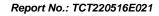




TEST REPORT									
FCC ID:	2APP6ADX-30								
Test Report No:	TCT220516E021								
Date of issue:	Jun. 16, 2022								
Testing laboratory:	SHENZHEN TONGCE TEST	SHENZHEN TONGCE TESTING LAB							
Testing location/ address:	TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, Bao'an District Shenzhen, Guangdong, 518103, People's Republic of China								
Applicant's name:	Aroma Music Co., Ltd.	Aroma Music Co., Ltd.							
Address:	203, No. 93 Qianjin 2nd Road, Area 81, Hexi Neighbourhood, Xixiang Town, Baoan District, Shenzhen City, Guangdong, 518000 China								
Manufacturer's name:	Aroma Technology Co., Limit	ed							
Address:	Building A, Aroma Park, Guwu Village, Danshui Town, Huiyang District, Huizhou, Guangdong 516200 China								
Standard(s):	FCC CFR Title 47 Part 15 Su FCC KDB 558074 D01 15.24 ANSI C63.10:2013	•							
Product Name:	E-DRUMS AMP								
Trade Mark:	AROMA								
Model/Type reference:	ADX-30								
Rating(s):	AC 120V/60Hz								
Date of receipt of test item	May 16, 2022		.61)						
Date (s) of performance of test:	May 16, 2022 - Jun. 16, 2022								
Tested by (+signature):	Onnado YE	Onnado Ja	GCE 78						
Check by (+signature):	Beryl ZHAO	Bay Chiam	CT)						
Approved by (+signature):	Tomsin	Tomsies							

#### General disclaimer:

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## 1. General Product Information

## 1.1. EUT description

Product Name:	E-DRUMS AMP	(C)		
Model/Type reference:	ADX-30			
Sample Number:	TCT220516E021-0101			
Bluetooth Version	V5.0			
Operation Frequency:	2402MHz~2480MHz			
Transfer Rate	1/2 Mbits/s			(0)
Number of Channel:	79			
Modulation Type	GFSK, π/4-DQPSK			
Modulation Technology:	FHSS			
Antenna Type	PCB Antenna	(C)		
Antenna Gain	-0.68dBi			
Rating(s)	AC 120V/60Hz		(c)	

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

	( . C <sub>1</sub> <sup>2</sup> )		( . C , Y )		( , C ) <sup>*</sup> )		$(.C_1^*)$
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
(0)	<	(0)		(0)		(0).	%
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
	(c)		(c))		(,c)		(3)
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		-
Remark:	Channel 0, 3	39 & 78 ha	ave been tes	sted for G	FSK, π/4-D	QPSK mo	dulation 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:	25.3 °C	25 °C					
Humidity:	56 % RH	55 % RH					
Atmospheric Pressure:	1010 mbar	1010 mbar					
Test Software:							
Software Information:	FCC Assist 1.0.0.2						
Power Level:	10						
Test Mode:							
Engineer mode:	Keep the EUT in continuous transmitting by select channel and modulations						

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
1	1	1	1	

#### 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-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: TCT Testing Industrial Park Fuqiao 5th Industrial Zone, Fuhai Street, 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:

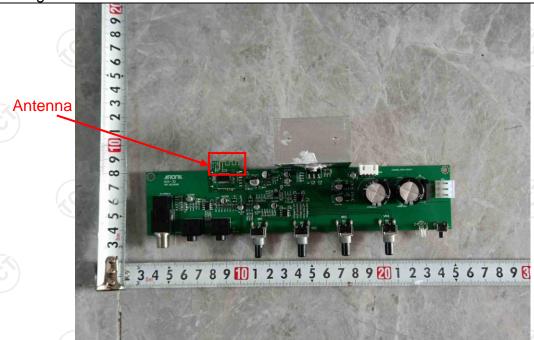
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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:

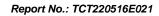
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional 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 0dBi.



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### 5.2. Conducted Emission

## 5.2.1. Test Specification

Test Requirement:	FCC Part15 C Section	15 207	ĺχĊ					
•		13.207						
Test Method:	ANSI C63.10:2013							
Frequency Range:	150 kHz to 30 MHz	<u>(C)</u>	(C)					
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto							
Limits:	Frequency range (MHz) 0.15-0.5 0.5-5 5-30	Limit ( Quasi-peak 66 to 56* 56 60	(dBuV) Average 56 to 46* 46 50					
Test Setup:	Reference Plane  40cm 80cm Filter AC power  Test table/Insulation plane  Remark E.U.T. Equipment Under Test LISN: Line Impedence Stabilization Network Test table height=0.8m							
Test Mode:	Transmitting Mode							
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 C63.10:2013 on conducted measurement.</li> </ol>							
Test Result:	PASS							



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### 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	Jul. 07, 2022						
Line Impedance Stabilisation Newtork(LISN)	Schwarzbeck	Schwarzbeck NSLK 8126		Feb. 24, 2023						
Line-5	TCT	CE-05	N/A	Jul. 07, 2022						
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A						

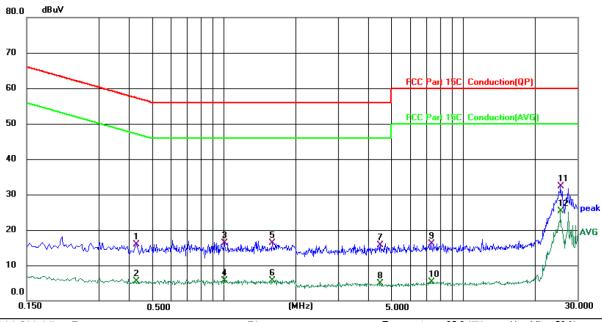




#### 5.2.3. Test data

### 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: 25.3 (°C) Humidity: 56 %

Power: AC 120 V/60 Hz

Limit: FCC Part 15C Conduction(QP)

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBu∀	dB	dBu∀	dBu∀	dB	Detector	Comment
1	0.4300	5.68	10.22	15.90	57.25	-41.35	QP	
2	0.4300	-4.63	10.22	5.59	47.25	-41.66	AVG	
3	1.0060	6.21	10.14	16.35	56.00	-39.65	QP	
4	1.0060	-4.37	10.14	5.77	46.00	-40.23	AVG	
5	1.5980	6.28	10.10	16.38	56.00	-39.62	QP	
6	1.5980	-4.35	10.10	5.75	46.00	-40.25	AVG	
7	4.5140	5.61	10.14	15.75	56.00	-40.25	QP	
8	4.5140	-5.19	10.14	4.95	46.00	-41.05	AVG	
9	7.3420	5.85	10.21	16.06	60.00	-43.94	QP	
10	7.3420	-4.85	10.21	5.36	50.00	-44.64	AVG	
11	25.5020	21.77	10.57	32.34	60.00	-27.66	QP	
12 *	25.5020	14.71	10.57	25.28	50.00	-24.72	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

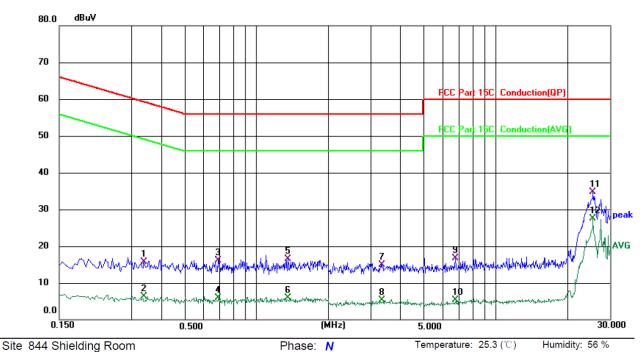
AVG =average

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<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)



Limit: FCC Part 15C Conduction(QP)

Power: AC 120 V/60 Hz

No. M	Лк. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBu∨	dB	dBu∀	dBu∀	dB	Detector	Comment
1	0.3379	5.44	10.27	15.71	59.25	-43.54	QP	
2	0.3379	-3.97	10.27	6.30	49.25	-42.95	AVG	
3	0.6900	5.99	10.14	16.13	56.00	-39.87	QP	
4	0.6900	-4.29	10.14	5.85	46.00	-40.15	AVG	
5	1.3580	6.29	10.15	16.44	56.00	-39.56	QP	
6	1.3580	-4.32	10.15	5.83	46.00	-40.17	AVG	
7	3.3500	4.81	10.18	14.99	56.00	-41.01	QP	
8	3.3500	-4.97	10.18	5.21	46.00	-40.79	AVG	
9	6.7778	6.34	10.30	16.64	60.00	-43.36	QP	
10	6.7778	-4.92	10.30	5.38	50.00	-44.62	AVG	
11	25.5180	24.15	10.51	34.66	60.00	-25.34	QP	
12 *	25.5180	17.07	10.51	27.58	50.00	-22.42	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	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022



# 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 modulation			
Test Procedure:	<ol> <li>Transmitting mode with modulation</li> <li>The RF output of EUT was connected to the spectrul analyzer by RF cable and attenuator. 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 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 = minold.     </li> </ol>			
Test Result:	Measure and record the results in the test report.  PASS			

### 5.4.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022



# 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 shall have hopping channel carrier frequencies separated by a minimum of 25 kHz of 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.			
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 and attenuator. 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	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022



# 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:	<ol> <li>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.</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
1 7	

### 5.6.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022



### 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 represent the property 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 and attenuator. 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	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022



### 5.8. Pseudorandom Frequency Hopping Sequence

### Test Requirement: FC

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

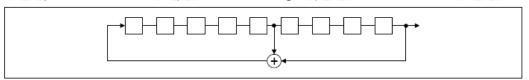
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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**

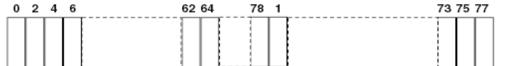
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized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

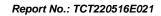


Linear Feedback Shift Register for Generation of the PRBS sequence

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.





