



TEST REPORT

Application No.: BTEK240425003AE
Applicant: Dongguan Guanrui Electronics Co. Ltd
Address of Applicant: Room 806, Lianhe Building, No. 1 Dongcheng Section Dongcheng Street, Dongguan City, Guangdong Prov, DONG GUAN, China
Manufacturer: Dongguan Guanrui Electronics Co. Ltd
Address of Manufacturer: Room 806, Lianhe Building, No. 1 Dongcheng Section Dongcheng Street, Dongguan City, Guangdong Prov, DONG GUAN, China
Factory: Dongguan Guanrui Electronics Co. Ltd
Address of Factory: Room 806, Lianhe Building, No. 1 Dongcheng Section Dongcheng Street, Dongguan City, Guangdong Prov, DONG GUAN, China
Equipment Under Test (EUT):
EUT Name: OWS
Model No.: G10,O1,O2,O3,O4,O5,O6,O7,O8,O9,O10,O11,O12,O13,O14,O15,O16,O17,O18,O19,O20,O21,O22,O23,O24,O25,O26,O27,O28,O29,O30,O40,O50,O60,O70,O80,O90,O100,O110,O120,O200,O300,O400,O500,O600,O700,O800,G11,G12,G13,G14,G15,G16,G17,G18,G19,G20,G30,G50,G60,G70,G80
Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark: N/A
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2024-04-25
Date of Test: 2024-04-25 to 2024-05-30
Date of Issue: 2024-05-30

Test Result:	Pass*
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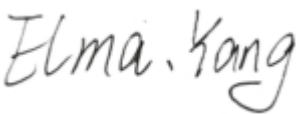
* In the configuration tested, the EUT complied with the standards specified above.

Lion Cai
EMC Laboratory Manager





Revision Record				
Version	Chapter	Date	Modifier	Remark
V0		2024-05-30		Original

Authorized for issue by:				
				
		David Zhuang/Project Engineer		
				
		Elma Yang/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	N/A
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:

The EUT can't work with Bluetooth while charging, So Conducted Emissions at AC Power Line (150kHz-30MHz) is not applicable.

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.

Model No.: O1,O2,O3,O4,O5,O6,O7,O8,O9,O10,O11,O12,O13,O14,O15,O16,O17,O18,O19,O20,O21,O22,O23,O24,O25,O26,O27,O28,O29,O30,O40,O50,O60,O70,O80,O90,O100,O110,O120,O200,O300,O400,O500,O600,O700,O800,G11,G12,G13,G14,G15,G16,G17,G18,G19,G20,G30,G50,G60,G70,G80



Only the model G10 was tested. According to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions of other models are identical for the above models, with only difference on Model No.



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4 General Information

4.1 Details of E.U.T.

Power supply:	3.7V by Battery
Cable(s):	/
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	V5.0
This test report is for classic mode.	
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)
Hopping Channel Type:	Adaptive Frequency Hopping systems
Modulation Type:	GFSK, $\pi/4$ DQPSK
Number of Channels:	79
Channel Spacing:	1MHz
Sample Type:	Portable device
Antenna Type:	Ceramic antenna
Antenna Gain:	2.78 dBi
Hardware Version	G10-V1.1
Software and Firmware Version	V1.1
Sample No.:	BTEK240425003AE-01
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.	

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
/	/	/	/

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	± 3.12 dB
Conducted Peak Output Power	± 0.76 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	± 0.8 dB
Conducted Spurious Emissions	± 0.8 dB
Radiated Emissions which fall in the restricted bands	± 5.1 dB (1GHz-6GHz); ± 5.2 dB(above 6GHz)
Radiated Spurious Emissions (Below 1GHz)	± 5.1 dB
Radiated Spurious Emissions (Above 1GHz)	± 5.1 dB (1GHz-6GHz); ± 5.2 dB(above 6GHz)



4.4 Test Location

All tests were performed at:

Shenzhen BANTEK Testing Co., Ltd.,

A5&A6, Building B1&B2, No.45 Gangtuo 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 Emissions at AC Power Line (150kHz-30MHz)					
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 V2.0.0.0	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:

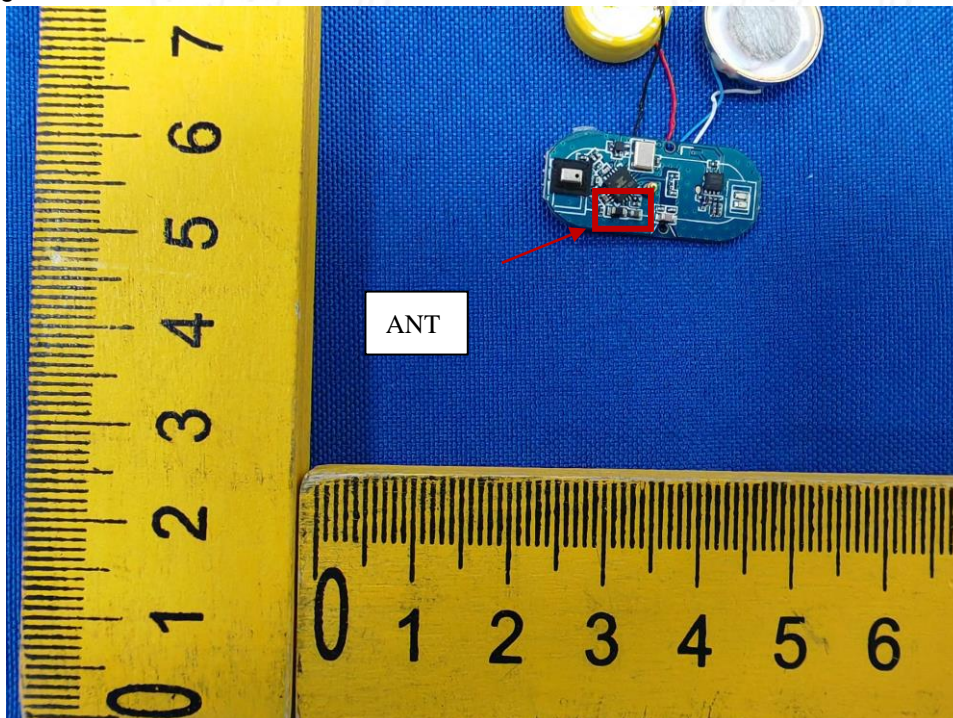
Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's 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 2.78 dBi.



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.

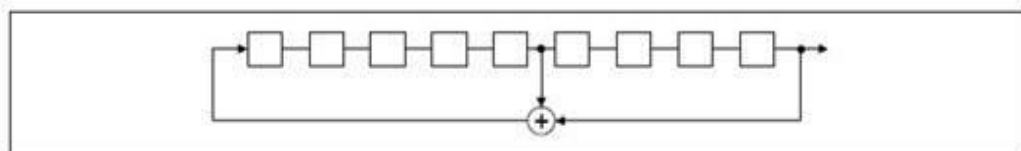
> Number of shift register stages: 9

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

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

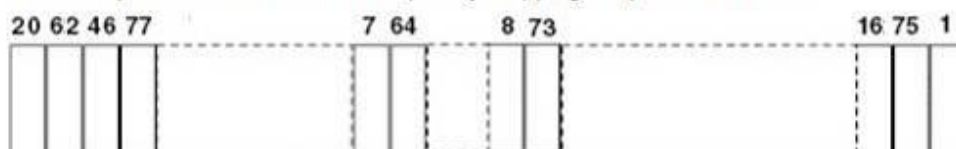
Linear Feedback Shift Register for Generation of the PRBS sequence

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: 23.7 °C

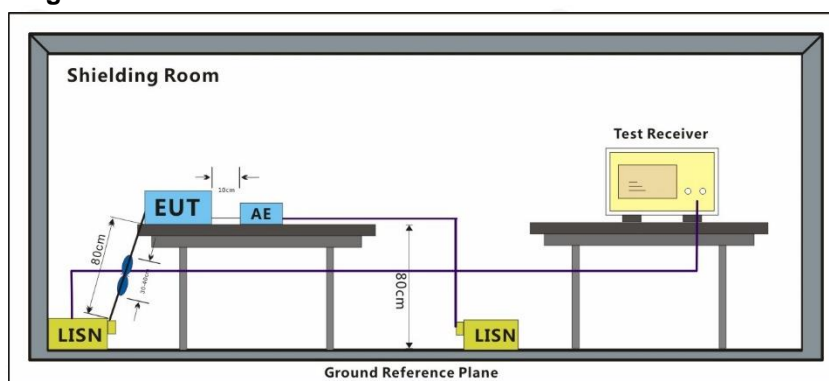
Humidity: 55.6 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	/	/

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: LISN=Read Level+ Cable Loss+ LISN Factor

Not applicable



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: 23.7 °C

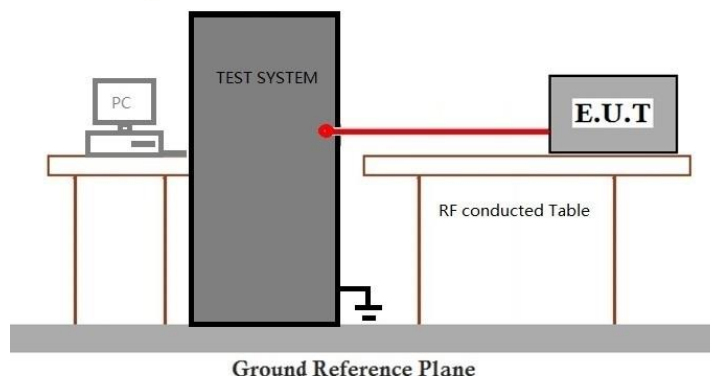
Humidity: 55.6 % RH

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. 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: 23.7 °C

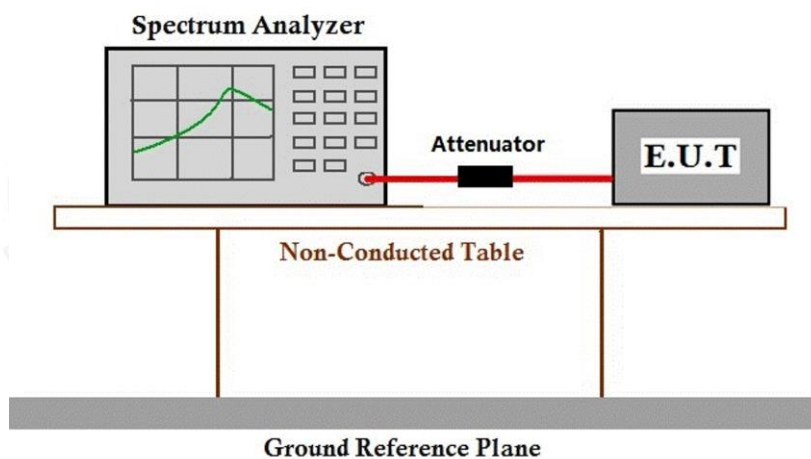
Humidity: 55.6 % RH

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. 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: 23.7 °C

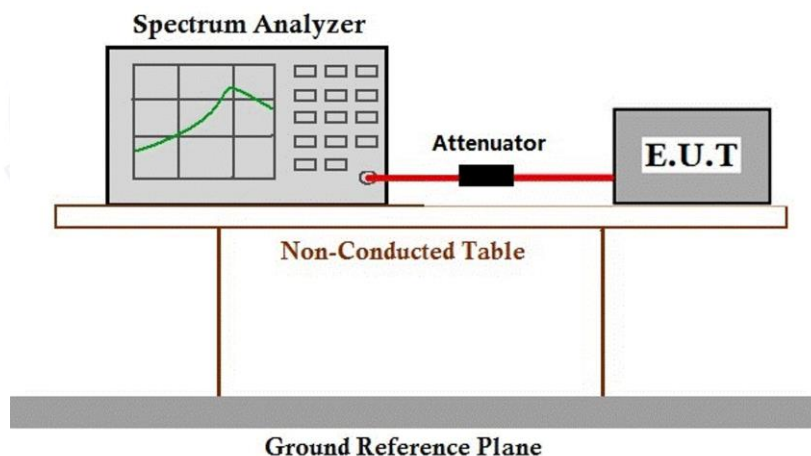
Humidity: 55.6 % RH

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. 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: 23.7 °C

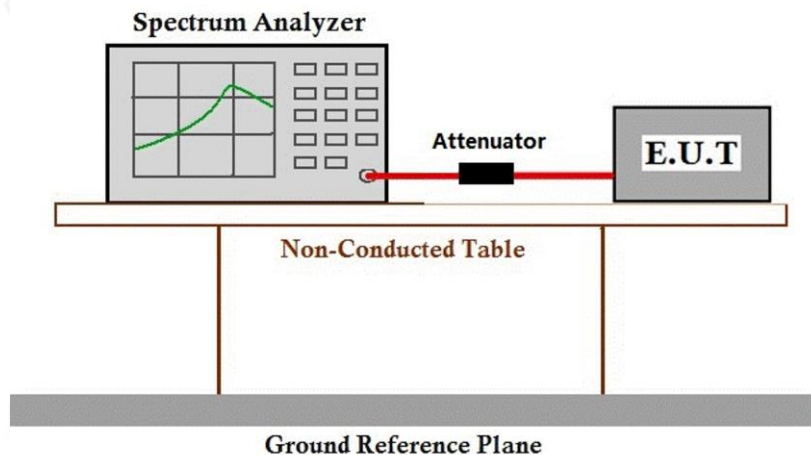
Humidity: 55.6 % RH

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. 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

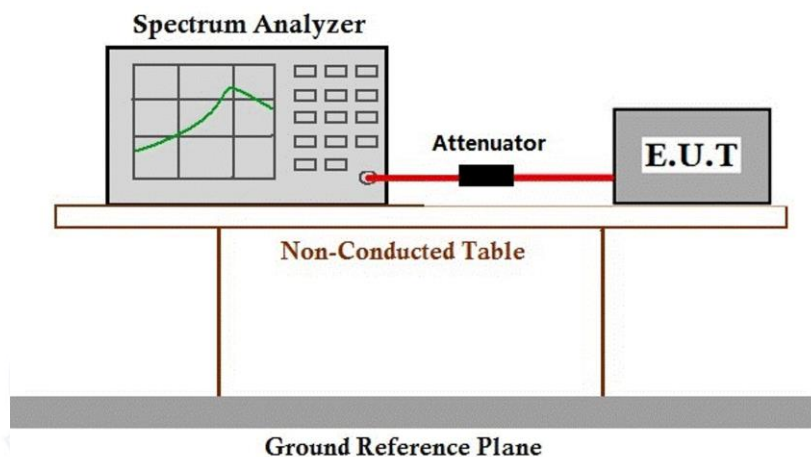
Operating Environment:

Temperature: 23.7 °C Humidity: 55.6 % 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. 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: 23.7 °C

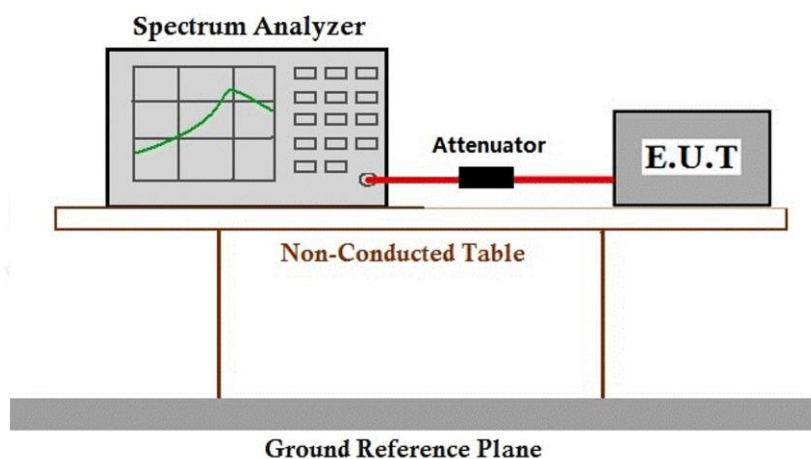
Humidity: 55.6 % RH

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. 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. 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: 23.7 °C

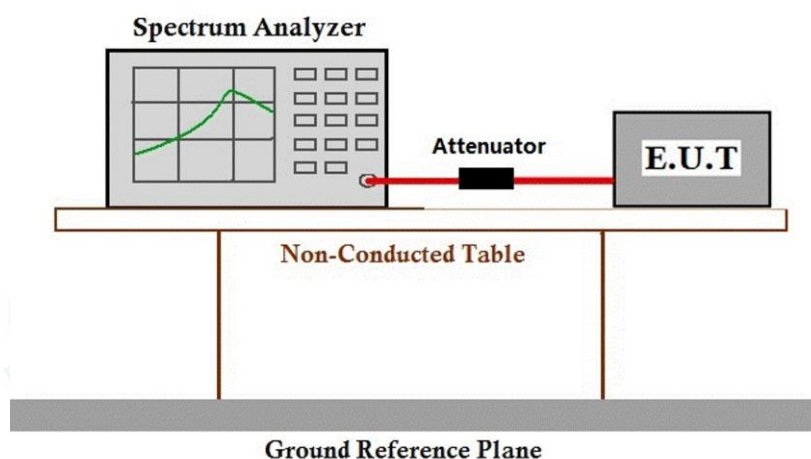
Humidity: 55.6 % RH

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. 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: 23.7 °C

Humidity: 55.6 % RH

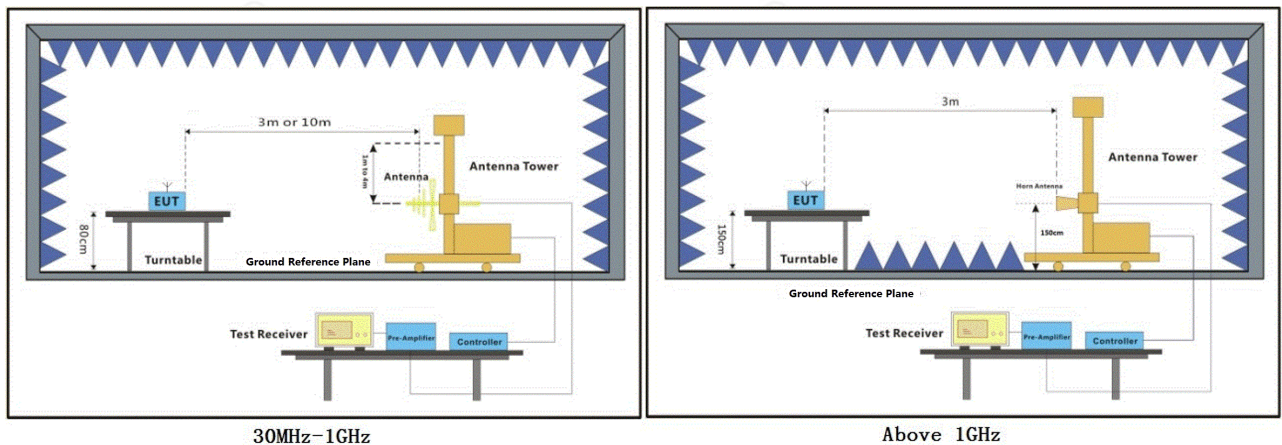
Atmospheric Pressure: 1010 mbar

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. 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	68.31	-30.59	37.72	74.00	-36.28	peak	P
2	2390.000	69.14	-30.49	38.65	74.00	-35.35	peak	P
3	2400.000	77.70	-30.48	47.22	74.00	-26.78	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	67.16	-30.59	36.57	74.00	-37.43	peak	P
2	2390.000	68.99	-30.49	38.50	74.00	-35.50	peak	P
3	2400.000	77.68	-30.48	47.20	74.00	-26.80	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	79.08	-30.39	48.69	74.00	-25.31	peak	P
2	2500.000	71.30	-30.37	40.93	74.00	-33.07	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	80.89	-30.39	50.50	74.00	-23.50	peak	P
2	2500.000	71.90	-30.37	41.53	74.00	-32.47	peak	P



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: 24.7 °C

Humidity: 55.6 % RH

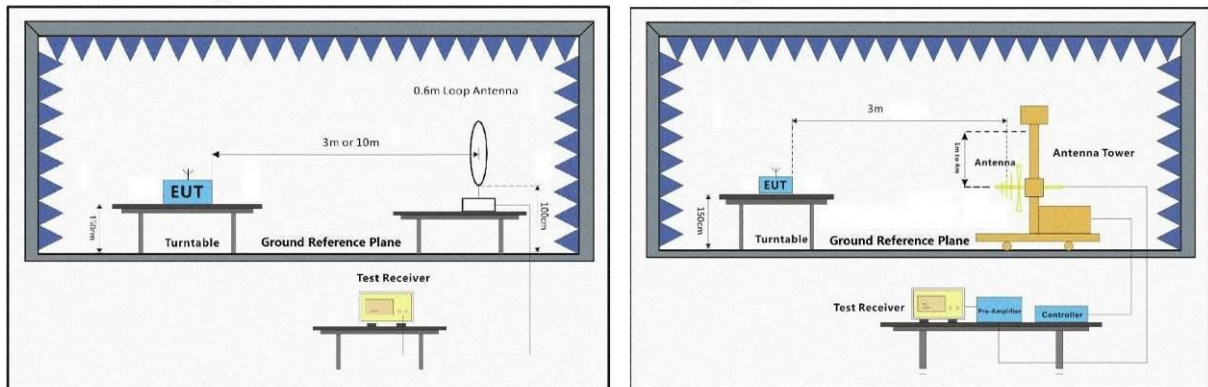
Atmospheric Pressure: 1010 mbar

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. 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:

1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

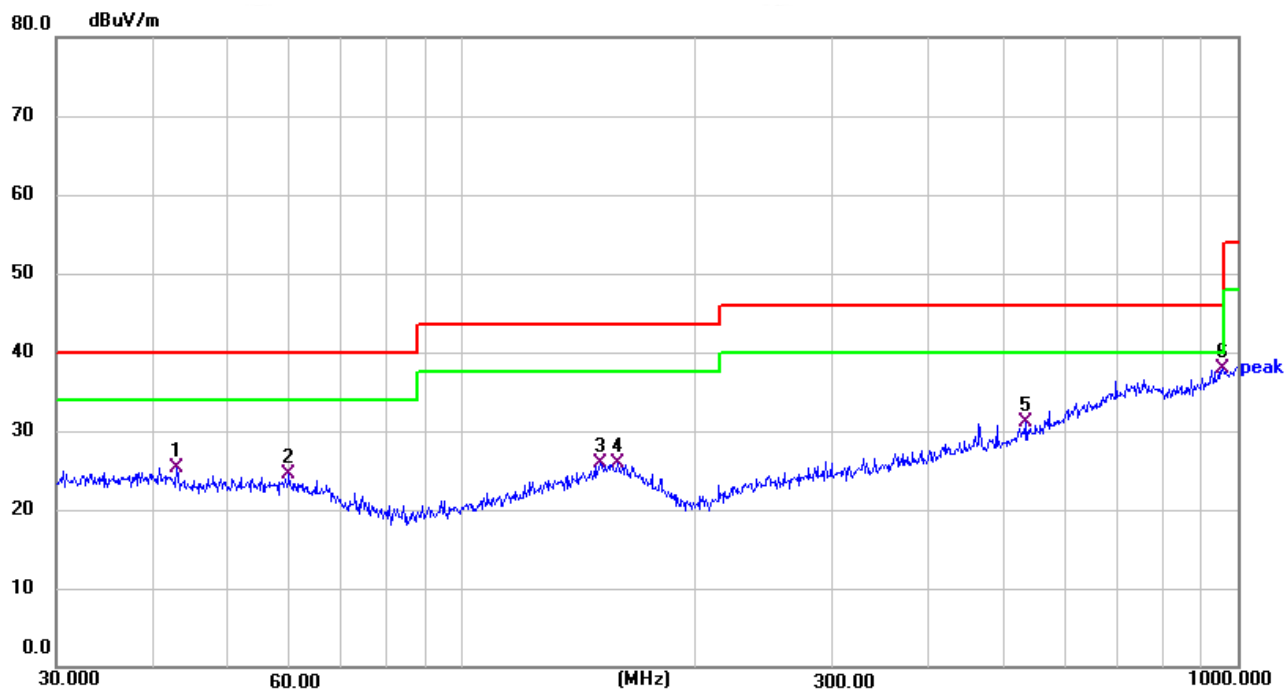
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Reading Level + Factor

3) 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.



