

TESTING CENTRE TEC	TEST REPOR	T					
FCC ID:	2AQ5C-HYPXL						
Test Report No::	TCT250120E008						
Date of issue::	Jan. 24, 2025						
Testing laboratory:	SHENZHEN TONGCE TESTING	G LAB					
Testing location/ address:	2101 & 2201, Zhenchang Factor Fuhai Subdistrict, Bao'an District 518103, People's Republic of Ch	t, Shenzhen, Guangdong,					
Applicant's name:	Hypercel Corporation						
Address::	28385 Constellation Rd., Valence States	ia, California 91355, United					
Manufacturer's name:	Shenzhen Hypercel Technology	Co., Ltd					
Address::	Room 605, No.4 Building, Tongta Avenue, Bao'an District, Shenzh	ai Times Center, No.6259 Bao'an en City 518103, China					
Standard(s):	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2020						
Product Name::	BeastXL Wireless Speaker						
Brand Name::	HyperGear Naztech						
Model/Type reference:	13920, 13896						
Rating(s):	Rechargeable Li-ion Battery DC	7.4V					
Date of receipt of test item:	Jan. 20, 2025						
Date (s) of performance of test:	Jan. 20, 2025 ~ Jan. 24, 2025						
Tested by (+signature):	Onnado YE						
Check by (+signature):	Beryl ZHAO	BoyC TCT)					
Approved by (+signature):	Tomsin	Tomsit's si					

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# 1. General Product Information

# 1.1. EUT description

Product Name:	BeastXL Wireless Speaker	(3)			
Model/Type reference:	13920				
Sample Number:	TCT250120E008-0101				
Bluetooth Version:	V5.3		(0)		
Operation Frequency:	2402MHz~2480MHz				
Transfer Rate:	1/2 Mbits/s	(C)		(C)	
Number of Channel:	79				
Modulation Type:	GFSK, π/4-DQPSK		(3)		
Modulation Technology:	FHSS				
Antenna Type:	PCB Antenna				
Antenna Gain:	-0.58dBi	(0)		(0)	
Rating(s)	: Rechargeable Li-ion Battery DC 7.4V				
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Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

# 1.2. Model(s) list

No.	Model No.	Tested with
1	13920	
Other models	13896	

Note: 13920 is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of 13920 can represent the remaining models.



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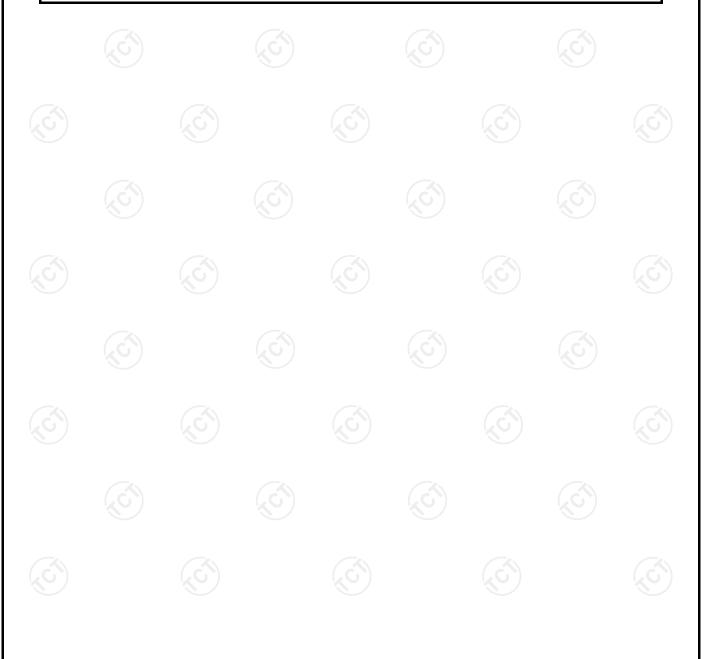
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# 1.3. Operation Frequency

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
_ 0	2402MHz	_ 20	2422MHz	40	2442MHz	60	2462MHz
G`)1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
				<i></i>			
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
	<b></b>		<b></b>		<b></b>		
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	- 59	2461MHz		-

Remark: Channel 0, 39 & 78 have been tested for GFSK, π/4-DQPSK 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:	24.1 °C	23.3 °C			
Humidity:	47 % RH	45 % RH			
Atmospheric Pressure:	1010 mbar 1010 mbar				
Test Software:					
Software Information:	FCC_assist_1.0.1.2				
Power Level:	10				
Test Mode:					
Engineering mode:  Keep the EUT in continuous transmitting by select channel and modulations with 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.	Model No. Serial No.		Trade Name
Adapter	ETA0U82CBC	RT10206CS/AE	7	SAMSUNG
Mobile Phone	SM-G9350	R28HA2ER3GT	/	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.



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## 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

SHENZHEN TONGCE TESTING LAB

CAB identifier: CN0031

The testing lab has been registered by Innovation, Science and Economic Development 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



### 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 -0.58dBi.



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# 5.2. Conducted Emission

# 5.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207						
Test Method:	ANSI C63.10:2020	ANSI C63.10:2020					
Frequency Range:	150 kHz to 30 MHz						
Receiver setup:	RBW=9 kHz, VBW=30	kHz, Sweep time	=auto				
	Frequency range	Limit (d					
	(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 Mode:	Remark E.U.T AC power  Test table/Insulation plane  Remark E.U.T. Equipment Under Test LISN: Line Impedence Stabilization Network Test table height=0.8m						
Test Wode:	Charging + Transmittin		andhara dha a Bara				
Test Procedure:	<ol> <li>The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2020 on conducted measurement.</li> </ol>						
Test Result:	PASS						



### 5.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)									
Equipment	Manufacturer	Model	Serial Number	Calibration Due					
EMI Test Receiver	R&S	ESCI3	100898	Jun. 26, 2025					
LISN	Schwarzbeck	NSLK 8126	8126453	Jan. 31, 2025					
Attenuator	N/A	10dB	164080	Jun. 26, 2025					
Line-5	TCT	CE-05	/	Jun. 26, 2025					
EMI Test Software	EZ_EMC	EMEC-3A1	1.1.4.2	/ (c					



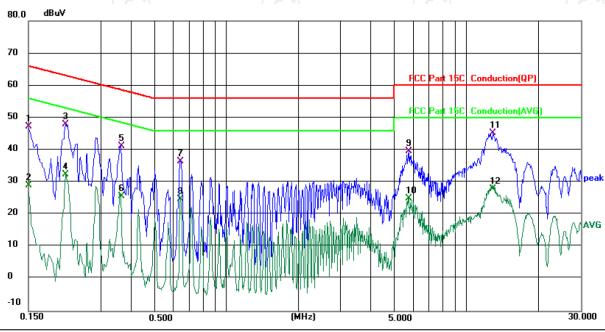


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5.2.3. Test data

### 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: 24.1 (°C)

Humidity: 47 %

Limit: FCC Part 15C Conduction(QP)

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

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBu∀	dB	dBu∀	dBu∀	dB	Detector	Comment
1	0.1500	37.51	9.67	47.18	66.00	-18.82	QP	
2	0.1500	19.44	9.67	29.11	56.00	-26.89	AVG	
3	0.2139	38.27	9.65	47.92	63.05	-15.13	QP	
4	0.2139	22.66	9.65	32.31	53.05	-20.74	AVG	
5	0.3619	31.13	10.01	41.14	58.68	-17.54	QP	
6	0.3619	15.65	10.01	25.66	48.68	-23.02	AVG	
7	0.6460	26.22	10.33	36.55	56.00	-19.45	QP	
8	0.6460	14.42	10.33	24.75	46.00	-21.25	AVG	
9	5.7819	29.30	10.22	39.52	60.00	-20.48	QP	
10	5.7819	14.76	10.22	24.98	50.00	-25.02	AVG	
11 *	12.9500	35.01	10.29	45.30	60.00	-14.70	QP	
12	12.9500	17.65	10.29	27.94	50.00	-22.06	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

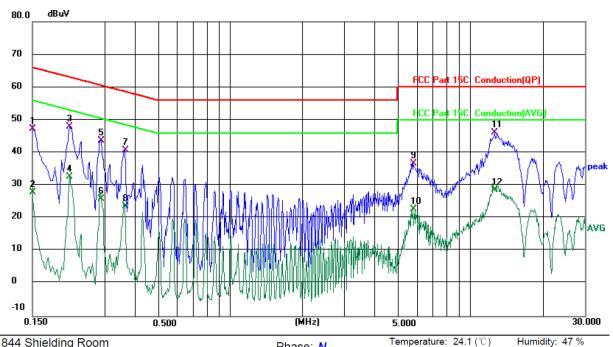
AVG =average

<sup>\*</sup> 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)



Site 844 Shielding Room

Phase: N Power: DC 5V(Adapter Input AC 120V/60Hz) Humidity: 47 %

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBu∀	dB	dBu∀	dBu∀	dB	Detector	Comment
1	0.1500	37.68	9.65	47.33	66.00	-18.67	QP	
2	0.1500	18.35	9.65	28.00	56.00	-28.00	AVG	
3	0.2139	38.33	9.63	47.96	63.05	-15.09	QP	
4	0.2139	22.92	9.63	32.55	53.05	-20.50	AVG	
5	0.2900	34.10	9.64	43.74	60.52	-16.78	QP	
6	0.2900	16.26	9.64	25.90	50.52	-24.62	AVG	
7	0.3619	30.65	9.99	40.64	58.68	-18.04	QP	
8	0.3619	13.69	9.99	23.68	48.68	-25.00	AVG	
9	5.7779	26.44	10.15	36.59	60.00	-23.41	QP	
10	5.7779	12.55	10.15	22.70	50.00	-27.30	AVG	
11 *	12.6620	35.80	10.28	46.08	60.00	-13.92	QP	
12	12.6620	18.35	10.28	28.63	50.00	-21.37	AVG	

#### Note1:

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.

