

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Report No.: SZEM200500418902 Page: 1 of 70

# TEST REPORT

Application No.:	SZEM2005004189CR
Applicant:	DONGGUAN LINPA ACOUSTIC TECHNOLOGY CO., LTD
Address of Applicant:	2A NO.60, Lizhong Road, Dali, Qingxi Town, Dongguan City, Guangdong Province, China
Manufacturer:	DONGGUAN LINPA ACOUSTIC TECHNOLOGY CO., LTD
Address of Manufacturer:	2A NO.60, Lizhong Road, Dali, Qingxi Town, Dongguan City, Guangdong Province, China
Factory:	DONGGUAN LINPA ACOUSTIC TECHNOLOGY CO., LTD
Address of Factory:	2A NO.60, Lizhong Road, Dali, Qingxi Town, Dongguan City, Guangdong Province, China
Equipment Under Test (EUT	):
EUT Name:	Bluetooth Wireless Earbuds
Model No.:	Linpa T03, Linpa ANC003, TWS003 🛛 🐥
*	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
FCC ID:	2AKZ8-TWS003
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2020-05-25
Date of Test:	2020-06-04 to 2020-07-09
Date of Issue:	2020-07-29
Test Result:	Pass*

\* In the configuration tested, the EUT complied with the standards specified above.

Keny. XN

Keny Xu EMC Laboratory Manager



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	Revision Record					
Version	Chapter	Date	Modifier	Remark		
01		2020-07-29		Original		

Authorized for issue by:		
	Bive chen	
	Bill Chen /Project Engineer	
	Evic Fu	
	Eric Fu /Reviewer	



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# 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part						
Item	Standard	Method	Requirement	Result		
Conducted Peak	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Output Power	Subpart C 15.247	Section 7.8.5	C 15.247(b)(1)			
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass		
Carrier Frequencies	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Separation	Subpart C 15.247	Section 7.8.2	C 15.247a(1)			
Hopping Channel	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Number	Subpart C 15.247	Section 7.8.3	C 15.247a(1)(iii)			
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass		
Conducted Band	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Edges Measurement	Subpart C 15.247	Section 7.8.6	C 15.247(d)			
Conducted Spurious	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Emissions	Subpart C 15.247	Section 7.8.8	C 15.247(d)			
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass		
Radiated Spurious	47 CFR Part 15,	ANSI C63.10 (2013)	47 CFR Part 15, Subpart	Pass		
Emissions	Subpart C 15.247	Section 6.4,6.5,6.6	C 15.205 & 15.209			

#### Remark:

Model No.: Linpa T03, Linpa ANC003, TWS003

Only the model Linpa T03 was tested, since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only the color, surface is different.



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#### **General Information** 4

## 4.1 Details of E.U.T.

Charging BOX:Rechargeable battery DC 3.7V 350mAh 1.29Wh(Charger by Type-C)
Left earphone:Rechargeable battery DC 3.7V 45mAh 0.166Wh(Charger by Charging Box)
Right earphone:Rechargeable battery DC 3.7V 45mAh 0.166Wh(Charger by Charging Box)
2402MHz to 2480MHz
V5.0
Frequency Hopping Spread Spectrum(FHSS)
GFSK, Pi/4DQPSK
79
1MHz
Integral
1dBi

#### **Operation Frequency each of channel**

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
2	2404MHz	22	2424MHz	42	2444MHz	62	2464MHz
3	2405MHz	23	2425MHz	43	2445MHz	63	2465MHz
4	2406MHz	24	2426MHz	44	2446MHz	64	2466MHz
5	2407MHz	25	2427MHz	45	2447MHz	65	2467MHz
6	2408MHz	26	2428MHz	46	2448MHz	66	2468MHz
7	2409MHz	27	2429MHz	47	2449MHz	67	2469MHz
8	2410MHz	28	2430MHz	48	2450MHz	68	2470MHz
9	2411MHz	29	2431MHz	49	2451MHz	69	2471MHz
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
12	2414MHz	32	2434MHz	52	2454MHz	72	2474MHz
13	2415MHz	33	2435MHz	53	2455MHz	73	2475MHz
14	2416MHz	34	2436MHz	54	2456MHz	74	2476MHz
15	2417MHz	35	2437MHz	55	2457MHz	75	2477MHz
16	2418MHz	36	2438MHz	56	2458MHz	76	2478MHz
17	2419MHz	37	2439MHz	57	2459MHz	77	2479MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		



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Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Selected Test Channel		
Channel	Frequency	
The lowest channel (CH0)	2402MHz	
The middle channel (C39)	2441MHz	
The highest channel (CH78)	2480MHz	

## 4.2 Description of Support Units

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10 <sup>-8</sup>
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 3%
4	RF conducted power	± 0.75dB
5	RF power density	± 2.84dB
6	Conducted Spurious emissions	± 0.75dB
7	DE Dedicted newer	± 4.5dB (Below 1GHz)
/	RF Radiated power	± 4.8dB (Above 1GHz)
0	Dedicted Courieus emission test	± 4.5dB (Below 1GHz)
8	Radiated Spurious emission test	± 4.8dB (Above 1GHz)
9	Temperature test	± 1 ℃
10	Humidity test	± 3%
11	Supply voltages	± 1.5%
12	Time	± 3%



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## 4.4 Test Location

All tests were performed at: SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

#### 4.5 Test Facility

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

#### A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

#### • VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

#### • FCC – Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

#### Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None



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#### **Equipment List** 5

RF Conducted						
Equipment Manufacturer		Model No	Inventory No	Cal Date	Cal Due Date	
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12	
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23	
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2020-09-23	
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2019-07-11	2020-07-10	
				2020-07-10	2021-07-09	
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	N/A	N/A	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2020-09-23	
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2020-09-23	
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27	

Radiated Emissions which fall in the restricted bands					
Equipment Manufacture		Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Capyial Cable	SGS	N/A	SEM026-01	2019-07-11	2020-07-10
Coaxial Cable	565	N/A	SEIVI026-01	2020-07-10	2021-07-09
EXA Spectrum Analyzer AgilentTechnologies		N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna Rohde & Schwarz		HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna Schwarzbeck		BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier	e-Amplifier Compliance Directions Systems Inc.		SEM004-11	2019-09-24	2020-09-23
Pre-amplifier Rohde & Schwarz		CH14-H052	SEM005-17	2020-04-01	2021-03-31
Pre-amplifier Compliance Directions Systems Inc.		PAP-2640-50	SEM005-08	2020-04-01	2021-03-31
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2020-09-23
Active Loop Antenna ETS-Lindgren		6502	SEM003-08	2017-08-22	2020-08-21



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Radiated Spurious Emissions						
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date	
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12	
EXA Signal Analyzer (10Hz-44GHz)	Agilent Technologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08	
BiConiLog Antenna	ETC Lindaron	21420	SEM002.01	2017-06-27	2020-06-26	
(26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2020-06-26	2023-06-25	
Horn Antenna (800MHz-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12	
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2019-09-24	2020-09-23	
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2020-09-23	
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A	
Capyiel Cable	000	N/A	SEM026-01	2019-07-11	2020-07-10	
Coaxial Cable	SGS			2020-07-10	2021-07-09	

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
Chamber			SEIVIOUT-UT	2017-00-05	2020-06-04
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-15	2019-12-16	2020-12-15
(3Hz-3.6GHz)	KETSIGHT	N9038A	SEIVI004-15	2019-12-16	
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
(26-3000MHz)				2020-06-26	2023-06-25
Pre-amplifier	Agilent	8447D	SEM005-01	2020-04-01	2021-03-31
(0.1-1300MHz)	Technologies			2020-04-01	2021-03-31
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2019-07-11	2020-07-10
				2020-07-10	2021-07-09



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General used equipmen	t				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2019-09-26	2020-09-25
Humidity/ Temperature Indicator Shanghai Meteorological Industry Factory		ZJ1-2B	SEM002-04	2019-09-26	2020-09-25
Humidity/ Temperature Indicator Mingle		N/A	SEM002-08	2019-09-26	2020-09-25
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06



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# 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

#### 6.1.2 Conclusion

#### Standard Requirement:

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(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -1.96dBi.