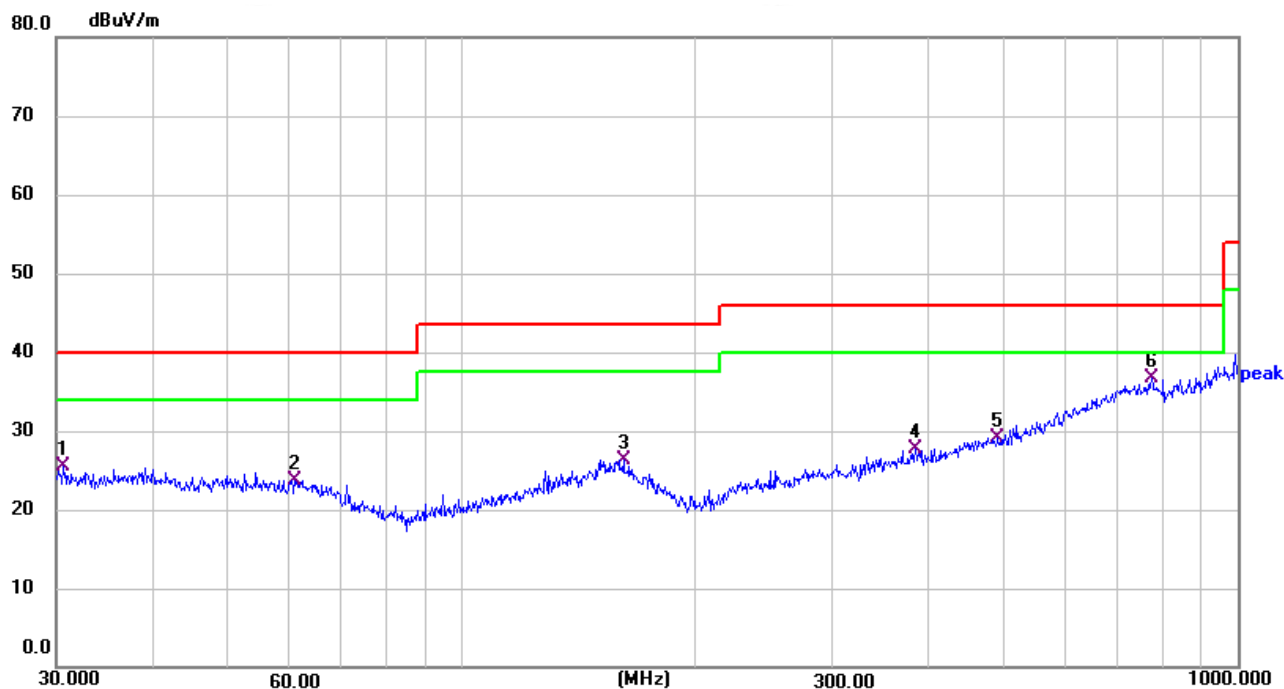
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High



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	42.8997	42.83	-17.53	25.30	40.00	-14.70	QP	100	28	P	
2	59.8588	42.48	-18.06	24.42	40.00	-15.58	QP	199	35	P	
3	150.5377	42.61	-16.80	25.81	43.50	-17.69	QP	199	10	P	
4	158.6677	43.02	-17.18	25.84	43.50	-17.66	QP	199	10	P	
5	533.8321	43.96	-12.90	31.06	46.00	-14.94	QP	100	151	P	
6 *	955.4381	44.81	-6.91	37.90	46.00	-8.10	QP	199	10	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	30.6379	43.36	-17.95	25.41	40.00	-14.59	QP	199	345	P	
2	60.9176	41.93	-18.24	23.69	40.00	-16.31	QP	199	111	P	
3	161.4742	43.85	-17.50	26.35	43.50	-17.15	QP	199	15	P	
4	383.9318	43.42	-15.70	27.72	46.00	-18.28	QP	199	15	P	
5	490.7447	42.96	-13.77	29.19	46.00	-16.81	QP	199	15	P	
6 *	774.1584	45.01	-8.36	36.65	46.00	-9.35	QP	199	15	P	



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: 23.4 °C

Humidity: 55.7 % RH

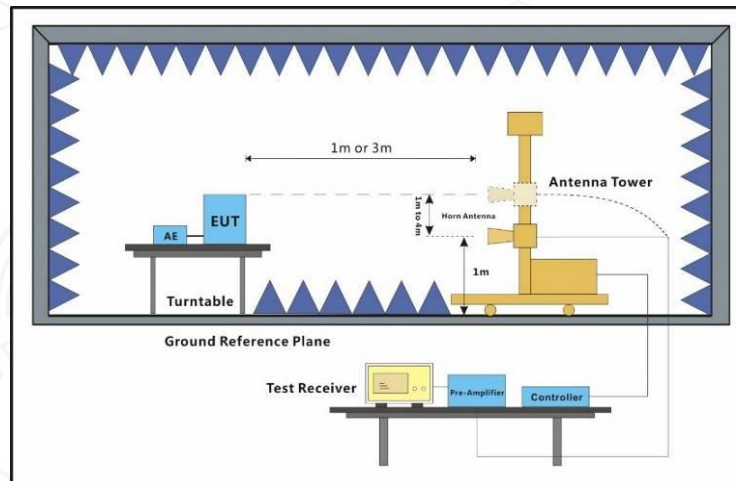
Atmospheric Pressure: 1010 mbar

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. 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

- 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.
- The EUT was set 3 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 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:

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.



TM01 / Polarization: Horizontal / Modulation: GFSK/ CH: L

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2915.120	70.22	-30.59	39.63	74.00	-34.37	peak	P
2	4276.517	68.28	-28.96	39.32	74.00	-34.68	peak	P
3	6085.763	64.39	-25.19	39.20	74.00	-34.80	peak	P
4	8645.932	69.23	-24.09	45.15	74.00	-28.85	peak	P
5	11046.624	68.12	-23.27	44.85	74.00	-29.15	peak	P
6	14218.160	71.75	-20.67	51.08	74.00	-22.92	peak	P

TM01 / Polarization: Vertical / Modulation: GFSK/ CH: L

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.182	67.01	-29.00	38.01	74.00	-35.99	peak	P
2	4313.676	69.61	-28.90	40.71	74.00	-33.29	peak	P
3	6354.210	66.91	-25.11	41.80	74.00	-32.20	peak	P
4	8576.475	70.61	-26.03	44.58	74.00	-29.42	peak	P
5	11286.437	68.45	-22.87	45.58	74.00	-28.42	peak	P
6	14955.451	71.69	-20.84	50.86	74.00	-23.14	peak	P

TM01 / Polarization: Horizontal / Modulation: GFSK/ CH: M

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.686	69.24	-28.80	40.45	74.00	-33.55	peak	P
2	4277.810	69.07	-28.27	40.80	74.00	-33.20	peak	P
3	6084.935	65.37	-25.30	40.07	74.00	-33.93	peak	P
4	8646.804	69.93	-26.02	43.92	74.00	-30.08	peak	P
5	11047.278	67.05	-23.25	43.80	74.00	-30.20	peak	P
6	14217.720	70.78	-21.59	49.19	74.00	-24.81	peak	P

TM01 / Polarization: Vertical / Modulation: GFSK/ CH: M

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.876	66.59	-29.31	37.28	74.00	-36.72	peak	P
2	4313.809	68.76	-28.37	40.39	74.00	-33.61	peak	P
3	6353.308	68.07	-25.39	42.68	74.00	-31.32	peak	P
4	8576.423	68.91	-24.97	43.95	74.00	-30.05	peak	P
5	11287.091	68.91	-23.39	45.52	74.00	-28.48	peak	P
6	14955.526	71.94	-20.56	51.38	74.00	-22.62	peak	P



TM01 / Polarization: Horizontal / Modulation: GFSK/ CH: H

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.858	68.70	-30.37	38.33	74.00	-35.67	peak	P
2	4277.284	68.81	-29.33	39.49	74.00	-34.51	peak	P
3	6086.077	65.79	-25.92	39.87	74.00	-34.13	peak	P
4	8645.116	69.01	-25.51	43.51	74.00	-30.49	peak	P
5	11048.045	67.59	-23.58	44.01	74.00	-29.99	peak	P
6	14218.600	70.88	-20.57	50.31	74.00	-23.69	peak	P

TM01 / Polarization: Vertical / Modulation: GFSK/ CH: H

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.271	67.88	-29.41	38.47	74.00	-35.53	peak	P
2	4313.897	69.81	-28.87	40.94	74.00	-33.06	peak	P
3	6354.060	66.94	-25.19	41.74	74.00	-32.26	peak	P
4	8576.434	69.93	-26.05	43.89	74.00	-30.11	peak	P
5	11286.603	68.95	-23.20	45.75	74.00	-28.25	peak	P
6	14954.881	70.84	-19.49	51.35	74.00	-22.65	peak	P

TM01 / Polarization: Horizontal / Modulation: $\pi/4$ DQPSK / CH: L

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2914.934	69.19	-29.61	39.57	74.00	-34.43	peak	P
2	4276.894	68.82	-28.54	40.28	74.00	-33.72	peak	P
3	6086.422	65.73	-26.23	39.50	74.00	-34.50	peak	P
4	8645.065	68.93	-25.18	43.75	74.00	-30.25	peak	P
5	11048.193	68.06	-23.89	44.16	74.00	-29.84	peak	P
6	14218.573	71.52	-20.87	50.66	74.00	-23.34	peak	P

TM01 / Polarization: Horizontal / Modulation: $\pi/4$ DQPSK / CH: L

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2972.325	67.77	-30.17	37.60	74.00	-36.40	peak	P
2	4313.034	68.50	-29.17	39.33	74.00	-34.67	peak	P
3	6353.613	67.30	-25.23	42.07	74.00	-31.93	peak	P
4	8576.305	70.05	-24.61	45.44	74.00	-28.56	peak	P
5	11286.706	67.40	-23.65	43.74	74.00	-30.26	peak	P
6	14956.662	70.53	-20.59	49.94	74.00	-24.06	peak	P



TM01 / Polarization: Horizontal / Modulation: $\pi/4$ DQPSK / CH: M

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.863	69.34	-30.33	39.01	74.00	-34.99	peak	P
2	4277.743	68.77	-28.28	40.48	74.00	-33.52	peak	P
3	6085.734	64.59	-25.54	39.05	74.00	-34.95	peak	P
4	8645.450	69.92	-24.30	45.62	74.00	-28.38	peak	P
5	11048.265	68.19	-24.33	43.85	74.00	-30.15	peak	P
6	14219.104	69.86	-21.86	48.00	74.00	-26.00	peak	P

TM01 / Polarization: Vertical / Modulation: $\pi/4$ DQPSK / CH: M

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2972.924	66.81	-29.64	37.18	74.00	-36.82	peak	P
2	4313.842	69.71	-28.89	40.82	74.00	-33.18	peak	P
3	6353.275	66.72	-26.39	40.33	74.00	-33.67	peak	P
4	8576.705	70.23	-24.88	45.35	74.00	-28.65	peak	P
5	11286.447	67.01	-23.74	43.27	74.00	-30.73	peak	P
6	14955.115	70.75	-20.41	50.34	74.00	-23.66	peak	P

TM01 / Polarization: Horizontal / Modulation: $\pi/4$ DQPSK / CH: H

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.965	69.55	-29.68	39.87	74.00	-34.13	peak	P
2	4277.036	67.75	-28.76	38.99	74.00	-35.01	peak	P
3	6084.686	65.13	-24.68	40.45	74.00	-33.55	peak	P
4	8645.131	70.47	-24.53	45.94	74.00	-28.06	peak	P
5	11046.420	68.92	-23.49	45.42	74.00	-28.58	peak	P
6	14217.964	71.60	-21.33	50.27	74.00	-23.73	peak	P

TM01 / Polarization: Vertical / Modulation: $\pi/4$ DQPSK / CH: H

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.371	67.79	-29.46	38.33	74.00	-35.67	peak	P
2	4313.723	68.85	-29.05	39.80	74.00	-34.20	peak	P
3	6354.238	68.34	-24.94	43.40	74.00	-30.60	peak	P
4	8575.981	70.30	-24.93	45.37	74.00	-28.63	peak	P
5	11286.508	68.13	-23.85	44.28	74.00	-29.72	peak	P
6	14955.301	70.31	-20.21	50.10	74.00	-23.90	peak	P



8 Test Setup Photo

Refer to Appendix – Test Setup Photos.

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Appendix EUT Photos

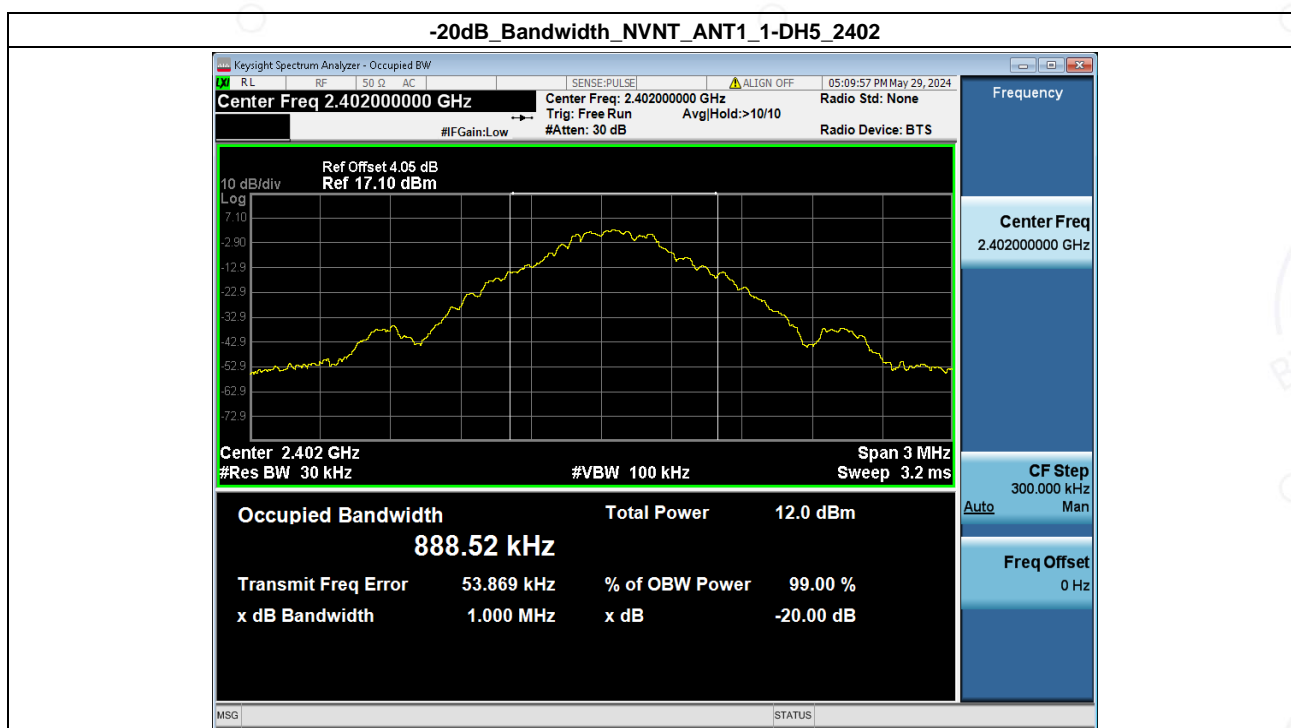


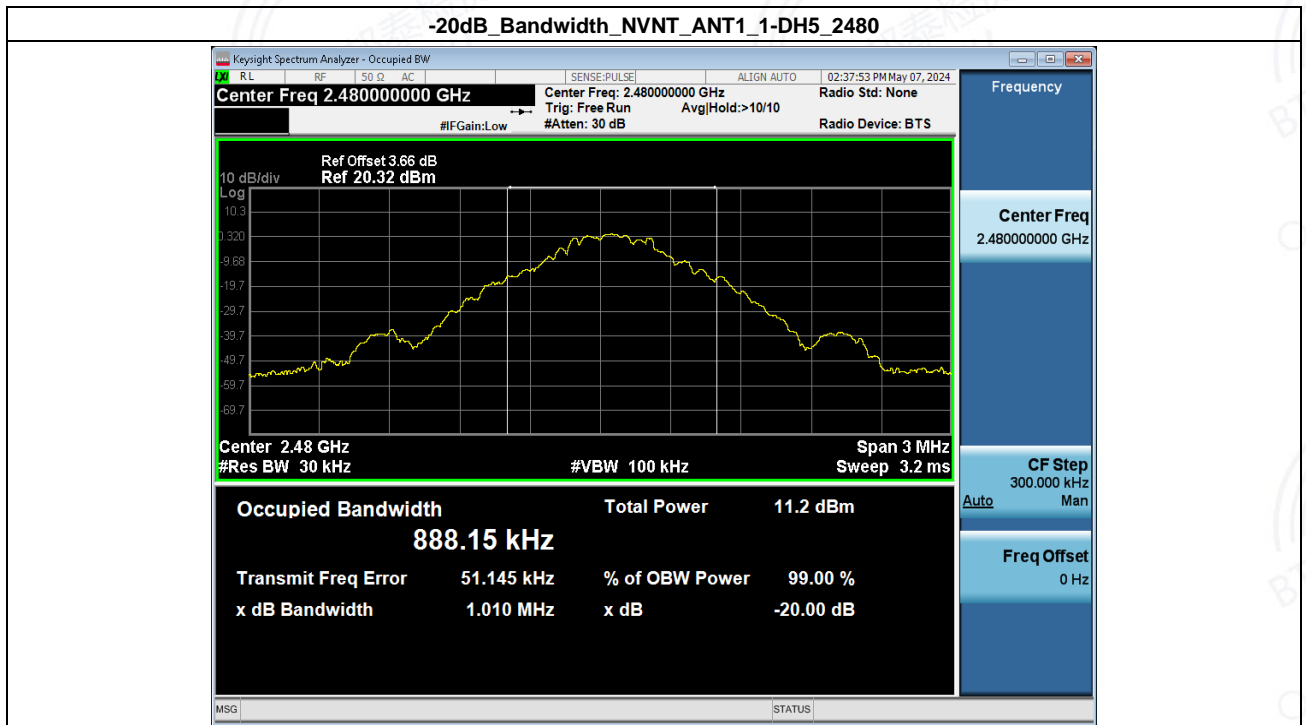
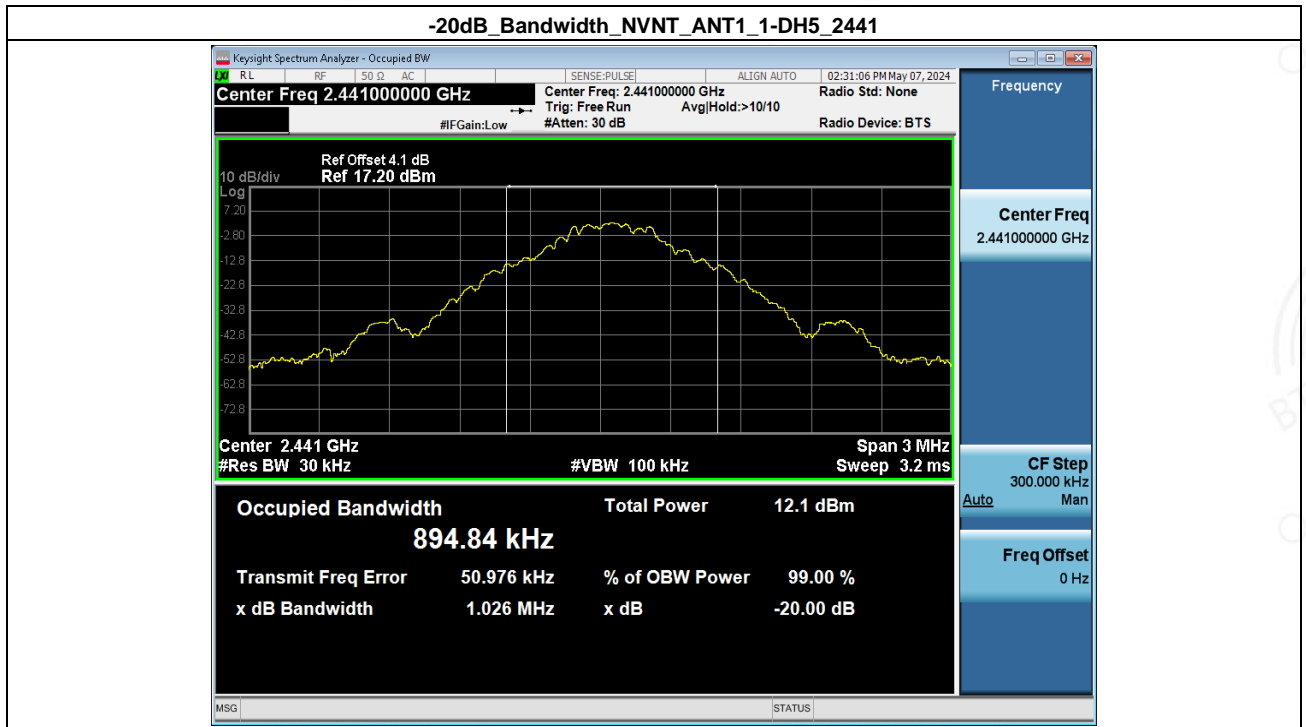
10 Appendix

