TEST REPORT

Application No.:	BTEK240124001AE
Applicant:	SHENZHEN YAZHOULONG ELECTRONIC TECHNOLOGICAL CO., LTD
Address of Applicant:	7/B and 13/B Floor, Fuhua Industry, Nanbo Road, Tangwei District, Fuhai, Baoan, Shenzhen, China
Manufacturer:	SHENZHEN YAZHOULONG ELECTRONIC TECHNOLOGICAL CO., LTD
Address of Manufacturer:	7/B and 13/B Floor, Fuhua Industry, Nanbo Road, Tangwei District, Fuhai, Baoan, Shenzhen, China
Factory:	SHENZHEN YAZHOULONG ELECTRONIC TECHNOLOGICAL CO., LTD
Address of Factory:	7/B and 13/B Floor, Fuhua Industry, Nanbo Road, Tangwei District, Fuhai, Baoan, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	Bluetooth speaker
Model No.:	BT-126, S26, BF-120, BT-140, BT-105, BS-156, BS-158, S25, S27, S40, BS-167, BS-169, BS-170, BS-171, BS-172, BS-180, BS-181, BT-130, BT-131 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:	2024-01-24
Date of Test:	2024-01-24 to 2024-01-30
Date of Issue:	2024-01-30
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		*2024-01-30*		*Original*

Authorized for issue by:				
		Elma Yang **Elma Yang /Project Engineer**		
		Carl Yang **Carl 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, Sub part 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.

Model No.: BT-126, S26, BF-120, BT-140, BT-105, BS-156, BS-158, S25, S27, S40, BS-167, BS-169, BS-170, BS-171, BS-172, BS-180, BS-181, BT-130, BT-131

Only the model BT-126 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:	DC 5V 0.5A 3W
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, π/4DQPSK
Number of Channels:	79
Channel Spacing:	1MHz
Sample Type:	Portable device
Antenna Type:	PCB Antenna
Antenna Gain:	-0.58 dBi
Sample No.:	BTEK240124001AE-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)	±3.12dB
Conducted Peak Output Power	± 0.76dB
20dB Bandwidth	± 3%
Carrier Frequencies Separation	± 7.3 x 10-8
Hopping Channel Number	± 7.3 x 10-8
Dwell Time	± 0.4%
Conducted Band Edges Measurement	± 0.8dB
Conducted Spurious Emissions	± 0.8dB
Radiated Emissions which fall in the restricted bands	±5.1dB (1GHz-6GHz); ±5.2dB(above 6GHz)
Radiated Spurious Emissions (Below 1GHz)	±5.1dB
Radiated Spurious Emissions (Above 1GHz)	±5.1dB (1GHz-6GHz); ±5.2dB(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 Emissions at AC Power Line (150kHz-30MHz)					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Shielding Room	YIHENG ENECTRONIC	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 ENECTRONIC	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 ENECTRONIC	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/Barometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11
Humidity/Temperature/Barometric 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:

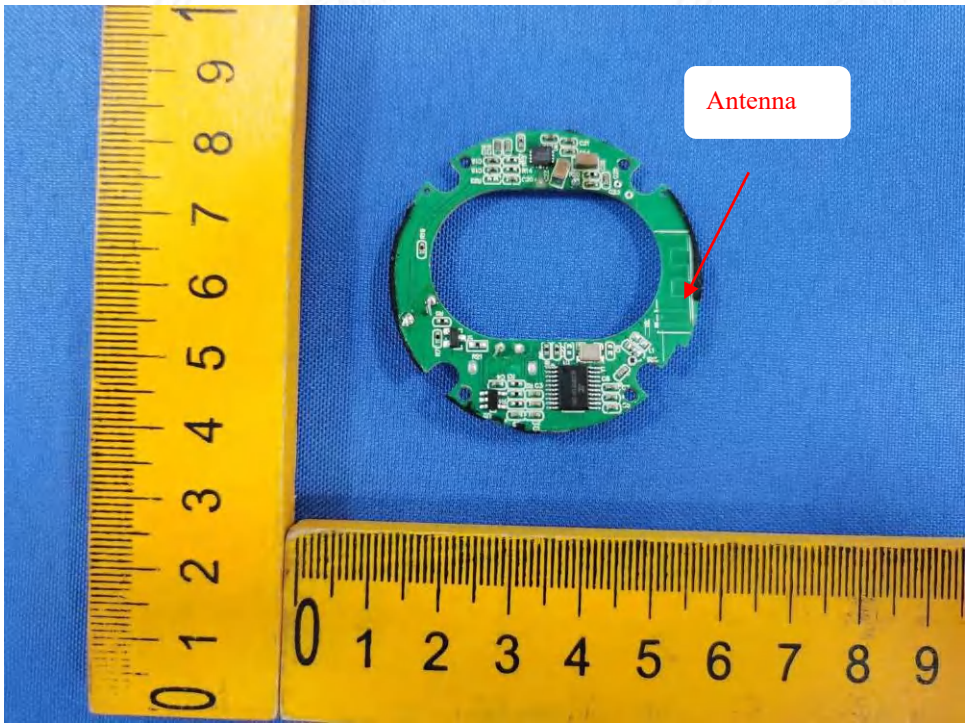
Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's 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 -0.58dBi.



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.

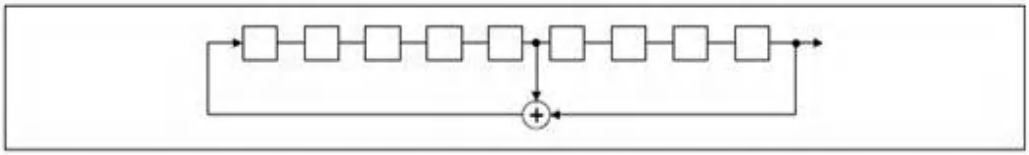
> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

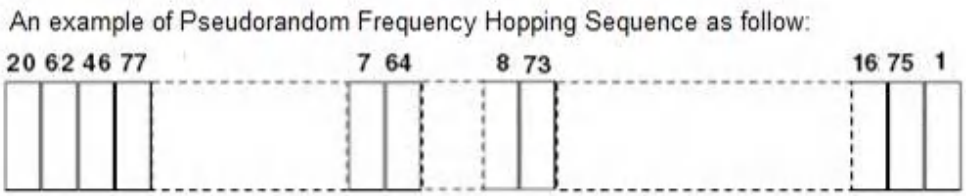
> Longest sequence of zeros: 8 (non-inverted signal)

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



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: 29 -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

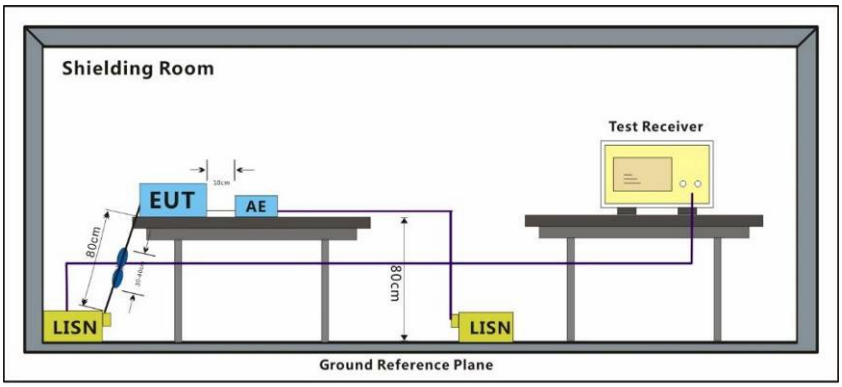
Operating Environment:

Temperature: 22.3 °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. 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.

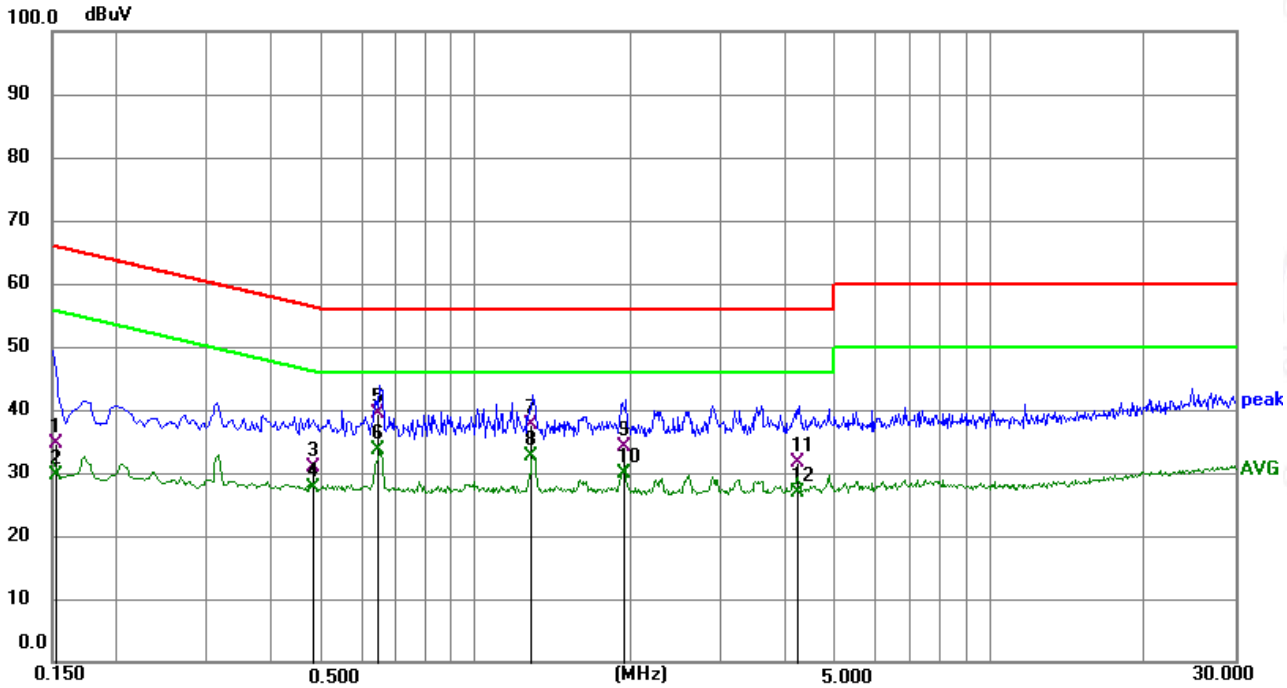
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

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.

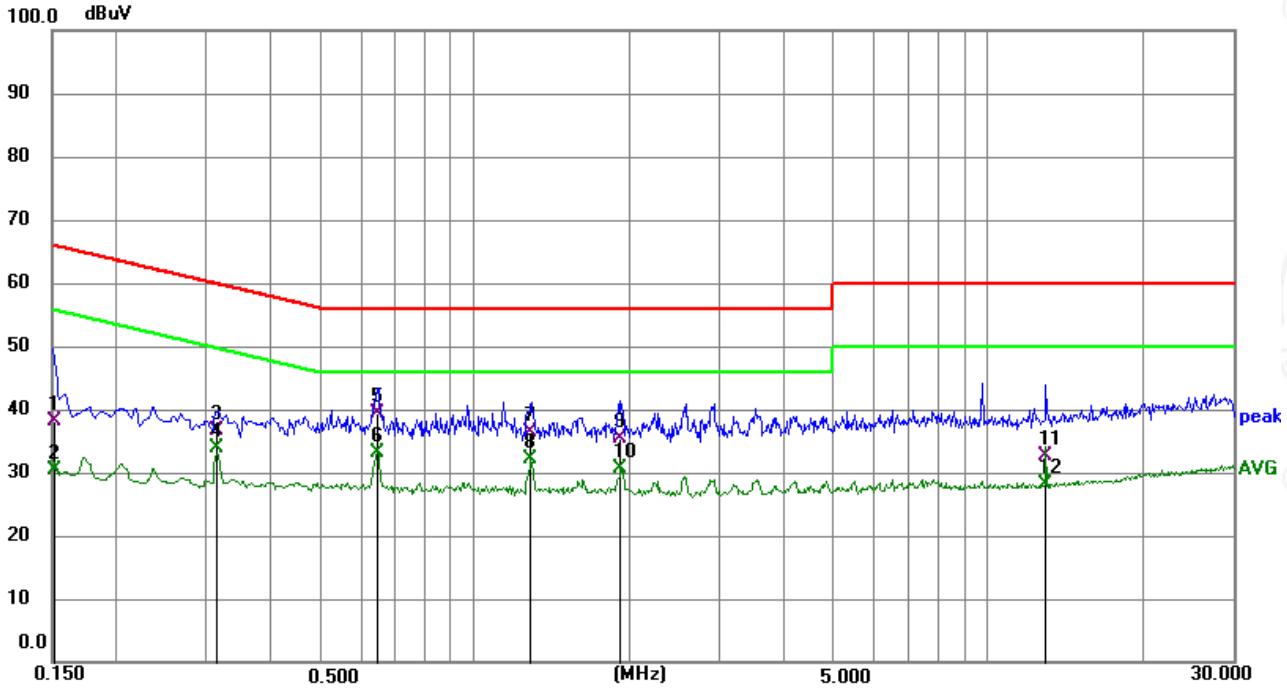
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Test Mode: 01; Line: Live line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1525	14.89	19.75	34.64	65.86	-31.22	QP	P	
2	0.1525	9.91	19.75	29.66	55.86	-26.20	AVG	P	
3	0.4829	11.04	19.84	30.88	56.29	-25.41	QP	P	
4	0.4829	7.86	19.84	27.70	46.29	-18.59	AVG	P	
5	0.6479	19.60	19.89	39.49	56.00	-16.51	QP	P	
6 *	0.6479	13.70	19.89	33.59	46.00	-12.41	AVG	P	
7	1.2925	17.56	20.04	37.60	56.00	-18.40	QP	P	
8	1.2925	12.67	20.04	32.71	46.00	-13.29	AVG	P	
9	1.9438	14.19	20.06	34.25	56.00	-21.75	QP	P	
10	1.9438	9.71	20.06	29.77	46.00	-16.23	AVG	P	
11	4.2661	11.28	20.23	31.51	56.00	-24.49	QP	P	
12	4.2661	6.70	20.23	26.93	46.00	-19.07	AVG	P	

Test Mode: 01; Line: Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1522	18.42	19.77	38.19	65.88	-27.69	QP	P	
2	0.1522	10.49	19.77	30.26	55.88	-25.62	AVG	P	
3	0.3133	16.81	19.83	36.64	59.88	-23.24	QP	P	
4	0.3133	14.13	19.83	33.96	49.88	-15.92	AVG	P	
5	0.6461	19.55	19.90	39.45	56.00	-16.55	QP	P	
6 *	0.6461	13.26	19.90	33.16	46.00	-12.84	AVG	P	
7	1.2846	16.45	20.04	36.49	56.00	-19.51	QP	P	
8	1.2846	11.98	20.04	32.02	46.00	-13.98	AVG	P	
9	1.9306	15.25	20.07	35.32	56.00	-20.68	QP	P	
10	1.9306	10.53	20.07	30.60	46.00	-15.40	AVG	P	
11	12.9990	11.68	21.06	32.74	60.00	-27.26	QP	P	
12	12.9990	7.03	21.06	28.09	50.00	-21.91	AVG	P	

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≤ 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

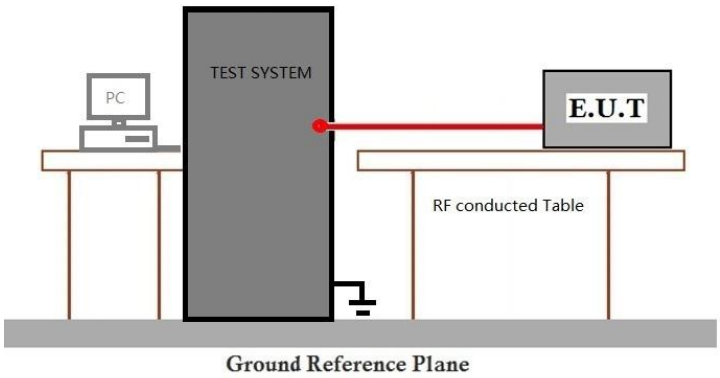
Operating Environment:

Temperature: 21.3 °C Humidity: 49.8 % 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