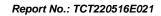
# 5.9. Conducted Band Edge Measurement

## 5.9.1. Test Specification

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 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			

### 5.9.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022





## **5.10. Conducted Spurious Emission Measurement**

## 5.10.1. Test Specification

FCC Part15 C Section 15.247 (d)
KDB 558074 D01 v05r02
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.
Spectrum Analyzer EUT
Transmitting mode with modulation
<ol> <li>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.</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>
PASS (C)

### 5.10.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 18, 2022
Combiner Box	Ascentest	AT890-RFB	N/A	Jul. 07, 2022

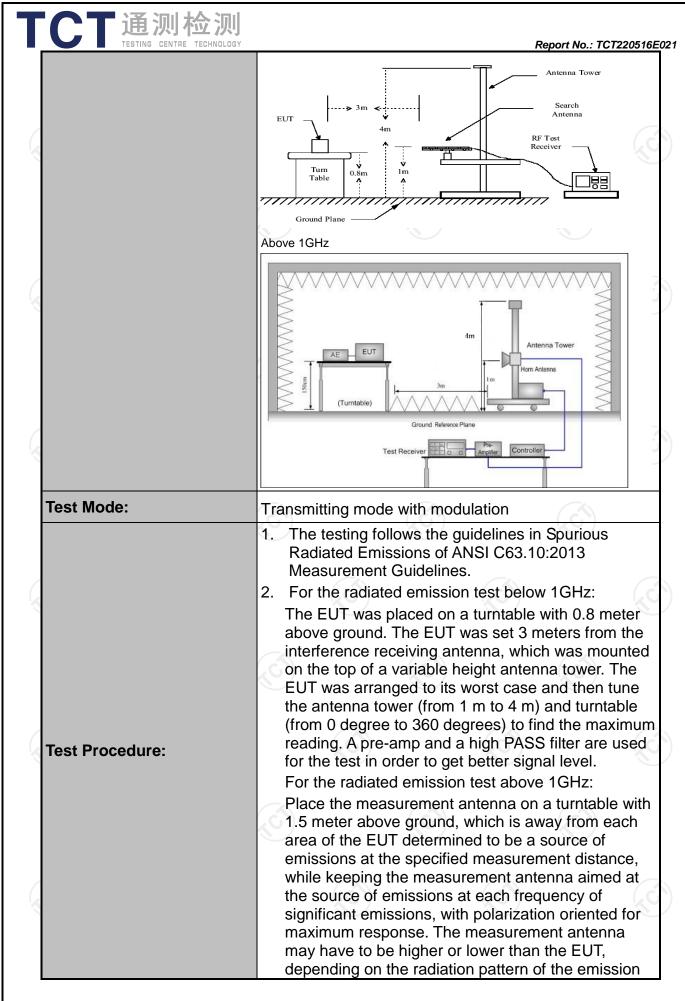
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# **5.11. Radiated Spurious Emission Measurement**

## 5.11.1. Test Specification

Test Requirement: Test Method:	FCC Part15 ANSI C63.10		n 15.209	(0)		KC						
	ANSI C63.10	)·2013										
Eroguanay Banga		9 kHz to 25 GHz										
Frequency Range:	9 kHz to 25 (	GHz										
Measurement Distance:	3 m		(6)		100	)						
Antenna Polarization:	Horizontal &	Vertical										
D	Frequency 9kHz- 150kHz 150kHz-	Detecto Quasi-pe Quasi-pe	ak 200Hz	VBW 1kHz 30kHz	Quas	Remark si-peak Value si-peak Value						
Receiver Setup:	30MHz 30MHz-1GHz Above 1GHz	Quasi-pe Peak Peak	ak 120KHz 1MHz 1MHz	300KHz 3MHz 10Hz	P	si-peak Value eak Value erage Value						
Limit:	0.009-0.4 0.490-1.7 1.705-3 30-88 88-216 216-96 Above 9	490 705 80 6	(microvo 2400/l 24000/ 3 11 11	trength lts/meter) =(KHz) (F(KHz) 00 00 50 00	Me	asurement nce (meters) 300 30 30 30 30 3 3 3 3						
	Frequency		eld Strength crovolts/meter	(mete	nce	Detector						
	Above 1GHz	z 💮	500 5000	3		Average Peak						
Test setup:		Turn table	w 30MHz		Compu	lter						



T 通測 检测	
TESTING CENTRE TECHNOLOGY	Report No.: TCT220516E02
	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 En	nission Test Site	e (966)	
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESIB7	100197	Jul. 07, 2022
Spectrum Analyzer	R&S	FSQ40	200061	Jul. 07, 2022
Pre-amplifier	SKET	LNPA_0118G- 45	SK2021012 102	Feb. 24, 2023
Pre-amplifier	SKET	LNPA_1840G- 50	SK2021092 03500	Feb. 24, 2023
Pre-amplifier	HP	8447D	2727A05017	Jul. 07, 2022
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 05, 2022
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 04, 2022
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Apr. 10, 2023
Antenna Mast	Keleto	RE-AM	N/A	N/A
Coaxial cable	SKET	RC_DC18G-N	N/A	Feb. 24, 2023
Coaxial cable	SKET	RC-DC18G-N	N/A	Feb. 24, 2023
Coaxial cable	SKET	RC-DC40G-N	N/A	Jul. 07, 2022
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

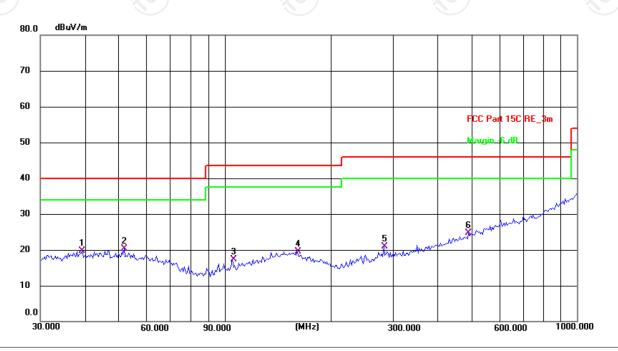


#### 5.11.3. Test Data

### Please refer to following diagram for individual

Below 1GHz

Horizontal:



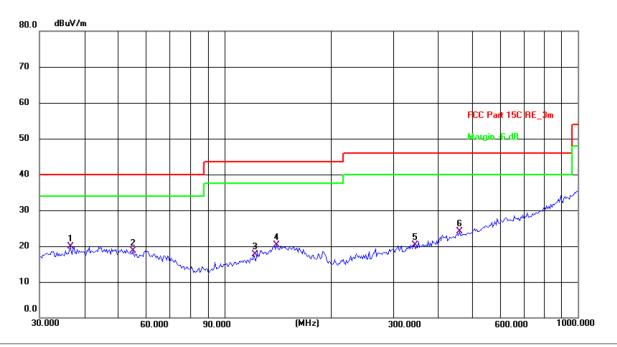
Site #1 3m Anechoic Chamber Polarization: *Horizontal* Temperature: 25(C) Humidity: 55 % Limit: FCC Part 15C RE\_3m Power: AC 120 V/60 Hz

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	39.4371	6.06	13.67	19.73	40.00	-20.27	QP	Р	
2 *	51.8430	7.18	13.22	20.40	40.00	-19.60	QP	Р	
3	105.2717	6.96	10.33	17.29	43.50	-26.21	QP	Р	
4	160.3456	6.15	13.35	19.50	43.50	-24.00	QP	Р	
5	282.9851	7.70	13.14	20.84	46.00	-25.16	QP	Р	
6	492.4685	6.34	18.32	24.66	46.00	-21.34	QP	Р	





#### Vertical:



Site #1 3m Anechoic Chamber Polarization: Vertical Temperature: 25(C) Humidity: 55 %

Limit: FCC Part 15C RE\_3m Power: AC 120 V/60 Hz

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	l .	Margin (dB)	Detector	P/F	Remark
1 *	36.5092	6.51	13.37	19.88	40.00	-20.12	QP	Р	
2	55.2207	5.89	12.79	18.68	40.00	-21.32	QP	Р	
3	121.1231	5.96	11.67	17.63	43.50	-25.87	QP	Р	
4	140.3420	7.67	12.66	20.33	43.50	-23.17	QP	Р	
5	344.3855	5.77	14.63	20.40	46.00	-25.60	QP	Р	
6	462.3455	6.61	17.57	24.18	46.00	-21.82	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 (dBµV/m) = Limit stated in standard

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

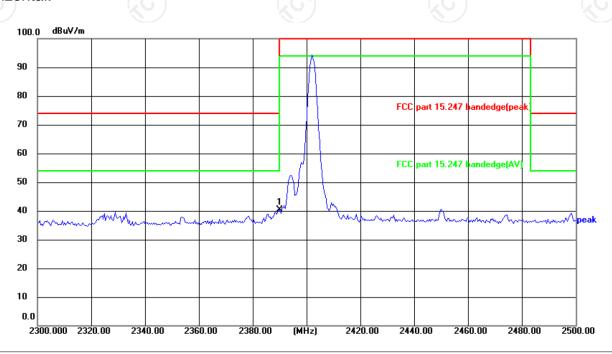
\* is meaning the worst frequency has been tested in the test frequency range.