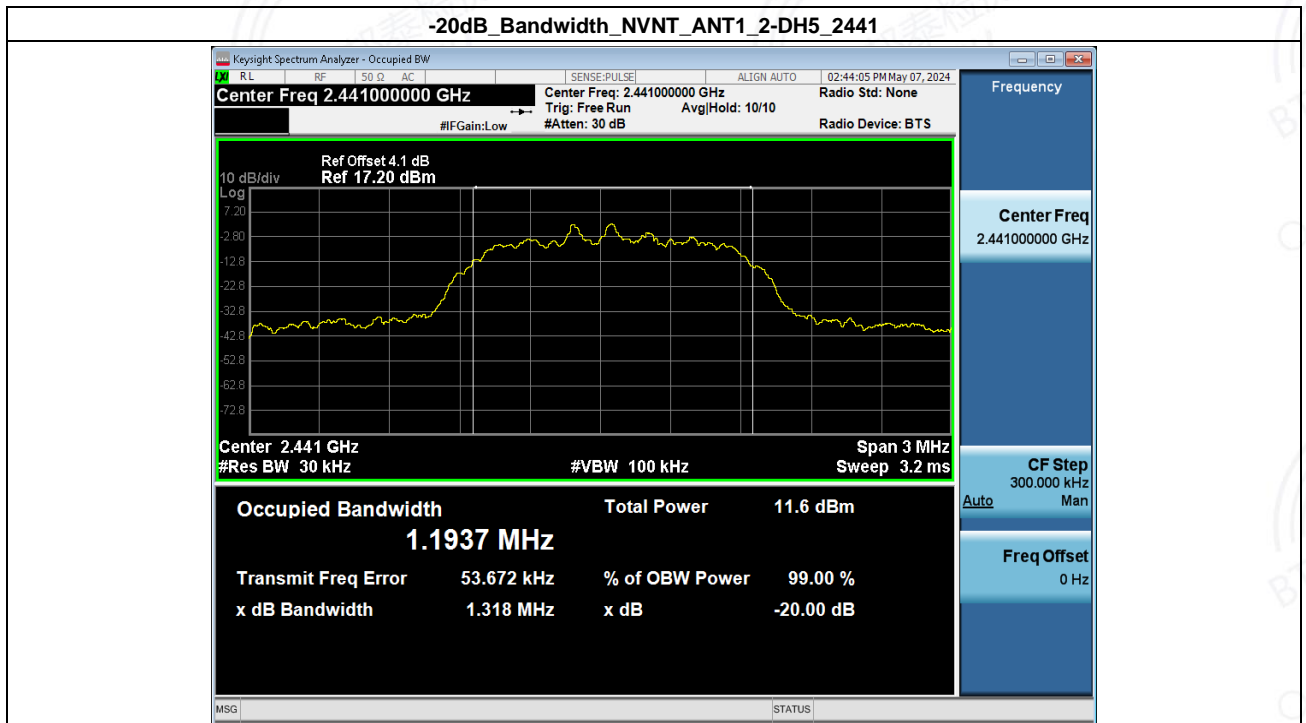
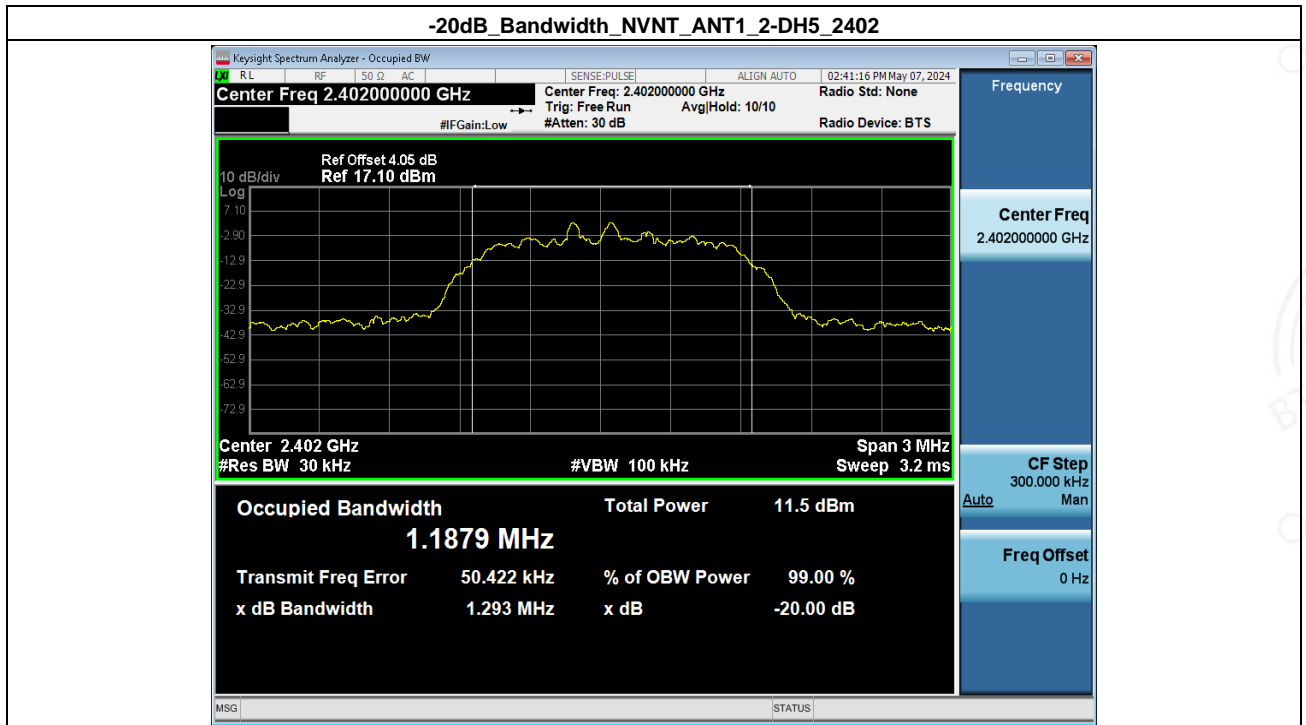
Cable loss=0.83 dB

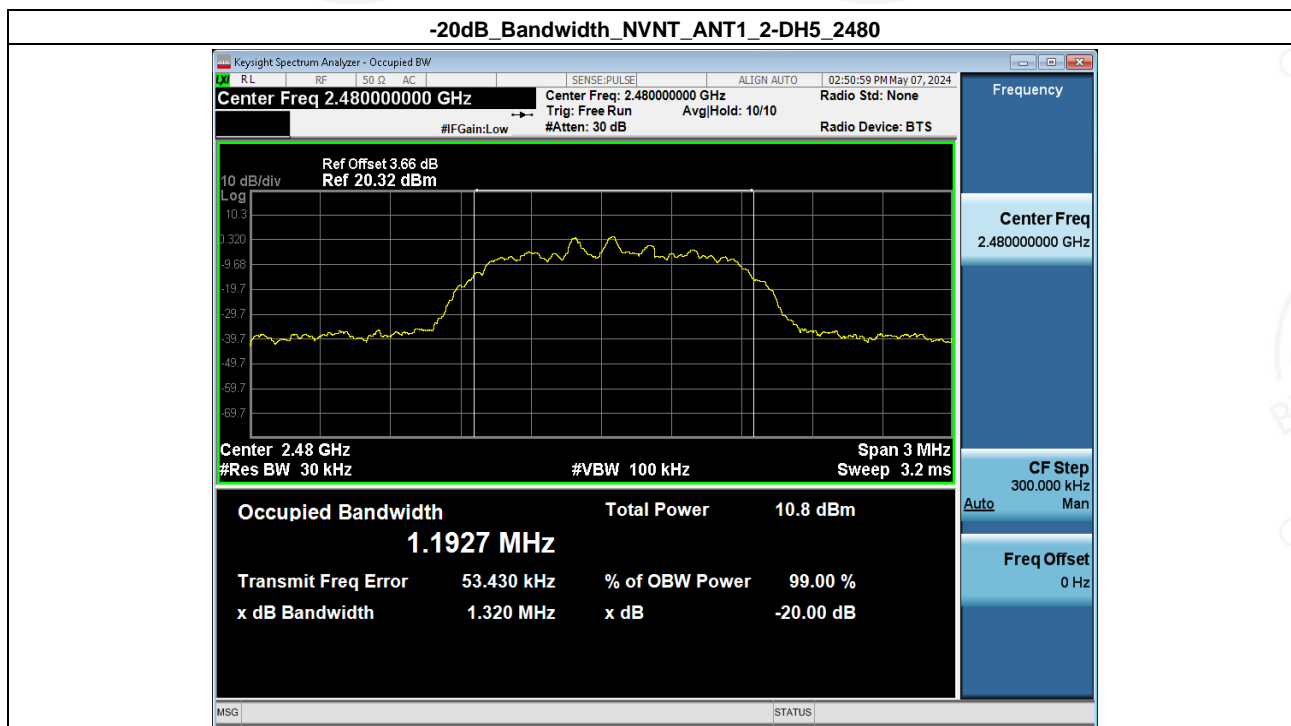
1. -20dB Bandwidth

Condition	Antenna	Modulation	Frequency (MHz)	-20dB BW(MHz)	if larger than CFS
NVNT	ANT1	1-DH5	2402	1.000	Yes
NVNT	ANT1	1-DH5	2441.00	1.026	Yes
NVNT	ANT1	1-DH5	2480	1.010	Yes
NVNT	ANT1	2-DH5	2402	1.293	Yes
NVNT	ANT1	2-DH5	2441.00	1.318	Yes
NVNT	ANT1	2-DH5	2480	1.320	Yes



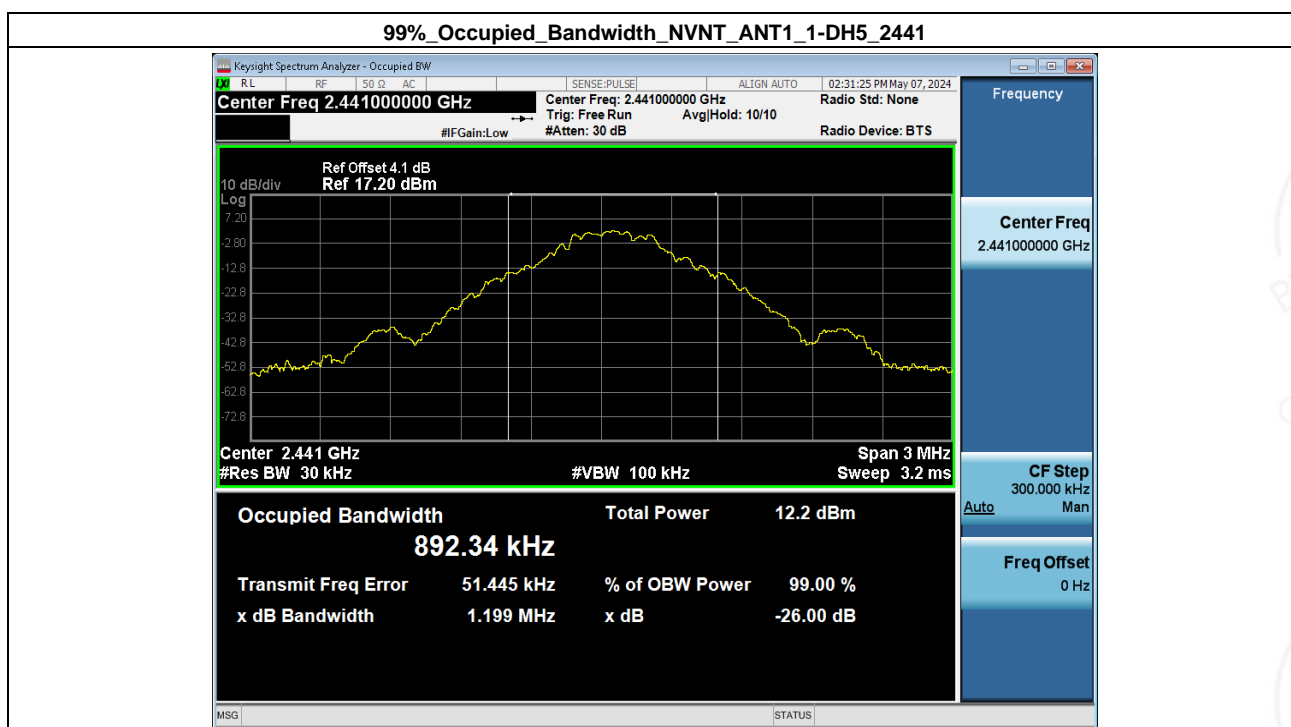
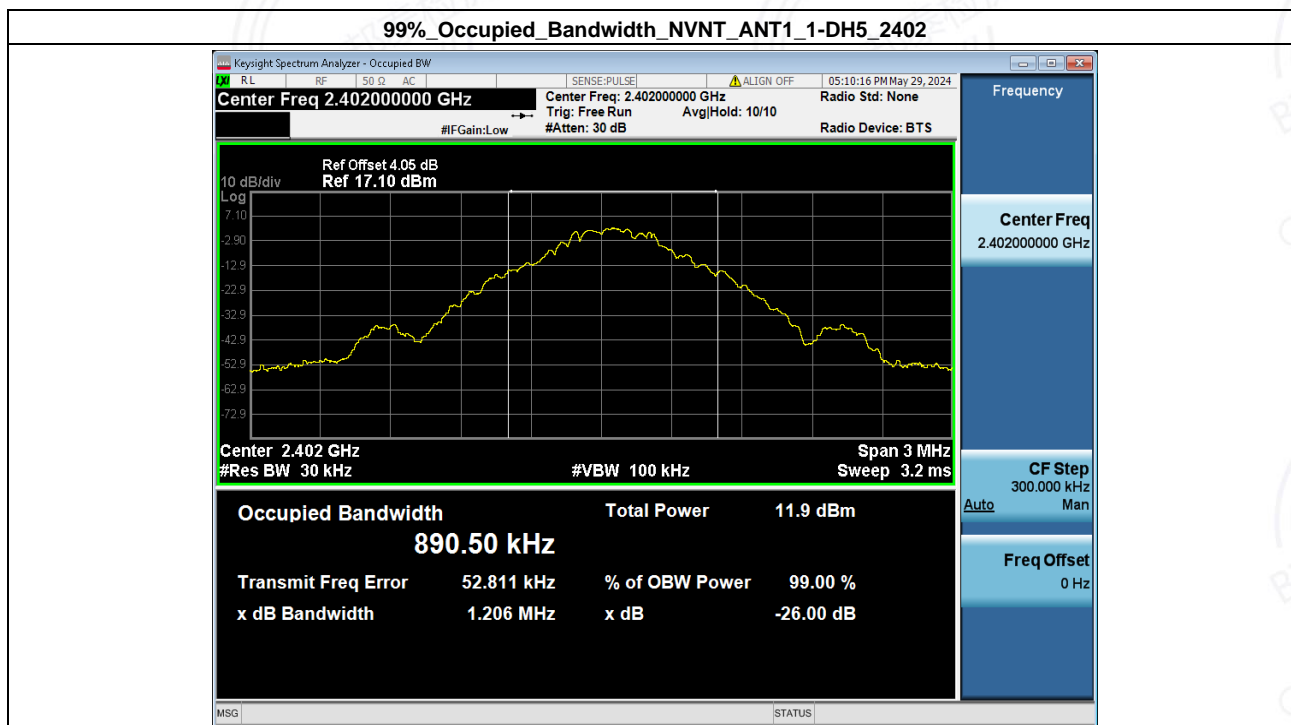




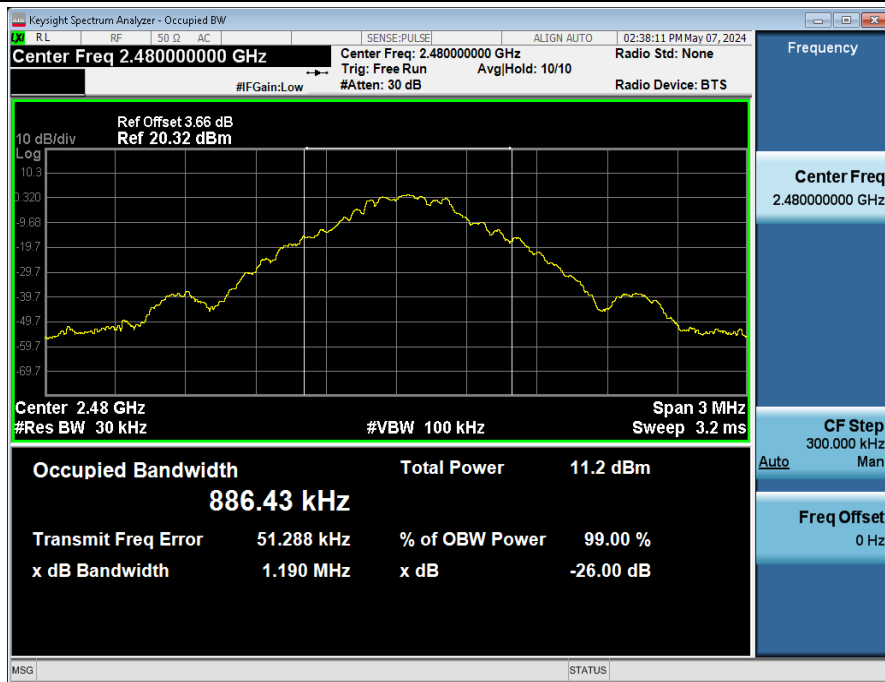


2. 99% Occupied Bandwidth

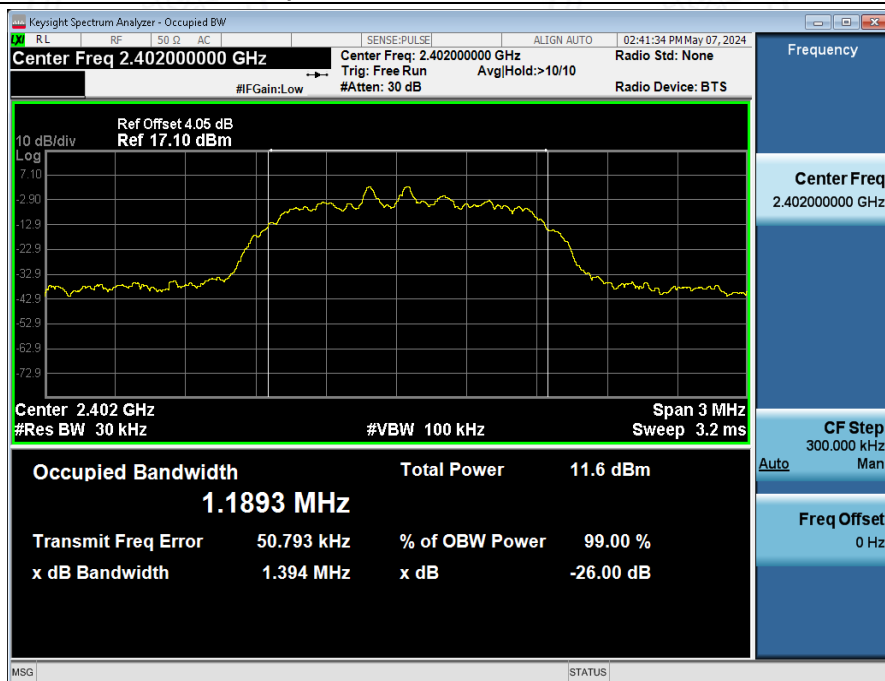
Condition	Antenna	Modulation	Frequency (MHz)	99%%BW(MHz)
NVNT	ANT1	1-DH5	2402	0.890
NVNT	ANT1	1-DH5	2441.00	0.892
NVNT	ANT1	1-DH5	2480	0.886
NVNT	ANT1	2-DH5	2402	1.189
NVNT	ANT1	2-DH5	2441.00	1.194
NVNT	ANT1	2-DH5	2480	1.190

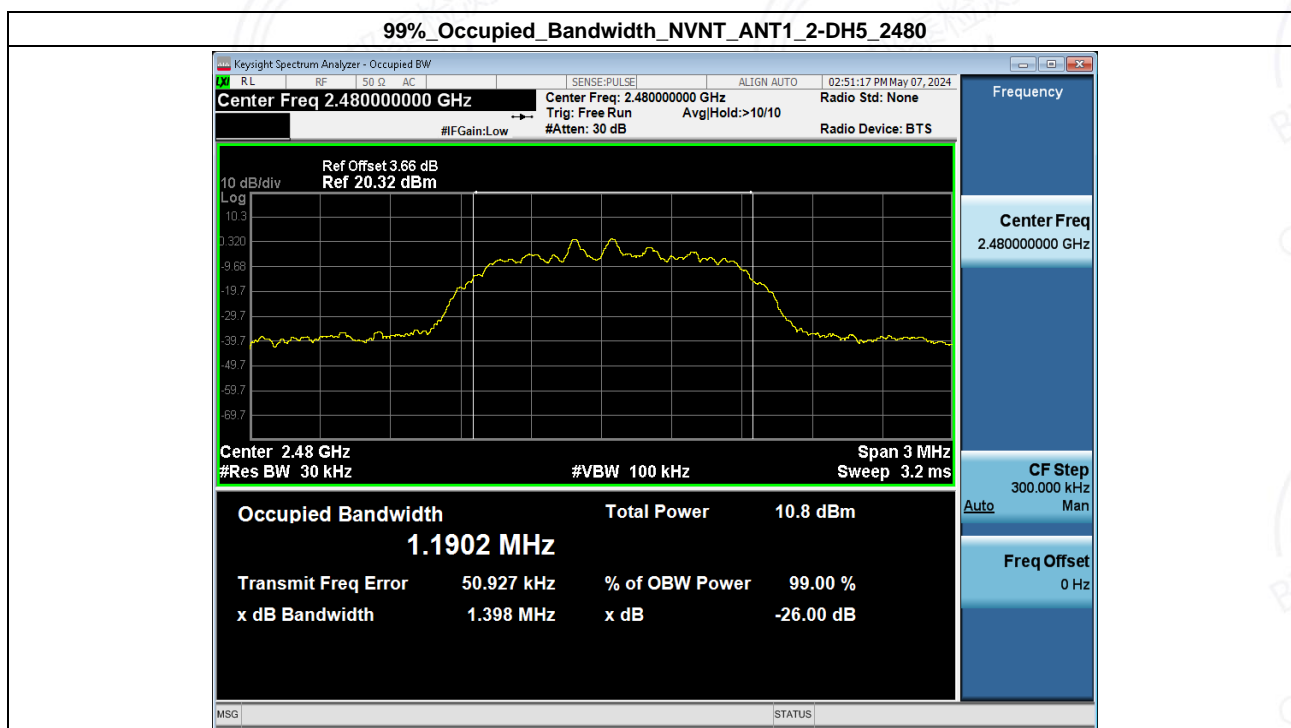
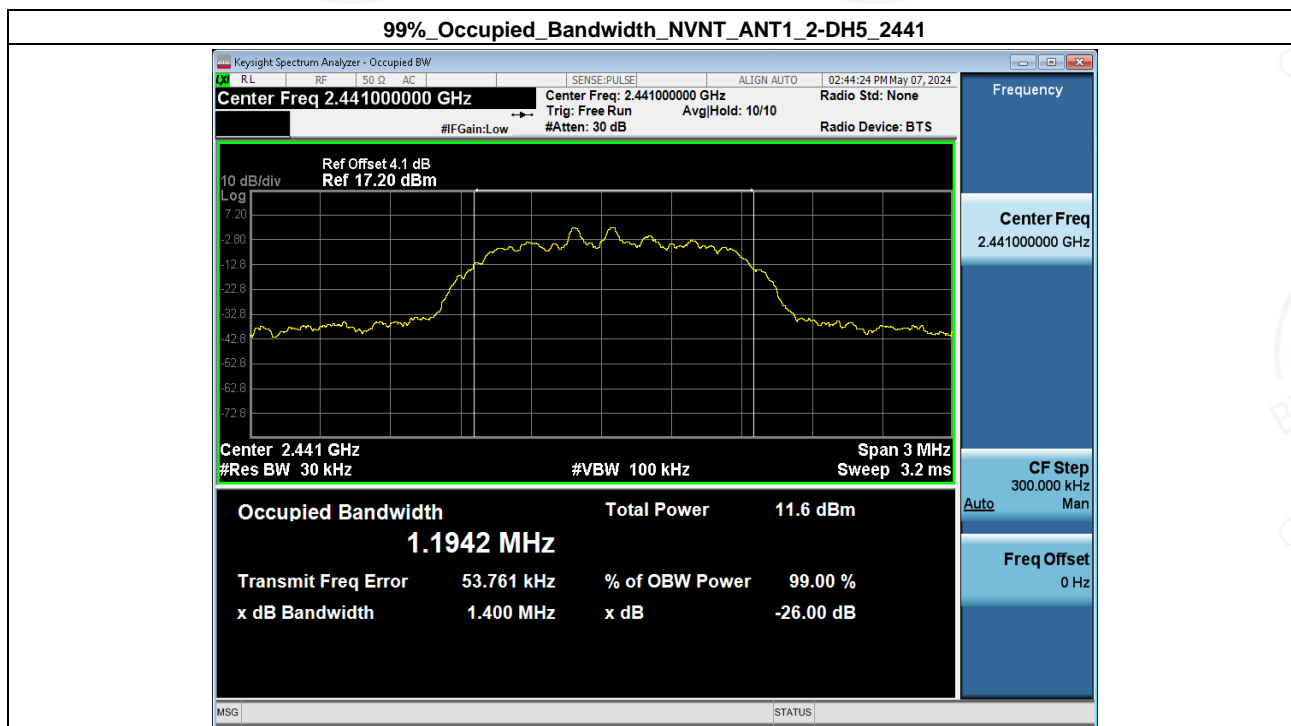