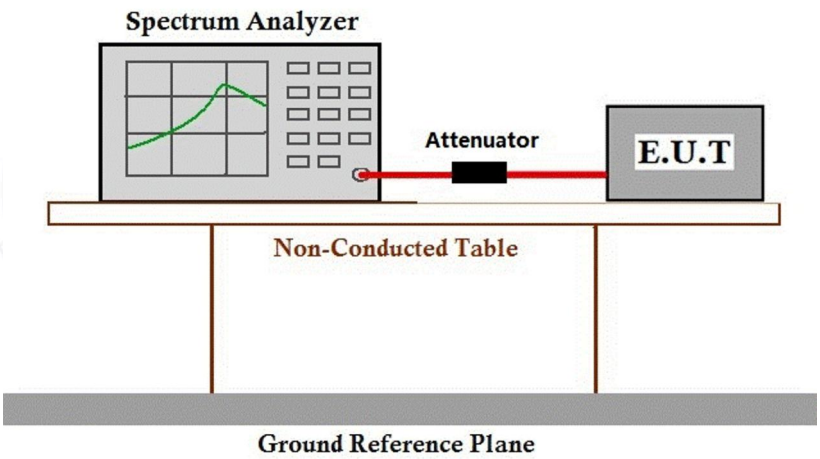
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 21.3 °C Humidity: 49.8 % 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

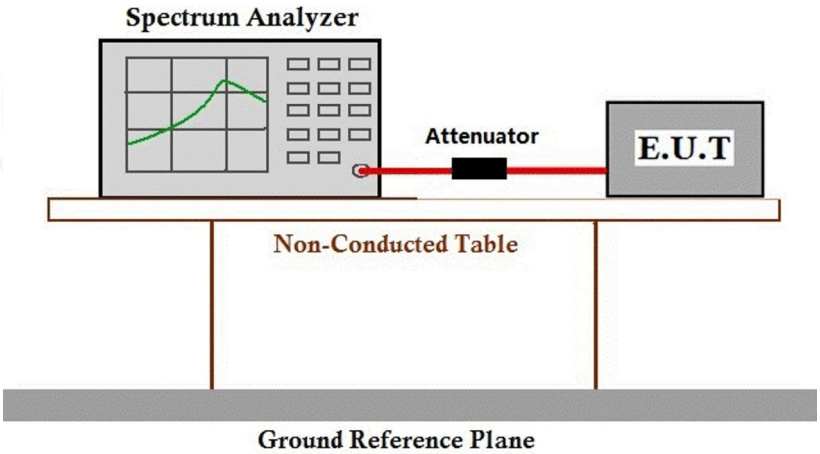
Operating Environment:

Temperature: 21.3 °C Humidity: 49.8 % 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

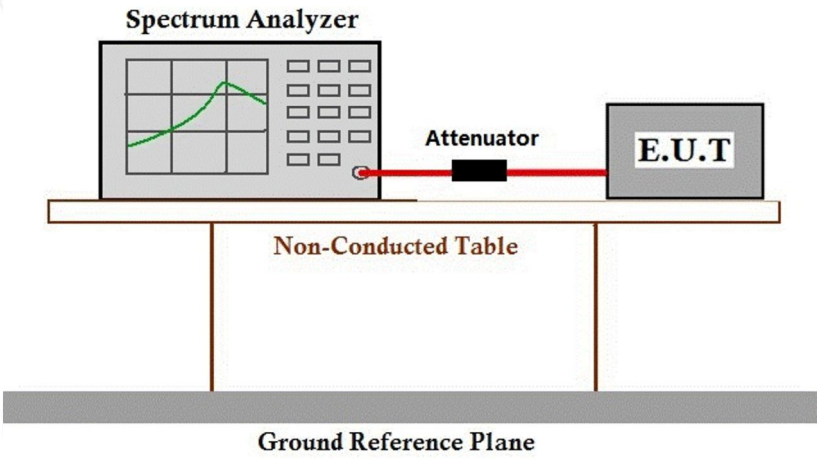
Operating Environment:

Temperature: 21.3 °C Humidity: 49.8 % 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

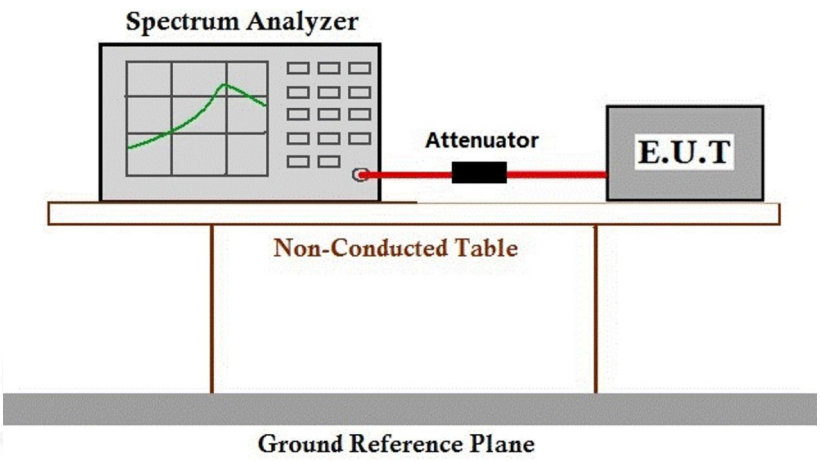
Operating Environment:

Temperature: 21.3 °C Humidity: 49.8 % 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

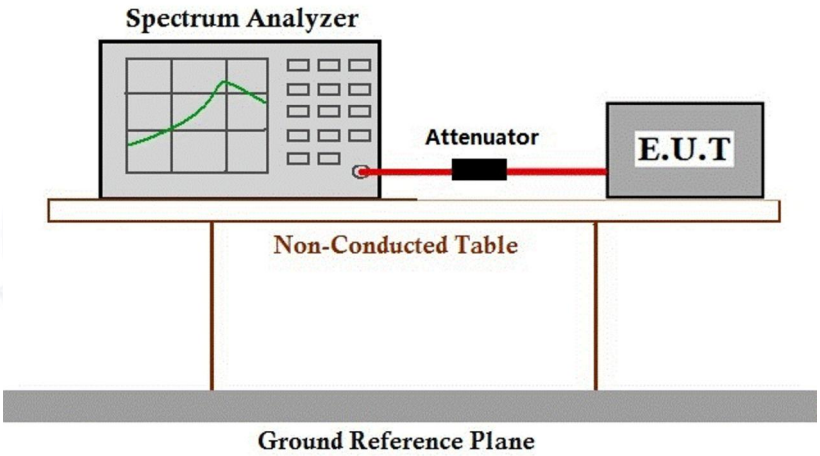
Operating Environment:

Temperature: 21.3 °C Humidity: 49.8 % 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

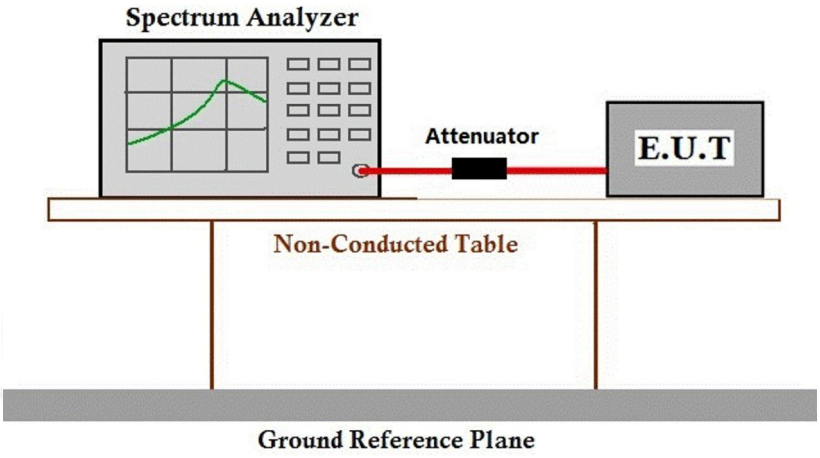
Operating Environment:

Temperature: 21.3 °C Humidity: 49.8 % 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

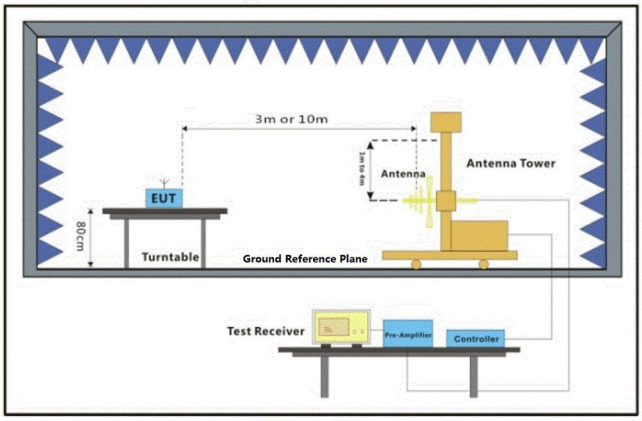
Operating Environment:

Temperature: 22.4 °C Humidity: 53.2 % RH Atmospheric Pressure: 1010 mbar

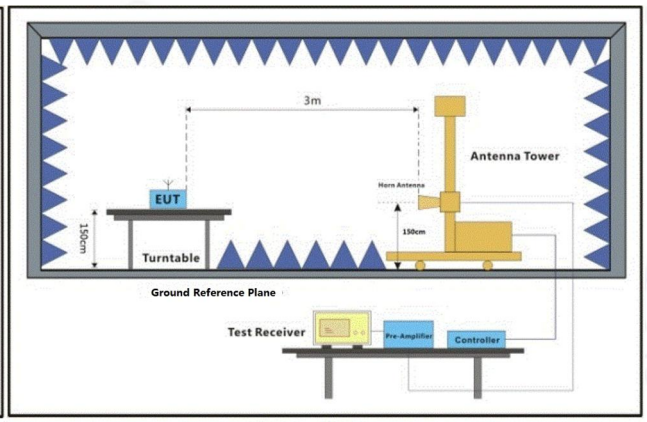
7.9.2 Test Mode Description

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



30MHz-1GHz



Above 1GHz

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	67.12	-30.59	36.53	74.00	-37.47	peak	P
2	2390.000	70.07	-30.49	39.58	74.00	-34.42	peak	P
3	2400.000	77.72	-30.48	47.24	74.00	-26.76	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	2310.000	68.90	-30.59	38.31	74.00	-35.69	peak	P
2	2390.000	69.80	-30.49	39.31	74.00	-34.69	peak	P
3	2400.000	77.53	-30.48	47.05	74.00	-26.95	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	80.26	-30.39	49.87	74.00	-24.13	peak	P
2	2500.000	71.43	-30.37	41.06	74.00	-32.94	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	79.11	-30.39	48.72	74.00	-25.28	peak	P
2	2500.000	70.70	-30.37	40.33	74.00	-33.67	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

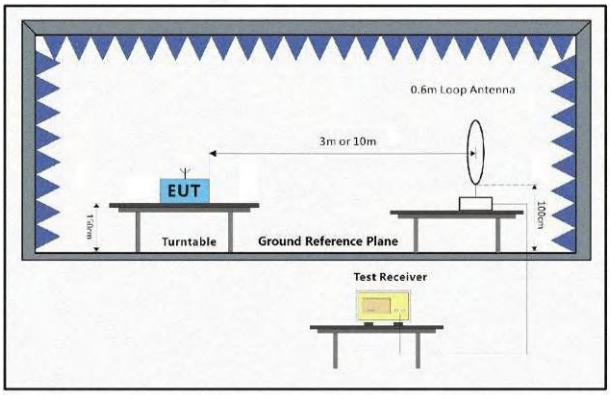
Operating Environment:

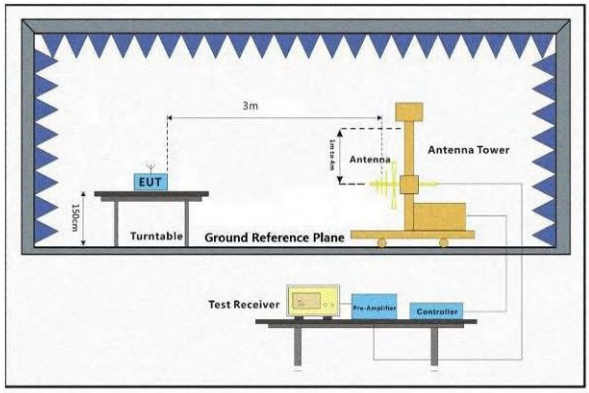
Temperature: 22.4 °C Humidity: 53.2 % RH Atmospheric Pressure: 1010 mbar

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

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. 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.

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 (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.

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:

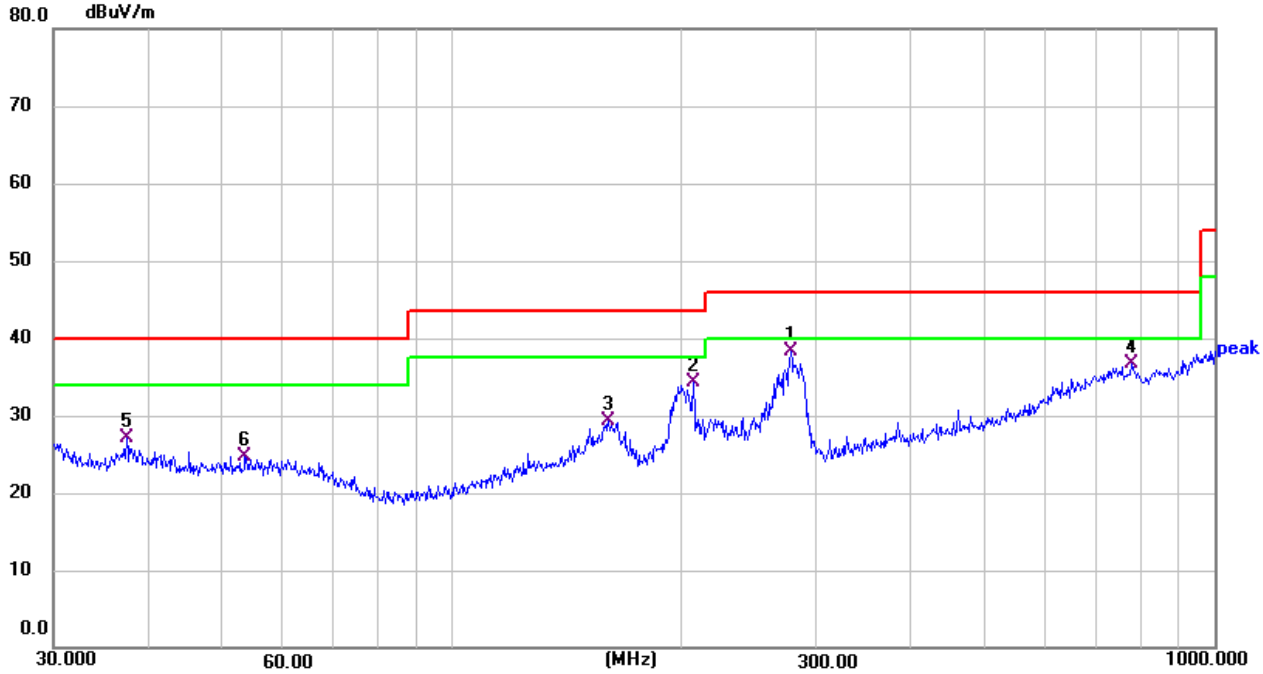
1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

