufacturer	Model No	Serial No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	YIHENG ENELECTRONIC	966	YH-BT-220304-01	2022-03-03	2025-03-02
EMI Test Receiver	Rohde&Schwarz	ESCI	100694	2023-06-12	2024-06-11
TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	01324	2022-06-15	2025-06-14
Pre-Amplifier	Schwarzbeck	BBV 9745	#180	2023-06-12	2024-06-11
Measurement Software	Fara	EZ EMC Ver. FA-03A2	N/A	2023-06-12	2024-06-11
EXA Signal Analyzer	Keysight	N9020A	MY54440290	2023-06-12	2024-06-11
Horn Antenna	Schwarzbeck	BBHA 9120D	02695	2022-06-15	2025-06-14
Pre-Amplifier	Tonscend	TAP0118045	AP20K806109	2023-06-12	2024-06-11
Horn Antenna	SCHWARZBECK	BBHA9170	1157	2022-06-15	2025-06-14





Low Noise Pre-amplifier	SKET	LNPA-1840G-50	SK2022032902	2023-06-12	2024-06-11
Signal analyzer	ROHDE&SCHWARZ	FSQ40	100010	2023-06-12	2024-06-11
Loop Antenna	ETS	6502	00201177	2022-06-15	2025-06-14

General used equipment					
Equipment	Manufacturer	Model No	Serial No	Cal Date	Cal Due Date
Humidity/Temperature/B arometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11
Humidity/Temperature/B arometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11



6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

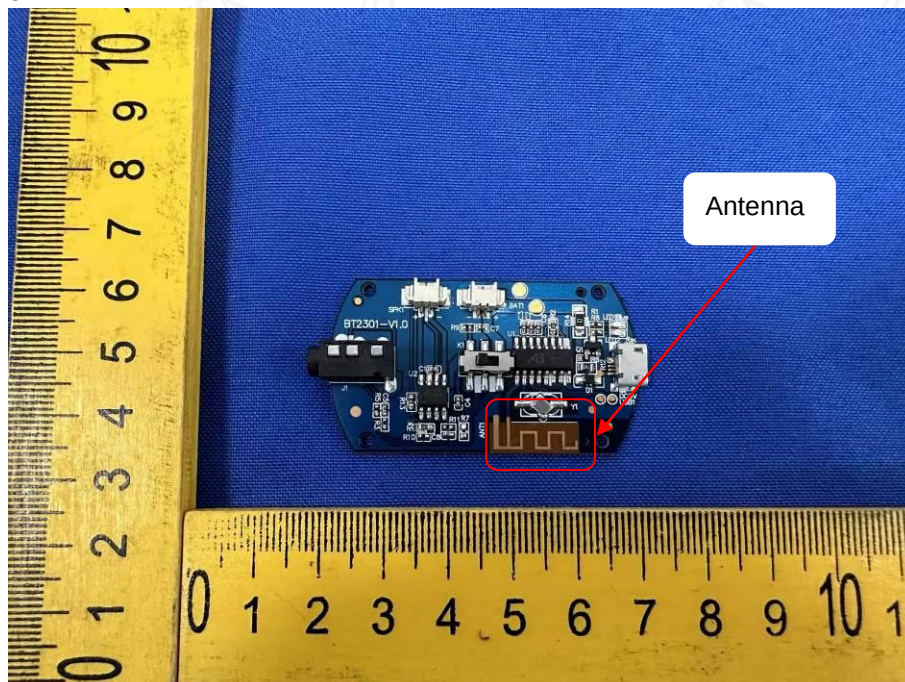
Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

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.

EUT Antenna:

The antenna is integrated on the Chip in PCB and no consideration of replacement. The best case gain of the antenna is 1.7dBi.



6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

Limit:

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

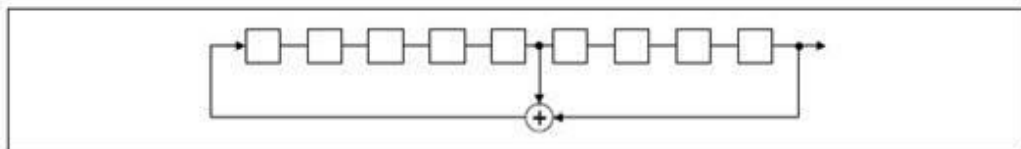
Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

- > Number of shift register stages: 9
- > Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- > Longest sequence of zeros: 8 (non-inverted signal)

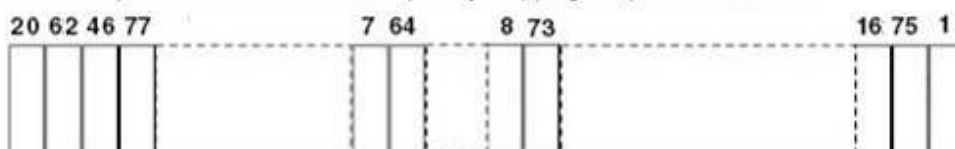
Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence: $2^9 - 1 = 511$ bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.



Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.



7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C

Humidity: 60.5 % RH

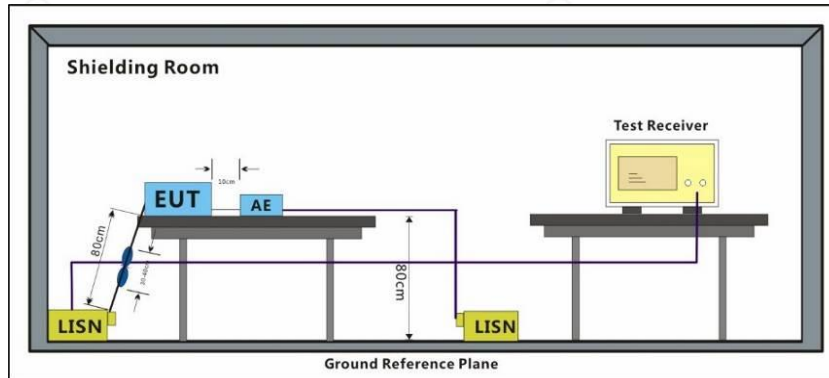
Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.1.3 Test Setup Diagram



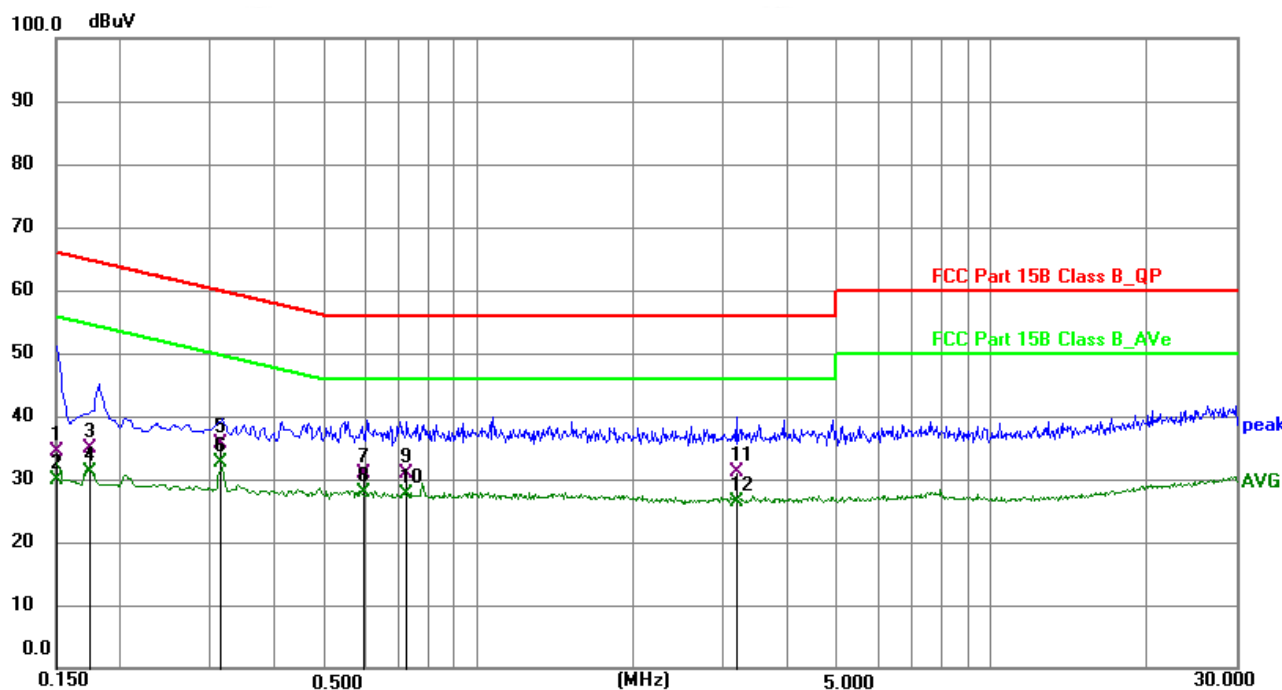
7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) 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 on conducted measurement.

Remark: Final Test Level = Reading Level + Factor



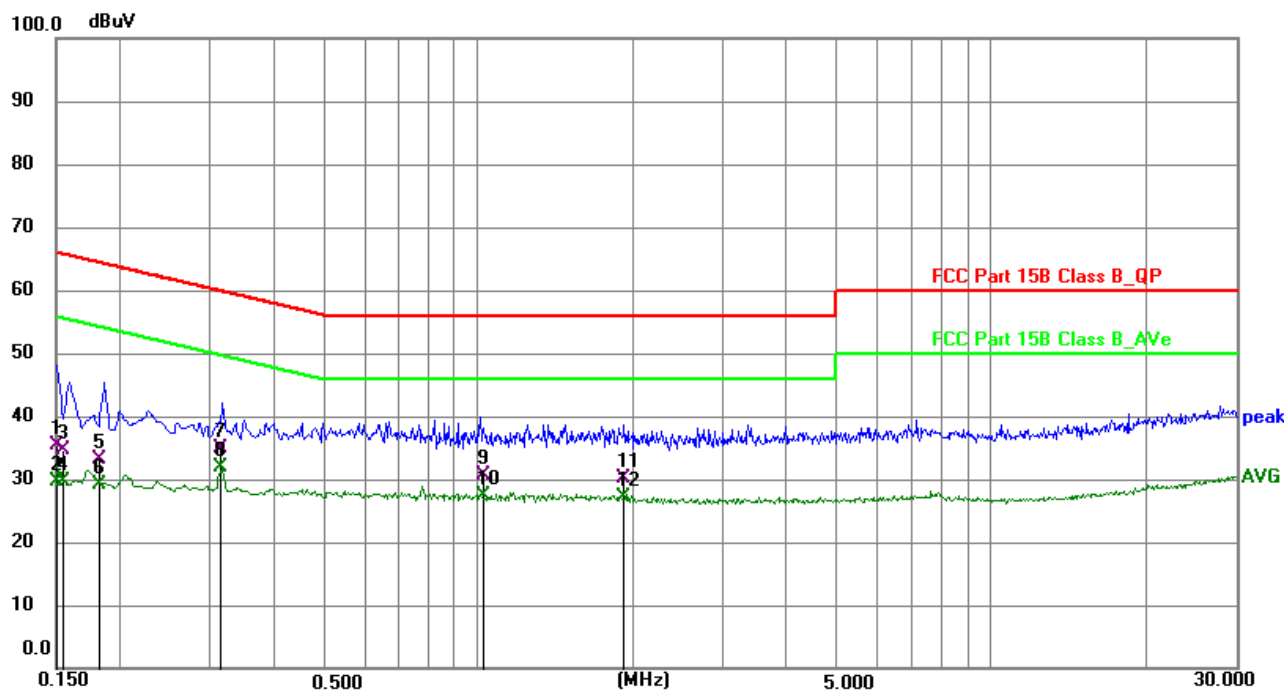
Test Mode: 01; Line: Live line; Modulation:GFSK; ; Channel:Low



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1511	14.67	19.75	34.42	65.94	-31.52	QP	P	
2	0.1511	10.01	19.75	29.76	55.94	-26.18	AVG	P	
3	0.1757	15.06	19.78	34.84	64.69	-29.85	QP	P	
4	0.1757	11.25	19.78	31.03	54.69	-23.66	AVG	P	
5	0.3135	15.85	19.82	35.67	59.88	-24.21	QP	P	
6 *	0.3135	12.72	19.82	32.54	49.88	-17.34	AVG	P	
7	0.5970	11.11	19.87	30.98	56.00	-25.02	QP	P	
8	0.5970	7.95	19.87	27.82	46.00	-18.18	AVG	P	
9	0.7251	11.05	19.92	30.97	56.00	-25.03	QP	P	
10	0.7251	7.82	19.92	27.74	46.00	-18.26	AVG	P	
11	3.1858	10.95	20.19	31.14	56.00	-24.86	QP	P	
12	3.1858	6.27	20.19	26.46	46.00	-19.54	AVG	P	



Test Mode: 01; Line: Neutral Line; Modulation:GFSK; ; Channel:Low



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1508	15.53	19.77	35.30	65.96	-30.66	QP	P	
2	0.1508	9.96	19.77	29.73	55.96	-26.23	AVG	P	
3	0.1550	14.89	19.77	34.66	65.73	-31.07	QP	P	
4	0.1550	9.87	19.77	29.64	55.73	-26.09	AVG	P	
5	0.1828	13.38	19.80	33.18	64.36	-31.18	QP	P	
6	0.1828	9.33	19.80	29.13	54.36	-25.23	AVG	P	
7	0.3122	15.14	19.83	34.97	59.91	-24.94	QP	P	
8 *	0.3122	12.01	19.83	31.84	49.91	-18.07	AVG	P	
9	1.0241	10.72	20.02	30.74	56.00	-25.26	QP	P	
10	1.0241	7.45	20.02	27.47	46.00	-18.53	AVG	P	
11	1.9228	10.08	20.07	30.15	56.00	-25.85	QP	P	
12	1.9228	7.00	20.07	27.07	46.00	-18.93	AVG	P	

Note:

- 1) Pre-scan all modes and recorded the worst case results in this report(Low Channel).
- 2) Level= Reading+ Factor; Margin=Level-limit.



7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C

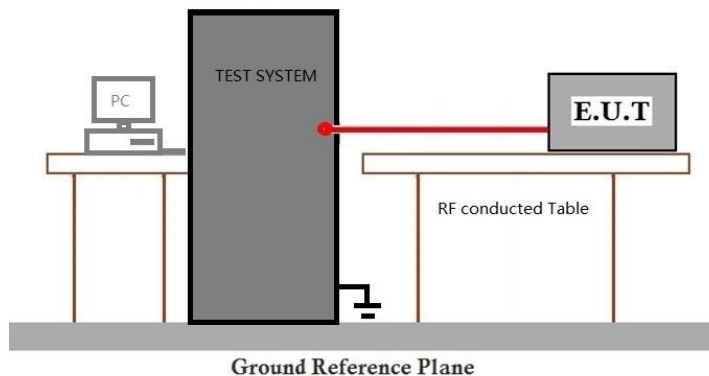
Humidity: 50.5 % RH

Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.3 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.7

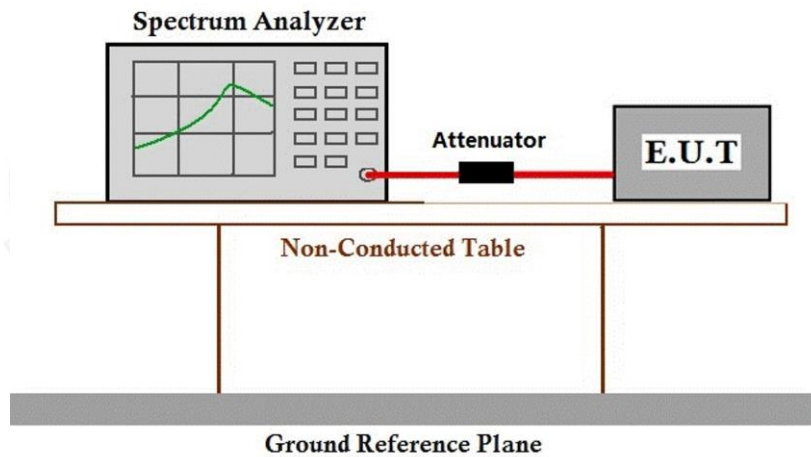
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 20.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.4 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)

Test Method: ANSI C63.10 (2013) Section 7.8.2

Limit:

2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W.

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C

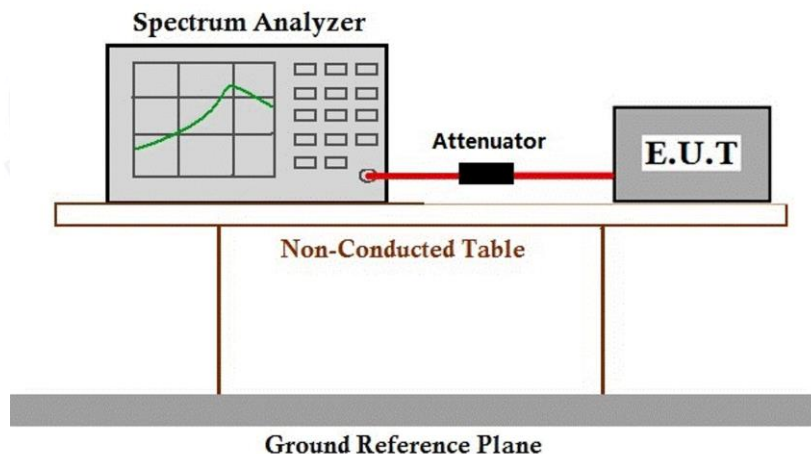
Humidity: 50.5 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.5 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C

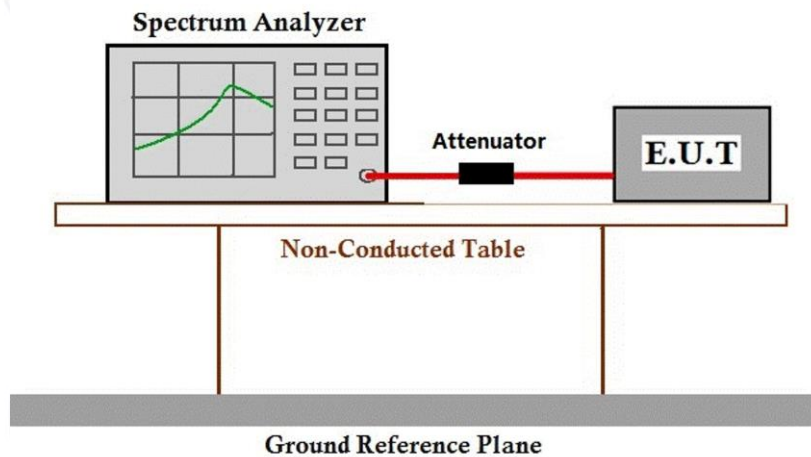
Humidity: 50.5 % RH

Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.6 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Frequency(MHz)	Limit
902-928	0.4s within a 20s period(20dB bandwidth<250kHz)
	0.4s within a 10s period(20dB bandwidth≥250kHz)
2400-2483.5	0.4s within a period of 0.4s multiplied by the number of hopping channels
5725-5850	0.4s within a 30s period

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C

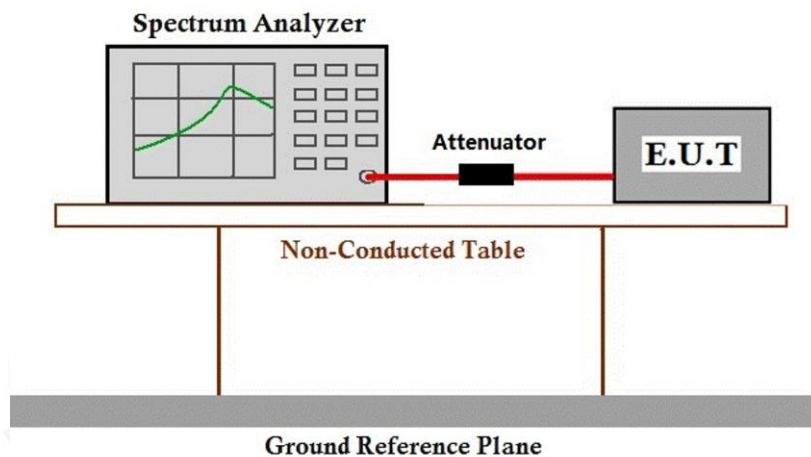
Humidity: 50.5 % RH

Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.7 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.6

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C

Humidity: 50.5 % RH

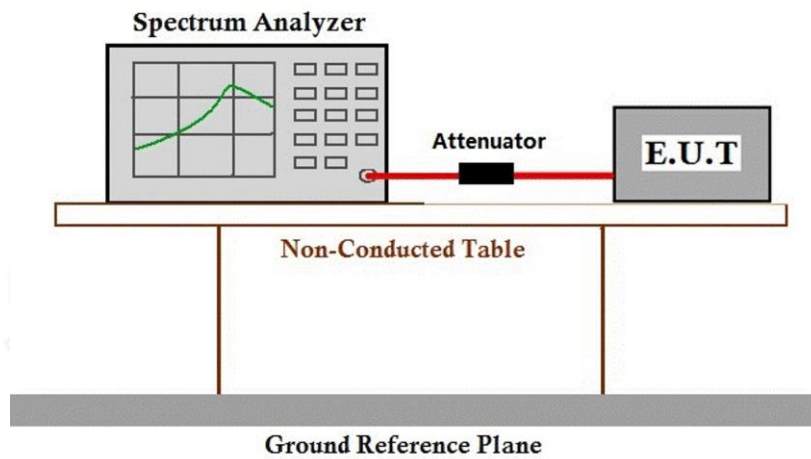
Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.8 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 20.6 °C

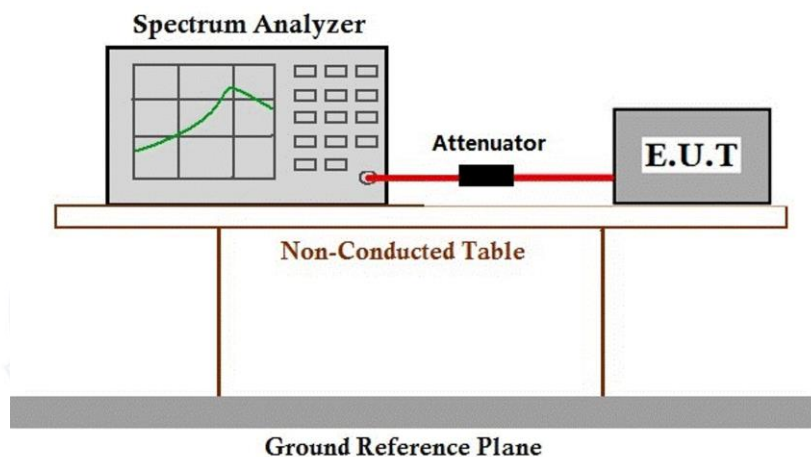
Humidity: 50.5 % RH

Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

cable loss=0.83dB

Please Refer to Appendix for Details



7.9 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 21.4 °C

Humidity: 54.3 % RH

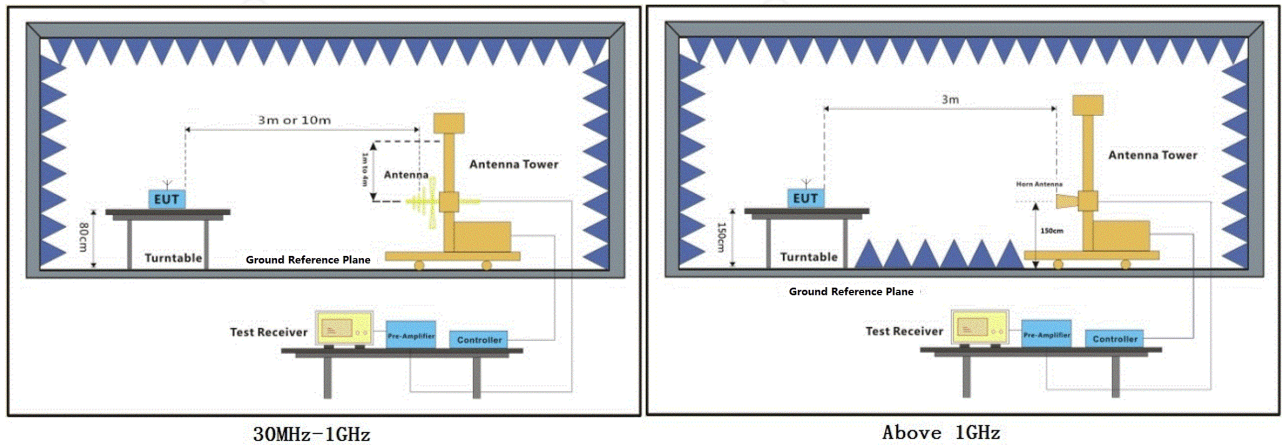
Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Reading Level + Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



Note: Level = Reading level + Factor

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2310.000	67.69	-30.59	37.10	74.00	-36.90	peak	P
2	2390.000	70.61	-30.49	40.12	74.00	-33.88	peak	P
3	2400.000	77.48	-30.48	47.00	74.00	-27.00	peak	P

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2310.000	68.50	-30.59	37.91	74.00	-36.09	peak	P
2	2390.000	70.19	-30.49	39.70	74.00	-34.30	peak	P
3	2400.000	78.30	-30.48	47.82	74.00	-26.18	peak	P

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2483.500	80.46	-30.39	50.07	74.00	-23.93	peak	P
2	2500.000	71.78	-30.37	41.41	74.00	-32.59	peak	P

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2483.500	79.61	-30.39	49.22	74.00	-24.78	peak	P
2	2500.000	70.15	-30.37	39.78	74.00	-34.22	peak	P

Note: Level = Reading level + Factor

Factor= Antenna Factor+ Cable Loss-Preamplifier Factor



7.10 Radiated Spurious Emissions (Below 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.10.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 68.6 % RH

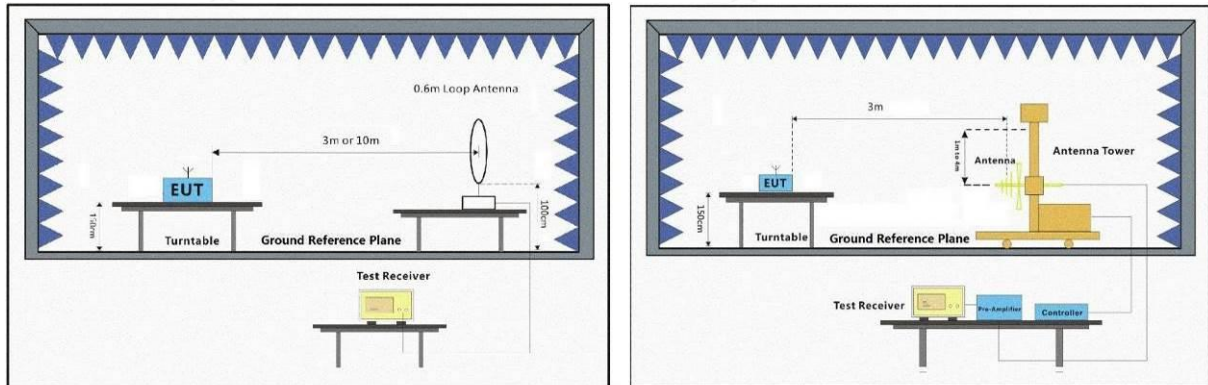
Atmospheric Pressure: 1010 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.10.3 Test Setup Diagram



7.10.4 Measurement Procedure and Data

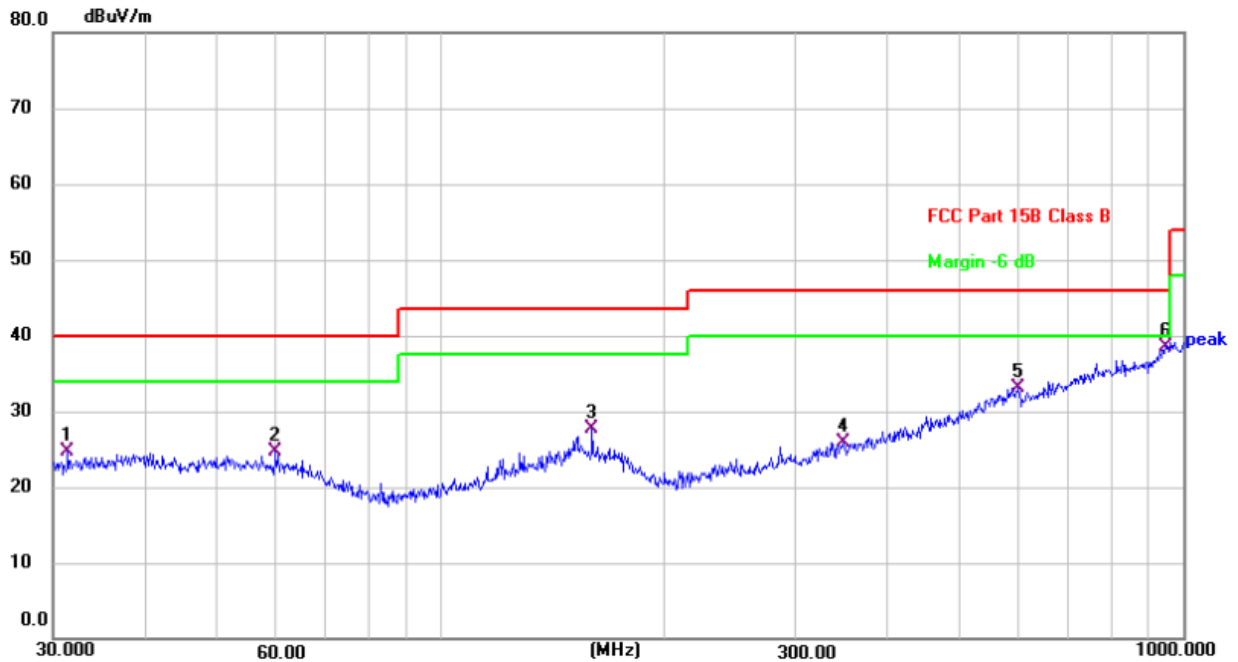
- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

Remark:

- Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Reading Level + Factor
- Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