99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2480



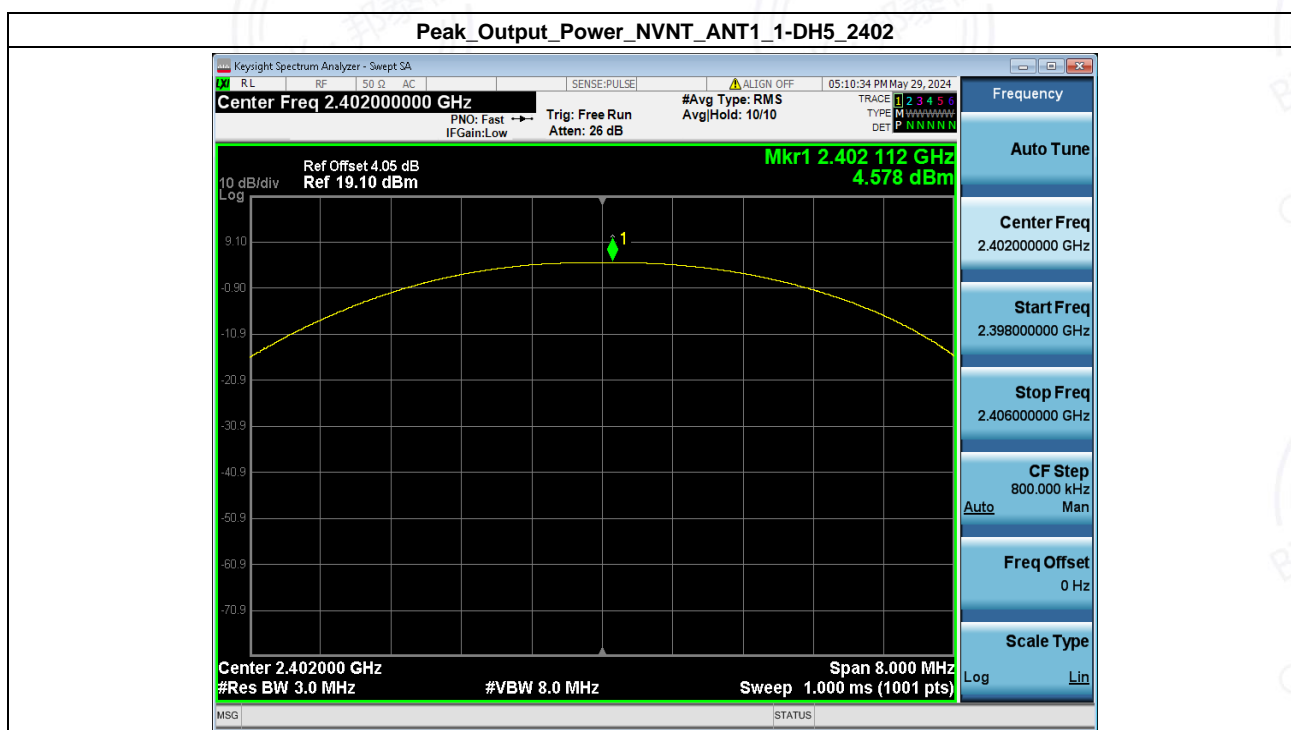
99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2402

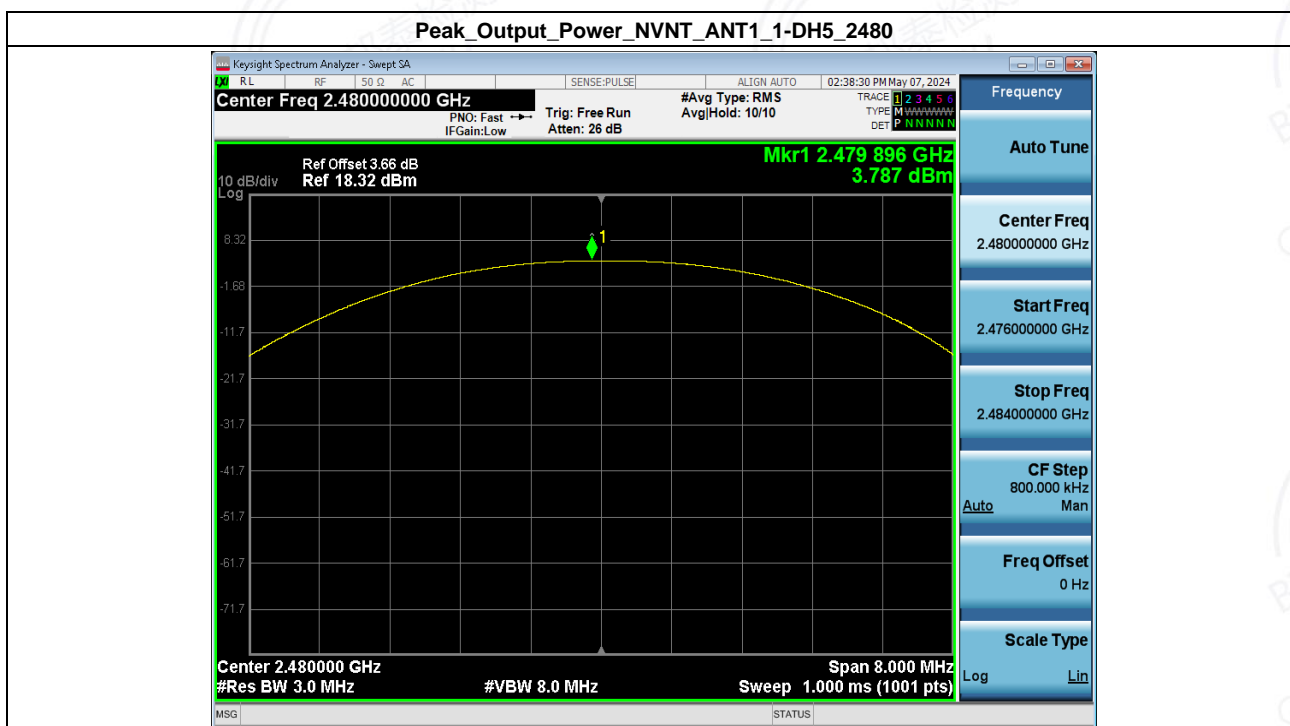
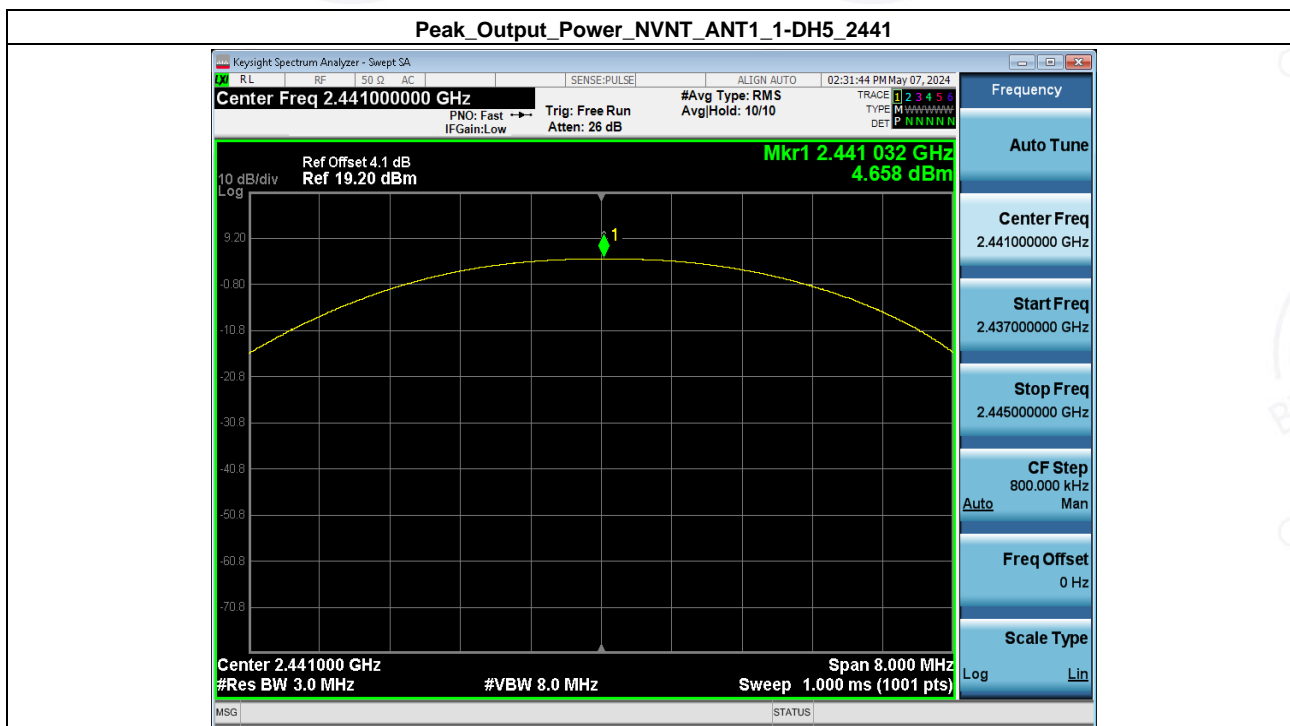


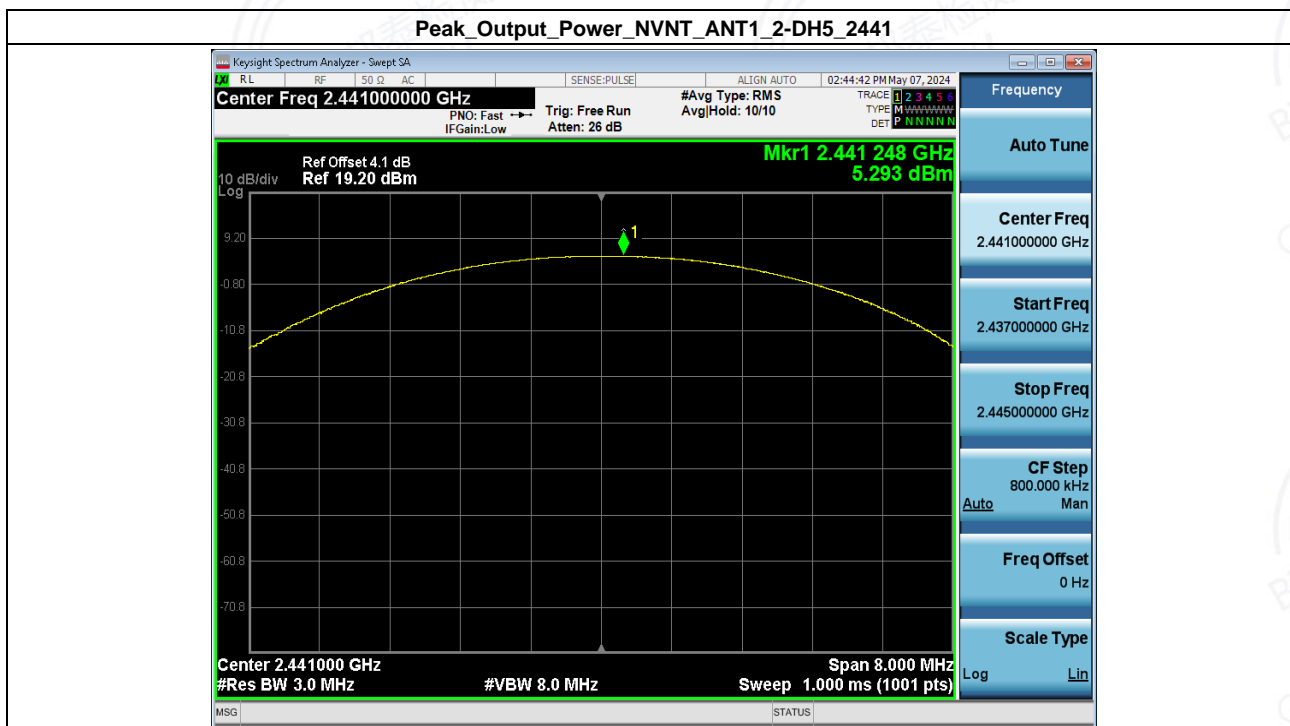
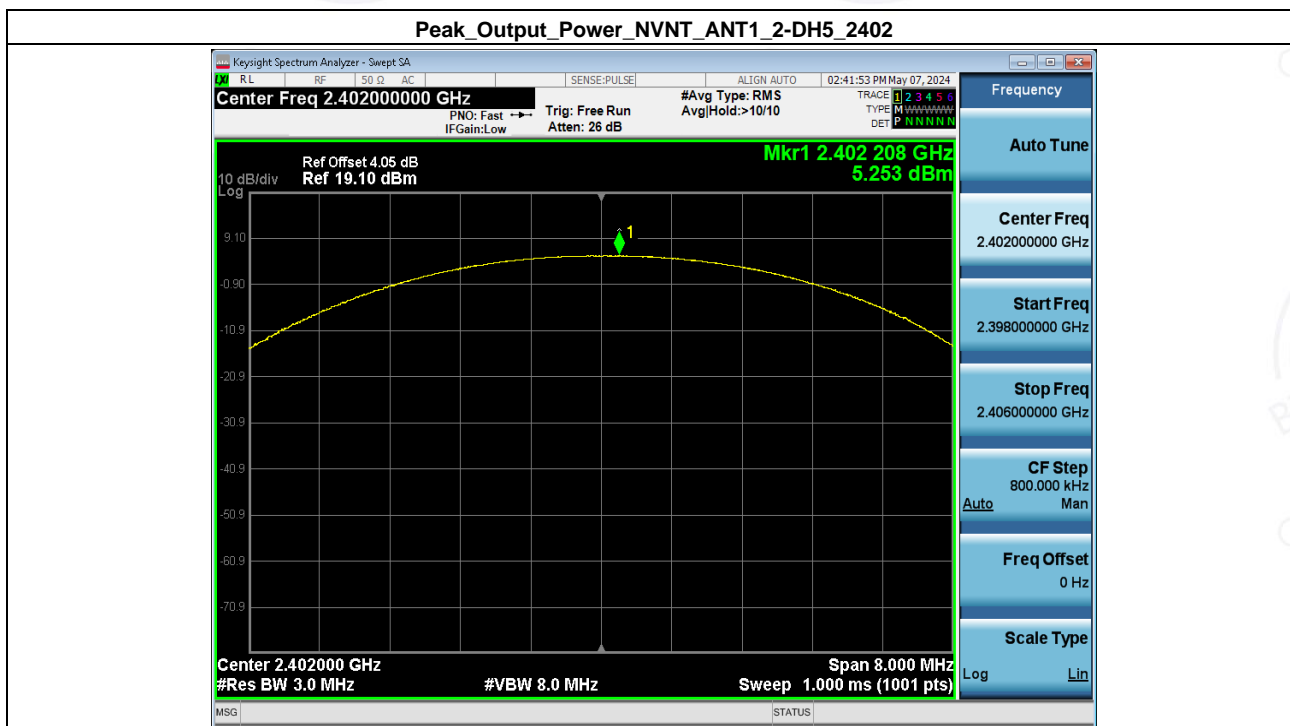


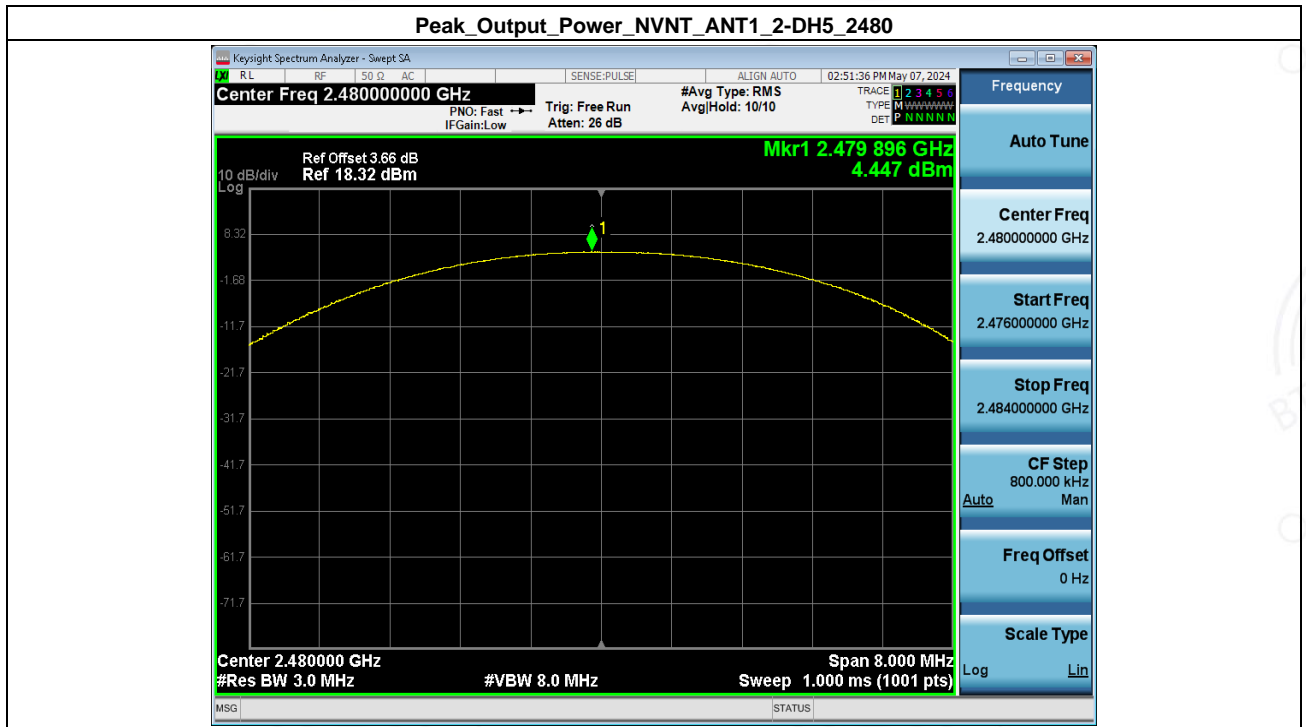
3. Peak Output Power

Condition	Antenna	Modulation	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1-DH5	2402	4.70	2.87	125	Pass
NVNT	ANT1	1-DH5	2441.00	4.66	2.92	125	Pass
NVNT	ANT1	1-DH5	2480	3.79	2.39	125	Pass
NVNT	ANT1	2-DH5	2402	5.25	3.35	125	Pass
NVNT	ANT1	2-DH5	2441.00	5.29	3.38	125	Pass
NVNT	ANT1	2-DH5	2480	4.45	2.78	125	Pass





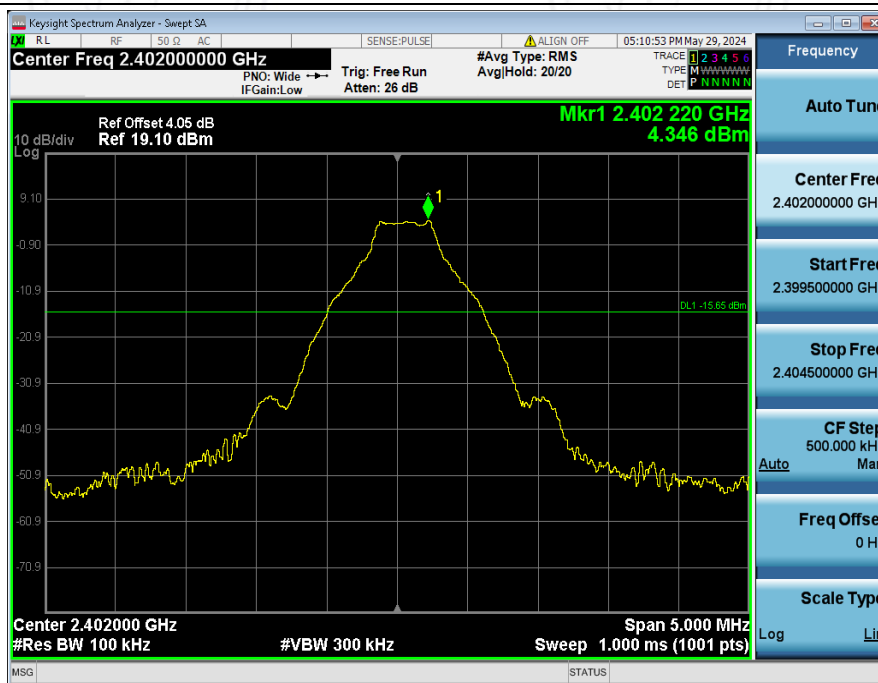




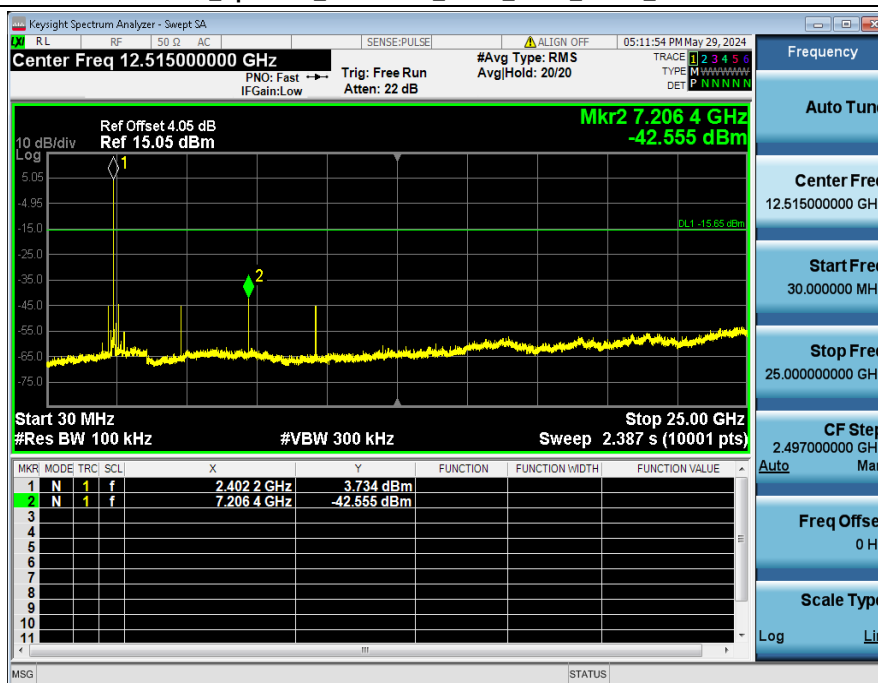
4. Spurious Emissions

Condition	Antenna	Modulation	TX Mode	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1-DH5	2402	-42.555	-15.654	Pass
NVNT	ANT1	1-DH5	2441.00	-43.633	-15.580	Pass
NVNT	ANT1	1-DH5	2480	-43.295	-16.447	Pass
NVNT	ANT1	2-DH5	2402	-45.477	-15.675	Pass
NVNT	ANT1	2-DH5	2441.00	-44.039	-15.721	Pass
NVNT	ANT1	2-DH5	2480	-45.067	-16.421	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402



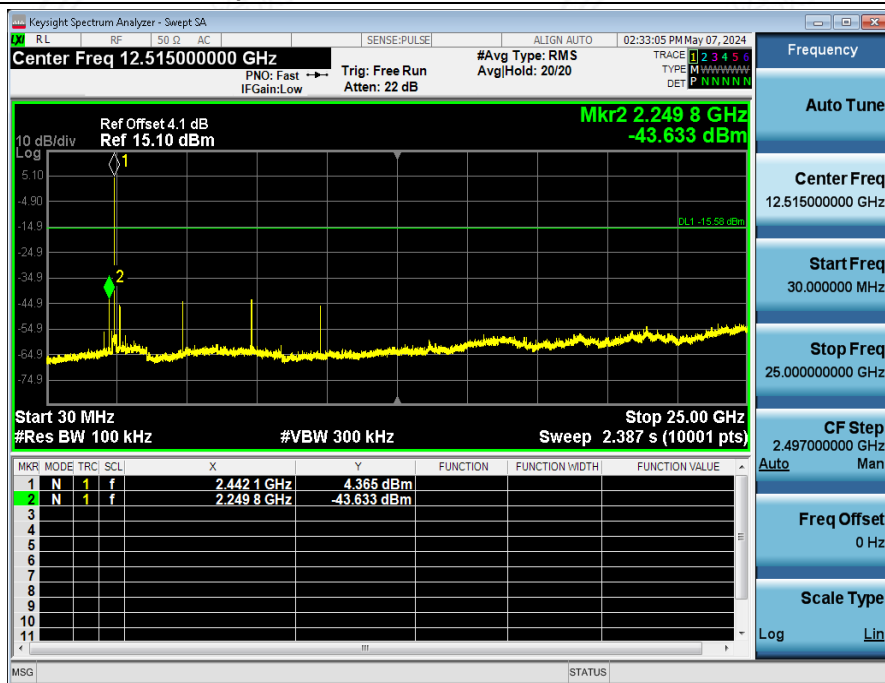
2_Spurious Emissions_NVNT_ANT1_1-DH5_2402