### Note2:

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

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# 5.3. Conducted Output Power

# 5.3.1. Test Specification

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 bandwidth, 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

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB		



# 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	(6)			
Test Setup:	Spectrum Analyze	r	EUT		
Test Mode:	Transmitting m	ode with modu	lation		
Test Procedure:	<ol> <li>Transmitting mode with modulation</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Use the following spectrum analyzer settings for 20dB 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 = max hold.     </li> <li>Measure and record the results in the test report.</li> </ol>				
Test Result:	PASS	)	(0)	EC.	

# 5.4.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB	1	1



# 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:	<ol> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>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.</li> <li>Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.</li> </ol>
Test Result:	PASS

### 5.5.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB	1	1

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# **5.6.** Hopping Channel Number

# 5.6.1. 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:	<ol> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>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.</li> <li>The number of hopping frequency used is defined as the number of total channel.</li> <li>Record the measurement data in report.</li> </ol>				
Test Result:	PASS				

## 5.6.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB	/	/

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



## 5.7. Dwell Time

# 5.7.1. Test Specification

FCC Part15 C Section 15.247 (a)(1)
KDB 558074 D01 v05r02
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.
Spectrum Analyzer EUT
Hopping mode
<ol> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>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 &gt;&gt; 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.</li> <li>Measure and record the results in the test report.</li> </ol>
PASS

### 5.7.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB		(6)1



## 5.8. Pseudorandom Frequency Hopping Sequence

### **Test Requirement:**

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

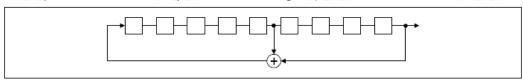
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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**

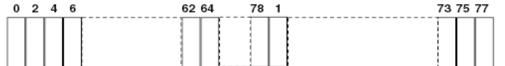
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized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



# 5.9. Conducted Band Edge Measurement

# 5.9.1. Test Specification

<u> </u>	
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:	<ol> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>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.</li> <li>Enable hopping function of the EUT and then repeat step 2 and 3.</li> <li>Measure and record the results in the test report.</li> </ol>
Test Result:	PASS (C)

### 5.9.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB	3 1	

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



# **5.10. Conducted Spurious Emission Measurement**

# 5.10.1. Test Specification

A) / A)								
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 fal 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:	<ol> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>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.</li> <li>Measure and record the results in the test report.</li> <li>The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</li> </ol>							
Test Result:	PASS							

### 5.10.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jun. 26, 2025
Combiner Box	Ascentest	AT890-RFB	/	(0)

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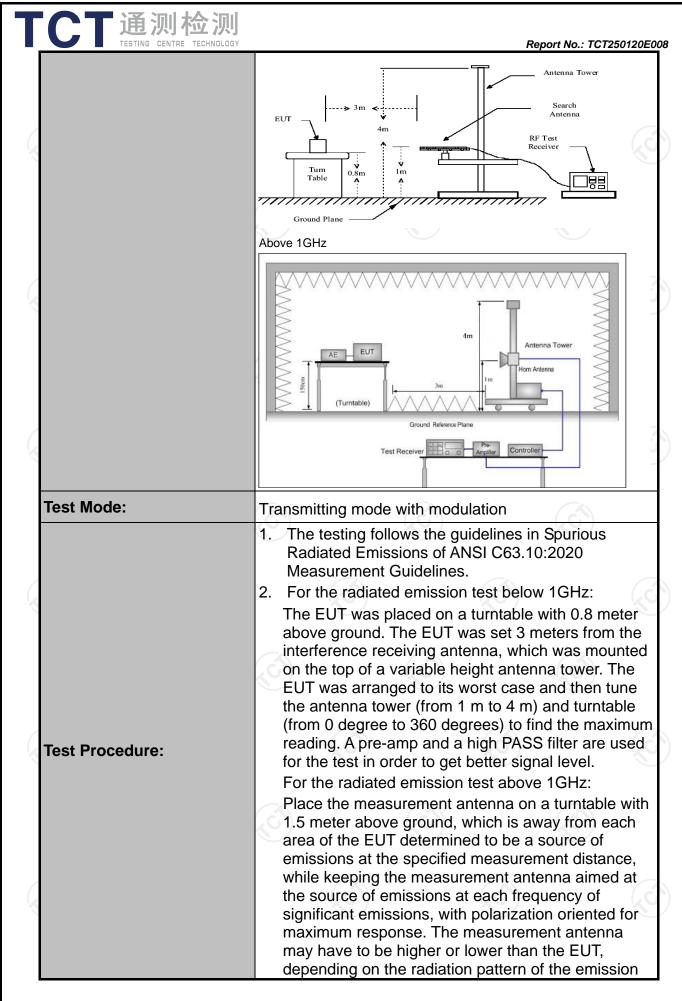




# **5.11. Radiated Spurious Emission Measurement**

# 5.11.1. Test Specification

		<u> </u>						
Test Requirement:	FCC Part15	C Section	n 15.209	(0)		KC		
Test Method:	ANSI C63.10	0:2020						
Frequency Range:	9 kHz to 25 (	GHz						
Measurement Distance:	3 m	K			1/20	)		
Antenna Polarization:	Horizontal &	Vertical						
	Frequency	Detector	RBW	VBW		Remark		
	9kHz- 150kHz	Quasi-pea	k 200Hz	1kHz	Quas	si-peak Value		
Receiver Setup:	150kHz- 30MHz	Quasi-pea		30kHz		si-peak Value		
•	30MHz-1GHz	Quasi-pea	k 120KHz	300KHz	Quas	si-peak Value		
	(G. )	Peak	1MHz	3MHz		eak Value		
	Above 1GHz	Peak	1MHz	10Hz		erage Value		
	Frequen	ісу	Field Stre	-	-			
	0.000.0	100		- V	Distance (meters)			
	0.009-0.4	- /	2400/F(I			300		
	0.490-1.7		24000/F(	KHZ)	30			
	1.705-3		30			30		
	30-88		100		3			
,	88-216		150		- (, C	3		
Limit:	216-96		200		3			
	Above 9	60	500		3			
	Frequency	2 1	Field Strength (microvolts/meter)		ment ice rs)	Detector		
	Above 4011		500	3		Average		
	Above 1GHz		5000	3		Peak		
	For radiated emis		/ 30MHz		(g)			
	Distance = 3m							
Test setup:	ЕИТ	(		Pre -/	Amplifier	7		
	0,8m	Turn table	d Plane	_ [R	teceiver			
	30MHz to 1GHz							
-/.		-/.						





TESTING CENTRE TECHNOLOGY	Report No.: TCT250120E0
	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.
	<ul> <li>4. Use the following spectrum analyzer settings:</li> <li>(1) Span shall wide enough to fully capture the emission being measured;</li> <li>(2) Set RBW=120 kHz for f &lt; 1 GHz, RBW=1MHz for f&gt;1GHz; VBW≥RBW;</li> </ul>
	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
Remark:	Left and right earphone have been tested, only the worst case (left earphone) is reported.





# 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	ESCI7	100529	Jan. 31, 2025
Spectrum Analyzer	R&S	FSQ40	200061	Jun. 26, 2025
Pre-amplifier	SKET	LNPA_0118G- 45	SK2021012 102	Jan. 31, 2025
Pre-amplifier	SKET	LNPA_1840G- 50	SK2021092 03500	Jan. 31, 2025
Pre-amplifier	HP	8447D	2727A05017	Jun. 26, 2025
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jun. 26, 2025
Broadband Antenna	Schwarzbeck	VULB9163	340	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jun. 28, 2025
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Feb. 02, 2025
Coaxial cable	SKET	RE-03-D	1	Jun. 26, 2025
Coaxial cable	SKET	RE-03-M	) /	Jun. 26, 2025
Coaxial cable	SKET	RE-03-L	/	Jun. 26, 2025
Coaxial cable	SKET	RE-04-D		Jun. 26, 2025
Coaxial cable	SKET	RE-04-M		Jun. 26, 2025
Coaxial cable	SKET	RE-04-L	/	Jun. 26, 2025
Antenna Mast	Keleto	RE-AM	1	(3)
EMI Test Software	EZ_EMC	FA-03A2 RE+	1.1.4.2	

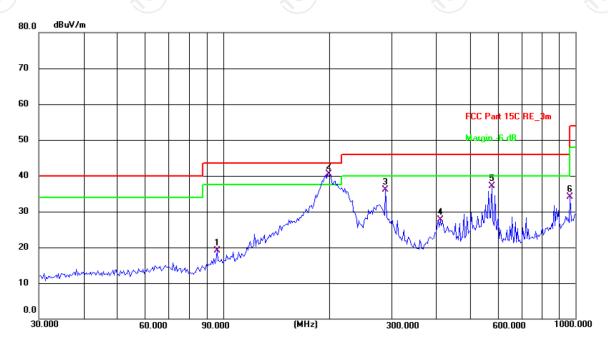


### 5.11.3. Test Data

### Please refer to following diagram for individual

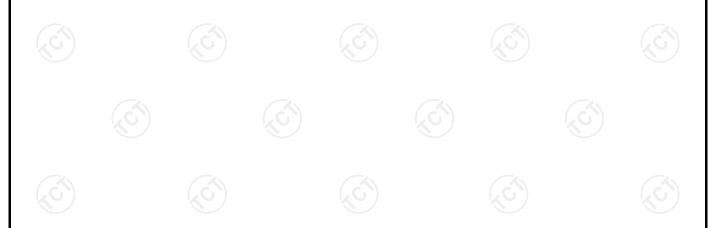
**Below 1GHz** 

Horizontal:



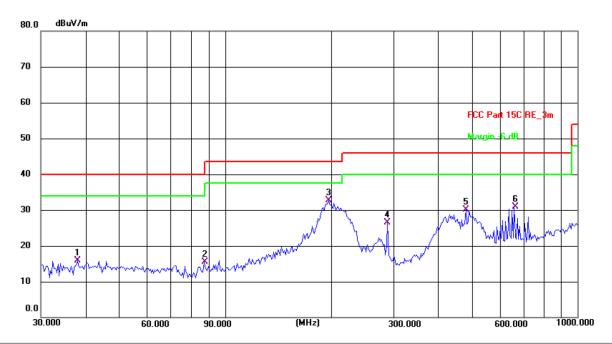
Temperature: 23.3(C) Humidity: 45 % Site: 3m Anechoic Chamber1 Polarization: Horizontal

L	imit: F	CC Part 15C R	E_3m			Р				
	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
	1	96.0985	35.09	-15.90	19.19	43.50	-24.31	QP	Р	
	2 *	197.8926	55.33	-14.83	40.50	43.50	-3.00	QP	Р	
	3	289.0020	47.39	-11.19	36.20	46.00	-9.80	QP	Р	
	4	413.2706	36.49	-8.78	27.71	46.00	-18.29	QP	Р	
	5	578.6700	42.86	-5.74	37.12	46.00	-8.88	QP	Р	
Г	6	965 5420	33.89	0.13	34.02	54 00	-19 98	OP	Р	





### Vertical:



Site: 3m Anechoic Chamber1 Polarization: Vertical Temperature: 23.3(C) Humidity: 45 %

Limit: FCC Part 15C RE\_3m Power: DC 7.4 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	38.0782	27.96	-12.13	15.83	40.00	-24.17	QP	Р	
2	87.1116	32.14	-16.56	15.58	40.00	-24.42	QP	Р	
3 *	196.5098	47.27	-14.61	32.66	43.50	-10.84	QP	Р	
4	289.0020	37.67	-11.19	26.48	46.00	-19.52	QP	Р	
5	482.2155	37.90	-7.71	30.19	46.00	-15.81	QP	Р	
6	661.1504	34.94	-3.98	30.96	46.00	-15.04	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 two modulation (GFSK, Pi/4 DQPSK) and the worst case Mode (Highest channel and Pi/4 DQPSK) 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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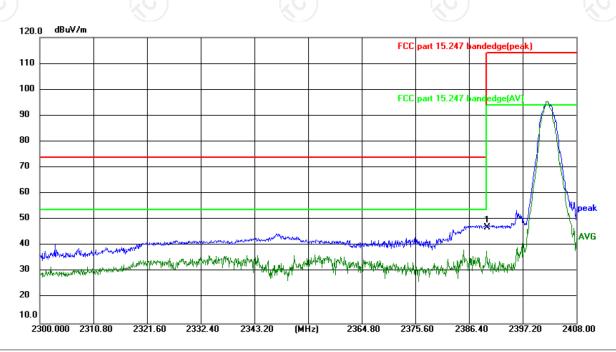
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### Test Result of Radiated Spurious at Band edges

### Lowest channel 2402:

### Horizontal:



Site: 3m Anechoic Chamber Polarization: Horizontal Temperature: 23(°C) Humidity: 61 %

Limit: FCC part 15.247 bandedge(peak)

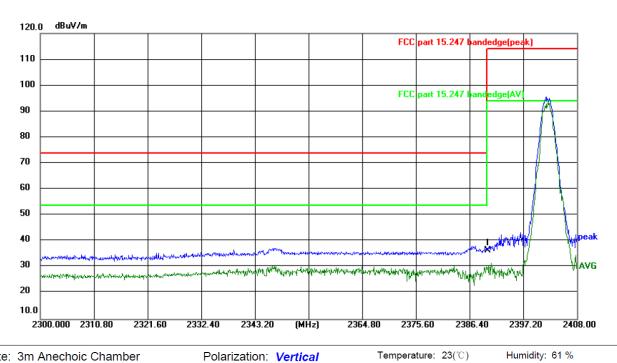
Power:DC 7.4V

No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	62.89	-15.86	47.03	74.00	-26.97	peak	Р	





### Vertical:



Site: 3m Anechoic Chamber Limit: FCC part 15.247 bandedge(peak)

Power:DC 7.4V

Temperature: 23(°C) Humidity: 61 %

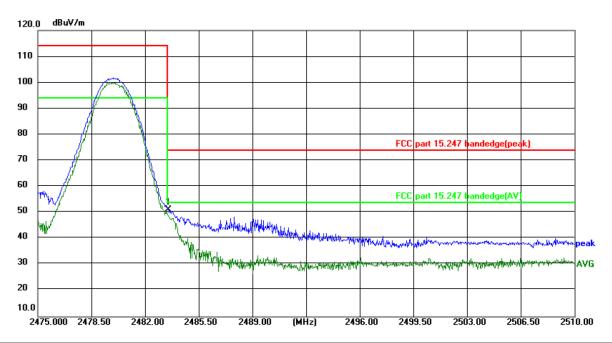
No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	52.48	-15.86	36.62	74.00	-37.38	peak	Р	





### Highest channel 2480:

### Horizontal:



Site: 3m Anechoic Chamber Polarization: *Horizontal* Temperature: 23(°C) Humidity: 61 %

Limit: FCC part 15.247 bandedge(peak)

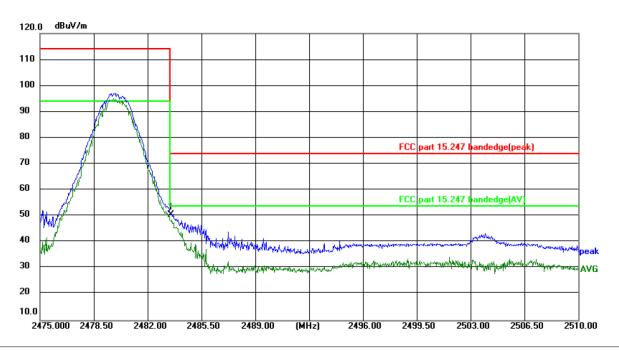
Power:DC 7.4V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	67.08	-15.87	51.21	74.00	-22.79	peak	Р	





### Vertical:



Site: 3m Anechoic Chamber

Power:DC 7.4V

Temperature: 23( $^{\circ}$ C) Humidity: 61 %

Limit: FCC part 15.247 bandedge(peak)

Reading Frequency Factor Level Limit Margin Detector P/F Remark No. (MHz) (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) 1 \* 2483.500 66.30 -15.87 50.43 74.00 -23.57 Ρ peak

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

Polarization: Vertical





#### **Above 1GHz**

Modulation Type: Pi/4 DQPSK									
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	56.35		-9.51	46.84		74	54	-7.16
7206	Н	45.61		-1.41	44.20		74	54	-9.80
	H							7-7	
	(G) $(G)$ $(G)$								
4804	V	56.80		-9.51	47.29	<u></u>	74	54	-6.71
7206	V	46.12	-	-1.41	44.71		74	54	-9.29
	V								

Middle cha	nnel: 2441	MHz		K	5)		(0)		IZ C
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emissic Peak (dBµV/m)	l AV	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
4882	H	54.59		-9.36	45.23		74	54	-8.77
7323	(OH)	45.73	1	-1.14	44.59	<del>-</del>	74	54	-9.41
	H					<u> </u>			
4882	V	55.94		-9.36	46.58		74	54	-7.42
7323	V	46.08		-1.14	44.94		74	54	-9.06
)	V	(A.2)		(	//		() /		

High channel: 2480 MHz									
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)
4960	Н	57.73		-9.20	48.53		74	54	-5.47
7440	Η	46.26		-0.96	45.30		74	54	-8.70
	Ι		-				-		
4960	V	55.91		-9.20	46.71		74	54	-7.29
7440	V	45.35		-0.96	44.39		74	54	-9.61
	V		-						

#### Note:

- 1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss Pre-amplifier
- 2. Margin (dB) = Emission Level (Peak) (dB $\mu$ V/m)-Average limit (dB $\mu$ 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 two modulation (GFSK, Pi/4 DQPSK), and the worst case Mode (Pi/4 DQPSK) was submitted only.
- 7. All the restriction bands are compliance with the limit of 15.209.