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

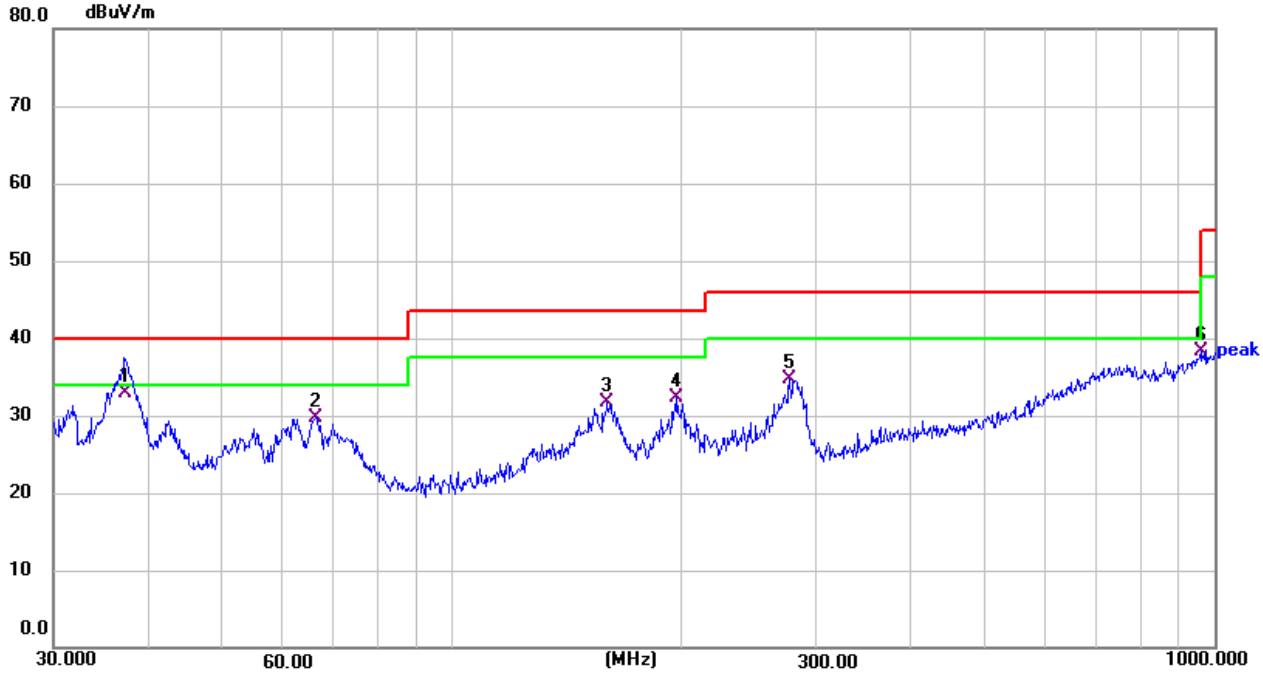
3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit 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 *	278.0668	56.61	-18.28	38.33	46.00	-7.67	QP	100	246	P	
2	207.1226	55.53	-21.19	34.34	43.50	-9.16	QP	100	162	P	
3	160.3456	46.59	-17.32	29.27	43.50	-14.23	QP	300	89	P	
4	779.6068	45.16	-8.53	36.63	46.00	-9.37	QP	100	14	P	
5	37.4165	44.28	-17.17	27.11	40.00	-12.89	QP	100	150	P	
6	53.5052	42.46	-17.79	24.67	40.00	-15.33	QP	100	14	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 *	37.3600	50.12	-17.17	32.95	40.00	-7.05	QP	100	357	P	
2	66.2661	48.98	-19.19	29.79	40.00	-10.21	QP	300	12	P	
3	159.7844	48.89	-17.23	31.66	43.50	-11.84	QP	100	200	P	
4	197.2001	53.68	-21.32	32.36	43.50	-11.14	QP	100	237	P	
5	277.0935	53.08	-18.32	34.76	46.00	-11.24	QP	100	163	P	
6	958.7943	45.14	-6.83	38.31	46.00	-7.69	QP	300	12	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

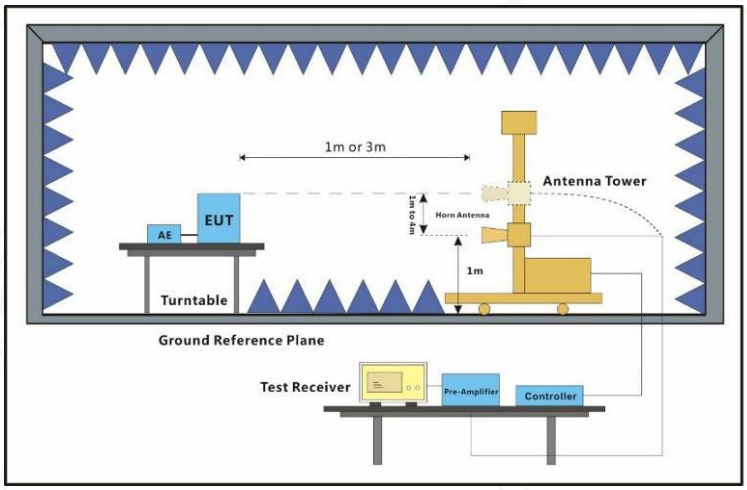
Operating Environment:

Temperature: 21.4 °C Humidity: 53.2 % 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

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.

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	2915.437	69.86	-29.78	40.08	74.00	-33.92	peak	P
2	4276.206	67.21	-28.98	38.23	74.00	-35.77	peak	P
3	6085.999	64.12	-25.82	38.30	74.00	-35.70	peak	P
4	8645.996	69.84	-24.11	45.74	74.00	-28.26	peak	P
5	11048.120	67.73	-24.29	43.44	74.00	-30.56	peak	P
6	14217.205	70.98	-21.08	49.90	74.00	-24.10	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	2974.010	66.66	-29.83	36.83	74.00	-37.17	peak	P
2	4313.942	68.66	-28.12	40.54	74.00	-33.46	peak	P
3	6353.658	67.60	-26.07	41.53	74.00	-32.47	peak	P
4	8577.072	70.57	-24.35	46.22	74.00	-27.78	peak	P
5	11285.191	68.13	-22.98	45.15	74.00	-28.85	peak	P
6	14956.673	70.06	-19.75	50.31	74.00	-23.69	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	2914.865	70.14	-29.58	40.56	74.00	-33.44	peak	P
2	4276.376	68.04	-29.68	38.36	74.00	-35.64	peak	P
3	6085.434	65.57	-25.55	40.02	74.00	-33.98	peak	P
4	8646.706	70.66	-24.07	46.58	74.00	-27.42	peak	P
5	11047.468	68.52	-23.17	45.34	74.00	-28.66	peak	P
6	14218.986	71.76	-22.01	49.75	74.00	-24.25	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	2972.799	66.48	-29.25	37.22	74.00	-36.78	peak	P
2	4312.205	68.33	-28.64	39.68	74.00	-34.32	peak	P
3	6352.392	66.91	-25.85	41.06	74.00	-32.94	peak	P
4	8576.589	69.02	-25.99	43.03	74.00	-30.97	peak	P
5	11286.764	68.84	-22.59	46.25	74.00	-27.75	peak	P
6	14955.845	70.91	-19.50	51.41	74.00	-22.59	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	2913.662	69.16	-28.90	40.26	74.00	-33.74	peak	P
2	4276.334	68.10	-28.60	39.50	74.00	-34.50	peak	P
3	6085.771	65.25	-25.75	39.50	74.00	-34.50	peak	P
4	8645.277	70.55	-25.46	45.09	74.00	-28.91	peak	P
5	11047.526	68.06	-23.03	45.04	74.00	-28.96	peak	P
6	14218.086	70.58	-22.13	48.45	74.00	-25.55	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	2972.902	66.61	-29.83	36.78	74.00	-37.22	peak	P
2	4313.155	68.30	-28.52	39.78	74.00	-34.22	peak	P
3	6352.645	67.21	-26.22	40.99	74.00	-33.01	peak	P
4	8575.723	70.47	-25.23	45.24	74.00	-28.76	peak	P
5	11286.120	68.69	-23.76	44.92	74.00	-29.08	peak	P
6	14955.767	70.96	-20.05	50.91	74.00	-23.09	peak	P

TM01 / Polarization: Horizontal / Modulation: π/4DQPSK / CH: L

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.862	68.98	-28.91	40.07	74.00	-33.93	peak	P
2	4276.760	67.37	-28.46	38.91	74.00	-35.09	peak	P
3	6084.711	65.59	-25.23	40.36	74.00	-33.64	peak	P
4	8646.446	70.16	-24.21	45.95	74.00	-28.05	peak	P
5	11047.993	67.74	-22.67	45.07	74.00	-28.93	peak	P
6	14218.810	70.36	-21.82	48.54	74.00	-25.46	peak	P

TM01 / Polarization: Horizontal / Modulation: π/4DQPSK / CH: L

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2972.936	66.25	-30.07	36.19	74.00	-37.81	peak	P
2	4312.852	69.21	-29.14	40.07	74.00	-33.93	peak	P
3	6352.492	68.47	-25.03	43.44	74.00	-30.56	peak	P
4	8576.403	68.81	-25.05	43.76	74.00	-30.24	peak	P
5	11286.710	67.78	-22.31	45.46	74.00	-28.54	peak	P
6	14955.618	71.94	-20.98	50.96	74.00	-23.04	peak	P

TM01 / Polarization: Horizontal / Modulation: π/4DQPSK / CH: M

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.666	70.20	-30.41	39.78	74.00	-34.22	peak	P
2	4277.129	68.78	-28.50	40.28	74.00	-33.72	peak	P
3	6085.405	65.20	-25.71	39.49	74.00	-34.51	peak	P
4	8645.406	69.49	-24.38	45.11	74.00	-28.89	peak	P
5	11047.955	68.78	-23.58	45.20	74.00	-28.80	peak	P
6	14218.327	70.89	-21.99	48.90	74.00	-25.10	peak	P

TM01 / Polarization: Vertical / Modulation: π/4DQPSK / CH: M

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.264	66.00	-30.43	35.58	74.00	-38.42	peak	P
2	4313.746	68.15	-29.66	38.49	74.00	-35.51	peak	P
3	6353.160	66.67	-25.11	41.56	74.00	-32.44	peak	P
4	8576.612	70.42	-24.67	45.75	74.00	-28.25	peak	P
5	11285.557	67.92	-23.64	44.28	74.00	-29.72	peak	P
6	14955.089	70.30	-19.81	50.48	74.00	-23.52	peak	P

TM01 / Polarization: Horizontal / Modulation: π/4DQPSK / CH: H

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2913.943	68.95	-28.77	40.18	74.00	-33.82	peak	P
2	4277.554	67.99	-29.57	38.43	74.00	-35.57	peak	P
3	6084.655	64.08	-25.45	38.63	74.00	-35.37	peak	P
4	8645.268	69.86	-25.35	44.51	74.00	-29.49	peak	P
5	11047.102	68.24	-22.62	45.62	74.00	-28.38	peak	P
6	14217.182	69.92	-20.54	49.38	74.00	-24.62	peak	P

TM01 / Polarization: Vertical / Modulation: π/4DQPSK / CH: H

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2972.649	66.91	-28.62	38.29	74.00	-35.71	peak	P
2	4312.432	67.86	-27.97	39.89	74.00	-34.11	peak	P
3	6354.114	67.27	-26.27	40.99	74.00	-33.01	peak	P
4	8577.102	70.06	-24.76	45.30	74.00	-28.70	peak	P
5	11285.305	67.90	-24.03	43.87	74.00	-30.13	peak	P
6	14956.295	70.29	-20.96	49.33	74.00	-24.67	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

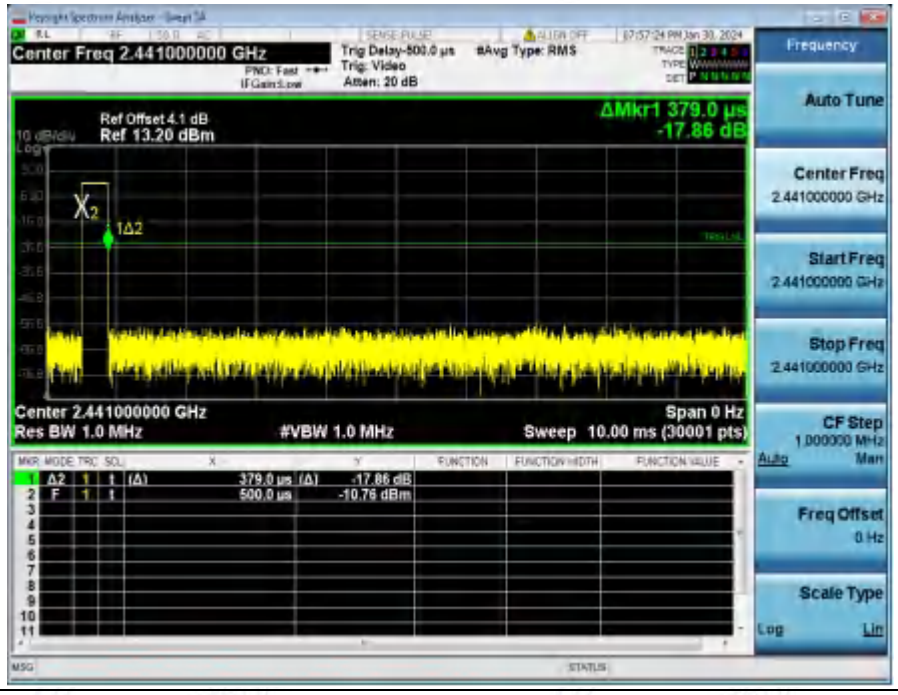
10 Appendix

Cable loss=0.83 dB

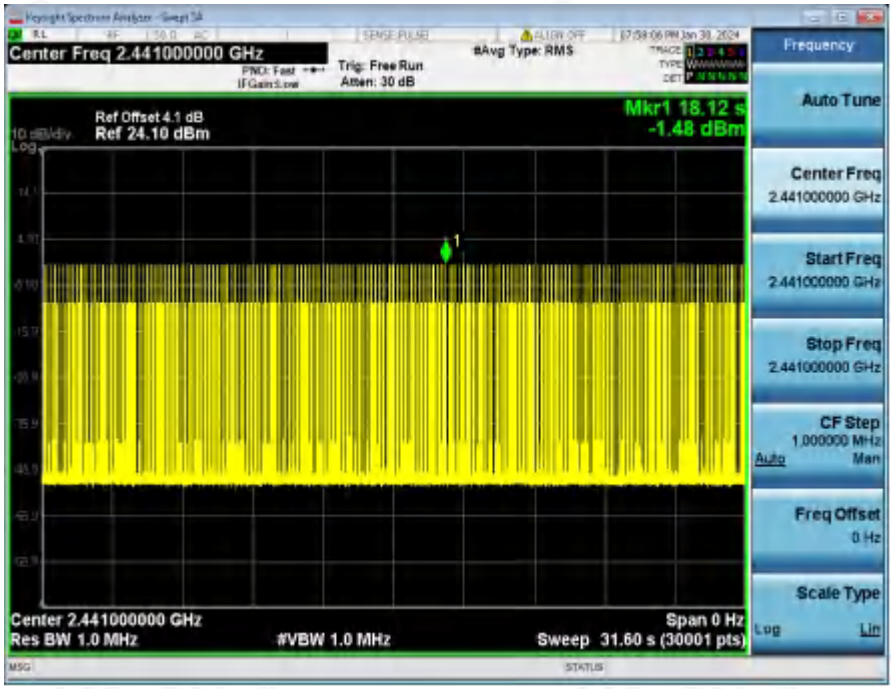
1. Dwell Time (Hopping)

Condition	Antenna	Packet Type	Pulse Time(ms)	Hops	Dwell Time(ms)	Limit(s)	Result
NVNT	ANT1	1-DH1	0.379	320.00	121.280	0.40	Pass
NVNT	ANT1	1-DH3	1.636	155.00	253.580	0.40	Pass
NVNT	ANT1	1-DH5	2.912	96.00	279.552	0.40	Pass
NVNT	ANT1	2-DH1	0.387	320.00	123.840	0.40	Pass
NVNT	ANT1	2-DH3	1.638	165.00	270.270	0.40	Pass
NVNT	ANT1	2-DH5	2.917	97.00	282.949	0.40	Pass

Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_One_Burst_Time



Dwell_Time_(Hopping)_NVNT_ANT1_1-DH1_2441_Accumulated



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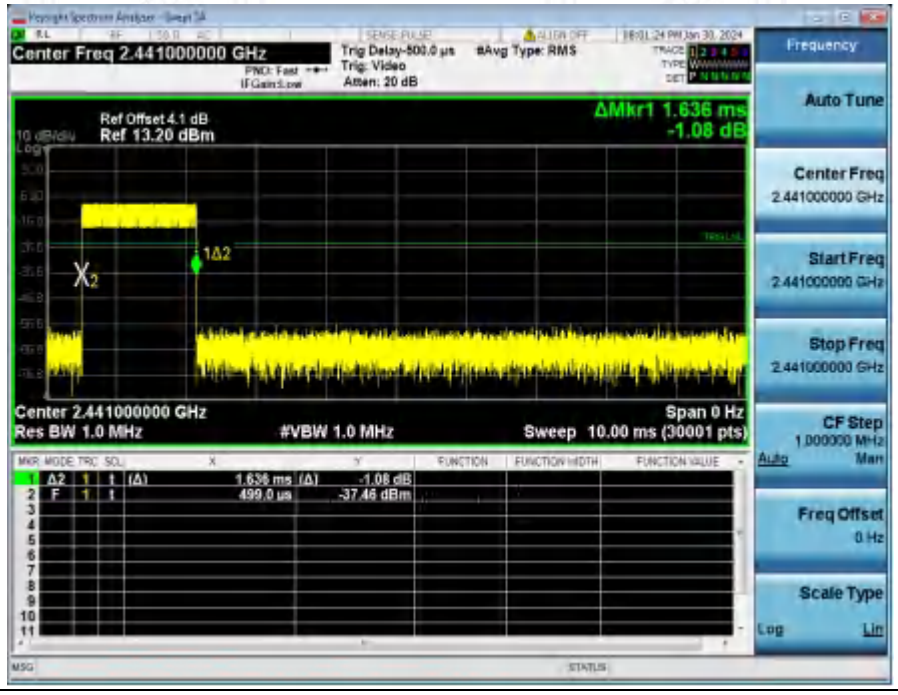

