

TESTING CENTRE TEC	TEST REPOR	T
FCC ID::	2AQ2W-H5	
Test Report No::	TCT231225E005	
Date of issue::	Jan. 03, 2024	
Testing laboratory:	SHENZHEN TONGCE TESTING	G LAB
Testing location/ address:	2101 & 2201, Zhenchang Factor Subdistrict, Bao'an District, Sher People's Republic of China	y Renshan Industrial Zone, Fuhai nzhen, Guangdong, 518103,
Applicant's name:	Shenzhen Doageas Technology	Co., Ltd.
Address::	5/F, 4th Bldg, Hedian Industrial F Shenzhen, Guangdong 518110,	
Manufacturer's name:	Shenzhen Doageas Technology	Co., Ltd.
Address:	5/F, 4th Bldg, Hedian Industrial F Shenzhen, Guangdong 518110,	
Standard(s):	FCC CFR Title 47 Part 15 Subpa FCC KDB 558074 D01 15.247 M ANSI C63.10:2013	
Product Name::	Bluetooth speaker	
Trade Mark:	DOAGEAS	
Model/Type reference:	H5	
Rating(s)::	Rechargeable Li-ion Battery DC	3.7V
Date of receipt of test item	Dec. 25, 2023	
Date (s) of performance of test:	Dec. 25, 2023 - Jan. 03, 2024	(c ¹)
Tested by (+signature) :	Onnado YE	Onnado Janger
Check by (+signature):	Beryl ZHAO	BoyC TOT
Approved by (+signature):	Tomsin	Tomsies &

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1. General Product Information

1.1. EUT description

Product Name:	Bluetooth speaker			
Model/Type reference:	H5			
Sample Number:	TCT231225E005-0101			
Bluetooth Version:	V5.0			
Operation Frequency:	2402MHz~2480MHz			
Transfer Rate:	1/2/3 Mbits/s	(C)		(0)
Number of Channel:	79			
Modulation Type:	GFSK, π/4-DQPSK, 8DPSK		(3)	
Modulation Technology:	FHSS			
Antenna Type:	PCB Antenna			
Antenna Gain:	-0.68dBi	(0)		(0)
Rating(s):	Rechargeable Li-ion Battery DC	3.7V		

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

1.2. Model(s) list

None.

1.3. Operation Frequency

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
9 11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		(.c)

Remark: Channel 0, 39 & 78 have been tested for GFSK, $\pi/4$ -DQPSK, 8DPSK modulation mode.



2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1)	PASS
20dB Occupied Bandwidth	§15.247 (a)(1)	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209	PASS
Band Edge	§15.247(d)	PASS

Note:

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



3. General Information

3.1. Test environment and mode

Operating Environment:		
Condition	Conducted Emission	Radiated Emission
Temperature:	23.5 °C	23.3 °C
Humidity:	52 % RH	50 % RH
Atmospheric Pressure:	1010 mbar	1010 mbar
Test Software:		
Software Information:	FCC assist 1.0.2.2	
Power Level:	10	
Test Mode:		
Engineering mode:	Keep the EUT in continuous channel and modulations wi	th Fully-charged battery

The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case(Z axis) are shown in Test Results of the following pages. DH1 DH3 DH5 all have been tested, only worse case DH1 is reported.

3.2. Description of Support Units

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

Equipment	Model No.	Serial No.	FCC ID	Trade Name
Adapter	EP-TA200	R37R55T6KL2SE3	/	SAMSUNG

Note:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
- 3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.



4. Facilities and Accreditations

4.1. Facilities

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

• FCC - Registration No.: 645098

SHENZHEN TONGCE TESTING LAB

Designation Number: CN1205

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

IC - Registration No.: 10668A-1

SHENZHEN TONGCE TESTING LAB

CAB identifier: CN0031

The testing lab has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

4.2. Location

SHENZHEN TONGCE TESTING LAB

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

TEL: +86-755-27673339

4.3. Measurement Uncertainty

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

No.	Item	MU
1	Conducted Emission	± 3.10 dB
2	RF power, conducted	± 0.12 dB
3	Spurious emissions, conducted	± 0.11 dB
4	All emissions, radiated(<1 GHz)	± 4.56 dB
5	All emissions, radiated(1 GHz - 18 GHz)	± 4.22 dB
6	All emissions, radiated(18 GHz- 40 GHz)	± 4.36 dB

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5. Test Results and Measurement Data

5.1. Antenna requirement

Standard requirement:

FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

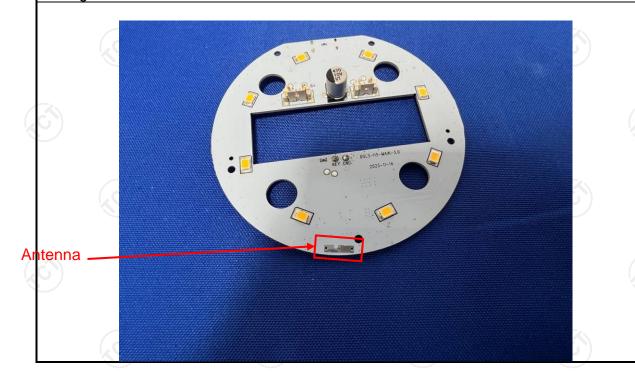
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit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

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna:

The Bluetooth antenna is PCB antenna which permanently attached, and the best case gain of the antenna is -0.68dBi.



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5.2. Conducted Emission

5.2.1. Test Specification

4) (4)			
Test Requirement:	FCC Part15 C Section	15.207	100
Test Method:	ANSI C63.10:2013		
Frequency Range:	150 kHz to 30 MHz	(C)	(C)
Receiver setup:	RBW=9 kHz, VBW=30	kHz, Sweep time	e=auto
	Frequency range	Limit (dBuV)
	(MHz)	Quasi-peak	Average
Limits:	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	Reference	e Plane	
Test Setup:	Test table/Insulation plane Remark: E.U.T. Equipment Under Test LISN: Line Impedence Stabilization Net Test table height=0.8m	EMI Receiver	r — AC power
Test Mode:	Charging + Transmittin	g Mode	
Test Procedure:	 The E.U.T is connecting impedance stabilized provides a 50 ohm/5 measuring equipment. The peripheral device power through a LI coupling impedance refer to the block photographs). Both sides of A.C. conducted interferent emission, the relative the interface cables. 	ation network 50uH coupling im nt. ees are also conne SN that provides with 50ohm terr diagram of the line are checkence. In order to five positions of equations	(L.I.S.N.). This appedance for the ected to the main a 50ohm/50uH mination. (Please test setup and ed for maximum and the maximum aipment and all of
	ANSI C63.10:2013 c	on conducted mea	asurement.



5.2.2. Test Instruments

Cond	lucted Emission	Shielding R	oom Test Site (8	43)
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCI3	100898	Jun. 29, 2024
Line Impedance Stabilisation Newtork(LISN)	Schwarzbeck	NSLK 8126	8126453	Feb. 20, 2024
Line-5	TCT	CE-05	/	Jul. 03, 2024
EMI Test Software	Shurple Technology	EZ-EMC	1 (3)	1 6

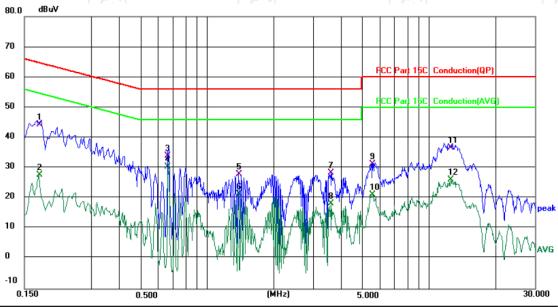




5.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site 844 Shielding Room

Phase: L1

Temperature: 23.5 (°C)

Humidity: 52 %

Report No.: TCT231225E005

Limit: FCC Part 15C Conduction(QP)

Power: DC 5 V(Adapter Input AC 120 V/60 Hz)

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1740	34.21	10.13	44.34	64.77	-20.43	QP	
2		0.1740	17.49	10.13	27.62	54.77	-27.15	AVG	
3		0.6660	24.79	9.29	34.08	56.00	-21.92	QP	
4	*	0.6660	21.11	9.29	30.40	46.00	-15.60	AVG	
5		1.3860	17.86	10.00	27.86	56.00	-28.14	QP	
6		1.3860	11.28	10.00	21.28	46.00	-24.72	AVG	
7		3.6060	18.21	10.07	28.28	56.00	-27.72	QP	
8		3.6060	8.14	10.07	18.21	46.00	-27.79	AVG	
9		5.5780	21.08	10.10	31.18	60.00	-28.82	QP	
10		5.5780	11.09	10.10	21.19	50.00	-28.81	AVG	
11		12.5300	26.44	10.16	36.60	60.00	-23.40	QP	
12		12.5300	15.90	10.16	26.06	50.00	-23.94	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level $(dB\mu V)$ = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement $(dB\mu V)$ = Reading level $(dB\mu V)$ + Corr. Factor (dB)

 $Limit (dB\mu V) = Limit stated in standard$

 $Margin (dB) = Measurement (dB\mu V) - Limits (dB\mu V)$

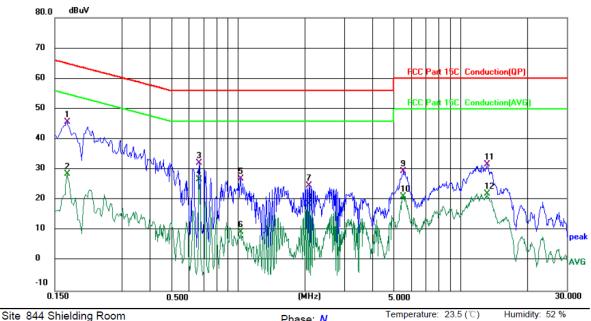
Q.P. =Quasi-Peak

AVG =average

^{*} is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.



Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Phase: N

Power: DC 5 V(Adapter Input AC 120 V/60 Hz)

Temperature: 23.5 (°C)

Humidity: 52 %

|--|

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1700	35.47	10.13	45.60	64.96	-19.36	QP	
2	0.1700	18.45	10.13	28.58	54.96	-26.38	AVG	
3	0.6700	22.94	9.29	32.23	56.00	-23.77	QP	
4 *	0.6700	17.41	9.29	26.70	46.00	-19.30	AVG	
5	1.0300	18.14	8.95	27.09	56.00	-28.91	QP	
6	1.0300	0.43	8.95	9.38	46.00	-36.62	AVG	
7	2.0979	14.77	10.01	24.78	56.00	-31.22	QP	
8	2.0979	8.58	10.01	18.59	46.00	-27.41	AVG	
9	5.5380	19.31	10.10	29.41	60.00	-30.59	QP	
10	5.5380	10.99	10.10	21.09	50.00	-28.91	AVG	
11	13.1780	21.61	10.16	31.77	60.00	-28.23	QP	
12	13.1780	11.94	10.16	22.10	50.00	-27.90	AVG	

Note1:

Freq. = Emission frequency in MHz

Reading level $(dB\mu V)$ = Receiver reading

Corr. Factor (dB) = LISN factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

 $Limit (dB\mu V) = Limit stated in standard$

 $Margin (dB) = Measurement (dB\mu V) - Limits (dB\mu V)$

Q.P. =Quasi-Peak AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

Note2:

Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (Lowest channel and 8DPSK) was submitted only.