#### Test Result of Radiated Spurious at Band edges

### Lowest channel 2402:

Horizontal:



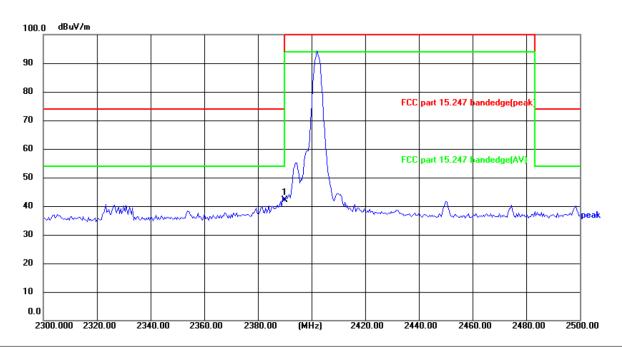
Site Polarization: Horizontal Temperature: 24( $^{\circ}$ C) Limit: FCC part 15.247 bandedge(peak) Power: Humidity: 52  $^{\circ}$ 

No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)	l .	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	56.09	-15.76	40.33	74.00	-33.67	peak	Р	





### Vertical:



Site Polarization: Vertical Temperature: 24(℃) Humidity: 52 % Power:

Limit: FCC part 15.247 bandedge(peak)

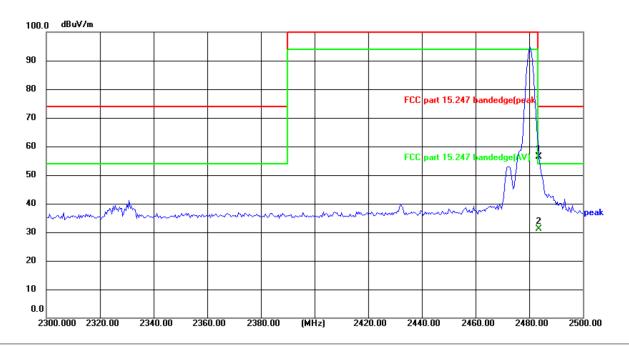
No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2390.000	57.80	-15.76	42.04	74.00	-31.96	peak	Р	





### Highest channel 2480:

### Horizontal:



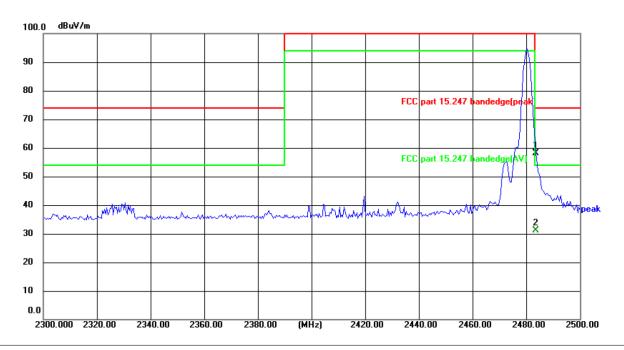
Site Polarization: Horizontal Temperature:  $24(^{\circ}C)$  Limit: FCC part 15.247 bandedge(peak) Power: Humidity: 52%

No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	2483.500	71.77	-15.41	56.36	74.00	-17.64	peak	Р	
2	2483.500	46.60	-15.41	31.19	54.00	-22.81	AVG	Р	





### Vertical:



Site Polarization: Vertical Temperature:  $24(^{\circ}\text{C})$  Limit: FCC part 15.247 bandedge(peak) Power: Humidity: 52%

İ	No.	Frequency (MHz)	Reading (dBuV)		Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
	1 *	2483.500	73.55	-15.41	58.14	74.00	-15.86	peak	Р	
	2	2483.500	46.50	-15.41	31.09	54.00	-22.91	AVG	Р	

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





#### **Above 1GHz**

Modulation	Type: Pi/	4 DQPSK											
Low chann	Low channel: 2402 MHz												
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Peak (dBµV/m)	AV	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)				
4804	Н	43.95		0.66	44.61		74	54	-9.39				
7206	Η	34.28		9.50	43.78		74	54	-10.22				
	H							7-7					
	,G')		(, G			.G`)		(,C)					
4804	V	43.61		0.66	44.27	<u></u>	74	54	-9.73				
7206	V	35.84		9.50	45.34		74	54	-8.66				
	V												

Middle cha	nnel: 2441	MHz		K	)		(0)		ZC.
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Peak		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
4882	H	44.06	-	0.99	45.05	<b></b>	74	54	-8.95
7323	(H)	34.52		9.87	44.39	O 1	74	54	-9.61
	H					<u></u>			
			•						
4882	V	43.70		0.99	44.69		74	54	-9.31
7323	V	32.13		9.87	42.00		74	54	-12.00
<b>S</b>	V	(A)			)		( <del></del> )		

High channel: 2480 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emissic Peak (dBµV/m)	n Level AV (dBµV/m)	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
4960	Н	44.39		1.33	45.72		74	54	-8.28
7440	I	35.47		10.22	45.69		74	54	-8.31
	Η	<i>-</i>							
4960	V	44.25		1.33	45.58		74	54	-8.42
7440	V	35.68		10.22	45.90		74	54	-8.10
	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**

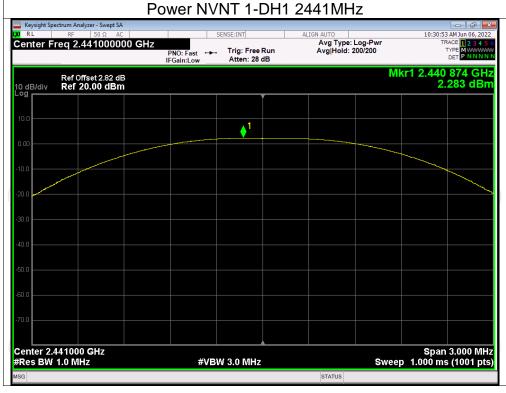
Condition	Maxi Mode	Frequency (MHz)	Limit (dBm)	Verdict	
NVNT	1-DH1	2402	1.76	30	Pass
NVNT	1-DH1	2441	2.28	30	Pass
NVNT	1-DH1	2480	2.98	30	Pass
NVNT	2-DH1	2402	2.47	21	Pass
NVNT	2-DH1	2441	2.97	21	Pass
NVNT	2-DH1	2480	3.64	21	Pass





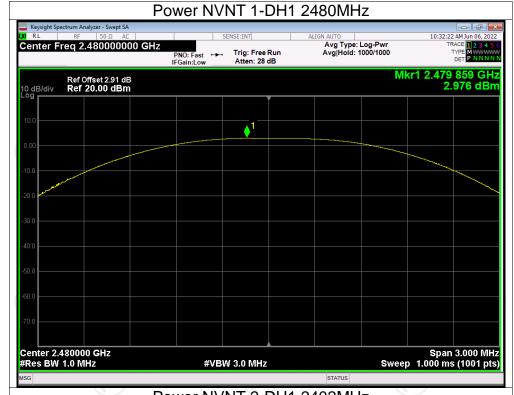


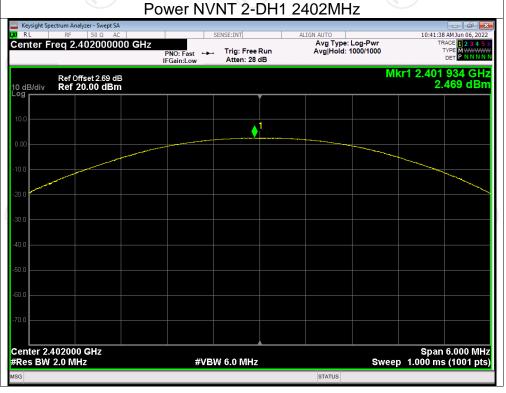


















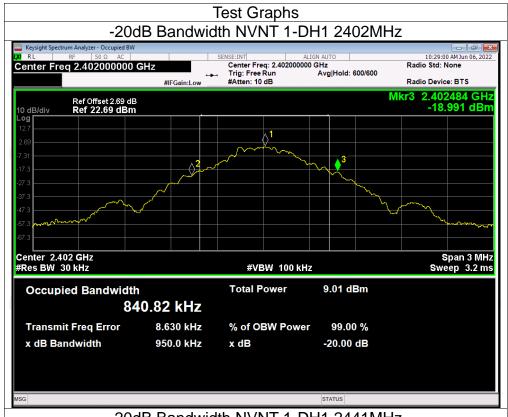


#### -20dB Bandwidth

Condition	Mode	Frequency (MHz)	-20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	0.950	Pass
NVNT	1-DH1	2441	0.953	Pass
NVNT	1-DH1	2480	0.956	Pass
NVNT	2-DH1	2402	1.234	Pass
NVNT	2-DH1	2441	1.232	Pass
NVNT	2-DH1	2480	1.236	Pass