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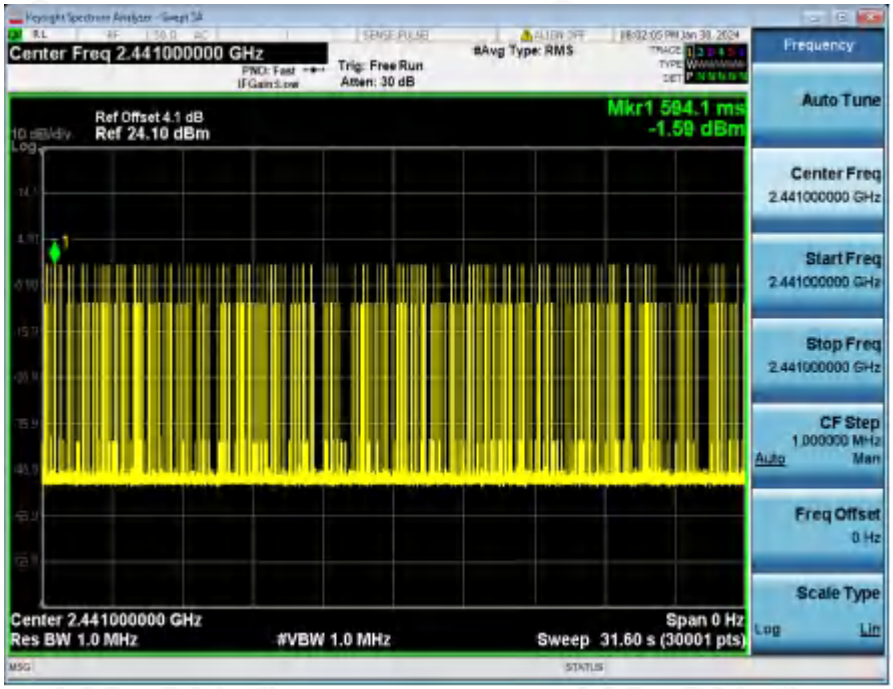
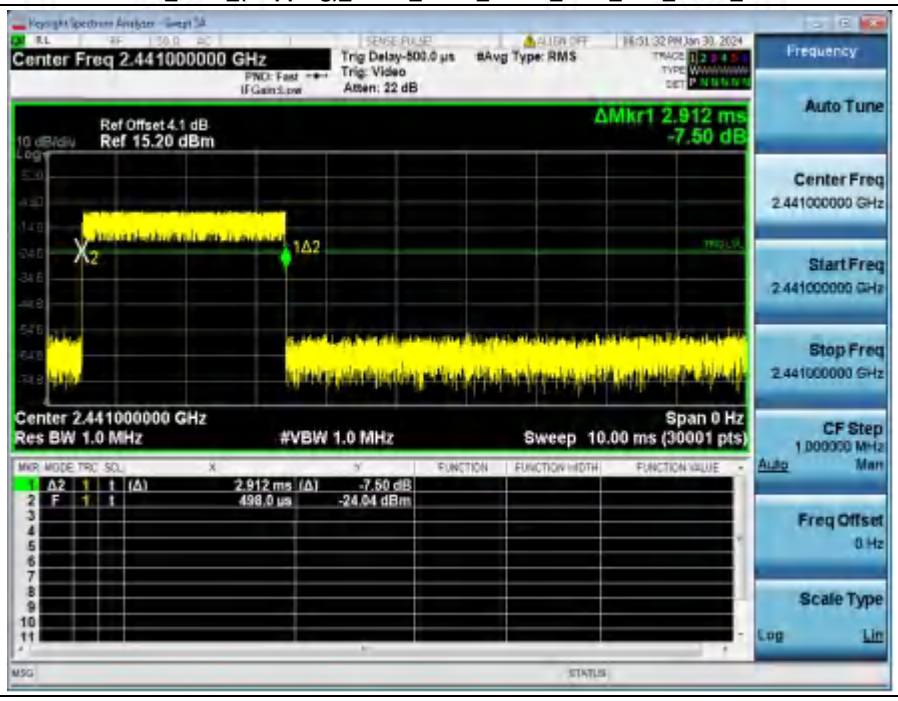


Dwell_Time_(Hopping)_NVNT_ANT1_1-DH5_2441_One_Burst_Time



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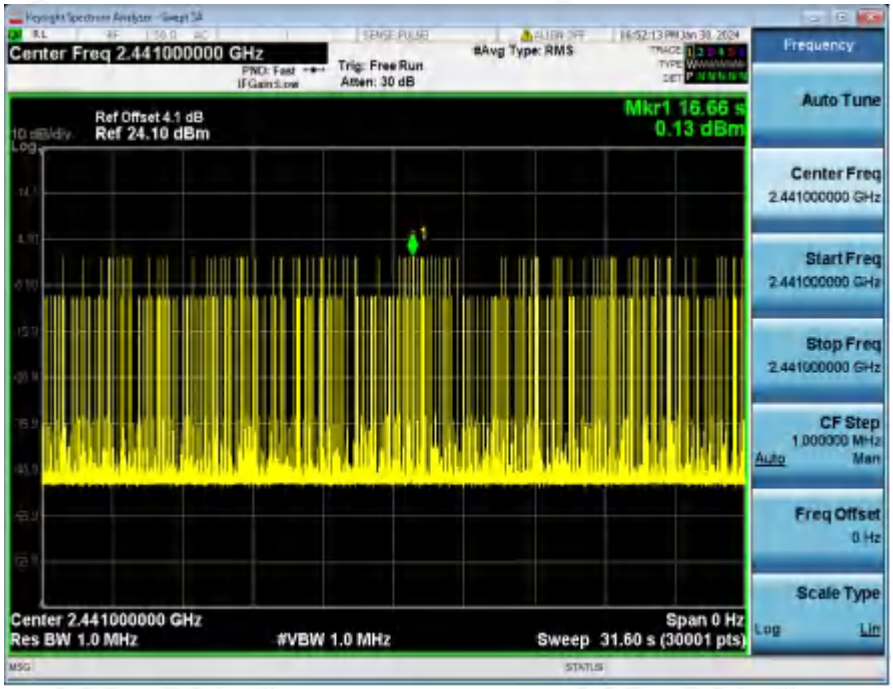

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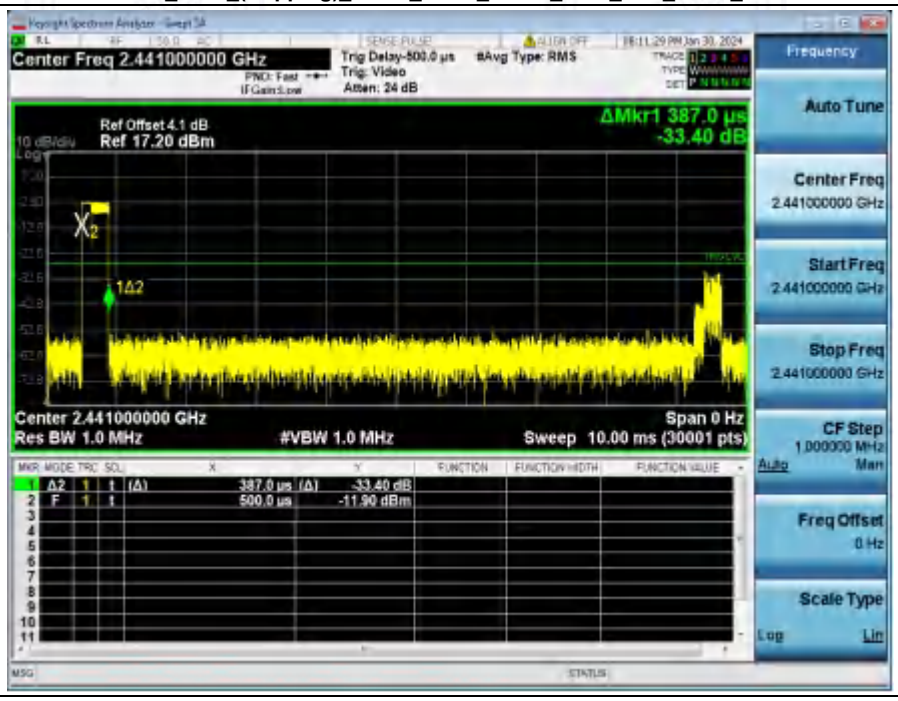

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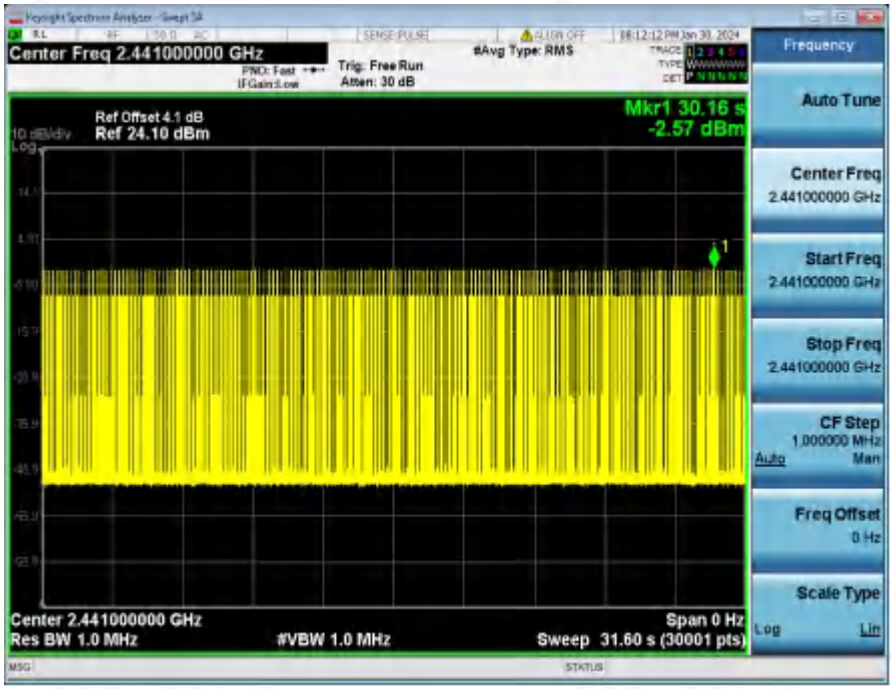

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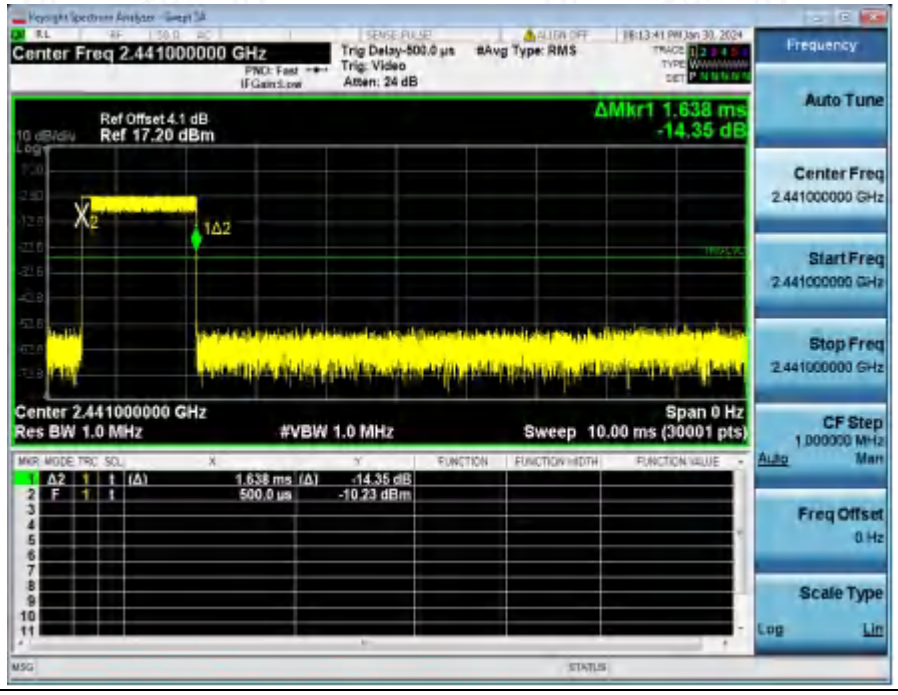
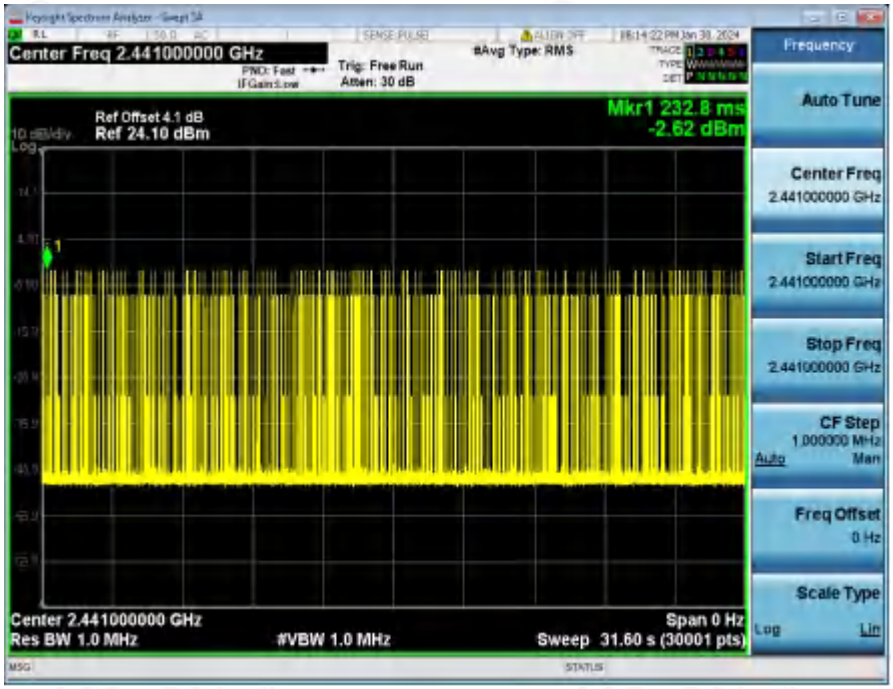
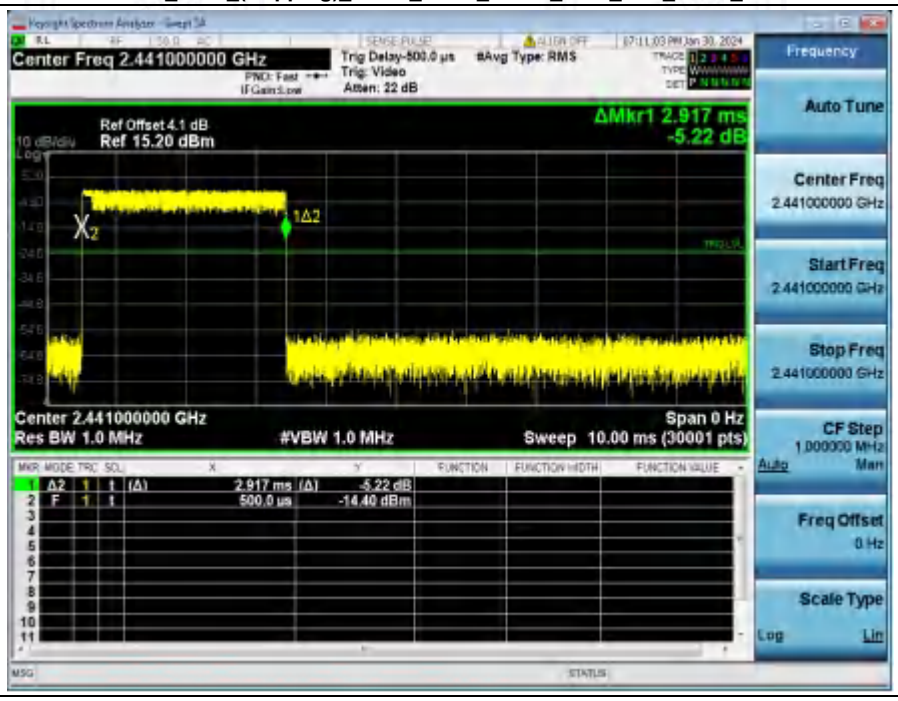