# **Appendix A: Test Result of Conducted Test**

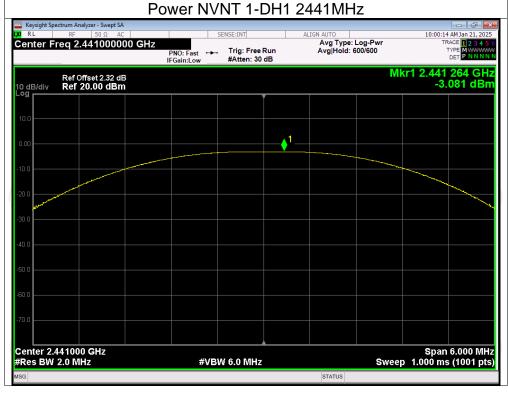
**Maximum Conducted Output Power** 

maximum conducted catput i ewei								
Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict			
NVNT	1-DH1	2402	-5.47	21	Pass			
NVNT	1-DH1	2441	-3.08	21	Pass			
NVNT	1-DH1	2480	-1.47	21	Pass			
NVNT	2-DH1	2402	-4.71	21	Pass			
NVNT	2-DH1	2441	-2.35	21	Pass			
NVNT	2-DH1	2480	-0.68	21	Pass			
			-(1)					

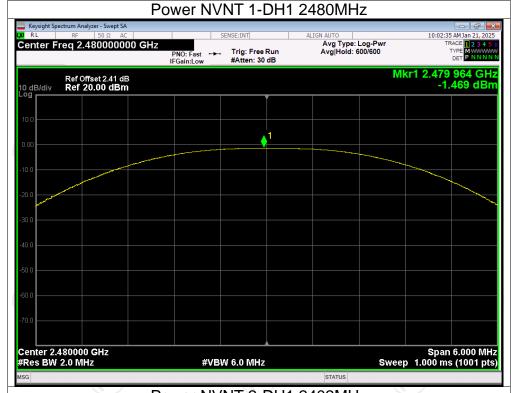


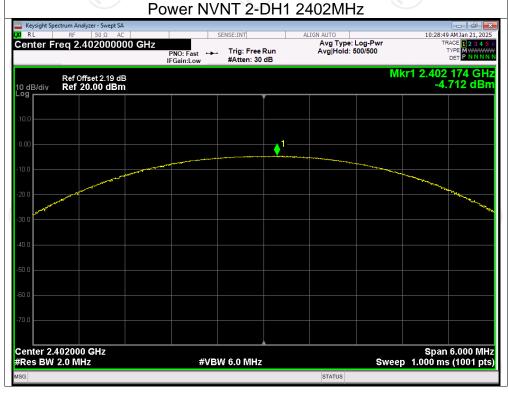






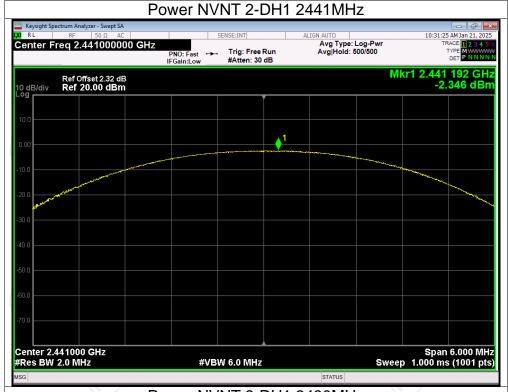


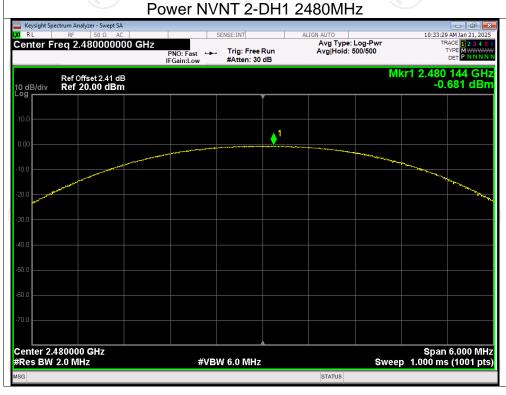








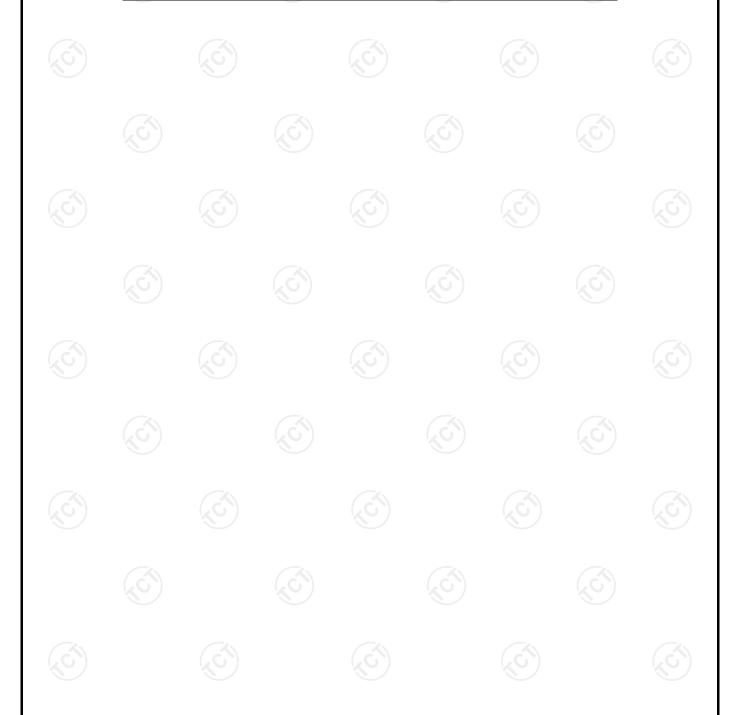




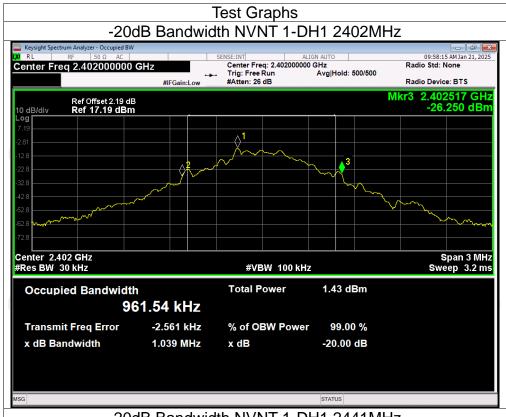


### -20dB Bandwidth

Condition	Mode	Frequency (MHz)	-20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	1.039	Pass
NVNT	1-DH1	2441	1.041	Pass
NVNT	1-DH1	2480	1.042	Pass
NVNT	2-DH1	2402	1.293	Pass
NVNT	2-DH1	2441	1.290	Pass
NVNT	2-DH1	2480	1.314	Pass

















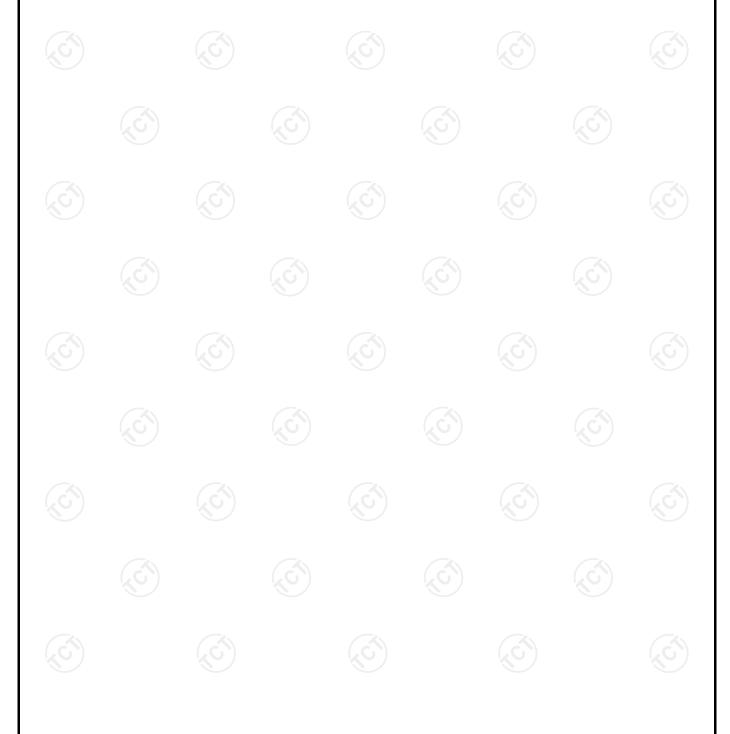




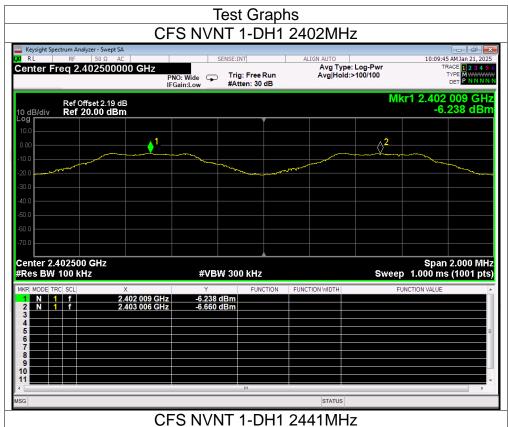


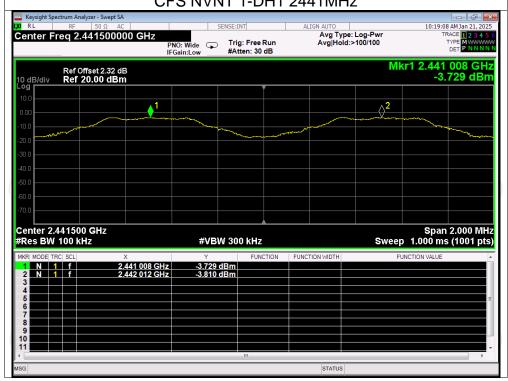
**Carrier Frequencies Separation** 

Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2402.009	2403.006	0.997	0.695	Pass
NVNT	1-DH1	2441.008	2442.012	1.004	0.695	Pass
NVNT	1-DH1	2479.007	2480.004	0.997	0.695	Pass
NVNT	2-DH1	2401.846	2402.836	0.990	0.876	Pass
NVNT	2-DH1	2440.844	2441.838	0.994	0.876	Pass
NVNT	2-DH1	2478.846	2479.840	0.994	0.876	Pass