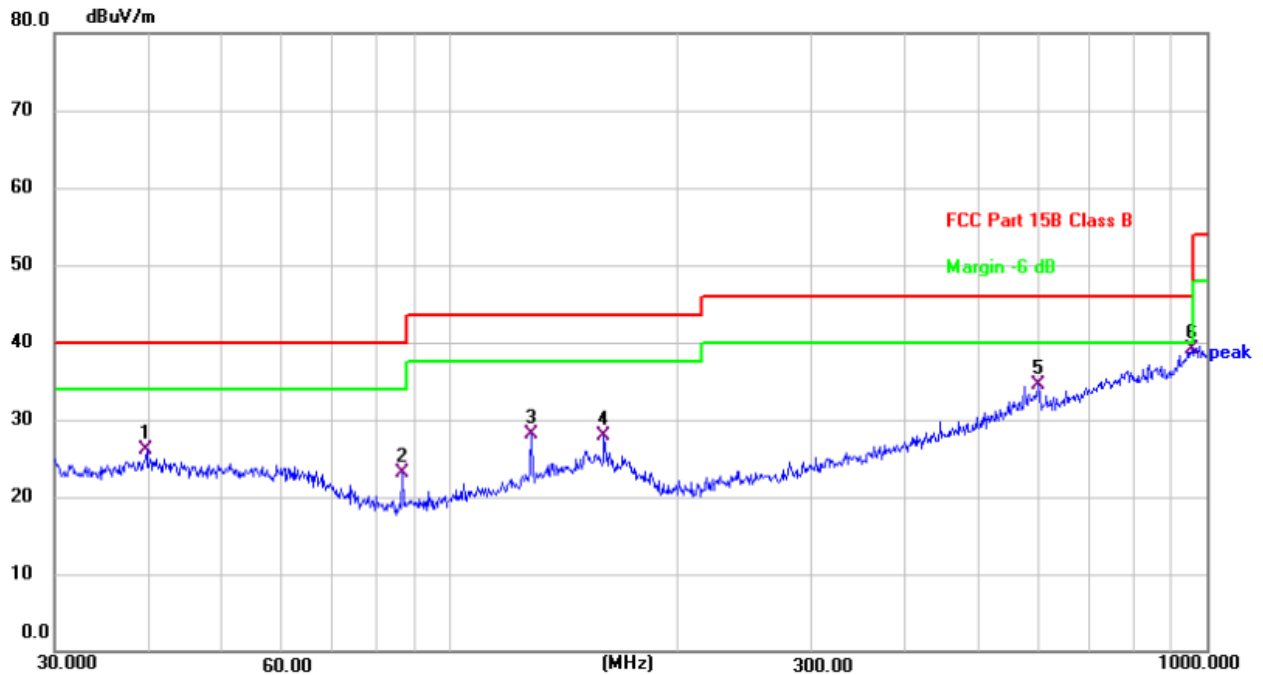
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	31.3992	42.69	-17.90	24.79	40.00	-15.21	QP	300	348	P	
2	59.8588	42.74	-18.06	24.68	40.00	-15.32	QP	300	348	P	
3	159.7844	44.91	-17.23	27.68	43.50	-15.82	QP	300	14	P	
4	348.0274	42.47	-16.49	25.98	46.00	-20.02	QP	300	1	P	
5	599.3212	44.62	-11.59	33.03	46.00	-12.97	QP	300	348	P	
6 *	948.7610	45.56	-6.96	38.60	46.00	-7.40	QP	300	348	P	



Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	39.7146	43.04	-16.92	26.12	40.00	-13.88	QP	100	136	P	
2	86.5029	45.28	-22.12	23.16	40.00	-16.84	QP	200	236	P	
3	128.1130	46.37	-18.26	28.11	43.50	-15.39	QP	300	270	P	
4	159.7844	45.12	-17.23	27.89	43.50	-15.61	QP	300	11	P	
5	599.3212	46.07	-11.59	34.48	46.00	-11.52	QP	200	213	P	
6 *	955.4381	45.94	-6.91	39.03	46.00	-6.97	QP	100	86	P	

Note:

- 1) Pre-scan all modes and recorded the worst case results in this report (High Channel).
- 2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3) Level= Reading+ Factor, Margin= Level- Limit, Factor= Antenna Factor Cable Loss-Preamp Factor



7.11 Radiated Spurious Emissions (Above 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.11.1 E.U.T. Operation

Operating Environment:

Temperature: 21.4 °C

Humidity: 54.3 % RH

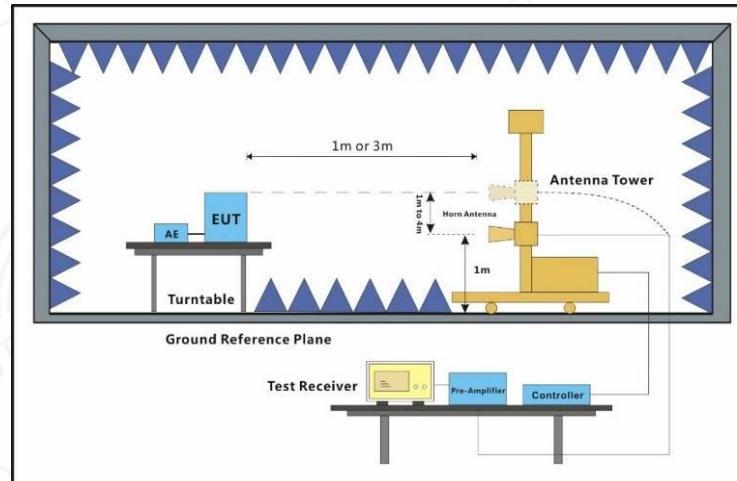
Atmospheric Pressure: 1010 mbar

7.11.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.11.3 Test Setup Diagram



7.11.4 Measurement Procedure and Data

- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) The field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin(dB)	Detector	P/F
1	2914.659	69.12	-28.95	40.17	74.00	-33.83	peak	P
2	4276.409	68.44	-28.06	40.38	74.00	-33.62	peak	P
3	6084.991	64.08	-26.11	37.97	74.00	-36.03	peak	P
4	8645.640	69.92	-24.20	45.73	74.00	-28.27	peak	P
5	11048.295	67.59	-22.85	44.73	74.00	-29.27	peak	P
6	14217.540	70.23	-21.99	48.24	74.00	-25.76	peak	P

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin(dB)	Detector	P/F
1	2974.199	67.15	-28.70	38.46	74.00	-35.54	peak	P
2	4312.274	69.52	-28.06	41.46	74.00	-32.54	peak	P
3	6352.881	66.97	-24.75	42.22	74.00	-31.78	peak	P
4	8576.450	69.16	-24.36	44.80	74.00	-29.20	peak	P
5	11286.412	68.14	-24.18	43.96	74.00	-30.04	peak	P
6	14956.760	70.39	-20.88	49.51	74.00	-24.49	peak	P

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Middle

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin(dB)	Detector	P/F
1	2913.811	69.12	-30.36	38.76	74.00	-35.24	peak	P
2	4277.346	68.31	-28.86	39.45	74.00	-34.55	peak	P
3	6085.794	64.43	-25.20	39.24	74.00	-34.76	peak	P
4	8646.500	69.93	-24.90	45.03	74.00	-28.97	peak	P
5	11047.893	68.64	-24.13	44.51	74.00	-29.49	peak	P
6	14217.228	71.09	-21.89	49.21	74.00	-24.79	peak	P



Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Middle

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.331	66.57	-29.96	36.62	74.00	-37.38	peak	P
2	4313.202	68.90	-27.96	40.94	74.00	-33.06	peak	P
3	6353.867	67.81	-26.35	41.46	74.00	-32.54	peak	P
4	8575.325	68.98	-24.23	44.75	74.00	-29.25	peak	P
5	11285.584	67.88	-24.00	43.88	74.00	-30.12	peak	P
6	14956.427	70.37	-20.44	49.92	74.00	-24.08	peak	P

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2914.426	69.10	-29.70	39.40	74.00	-34.60	peak	P
2	4277.364	68.19	-29.73	38.47	74.00	-35.53	peak	P
3	6085.828	65.71	-24.49	41.22	74.00	-32.78	peak	P
4	8646.326	70.40	-24.63	45.76	74.00	-28.24	peak	P
5	11046.694	67.97	-22.67	45.30	74.00	-28.70	peak	P
6	14218.167	70.98	-20.87	50.11	74.00	-23.89	peak	P

Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2972.949	67.07	-30.10	36.97	74.00	-37.03	peak	P
2	4313.188	69.54	-29.55	39.99	74.00	-34.01	peak	P
3	6353.763	66.77	-25.89	40.88	74.00	-33.12	peak	P
4	8576.547	68.98	-25.49	43.49	74.00	-30.51	peak	P
5	11285.319	67.06	-23.08	43.98	74.00	-30.02	peak	P
6	14956.433	71.97	-19.94	52.03	74.00	-21.97	peak	P

Notes:

- 1).Measuring frequencies from 9 KHz~10th harmonic(ex.26GHz),at least have 20dB margin found between lowest internal used/generated frequency to 30 MHz.
- 2).Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex.26GHz)were made with an instrument using Peak detector mode.
- 3).18-25GHz at least have 20dB margin.No recording in the test report.
- 4) Level=Reading +Factor
Factor= Antenna Factor+ Cable Loss-Preamp Factor



8 Test Setup Photo

Please Refer to Appendix – Test Setup Photos.

9 EUT Constructional Details (EUT Photos)

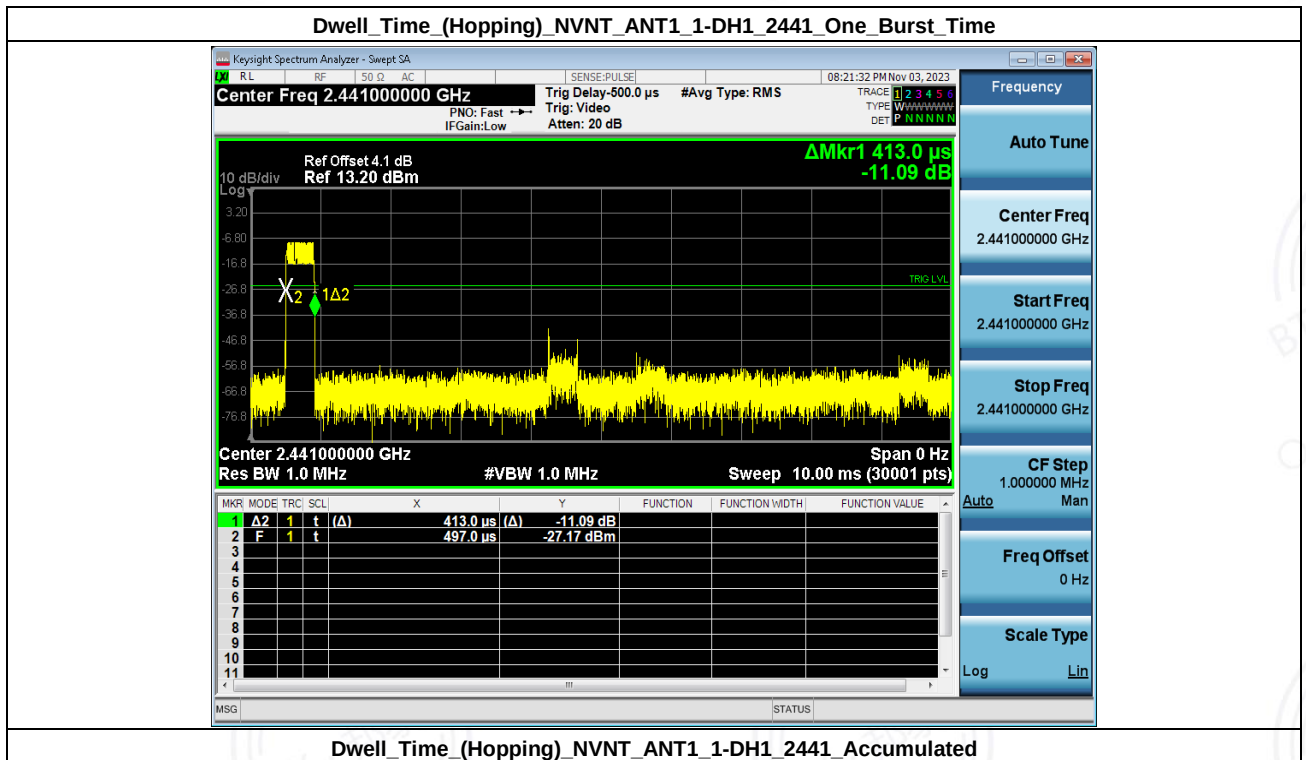
Please Refer to Appendix - External and Internal Appendix EUT Photos

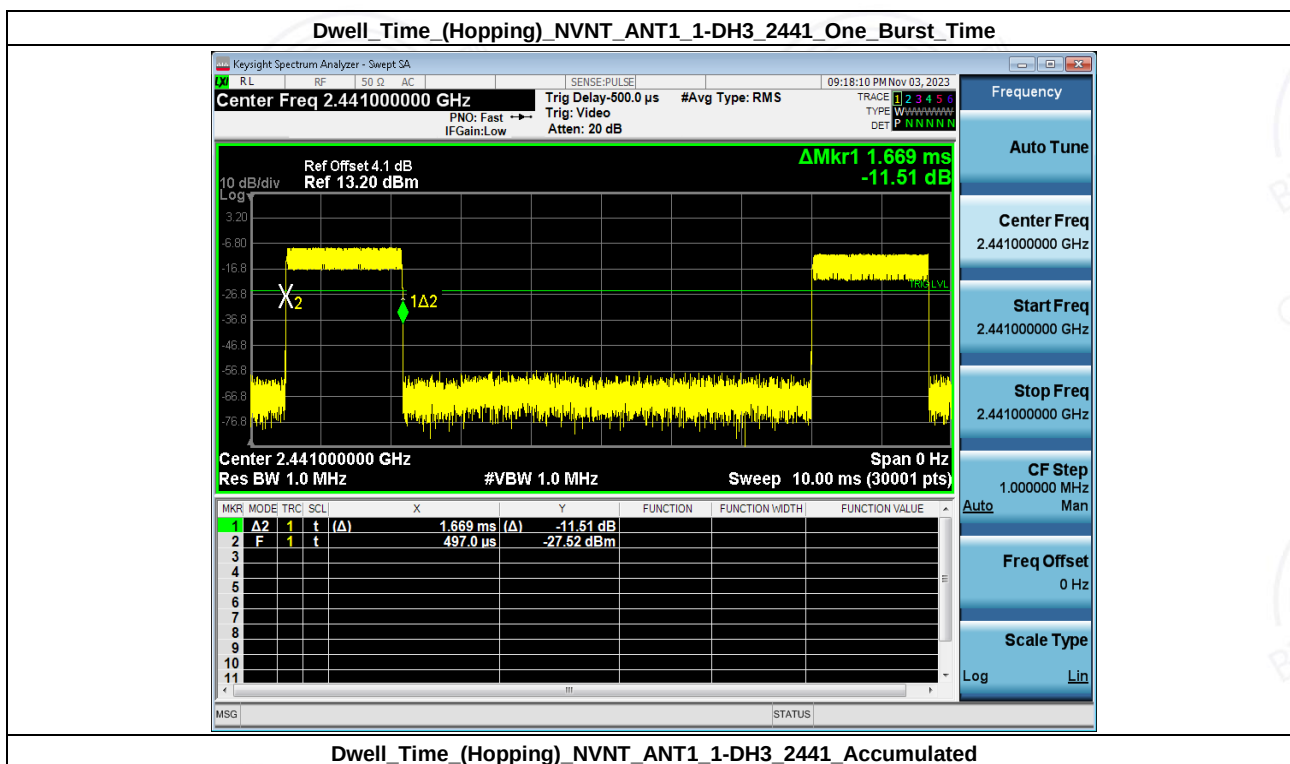
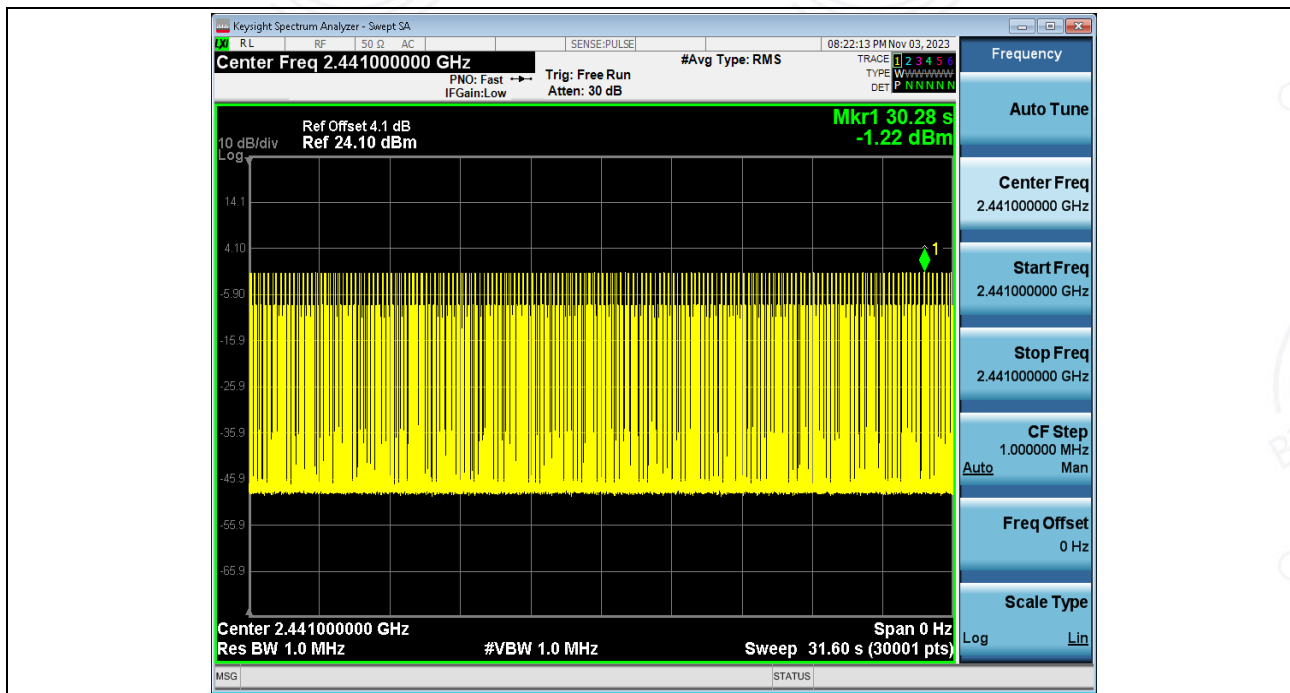


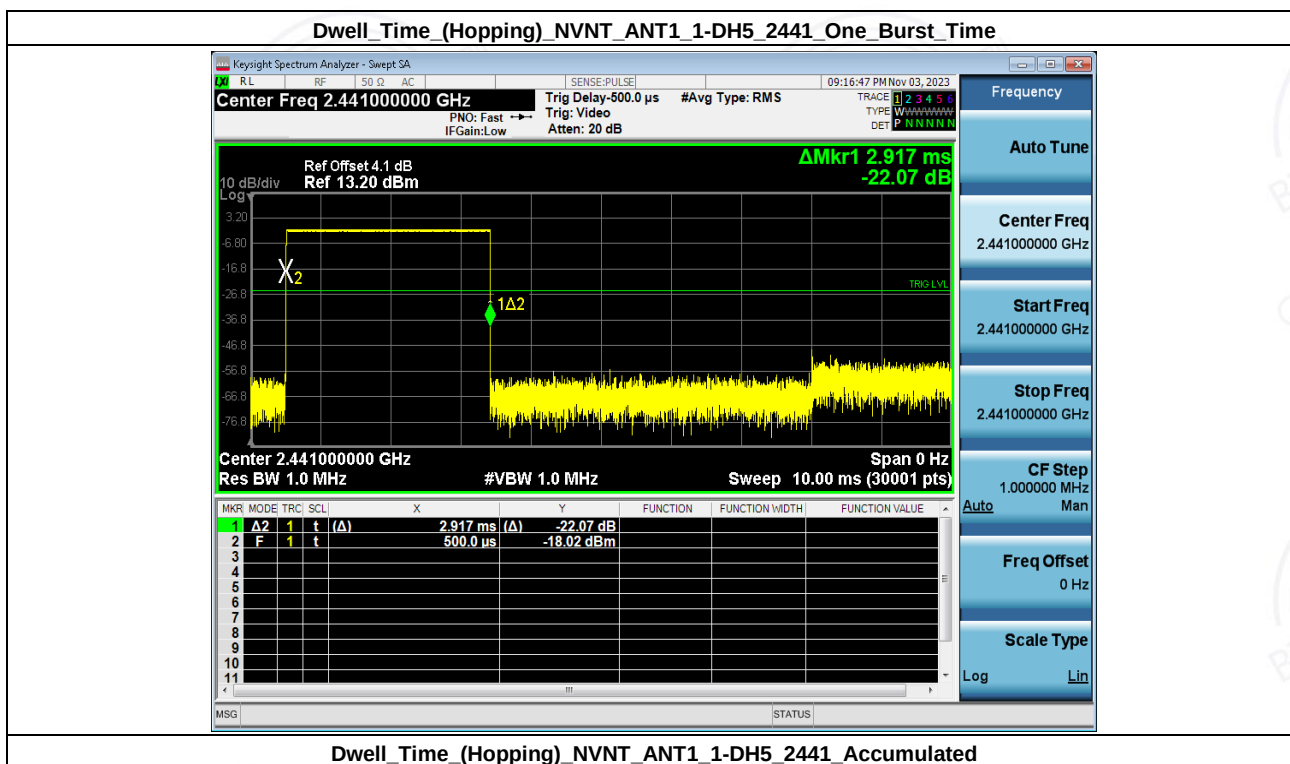
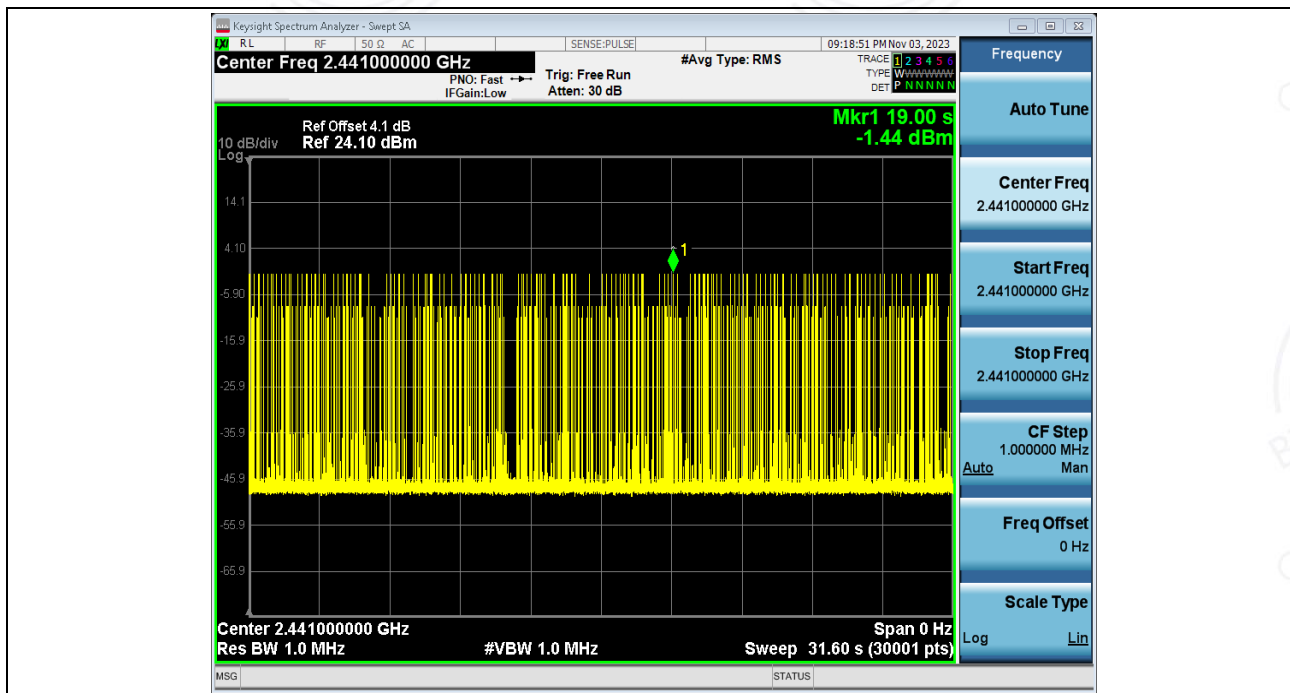
10 Appendix

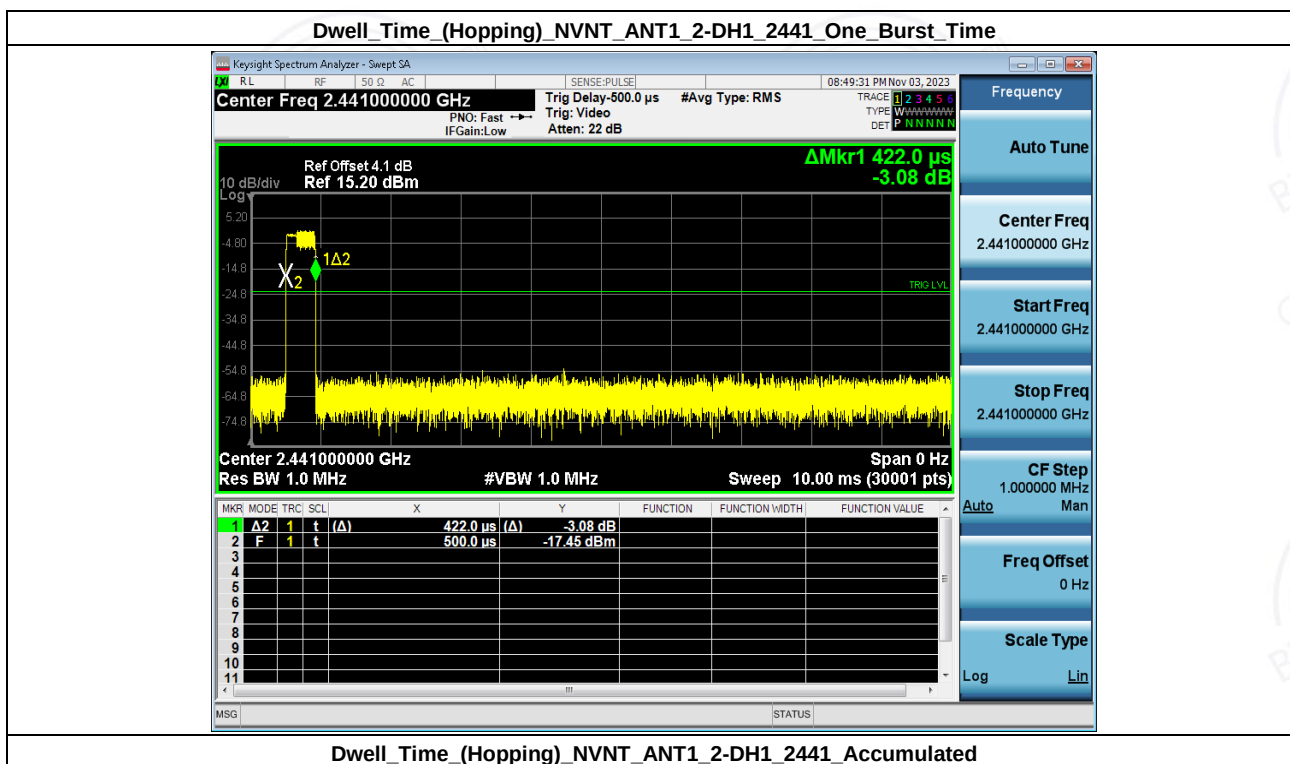
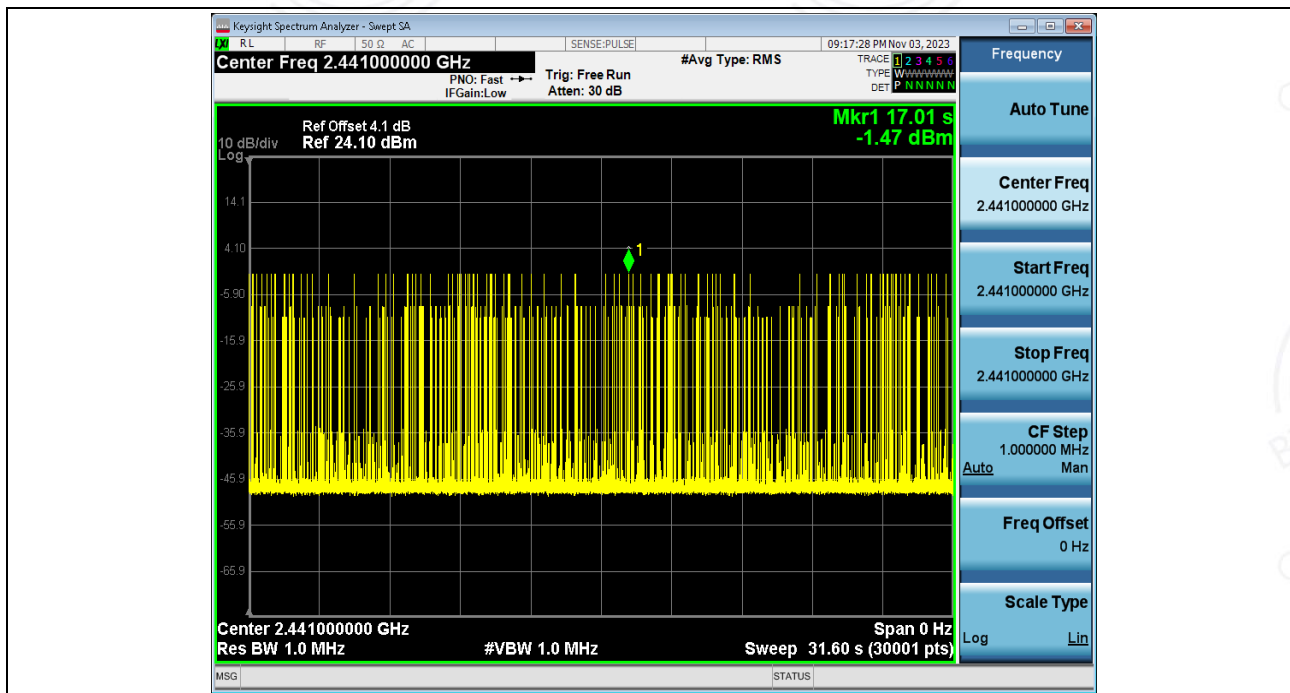
1. Dwell Time (Hopping)