Antenna location: Refer to internal photo.



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# 6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

#### 6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

#### 6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1): According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

Number of shift register stages: 9

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

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

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g): According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h): According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.



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# 7 Radio Spectrum Matter Test Results

## 7.1 Conducted Peak Output Power

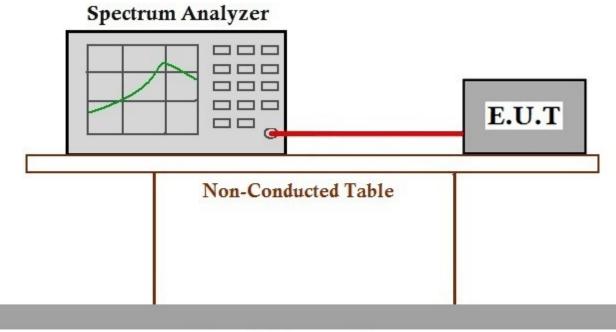
Test Requirement	47 CFR Part 15, Subpart C 15.247(b)(1)
Test Method:	ANSI C63.10 (2013) Section 7.8.5
Limit:	≤20.97dBm

## 7.1.1 E.U.T. Operation

Operating Environment:

Temperature:	28.1 °C	Humidity:	52.6 % RH	Atmospheric Pressure:	1005	mbar
Test mode	modulation, Pi/	4DQPSK m		nuously transmitting mod les have been tested and		

#### 7.1.2 Test Setup Diagram



# **Ground Reference Plane**

## 7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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## 7.2 20dB Bandwidth

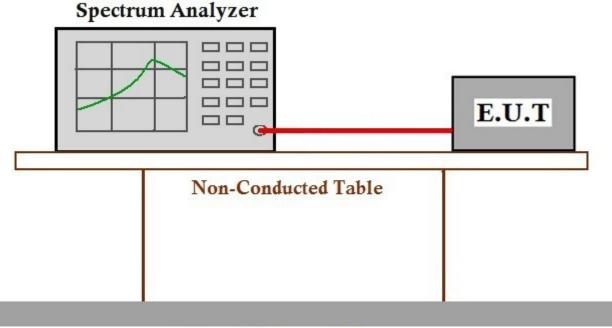
Test Requirement47 CFR Part 15, Subpart C 15.247(a)(1)Test Method:ANSI C63.10 (2013) Section 7.8.7

#### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: Test mode 28.1 °C Humidity: 52.6 % RH Atmospheric Pressure: 1005 mbar b:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.2.2 Test Setup Diagram



# **Ground Reference Plane**

## 7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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## 7.3 Carrier Frequencies Separation

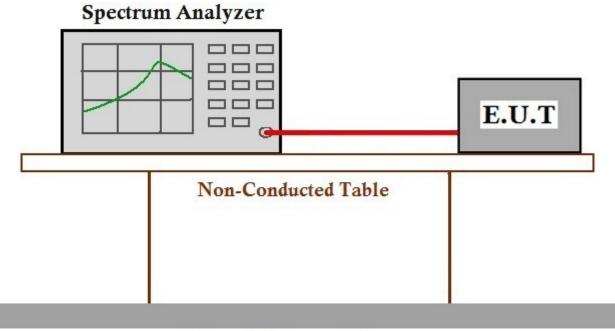
Test Requirement	47 CFR Part 15, Subpart C 15.247a(1)
Test Method:	ANSI C63.10 (2013) Section 7.8.2
Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature:28.1 °CHumidity:52.6 % RHAtmospheric Pressure:1005mbarTest modea:TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK<br/>modulation, Pi/4DQPSK modulation. All modes have been tested and only the<br/>data of worst case is recorded in the report.

### 7.3.2 Test Setup Diagram



# **Ground Reference Plane**

## 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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# 7.4 Hopping Channel Number

Test Requirement	47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method:	ANSI C63.10 (2013) Section 7.8.3
Limit:	

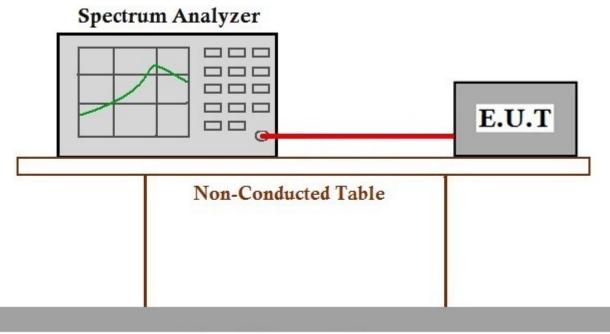
Frequency range(MHz)	Number of hopping channels (minimum)
000.000	50 for 20dB bandwidth <250kHz
902-928	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

### 7.4.1 E.U.T. Operation

**Operating Environment:** 

Temperature: 28.1 °C Atmospheric Pressure: 1005 mbar Humidity: 52.6 % RH Test mode a:TX Hop mode Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.4.2 Test Setup Diagram



# Ground Reference Plane

## 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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## 7.5 Dwell Time

Test Requirement47 CFR Part 15, Subpart C 15.247a(1)(iii)Test Method:ANSI C63.10 (2013) Section 7.8.4Limit:Limit:

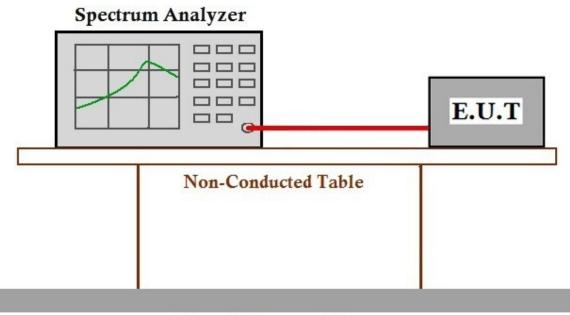
Frequency(MHz)	Limit		
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)		
902-928	0.4S within a 10S period(20dB bandwidth≥250kHz)		
0400 0400 5	0.4S within a period of 0.4S multiplied by the number		
2400-2483.5	of hopping channels		
5725-5850	0.4S within a 30S period		

#### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature:28.1 °CHumidity:52.6 % RHAtmospheric Pressure:1005mbarTest modea:TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK<br/>modulation, Pi/4DQPSK modulation. All modes have been tested and only the<br/>data of worst case is recorded in the report.a:TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK<br/>modulation, Pi/4DQPSK modulation. All modes have been tested and only the

### 7.5.2 Test Setup Diagram



# **Ground Reference Plane**

#### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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# 7.6 Conducted Band Edges Measurement

Test Requirement Test Method: Limit:

47 CFR Part 15, Subpart C 15.247(d) ANSI C63.10 (2013) Section 7.8.6

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)