5.3. Conducted Output Power

5.3.1. Test Specification

<u> </u>			
Test Requirement:	FCC Part15 C Section 15.247 (b)(1)		
Test Method:	KDB 558074 D01 v05r02		
Limit:	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.		
Test Setup:	Spectrum Analyzer EUT		
Test Mode:	Transmitting mode with modulation		
Test Procedure:	Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidt centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.		
Test Result:	PASS		

5.3.2. Test Instruments

1	Name	Manufacturer	Model No.	Serial Number	Calibration Due
	Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
	Combiner Box	Ascentest	AT890-RFB	9 1	(0)



5.4. 20dB Occupy Bandwidth

5.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)		
Test Method:	KDB 558074 D01 v05r02		
Limit:	N/A		
Test Setup:	Spectrum Analyzer	EUT	
Test Mode:	Transmitting mode with	n modulation	
Test Procedure:	 Transmitting mode with modulation The RF output of EUT was connected to the spectru analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Use the following spectrum analyzer settings for 200 Bandwidth measurement. Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel; 1%≤RBW≤5% of the 20 dB bandwidth; VBW≥3RBW Sweep = auto; Detector function = peak; Trace = mahold. 		
Test Result:	PASS		

5.4.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
Combiner Box	Ascentest	AT890-RFB	/	/





5.5. Carrier Frequencies Separation

5.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	KDB 558074 D01 v05r02
Limit:	Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	 The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Enable the EUT hopping function. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels; RBW is set to approximately 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.
Test Result:	PASS

5.5.2. Test Instruments

		7 2 1		
Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
Combiner Box	Ascentest	AT890-RFB	(6) /	((C))



5.6. Hopping Channel Number

5.6.1. Test Specification

J.o. 1. Test Specification	
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	KDB 558074 D01 v05r02
Limit:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	 The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Enable the EUT hopping function. Use the following spectrum analyzer settings: Span = the frequency band of operation; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. The number of hopping frequency used is defined as the number of total channel. Record the measurement data in report.
Test Result:	PASS
1 // 1	

5.6.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
Combiner Box	Ascentest	AT890-RFB	/	/



5.7. Dwell Time

5.7.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)			
Test Method:	KDB 558074 D01 v05r02			
Limit:	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.			
Test Setup:	Spectrum Analyzer EUT			
Test Mode:	Hopping mode			
Test Procedure:	 The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Enable the EUT hopping function. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel; VBW≥RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold. Measure and record the results in the test report. 			
Test Result:	PASS			
100111000111	7.100			

5.7.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
Combiner Box	Ascentest	AT890-RFB	/	



5.8. Pseudorandom Frequency Hopping Sequence

Test Requirement:

FCC Part15 C Section 15.247 (a)(1) requirement:

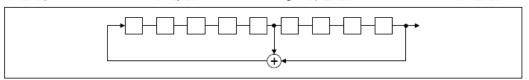
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. 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.

EUT Pseudorandom Frequency Hopping Sequence

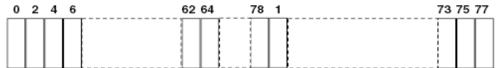
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized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



Each frequency used equally on the average by each transmitter. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com



5.9. Conducted Band Edge Measurement

5.9.1. Test Specification

2.3.1. Test opecification	
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB 558074 D01 v05r02
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	 Set to the maximum power setting and enable the EUT transmit continuously. Set RBW = 100 kHz (≥1% span=10MHz), VBW = 300 kHz (≥RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used. Enable hopping function of the EUT and then repeat step 2 and 3. Measure and record the results in the test report.
Test Result:	PASS

5.9.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
Combiner Box	Ascentest	AT890-RFB	/	/



5.10. Conducted Spurious Emission Measurement

5.10.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB 558074 D01 v05r02
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	 The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Measure and record the results in the test report. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

5.10.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 28, 2024
Combiner Box	Ascentest	AT890-RFB	/	

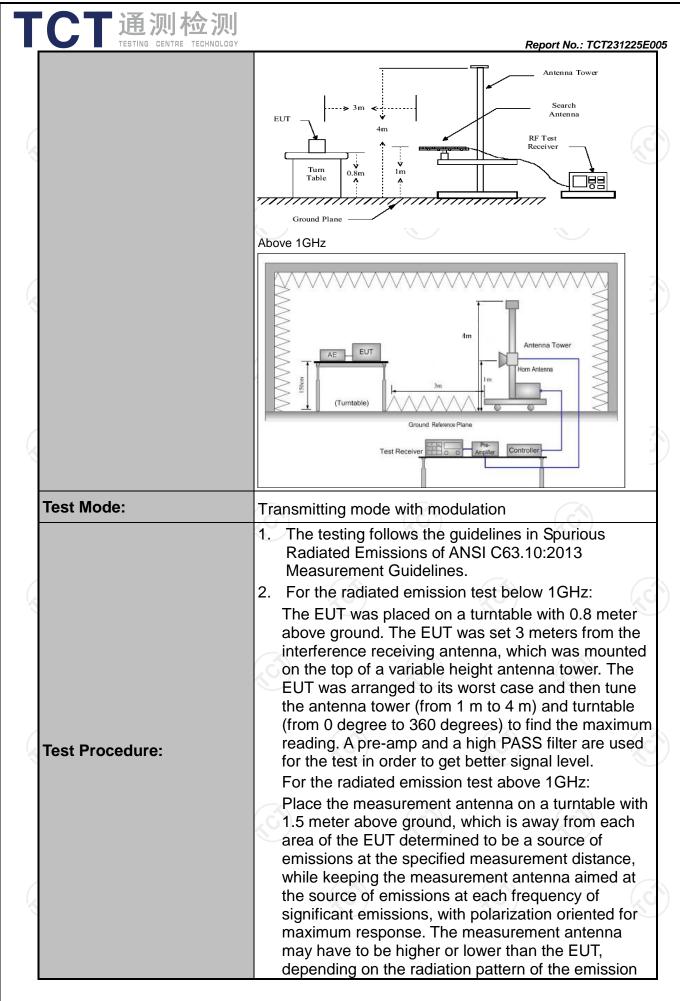
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5.11. Radiated Spurious Emission Measurement

5.11.1. Test Specification

		<u> </u>	/		
Test Requirement:	FCC Part15	C Section	n 15.209		100
Test Method:	ANSI C63.10	0:2013			
Frequency Range:	9 kHz to 25 (GHz			
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal &	Vertical			
	Frequency 9kHz- 150kHz 150kHz-	Detecto Quasi-pe Quasi-pe	ak 200Hz	VBW 1kHz 30kHz	Remark Quasi-peak Value Quasi-peak Value
Receiver Setup:	30MHz 30MHz-1GHz Above 1GHz	Quasi-pe Peak Peak	ak 120KHz 1MHz 1MHz	300KHz 3MHz 10Hz	Quasi-peak Value Peak Value Average Value
Limit:	Frequent 0.009-0.4 0.490-1.7 1.705-3 30-88 88-216 216-96 Above 9 Frequency Above 1GH:	490 705 30 6 60 Figure	Field Stre (microvolts 2400/F(I 24000/F(I 24000/F(I 30 150 200 500 eld Strength rovolts/meter)	/meter) (Hz) (KHz)	Measurement Distance (meters) 300 30 30 30 30 3 3 3 3 3 Diment oce Detector
Test setup:	For radiated emis	ssions belo stance = 3m Turn table	Pre -/	Computer	



「C T通测检测	
TESTING CENTRE TECHNOLOGY	Report No.: TCT231225E005
	and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 3. Set to the maximum power setting and enable the EUT transmit continuously.
	 4. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for f < 1 GHz, RBW=1MHz for f>1GHz; VBW≥RBW;
	Sweep = auto; Detector function = peak; Trace = max hold for peak (3) For average measurement: use duty cycle correction factor method per
	15.35(c). Duty cycle = On time/100 milliseconds On time =N1*L1+N2*L2++Nn-1*LNn-1+Nn*Ln Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
	Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
Test results:	PASS





5.11.2. Test Instruments

	Radiated Em	nission Test Site	e (966)	
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESIB7	100197	Jun. 29, 2024
Spectrum Analyzer	R&S	FSQ40	200061	Jun. 29, 2024
Pre-amplifier	SKET	LNPA_0118G- 45	SK2021012 102	Feb. 20, 2024
Pre-amplifier	SKET	LNPA_1840G- 50	SK2021092 03500	Feb. 20, 2024
Pre-amplifier	HP	8447D	2727A05017	Jun. 27, 2024
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jul. 02, 2024
Broadband Antenna	Schwarzbeck	VULB9163	340	Jul. 01, 2024
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jul. 01, 2024
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Feb. 24, 2024
Antenna Mast	Keleto	RE-AM	/	/
Coaxial cable	SKET	RC-18G-N-M	1	Feb. 24, 2024
Coaxial cable	SKET	RC_40G-K-M	/	Feb. 24, 2024
EMI Test Software	Shurple Technology	EZ-EMC	(6)	1 6



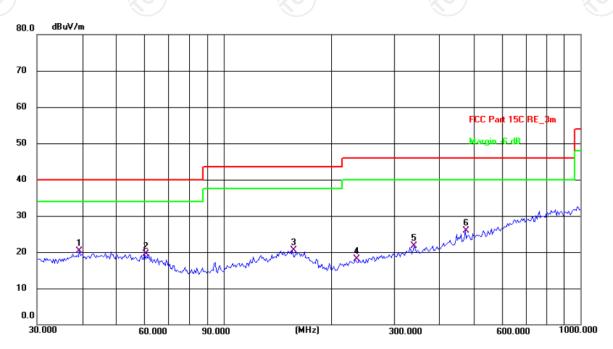


5.11.3. Test Data

Please refer to following diagram for individual

Horizontal:

Below 1GHz

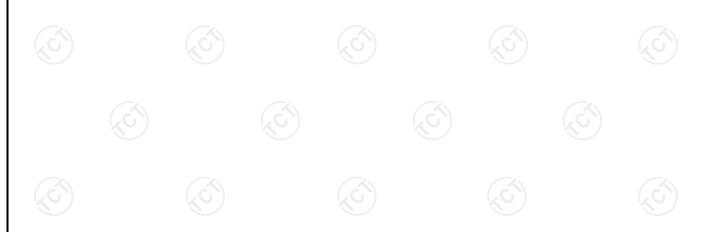


Site: #1 3m Anechoic Chamber Polarization: Horizontal Temperature: 23.3(C) Humidity: 50 %

Limit: FCC Part 15C RE_3m

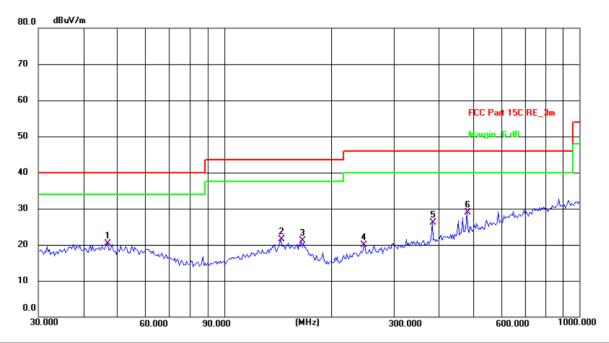
Power: DC 3.7 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	39.4371	6.10	14.17	20.27	40.00	-19.73	QP	Р	
2	60.0691	6.60	12.96	19.56	40.00	-20.44	QP	Р	
3	155.9101	5.96	14.59	20.55	43.50	-22.95	QP	Р	
4	234.1683	6.09	12.09	18.18	46.00	-27.82	QP	Р	
5	341.9786	6.68	14.95	21.63	46.00	-24.37	QP	Р	
6	475.4991	7.79	18.07	25.86	46.00	-20.14	QP	Р	





Vertical:



Humidity: 50 % Temperature: 23.3(C) Site: #1 3m Anechoic Chamber Polarization: Vertical

it: FOO Port 4FO DE 3

Limit: 1	-CC Part 15C R	(E_3m			Р	ower: L	C 3.7 V		
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	46.9947	6.47	13.75	20.22	40.00	-19.78	QP	Р	
2	144.3347	7.44	14.08	21.52	43.50	-21.98	QP	Р	
3	164.9075	7.10	14.10	21.20	43.50	-22.30	QP	Р	
4	247.6818	7.51	12.38	19.89	46.00	-26.11	QP	Р	
5	385.2805	10.09	15.94	26.03	46.00	-19.97	QP	Р	
6 *	482.2156	10.68	18.21	28.89	46.00	-17.11	QP	Р	

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

- 2. Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4 DQPSK, 8DPSK) and the worst case Mode (Lowest channel and 8DPSK) was submitted only.
- 3. Freq. = Emission frequency in MHz

Measurement $(dB\mu V/m) = Reading level (dB\mu V) + Corr. Factor (dB)$

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

 $Limit (dB\mu V/m) = Limit stated in standard$

Over (dB) = Measurement $(dB\mu V/m)$ – Limits $(dB\mu V/m)$

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

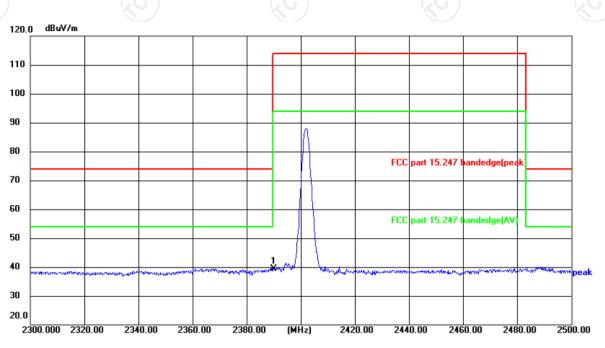
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Test Result of Radiated Spurious at Band edges

Lowest channel 2402:

Horizontal:



Site: #3 3m Anechoic Chamber

Polarization: Horizontal

Temperature: 23.3(°C)

Humidity: 52 %

Limit: FCC part 15.247 bandedge(peak)

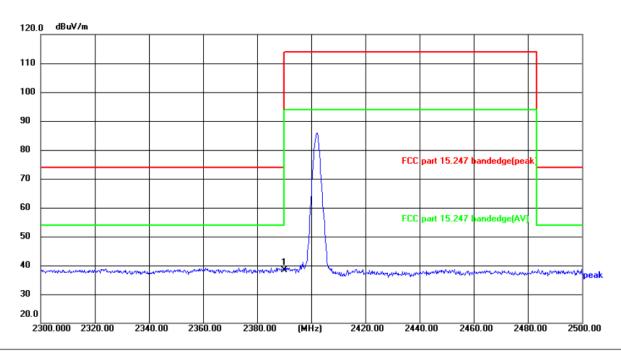
Power: DC 5 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	55.87	-16.53	39.34	74.00	-34.66	peak	Р	





Vertical:



Site: #3 3m Anechoic Chamber Polarization: Vertical Temperature: 23.3(°C) Humidity: 52 %

Limit: FCC part 15.247 bandedge(peak)

Power:DC 5 V

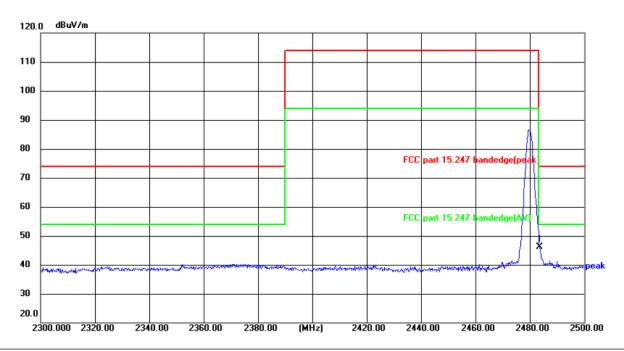
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	55.01	-16.53	38.48	74.00	-35.52	peak	Р	





Highest channel 2480:

Horizontal:

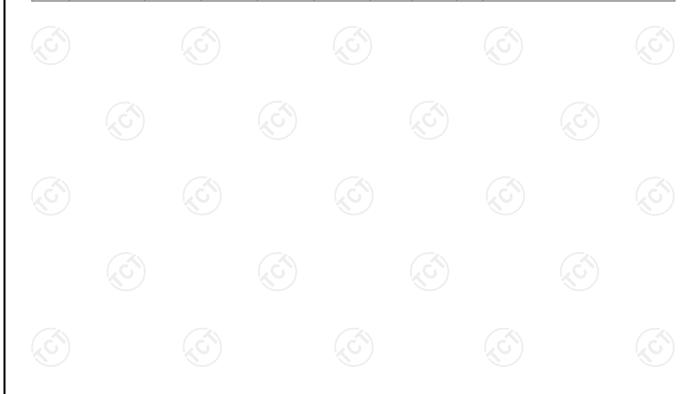


Site: #3 3m Anechoic Chamber Polarization: Horizontal Temperature: 23.3(°C) Humidity: 52 %

Limit: FCC part 15.247 bandedge(peak)

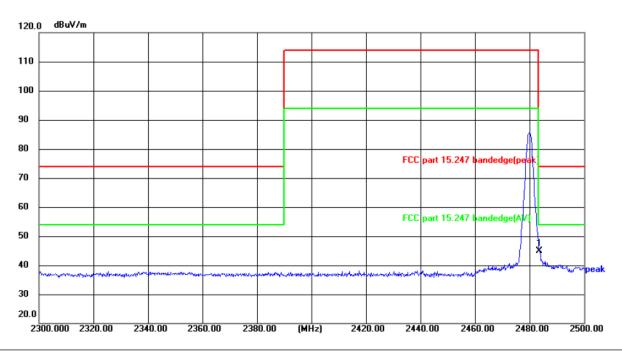
Power: DC 5 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	62.67	-16.43	46.24	74.00	-27.76	peak	Р	





Vertical:



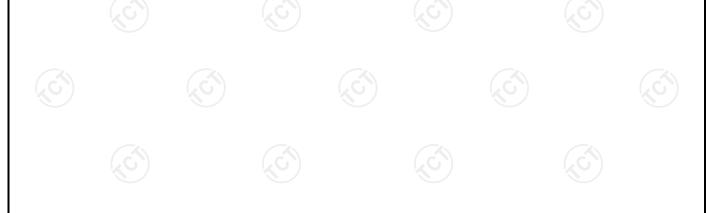
Site: #3 3m Anechoic Chamber Polarization: Vertical Temperature: 23.3(°C) Humidity: 52 %

Limit: FCC part 15.247 bandedge(peak)

Power: DC 5 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	61.37	-16.43	44.94	74.00	-29.06	peak	Р	

Note: Measurements were conducted in all three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (8DPSK) was submitted only.





Above 1GHz

Modulation Type: 8DPSK										
Low channel: 2402 MHz										
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emissic Peak (dBµV/m)	AV	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)	
4804	Н	46.02		0.66	46.68		74	54	-7.32	
7206	Η	36.19		9.50	45.69		74	54	-8.31	
	Н					\ <u>-</u>		7-7		
(G) (G) (G)										
4804	V	44.63		0.66	45.29		74	54	-8.71	
7206	V	35.42	-	9.50	44.92		74	54	-9.08	
	V									

Middle cha	nnel: 2441	MHz		XC)		70)		ZC.
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emissic Peak (dBµV/m)	AV	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
4882	H	44.97	-	0.99	45.96		74	54	-8.04
7323	H	34.78		9.87	44.65	O 4	74	54	-9.35
	H					<u></u>		<u></u>	
				, , , , , , , , , , , , , , , , , , , ,		1	I		
4882	V	46.36		0.99	47.35		74	54	-6.65
7323	V	36.21		9.87	46.08		74	54	-7.92
)	V	(A.2)		')		(S-2-)		

High channel: 2480 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Peak	A \ /	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
4960	Н	45.50)	1.33	46.83	-	74	54	-7.17
7440	Н	35.08		10.22	45.30		74	54	-8.70
	Η				2		-		
		(.C)		(,)			(.G))		(.c)
4960	V	45.79		1.33	47.12		74	54	-6.88
7440	V	36.55		10.22	46.77		74	54	-7.23
	V								

Note:

- 1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss Pre-amplifier
- 2. Margin (dB) = Emission Level (Peak) (dB μ V/m)-Average limit (dB μ V/m)
- 3. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 5. Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
- 6. Measurements were conducted in all three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (8DPSK) was submitted only.
- 7. All the restriction bands are compliance with the limit of 15.209.