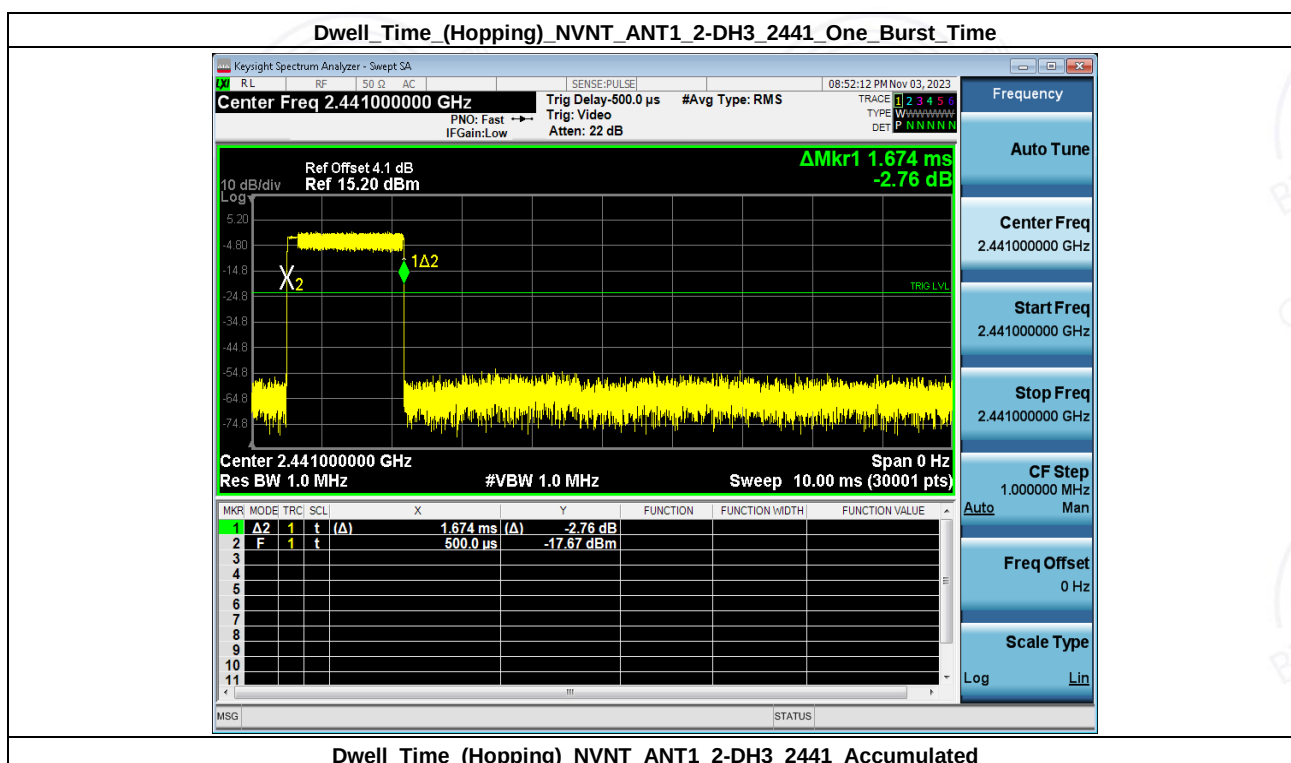
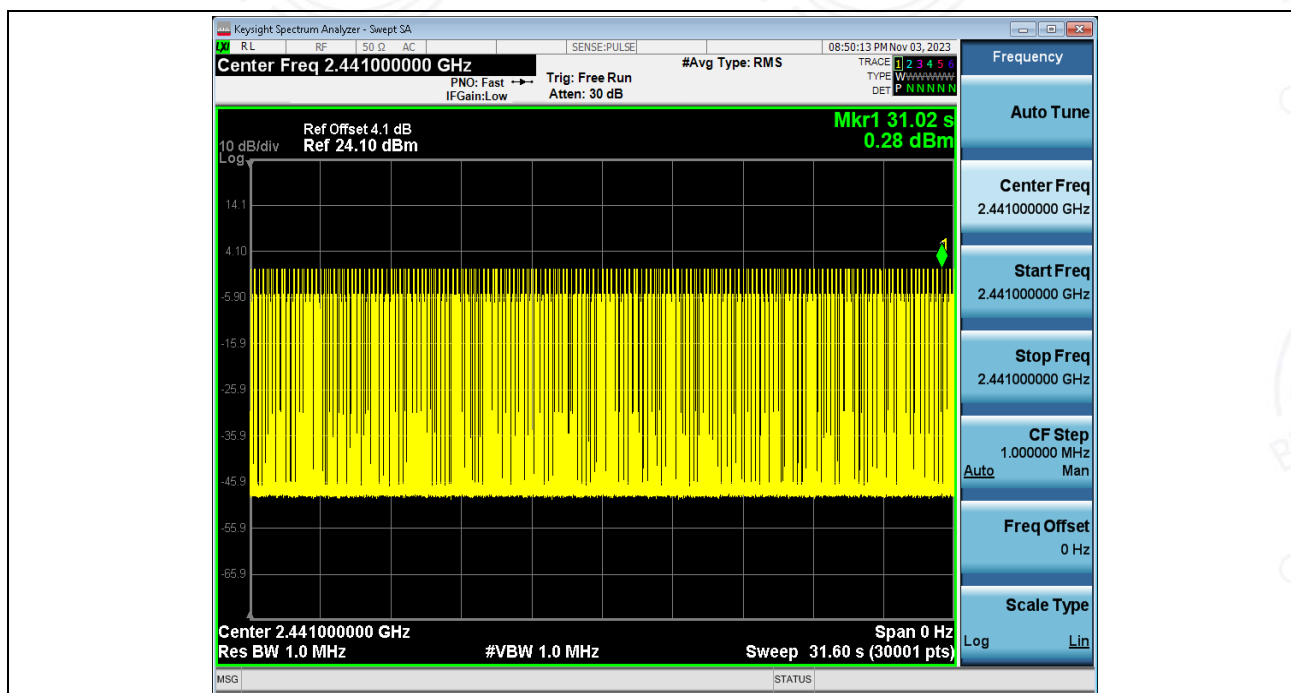
Condition	Antenna	Packet Type	Pulse Time(ms)	Hops	Dwell Time(ms)	Limit(s)	Result
NVNT	ANT1	1-DH1	0.413	320.00	132.160	0.40	Pass
NVNT	ANT1	1-DH3	1.669	163.00	272.047	0.40	Pass
NVNT	ANT1	1-DH5	2.917	101.00	294.617	0.40	Pass
NVNT	ANT1	2-DH1	0.422	320.00	135.040	0.40	Pass
NVNT	ANT1	2-DH3	1.674	154.00	257.796	0.40	Pass
NVNT	ANT1	2-DH5	2.918	102.00	297.636	0.40	Pass
NVNT	ANT1	3-DH1	0.422	316.00	133.352	0.40	Pass
NVNT	ANT1	3-DH3	1.674	157.00	262.818	0.40	Pass
NVNT	ANT1	3-DH5	2.922	110.00	321.420	0.40	Pass





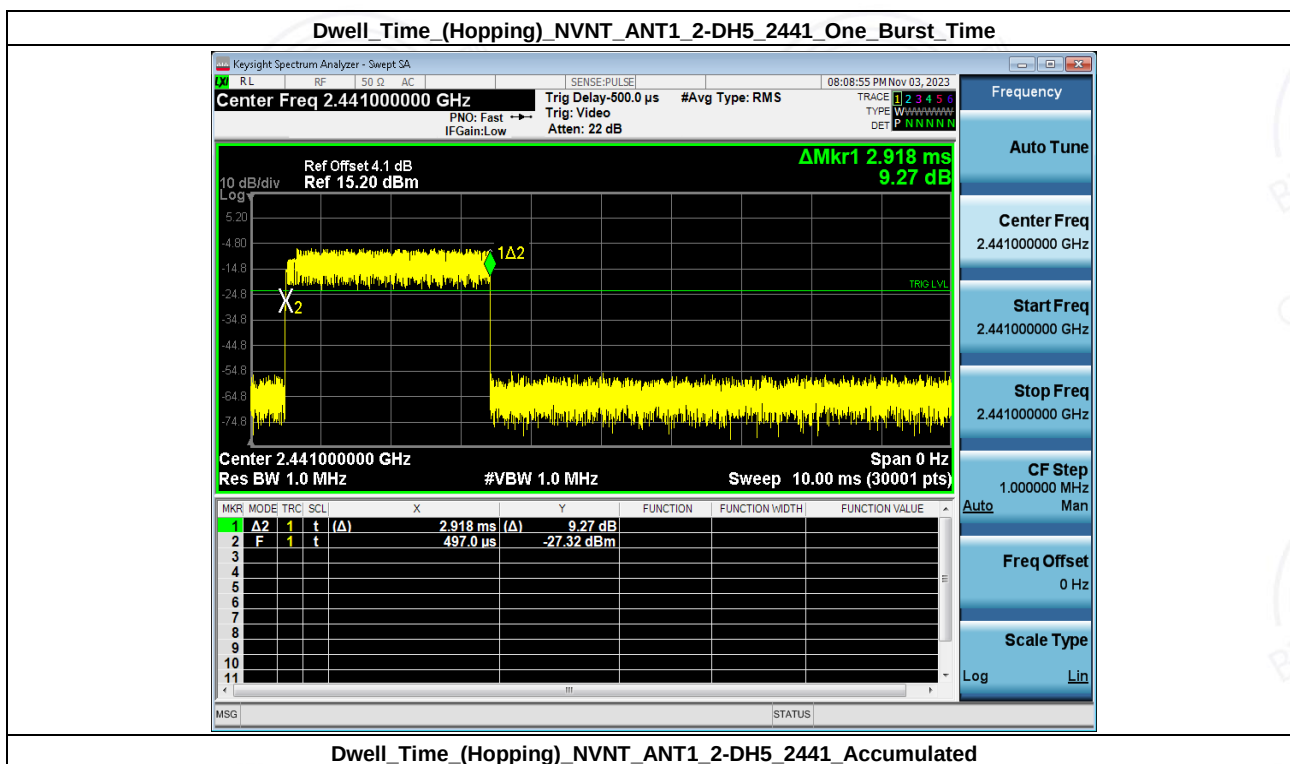
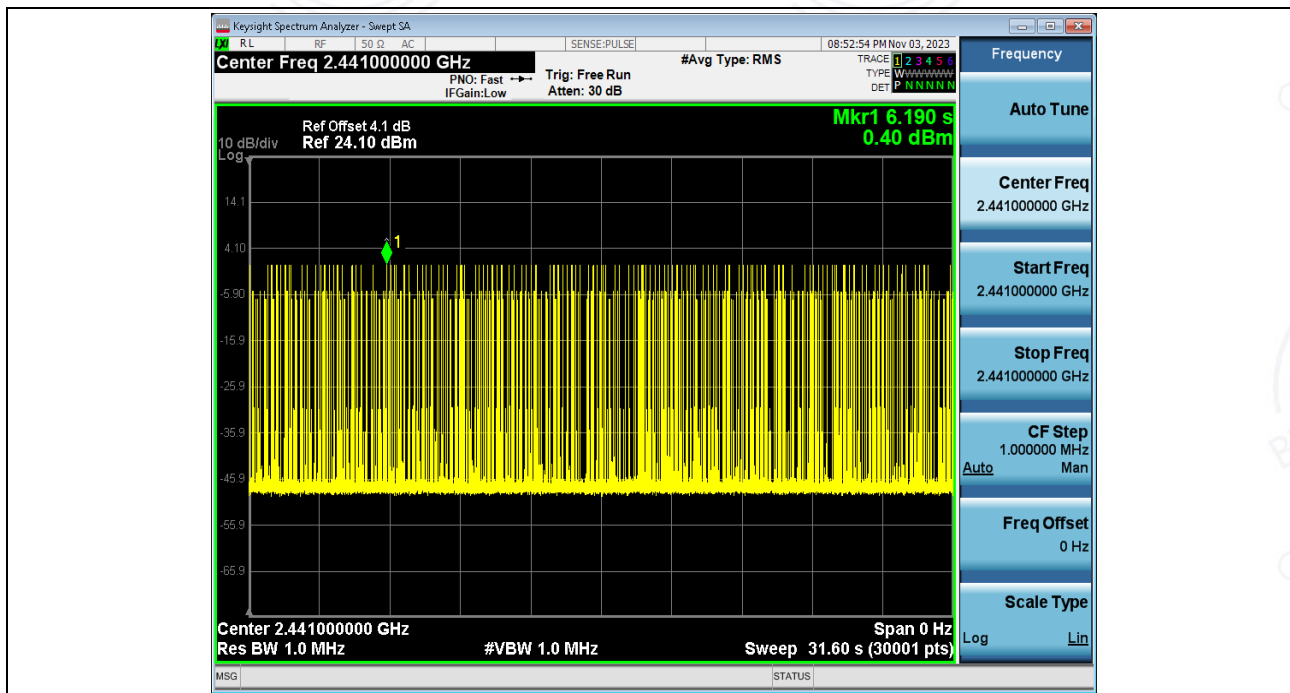


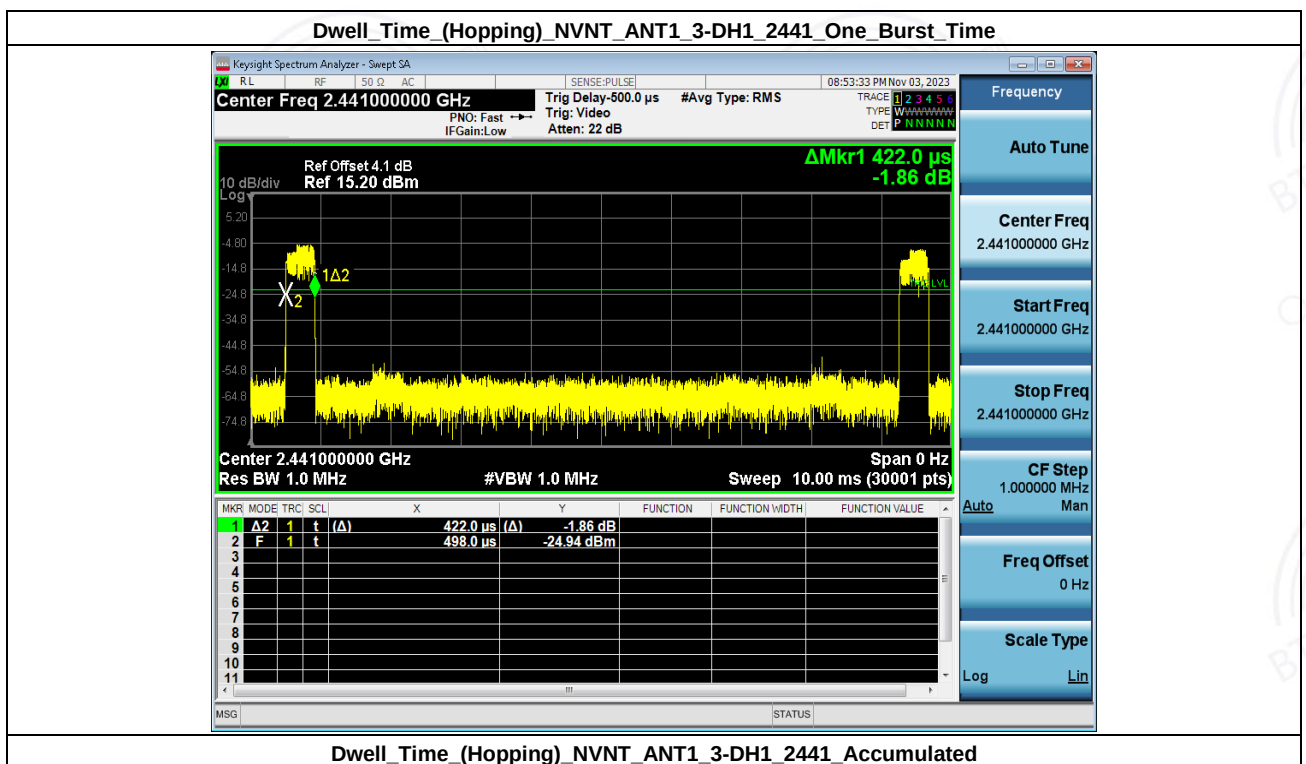
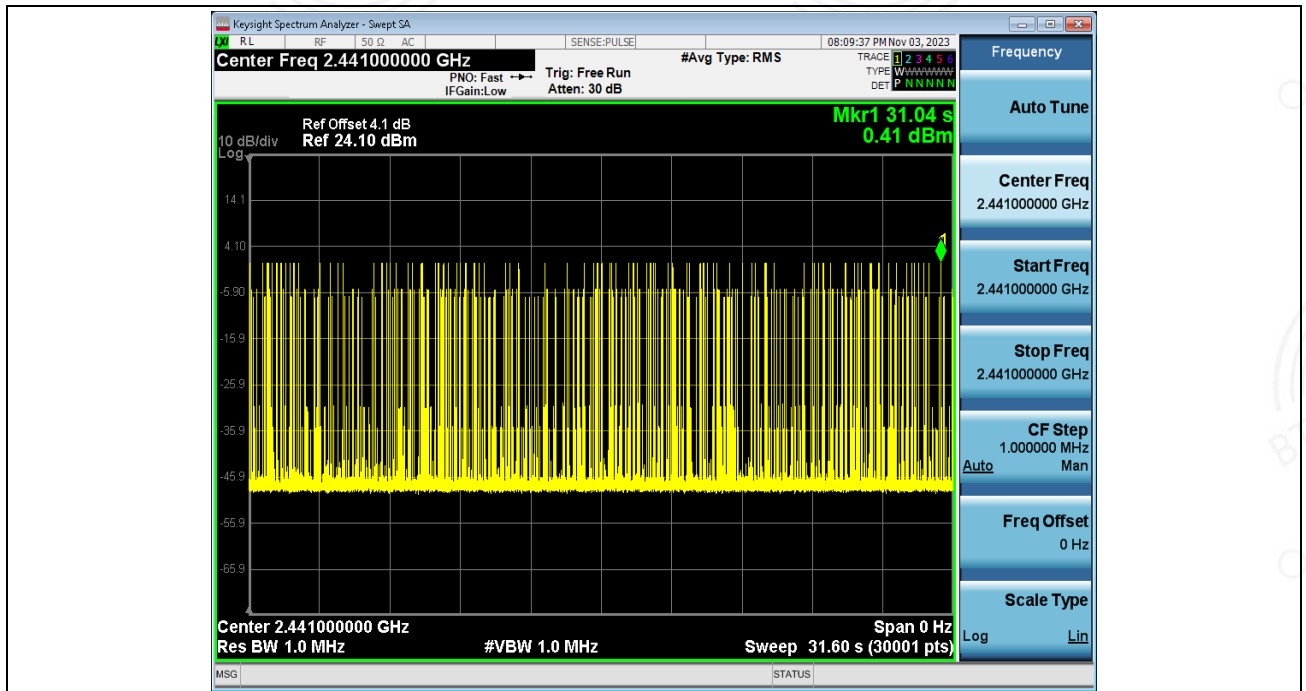


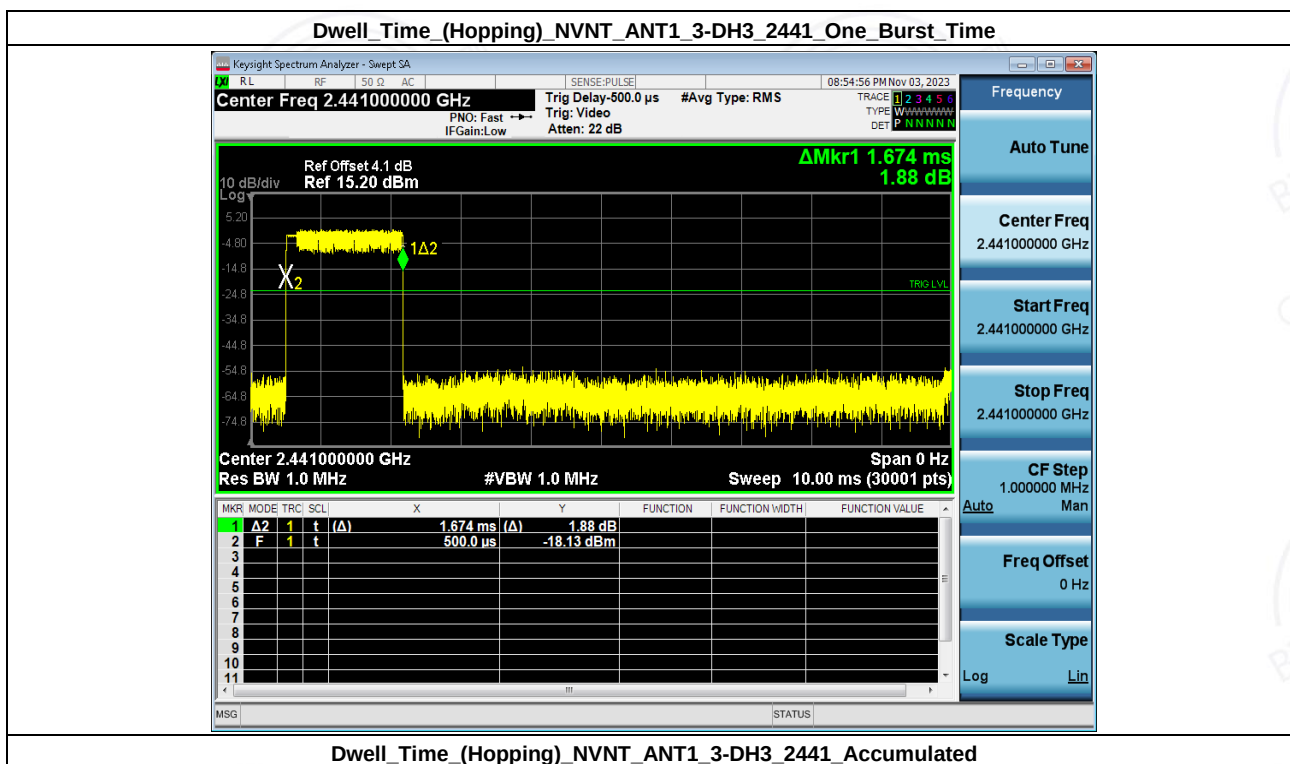
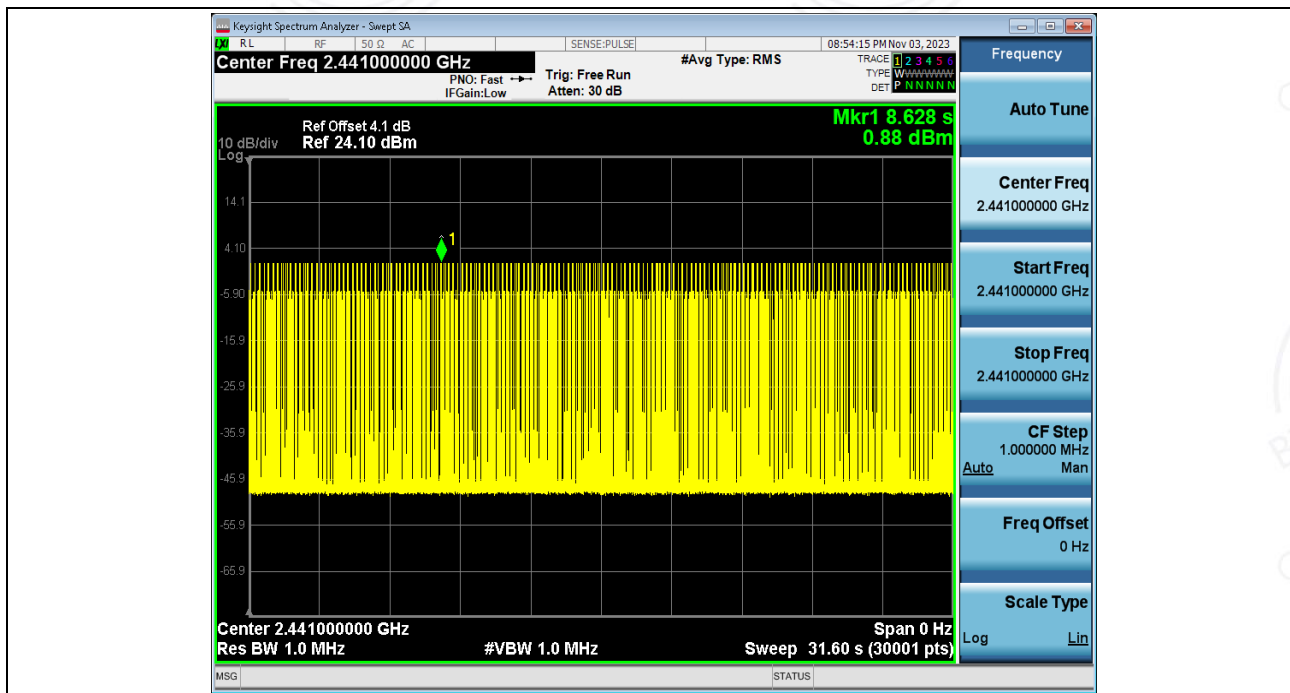


Dwell Time (Hopping)_NVNT_ANT1_2-DH3_2441_Accumulated



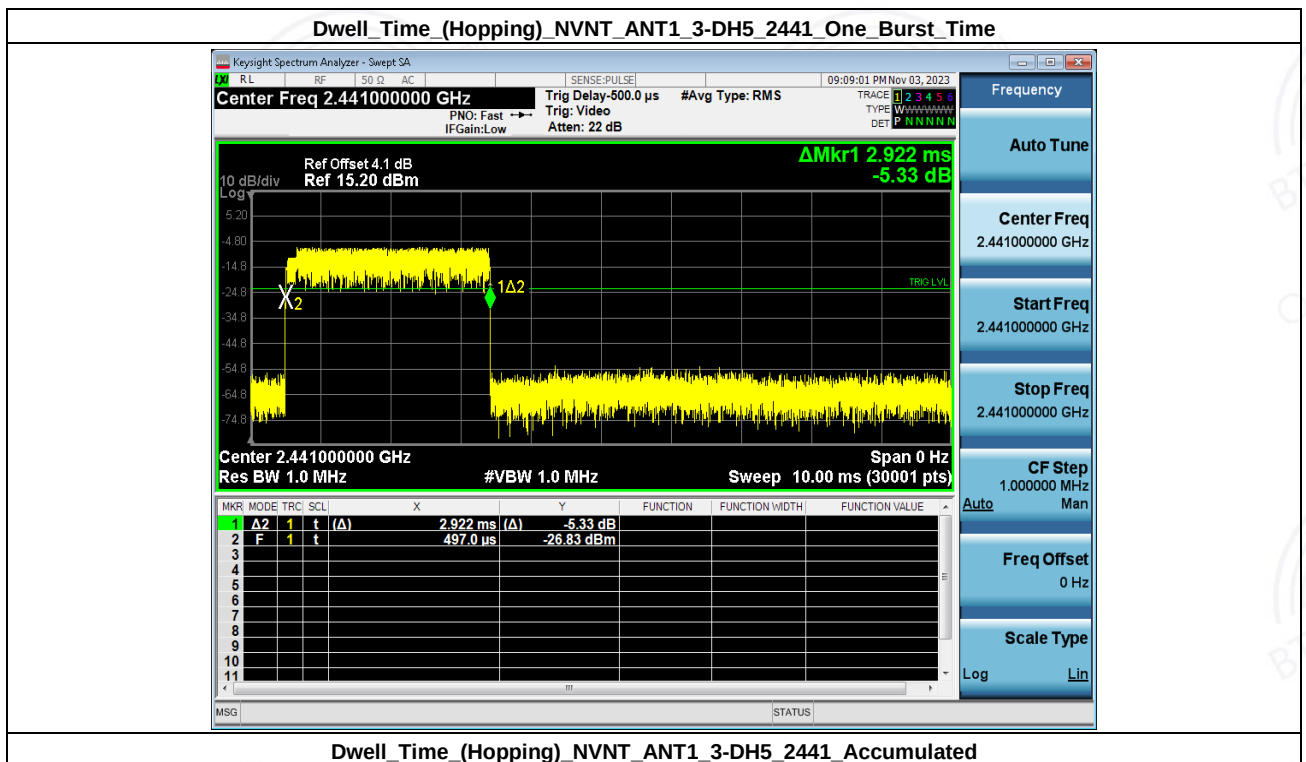
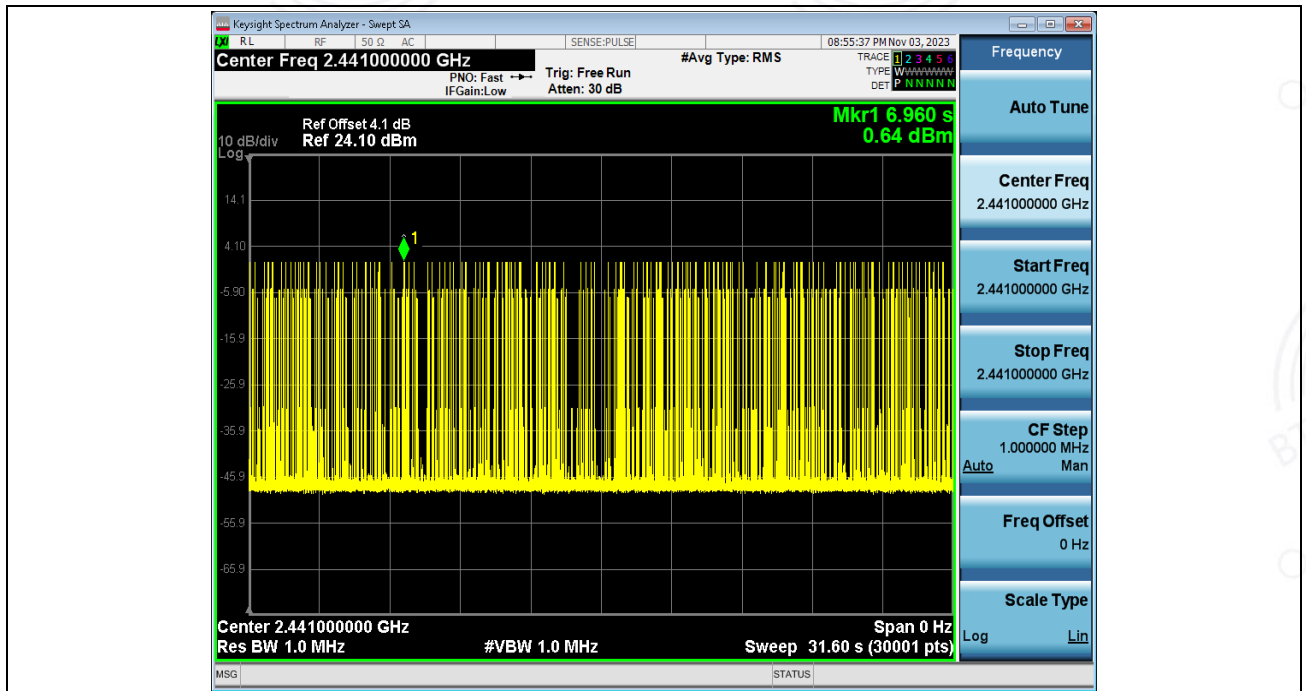