1_Reference_Level_NVNT_ANT1_1-DH5_2441



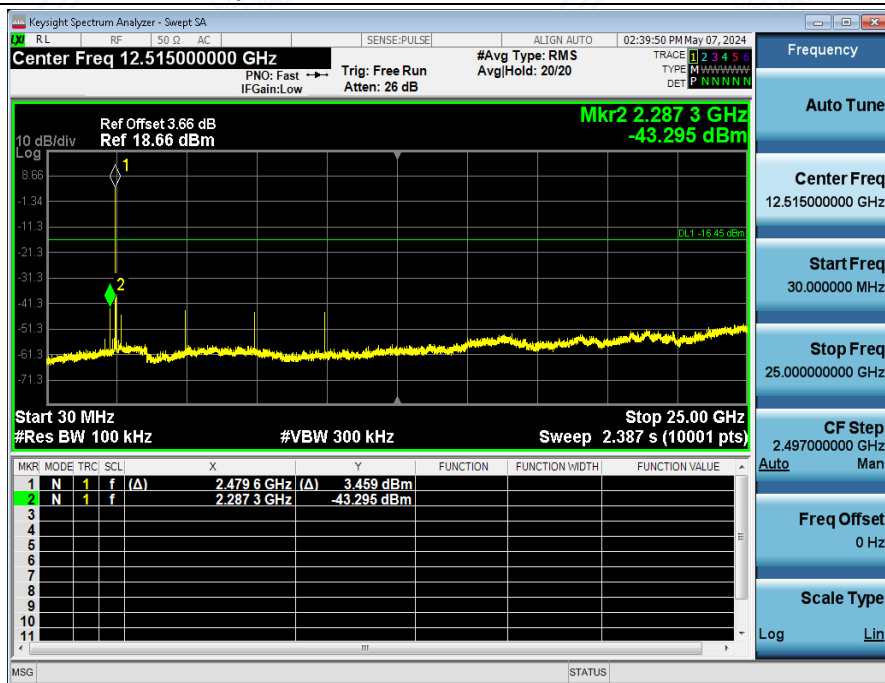
2_Spurious Emissions_NVNT_ANT1_1-DH5_2441



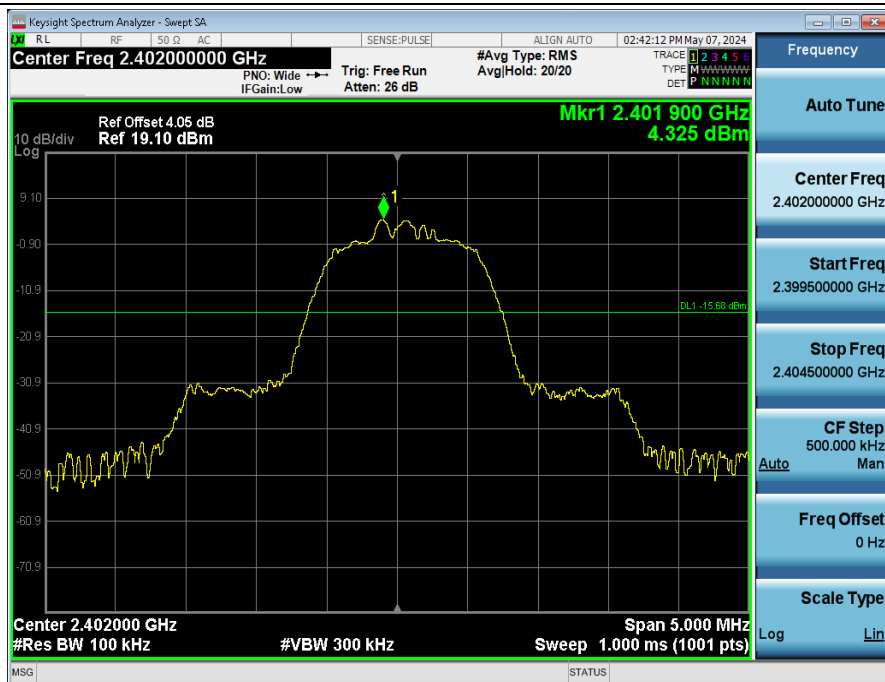
1_Reference_Level_NVNT_ANT1_1-DH5_2480



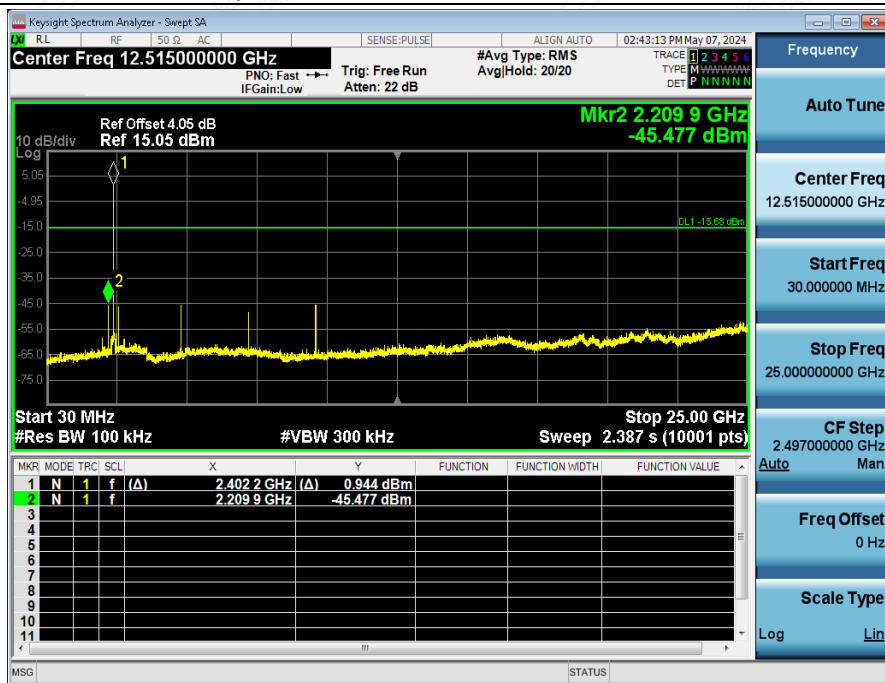
2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480



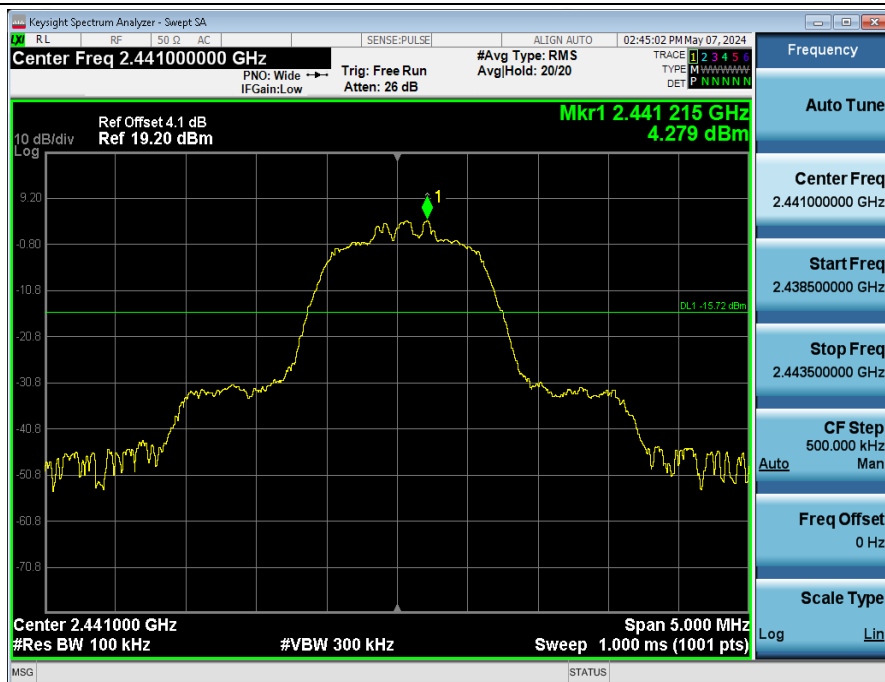
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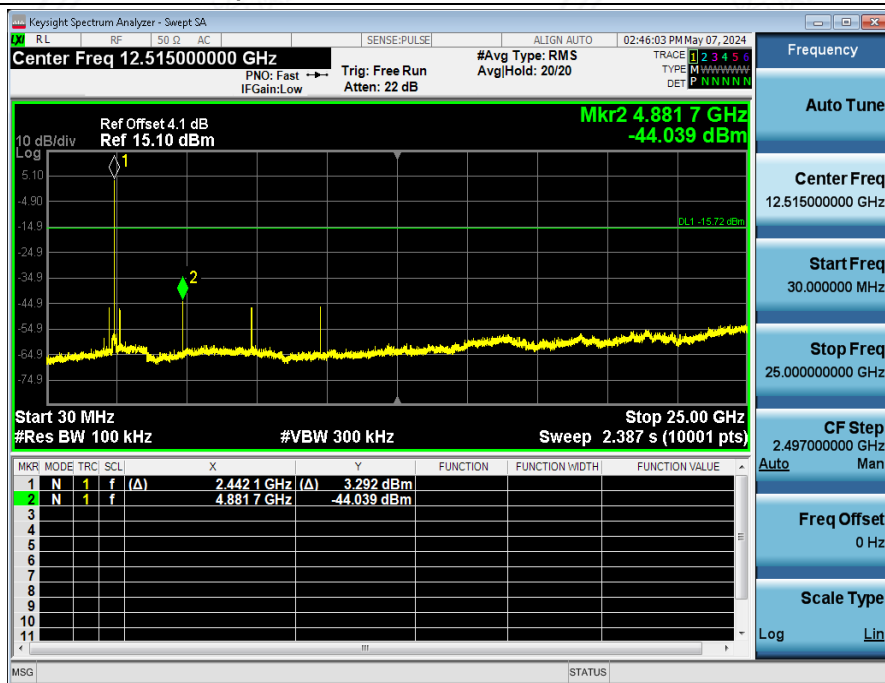
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402



1_Reference_Level_NVNT_ANT1_2-DH5_2441



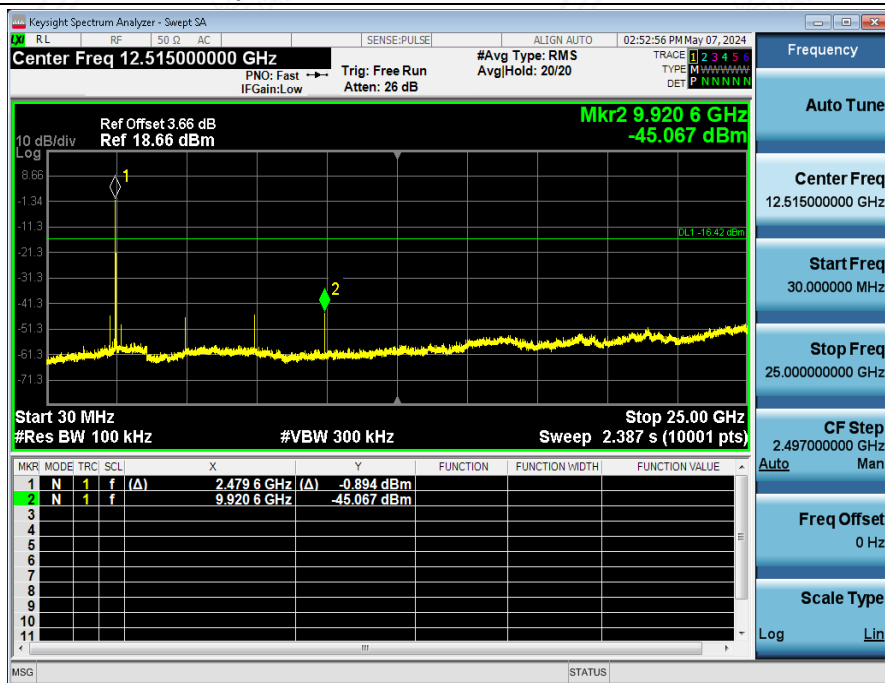
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441



1_Reference_Level_NVNT_ANT1_2-DH5_2480

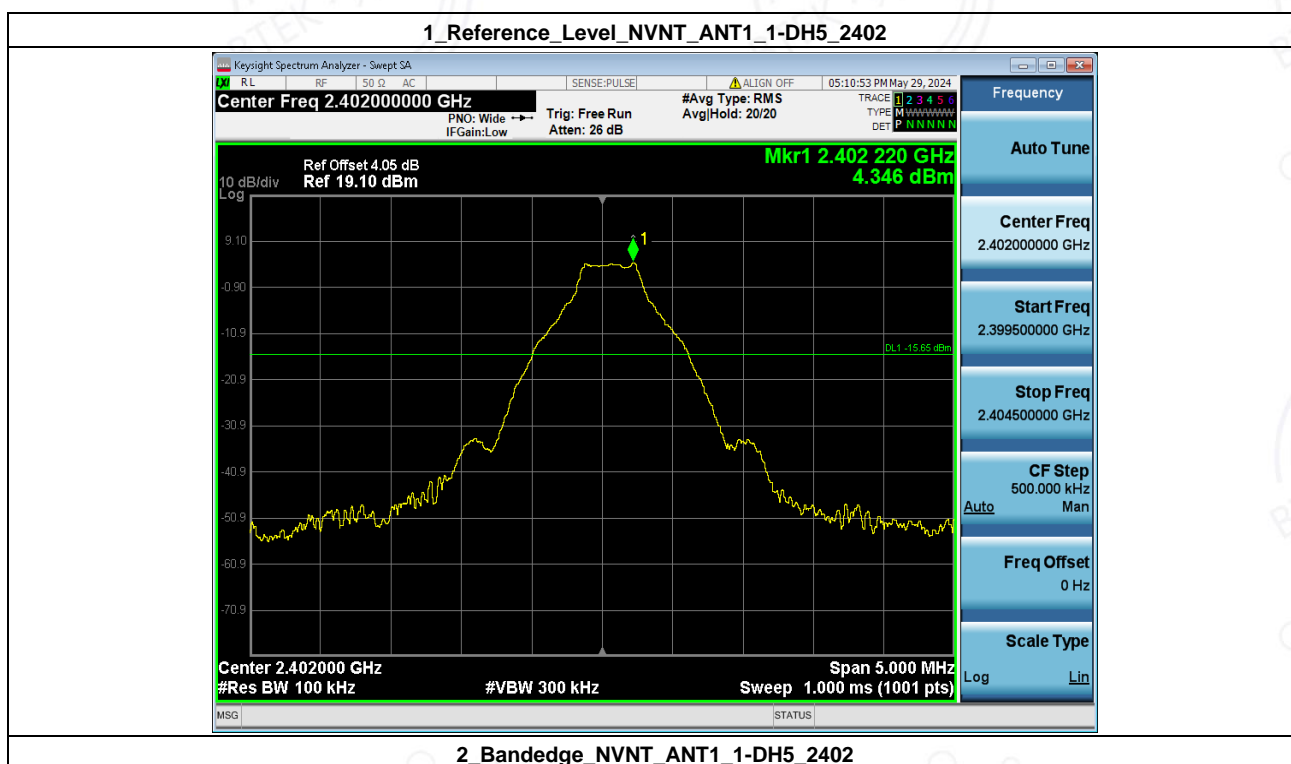


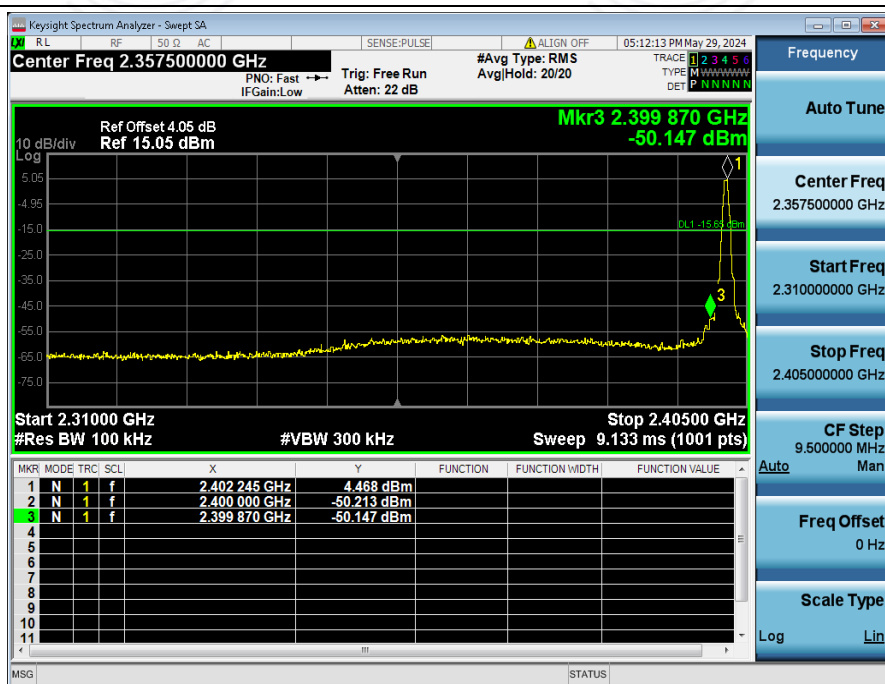
2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480



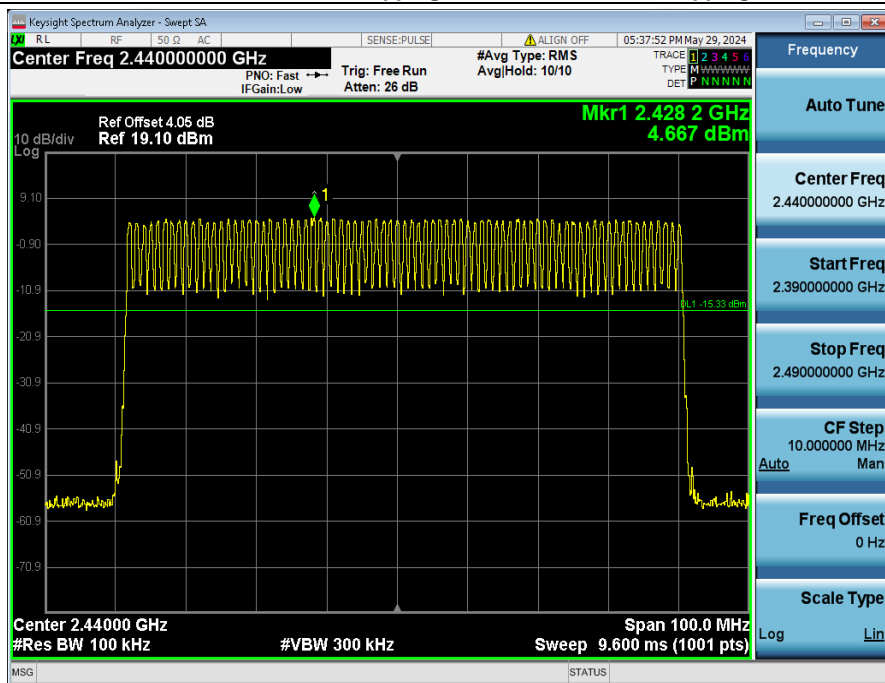
5. Bandedge

Condition	Antenna	Modulation	TX Mode	Bandedge MAX.Value	Limit	Result
NVNT	ANT1	1-DH5	2402	-50.147	-15.654	Pass
NVNT	ANT1	1-DH5	Hopping_LCH	-54.881	-15.333	Pass
NVNT	ANT1	1-DH5	2480	-56.726	-16.447	Pass
NVNT	ANT1	1-DH5	Hopping_HCH	-56.441	-16.077	Pass
NVNT	ANT1	2-DH5	2402	-45.730	-15.675	Pass
NVNT	ANT1	2-DH5	Hopping_LCH	-53.105	-15.251	Pass
NVNT	ANT1	2-DH5	2480	-52.582	-16.421	Pass
NVNT	ANT1	2-DH5	Hopping_HCH	-57.385	-16.064	Pass