Dwell_Time_(Hopping)_NVNT_ANT1_2-DH3_2441_Accumulated



Dwell_Time_(Hopping)_NVNT_ANT1_2-DH5_2441_One_Burst_Time



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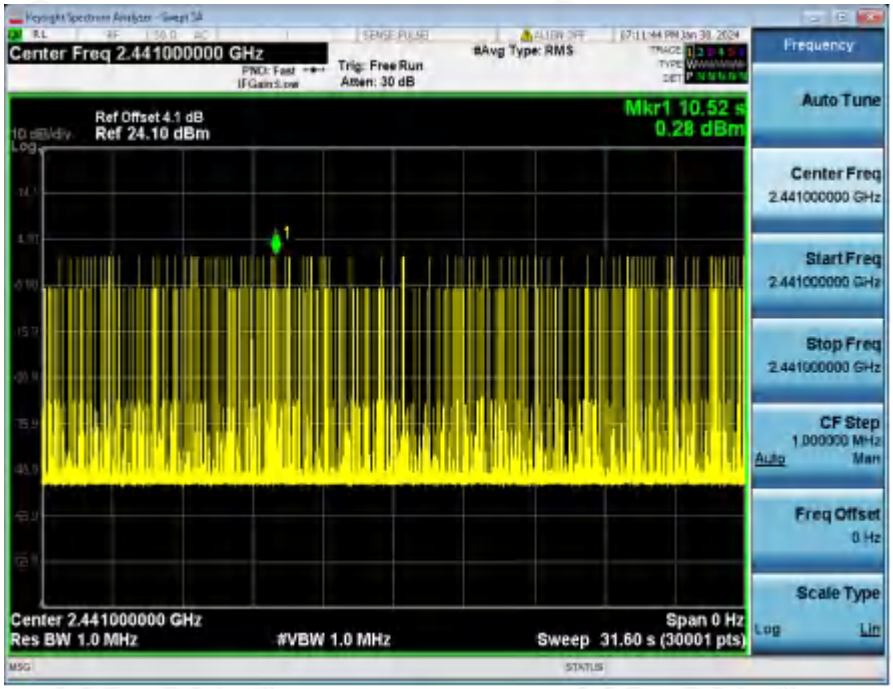
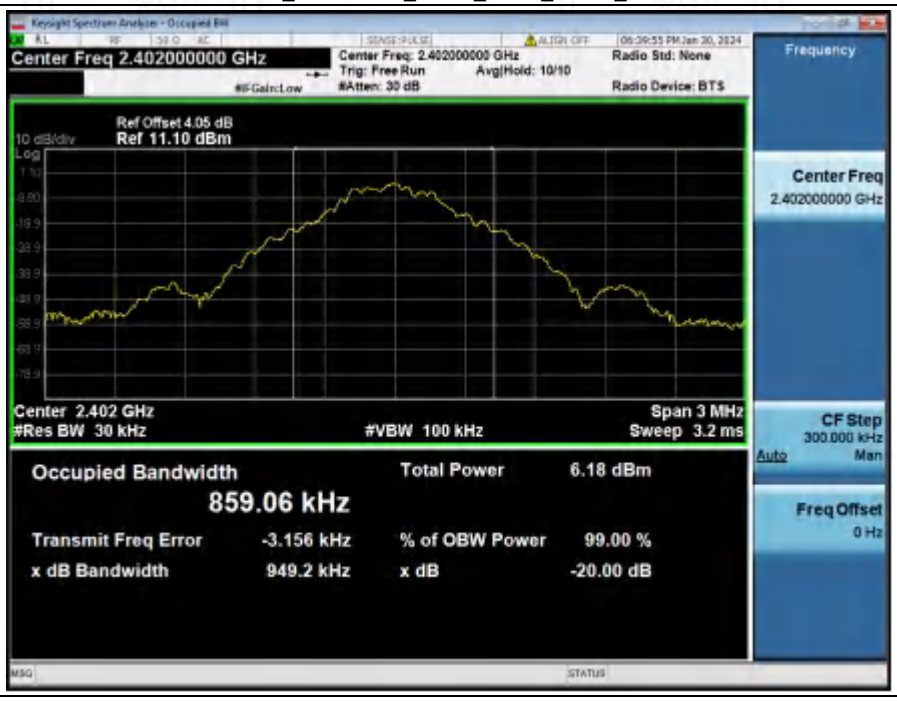


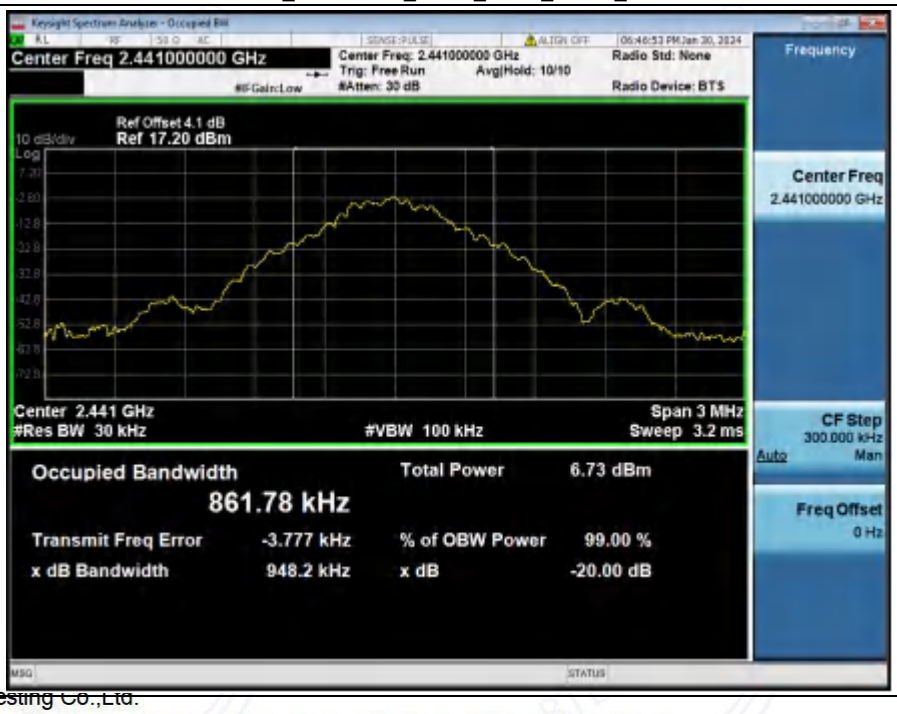
2. -20dB Bandwidth

Condition	Antenna	Modulation	Frequency (MHz)	-20dB BW(MHz)	if larger than CFS
NVNT	ANT1	1-DH5	2402.00	0.949	No
NVNT	ANT1	1-DH5	2441.00	0.948	No
NVNT	ANT1	1-DH5	2480.00	0.947	No
NVNT	ANT1	2-DH5	2402.00	1.268	Yes
NVNT	ANT1	2-DH5	2441.00	1.270	Yes
NVNT	ANT1	2-DH5	2480.00	1.268	Yes