Appendix A: Test Result of Conducted Test

Maximum Conducted Output Power

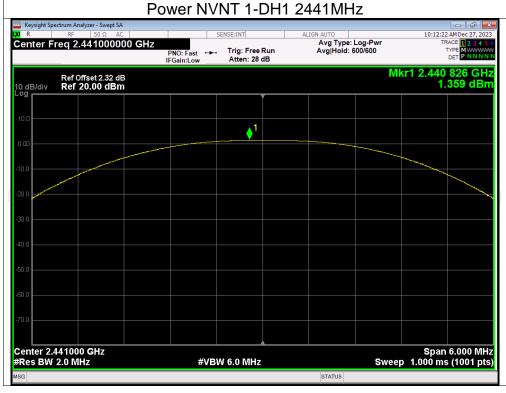
Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	1.75	21	Pass
NVNT	1-DH1	2441	1.36	21	Pass
NVNT	1-DH1	2480	0.42	21	Pass
NVNT	2-DH1	2402	2.52	21	Pass
NVNT	2-DH1	2441	2.19	21	Pass
NVNT	2-DH1	2480	1.33	21	Pass
NVNT	3-DH1	2402	3.03	21	Pass
NVNT	3-DH1	2441	2.70	21	Pass
NVNT	3-DH1	2480	1.81	21	Pass

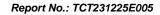






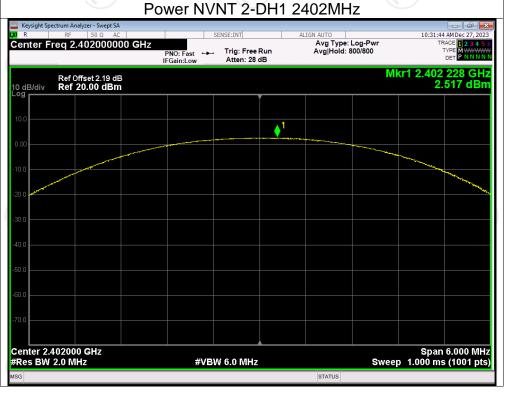






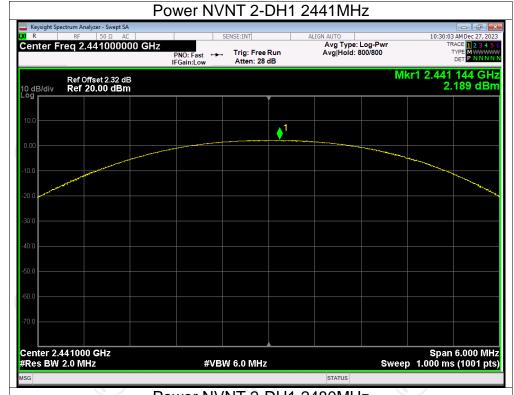


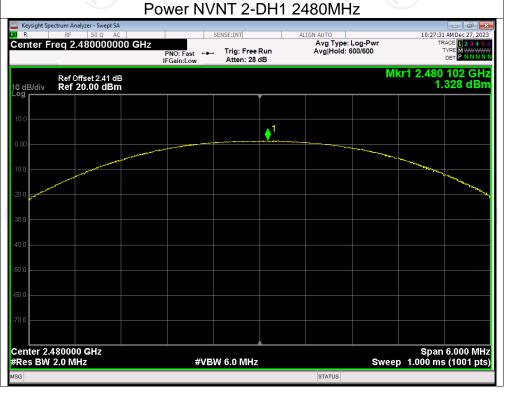






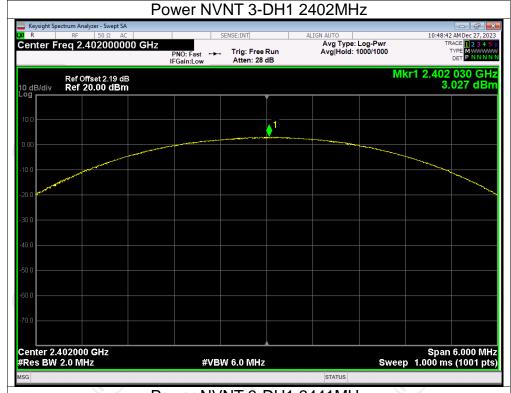


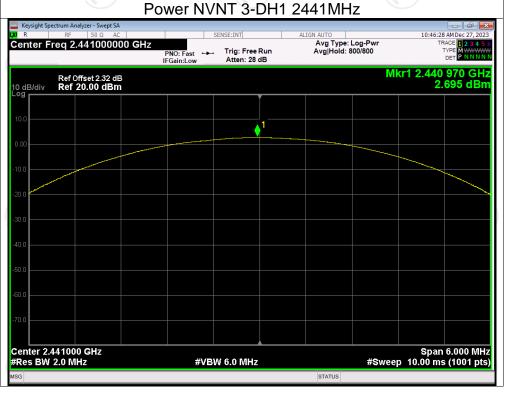


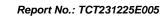




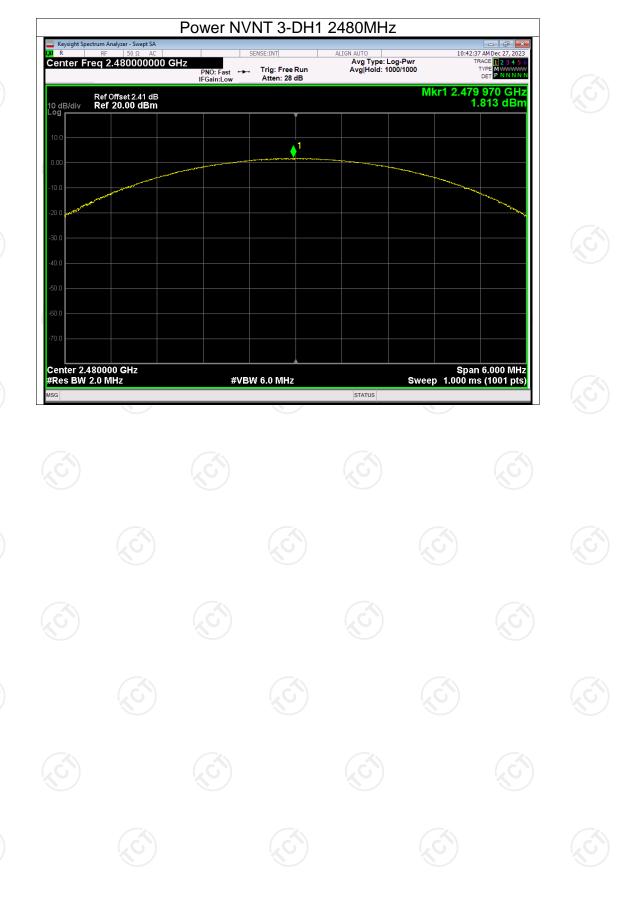










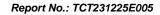




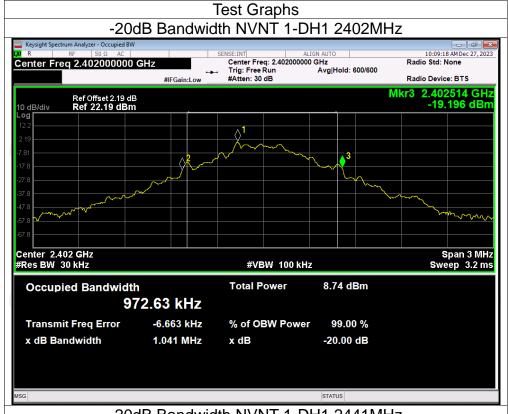
-20dB Bandwidth

Condition	Mode	Frequency (MHz)	-20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	1.041	Pass
NVNT	1-DH1	2441	1.035	Pass
NVNT	1-DH1	2480	1.036	Pass
NVNT	2-DH1	2402	1.288	Pass
NVNT	2-DH1	2441	1.308	Pass
NVNT	2-DH1	2480	1.298	Pass
NVNT	3-DH1	2402	1.268	Pass
NVNT	3-DH1	2441	1.266	Pass
NVNT	3-DH1	2480	1.262	Pass