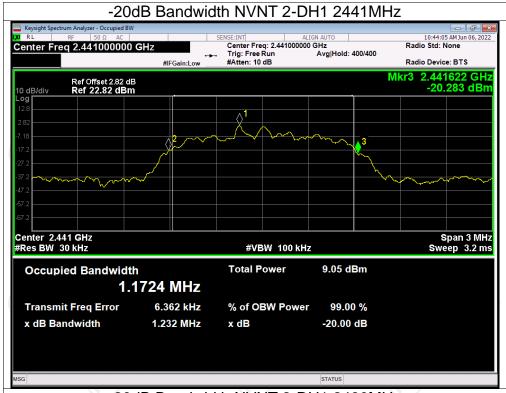










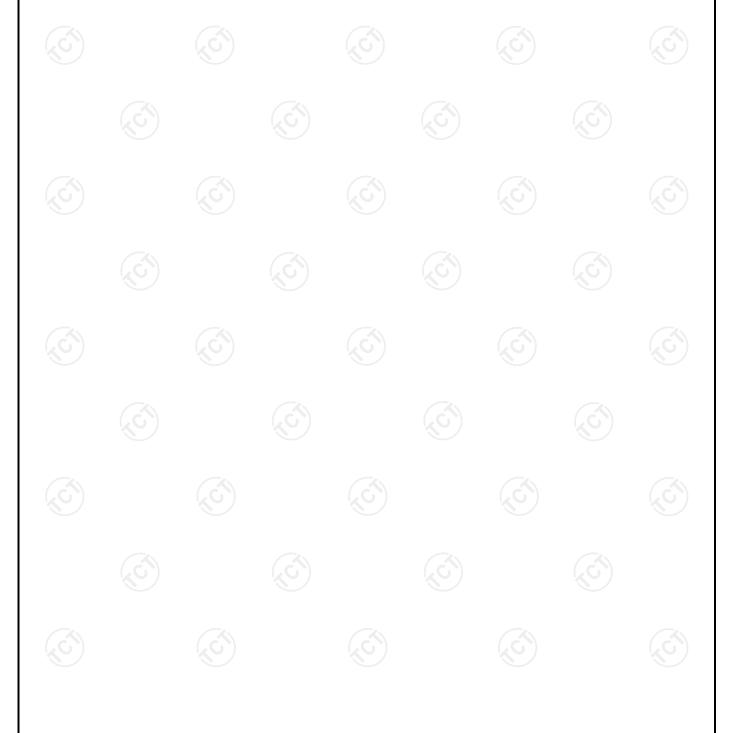


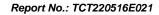




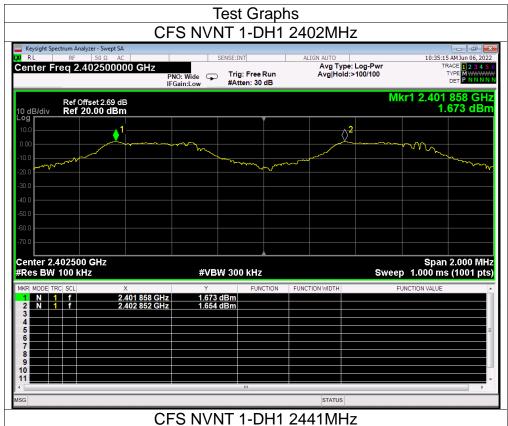
**Carrier Frequencies Separation** 

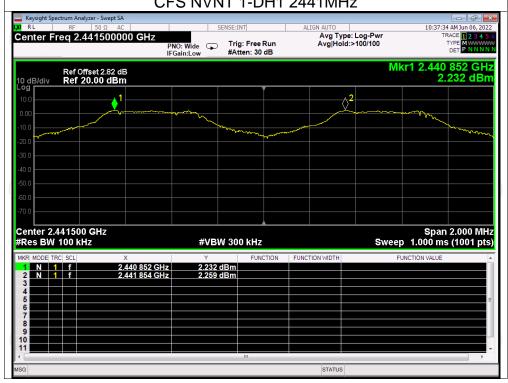
		• • • • • • • • • • • • • • • • • • • •				
Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2401.858	2402.852	0.994	0.956	Pass
NVNT	1-DH1	2440.852	2441.854	1.002	0.956	Pass
NVNT	1-DH1	2478.858	2479.854	0.996	0.956	Pass
NVNT	2-DH1	2401.854	2402.858	1.004	0.824	Pass
NVNT	2-DH1	2440.856	2441.852	0.996	0.824	Pass
NVNT	2-DH1	2478.86	2479.858	0.998	0.824	Pass