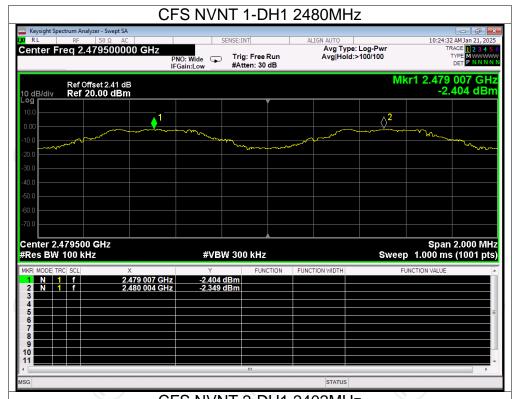


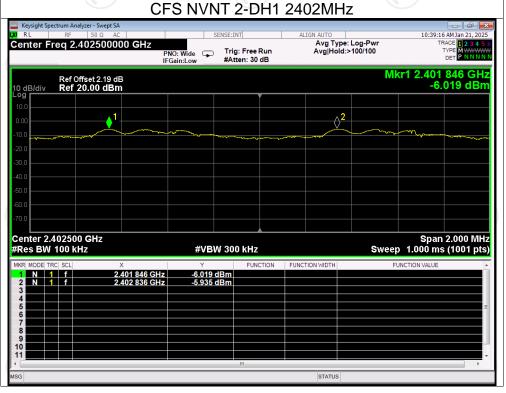




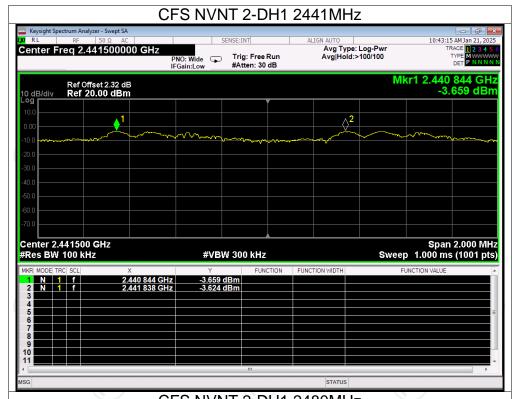


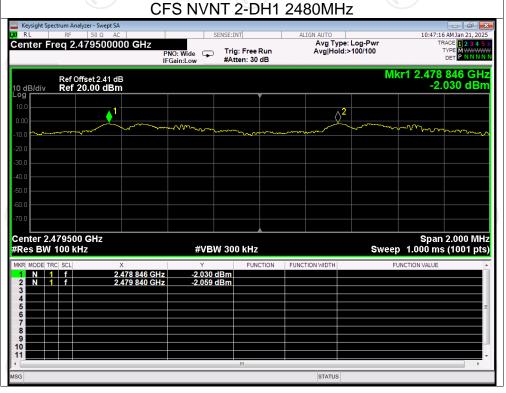








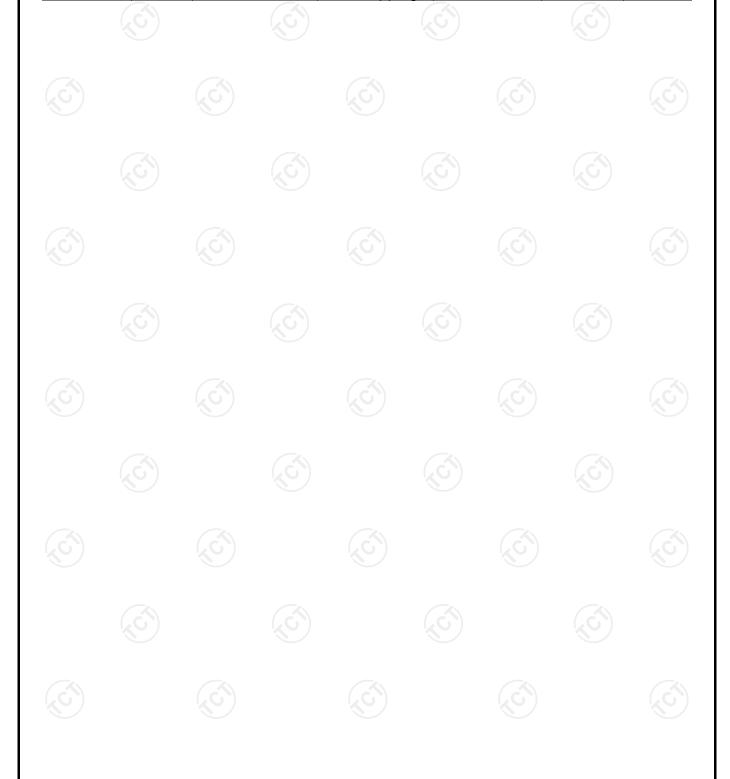




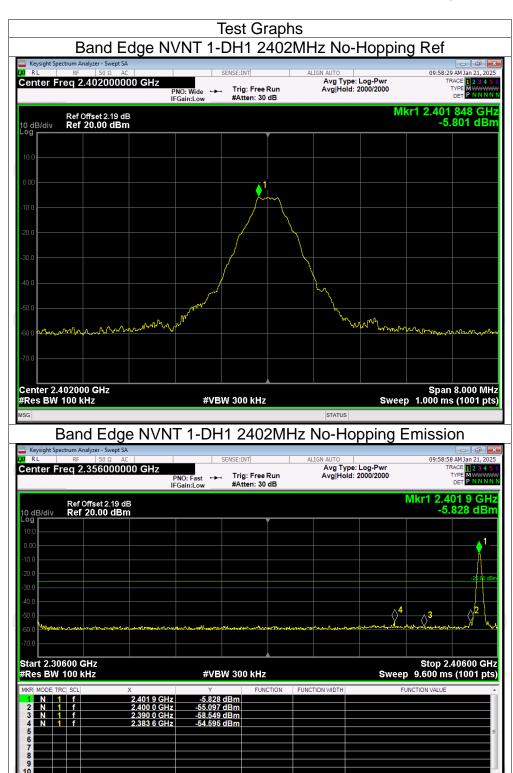


**Band Edge** 

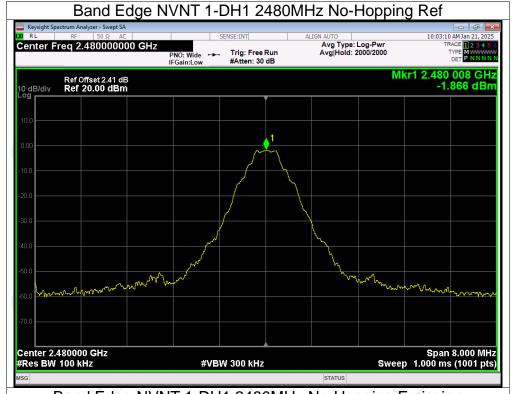
Condition	Mode	Frequency (MHz)	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	No-Hopping	-48.79	-20	Pass
NVNT	1-DH1	2480	No-Hopping	-53.39	-20	Pass
NVNT	2-DH1	2402	No-Hopping	-49.49	-20	Pass
NVNT	2-DH1	2480	No-Hopping	-52.69	-20	Pass