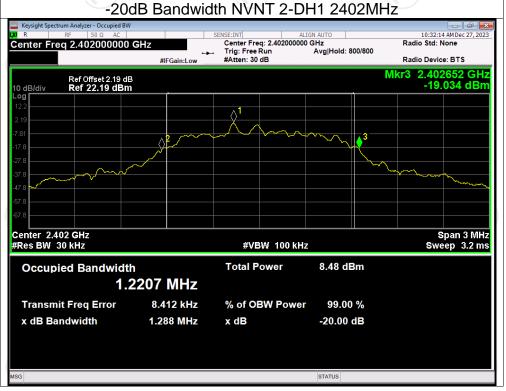
















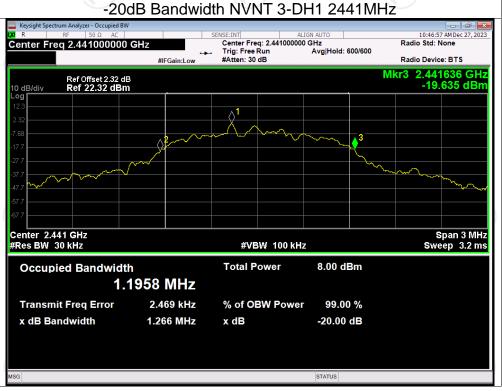


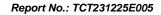












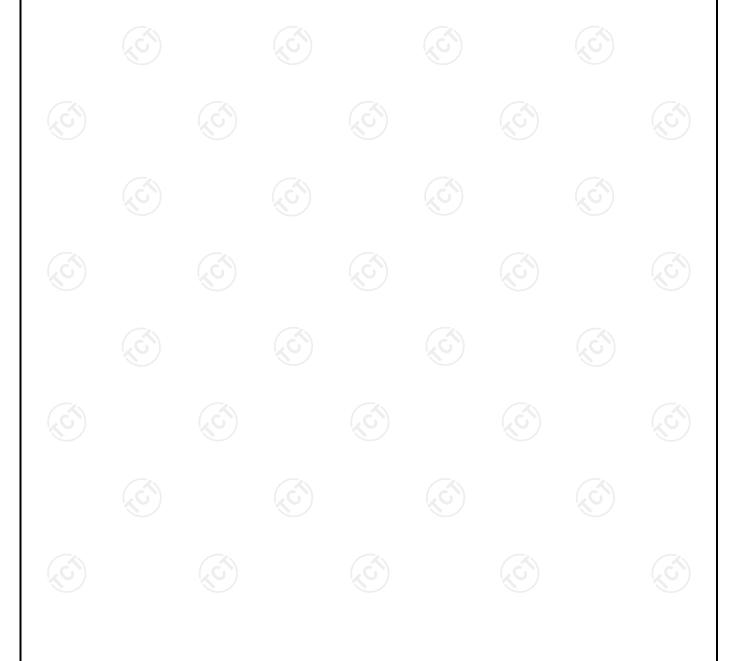


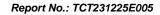




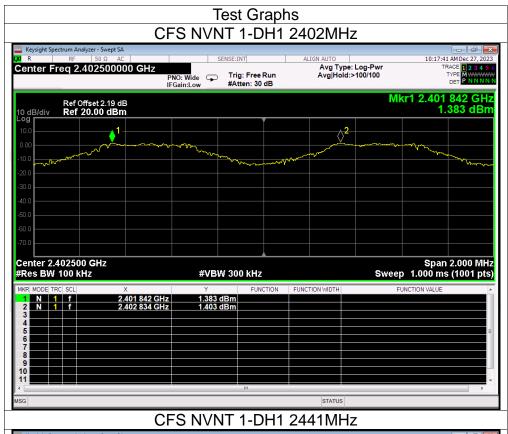
Carrier Frequencies Separation

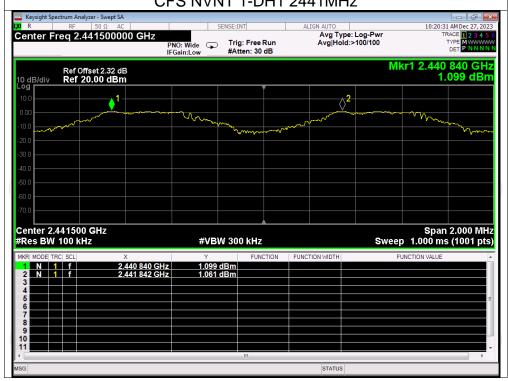
Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict	
NVNT	1-DH1	2401.842	2402.834	0.992	0.694	Pass	
NVNT	1-DH1	2440.840	2441.842	1.002	0.694	Pass	
NVNT	1-DH1	2478.840	2479.840	1	0.694	Pass	
NVNT	2-DH1	2401.836	2402.834	0.998	0.872	Pass	
NVNT	2-DH1	2440.836	2441.834	0.998	0.872	Pass	
NVNT	2-DH1	2478.840	2479.840	1	0.872	Pass	
NVNT	3-DH1	2401.832	2402.836	1.004	0.845	Pass	
NVNT	3-DH1	2440.836	2441.834	0.998	0.845	Pass	
NVNT	3-DH1	2478.836	2479.836	1	0.845	Pass	