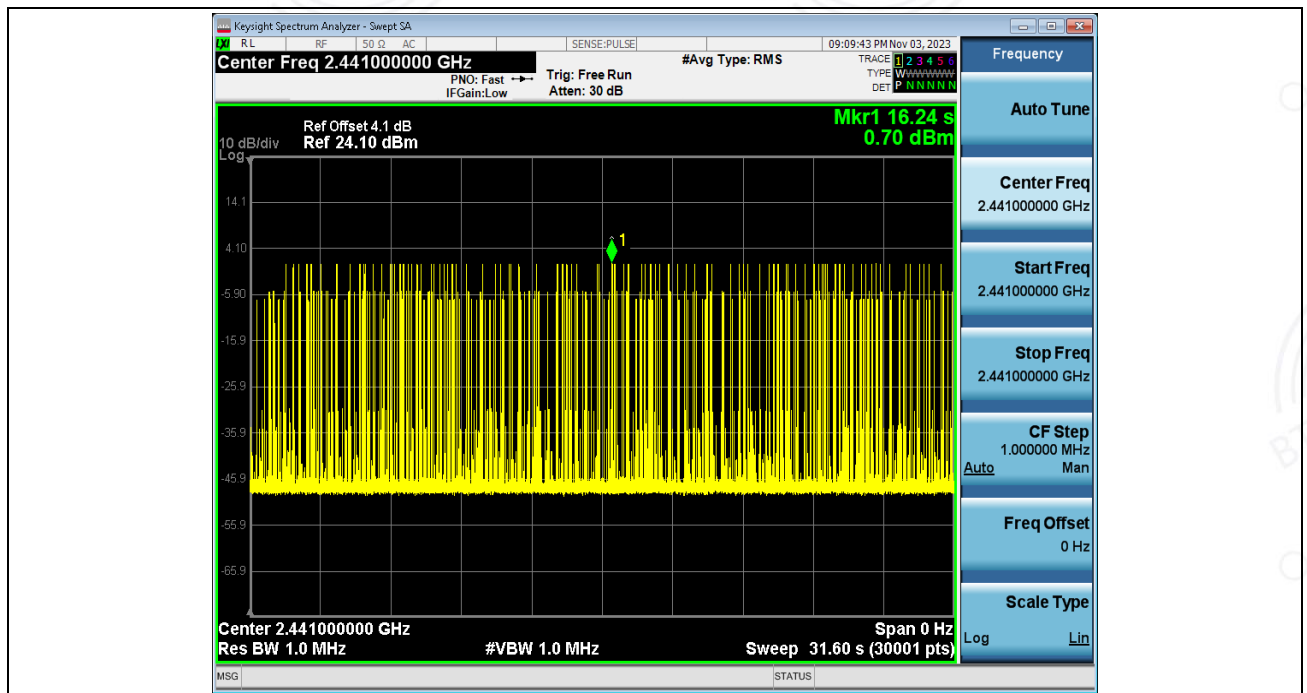




Dwell_Time_(Hopping)_NVNT_ANT1_3-DH3_2441_Accumulated

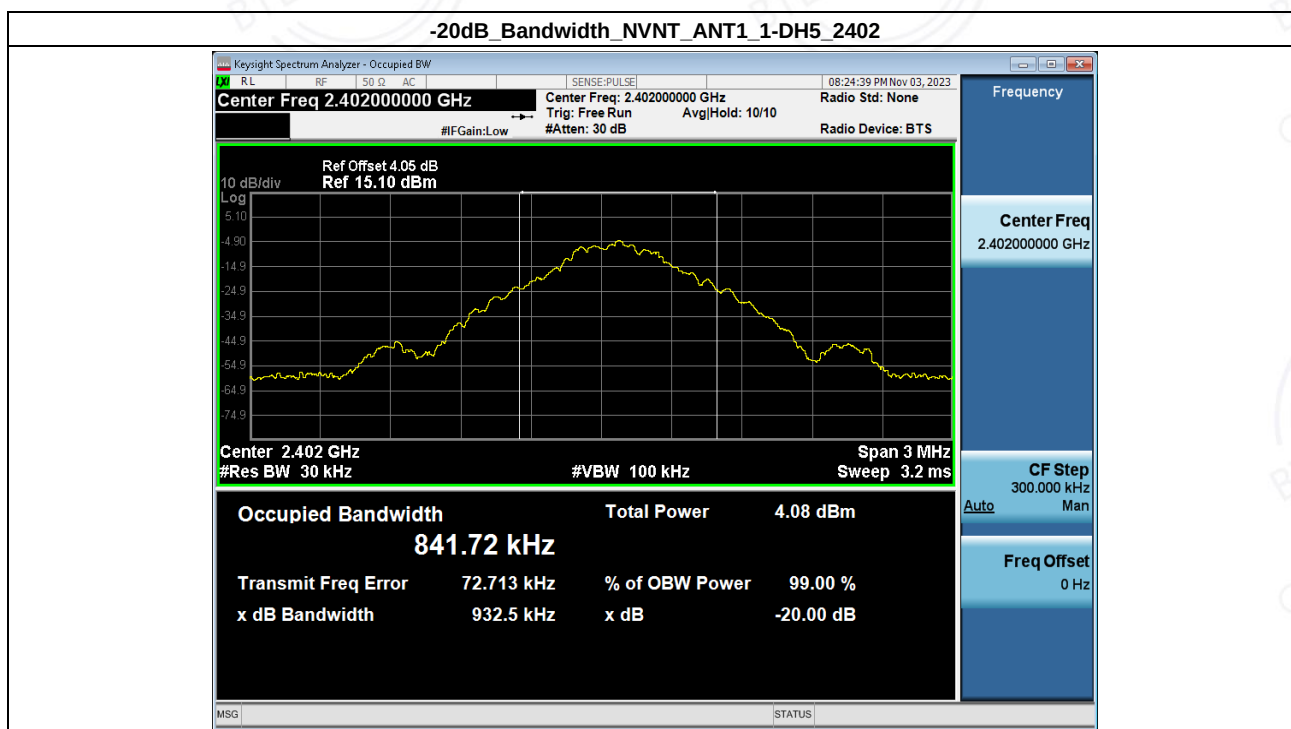




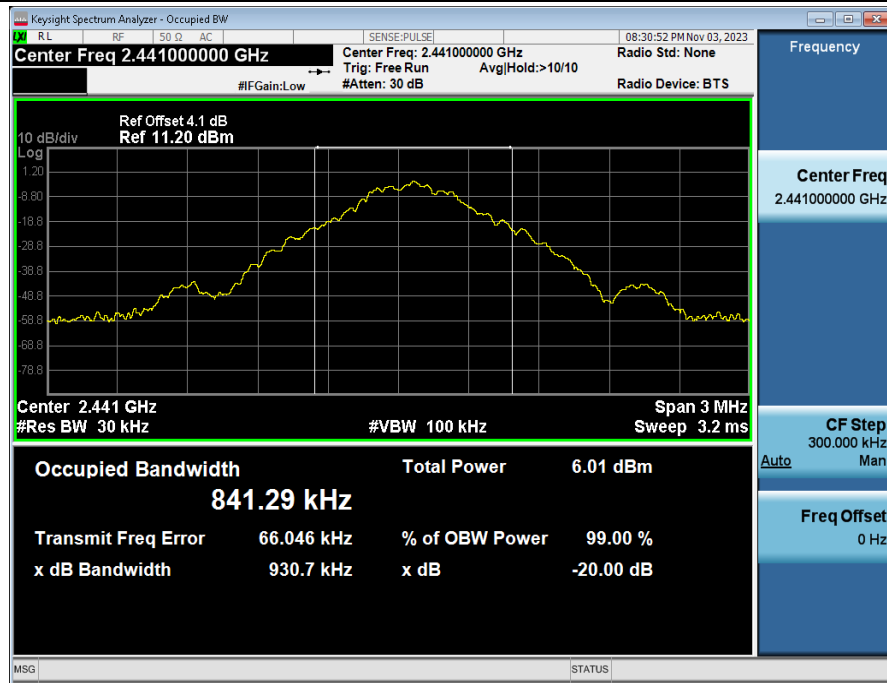


2. -20dB Bandwidth

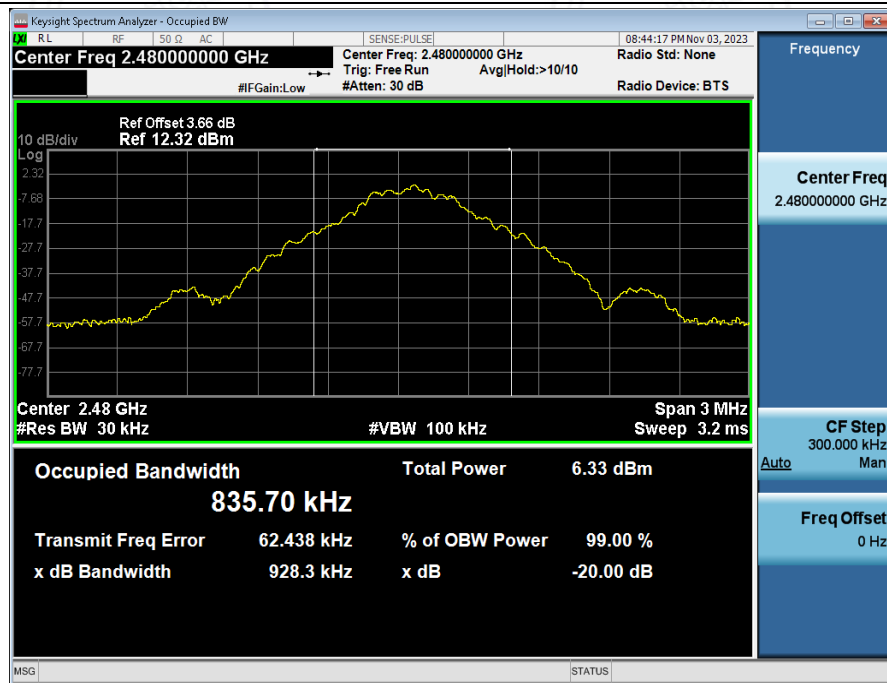
Condition	Antenna	Modulation	Frequency (MHz)	-20dB BW(MHz)	if larger than CFS
NVNT	ANT1	1-DH5	2402.00	0.932	No
NVNT	ANT1	1-DH5	2441.00	0.931	No
NVNT	ANT1	1-DH5	2480.00	0.928	No
NVNT	ANT1	2-DH5	2402.00	1.283	Yes
NVNT	ANT1	2-DH5	2441.00	1.284	Yes
NVNT	ANT1	2-DH5	2480.00	1.288	Yes
NVNT	ANT1	3-DH5	2402.00	1.300	Yes
NVNT	ANT1	3-DH5	2441.00	1.307	Yes
NVNT	ANT1	3-DH5	2480.00	1.295	Yes



-20dB Bandwidth_NVNT_ANT1_1-DH5_2441



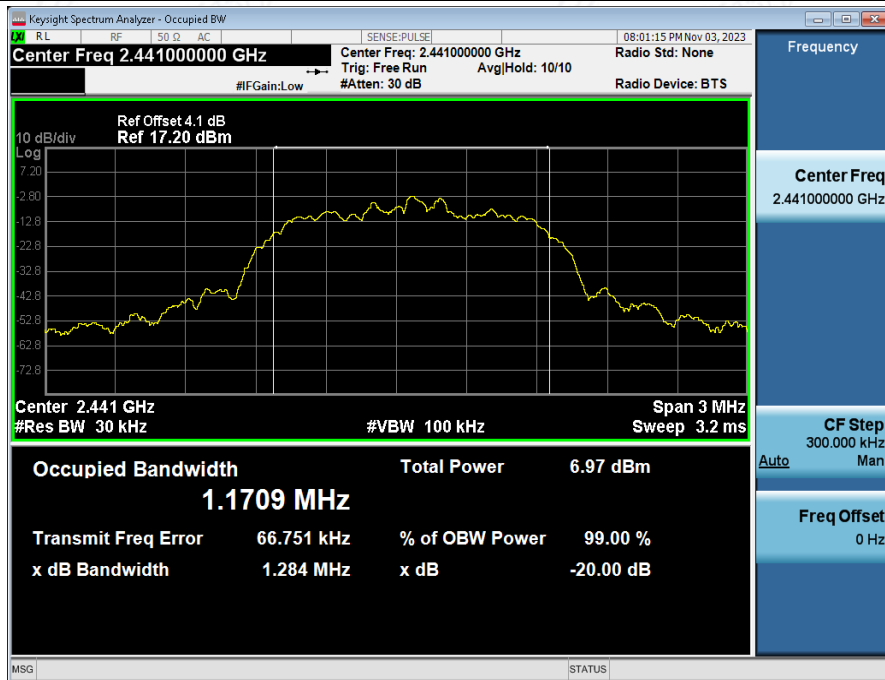
-20dB Bandwidth_NVNT_ANT1_1-DH5_2480



-20dB Bandwidth_NVNT_ANT1_2-DH5_2402



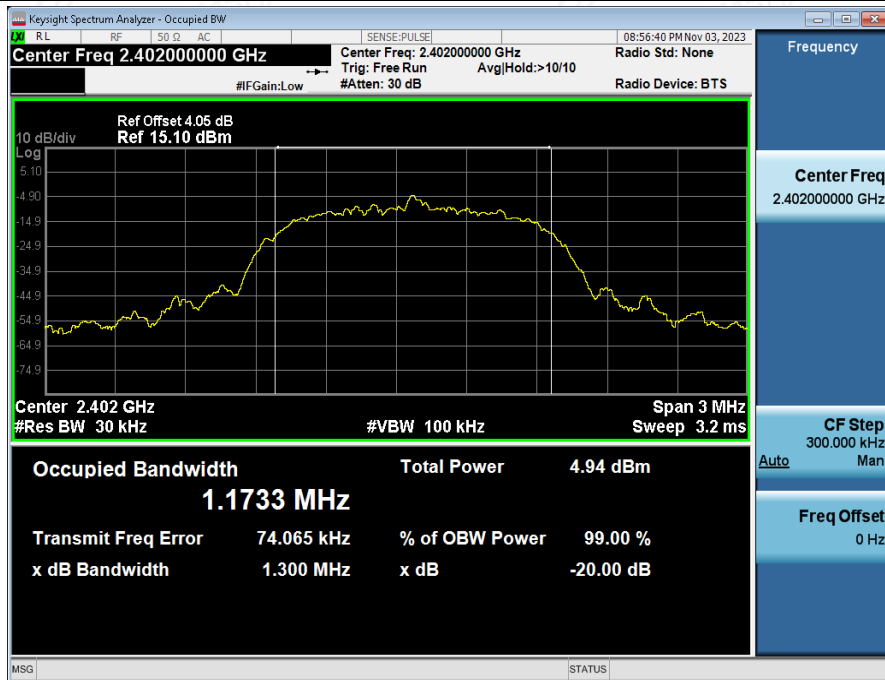
-20dB Bandwidth_NVNT_ANT1_2-DH5_2441



-20dB Bandwidth_NVNT_ANT1_2-DH5_2480



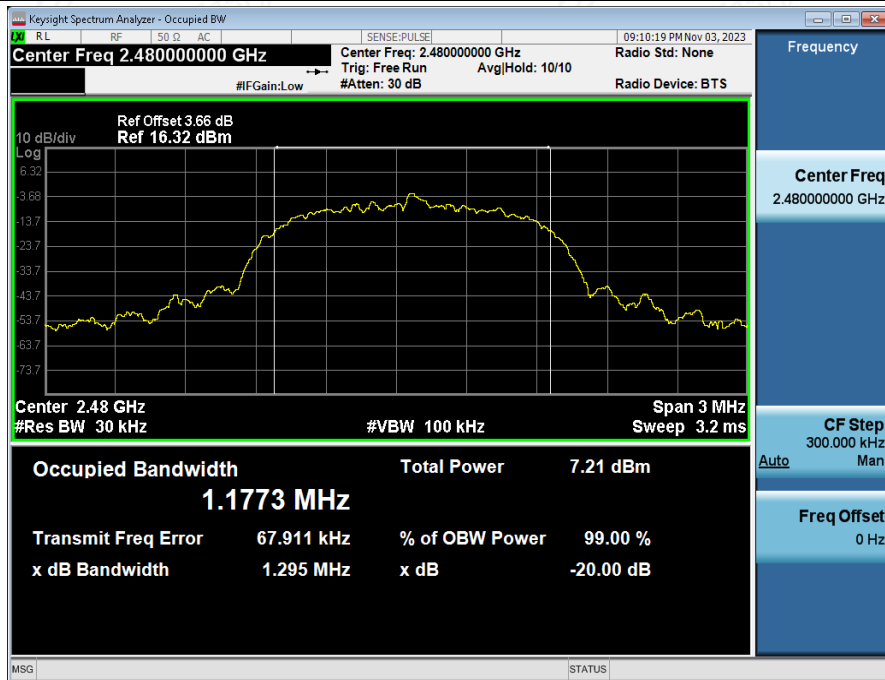
-20dB Bandwidth_NVNT_ANT1_3-DH5_2402



-20dB Bandwidth_NVNT_ANT1_3-DH5_2441

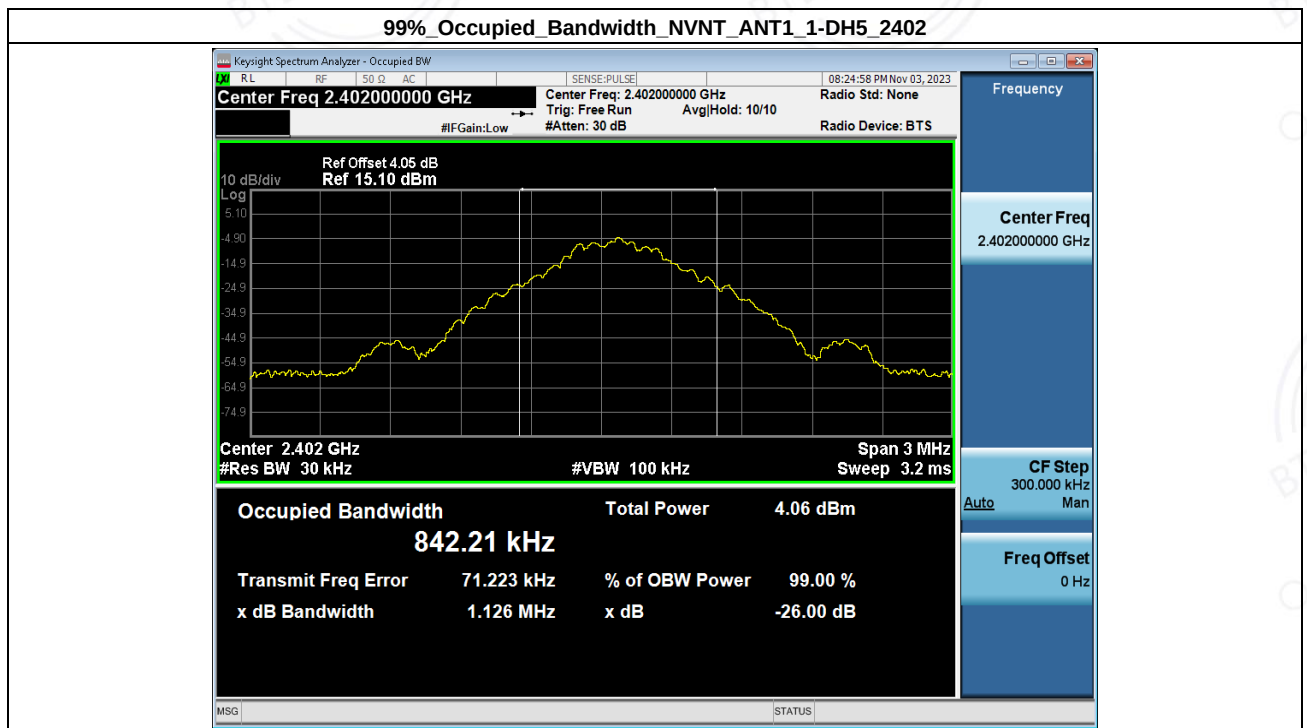


-20dB Bandwidth_NVNT_ANT1_3-DH5_2480



3. 99% Occupied Bandwidth

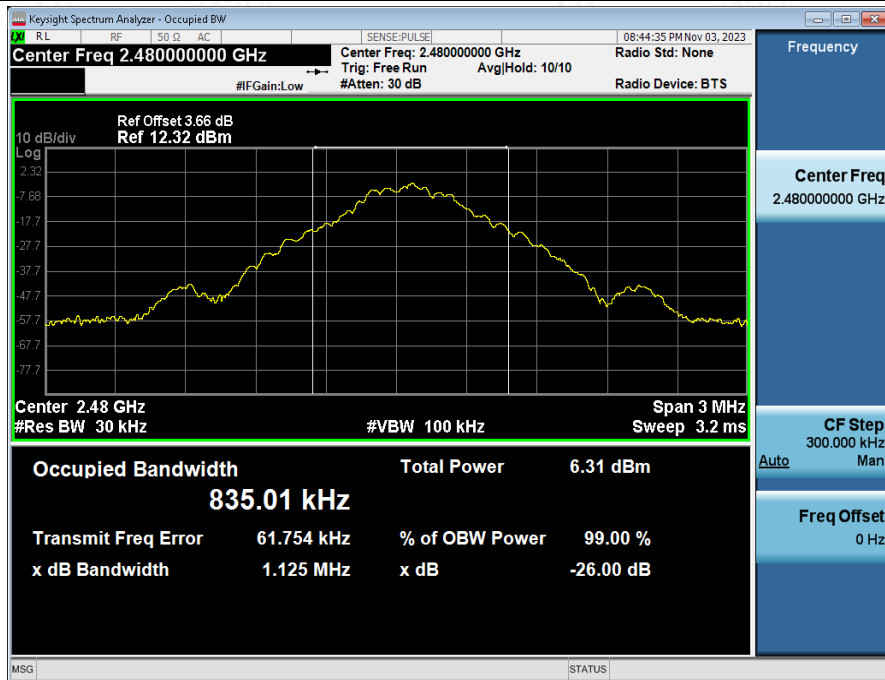
Condition	Antenna	Modulation	Frequency (MHz)	99% BW (MHz)
NVNT	ANT1	1-DH5	2402.00	0.842
NVNT	ANT1	1-DH5	2441.00	0.842
NVNT	ANT1	1-DH5	2480.00	0.835
NVNT	ANT1	2-DH5	2402.00	1.171
NVNT	ANT1	2-DH5	2441.00	1.171
NVNT	ANT1	2-DH5	2480.00	1.173
NVNT	ANT1	3-DH5	2402.00	1.176
NVNT	ANT1	3-DH5	2441.00	1.174
NVNT	ANT1	3-DH5	2480.00	1.175

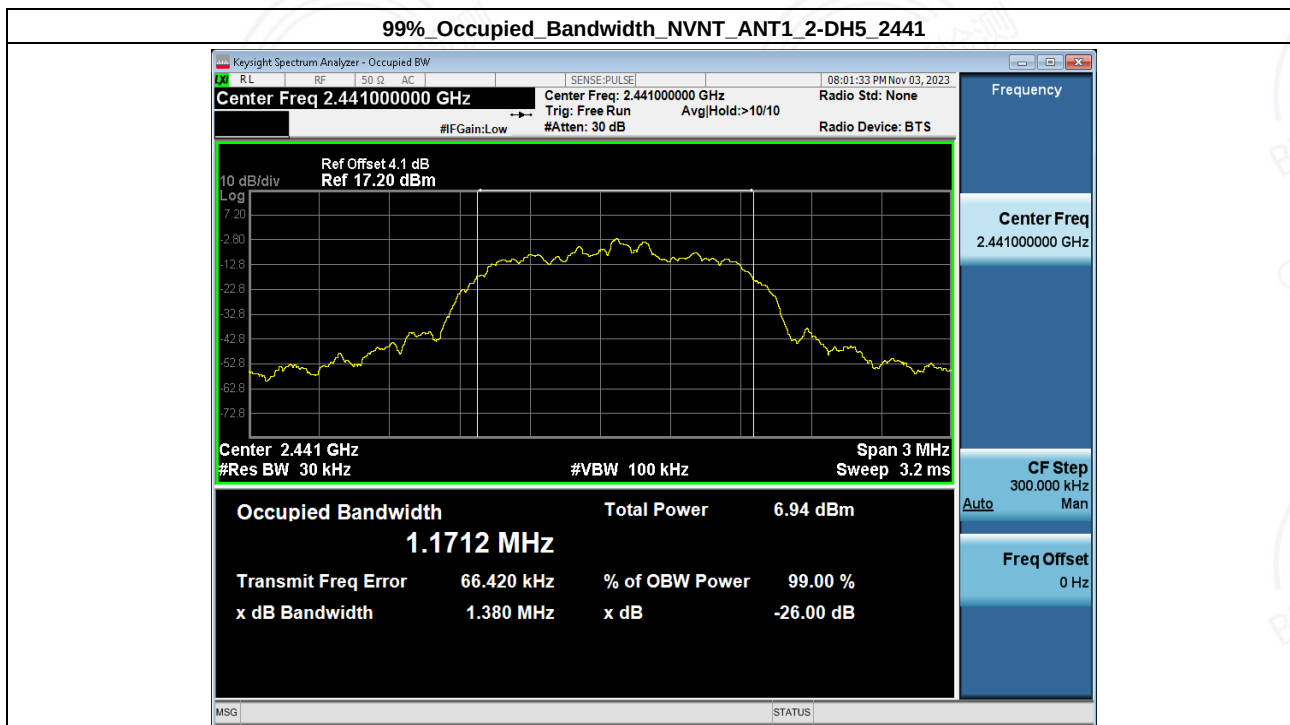
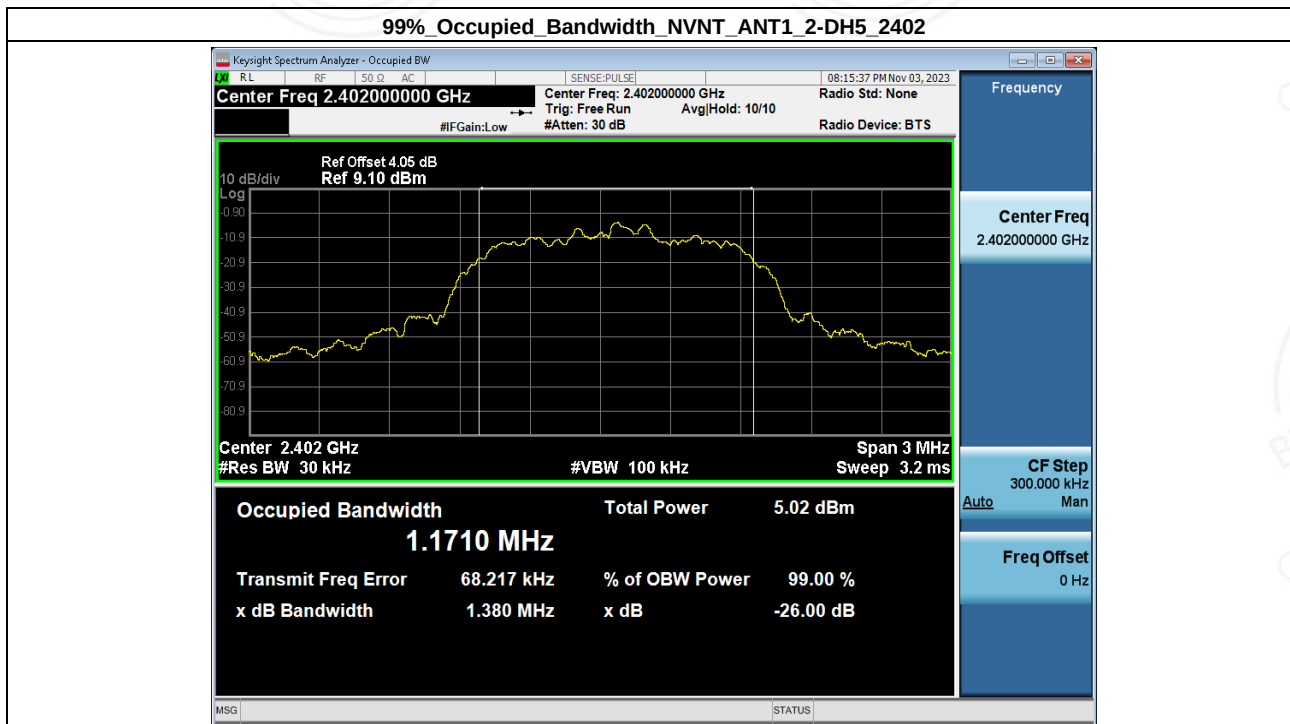


99% Occupied Bandwidth NVNT_ANT1_1-DH5_2441



99% Occupied Bandwidth NVNT_ANT1_1-DH5_2480





99% Occupied Bandwidth NVNT_ANT1_2-DH5_2480



99% Occupied Bandwidth NVNT_ANT1_3-DH5_2402



99% Occupied Bandwidth NVNT_ANT1_3-DH5_2441

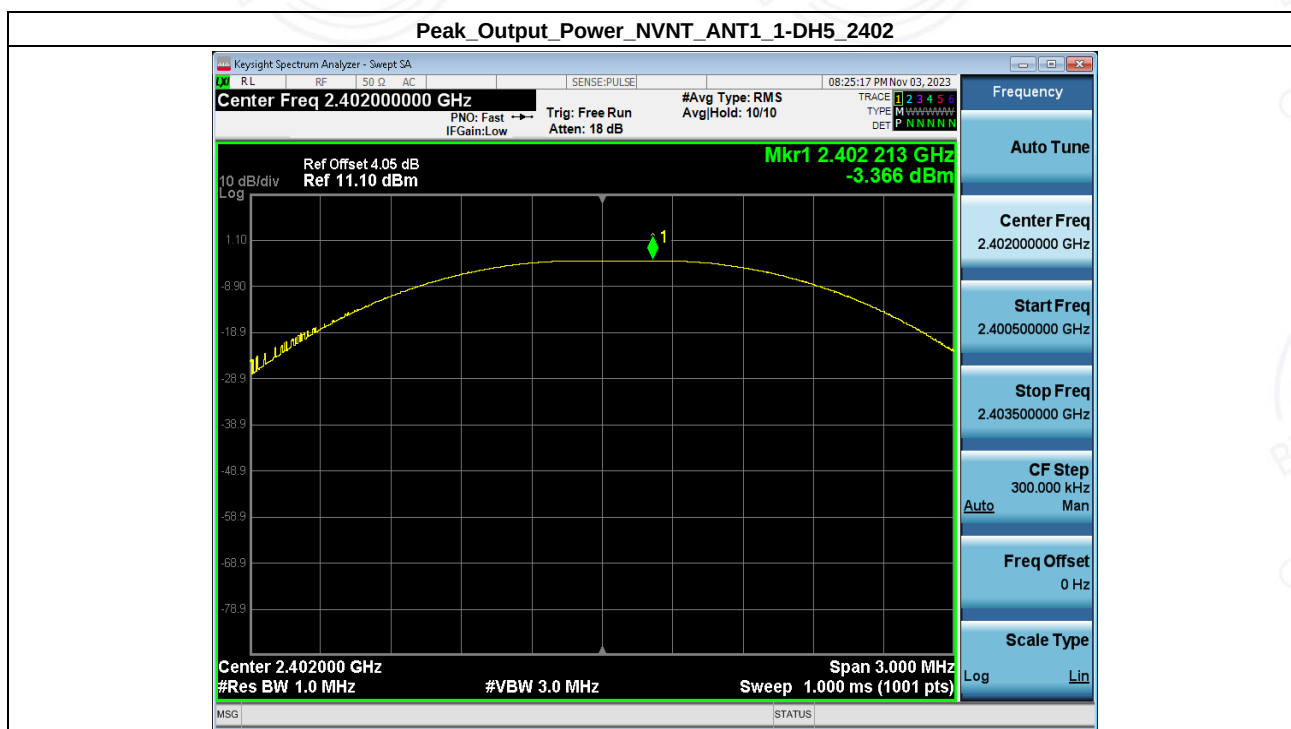


99% Occupied Bandwidth NVNT_ANT1_3-DH5_2480

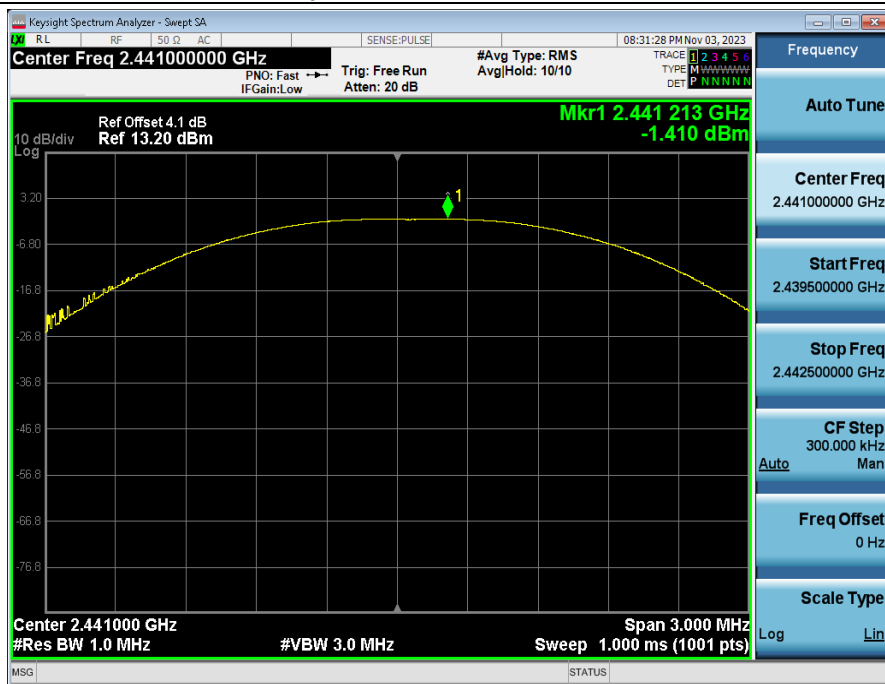


4. Peak Output Power

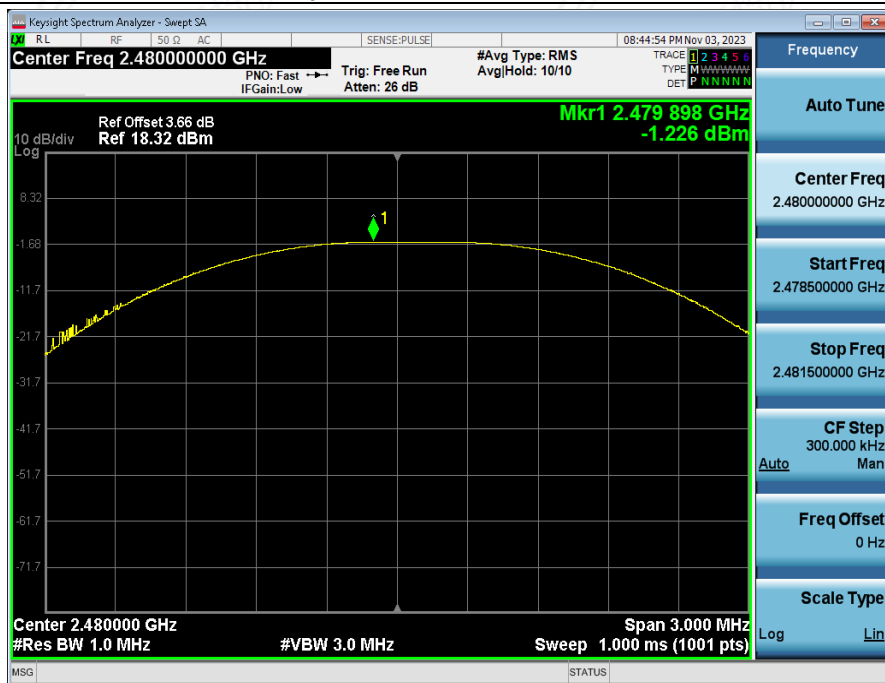
Condition	Antenna	Modulation	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1-DH5	2402.00	-3.37	0.46	1000	Pass
NVNT	ANT1	1-DH5	2441.00	-1.41	0.72	1000	Pass
NVNT	ANT1	1-DH5	2480.00	-1.23	0.75	1000	Pass
NVNT	ANT1	2-DH5	2402.00	-0.90	0.81	125	Pass
NVNT	ANT1	2-DH5	2441.00	0.94	1.24	125	Pass
NVNT	ANT1	2-DH5	2480.00	1.13	1.30	125	Pass
NVNT	ANT1	3-DH5	2402.00	-0.38	0.92	125	Pass
NVNT	ANT1	3-DH5	2441.00	1.48	1.41	125	Pass
NVNT	ANT1	3-DH5	2480.00	1.68	1.47	125	Pass