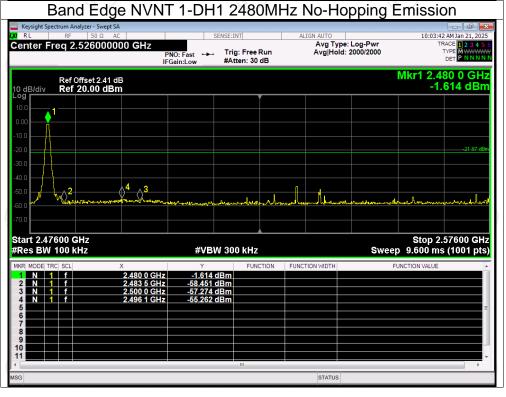




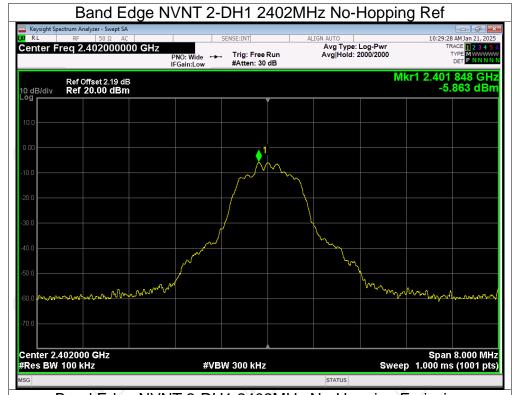


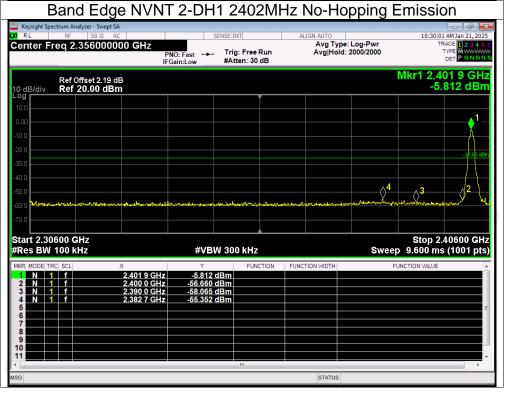






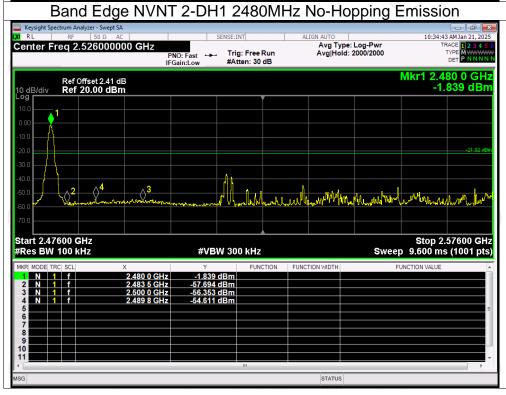








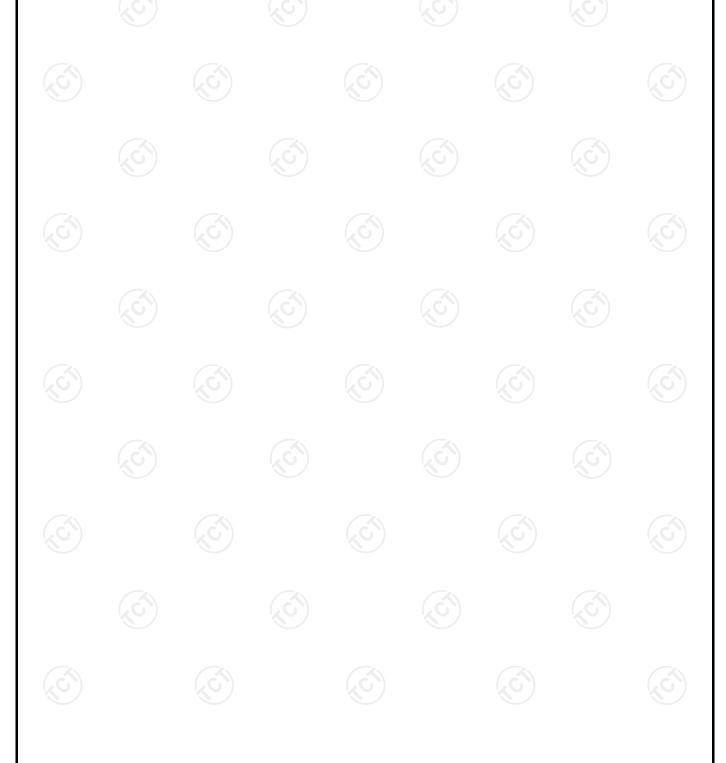




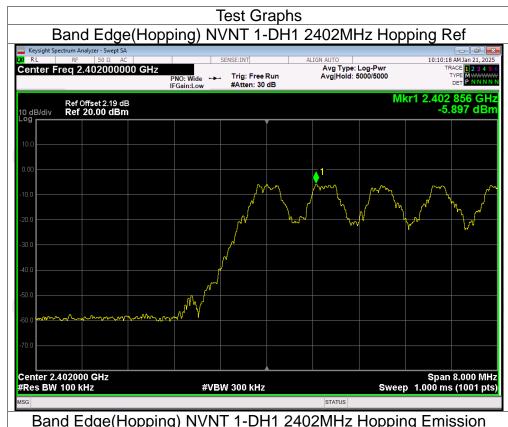


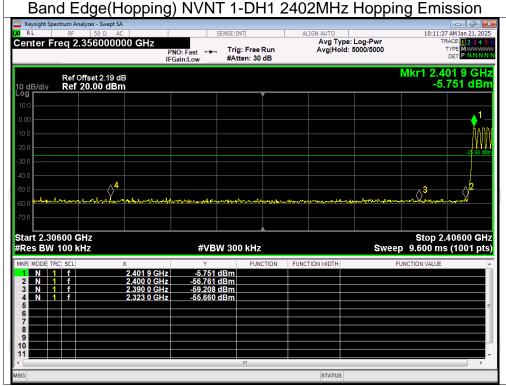
**Band Edge(Hopping)** 

Condition	Mode	Frequency (MHz)	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Hopping	-49.75	-20	Pass
NVNT	1-DH1	2480	Hopping	-52.93	-20	Pass
NVNT	2-DH1	2402	Hopping	-49.38	-20	Pass
NVNT	2-DH1	2480	Hopping	-52.29	-20	Pass