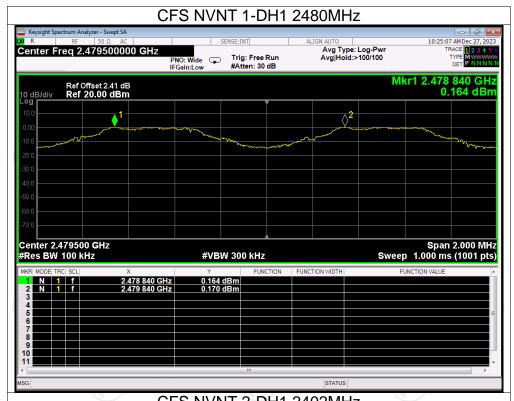


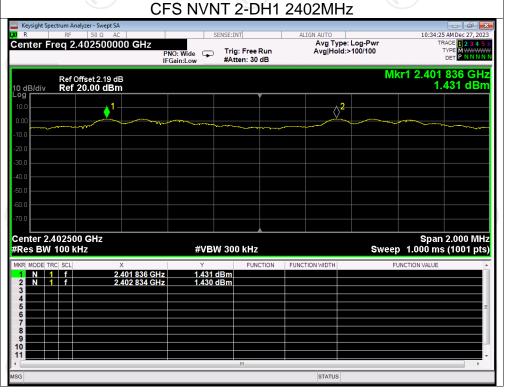






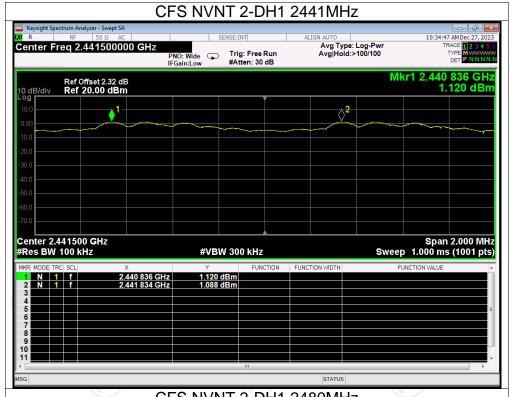


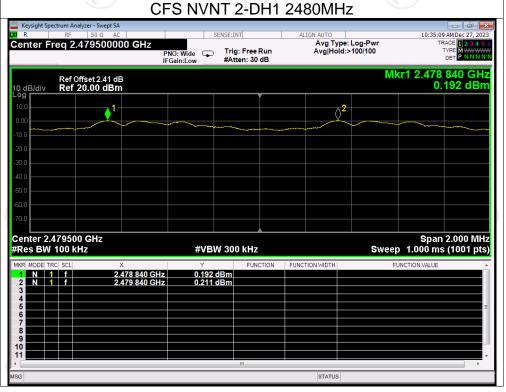






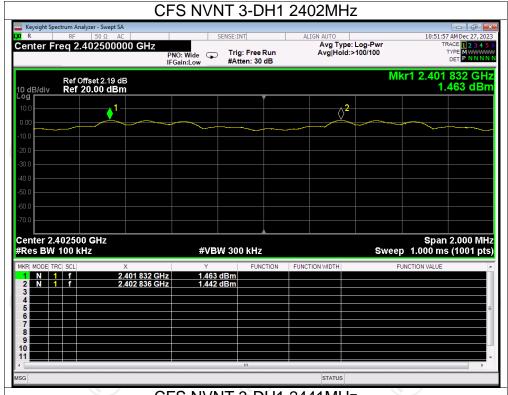


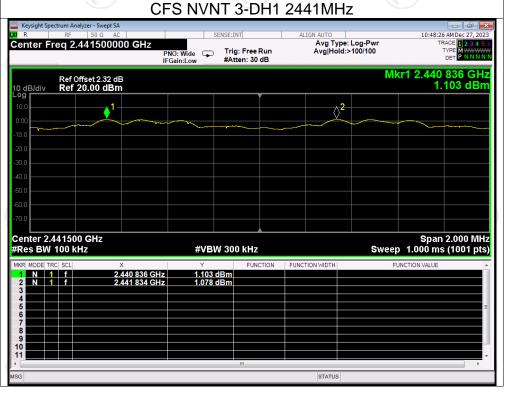






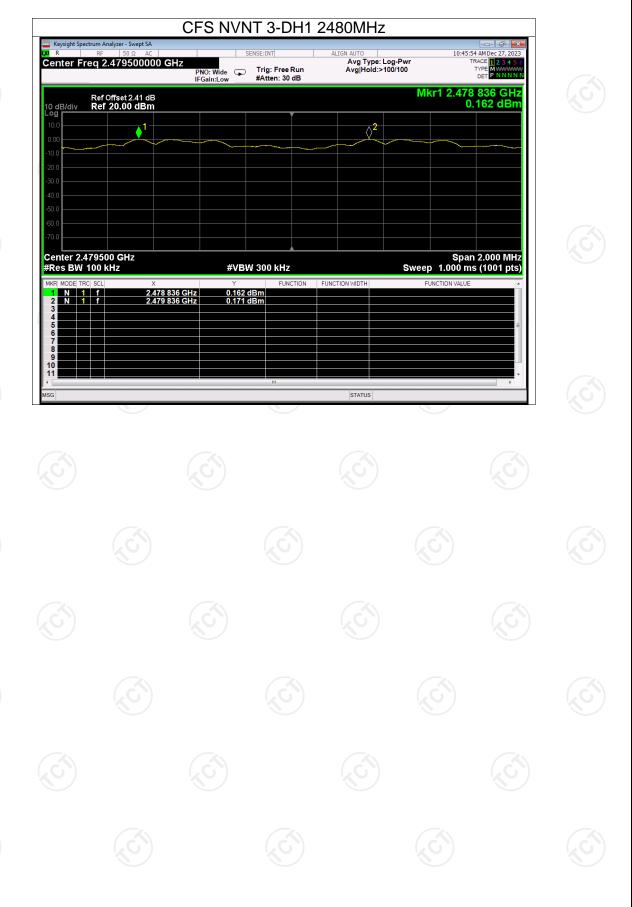








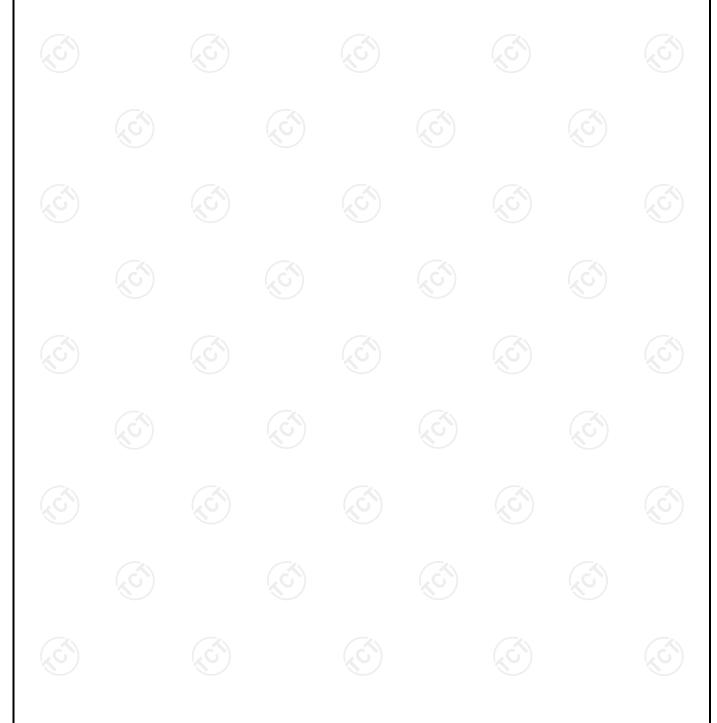




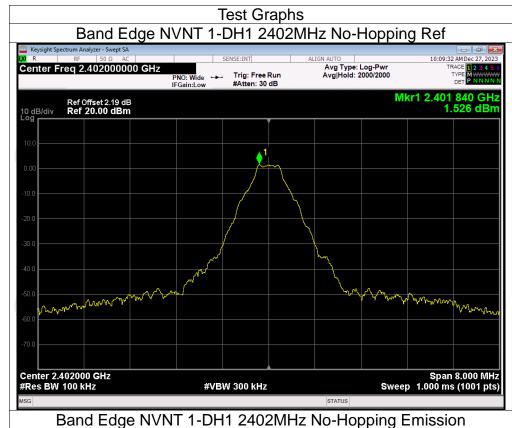


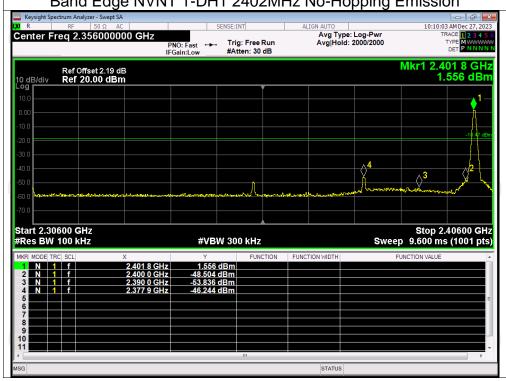
Band Edge

Condition	Mode	Frequency (MHz)	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	No-Hopping	-47.77	-20	Pass
NVNT	1-DH1	2480	No-Hopping	-53.87	-20	Pass
NVNT	2-DH1	2402	No-Hopping	-47.91	-20	Pass
NVNT	2-DH1	2480	No-Hopping	-54.58	-20	Pass
NVNT	3-DH1	2402	No-Hopping	-47.47	-20	Pass
NVNT	3-DH1	2480	No-Hopping	-53.80	-20	Pass

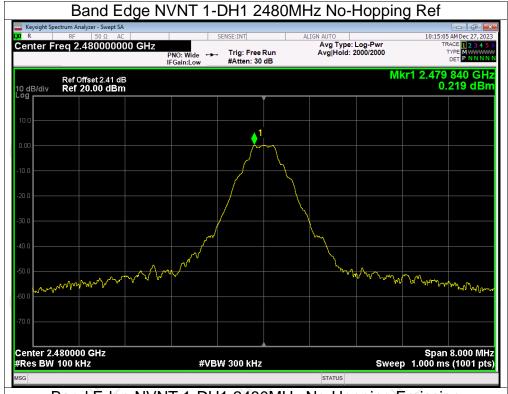


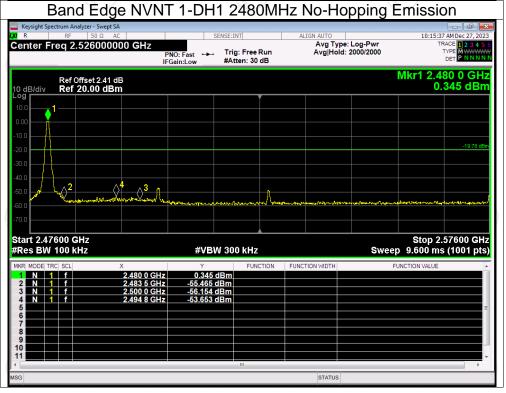


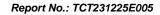






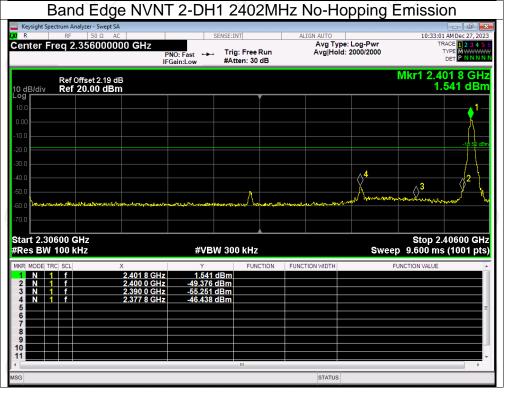






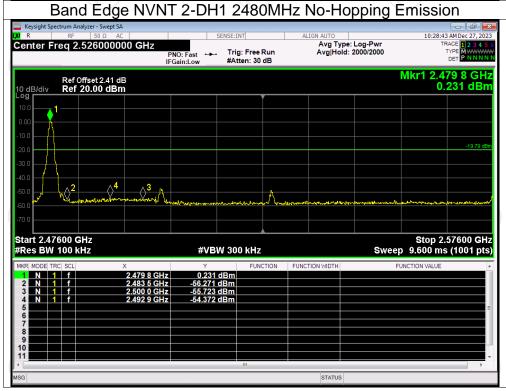






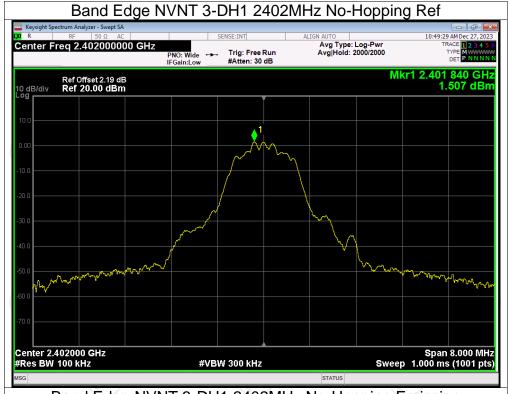


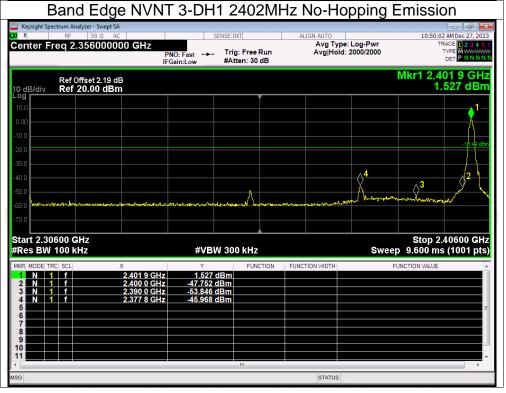






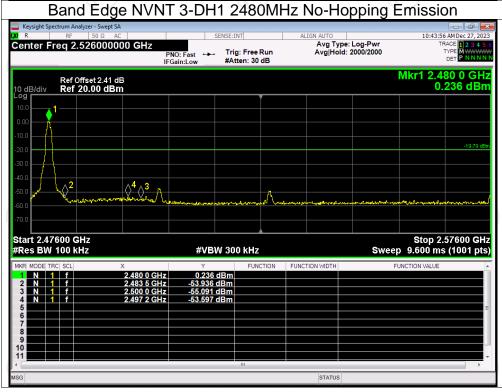








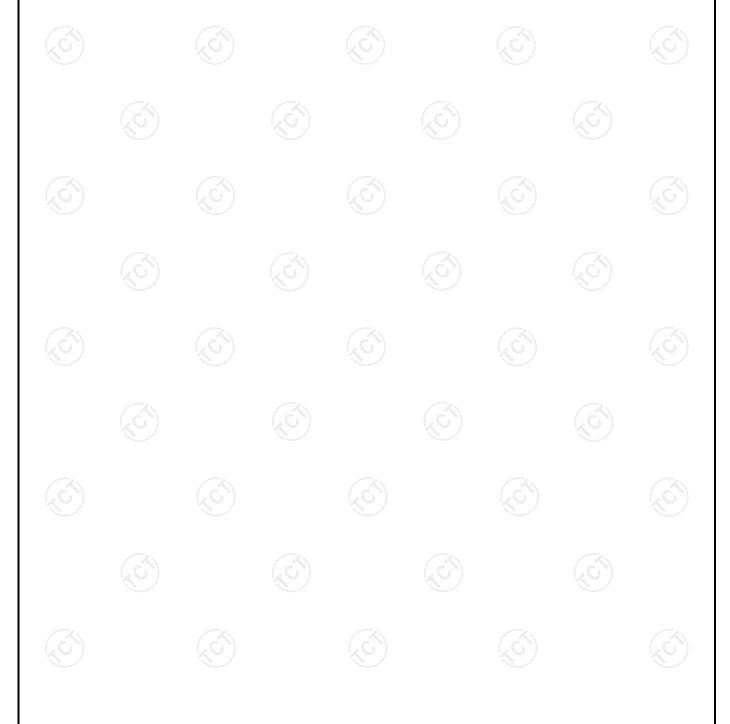






Band Edge(Hopping)

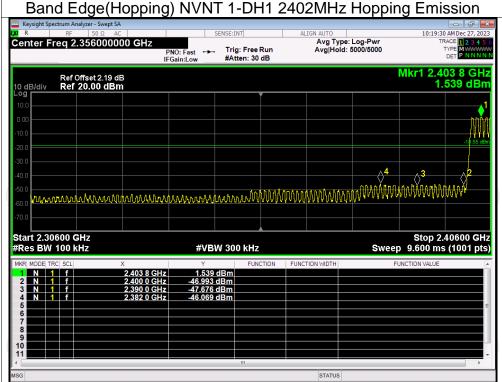
Condition	Mode	Frequency (MHz)	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Hopping	-47.51	-20	Pass
NVNT	1-DH1	2480	Hopping	-46.78	-20	Pass
NVNT	2-DH1	2402	Hopping	-48.02	-20	Pass
NVNT	2-DH1	2480	Hopping	-47.39	-20	Pass
NVNT	3-DH1	2402	Hopping	-47.99	-20	Pass
NVNT	3-DH1	2480	Hopping	-47.17	-20	Pass