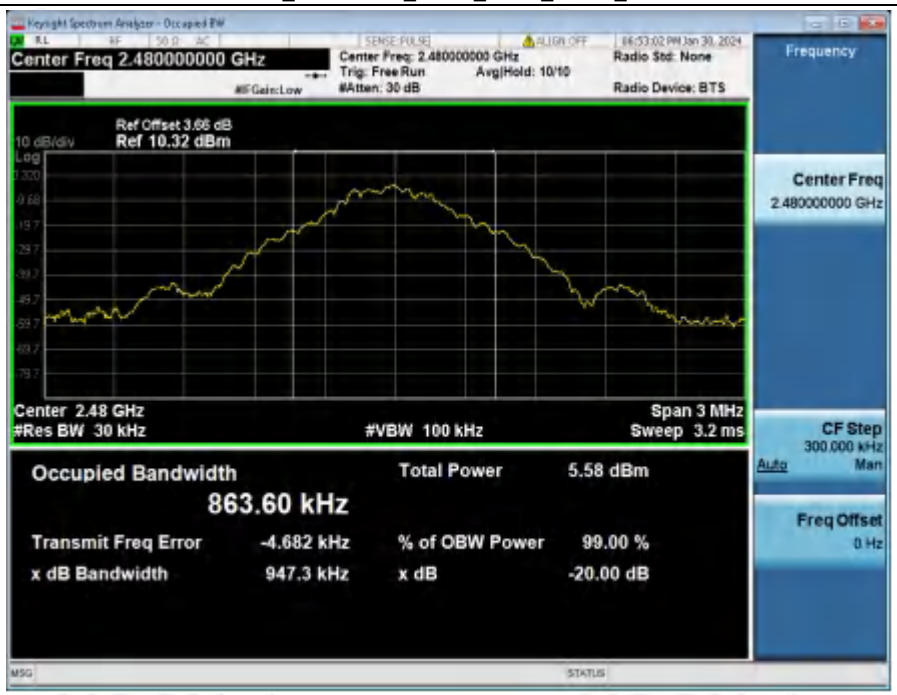
-20dB_Bandwidth_NVNT_ANT1_1-DH5_2402



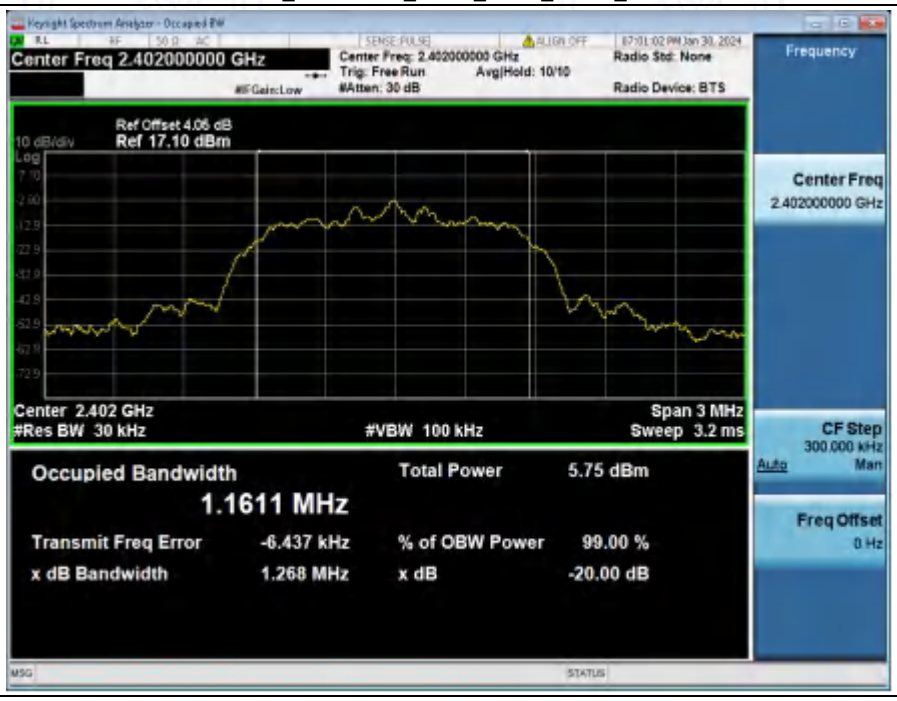
-20dB_Bandwidth_NVNT_ANT1_1-DH5_2441



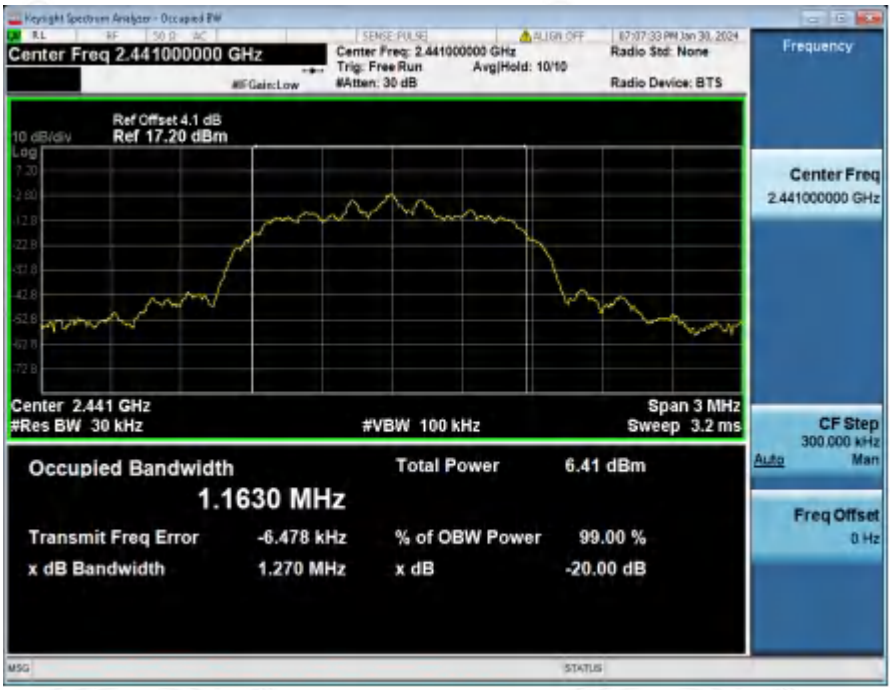
-20dB_Bandwidth_NVNT_ANT1_1-DH5_2480



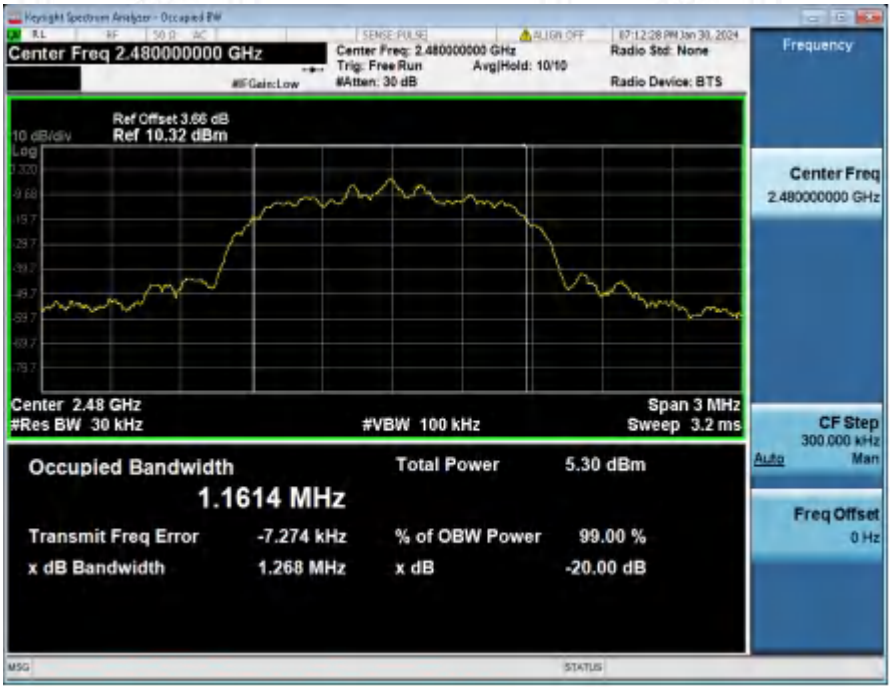
-20dB_Bandwidth_NVNT_ANT1_2-DH5_2402



-20dB_Bandwidth_NVNT_ANT1_2-DH5_2441



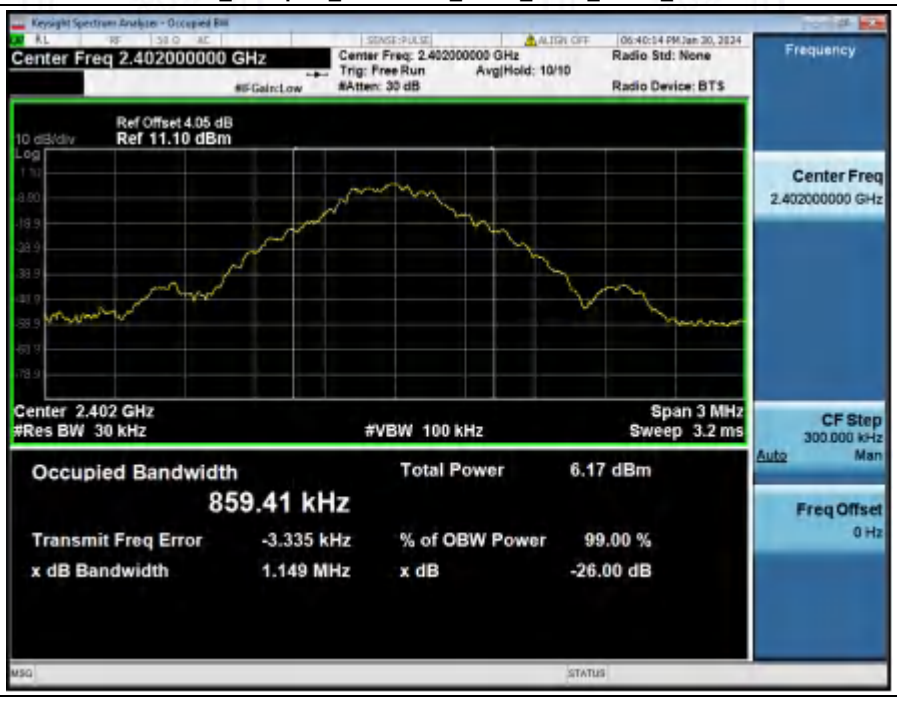
-20dB_Bandwidth_NVNT_ANT1_2-DH5_2480



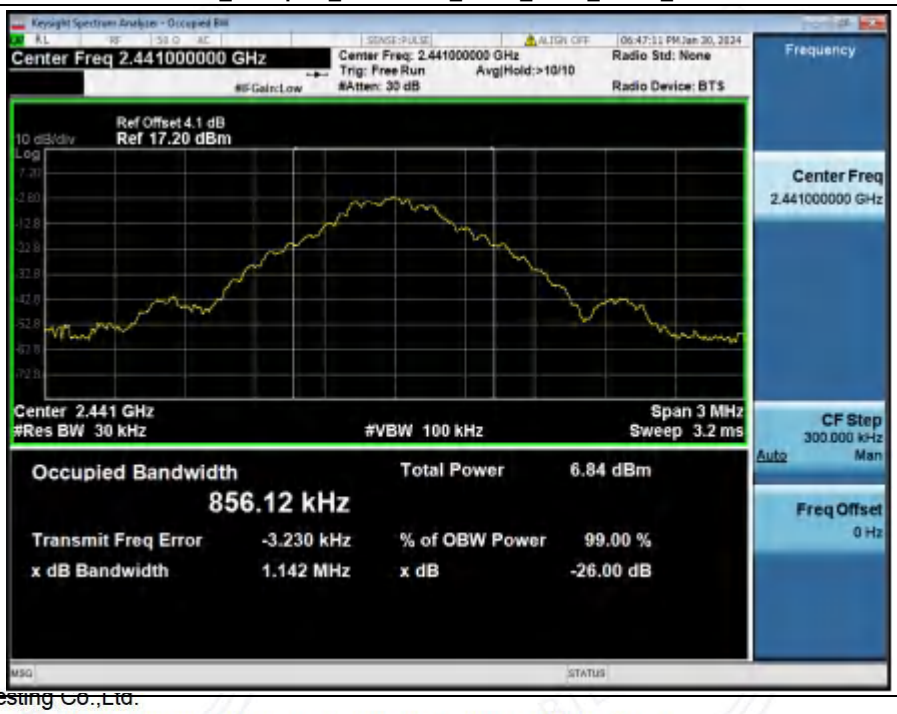
3. 99% Occupied Bandwidth

Condition	Antenna	Modulation	Frequency (MHz)	99%%BW(MHz)
NVNT	ANT1	1-DH5	2402.00	0.859
NVNT	ANT1	1-DH5	2441.00	0.856
NVNT	ANT1	1-DH5	2480.00	0.860
NVNT	ANT1	2-DH5	2402.00	1.162
NVNT	ANT1	2-DH5	2441.00	1.160
NVNT	ANT1	2-DH5	2480.00	1.163

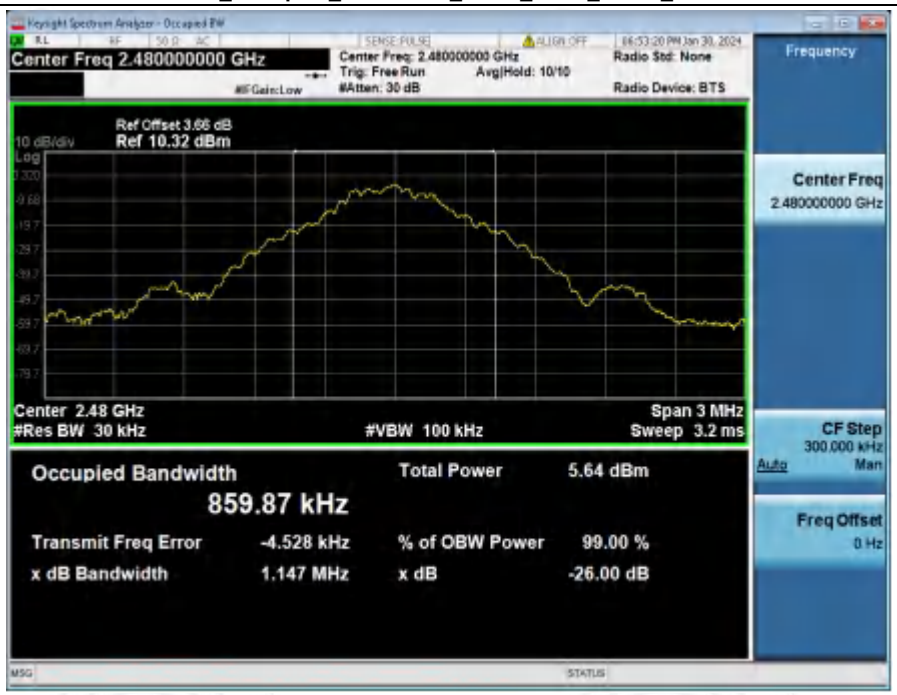
99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2402



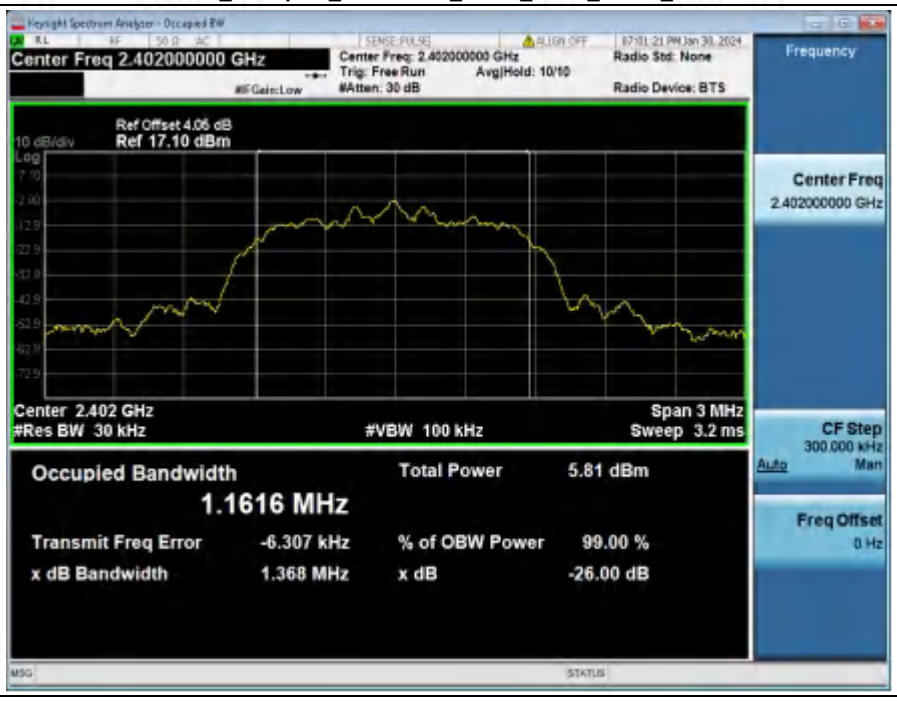
99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2441



99%_Occupied_Bandwidth_NVNT_ANT1_1-DH5_2480



99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2402



99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2441

99%_Occupied_Bandwidth_NVNT_ANT1_2-DH5_2480

4. Peak Output Power

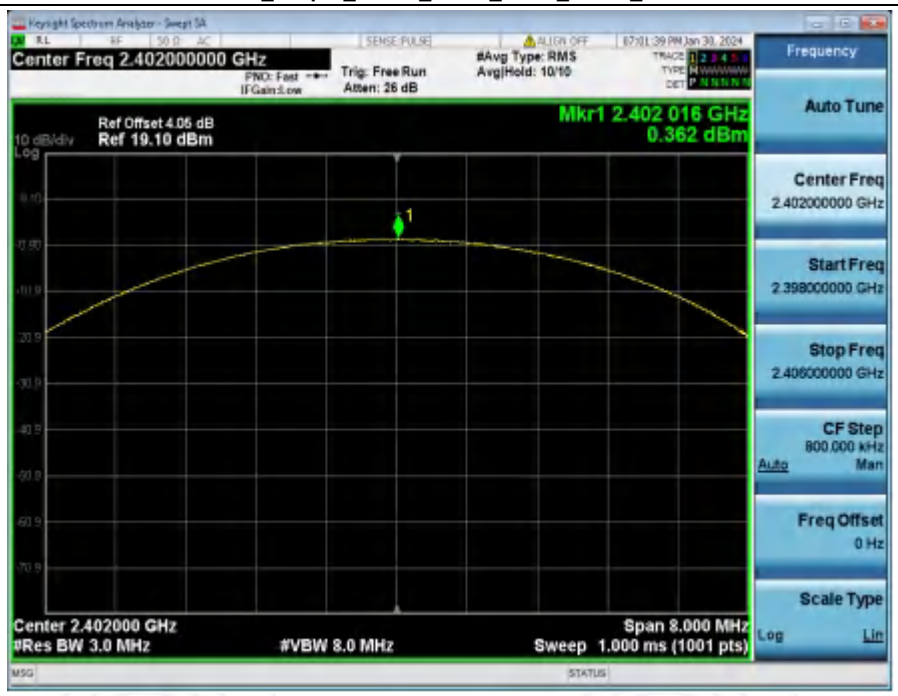
Condition	Antenna	Modulation	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1-DH5	2402.00	-0.40	0.91	1000	Pass
NVNT	ANT1	1-DH5	2441.00	0.11	1.03	1000	Pass
NVNT	ANT1	1-DH5	2480.00	-0.97	0.80	1000	Pass
NVNT	ANT1	2-DH5	2402.00	0.36	1.09	125	Pass
NVNT	ANT1	2-DH5	2441.00	0.88	1.23	125	Pass
NVNT	ANT1	2-DH5	2480.00	-0.24	0.95	125	Pass

Peak_Output_Power_NVNT_ANT1_1-DH5_2402

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

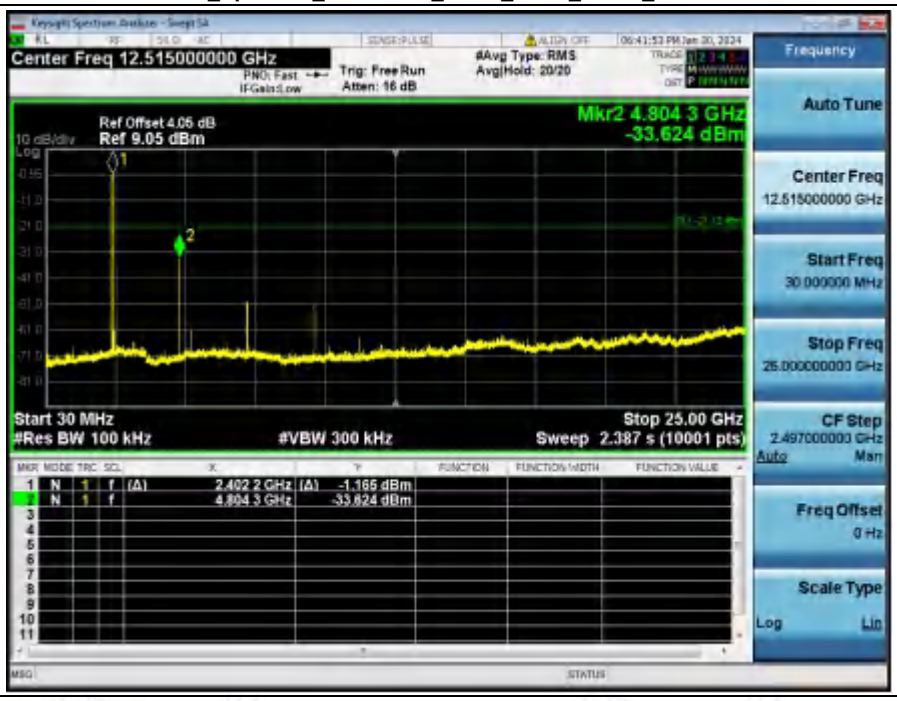
Peak_Output_Power_NVNT_ANT1_2-DH5_2480

5. Spurious Emissions

Condition	Antenna	Modulation	TX Mode	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-33.624	-21.122	Pass
NVNT	ANT1	1-DH5	2441.00	-31.388	-20.659	Pass
NVNT	ANT1	1-DH5	2480.00	-33.642	-21.707	Pass
NVNT	ANT1	2-DH5	2402.00	-34.719	-21.572	Pass
NVNT	ANT1	2-DH5	2441.00	-34.597	-20.999	Pass
NVNT	ANT1	2-DH5	2480.00	-36.071	-22.224	Pass