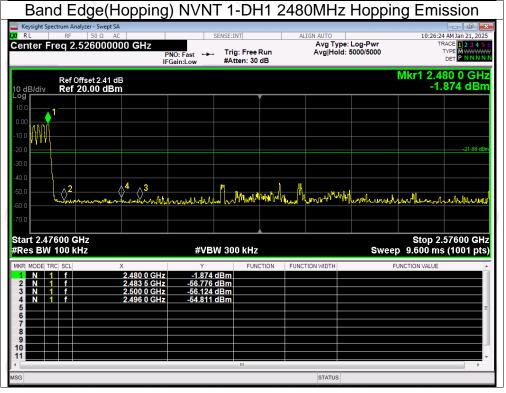




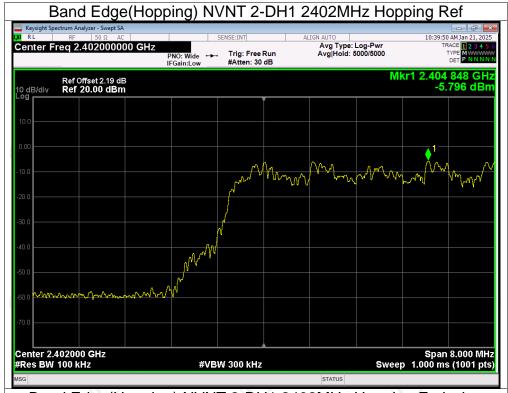


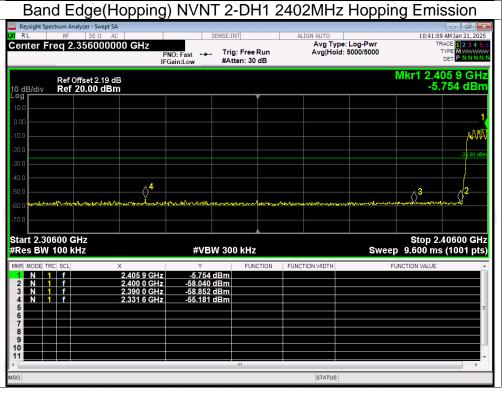




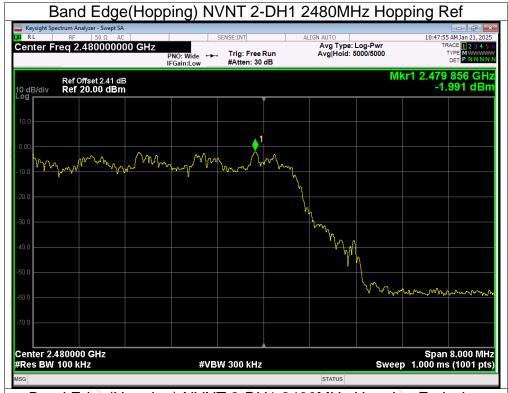


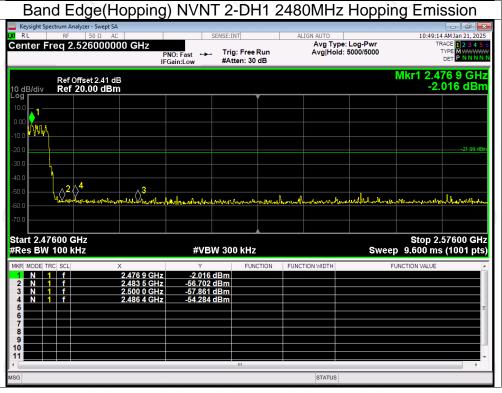








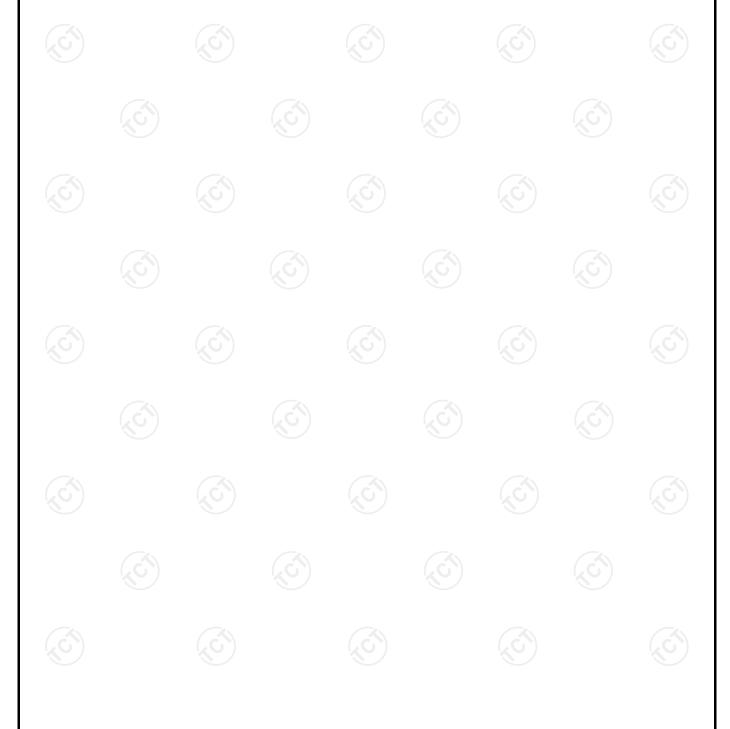




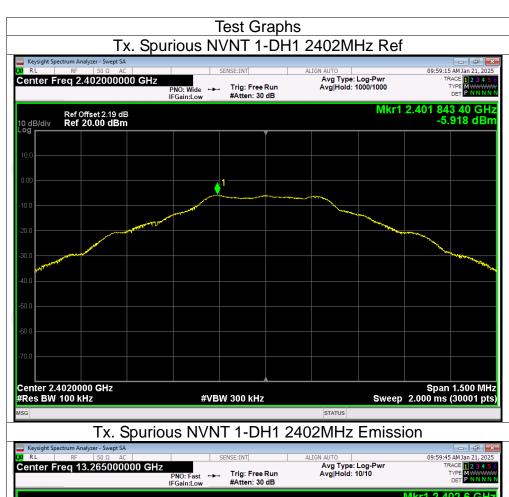


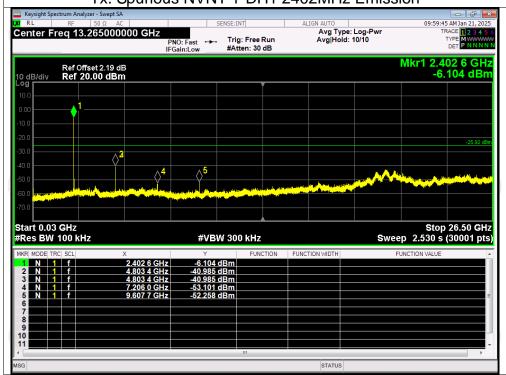
**Conducted RF Spurious Emission** 

Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	-35.06	-20	Pass
NVNT	1-DH1	2441	-37.02	-20	Pass
NVNT	1-DH1	2480	-36.53	-20	Pass
NVNT	2-DH1	2402	-36.55	-20	Pass
NVNT	2-DH1	2441	-36.28	-20	Pass
NVNT	2-DH1	2480	-38.88	-20	Pass