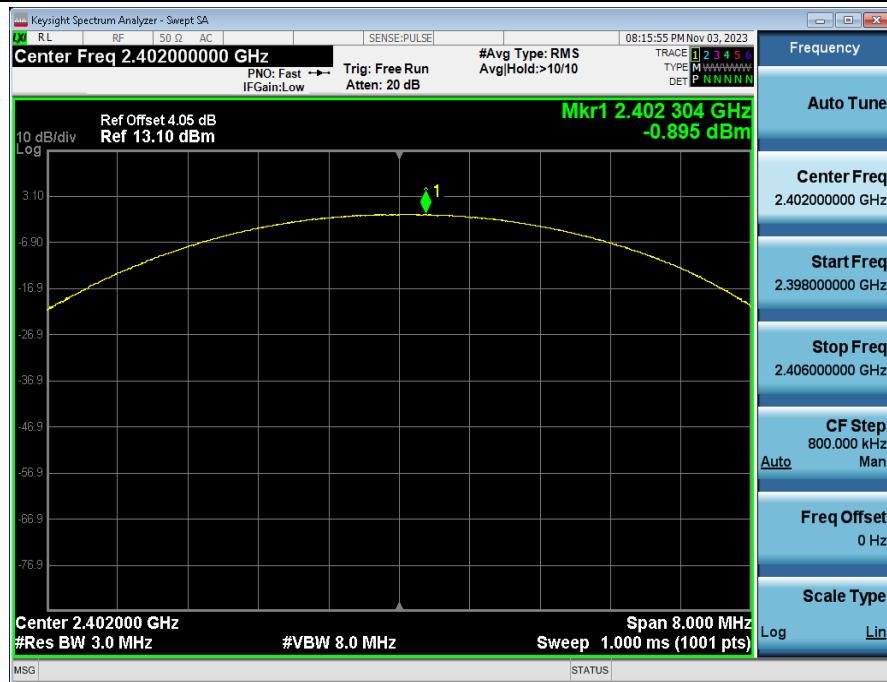
Peak_Output_Power_NVNT_ANT1_1-DH5_2441



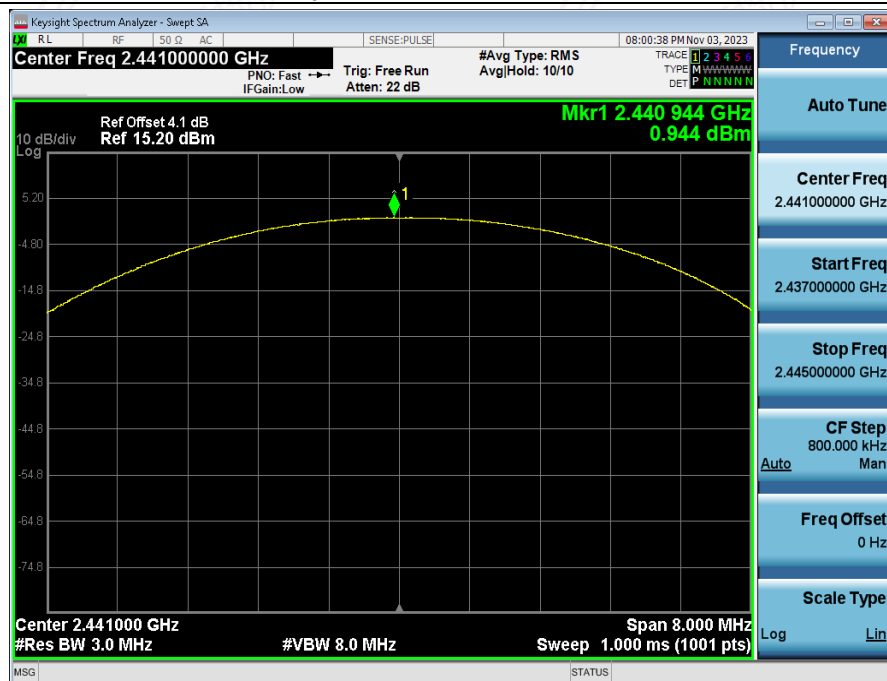
Peak_Output_Power_NVNT_ANT1_1-DH5_2480



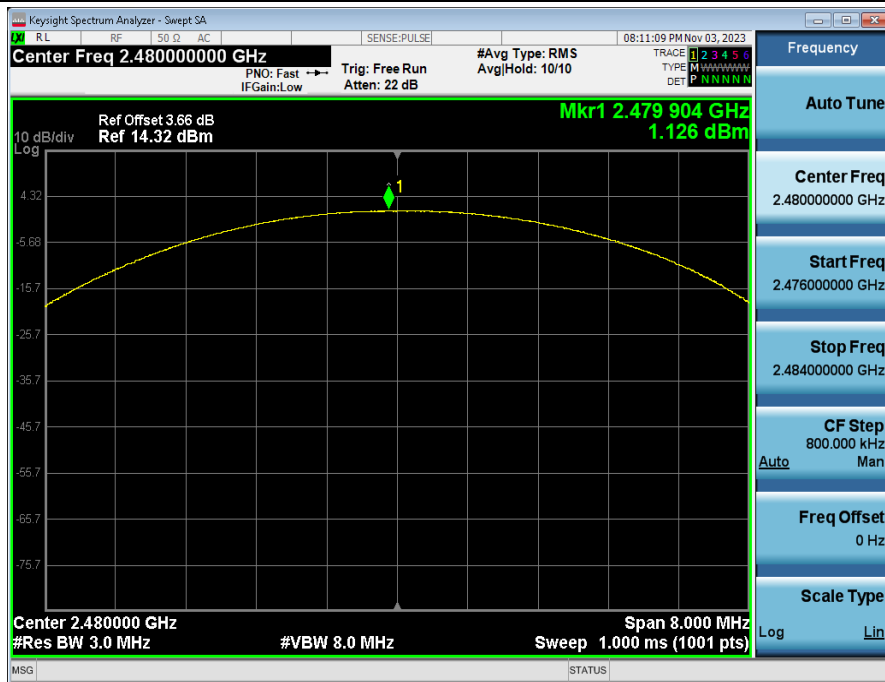
Peak_Output_Power_NVNT_ANT1_2-DH5_2402



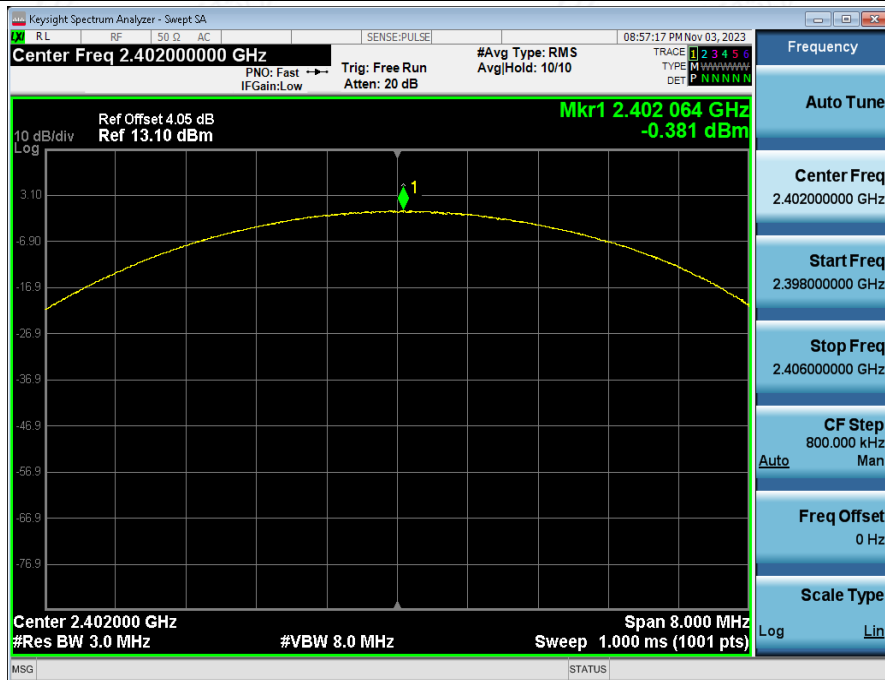
Peak_Output_Power_NVNT_ANT1_2-DH5_2441



Peak_Output_Power_NVNT_ANT1_2-DH5_2480



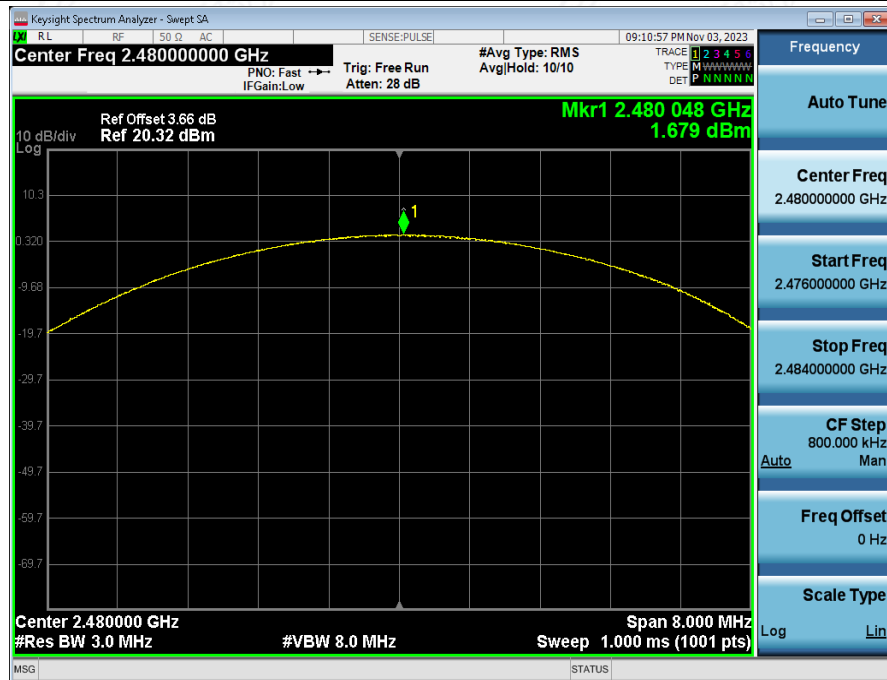
Peak_Output_Power_NVNT_ANT1_3-DH5_2402



Peak Output Power_NVNT_ANT1_3-DH5_2441



Peak Output Power_NVNT_ANT1_3-DH5_2480



5. Spurious Emissions

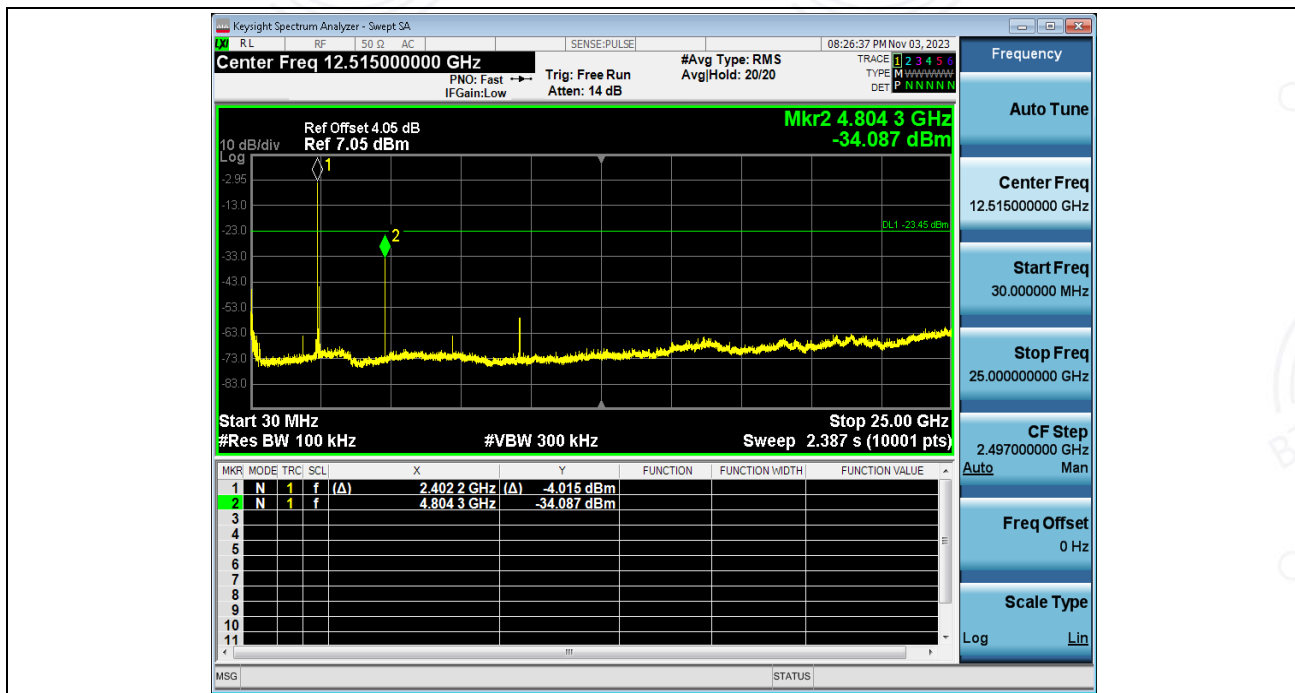
Condition	Antenna	Modulation	TX Mode	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-34.087	-23.454	Pass
NVNT	ANT1	1-DH5	2441.00	-34.536	-21.565	Pass
NVNT	ANT1	1-DH5	2480.00	-34.170	-21.286	Pass
NVNT	ANT1	2-DH5	2402.00	-38.065	-23.464	Pass
NVNT	ANT1	2-DH5	2441.00	-34.259	-21.503	Pass
NVNT	ANT1	2-DH5	2480.00	-35.051	-21.242	Pass
NVNT	ANT1	3-DH5	2402.00	-34.918	-23.430	Pass
NVNT	ANT1	3-DH5	2441.00	-34.661	-21.565	Pass
NVNT	ANT1	3-DH5	2480.00	-34.864	-21.293	Pass