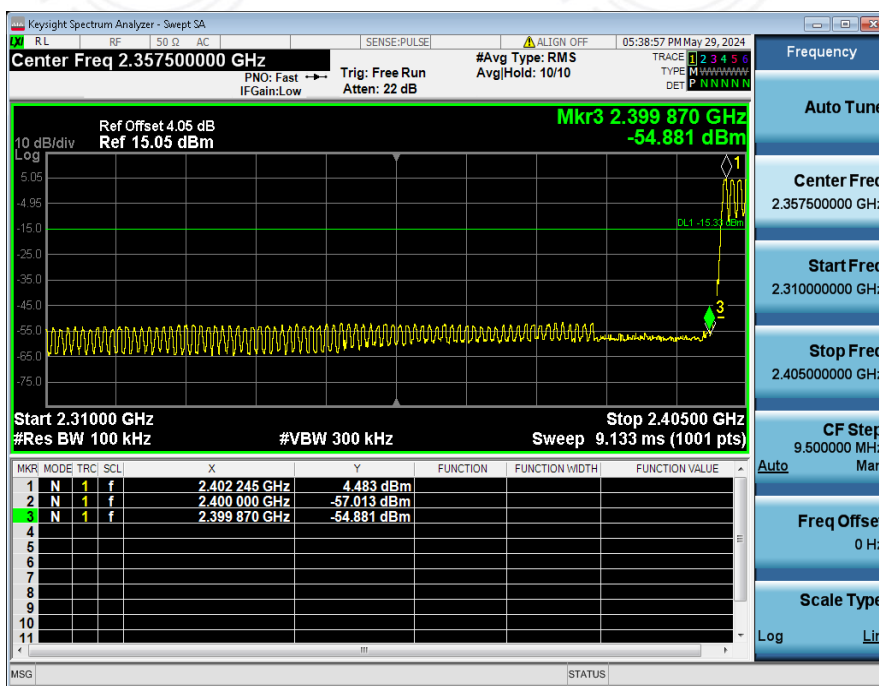


1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping



2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping

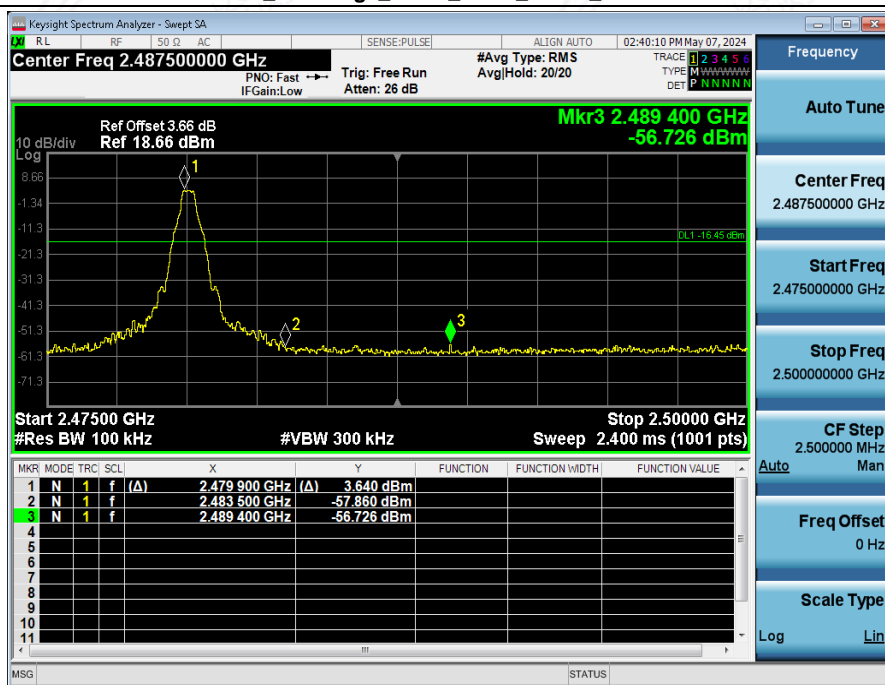




1_Reference_Level_NVNT_ANT1_1-DH5_2480

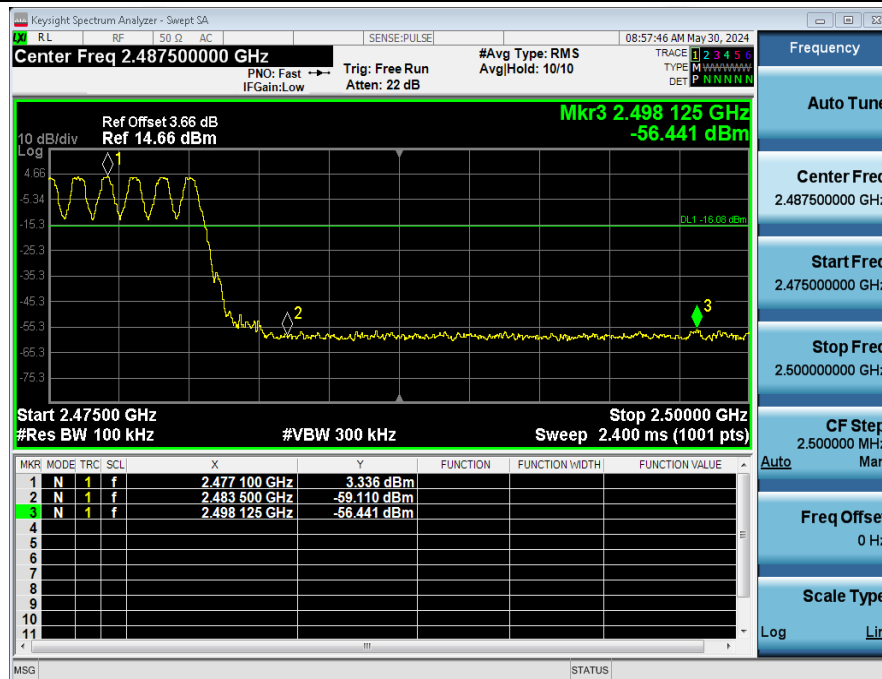
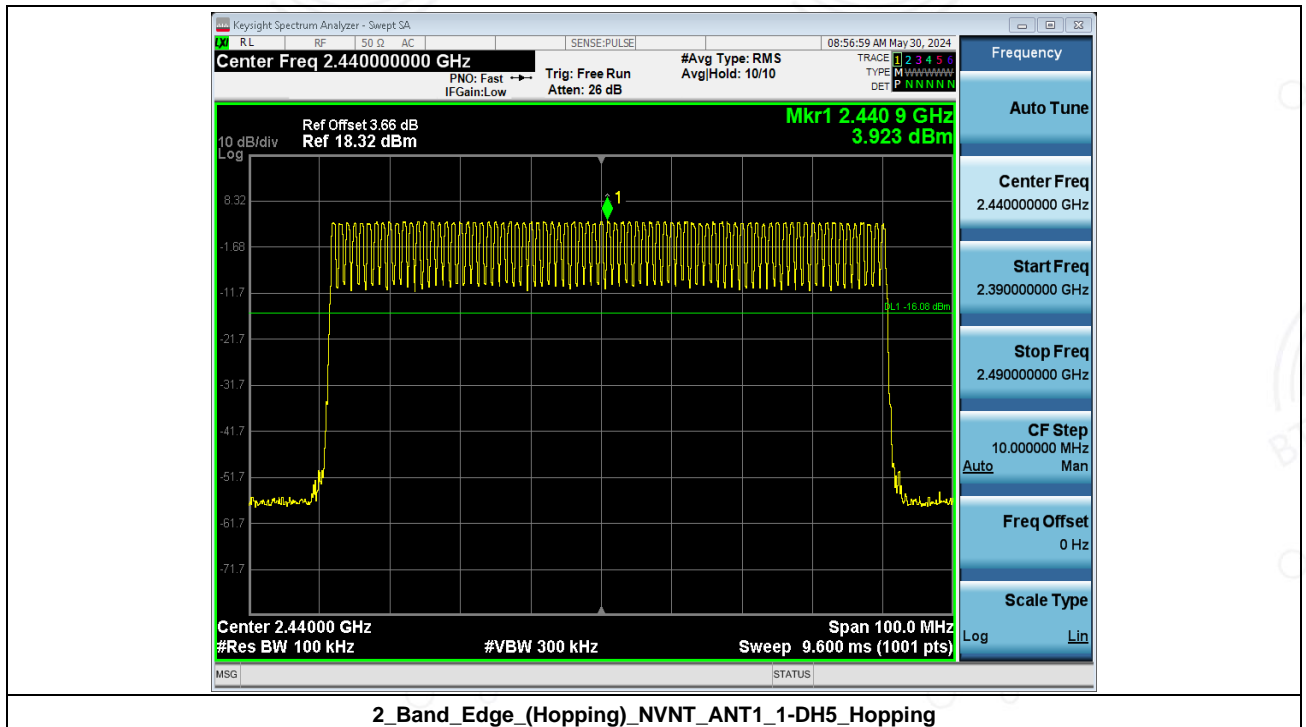


2_Bandedge_NVNT_ANT1_1-DH5_2480



1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

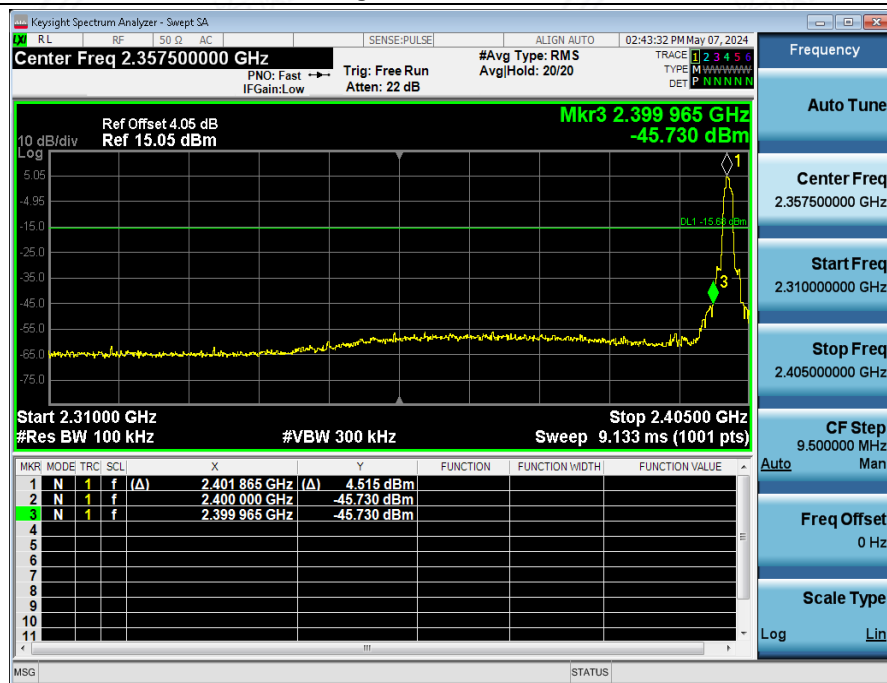




1_Reference_Level_NVNT_ANT1_2-DH5_2402

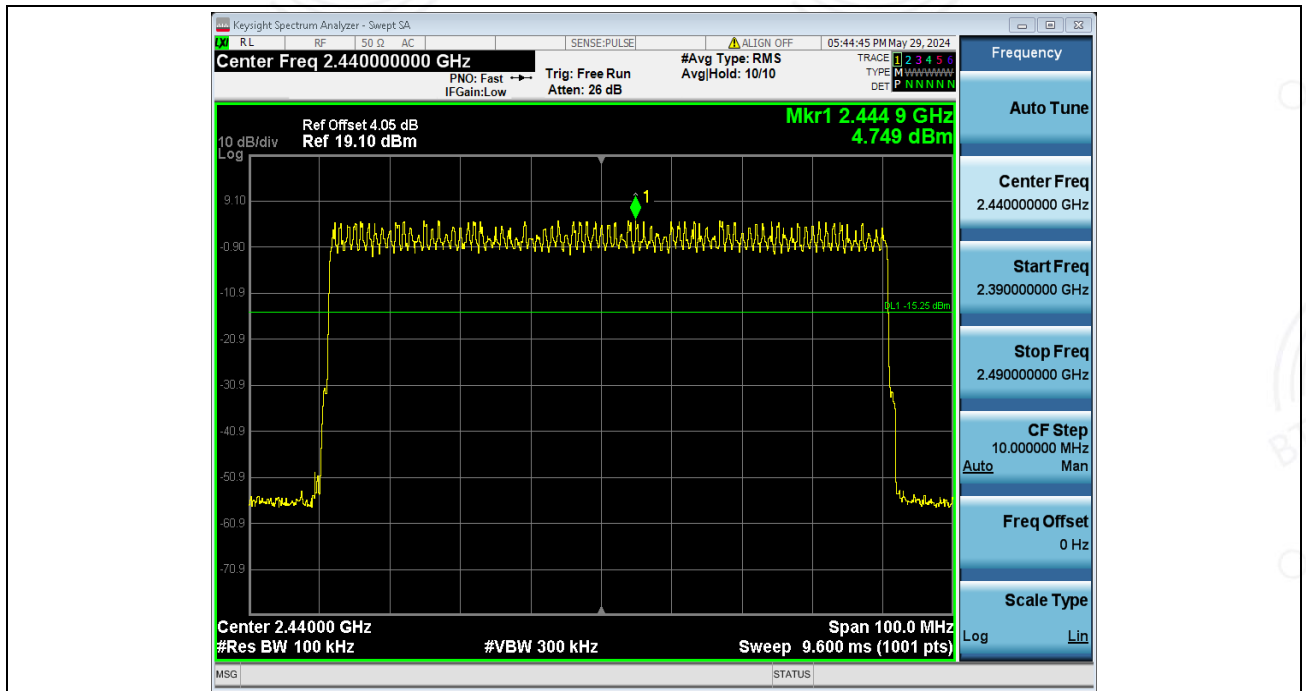


2_Bandedge_NVNT_ANT1_2-DH5_2402

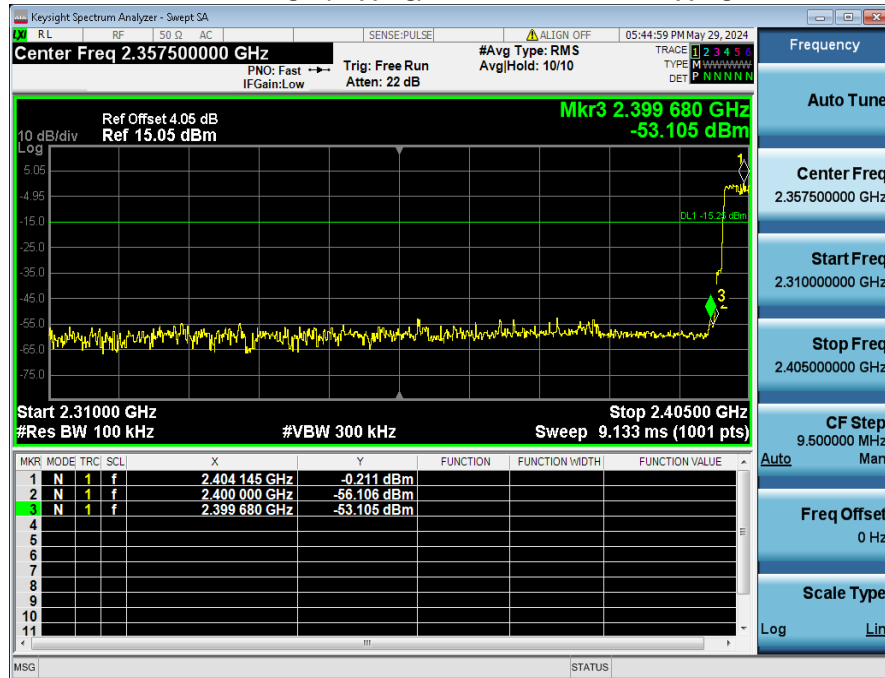


1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping





2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping



1_Reference_Level_NVNT_ANT1_2-DH5_2480

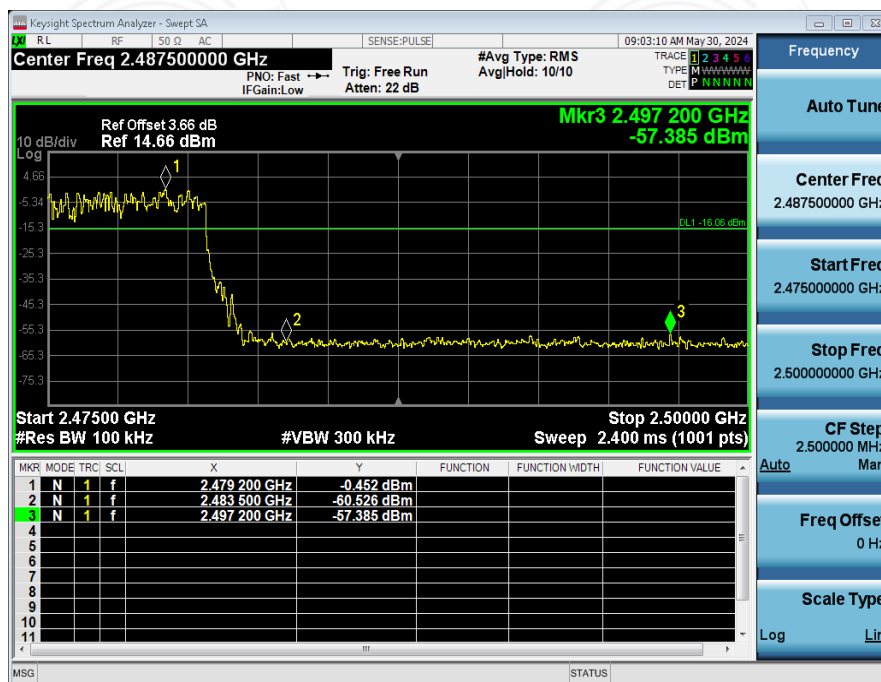
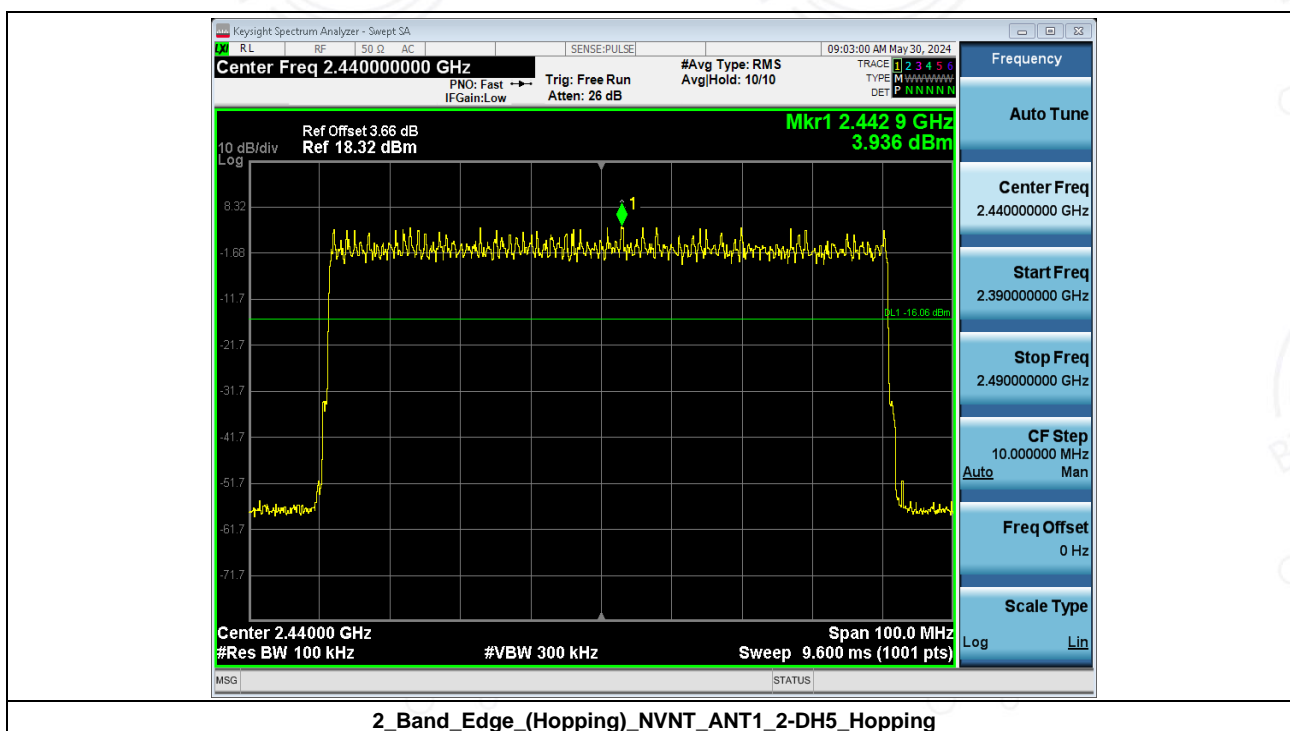


2_Bandedge_NVNT_ANT1_2-DH5_2480

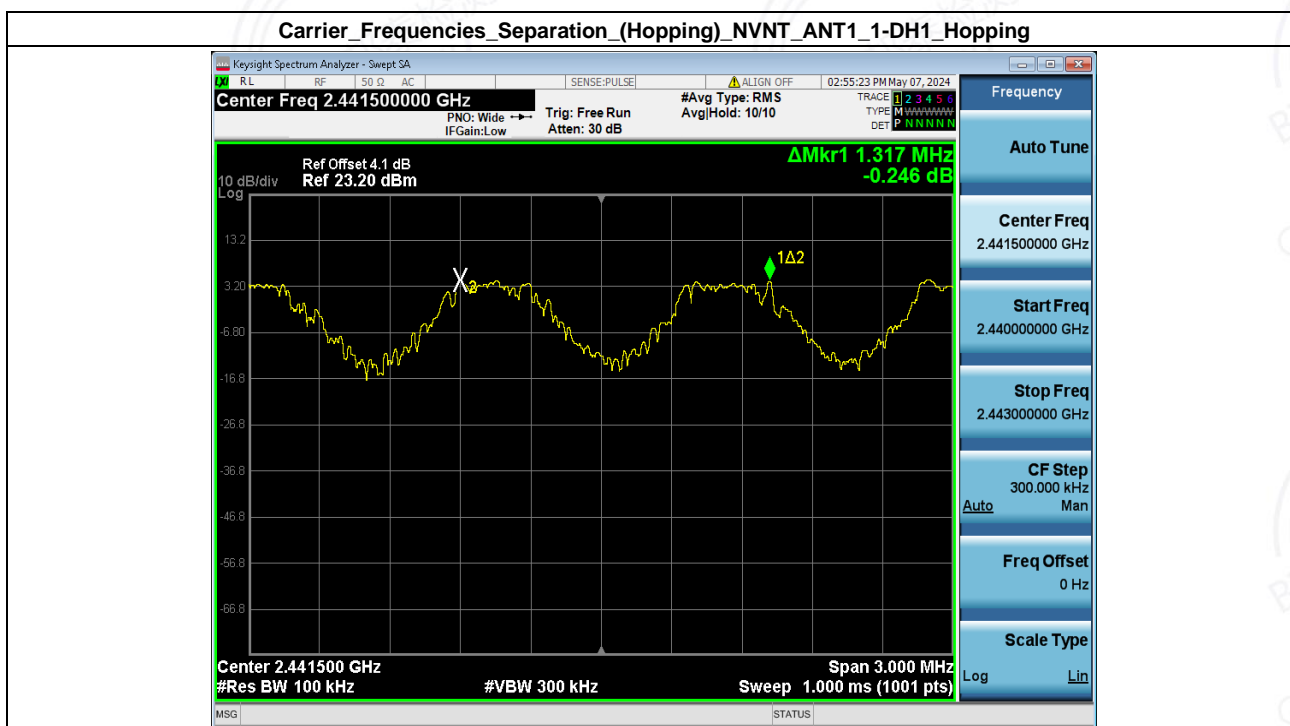
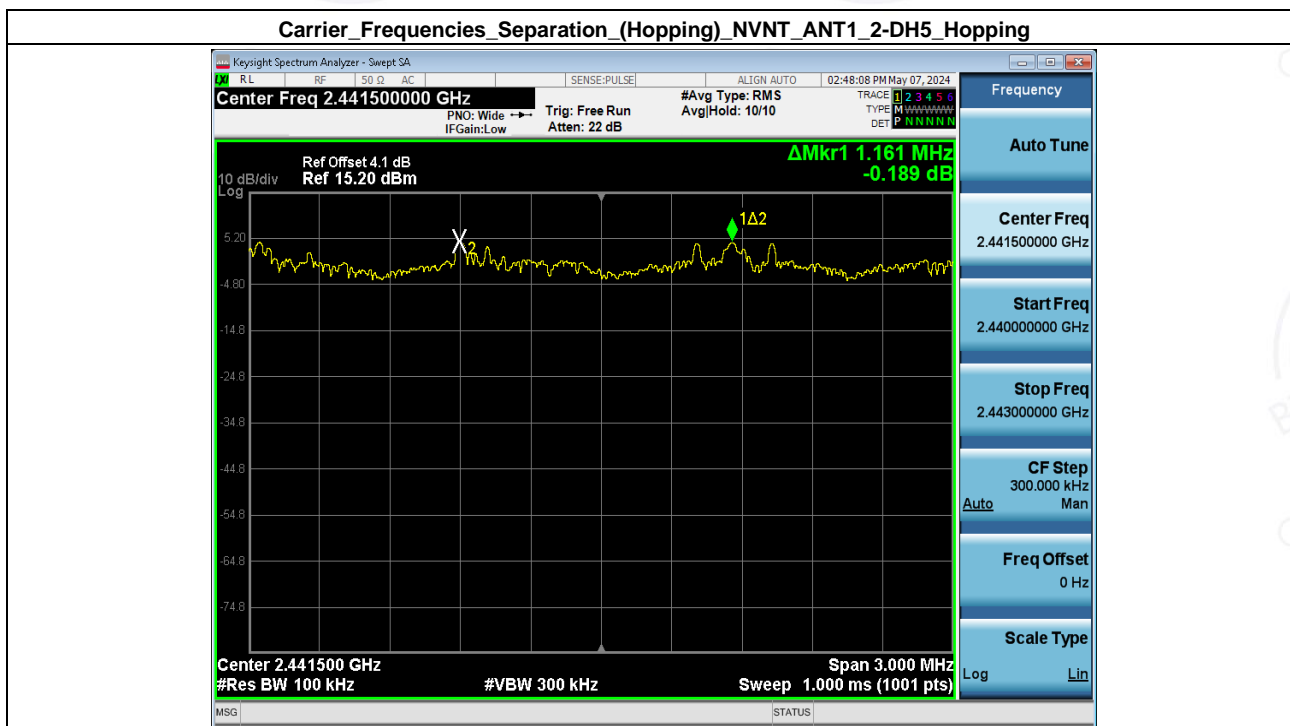