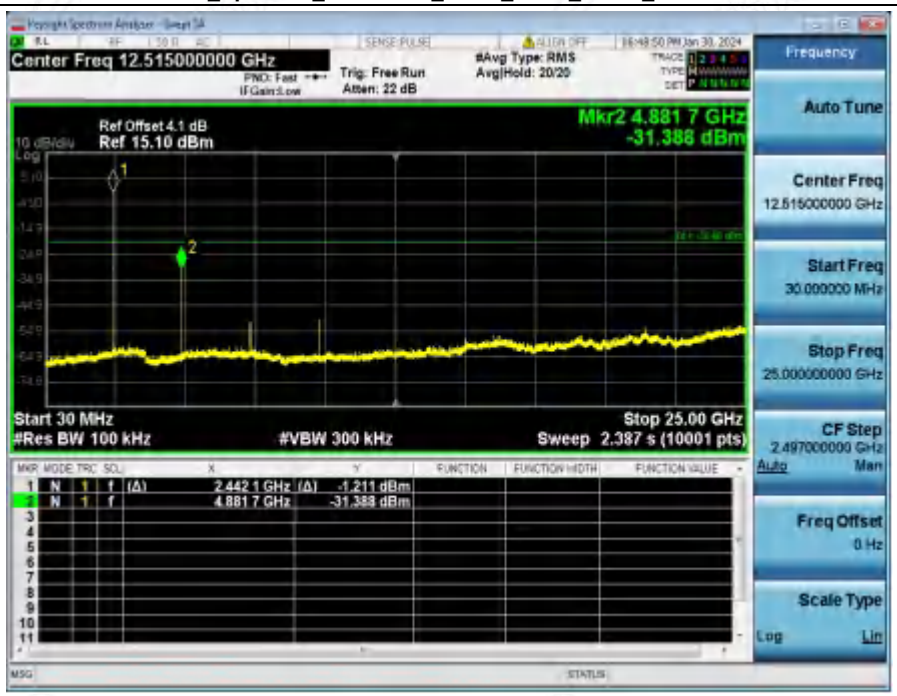
1_Reference_Level_NVNT_ANT1_1-DH5_2402

2_Spurious_Emissions_NVNT_ANT1_1-DH5_2402



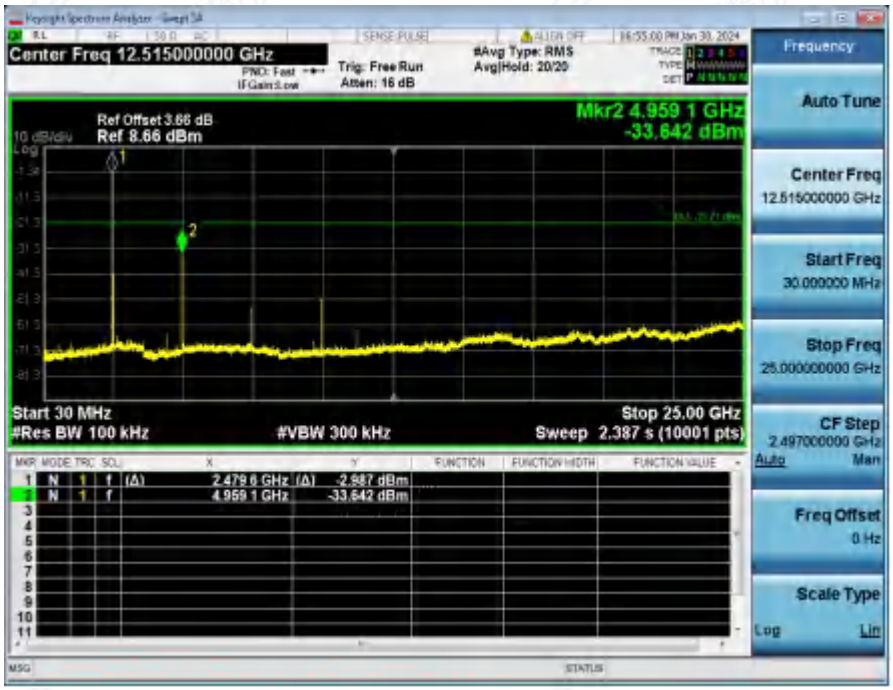
1_Reference_Level_NVNT_ANT1_1-DH5_2441

2_Spurious_Emissions_NVNT_ANT1_1-DH5_2441



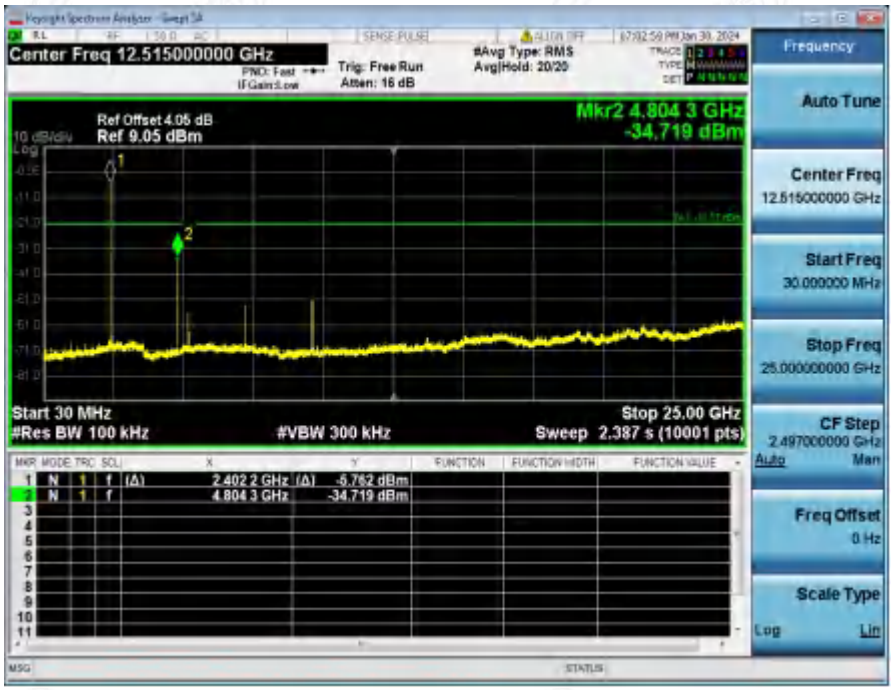
1_Reference_Level_NVNT_ANT1_1-DH5_2480

2_Spurious_Emissions_NVNT_ANT1_1-DH5_2480



1_Reference_Level_NVNT_ANT1_2-DH5_2402

2_Spurious_Emissions_NVNT_ANT1_2-DH5_2402

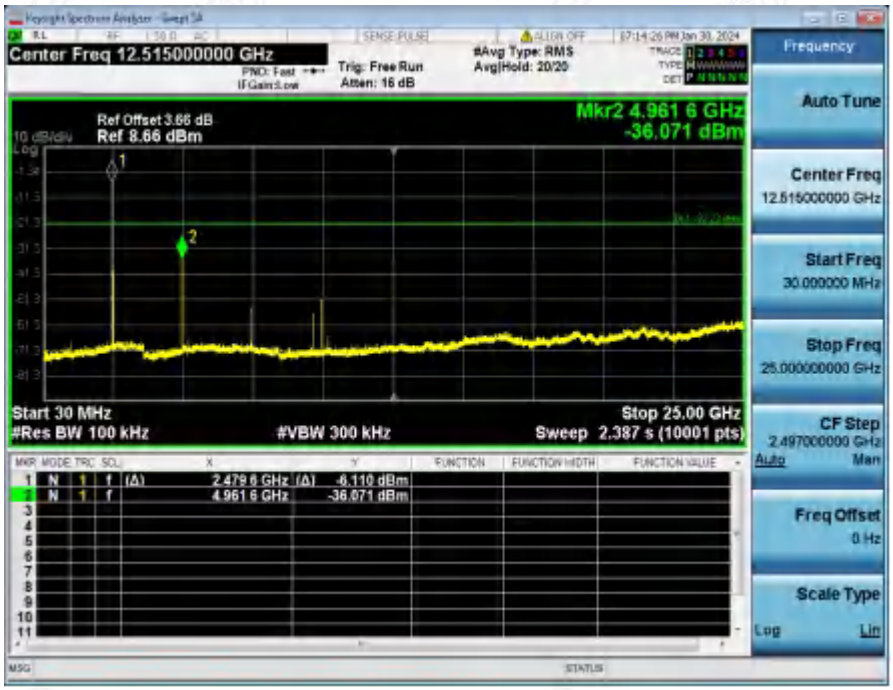


1_Reference_Level_NVNT_ANT1_2-DH5_2441

2_Spurious_Emissions_NVNT_ANT1_2-DH5_2441

1_Reference_Level_NVNT_ANT1_2-DH5_2480

2_Spurious_Emissions_NVNT_ANT1_2-DH5_2480

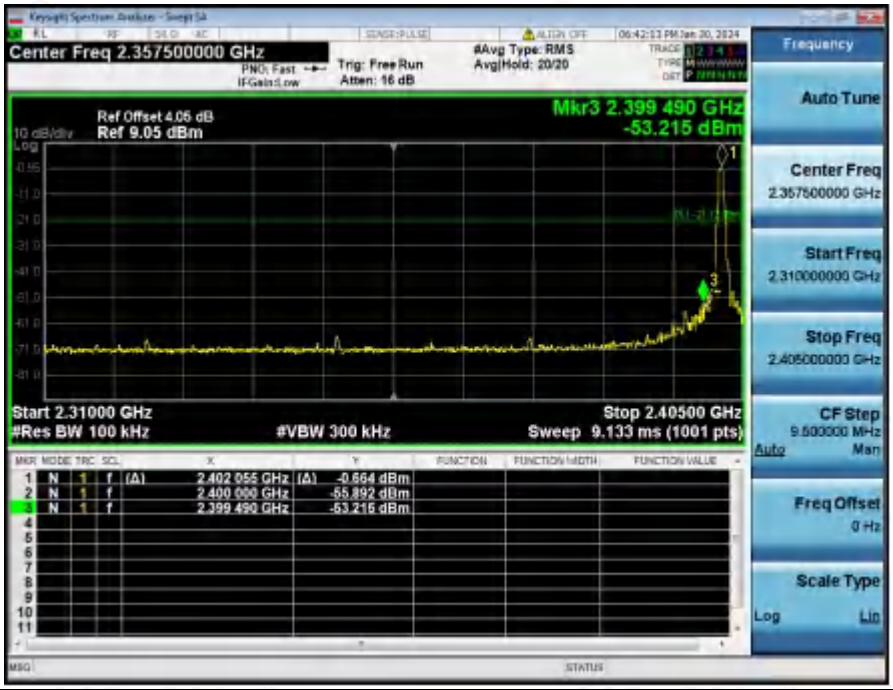


6. Bandedge

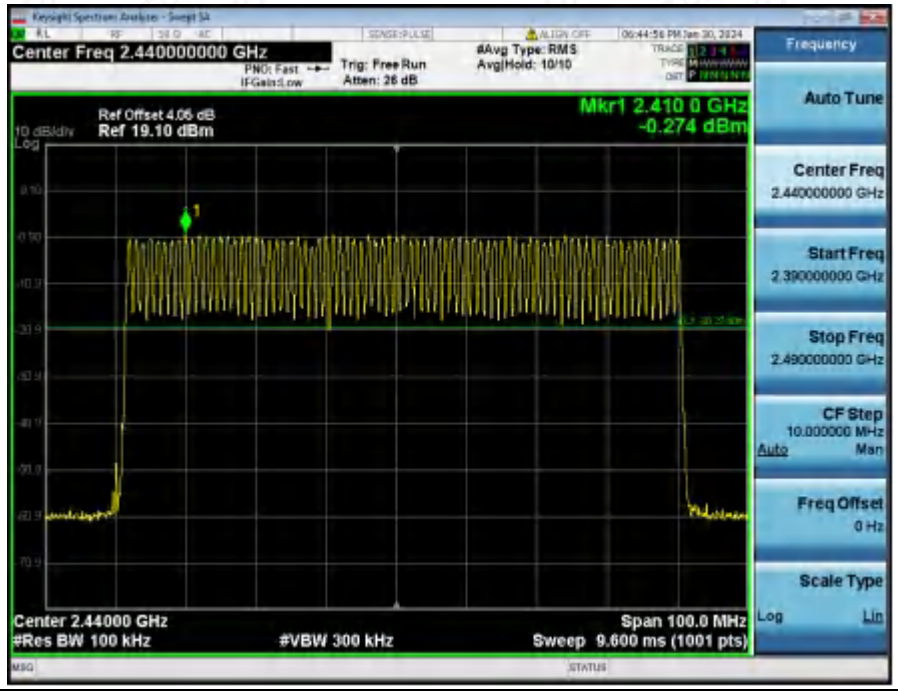
Condition	Antenna	Modulation	TX Mode	Bandedge MAX.Value	Limit	Result
NVNT	ANT1	1-DH5	2402.00	-53.215	-21.122	Pass
NVNT	ANT1	1-DH5	Hopping_LCH	-59.838	-20.274	Pass
NVNT	ANT1	1-DH5	2480.00	-56.213	-21.707	Pass
NVNT	ANT1	1-DH5	Hopping_HCH	-61.572	-20.963	Pass
NVNT	ANT1	2-DH5	2402.00	-50.568	-21.572	Pass
NVNT	ANT1	2-DH5	Hopping_LCH	-59.113	-21.382	Pass
NVNT	ANT1	2-DH5	2480.00	-56.521	-22.224	Pass
NVNT	ANT1	2-DH5	Hopping_HCH	-60.458	-21.794	Pass