1. Reference_Level_NVNT_ANT1_1-DH5_2402



2. Spurious Emissions_NVNT_ANT1_1-DH5_2402



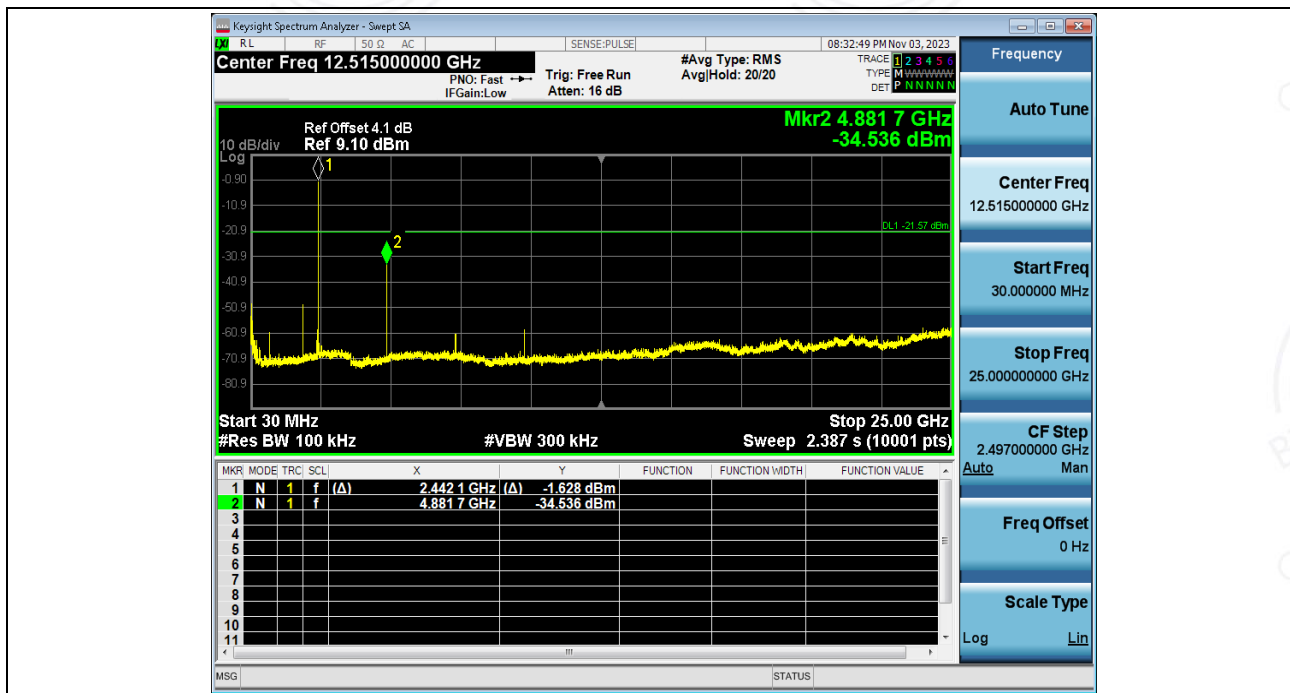


1_Reference_Level_NVNT_ANT1_1-DH5_2441



2_Spurious_Emissions_NVNT_ANT1_1-DH5_2441



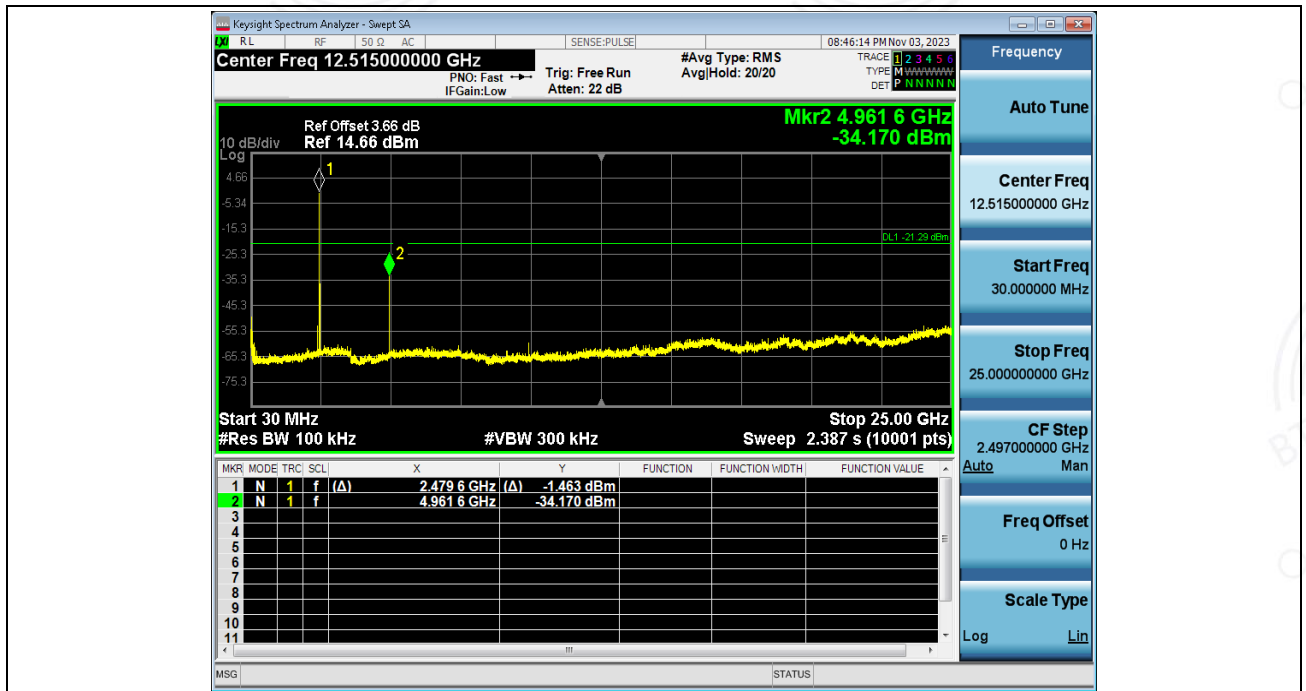


1_Reference_Level_NVNT_ANT1_1-DH5_2480



2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480



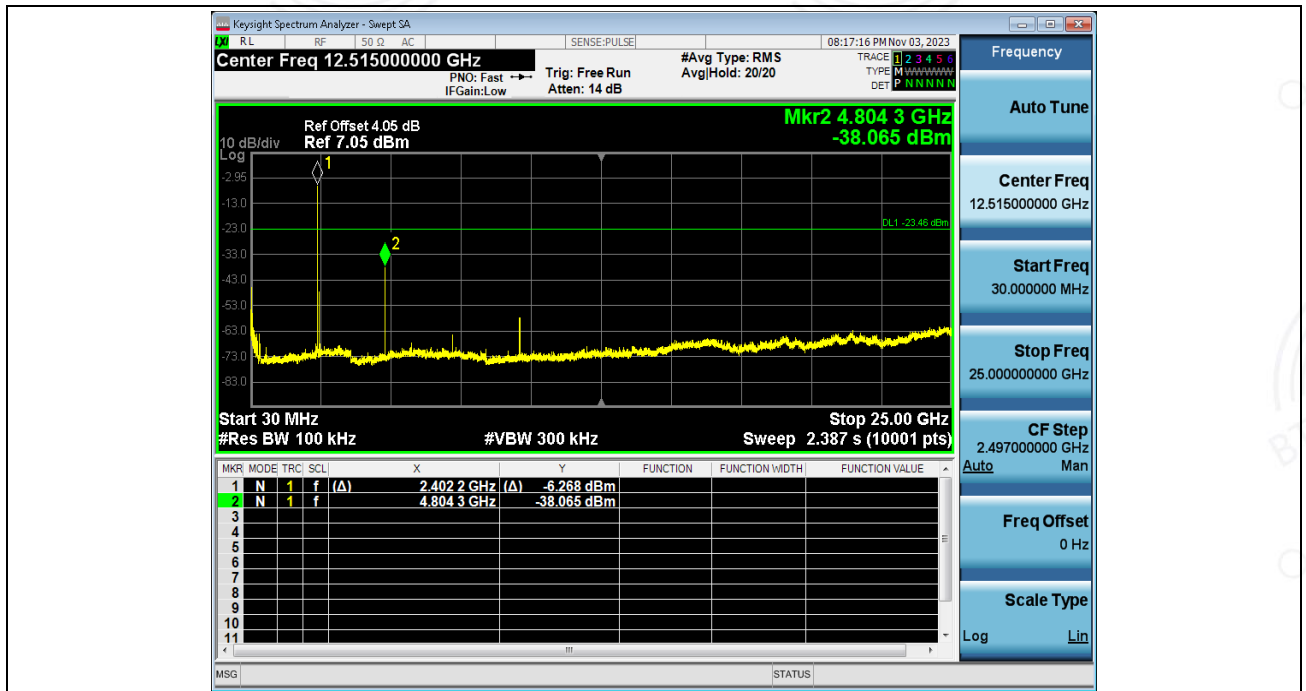


1_Reference_Level_NVNT_ANT1_2-DH5_2402

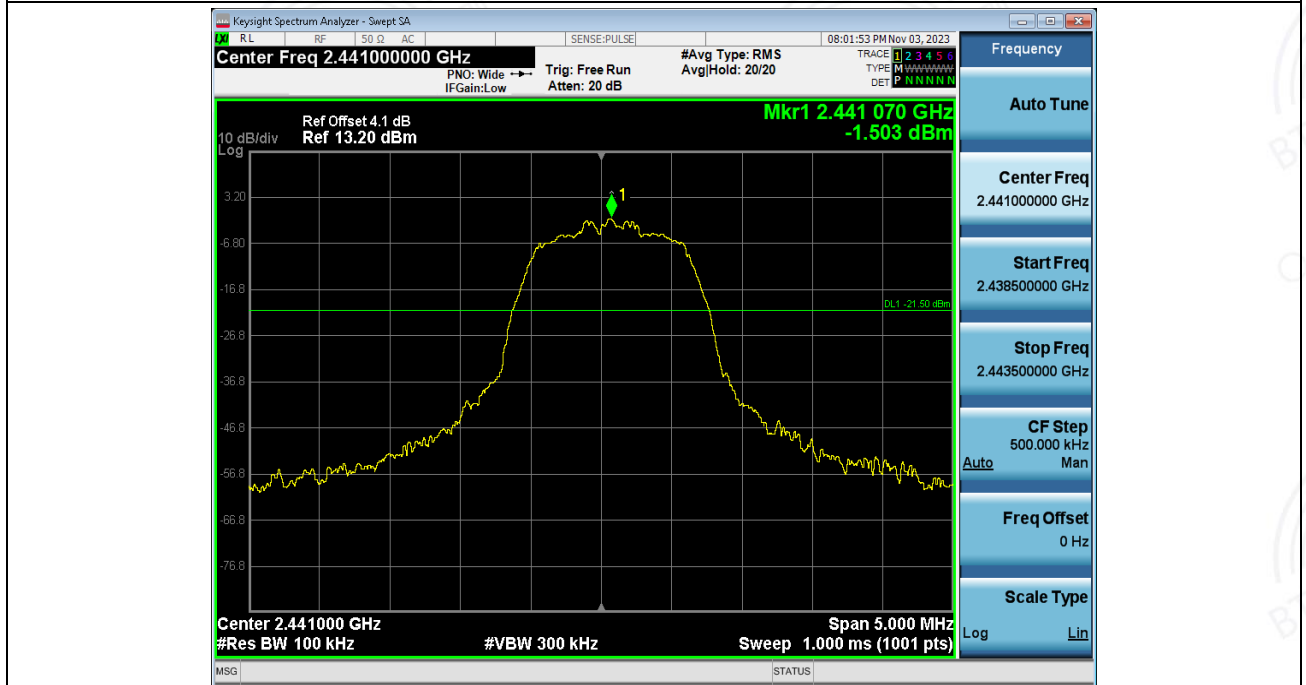


2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402



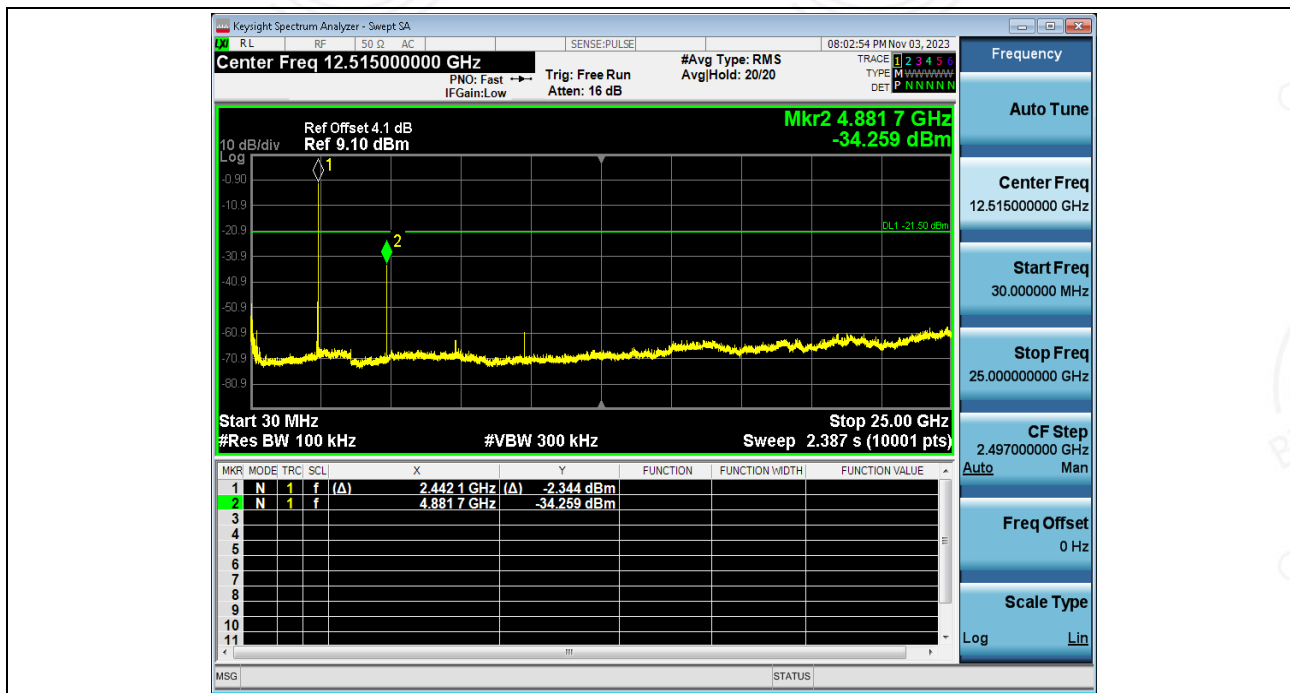


1_Reference_Level_NVNT_ANT1_2-DH5_2441

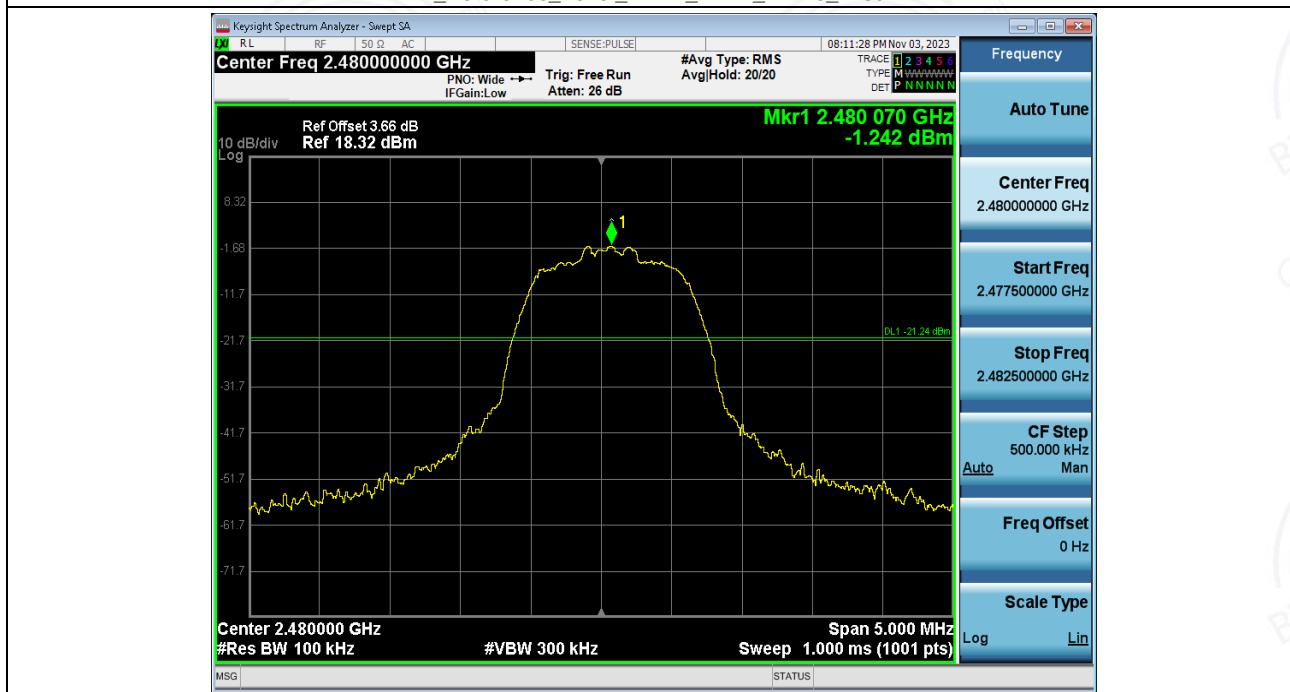


2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441



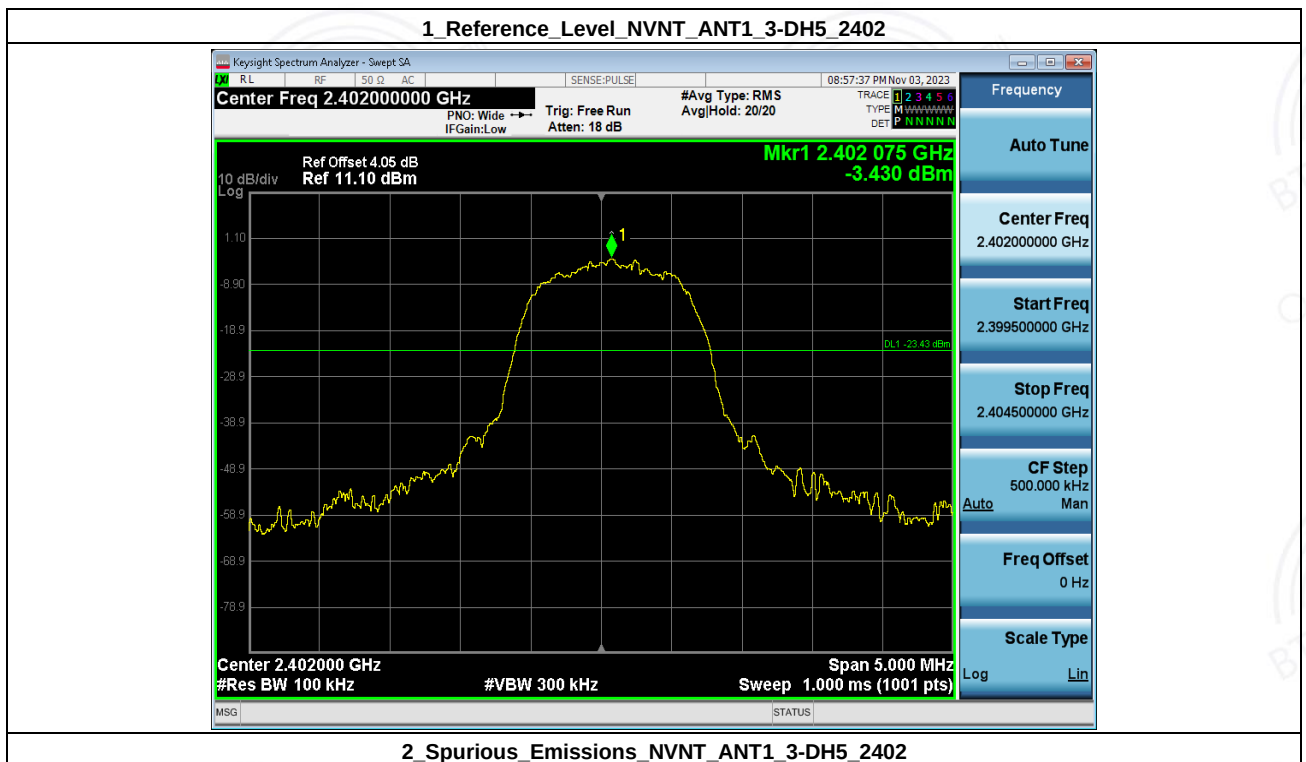
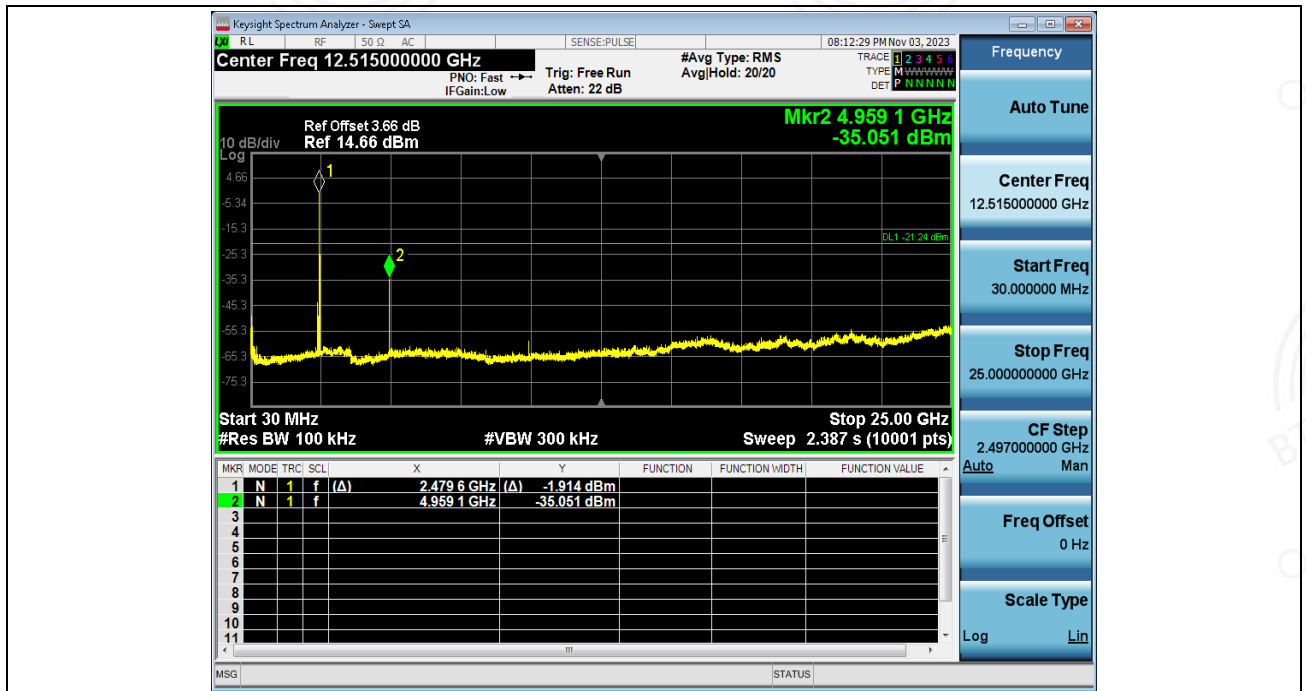


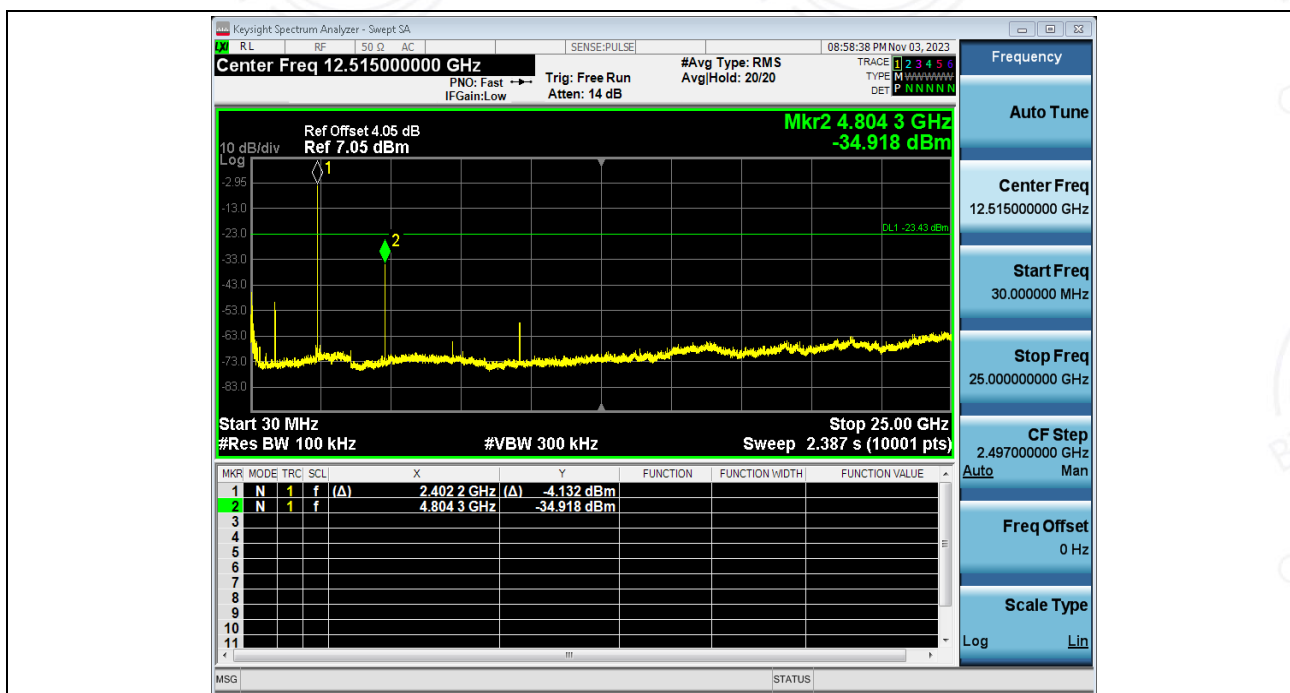
1_Reference_Level_NVNT_ANT1_2-DH5_2480



2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480





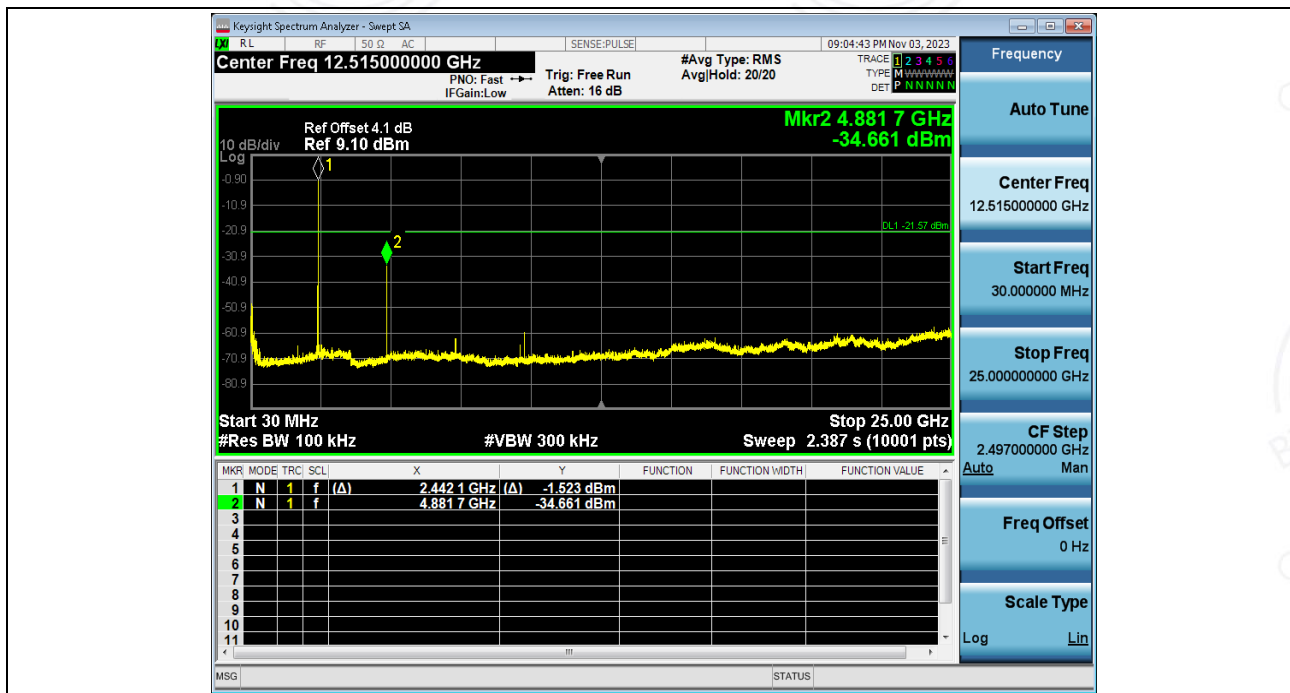


1_Reference_Level_NVNT_ANT1_3-DH5_2441



2_Spurious_Emissions_NVNT_ANT1_3-DH5_2441



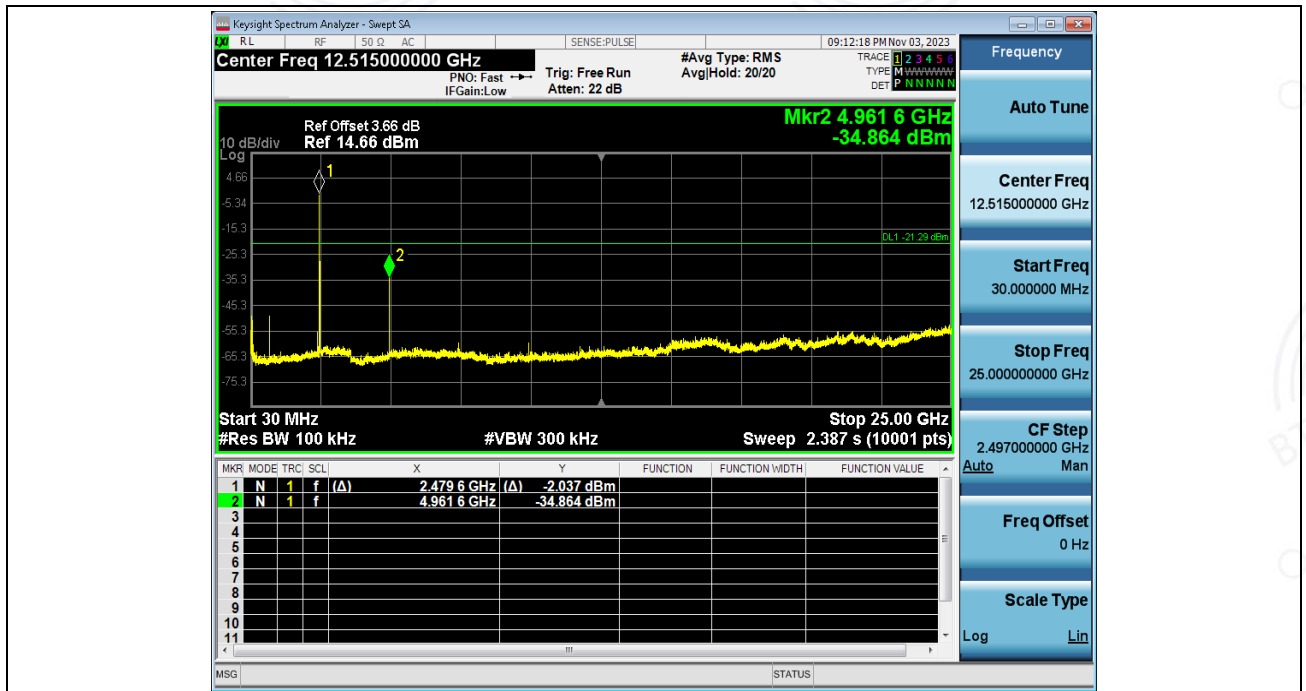


1_Reference_Level_NVNT_ANT1_3-DH5_2480



2_Spurious_Emissions_NVNT_ANT1_3-DH5_2480





6. Bandedge

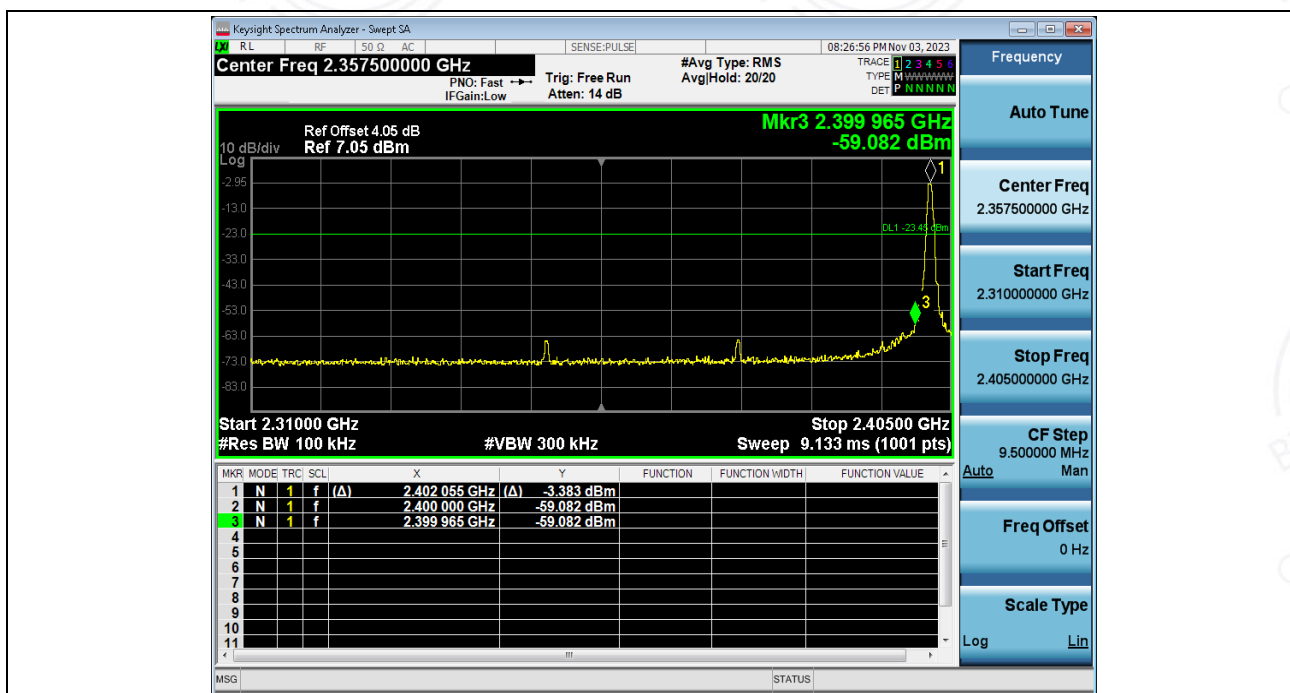
Condition	Antenna	Modulation	TX Mode	Bandedge MAX.Value	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-59.082	-23.454	Pass
NVNT	ANT1	1-DH5	Hopping_LCH	-61.030	-20.919	Pass
NVNT	ANT1	1-DH5	2480.00	-58.116	-21.286	Pass
NVNT	ANT1	1-DH5	Hopping_HCH	-61.685	-21.278	Pass
NVNT	ANT1	2-DH5	2402.00	-54.438	-23.464	Pass
NVNT	ANT1	2-DH5	Hopping_LCH	-54.377	-20.841	Pass
NVNT	ANT1	2-DH5	2480.00	-58.824	-21.242	Pass
NVNT	ANT1	2-DH5	Hopping_HCH	-62.738	-21.189	Pass
NVNT	ANT1	3-DH5	2402.00	-54.028	-23.430	Pass
NVNT	ANT1	3-DH5	Hopping_LCH	-60.492	-20.888	Pass
NVNT	ANT1	3-DH5	2480.00	-59.001	-21.293	Pass
NVNT	ANT1	3-DH5	Hopping_HCH	-62.935	-21.331	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402