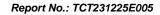






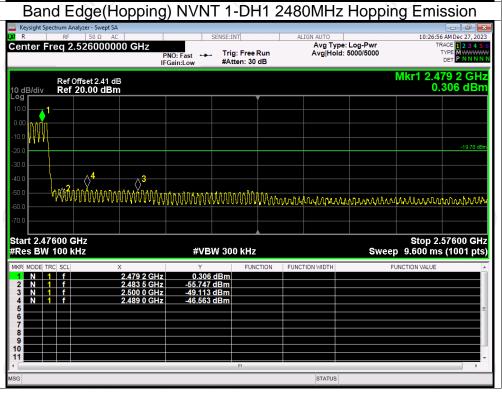


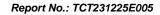




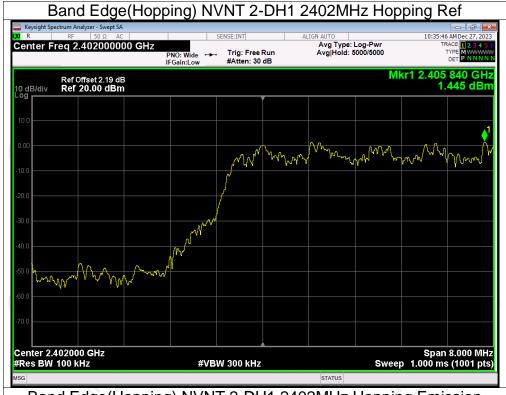


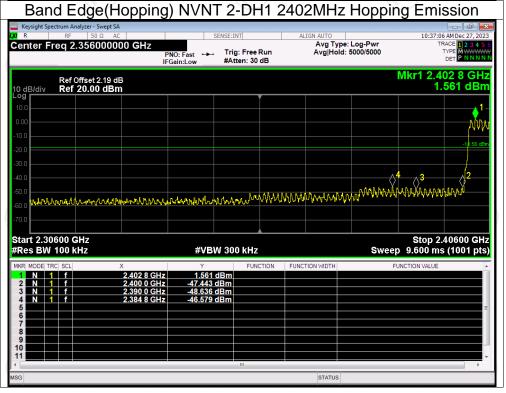


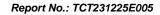






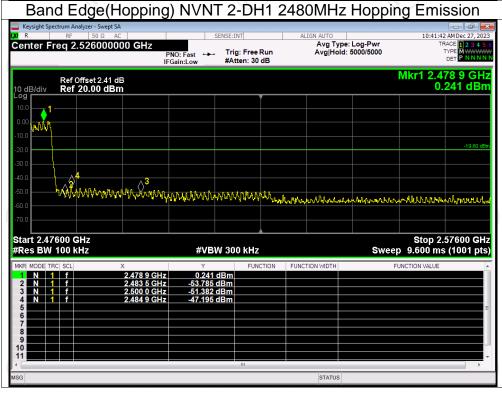


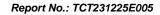






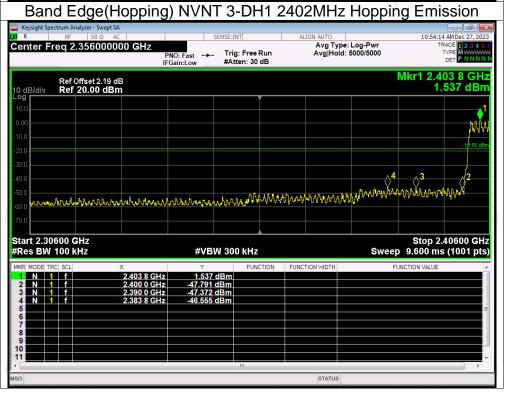


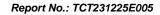






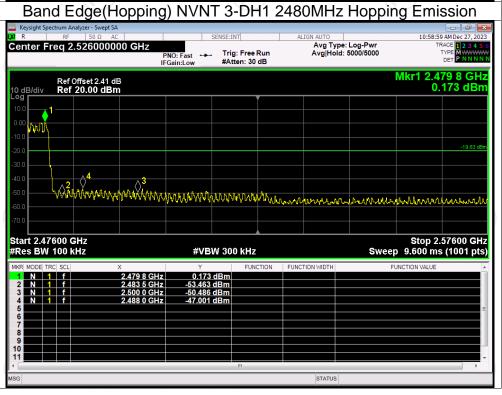








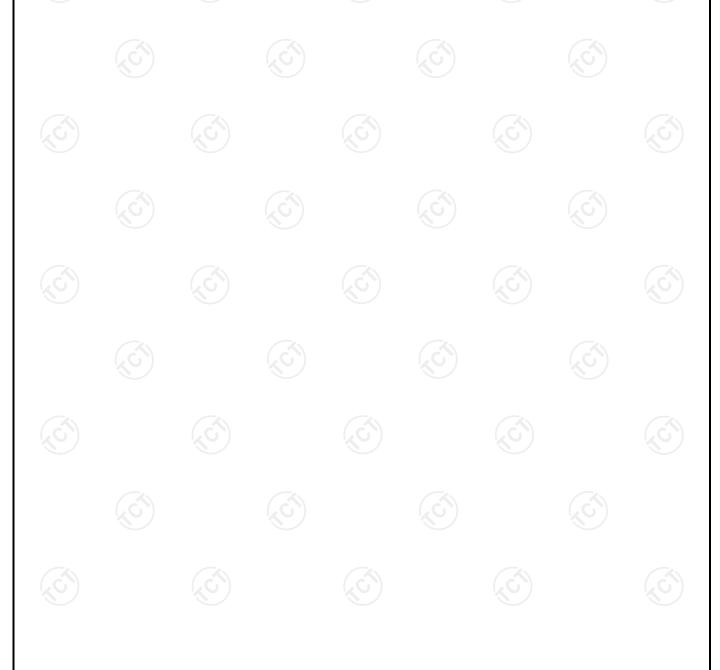






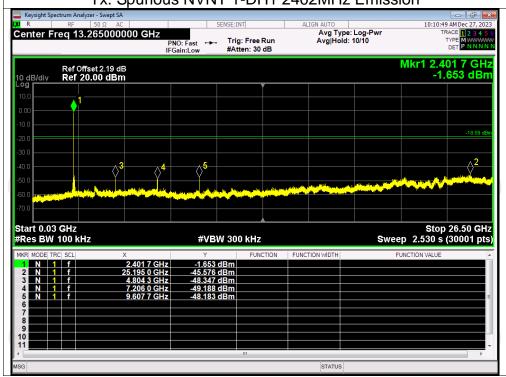
Conducted RF Spurious Emission

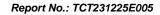
Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	-46.98	-20	Pass
NVNT	1-DH1	2441	-46.97	-20	Pass
NVNT	1-DH1	2480	-45.76	-20	Pass
NVNT	2-DH1	2402	-46.83	-20	Pass
NVNT	2-DH1	2441	-46.39	-20	Pass
NVNT	2-DH1	2480	-45.07	-20	Pass
NVNT	3-DH1	2402	-46.72	-20	Pass
NVNT	3-DH1	2441	-46.65	-20	Pass
NVNT	3-DH1	2480	-44.25	-20	Pass