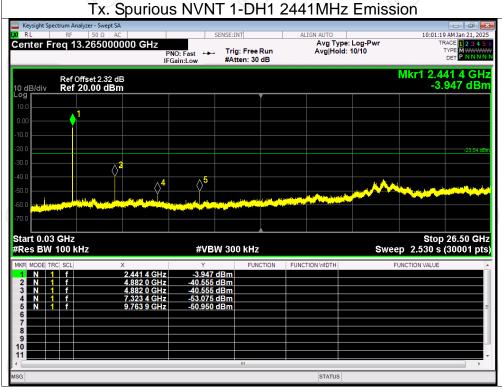






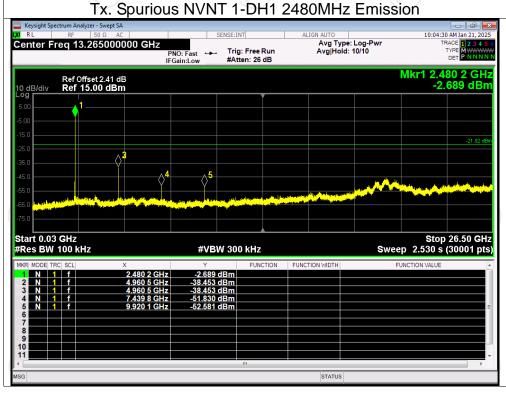




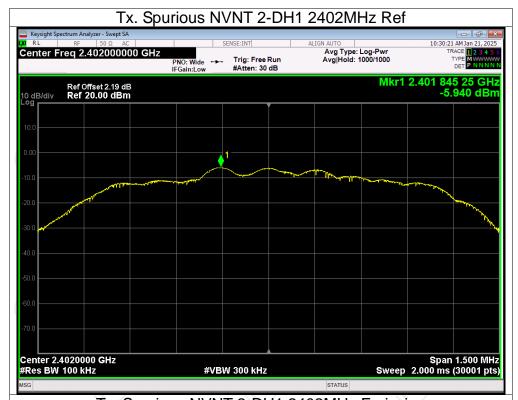


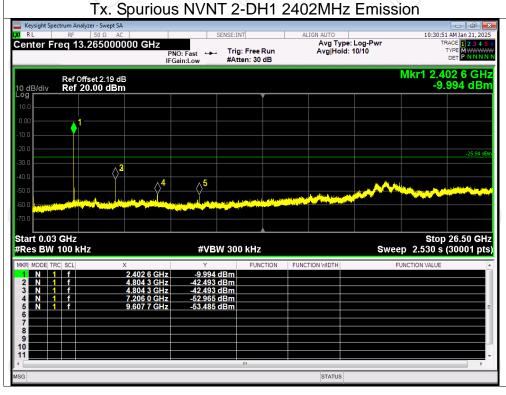




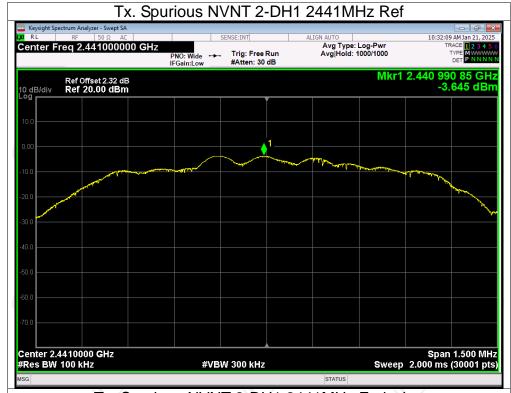


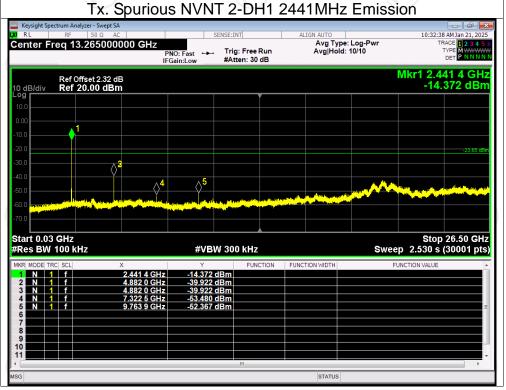






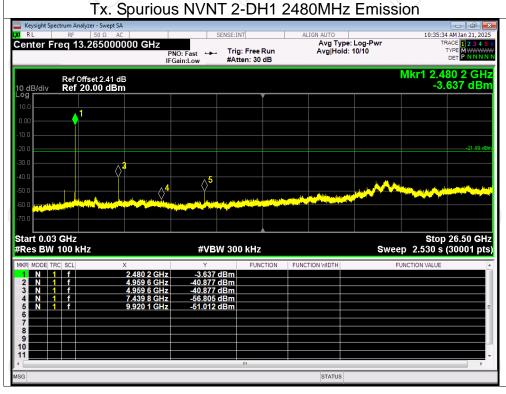








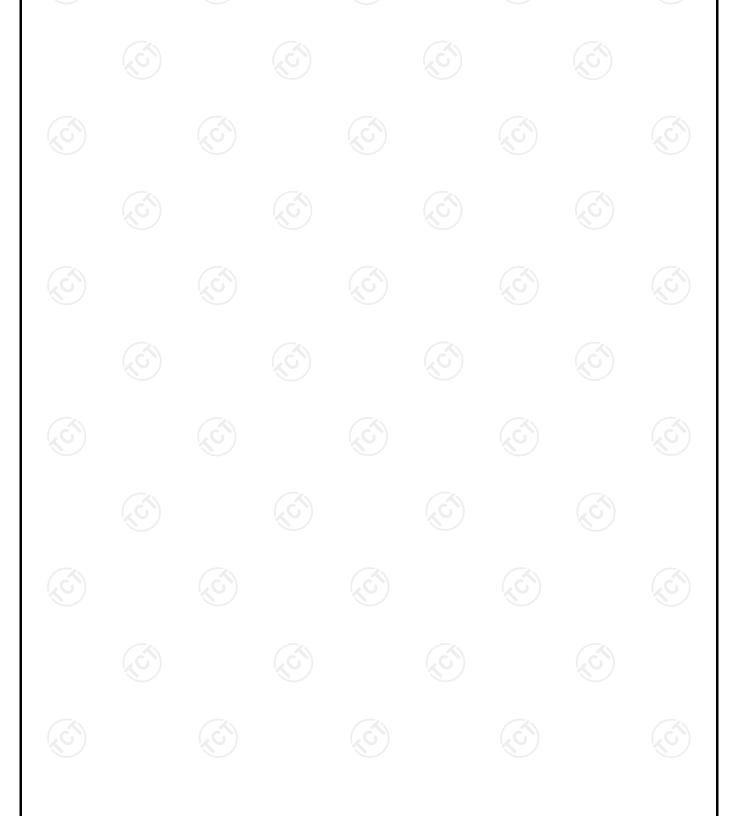




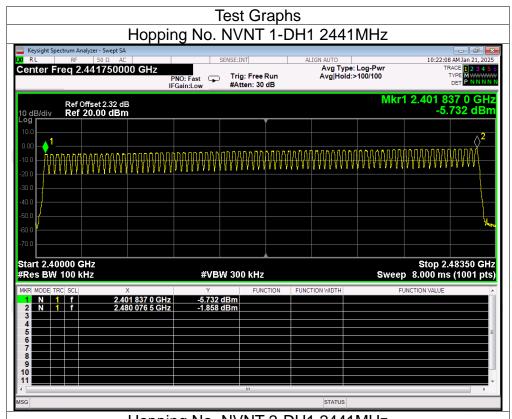


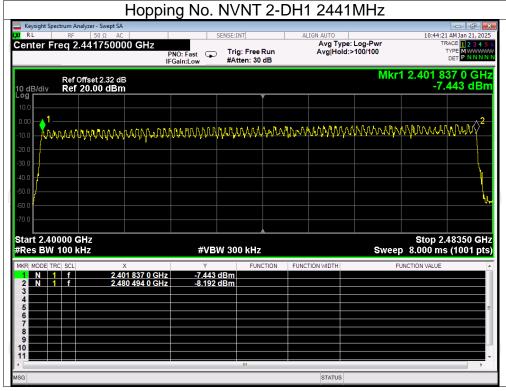
**Number of Hopping Channel** 

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









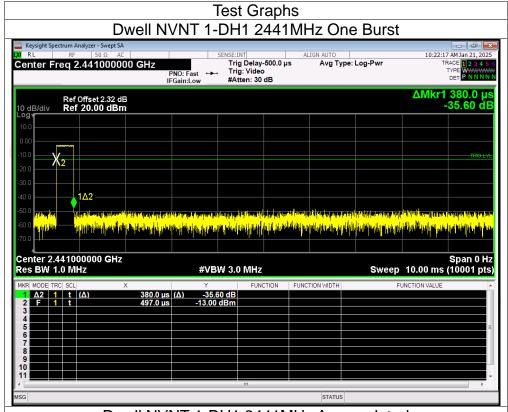


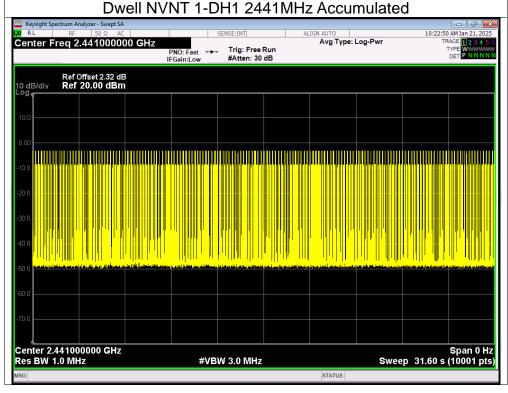
## **Dwell Time**

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	120.46	317	31600	400	Pass
NVNT	1-DH3	2441	1.63	257.54	158	31600	400	Pass
NVNT	1-DH5	2441	2.88	313.92	109	31600	400	Pass
NVNT	2-DH1	2441	0.39	124.41	319	31600	400	Pass
NVNT	2-DH3	2441	1.64	252.56	154	31600	400	Pass
NVNT	2-DH5	2441	2.88	313.92	109	31600	400	Pass

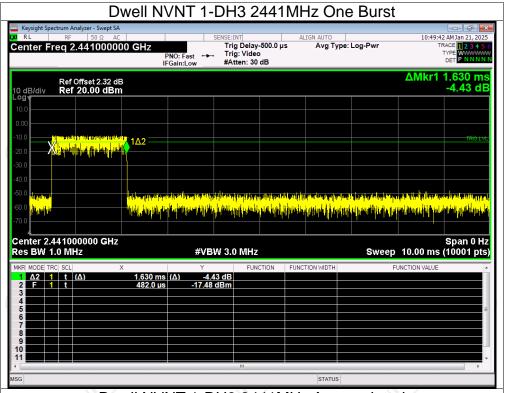


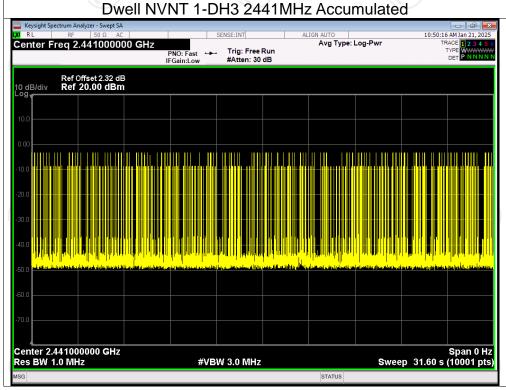




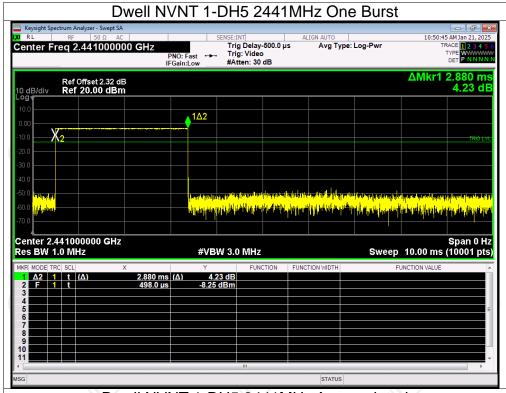


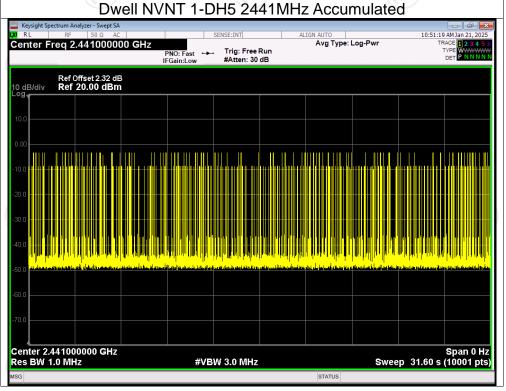




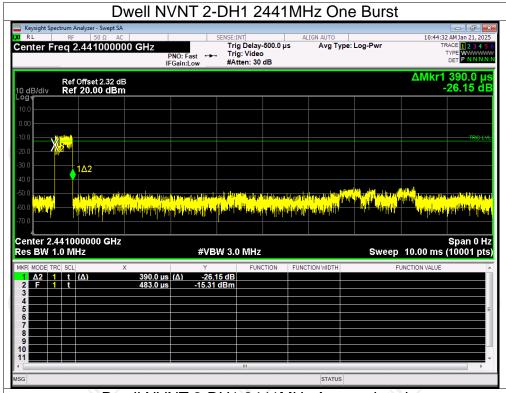


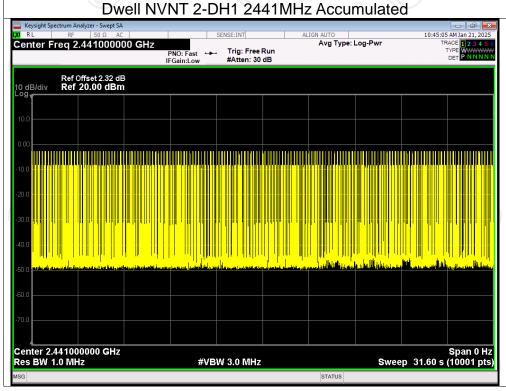




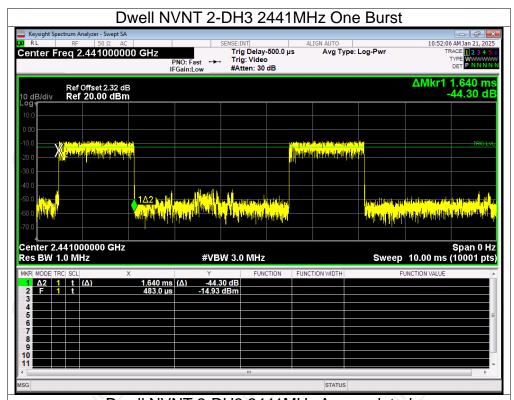


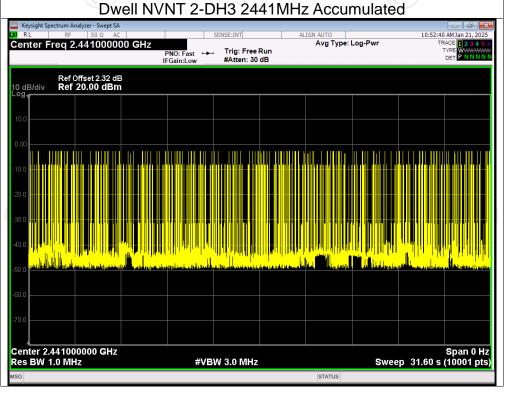




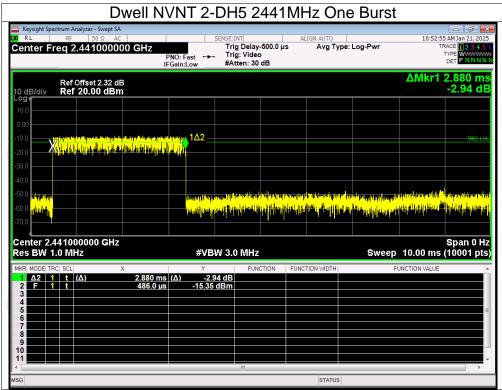


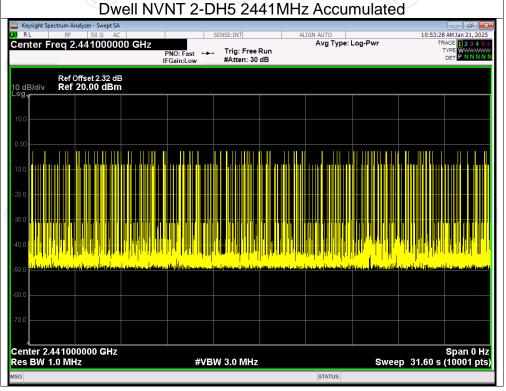














## **Appendix B: Photographs of Test Setup**

Please refer to document Appendix No.: TCT250120E008-A

## **Appendix C: Photographs of EUT**

Please refer to document Appendix No.: TCT250120E008-B & TCT250120E008-C