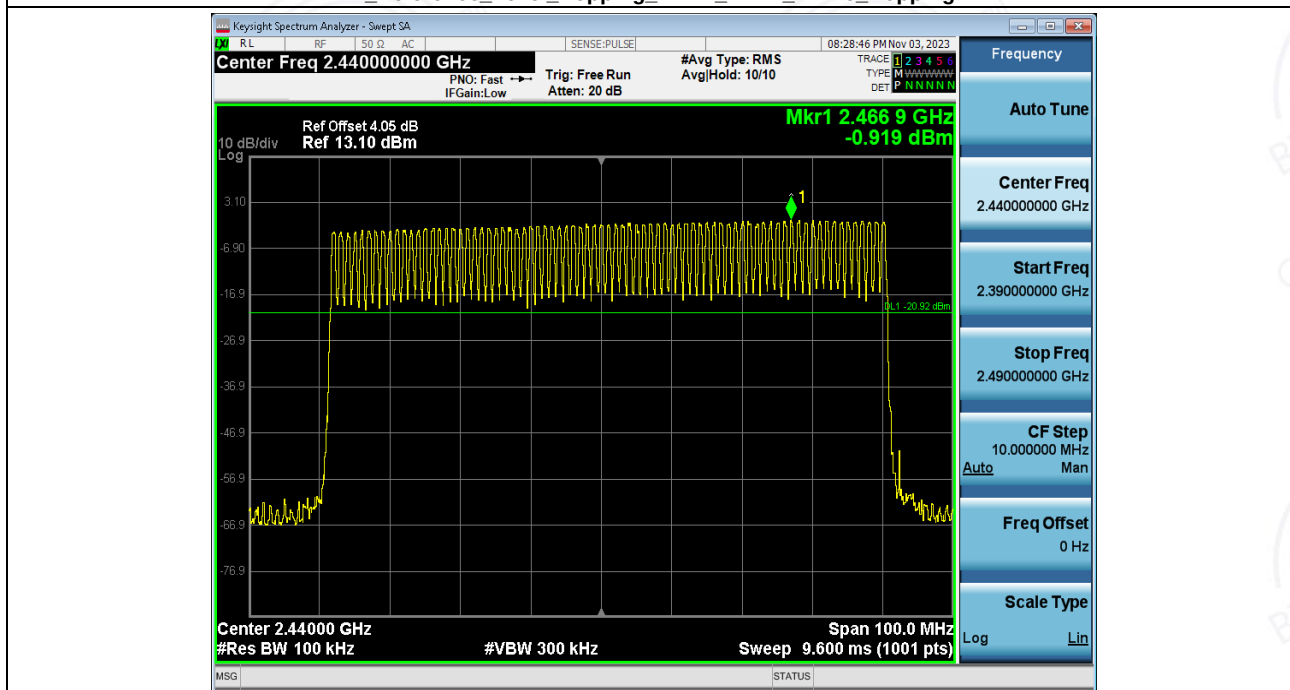


2_Bandedge_NVNT_ANT1_1-DH5_2402



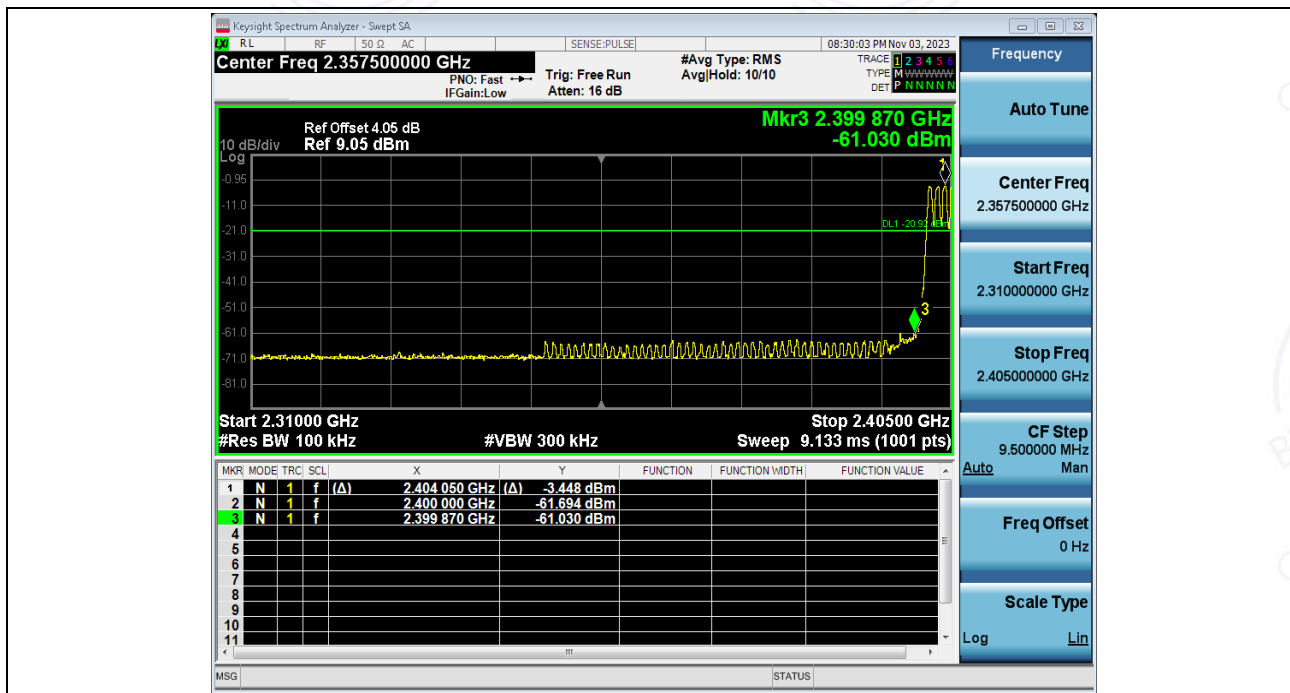


1 Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping



2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



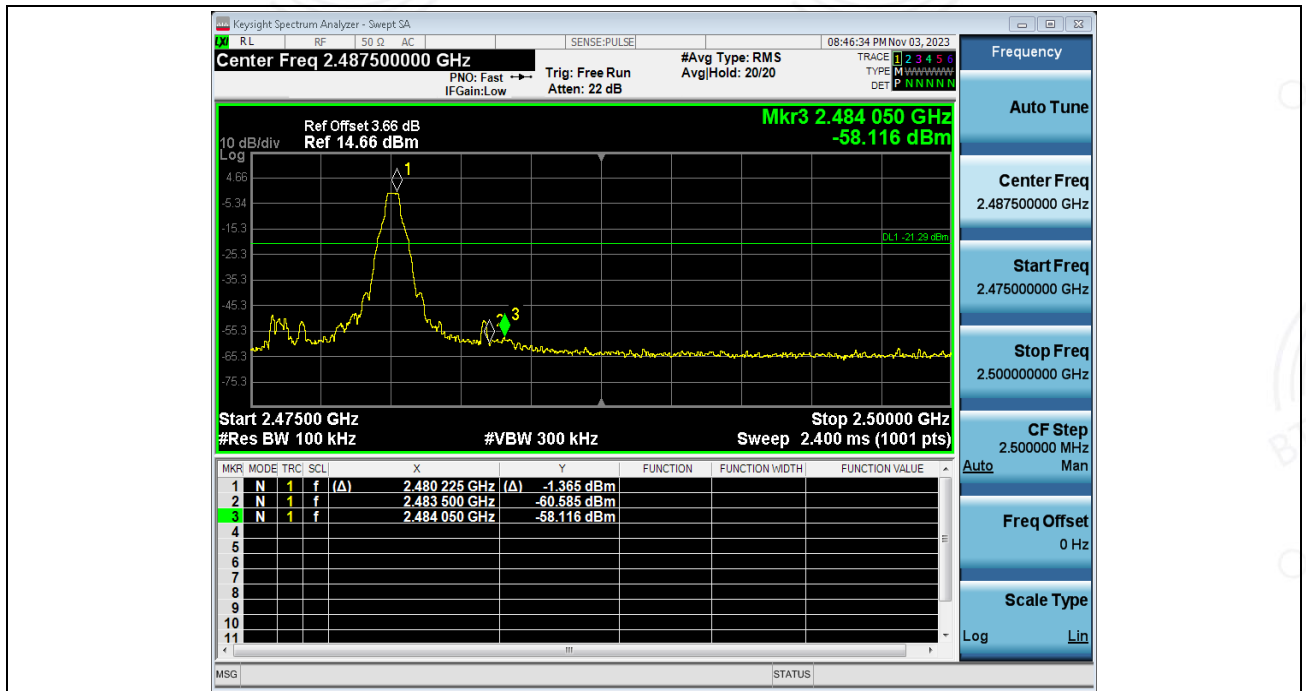


1 Reference_Level_NVNT_ANT1_1-DH5_2480

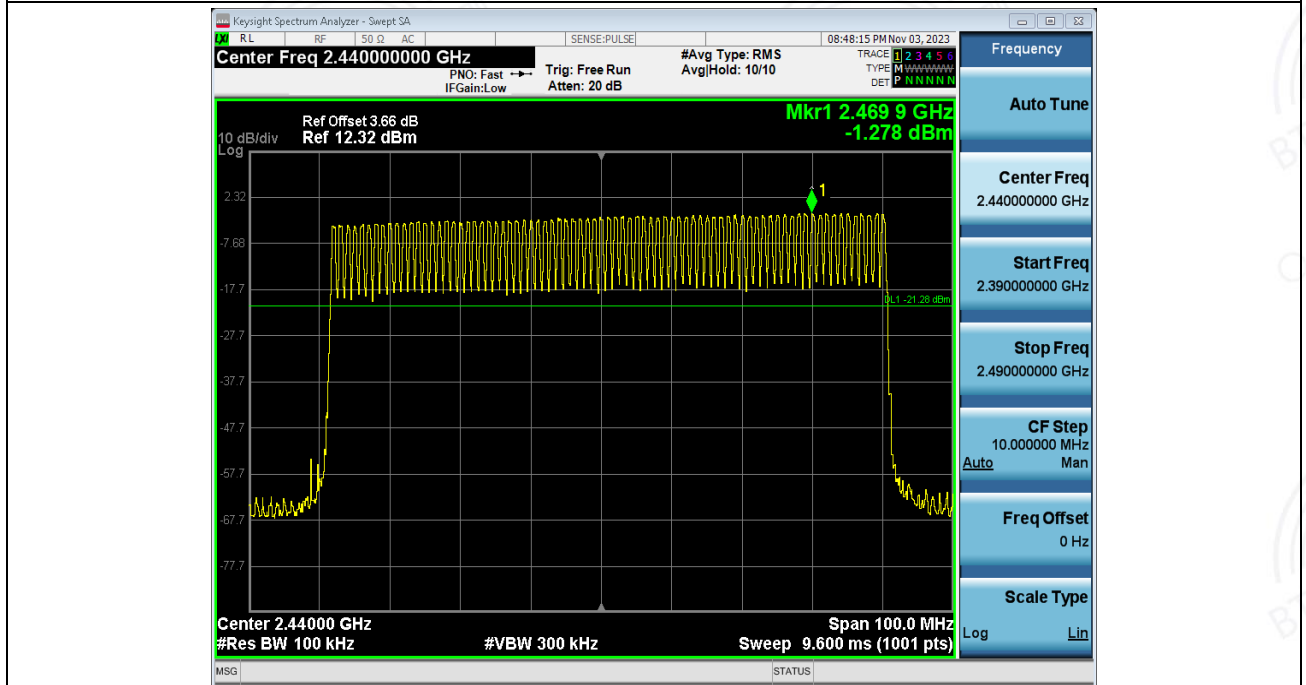


2 Bandedge_NVNT_ANT1_1-DH5_2480



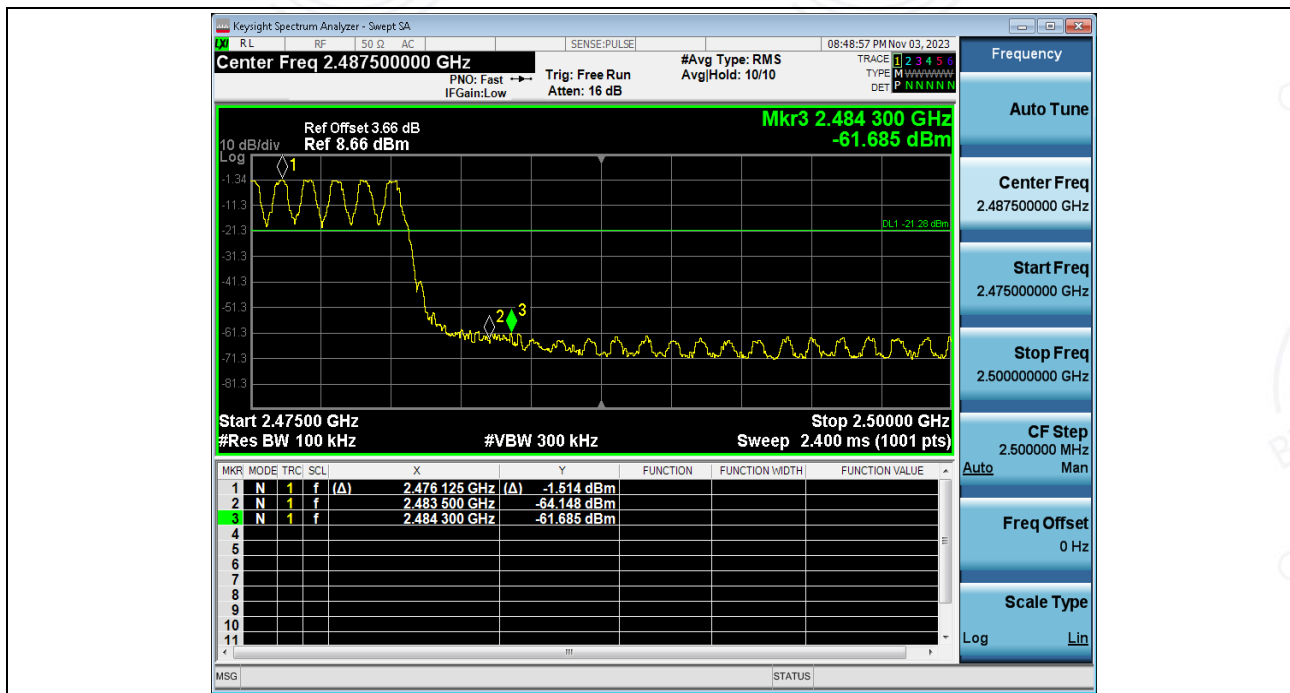


1 Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

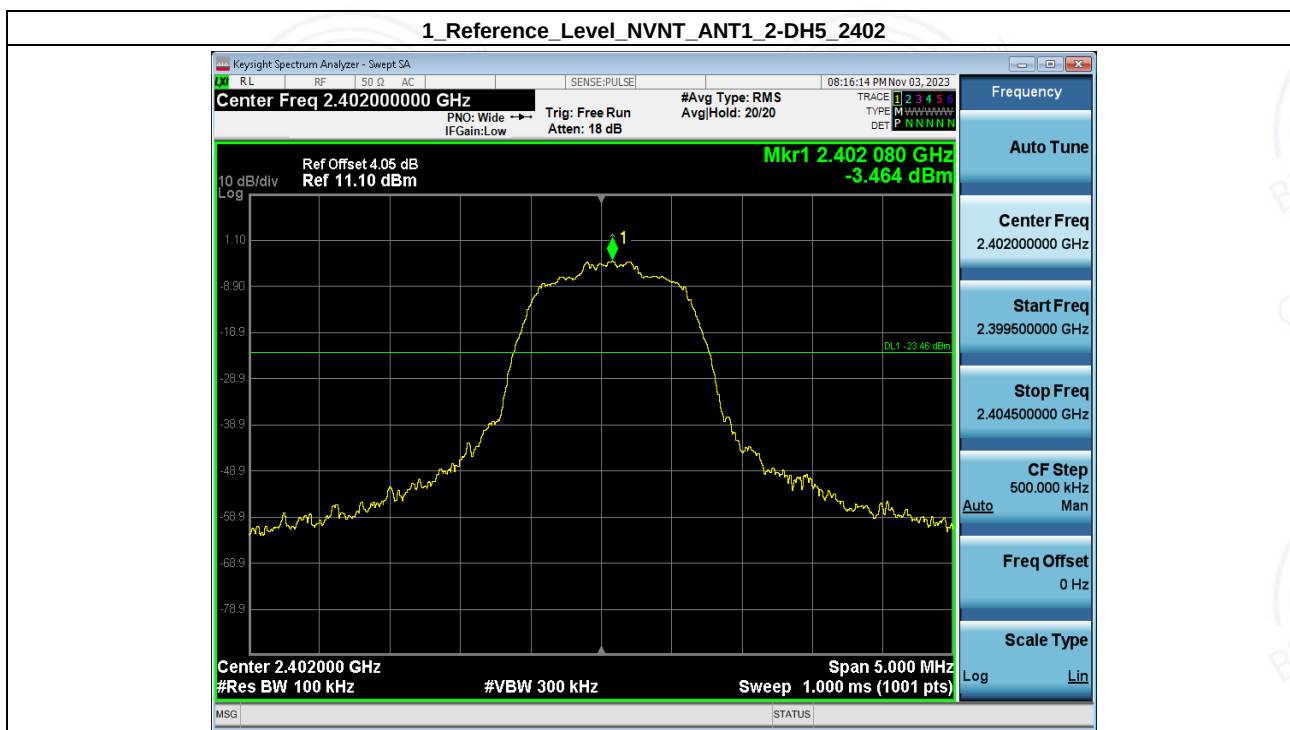


2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping



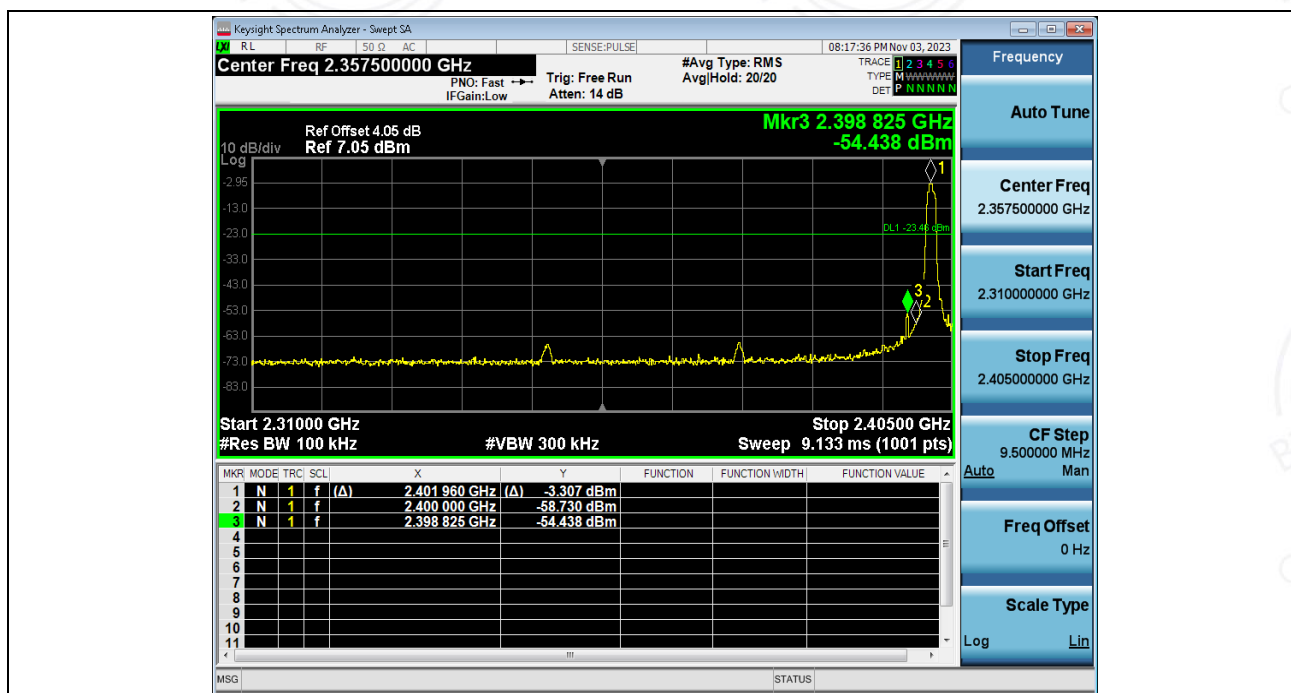


1_Reference_Level_NVNT_ANT1_2-DH5_2402

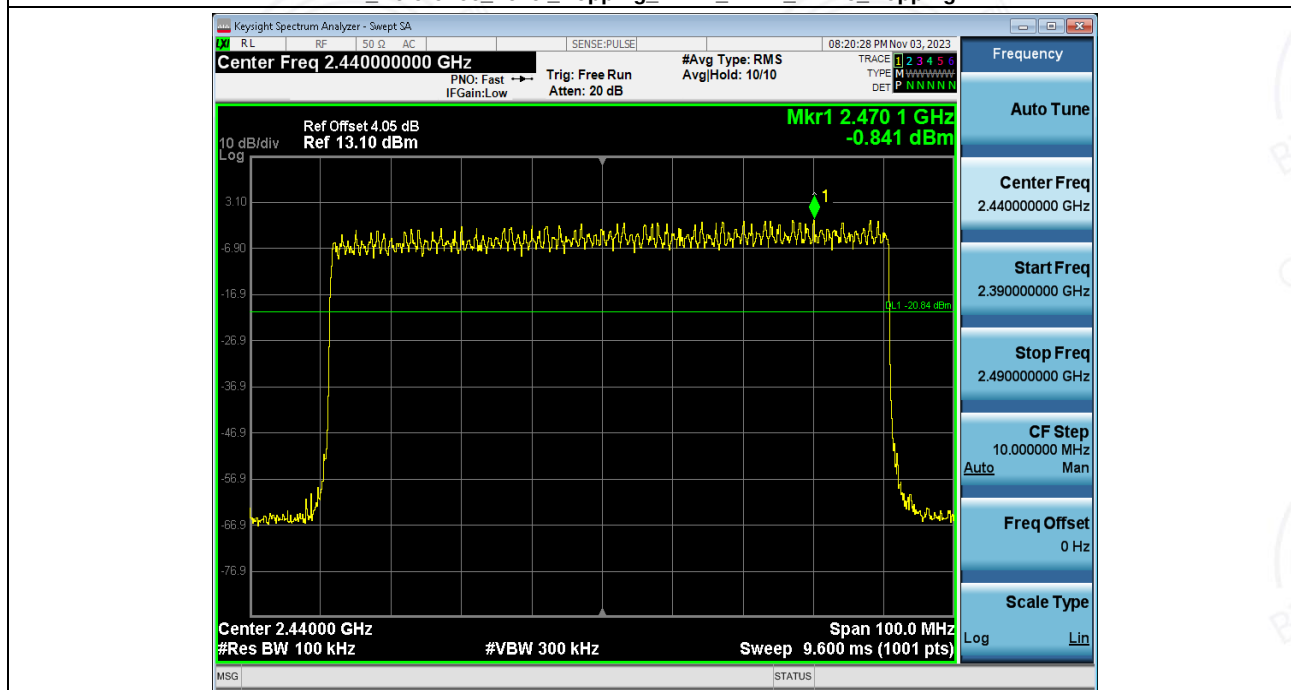


2_Bandedge_NVNT_ANT1_2-DH5_2402



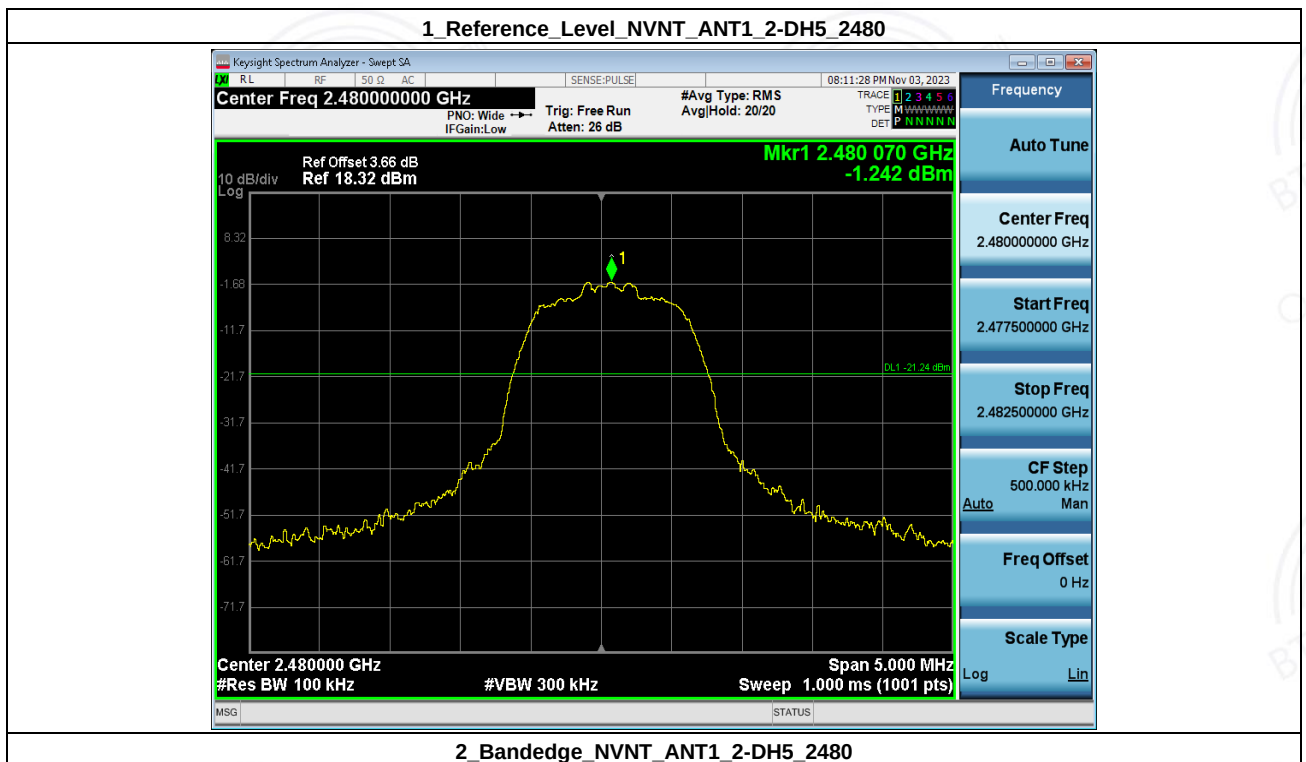
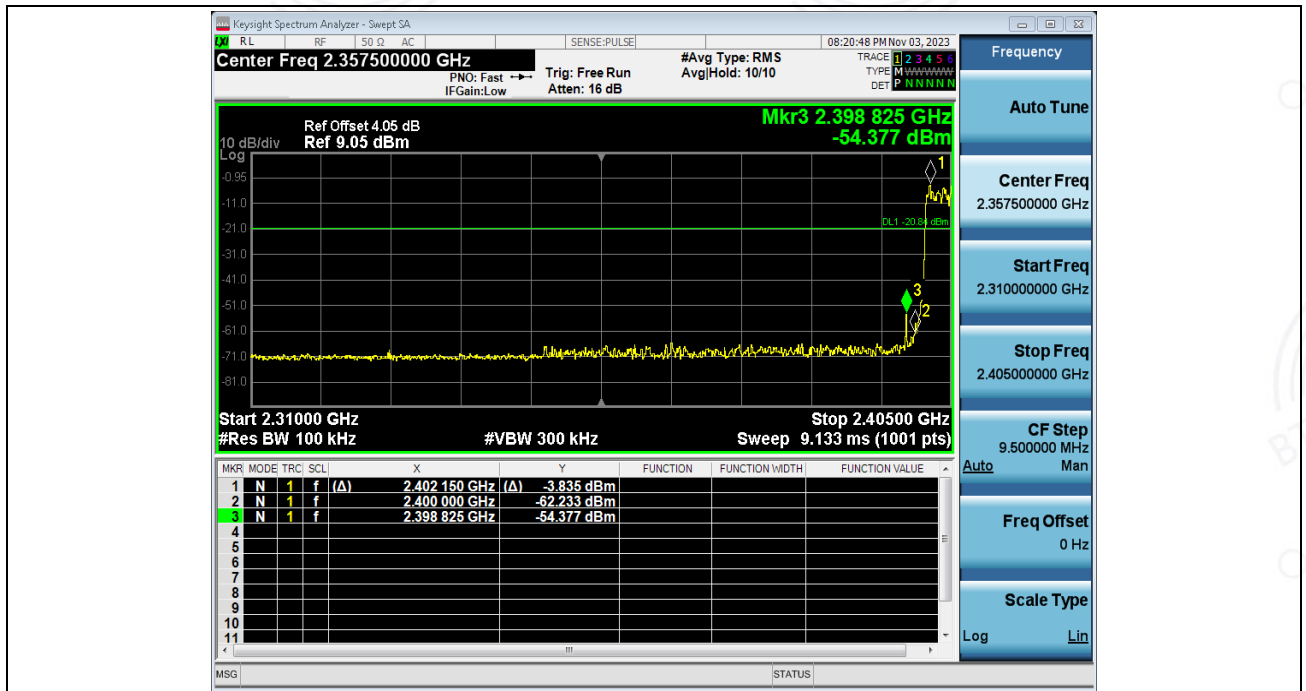


1 Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping



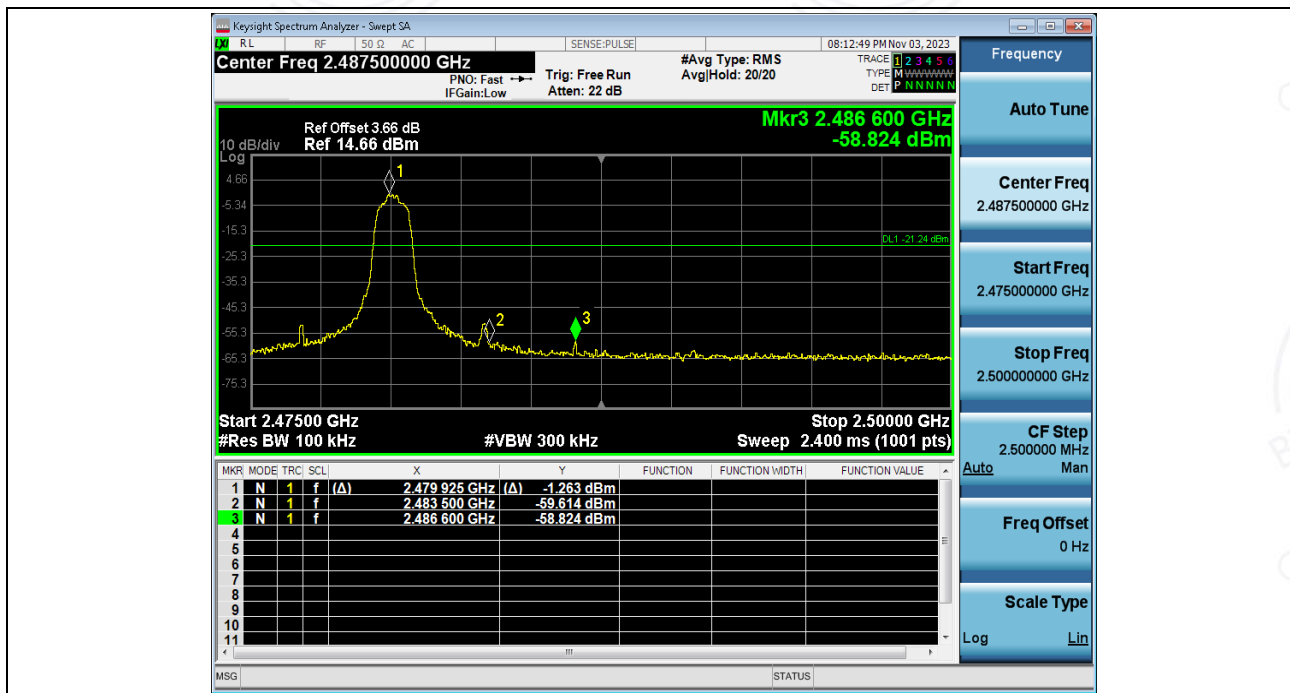
2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