1_Reference_Level_NVNT_ANT1_1-DH5_2402

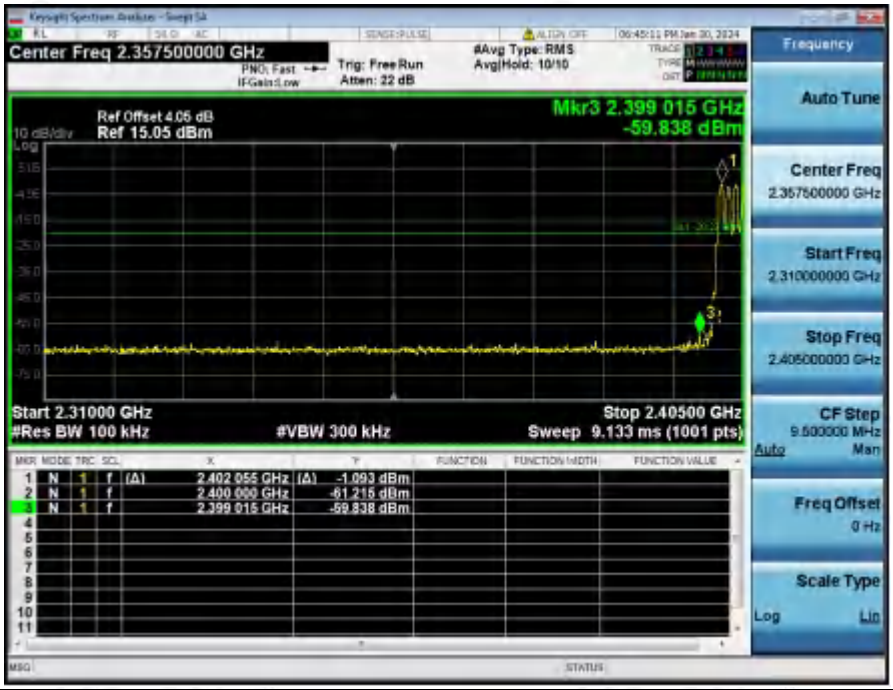
2_Bandedge_NVNT_ANT1_1-DH5_2402



1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

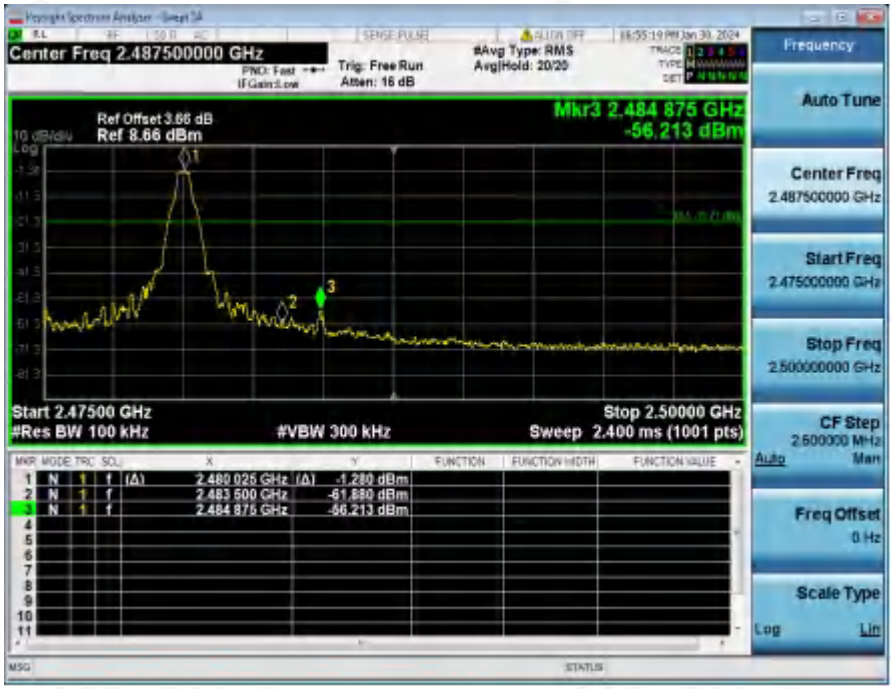


2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping

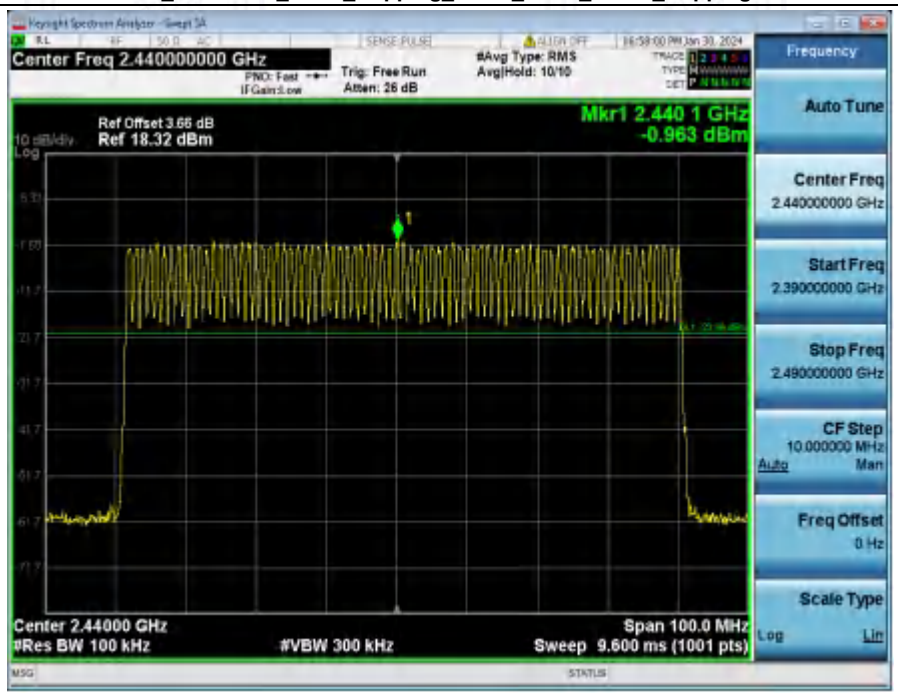


1_Reference_Level_NVNT_ANT1_1-DH5_2480

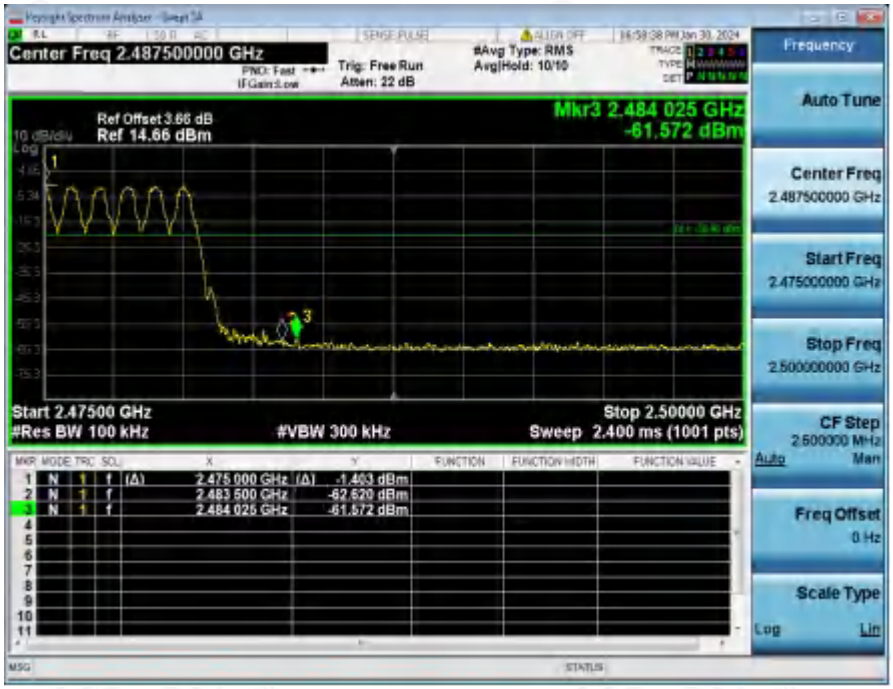
2_Bandedge_NVNT_ANT1_1-DH5_2480



1_Reference_Level_Hopping_NVNT_ANT1_1-DH5_Hopping

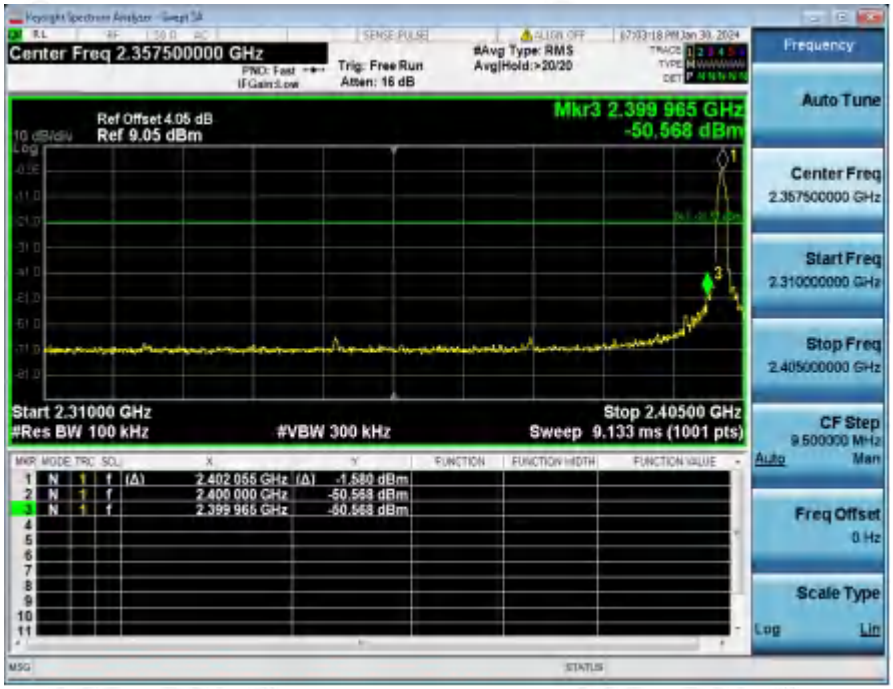


2_Band_Edge_(Hopping)_NVNT_ANT1_1-DH5_Hopping

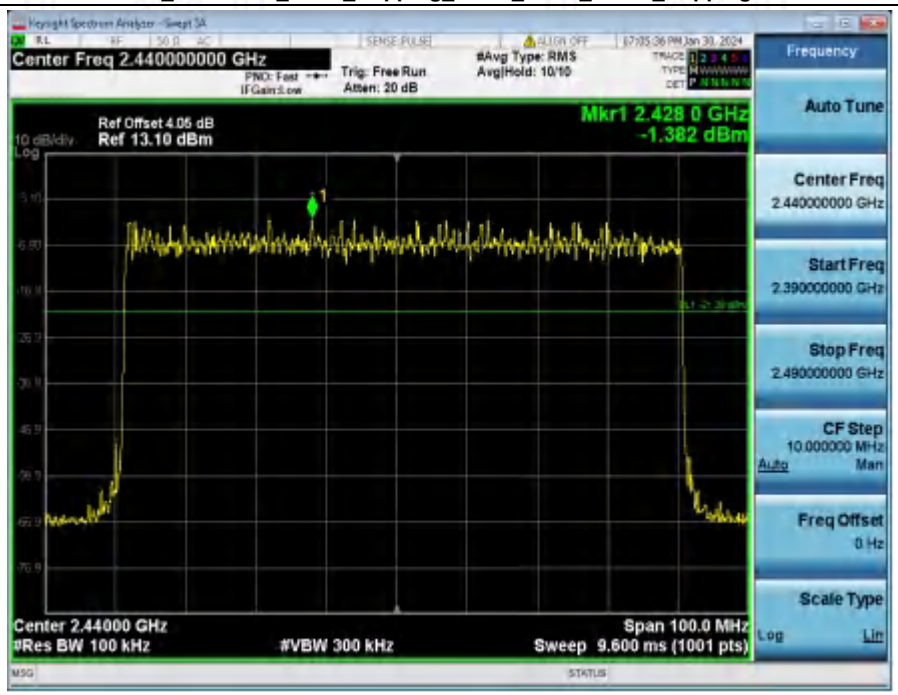


1_Reference_Level_NVNT_ANT1_2-DH5_2402

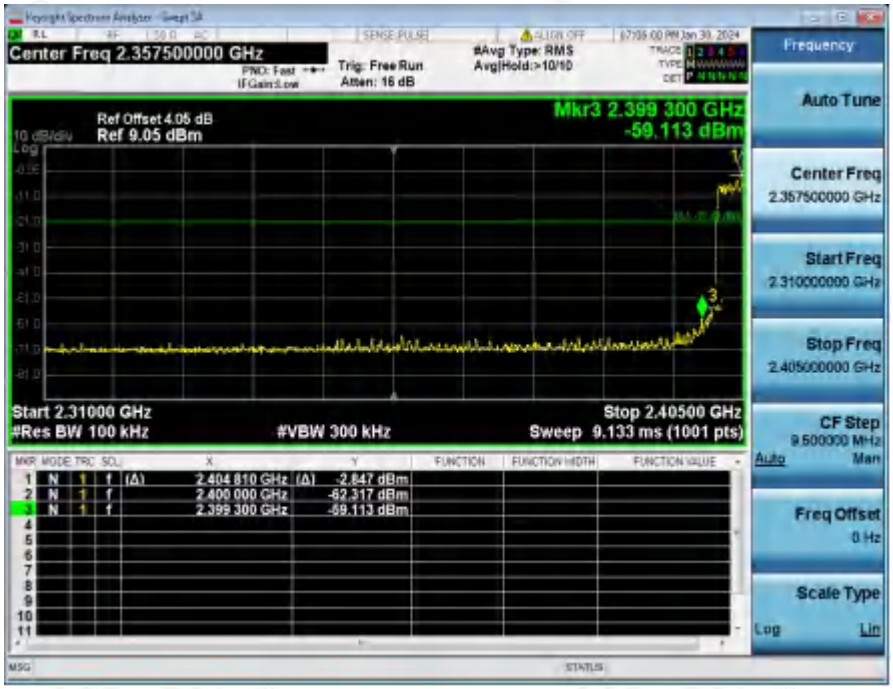
2_Bandedge_NVNT_ANT1_2-DH5_2402



1_Reference_Level_Hopping_NVNT_ANT1_2-DH5_Hopping



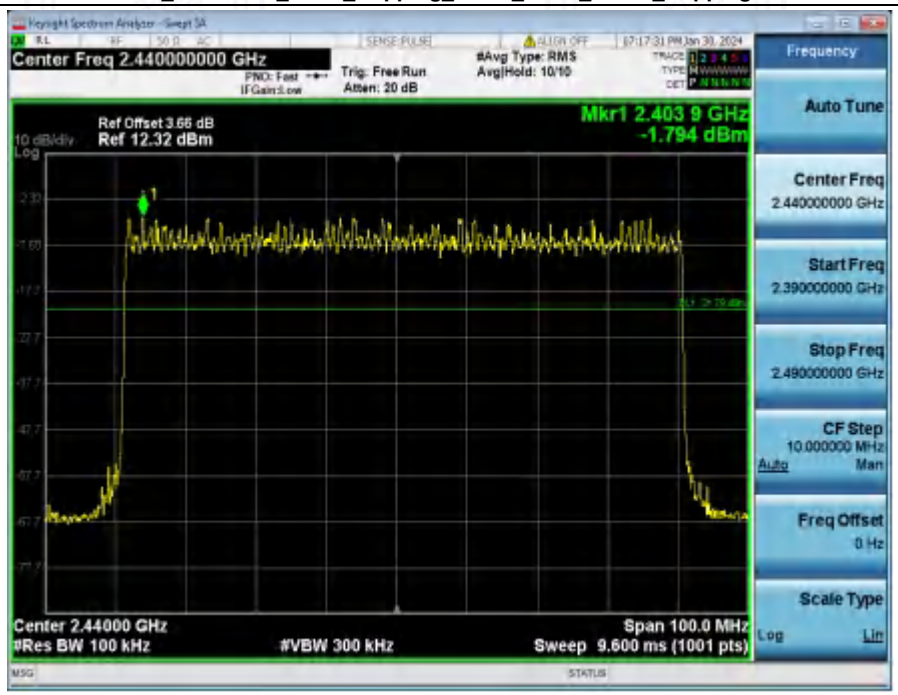
2_Band_Edge_(Hopping)_NVNT_ANT1_2-DH5_Hopping

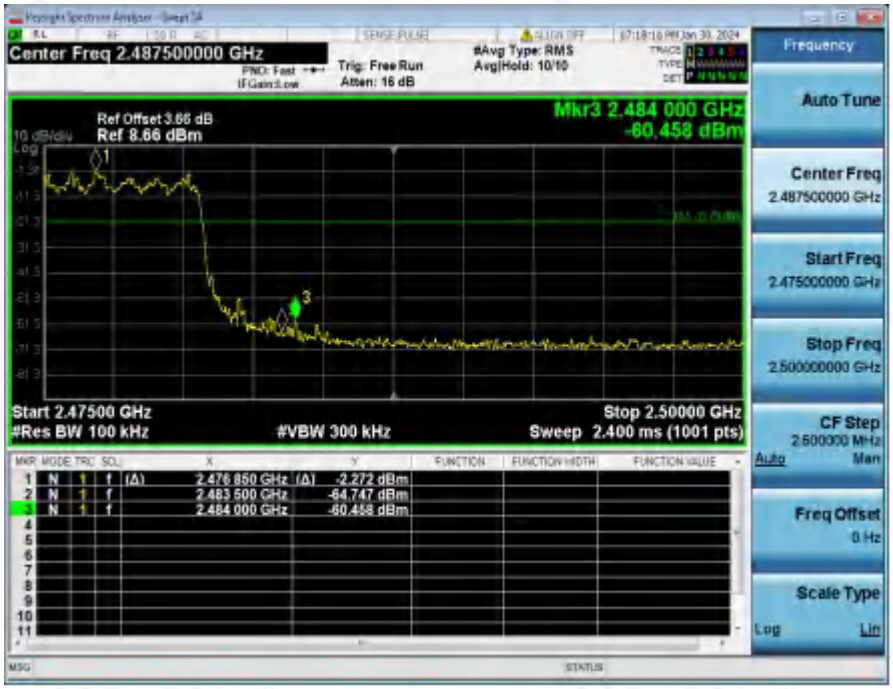


1_Reference_Level_NVNT_ANT1_2-DH5_2480

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


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	2441.017	2442.070	1.05	0.948	Pass
NVNT	ANT1	2-DH5	2441.00	2441.125	2442.034	0.91	0.847	Pass

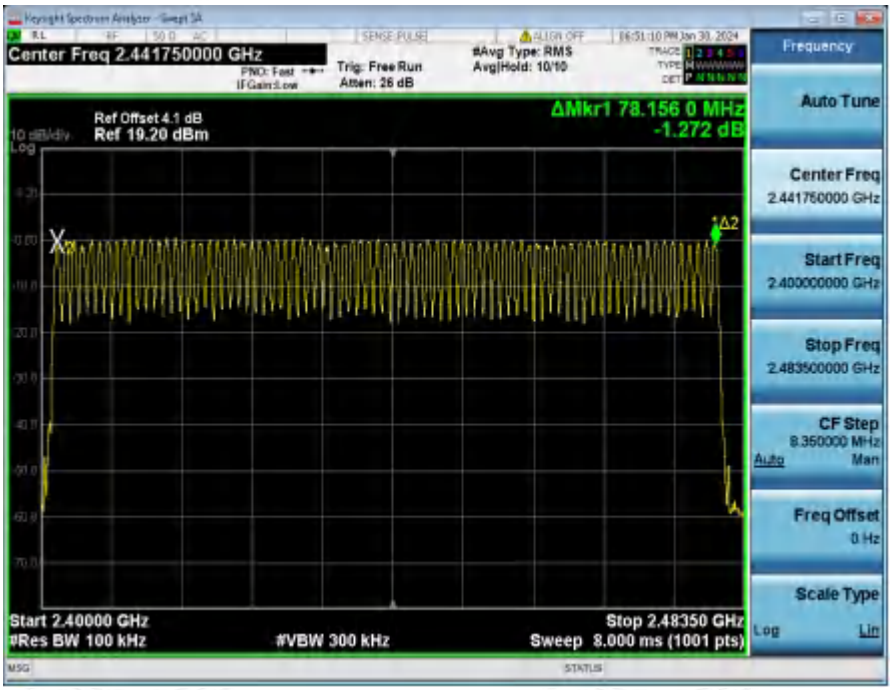
Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_1-DH5_Hopping

Carrier_Frequencies_Separation_(Hopping)_NVNT_ANT1_2-DH5_Hopping

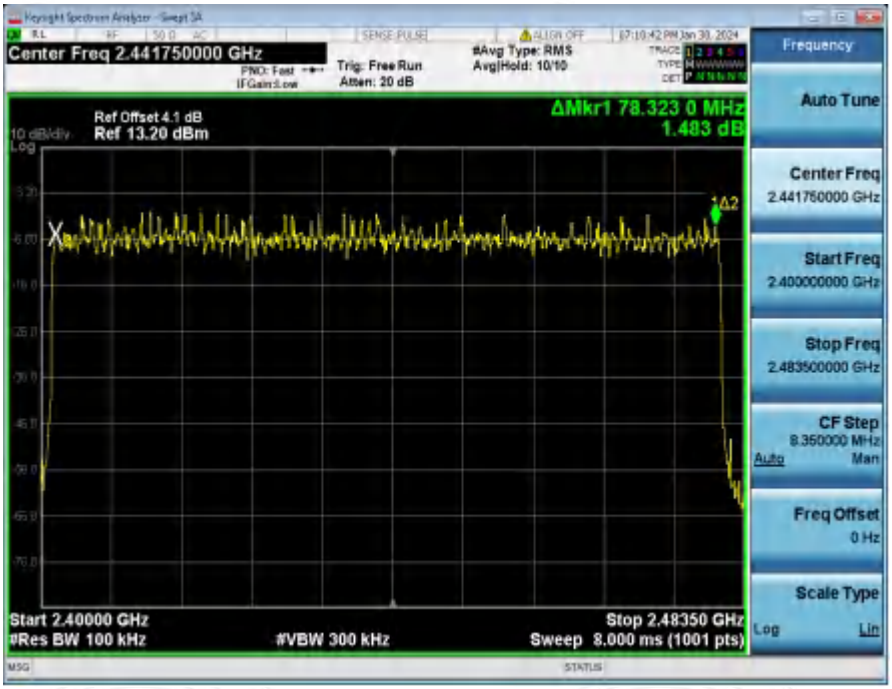
8. Number of Hopping Channel (Hopping)

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

Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_1-DH5_Hopping



Number_of_Hopping_Channel_(Hopping)_NVNT_ANT1_2-DH5_Hopping



- End of the Report -