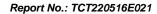






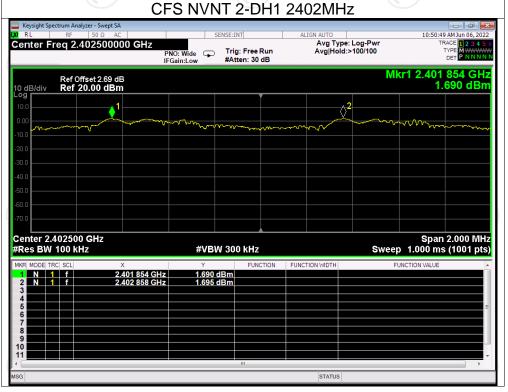




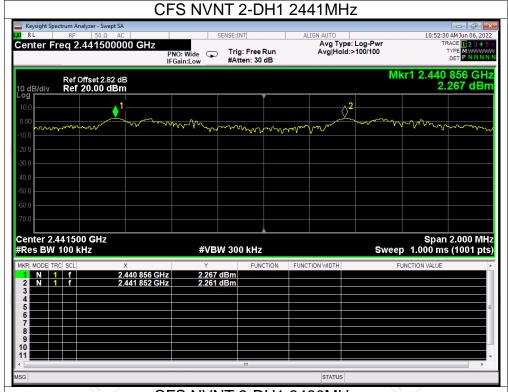


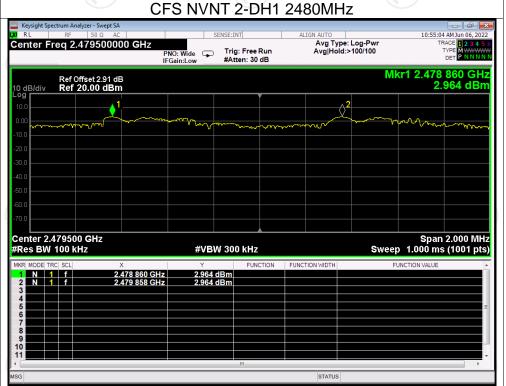








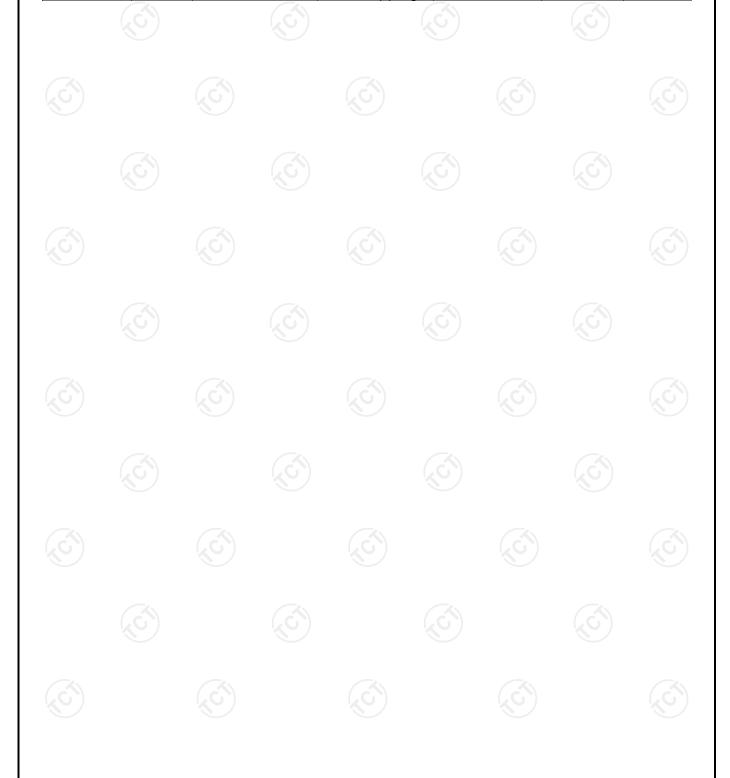




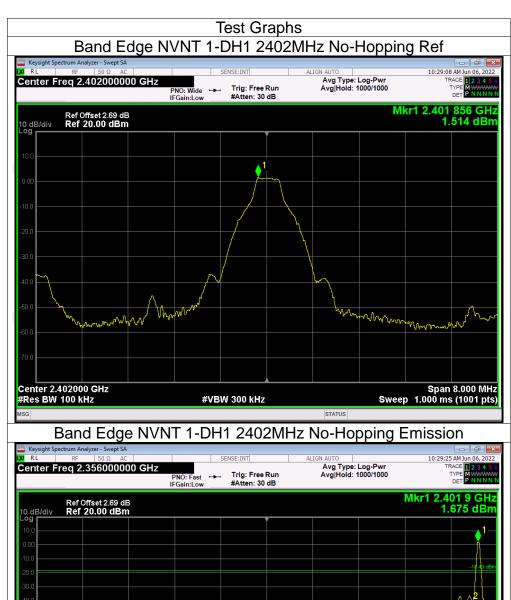


**Band Edge** 

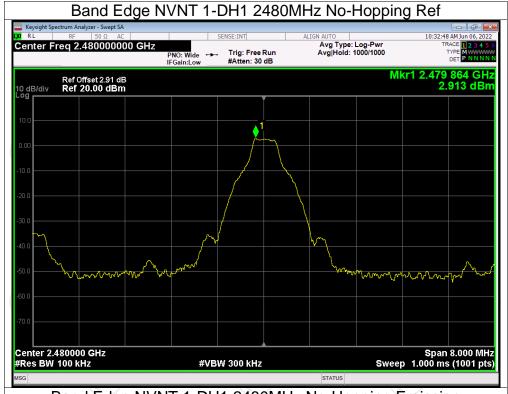
Condition	Mode	Frequency (MHz)	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	No-Hopping	-57.70	-20	Pass
NVNT	1-DH1	2480	No-Hopping	-50.24	-20	Pass
NVNT	2-DH1	2402	No-Hopping	-57.32	-20	Pass
NVNT	2-DH1	2480	No-Hopping	-48.99	-20	Pass

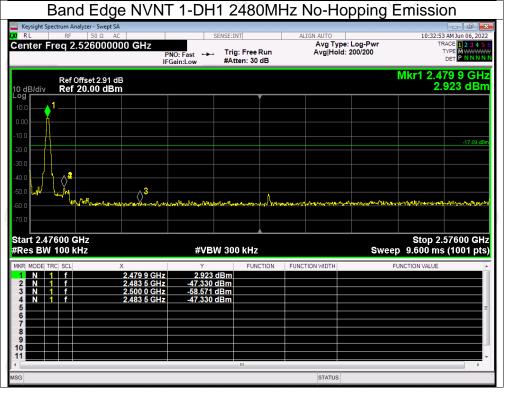






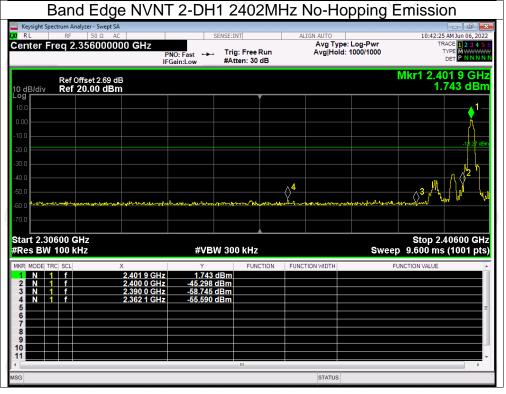






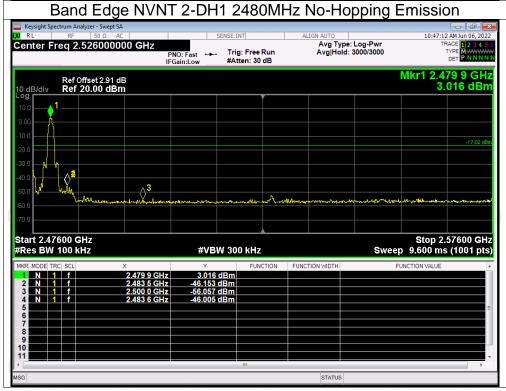








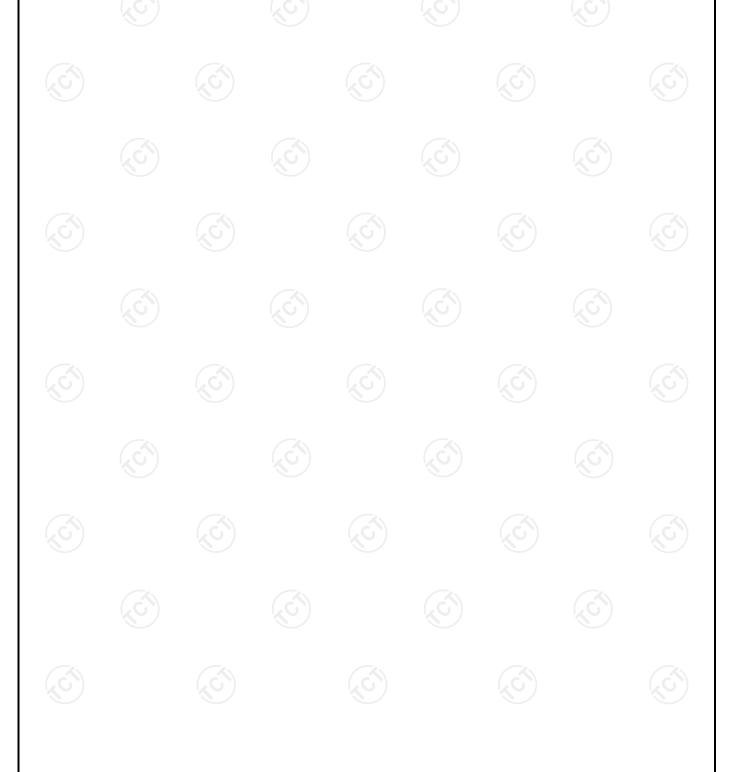




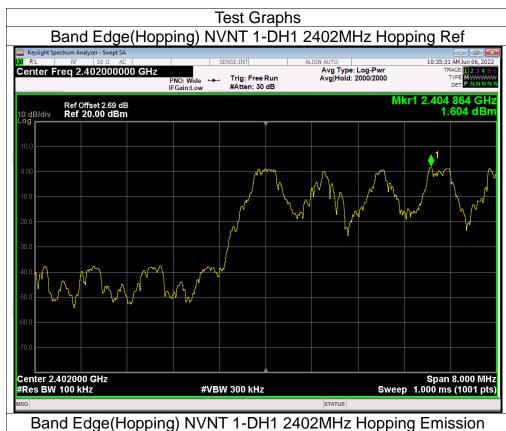


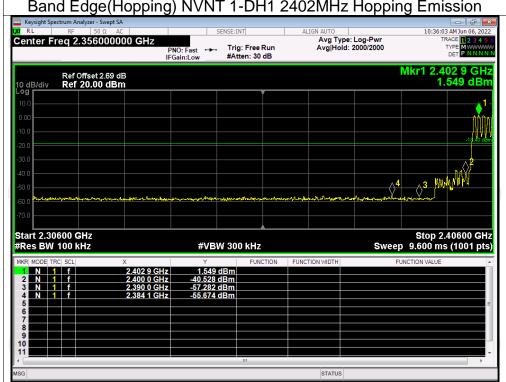
**Band Edge(Hopping)** 

Condition	Mode	Frequency (MHz)	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Hopping	-57.27	-20	Pass
NVNT	1-DH1	2480	Hopping	-50.07	-20	Pass
NVNT	2-DH1	2402	Hopping	-57.79	-20	Pass
NVNT	2-DH1	2480	Hopping	-50.28	-20	Pass