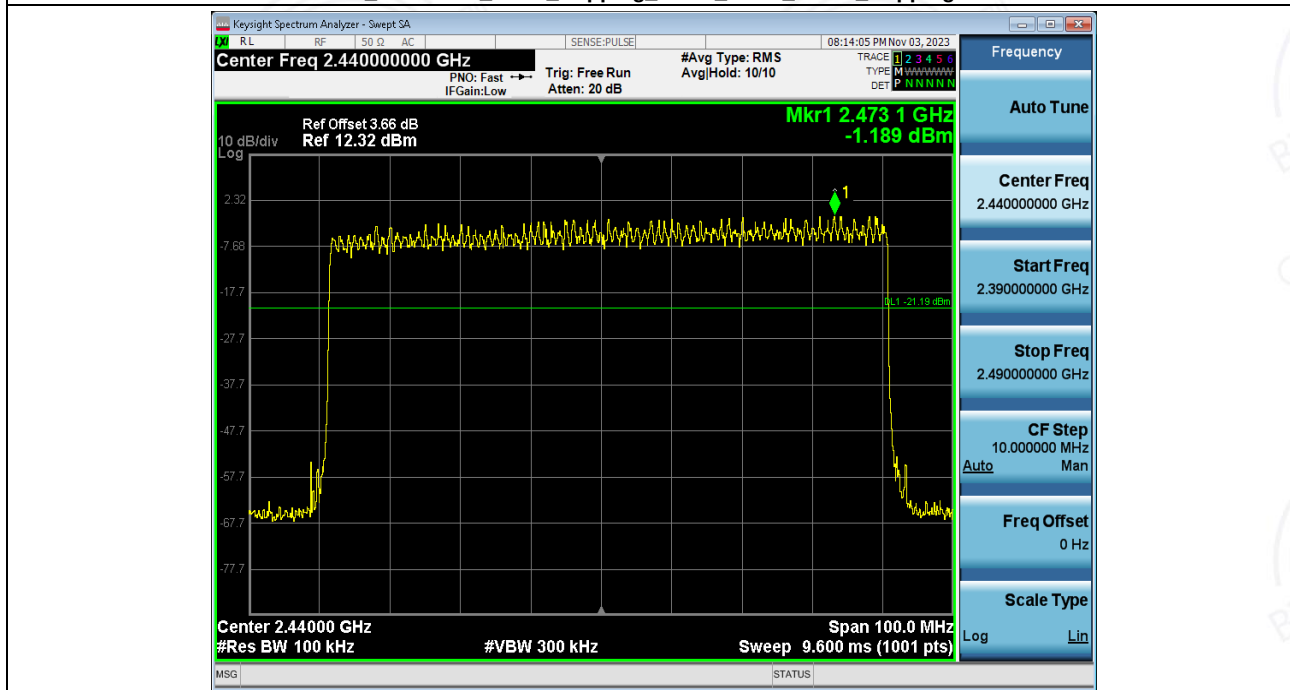


2_Bandedge_NVNT_ANT1_2-DH5_2480



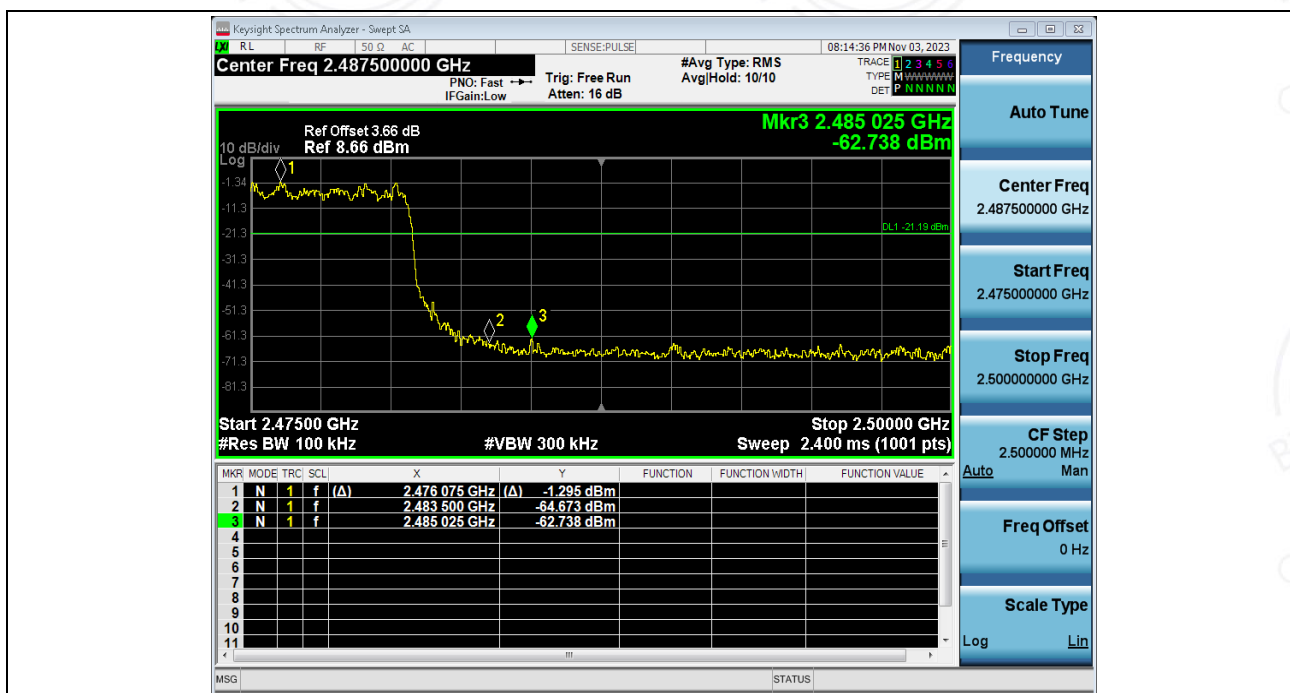


1 Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping



2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



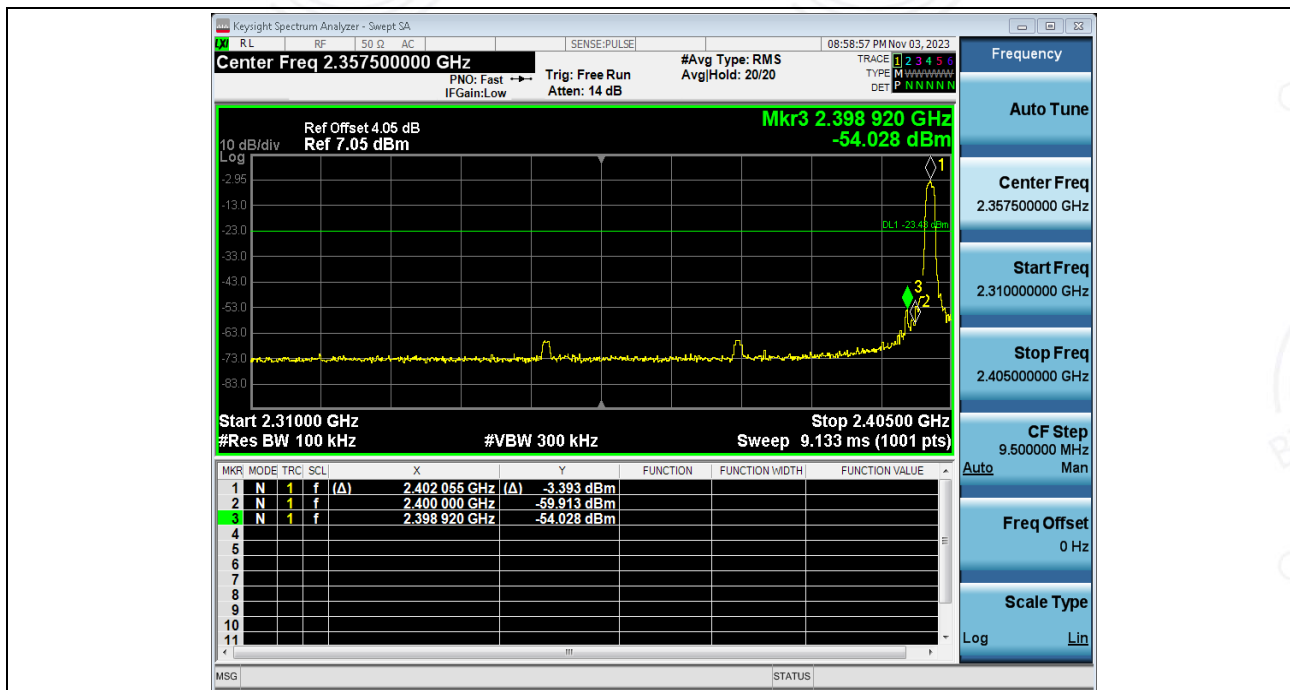


1_Reference_Level_NVNT_ANT1_3-DH5_2402

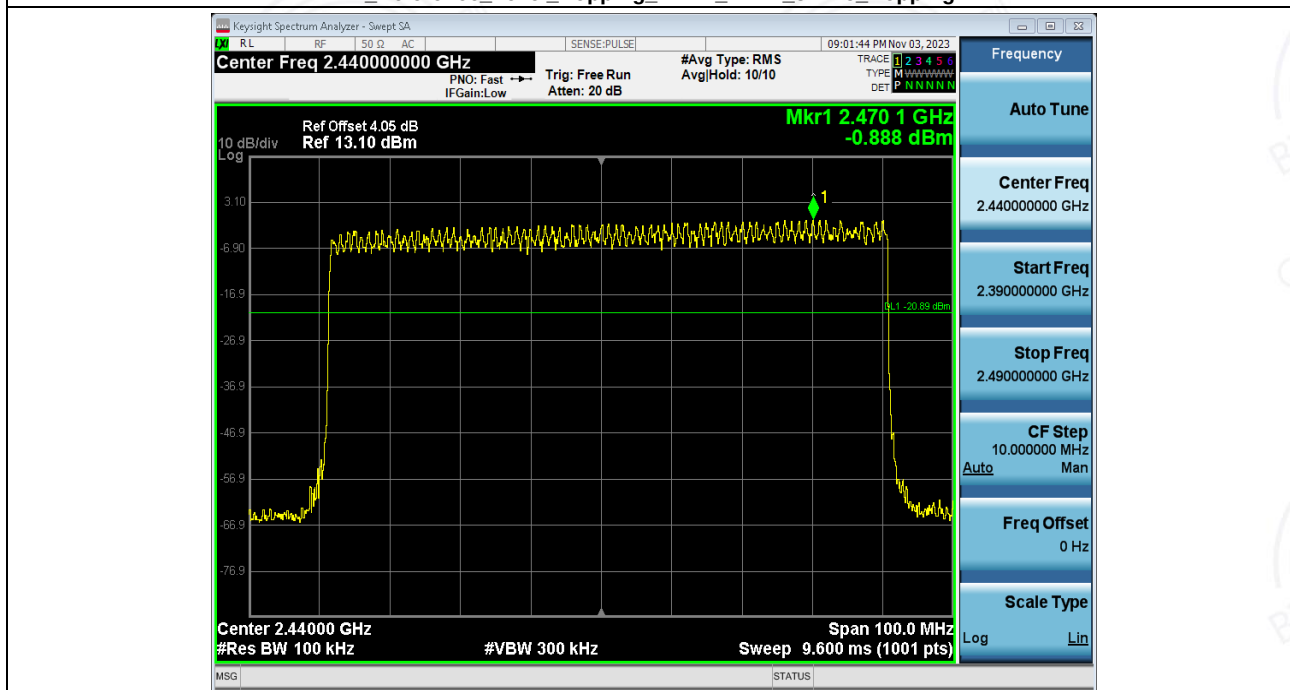


2_Bandedge_NVNT_ANT1_3-DH5_2402



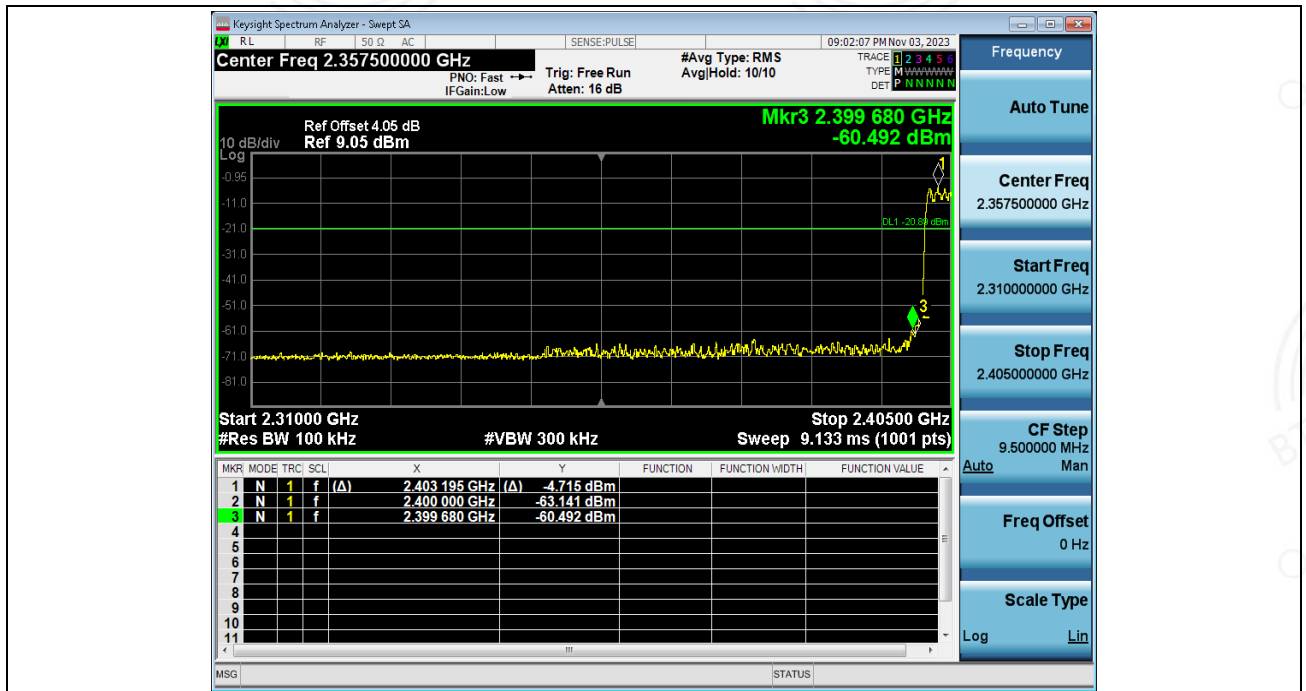


1 Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping



2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping



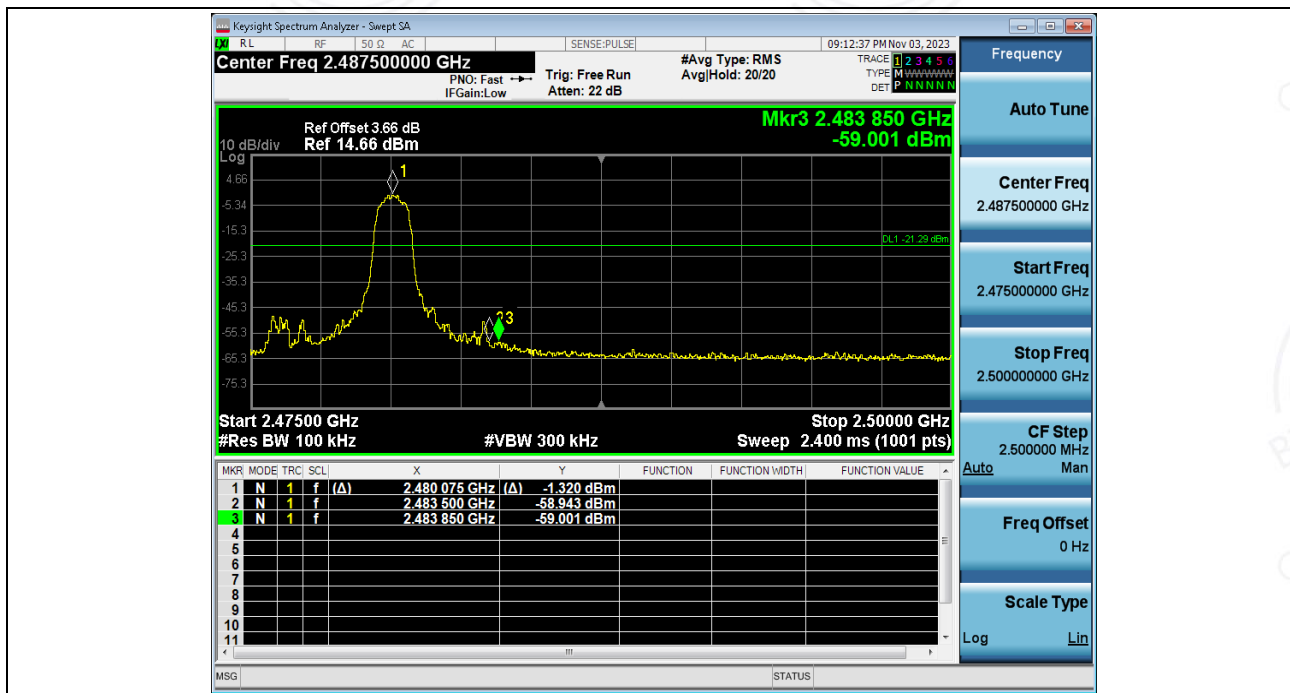


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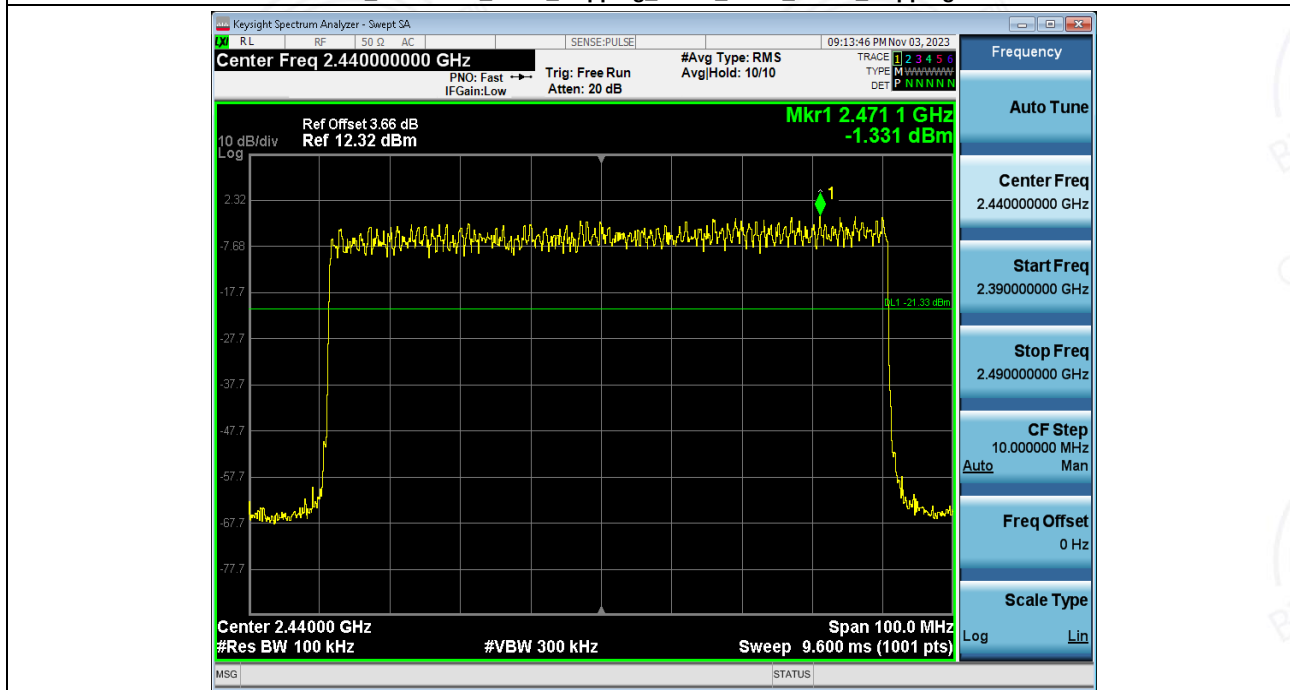


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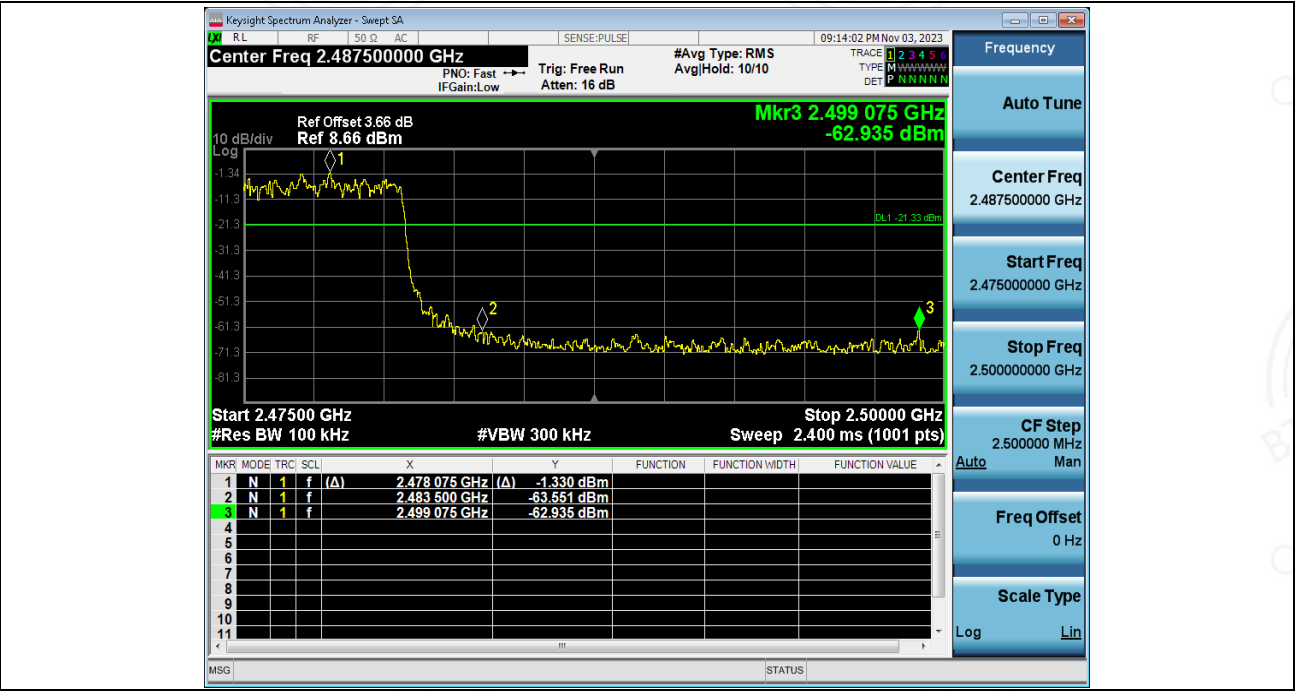


1 Reference_Level_Hopping_NVNT_ANT1_3-DH5_Hopping



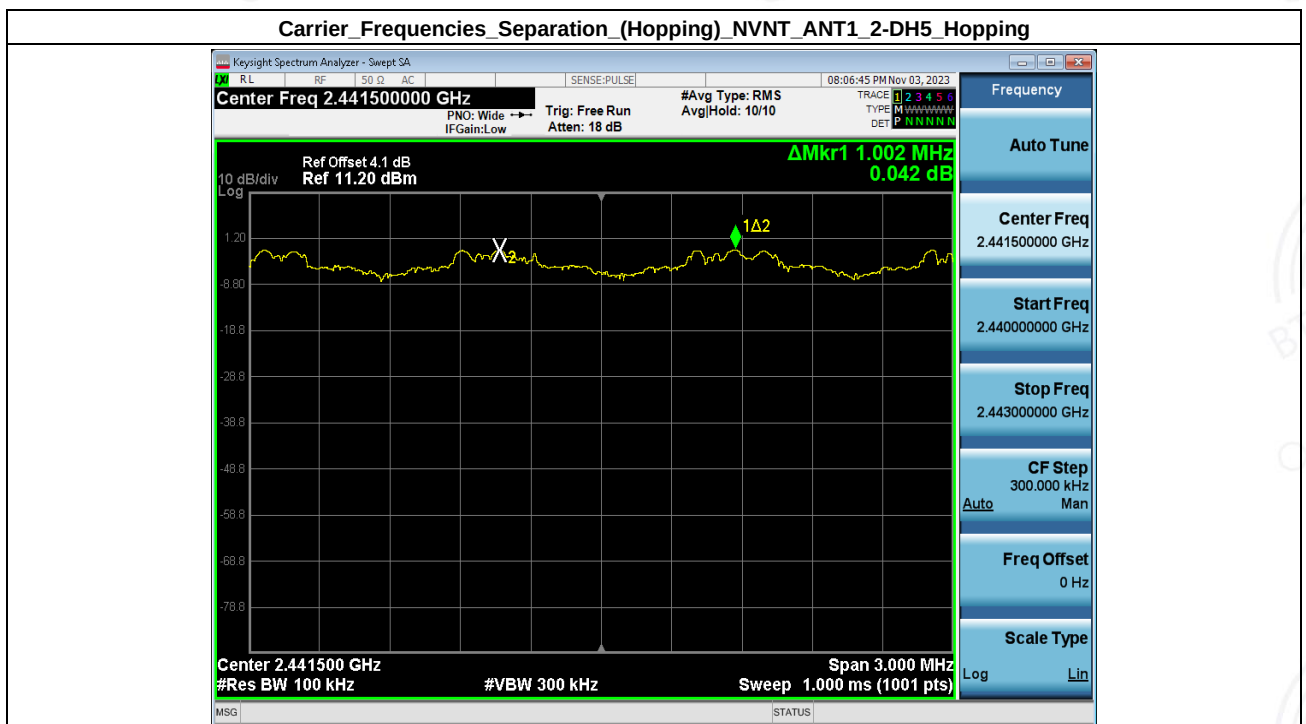
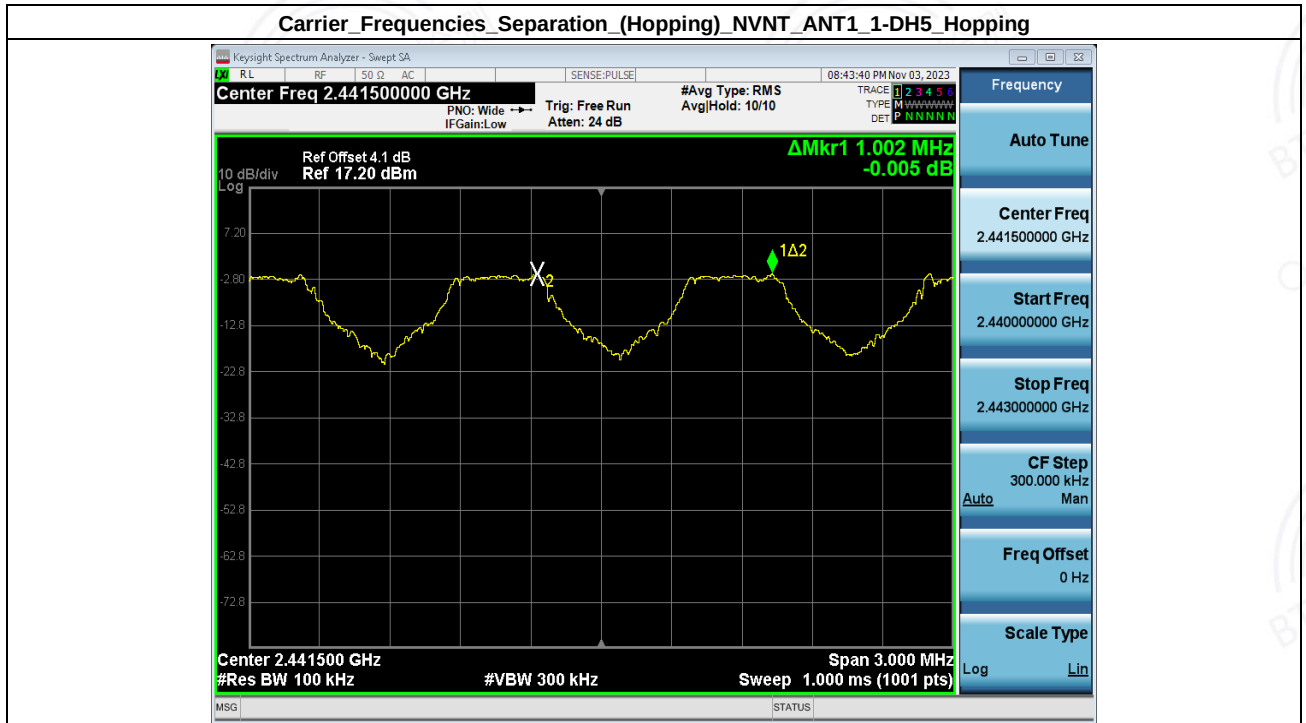
2_Band_Edge_(Hopping)_NVNT_ANT1_3-DH5_Hopping

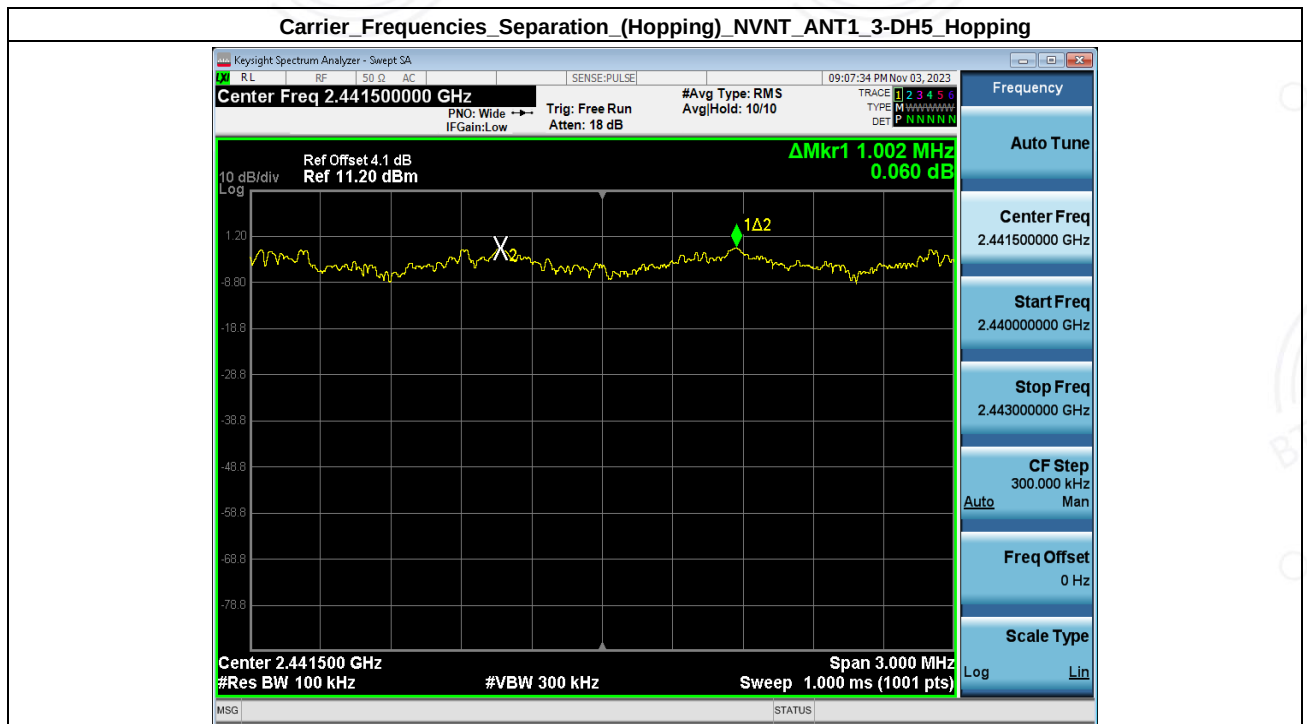




7. Carrier Frequencies Separation (Hopping)

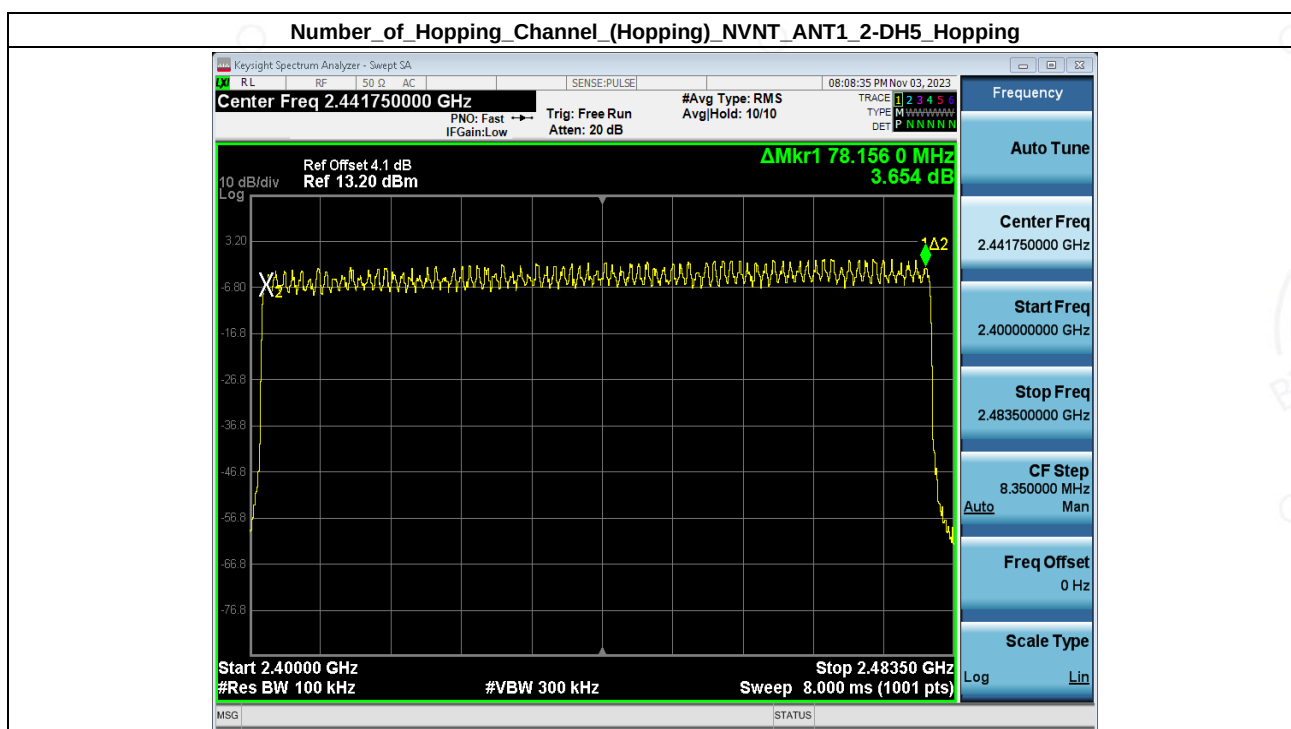
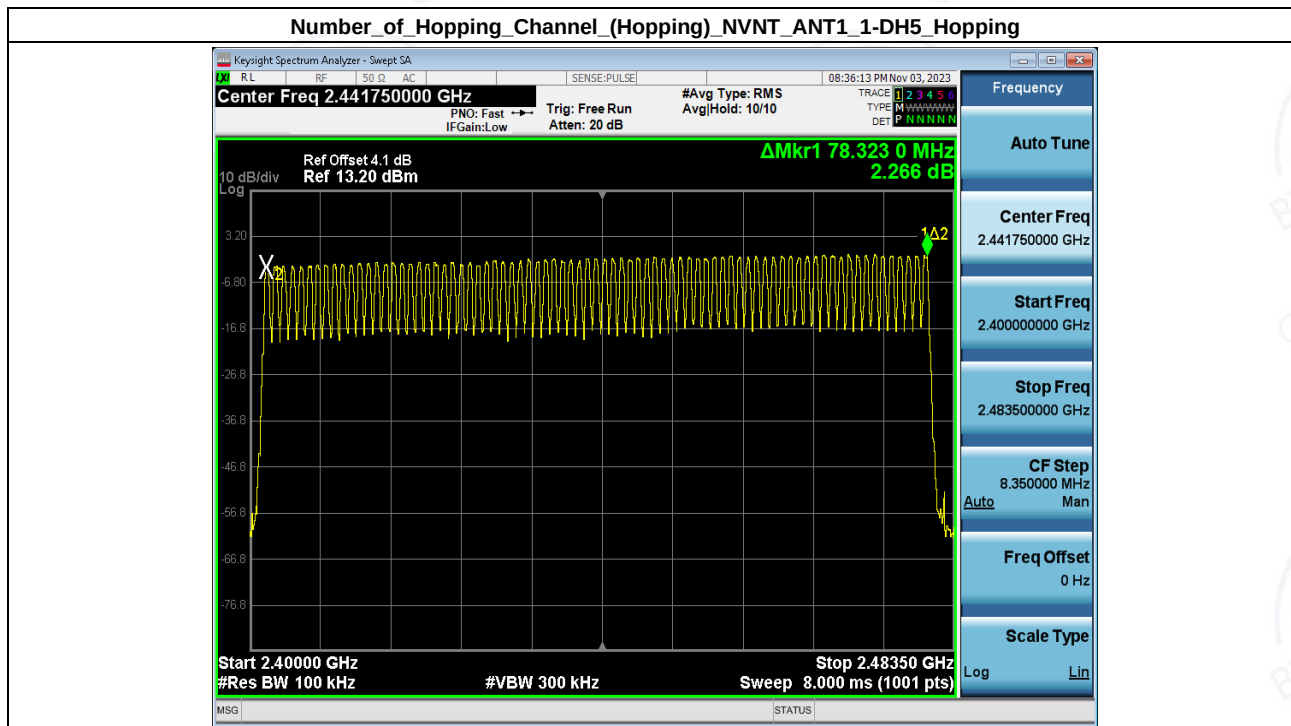
Condition	Antenna	Modulation	Frequency(MHz)	Hopping NO.0 (MHz)	Hopping NO.1 (MHz)	Carrier Frequencies Separation(MHz)	Limit(MHz)	Result
NVNT	ANT1	1-DH5	2441.00	2441.227	2442.229	1.00	0.931	Pass
NVNT	ANT1	2-DH5	2441.00	2441.068	2442.070	1.00	0.856	Pass
NVNT	ANT1	3-DH5	2441.00	2441.068	2442.070	1.00	0.871	Pass

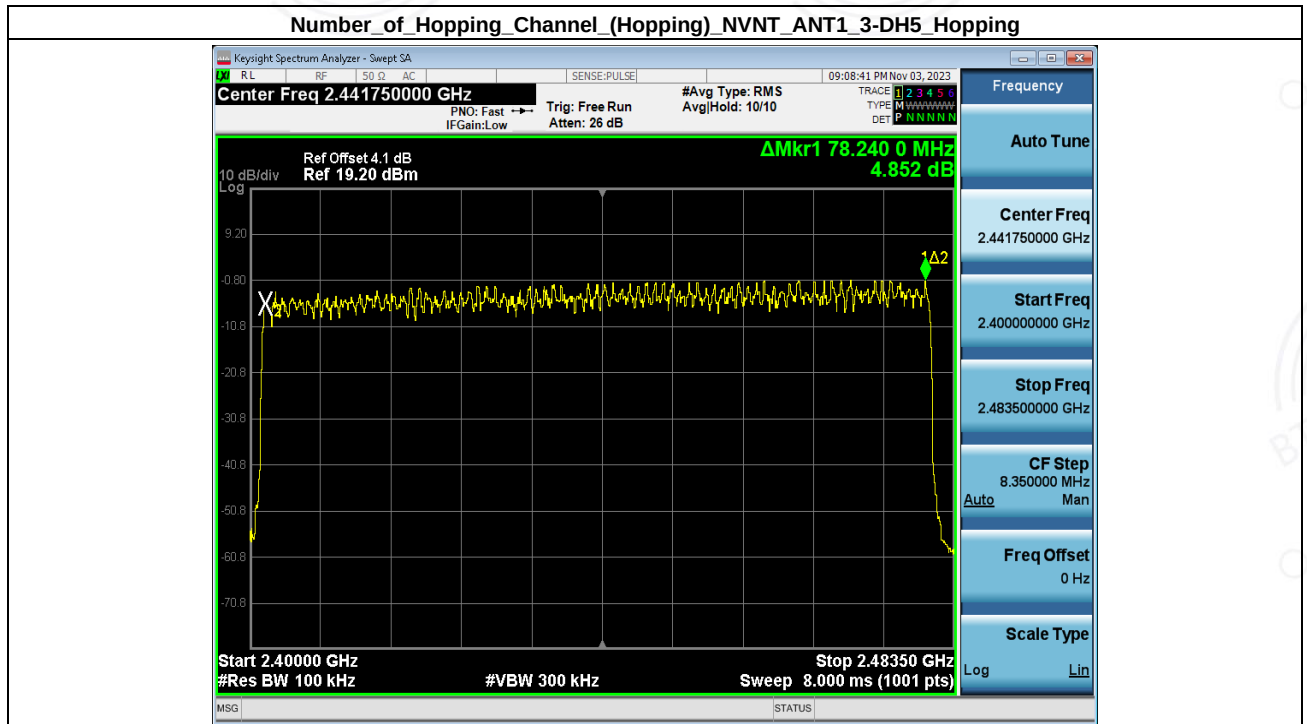




8. Number of Hopping Channel (Hopping)

Condition	Antenna	Modulation	Hopping Num	Limit	Result
NVNT	ANT1	1-DH5	79	15	Pass
NVNT	ANT1	2-DH5	79	15	Pass
NVNT	ANT1	3-DH5	79	15	Pass





- End of the Report -