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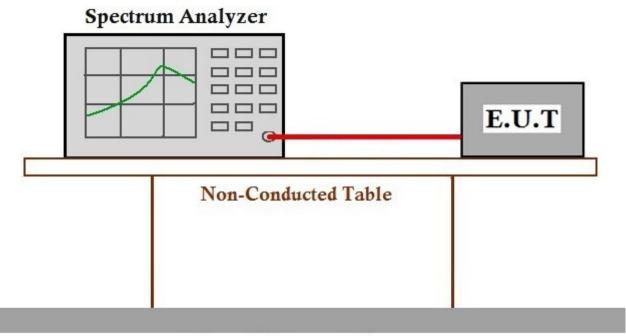
#### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature:28.1 °CHumidity:52.8 % RHAtmospheric Pressure:1005mbarTest mode:a:TX\_Hop mode\_Keep the EUT in frequency hopping mode with GFSK<br/>modulation, Pi/4DQPSK modulation. All modes have been tested and only the<br/>data of worst case is recorded in the report.

b:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

#### 7.6.2 Test Setup Diagram



# **Ground Reference Plane**

#### 7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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# 7.7 Conducted Spurious Emissions

Test Requirement
Test Method:
Limit:

47 CFR Part 15, Subpart C 15.247(d) ANSI C63.10 (2013) Section 7.8.8

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)



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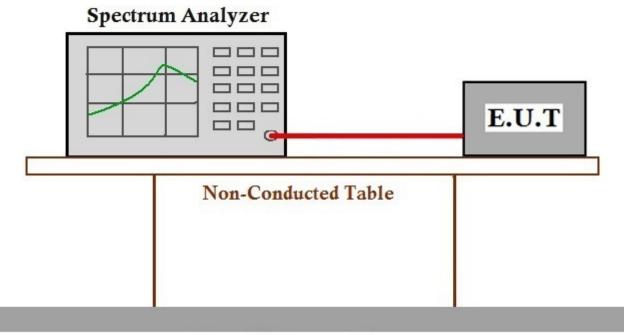
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#### 7.7.1 E.U.T. Operation

**Operating Environment:** 

Temperature:	28.1 °C	Humidity:	52.6 % RH	Atmospheric Pressure:	1005	mbar
Test mode	modulation, Pi/	4DQPSK m		nuously transmitting mod es have been tested and		

#### 7.7.2 Test Setup Diagram



# Ground Reference Plane

#### 7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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# 7.8 Radiated Emissions which fall in the restricted bands

Test Requirement	47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method:	ANSI C63.10 (2013) Section 6.10.5
Measurement Distance:	3m
Limit:	

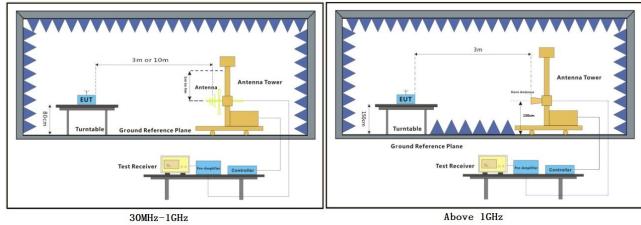
Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.8.1 E.U.T. Operation

Operating Environment:

Temperature:21.9 °CHumidity:61.1 % RHAtmospheric Pressure:1010mbarTest modeb:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK<br/>modulation, Pi/4DQPSK modulation. All modes have been tested and only the<br/>data of worst case is recorded in the report.



#### 7.8.2 Test Setup Diagram



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#### 7.8.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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Center 2.402000000 Res BW 910 kHz Msc Msc Msc Center Freq 2.4020 Center Freq 2.4020 Center Freq 2.4020 Center 2.402000000 Center 2.4020000000 Center 2.40200000000 Center 2.40200000000 Center 2.40200000000 Center 2.4020000000000 Center 2.402000000000 Center 2.402000000000000 Center 2.40200000000000 Center 2.4020000000000000000000000000000000000	VBW wept 5A P DC 00000 GHz PNO; Fast ↔ IBM IBM IBM IBM IBM IBM IBM IBM	SENSE:IM Trig: Free Run #Atten: 40 dB	Ανς '	ALLIGN OFF Type: RMS 2 3 Sweep 1	100.0 ms (* s 10:29:34 PM TRACE TYPE DET SE UNKr2 2.9 2 2 2 2 2 3 3 3 3 4 5 5 0.00 ms (1	Jun 04, 2020 1001 pts) 1001 pts) 1001 pts) Jun 04, 2020 1001 pts) Jun 04, 2020 1002 pts) 1002 pt	2 c Frequency Auto Tur 2.40200000 G Start Fr 2.40200000 G Stop Fr 2.402000000 G Stop Fr 3.000 G Stop Fr 3.0000000 G Stop Fr 3.0000000 G Stop Fr 3.0000000 G Stop Fr 3.0000000 G Stop Fr 3.00000000 G Stop Fr 3.00000000 G Stop Fr 3.0000000000 G Stop Fr 3.000000000 M Stop Fr 3.000000000 M Stop Fr 3.0000000000 M Stop Fr 3.000000000 M Stop Fr 3.000000000 M Stop Fr 3.00000000 M Stop Fr 3.00000000 M Stop Fr 3.000000000 M Stop Fr 3.000000000 M Stop Fr 3.000000000 M Stop Fr 3.0000000000 M Stop Fr 3.000000000000000000000000000000000000	eq Hz Hz Hz Hz
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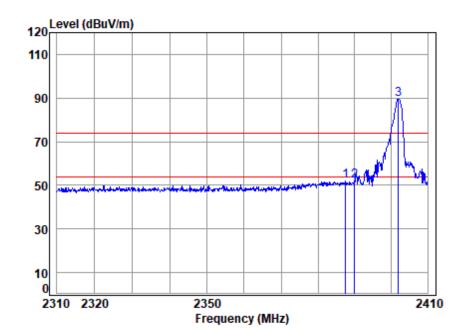
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Report No.: SZEM200500418902 Page: 26 of 70

Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Job No	ion: 3m	HORIZ L89CR							
Note	: DI	C-11-	A	D	Deed			0	
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
_									
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 2	2387.534	4.34	28.51	40.97	60.34	52.22	74.00	-21.78	peak
2 2	2390.000	4.34	28.52	40.97	60.11	52.00	74.00	-22.00	peak
3 * 2	2402.000	4.36	28.54	40.98	97.47	89.39	74.00	15.39	peak



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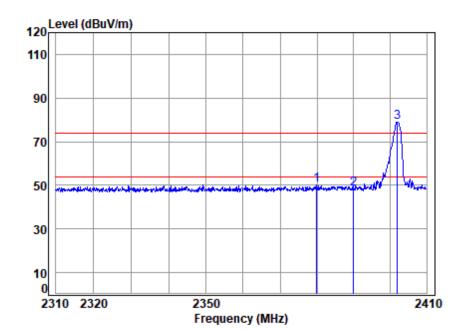
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Report No.: SZEM200500418902 Page: 27 of 70

Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Site Conditio Job No Mode Note	n: 3m : 041	VERTI L89CR							
Note	: DI	C-1-1-	A	D	Deed		1224	0	
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 237	9.957	4.33	28.50	40.97	58.40	50.26	74.00	-23.74	peak
2 239	0.000	4.34	28.52	40.97	56.64	48.53	74.00	-25.47	peak
3 * 240				40.98					



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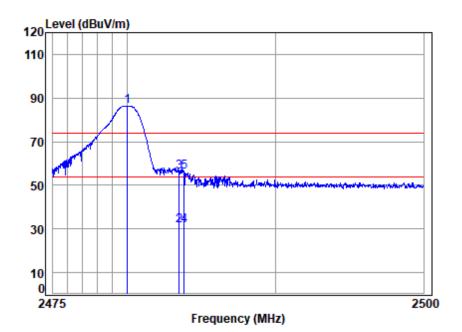
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Report No.: SZEM200500418902 Page: 28 of 70

Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Site	: ch	amber							
Condition: 3m HORIZONTAL									
Job N	lo : 04	189CR							
Mode	: 24	80 Ban	d edge						
Note	: BT								
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
-									
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
	MHz	dB	dB/m			-			
1 *		dB 4.49	dB/m	dB	dBuV 94.30	-	dBuV/m		peak
1 * 2					94.30	86.45	74.00	12.45	peak Average
-	2480.000	4.49	28.67	41.01	94.30 39.17	86.45 31.32	74.00	12.45	Average
2	2480.000 2483.500	4.49 4.49	28.67 28.67 28.67	41.01 41.01 41.01	94.30 39.17 63.82	86.45 31.32 55.97	74.00 54.00 74.00	12.45 -22.68 -18.03	Average
2 3	2480.000 2483.500 2483.500	4.49 4.49 4.49	28.67 28.67 28.67	41.01 41.01 41.01	94.30 39.17 63.82 39.53	86.45 31.32 55.97 31.68	74.00 54.00 74.00	12.45 -22.68 -18.03 -22.32	Average peak Average



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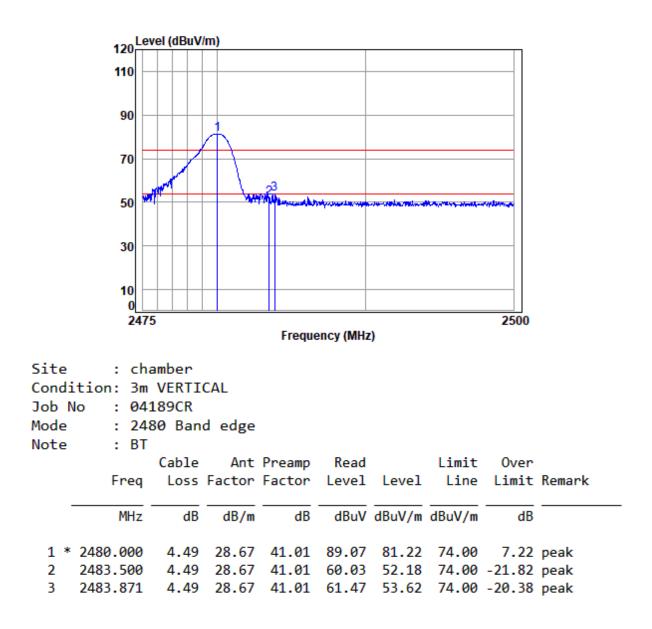
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Report No.: SZEM200500418902 Page: 29 of 70

Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:High





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## 7.9 Radiated Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method:	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance:	3m
Limit:	

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



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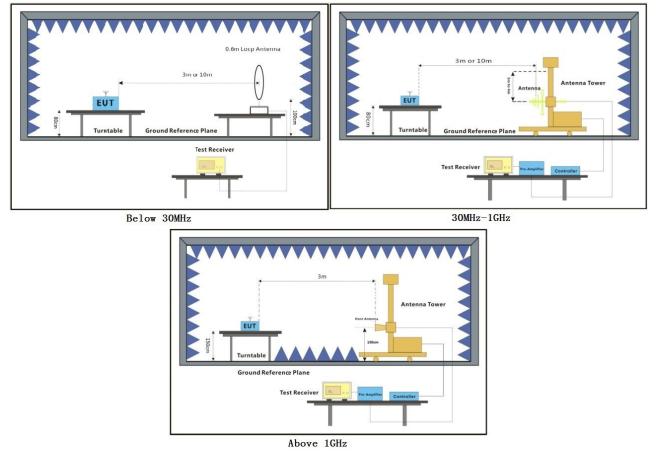
Report No.: SZEM200500418902 Page: 31 of 70

#### 7.9.1 E.U.T. Operation

**Operating Environment:** 

Temperature:23.6 °CHumidity:58.8 % RHAtmospheric Pressure:1010mbarTest modeb:TX\_non-Hop mode\_Keep the EUT in continuously transmitting mode with GFSK<br/>modulation, Pi/4DQPSK. All modes have been tested and only the data of worst<br/>case is recorded in the report.

#### 7.9.2 Test Setup Diagram





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#### 7.9.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

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

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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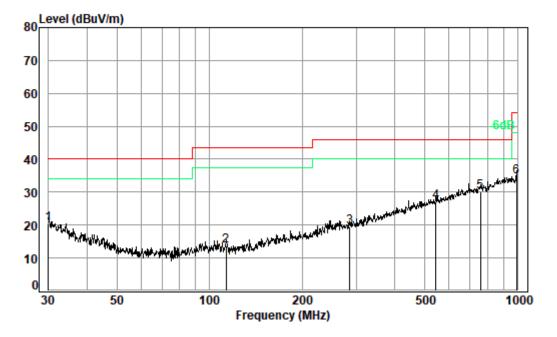
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# SGS-CSTC Standards Technical Services Co., Ltd. **Shenzhen Branch**

Report No.: SZEM200500418902 Page: 33 of 70

QP Mode:b; Polarization:Horizontal



Condition: 3m HORIZONTAL Job No. : 04189CR Test Mode: b

	Freq			Preamp Factor					Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.00	0.60	22.50	27.73	24.90	20.27	40.00	-19.73	QP
2	113.32	1.24	13.38	27.55	26.56	13.63	43.50	-29.87	QP
3	285.98	1.84	19.04	26.92	25.43	19.39	46.00	-26.61	QP
4	543.27	2.65	25.51	27.99	26.78	26.95	46.00	-19.05	QP
5 pp	758.04	3.08	28.26	27.80	26.64	30.18	46.00	-15.82	QP
6	993.01	3.69	30.27	26.94	27.54	34.56	54.00	-19.44	QP



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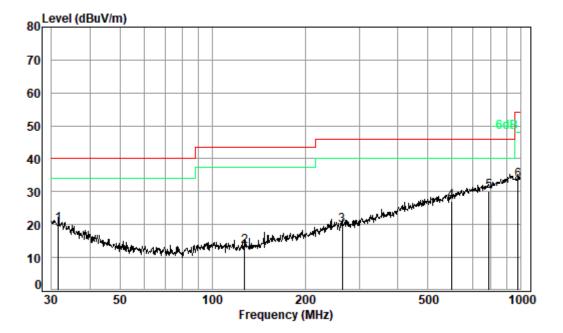
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# SGS-CSTC Standards Technical Services Co., Ltd. **Shenzhen Branch**

Report No.: SZEM200500418902 Page: 34 of 70

Mode:b; Polarization:Vertical



Condition: 3m VERTICAL Job No. : 04189CR Test Mode: b

	-			Preamp					
	Freq	LOSS	Factor	Factor	Level	Level	Line	Limit	Kemark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	31.62	0.60	21.59	27.73	25.65	20.11	40.00	-19.89	QP
2	127.22	1.27	13.33	27.48	26.15	13.27	43.50	-30.23	QP
3	263.82	1.74	19.04	26.98	25.89	19.69	46.00	-26.31	QP
4	597.22	2.70	26.55	28.16	26.10	27.19	46.00	-18.81	QP
5 pp	790.62	3.18	28.45	27.74	26.37	30.26	46.00	-15.74	QP
6	982.62	3.68	30.22	26.97	26.40	33.33	54.00	-20.67	QP