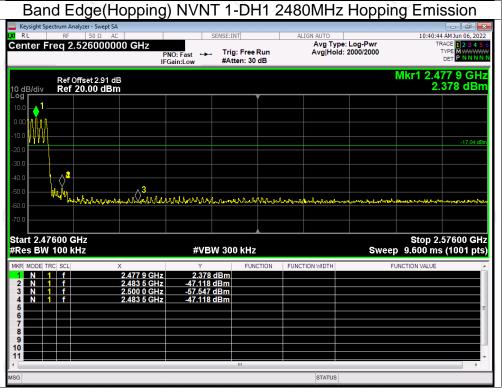




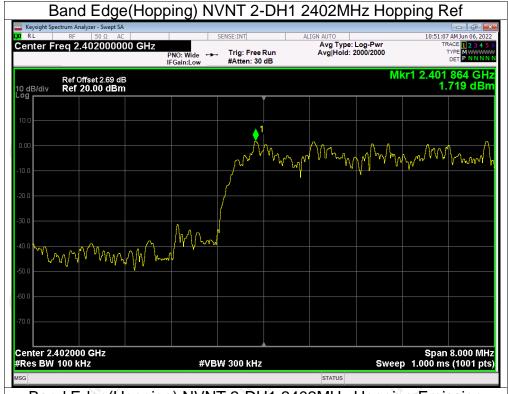


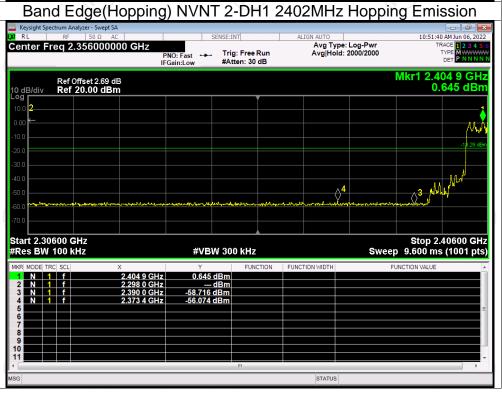






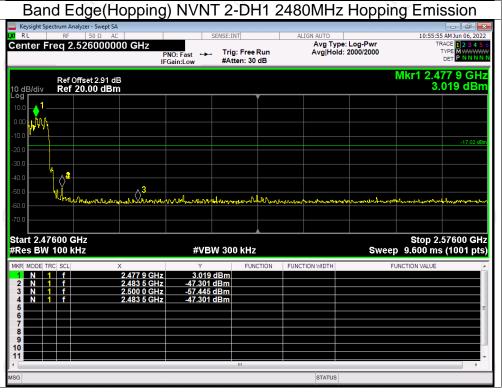








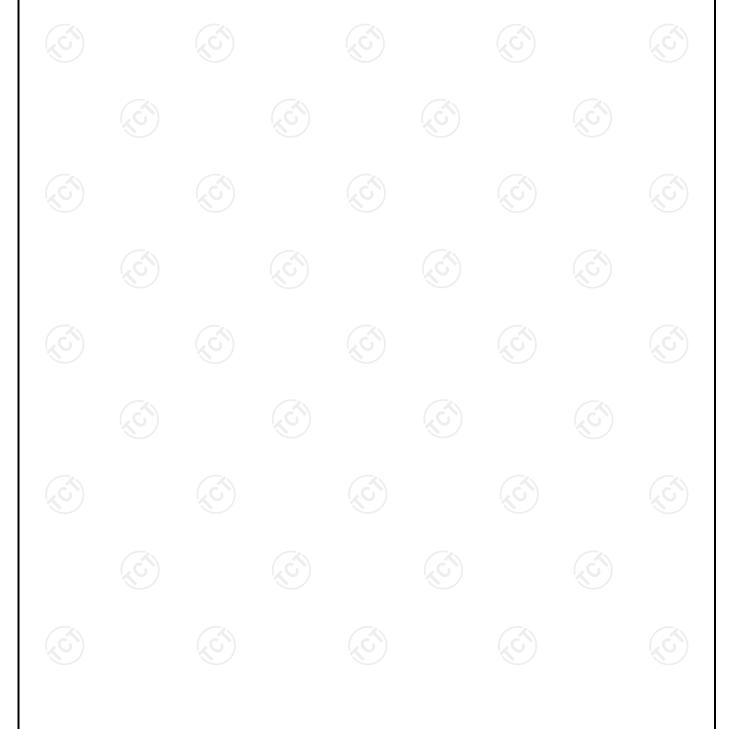






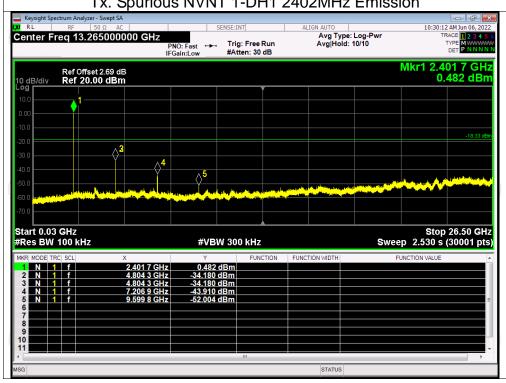
**Conducted RF Spurious Emission** 

Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	-35.84	-20	Pass
NVNT	1-DH1	2441	-38.78	-20	Pass
NVNT	1-DH1	2480	-37.25	-20	Pass
NVNT	2-DH1	2402	-43.74	-20	Pass
NVNT	2-DH1	2441	-39.30	-20	Pass
NVNT	2-DH1	2480	-39.01	-20	Pass