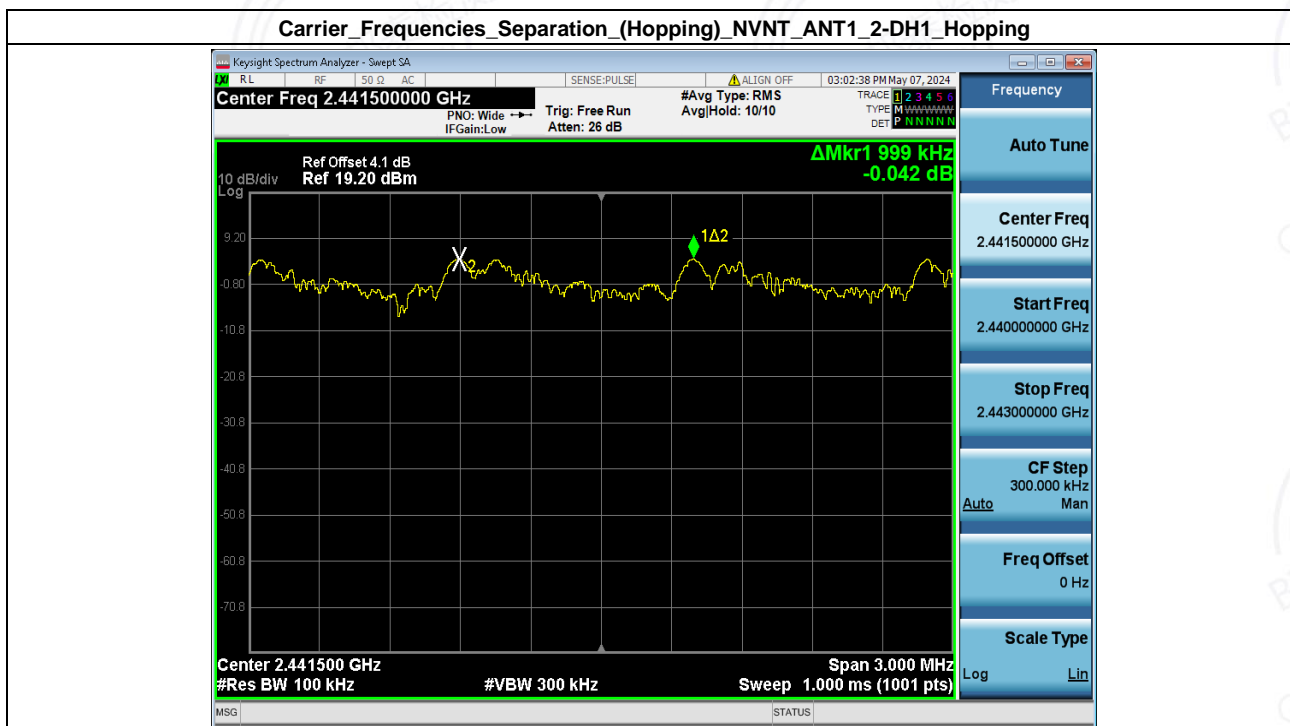
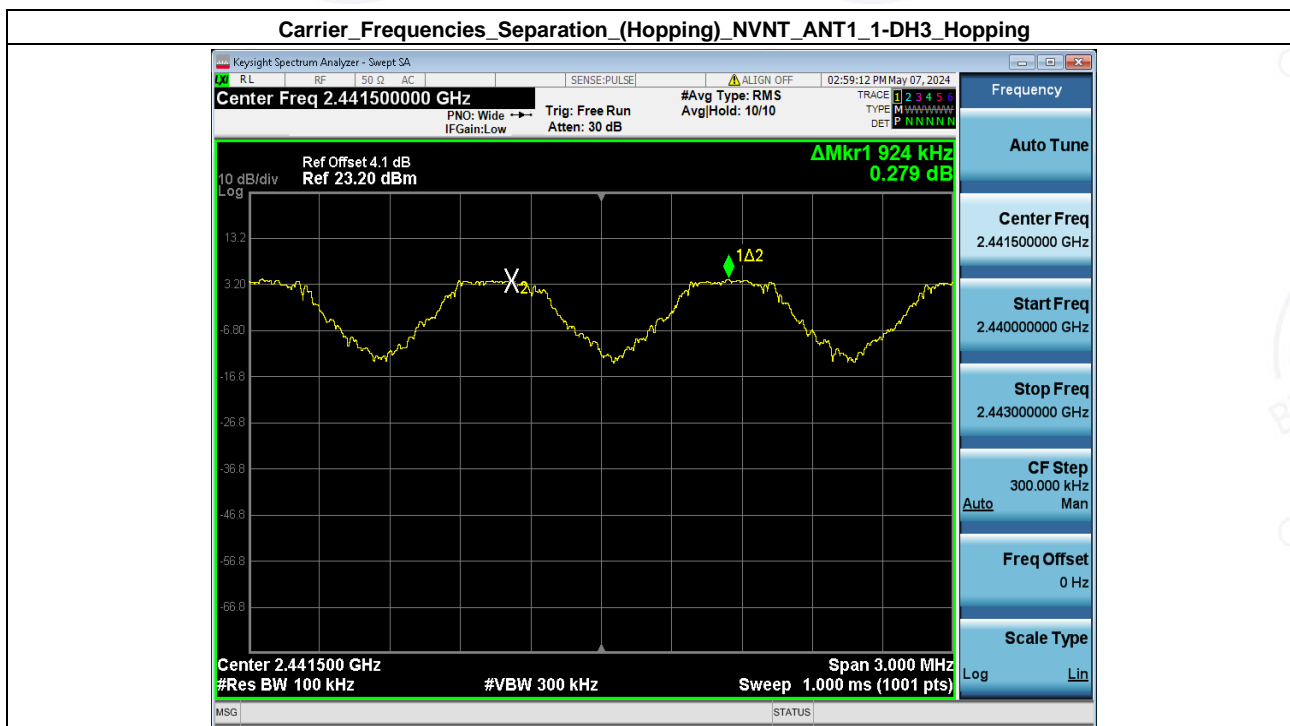
1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping

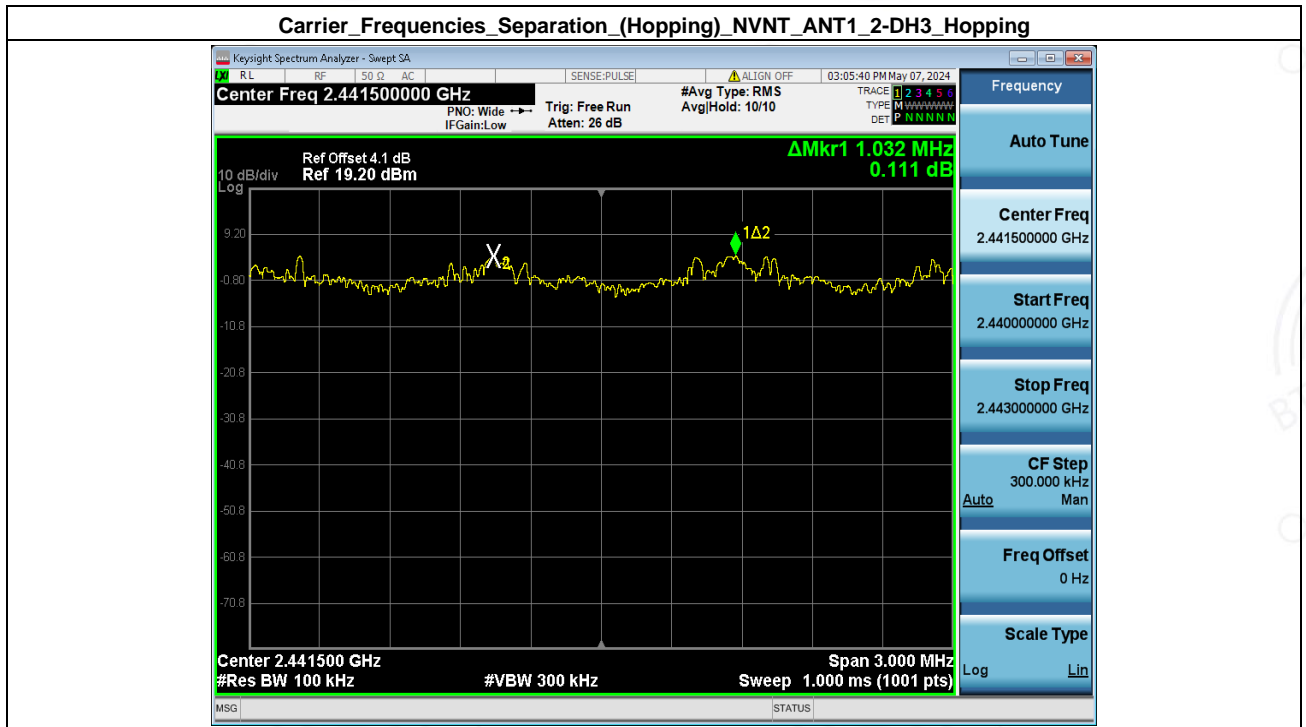




Condition	Antenna	Modulation	Frequency(MHz)	Hopping NO.0 (MHz)	Hopping NO.1 (MHz)	Carrier Frequencies Separation(MHz)	Limit(MHz)	Result
NVNT	ANT1	1-DH5	2441.00	2441.077	2441.929	1.194	0.880	Pass
NVNT	ANT1	2-DH5	2441.00	2440.897	2442.058	1.16	0.880	Pass
NVNT	ANT1	1-DH1	2441.00	2440.900	2442.217	1.32	0.880	Pass
NVNT	ANT1	1-DH3	2441.00	2441.119	2442.043	0.92	0.880	Pass
NVNT	ANT1	2-DH1	2441.00	2440.894	2441.893	1.00	0.880	Pass
NVNT	ANT1	2-DH3	2441.00	2441.041	2442.073	1.03	0.880	Pass



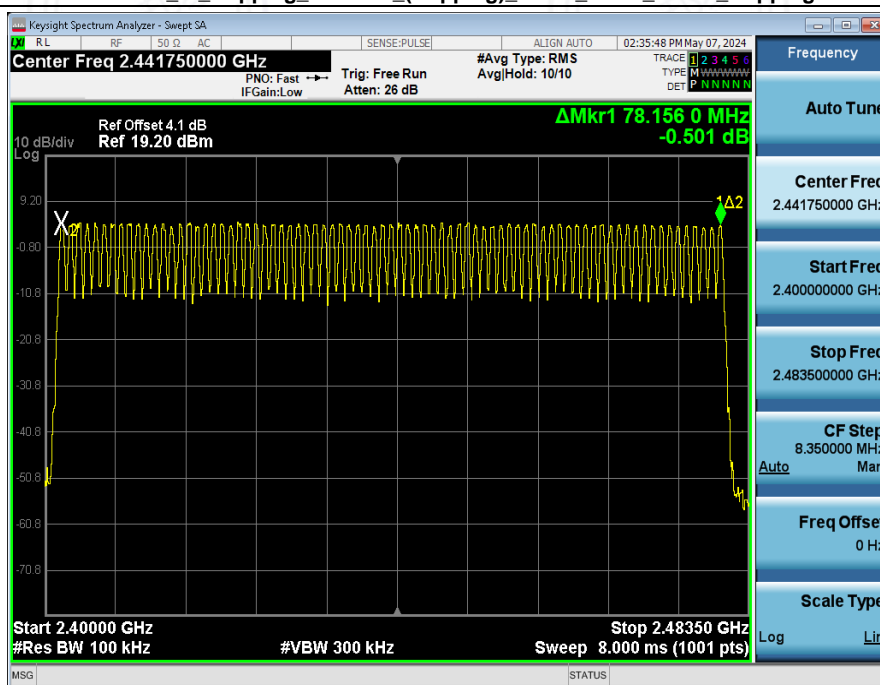




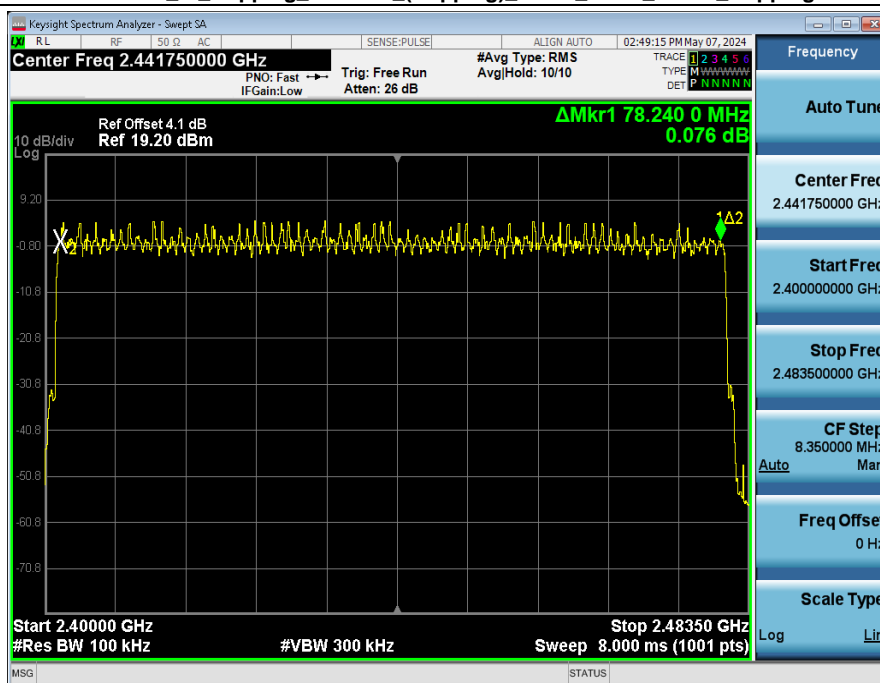
7. Number of Hopping Channel (Hopping)

Condition	Antenna	Modulation	Hopping Num	Limit	Result
NVNT	ANT1	1-DH5	79	15	Pass
NVNT	ANT1	2-DH5	79	15	Pass
NVNT	ANT1	1-DH1	79	15	Pass
NVNT	ANT1	1-DH3	79	15	Pass
NVNT	ANT1	2-DH1	79	15	Pass
NVNT	ANT1	2-DH3	79	15	Pass

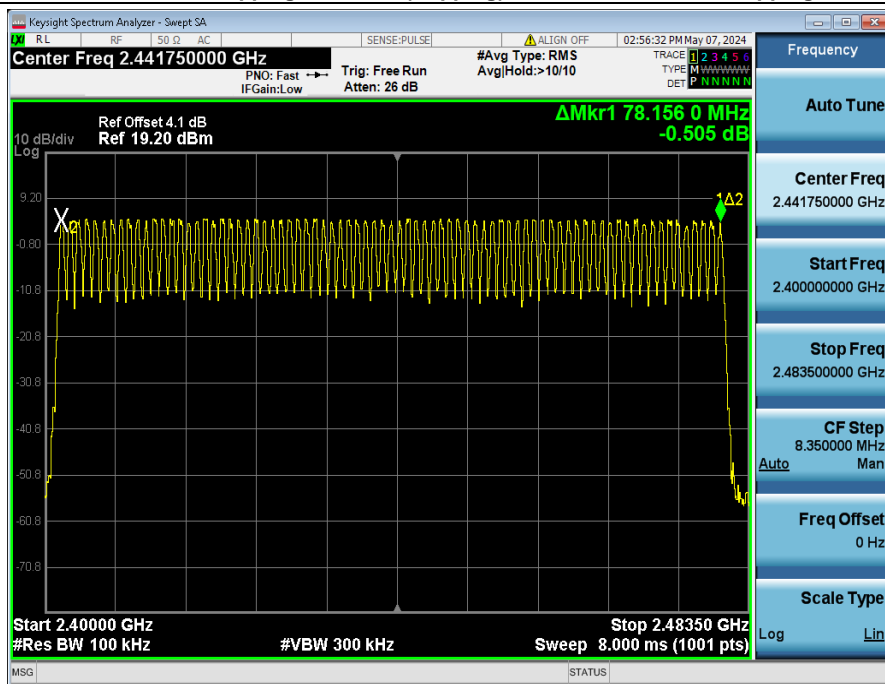
Number_of_Hopping_Channel (Hopping) NVNT_ANT1_1-DH5_Hopping



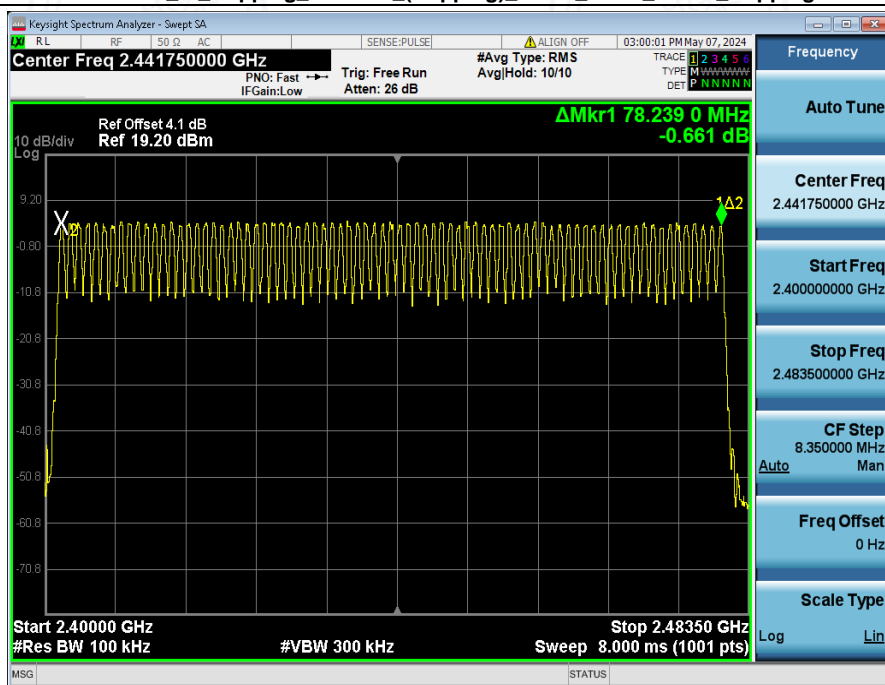
Number_of_Hopping_Channel (Hopping) NVNT_ANT1_2-DH5_Hopping

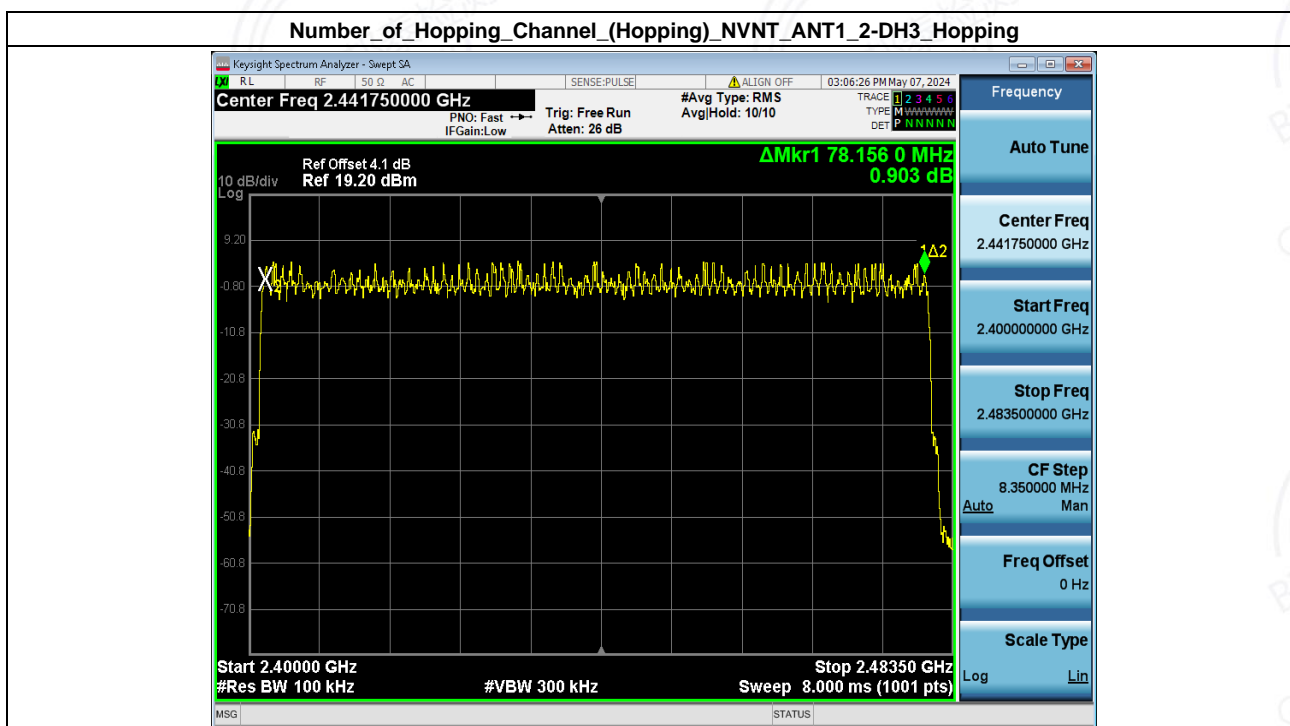
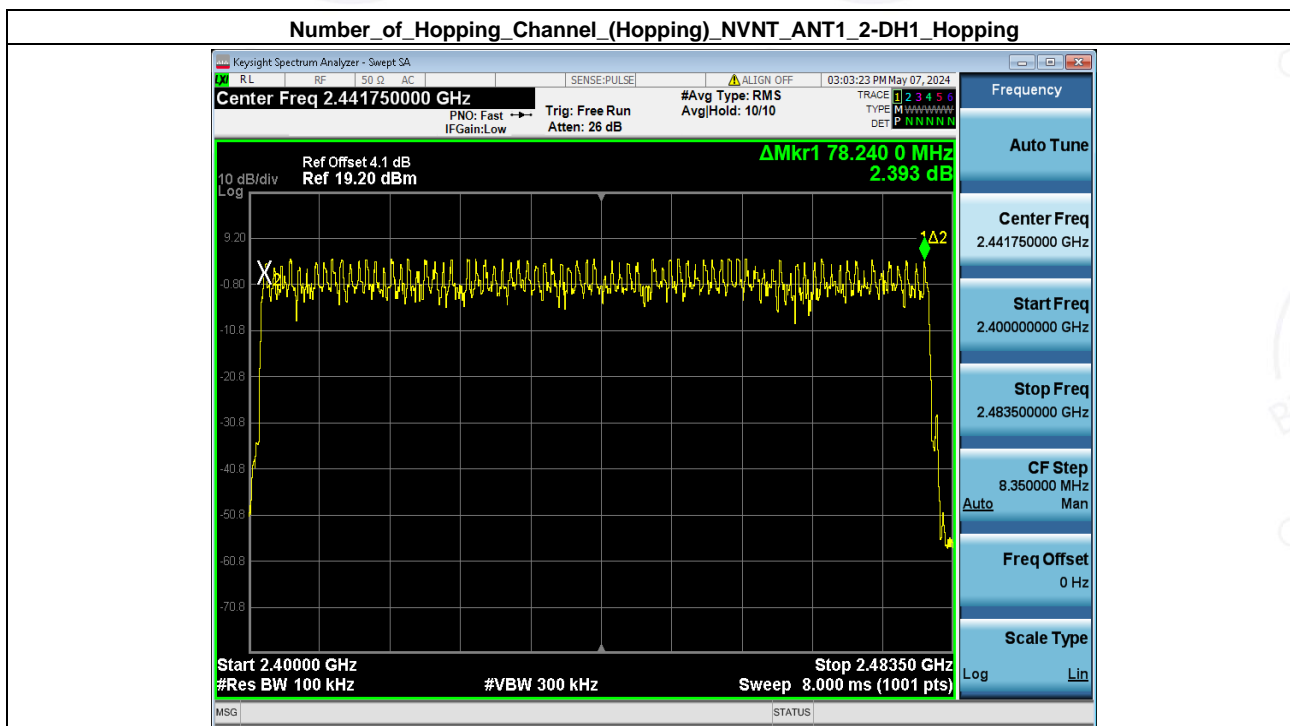


Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_1-DH1_Hopping



Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_1-DH3_Hopping

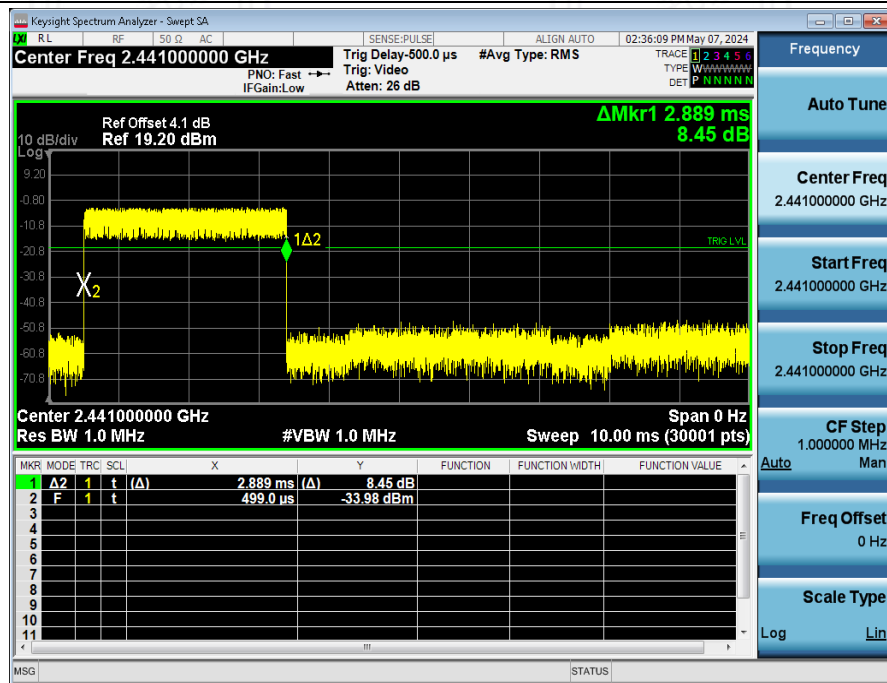




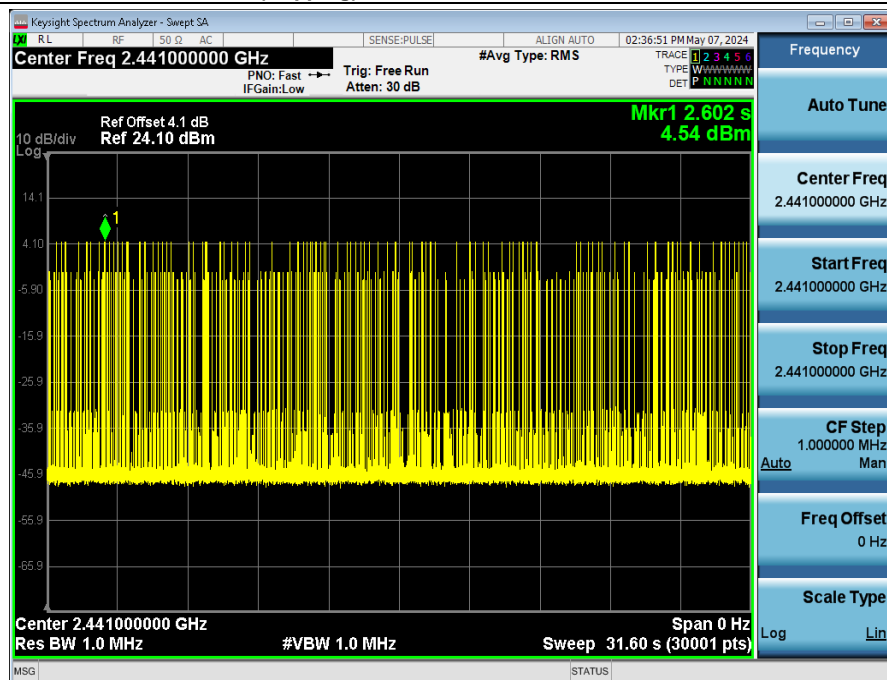
8. Dwell Time (Hopping)

Condition	Antenna	Packet Type	Pulse Time(ms)	Hops	Dwell Time(ms)	Limit(s)	Result
NVNT	ANT1	1-DH5	2.889	111.00	320.679	0.40	Pass
NVNT	ANT1	2-DH5	2.893	112.00	324.016	0.40	Pass
NVNT	ANT1	1-DH1	0.385	319.00	122.815	0.40	Pass
NVNT	ANT1	1-DH3	1.640	167.00	273.880	0.40	Pass
NVNT	ANT1	2-DH1	0.393	320.00	125.760	0.40	Pass
NVNT	ANT1	2-DH3	1.646	163.00	268.298	0.40	Pass

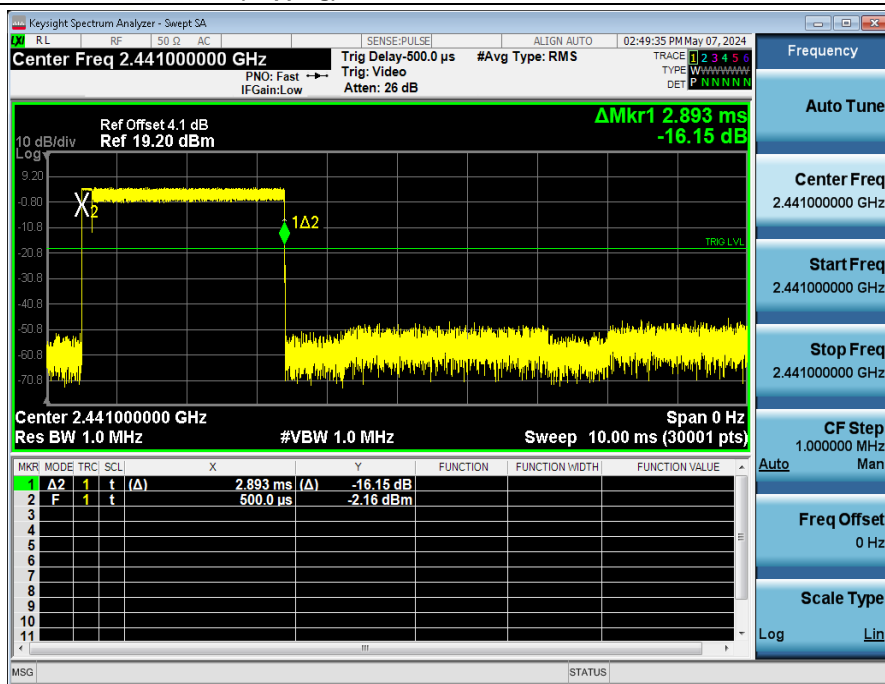
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_One_Burst_Time



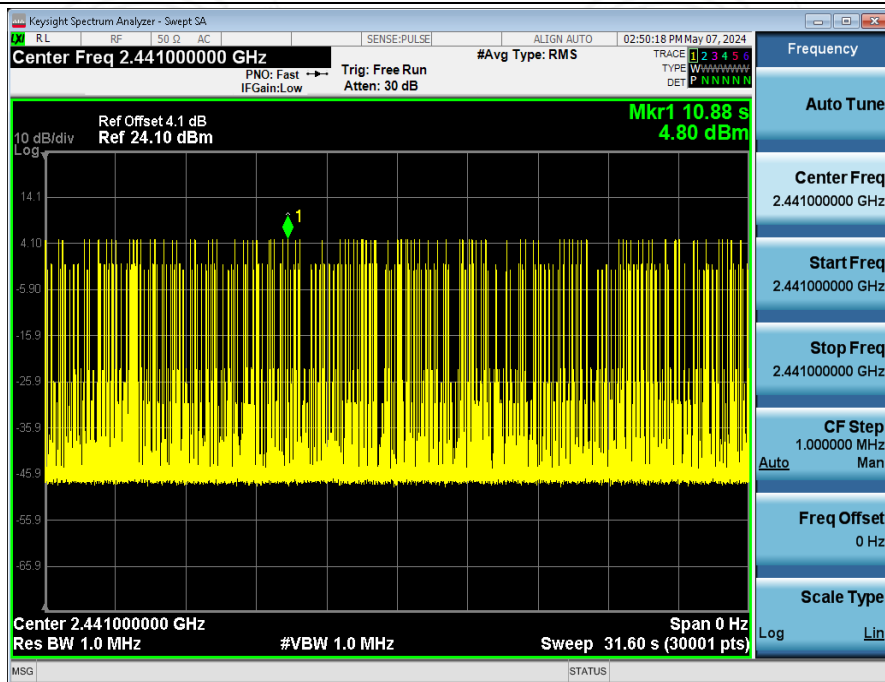
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_Accumulated



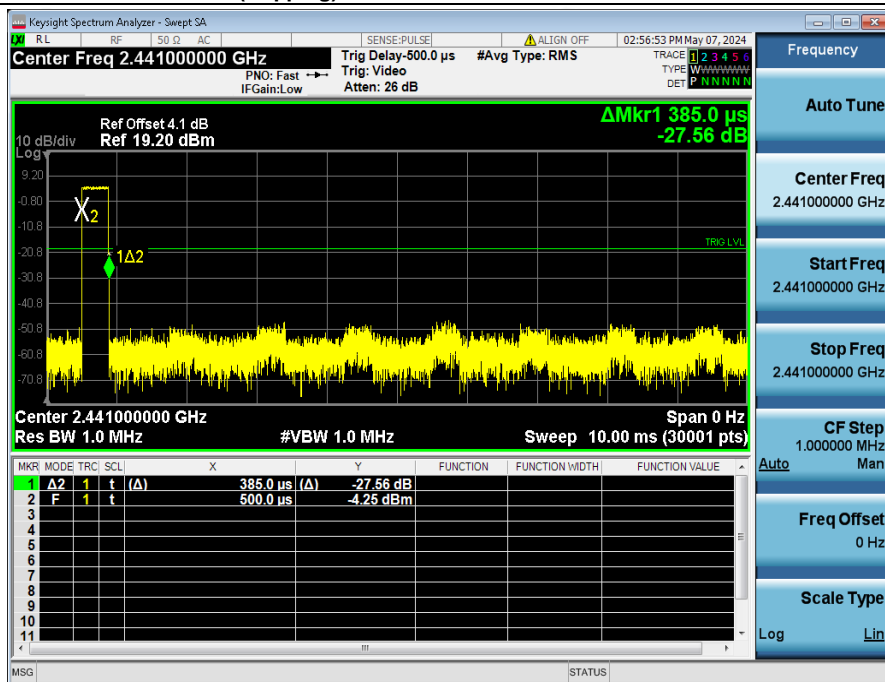
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_One_Burst_Time



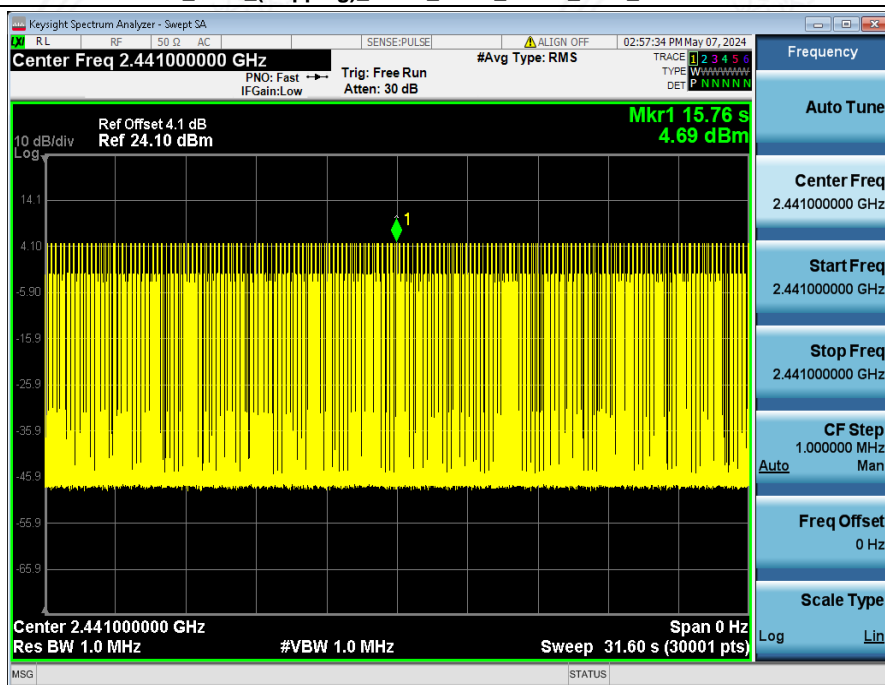
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_Accumulated



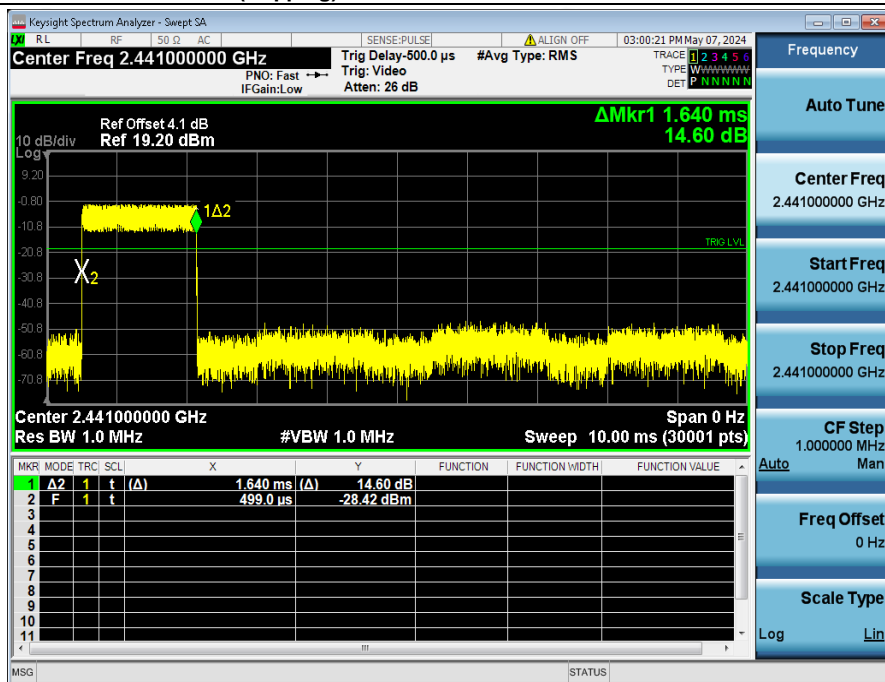
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_One_Burst_Time



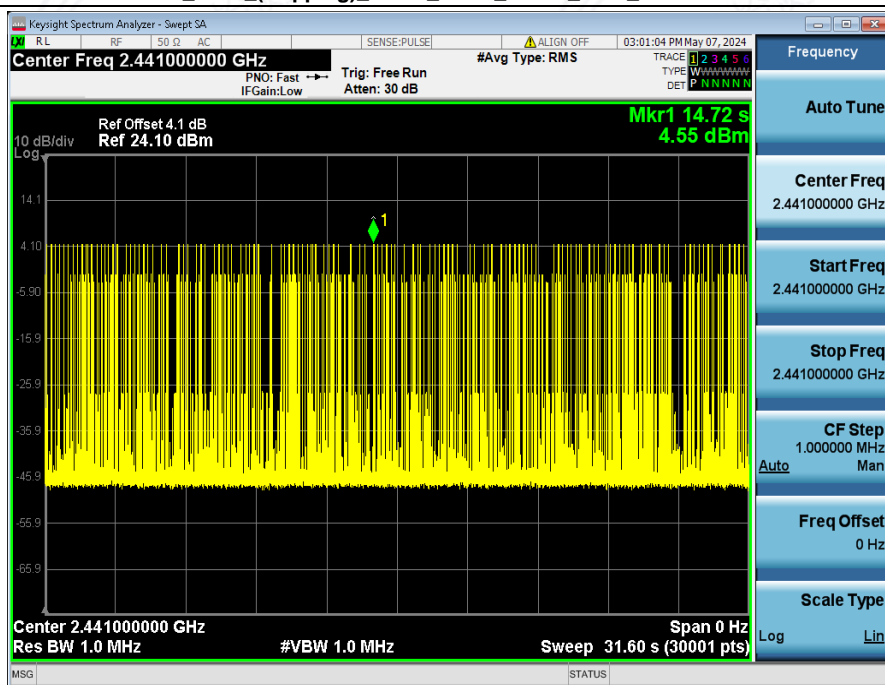
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_Accumulated



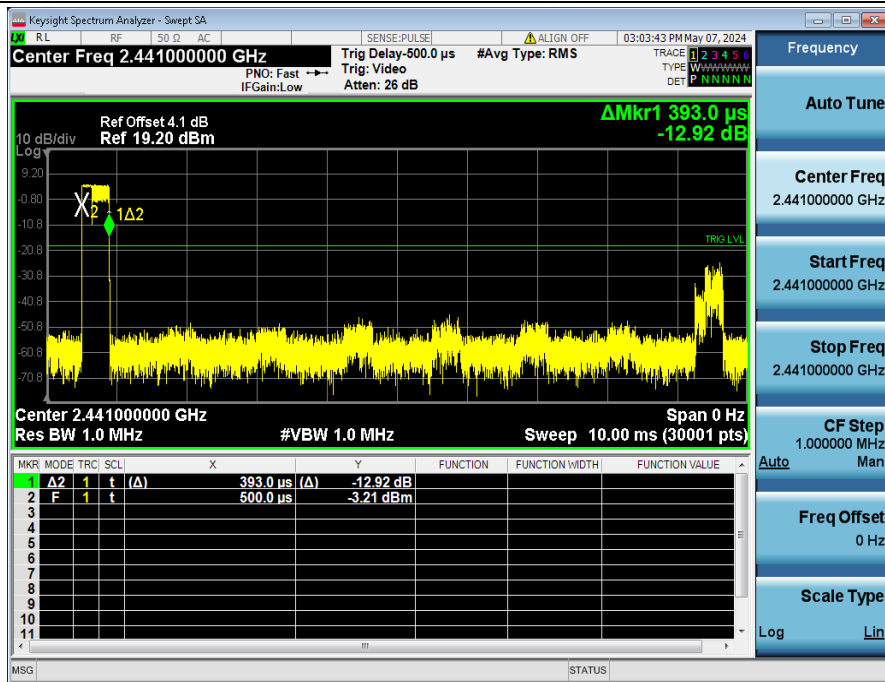
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_One_Burst_Time



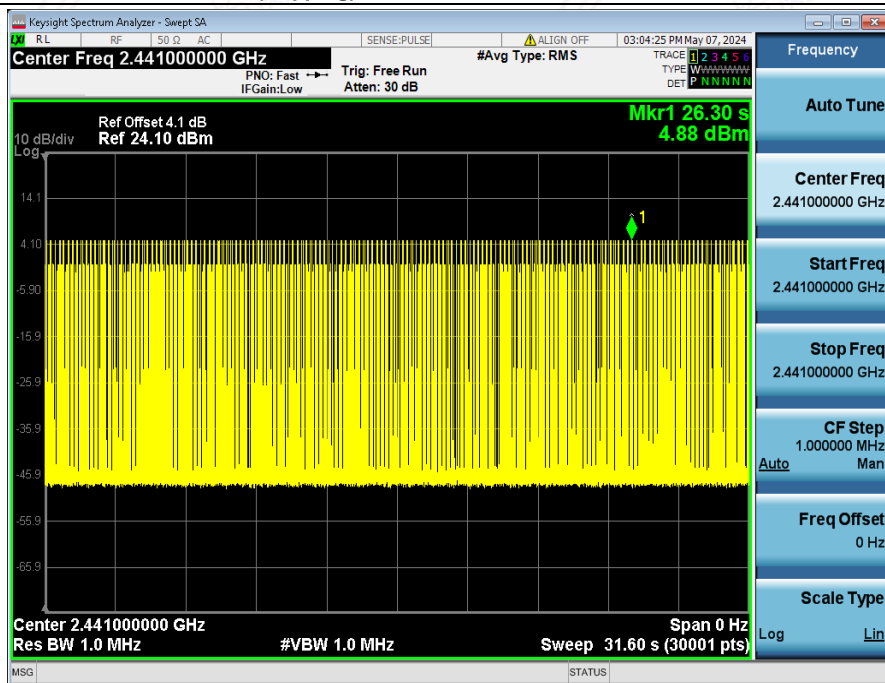
Dwell_Time_(Hopping)_NVNT_ANT1_1-DH3_2441_Accumulated



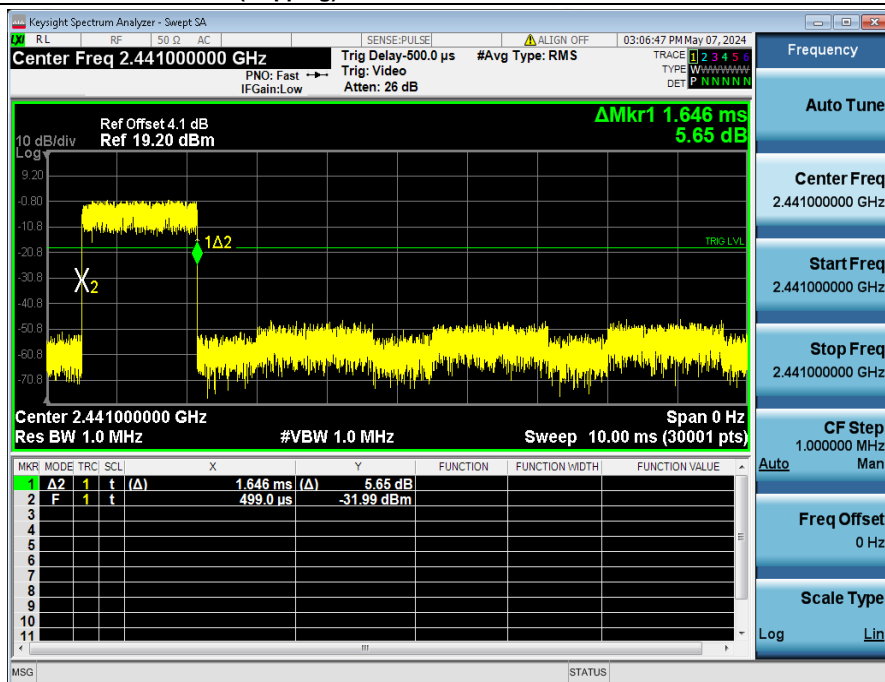
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_One_Burst_Time



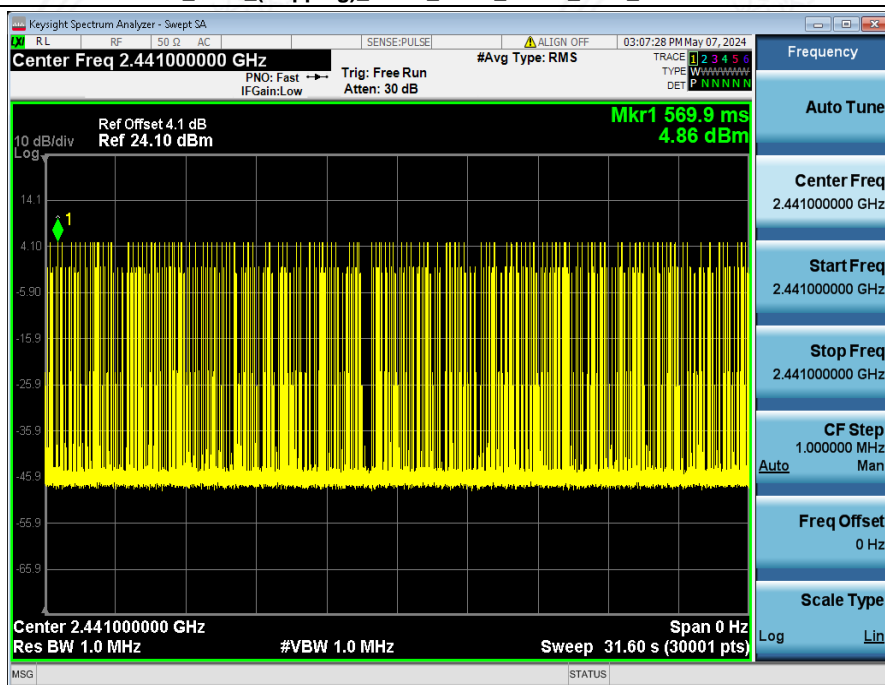
Dwell_Time_(Hopping)_NVNT_ANT1_2-DH1_2441_Accumulated



Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_One_Burst_Time



Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_Accumulated



- End of the Report -