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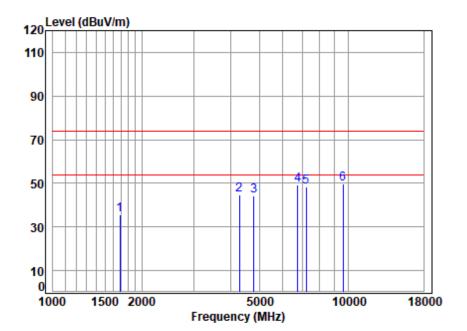
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Above 1G Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Site :	chamber
Condition:	3m HORIZONTAL
Job No :	04189CR
Mode :	2402 TX RSE
Note :	BT
	Cable Ant

ore									
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1687.347	3.27	26.62	40.62	46.22	35.49	74.00	-38.51	peak
2	4291.977	6.29	33.24	42.39	47.76	44.90	74.00	-29.10	peak
3	4804.000	6.80	33.97	42.77	46.24	44.24	74.00	-29.76	peak
4	6737.207	8.21	35.75	41.82	47.23	49.37	74.00	-24.63	peak
5	7206.000	8.44	36.07	41.58	45.63	48.56	74.00	-25.44	peak
6	9608.000	9.17	37.67	38.57	41.56	49.83	74.00	-24.17	peak



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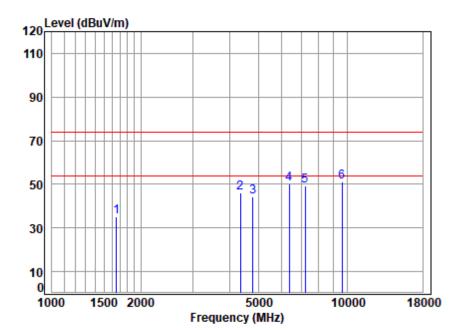
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Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Site	: ch	amber							
Condi	ition: 3m	VERTI	CAL						
Job N	No : 04	189CR							
Mode	: 24	02 TX	RSE						
Note	: BT								
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
						-			
1	MHz 1653.550	dB 3.15				-	dBuV/m		peak
1 2				40.60		35.07		-38.93	
-	1653.550	3.15	26.48	40.60 42.44	46.04	35.07 45.88	74.00	-38.93 -28.12	peak
2	1653.550 4354.454	3.15 6.51 6.80	26.48 33.35	40.60 42.44 42.77	46.04 48.46 46.37	35.07 45.88 44.37	74.00 74.00	-38.93 -28.12 -29.63	peak peak



43.03 51.30

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9.17 37.67 38.57

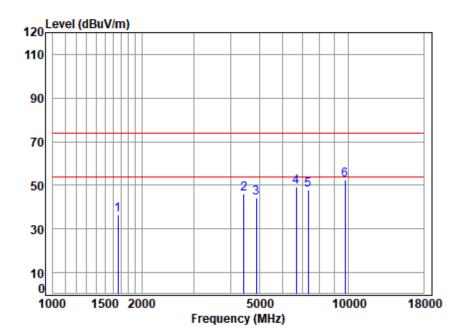
74.00 -22.70 peak

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Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



Site :	chamber
Condition:	3m HORIZONTAL
Job No :	04189CR
Mode :	2441 TX RSE
Note :	BT
	Cable Ant

		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
_									
1	1663.137	3.18	26.52	40.61	47.61	36.70	74.00	-37.30	peak
2	4430.628	6.59	33.48	42.50	48.61	46.18	74.00	-27.82	peak
3	4882.000	7.03	34.06	42.82	46.11	44.38	74.00	-29.62	peak
4	6659.763	8.21	35.70	41.86	47.05	49.10	74.00	-24.90	peak
5	7323.000	8.36	36.16	41.52	44.80	47.80	74.00	-26.20	peak
6	9764.000	9.30	37.76	38.34	43.54	52.26	74.00	-21.74	peak





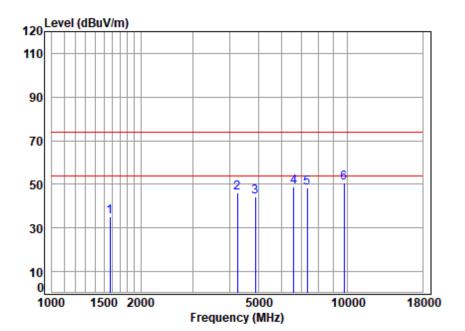
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Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



Site Cond: Job I Mode Note	ition: 3m No : 042 : 244	amber VERTI 189CR 41 TX							
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1574.265	2.96	26.14	40.55	46.81	35.36	74.00	-38.64	peak
2	4242.641	6.20	33.15	42.35	48.96	45.96	74.00	-28.04	peak
3	4882.000	7.03	34.06	42.82	46.03	44.30	74.00	-29.70	peak
4	6583.209	7.90	35.65	41.91	47.38	49.02	74.00	-24.98	peak
5	7323.000	8.36	36.16	41.52	45.48	48.48	74.00	-25.52	peak
6	9764.000	9.30	37.76	38.34	41.97	50.69	74.00	-23.31	peak



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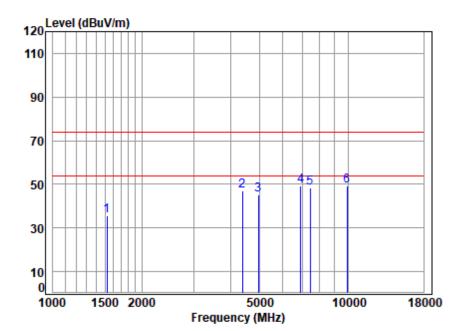
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Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Site :	chamber
Condition:	3m HORIZONTAL
Job No :	04189CR
Mode :	2480 TX RSE
Note :	BT
	Cable Ant

occ									
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1525.000	2.98	25.91	40.52	47.02	35.39	74.00	-38.61	peak
2	4392.376	6.66	33.42	42.47	49.20	46.81	74.00	-27.19	peak
3	4960.000	7.02	34.15	42.87	46.88	45.18	74.00	-28.82	peak
4	6914.763	7.83	35.85	41.73	47.13	49.08	74.00	-24.92	peak
5	7440.000	8.10	36.25	41.46	45.51	48.40	74.00	-25.60	peak
6	9920.000	8.96	37.85	38.12	40.45	49.14	74.00	-24.86	peak
									-



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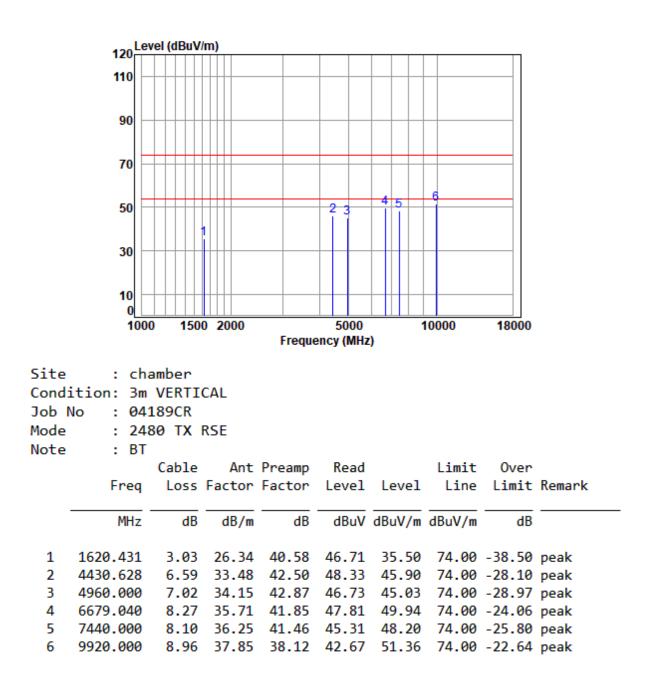
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Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:High





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#### 8 **Photographs**

#### 8.1 **Test Setup**

Please refer to setup photos.