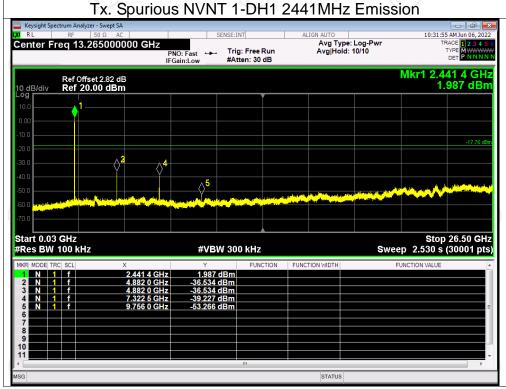




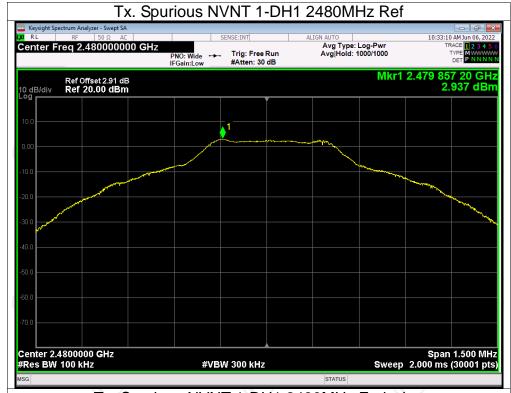


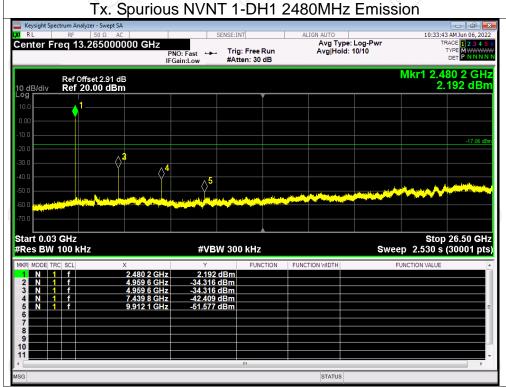


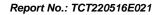






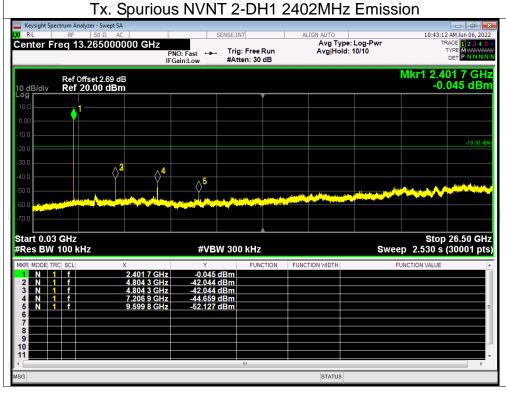






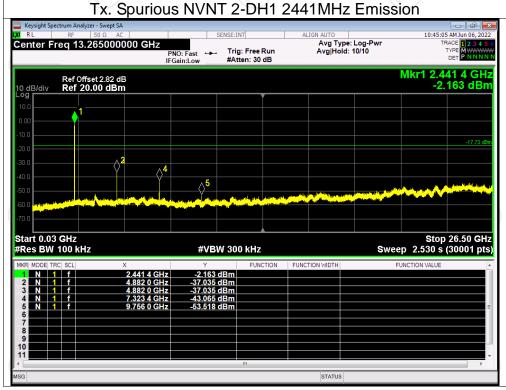






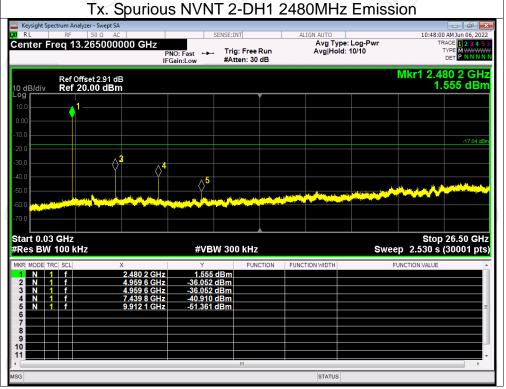








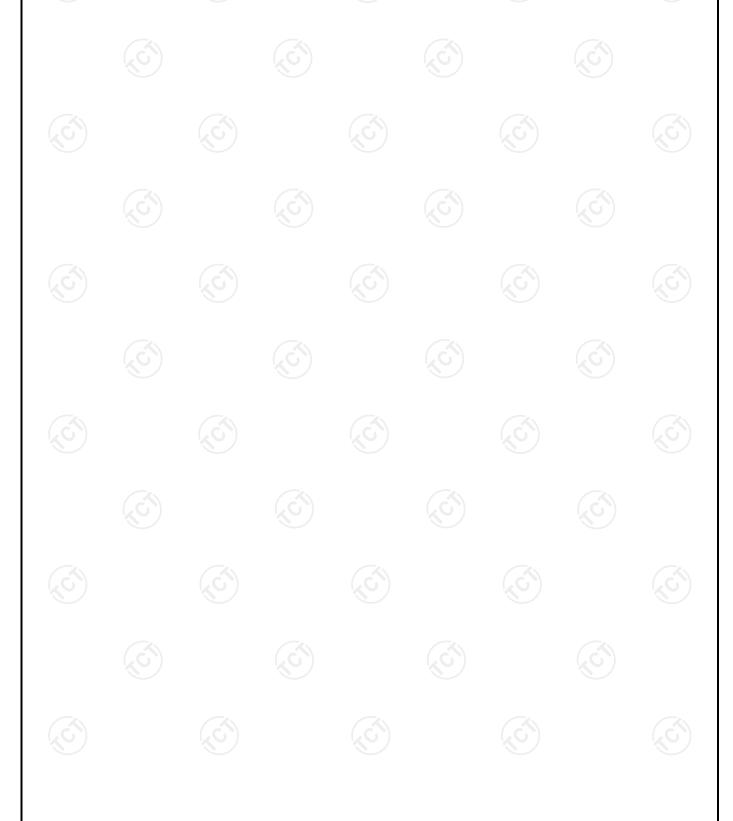




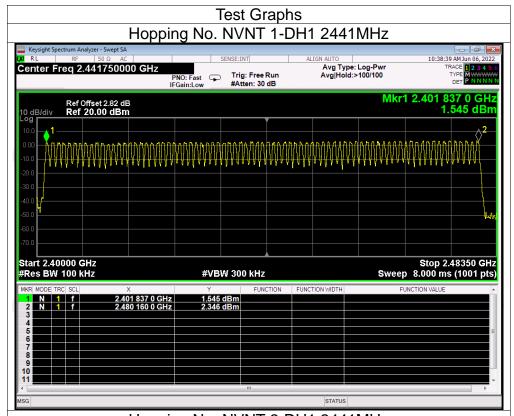


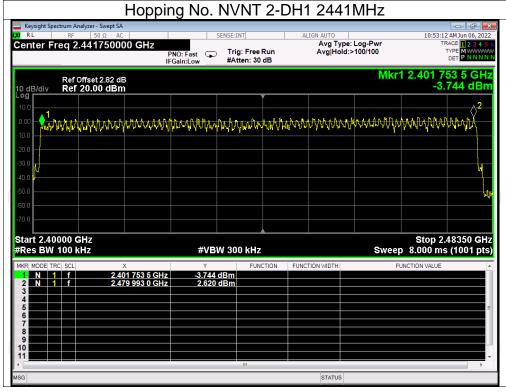
**Number of Hopping Channel** 

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





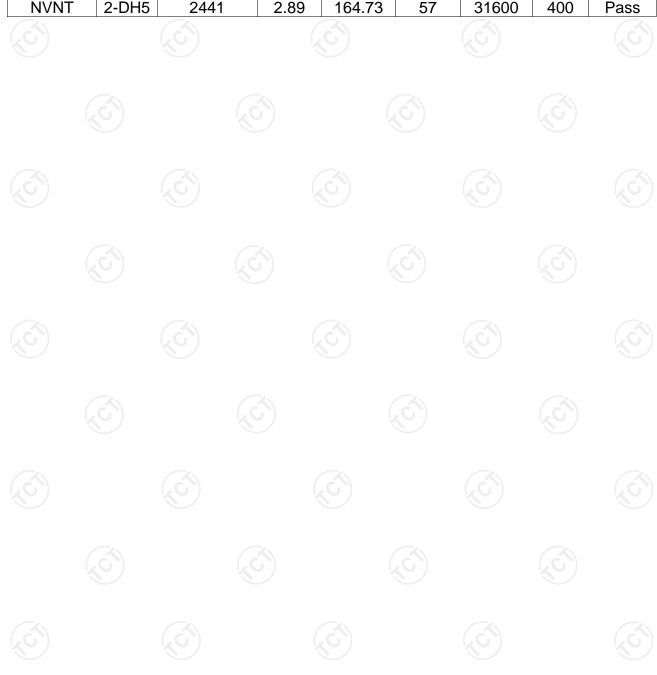




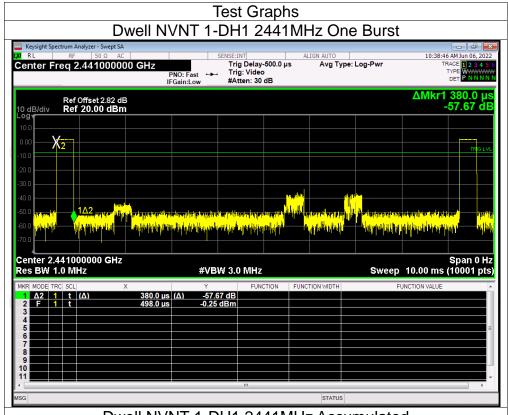


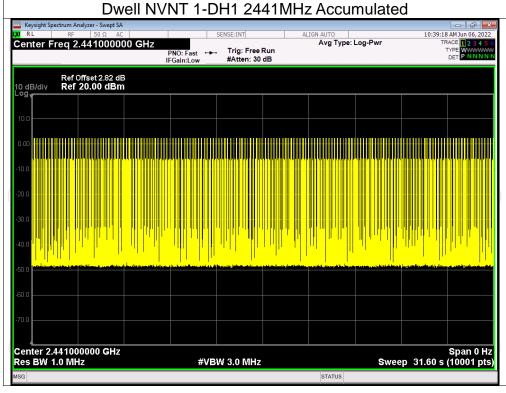
#### **Dwell Time**

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	120.84	318	31600	400	Pass
NVNT	1-DH3	2441	1.63	185.82	114	31600	400	Pass
NVNT	1-DH5	2441	2.88	169.92	59	31600	400	Pass
NVNT	2-DH1	2441	0.39	123.63	317	31600	400	Pass
NVNT	2-DH3	2441	1.64	170.56	104	31600	400	Pass
NVNT	2-DH5	2441	2.89	164.73	57	31600	400	Pass

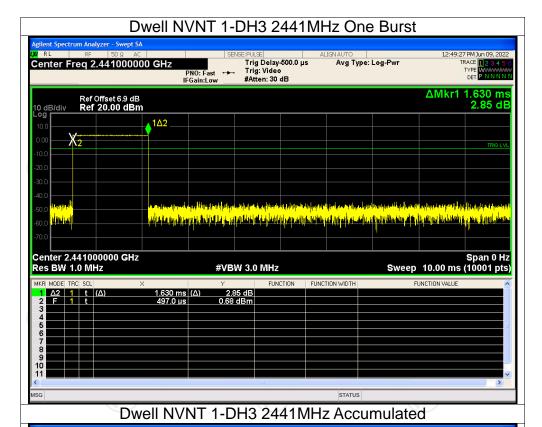










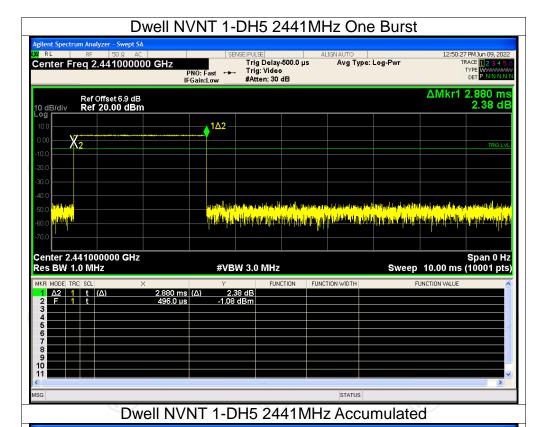


## ALIGNAUTO Avg Type: Log-Pwr Center Freq 2.441000000 GHz PNO: Fast +>- Trig: Free Run IFGain:Low #Atten: 30 dB Ref Offset 6.9 dB Ref 20.00 dBm Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 31.60 s (10001 pts)

**#VBW 3.0 MHz** 



Center 2.441000000 GHz Res BW 1.0 MHz

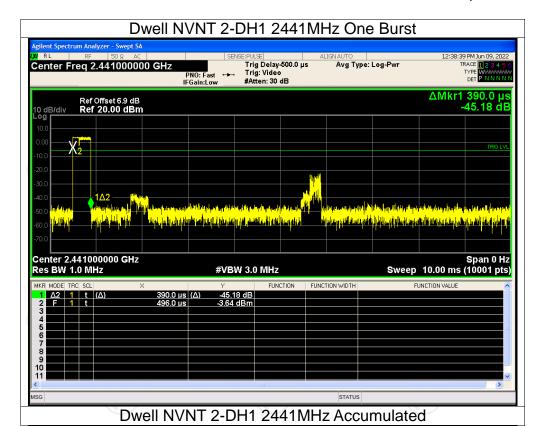


# 

**#VBW 3.0 MHz** 

Span 0 Hz Sweep 31.60 s (10001 pts)