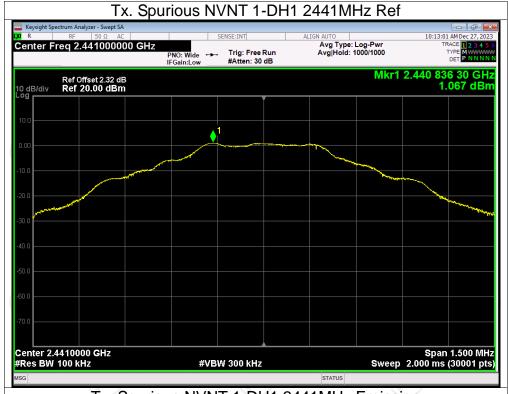


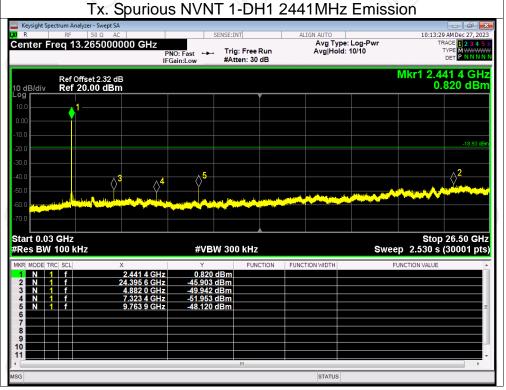


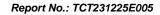




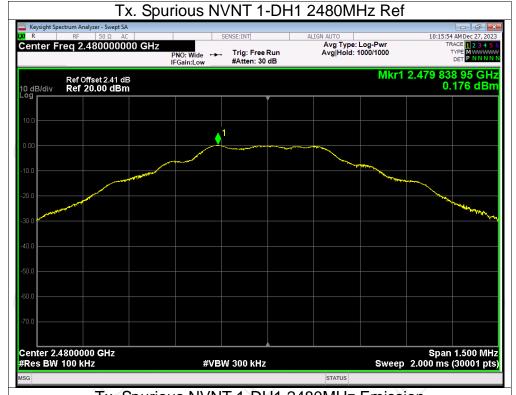


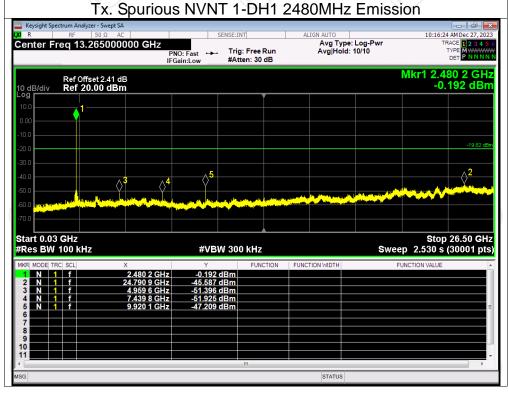








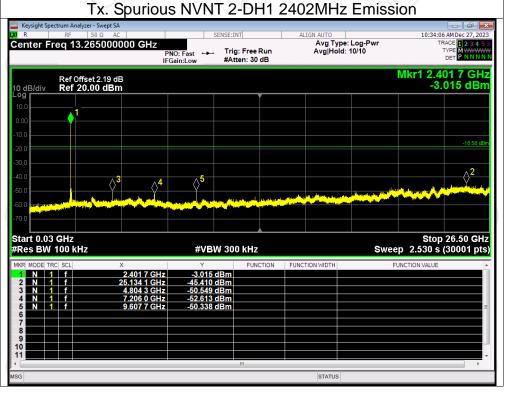


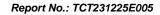




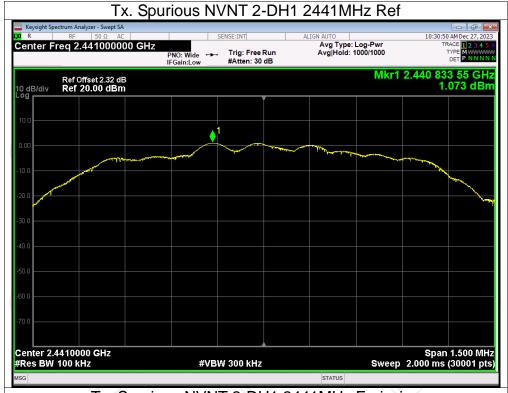


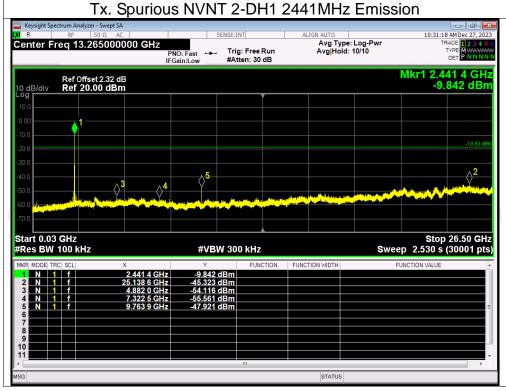


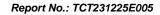






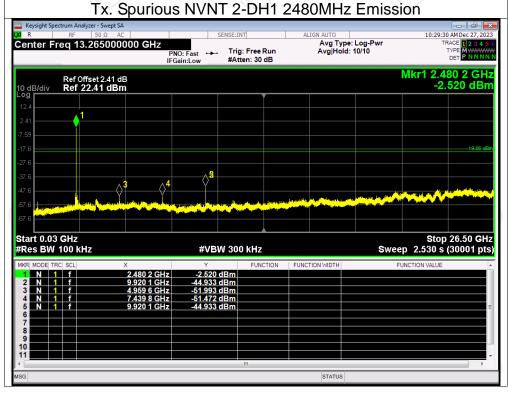


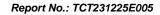






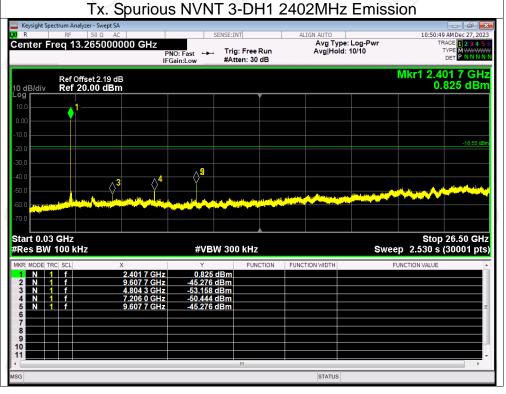






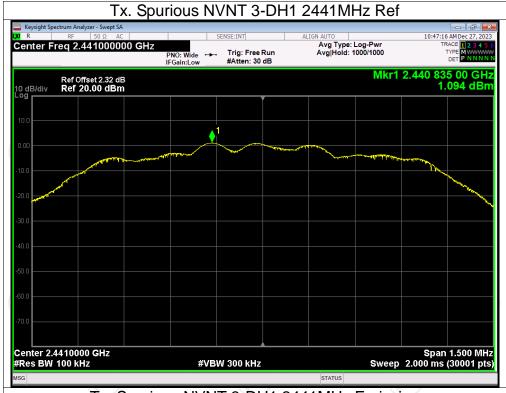


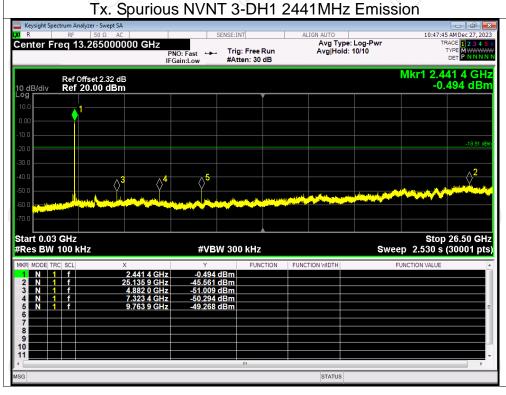






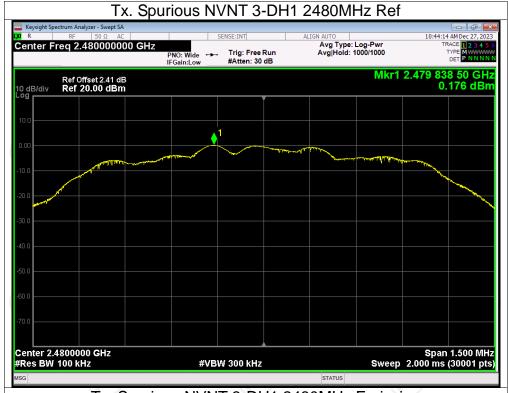


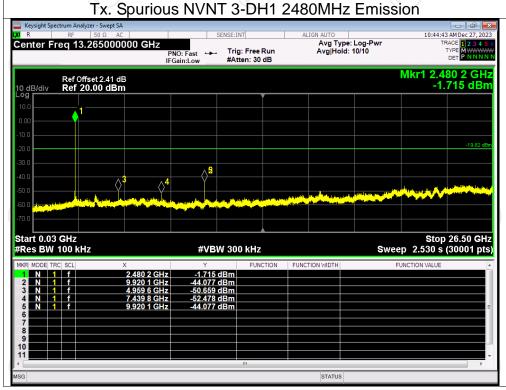








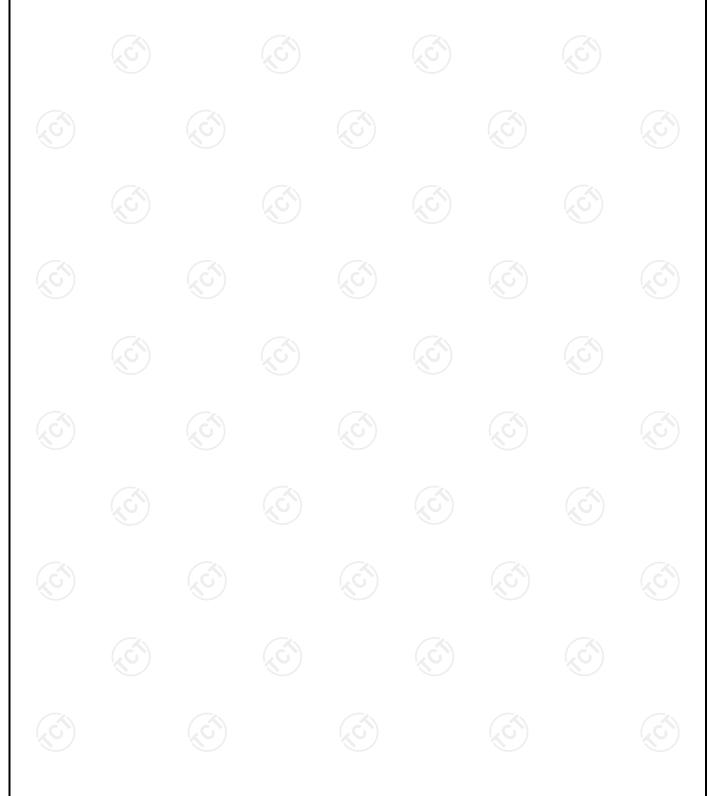






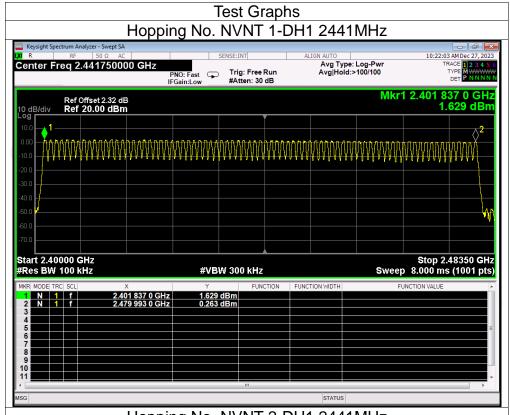
Number of Hopping Channel

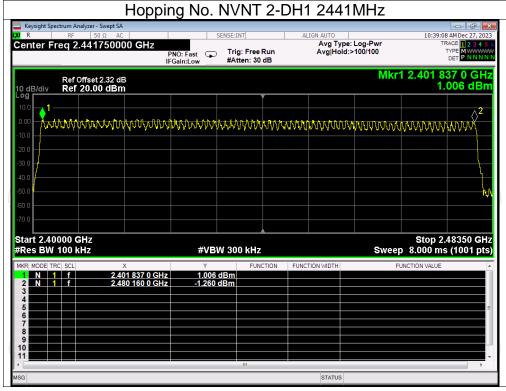
Condition	Mode	Hopping Number	Limit	Verdict	
NVNT	1-DH1	79	15	Pass	
NVNT	2-DH1	79	15	Pass	
NVNT	3-DH1	79	15	Pass	

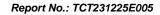




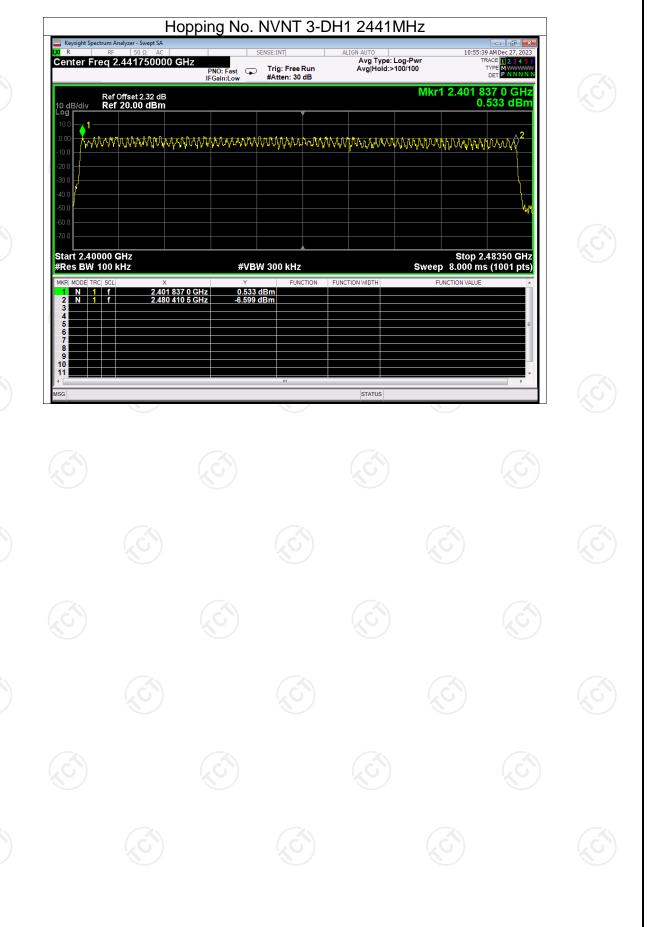














Dwell Time

Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	0.38	121.22	319	31600	400	Pass
NVNT	1-DH3	2441	1.63	257.54	158	31600	400	Pass
NVNT	1-DH5	2441	2.88	299.52	104	31600	400	Pass
NVNT	2-DH1	2441	0.38	119.70	315	31600	400	Pass
NVNT	2-DH3	2441	1.64	273.88	167	31600	400	Pass
NVNT	2-DH5	2441	2.89	335.24	116	31600	400	Pass
NVNT	3-DH1	2441	0.39	124.02	318	31600	400	Pass
NVNT	3-DH3	2441	1.64	257.48	157	31600	400	Pass
NVNT	3-DH5	2441	2.89	280.33	97	31600	400	Pass