### 8.2 EUT Constructional Details (EUT Photos)

Please Refer to external and internal photos for details.



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#### **Appendix** 9

9.1 Appendix 15.247

### 1. Bandwidth

#### 1.1 Test Result

Test Mode	Frequency	TV Turne	ANT No.	20dB Bandwidth	Verdict	
	(MHz) TX Type		ANT NO.	Test Result (MHz)	Verdict	
GFSK	2402	SISO	1	0.805	PASS	
	2441	SISO	1	0.806	PASS	
	2480	SISO	1	0.808	PASS	
	2402	SISO	1	1.218	PASS	
Pi/4DQPSK	2441	SISO	1	1.215	PASS	
	2480	SISO	1	1.223	PASS	

Test Mode	Frequency	TV Tupo	ANT No.	99% Occupied Bandwidth Test Result (MHz)			
Test Mode	(MHz)	ТХ Туре	ANT NO.				
	2402	SISO	1	0.812	Only for Report Use		
GFSK	2441 SISO		1	0.809	Only for Report Use		
	2480	SISO	1	0.810	Only for Report Use		
	2402	SISO	1	1.166	Only for Report Use		
Pi/4DQPSK	2441	SISO	1	1.166	Only for Report Use		
	2480	SISO	1	1.166	Only for Report Use		

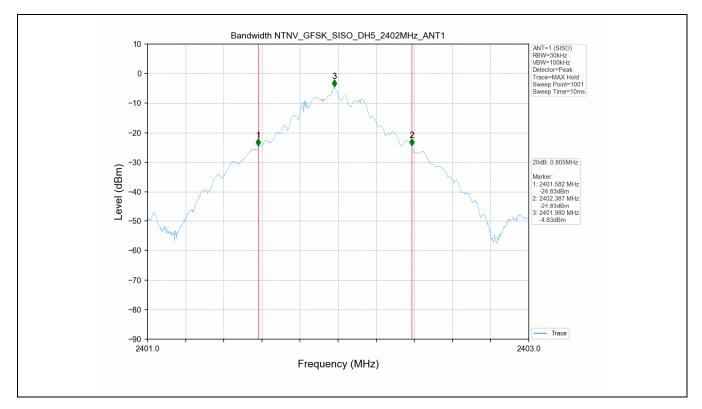


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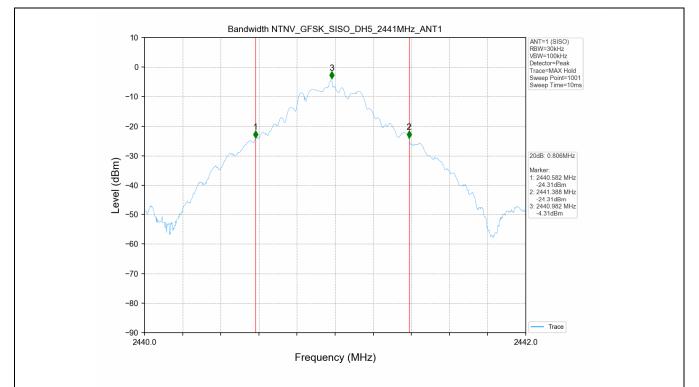
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#### 1.2 Test Graph - 20dB Bandwidth





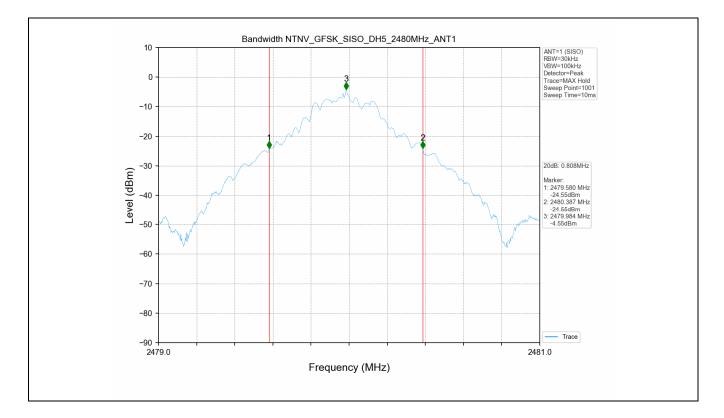
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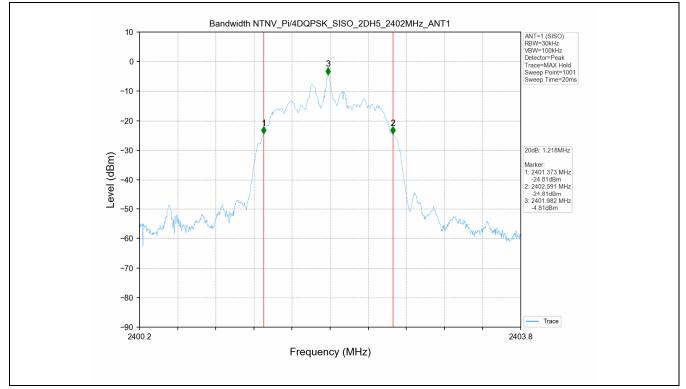
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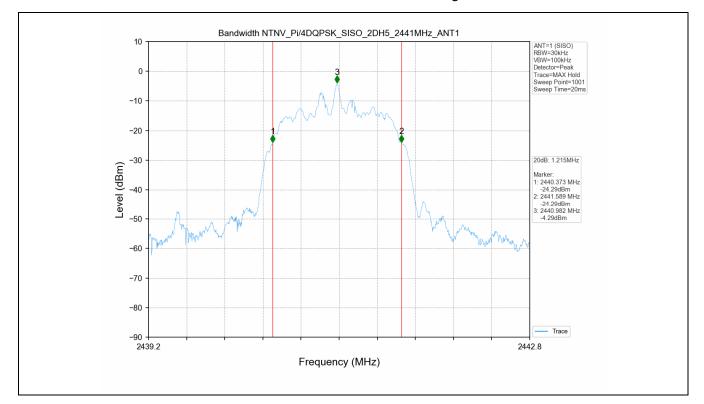
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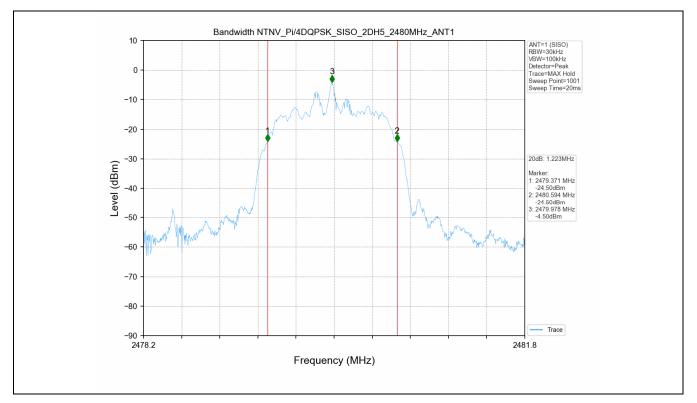