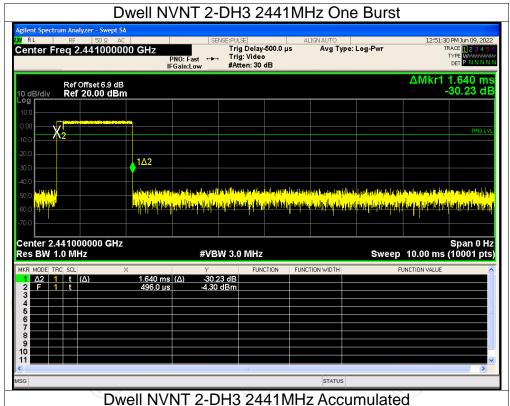


## | SENSE:PULSE | ALIGNAUTO | Avg Type: Log-Pwr Center Freq 2.441000000 GHz PNO: Fast +>- Trig: Free Run IFGain:Low #Atten: 30 dB Ref Offset 6.9 dB Ref 20.00 dBm Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 31.60 s (10001 pts)

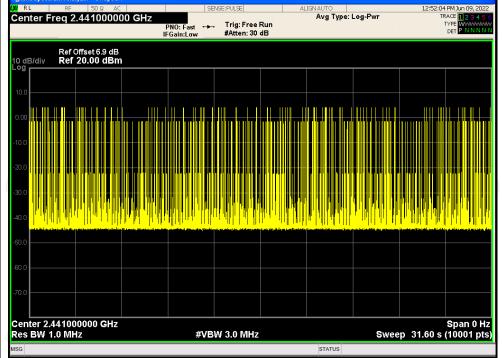
**#VBW 3.0 MHz** 



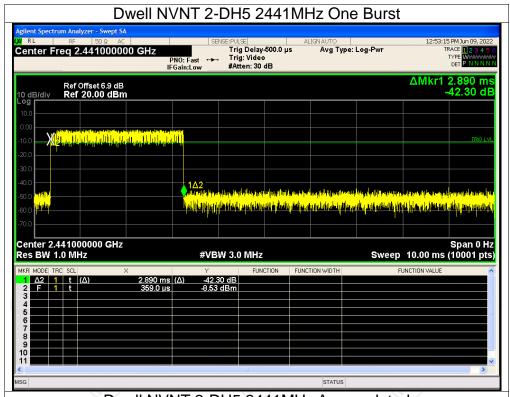




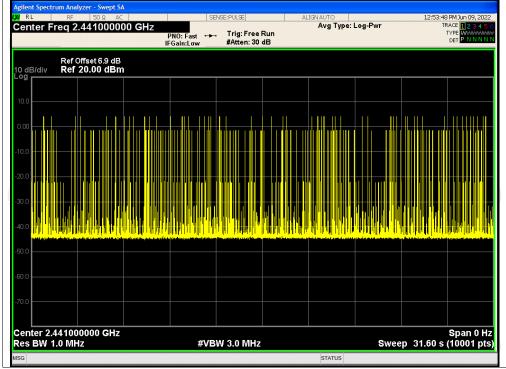
### Swept SA 1. SENSE PULSE ALIGNAUTO







#### Dwell NVNT 2-DH5 2441MHz Accumulated





### Appendix B: Photographs of Test Setup Product: E-DRUMS AMP

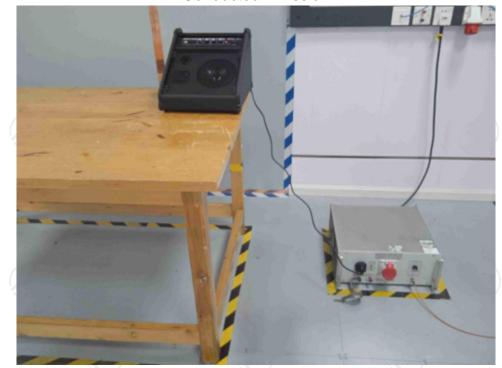
Model: ADX-30







#### **Conducted Emission**

















# Appendix C: Photographs of EUT Product: E-DRUMS AMP Model: ADX-30



















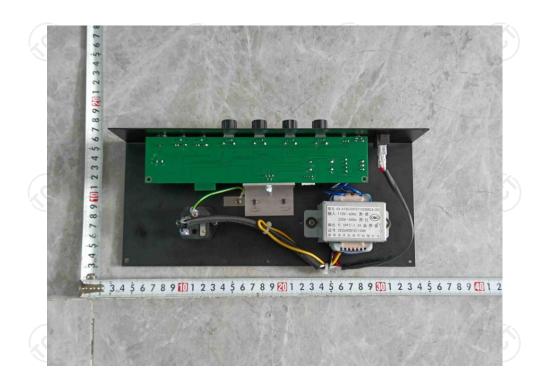






Product: E-DRUMS AMP Model: ADX-30 Internal Photos



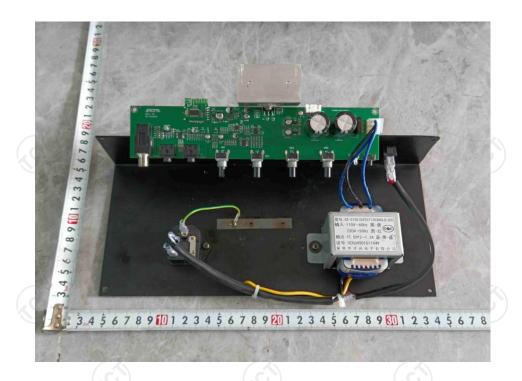


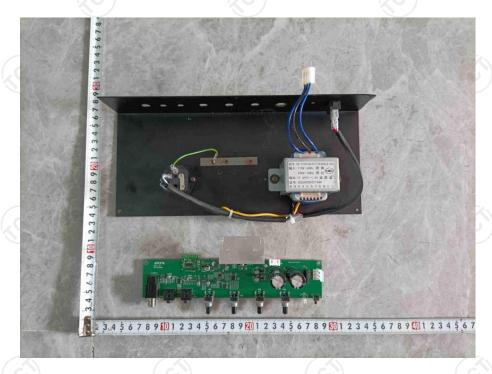




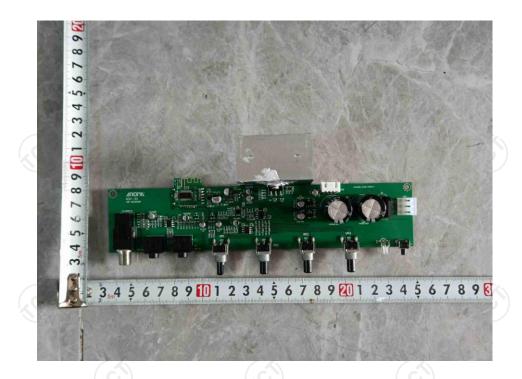






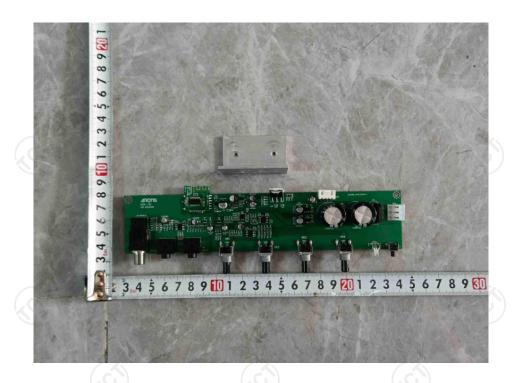


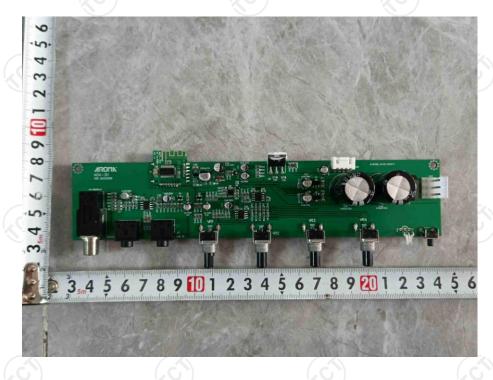




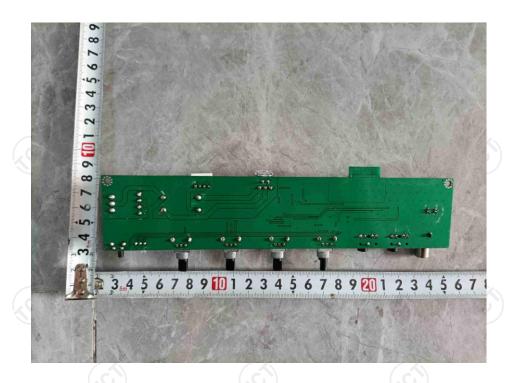














\*\*\*\*\*END OF REPORT\*\*\*\*