Shenzhen B

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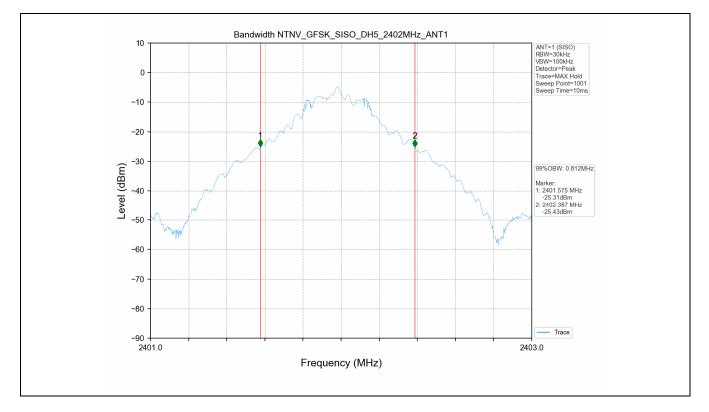




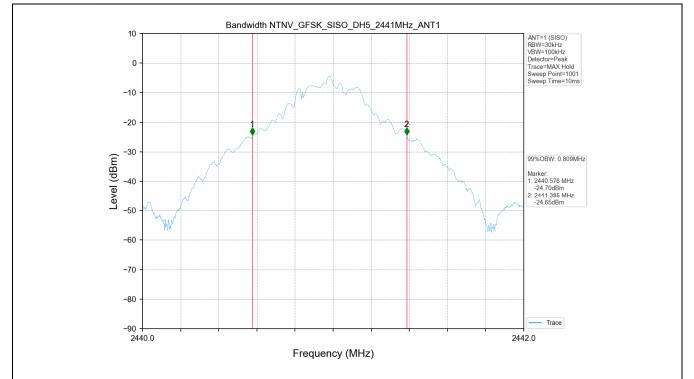




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#### 1.3 Test Graph - 99% Occupied Bandwidth





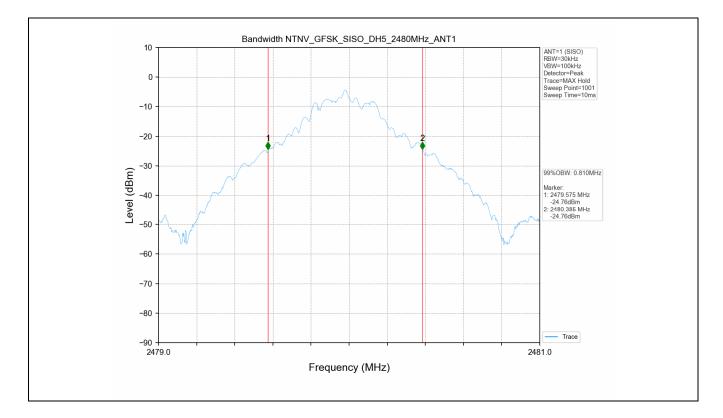
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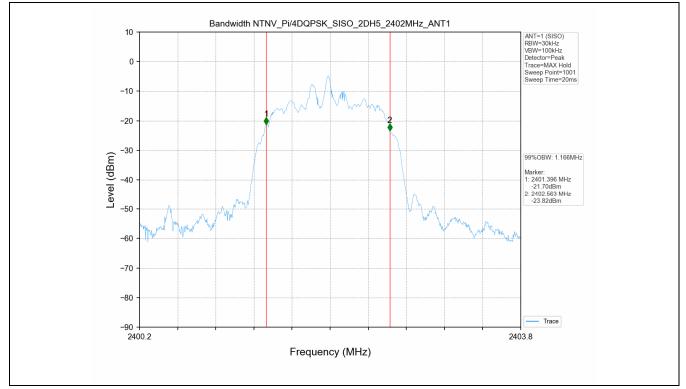
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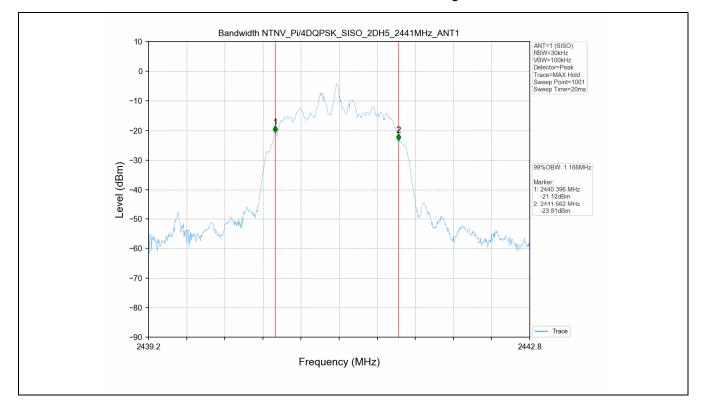
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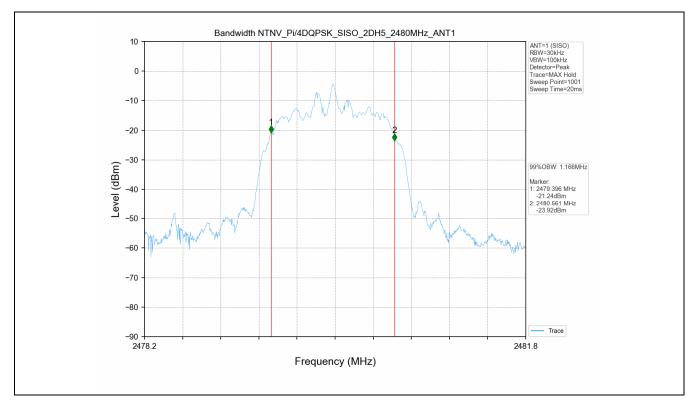
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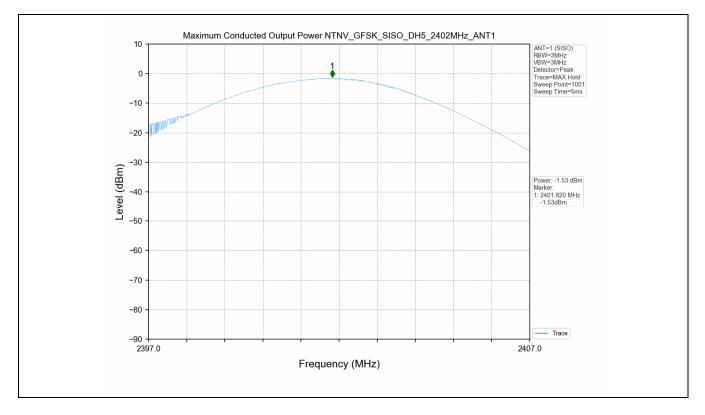
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### 2. Maximum Conducted Output Power

#### 2.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Measured Peak Output Power (dBm)	Limits (dBm)	Verdict
			Ant 1		
	2402	SISO	-1.53	30	PASS
GFSK	2441	SISO	-1.91	30	PASS
	2480	SISO	-2.52	30	PASS
	2402	SISO	-1.37	30	PASS
Pi/4DQPSK	2441	SISO	-1.70	30	PASS
	2480	SISO	-2.27	30	PASS

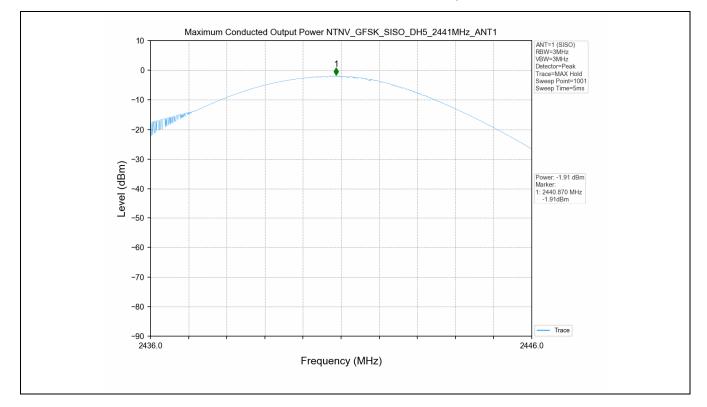
#### 2.2 Test Graph

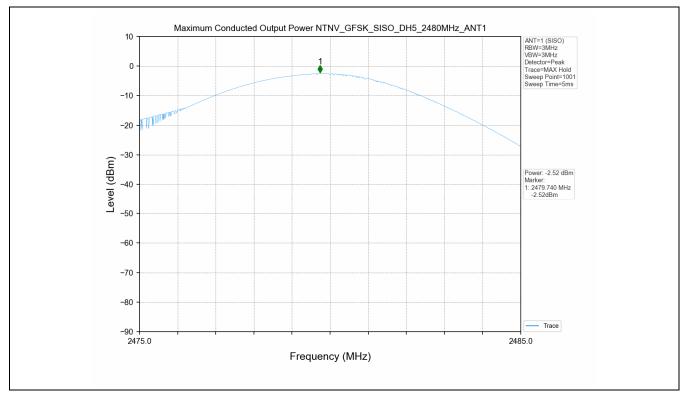






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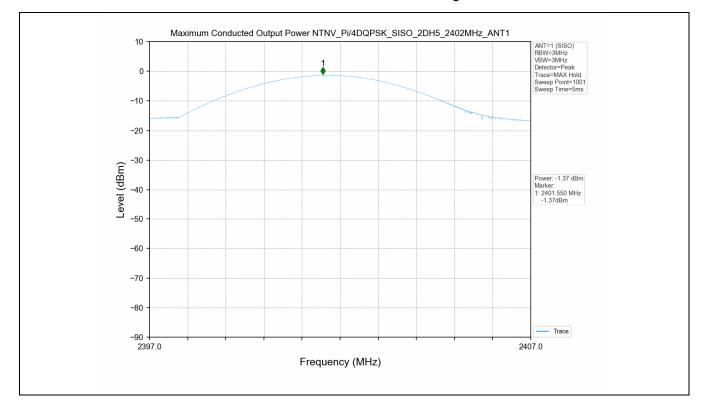
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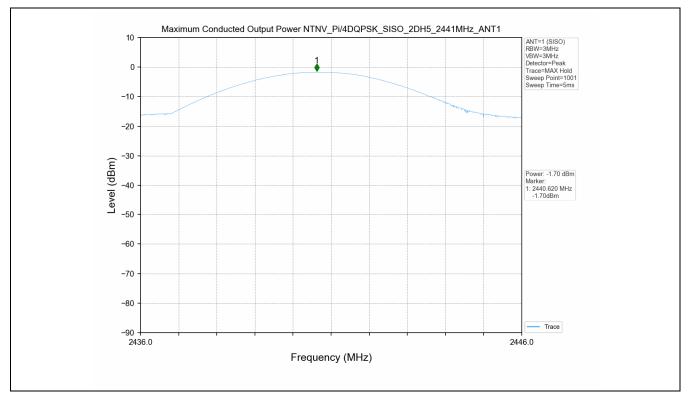
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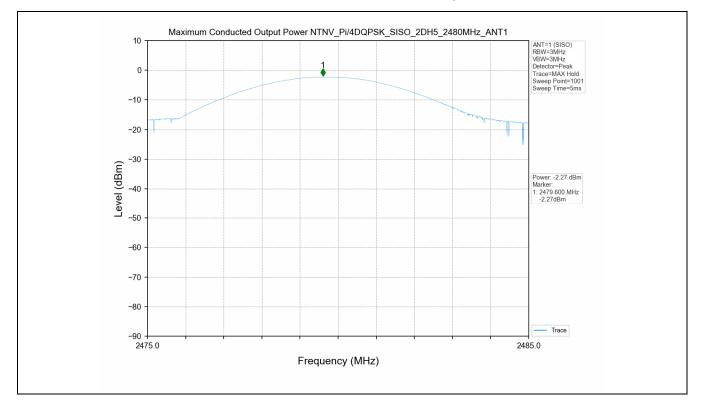
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### 3. Carrier frequency separation

#### 3.1 Test Result

Test Mode	ТХ Туре	ANT No.	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limits (MHz)	Verdict
GFSK	SISO	1	1.000	0.922	≥0.922	PASS
Pi/4DQPSK	SISO	1	1.026	1.223	≥0.815	PASS



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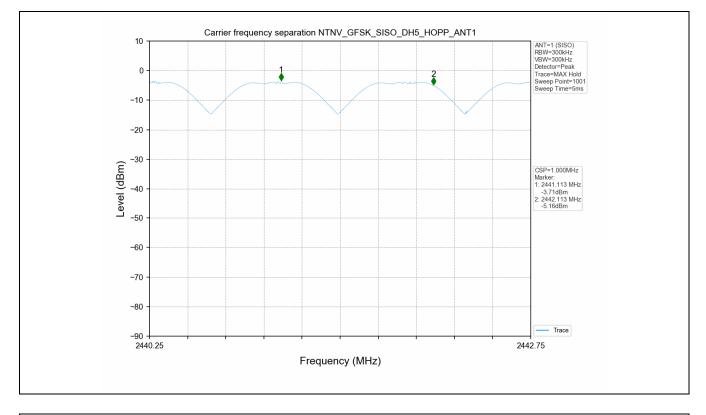
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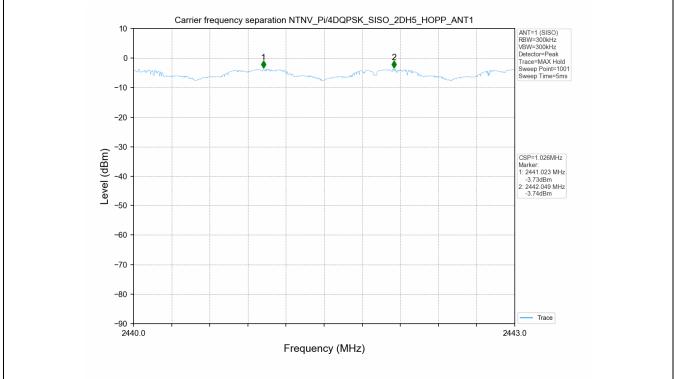
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#### 3.2 Test Graph





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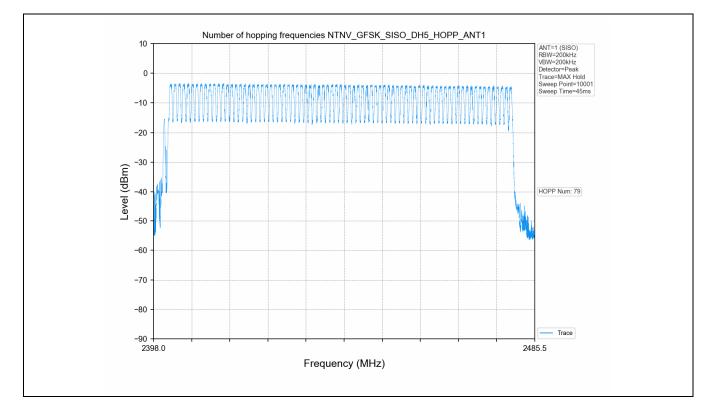
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### 4. Number of hopping frequencies

#### 4.1 Test Result

	Test Mode	ТХ Туре	ANT No.	Num of Hopping Frequencies	Limits	Verdict
ſ	GFSK	SISO	1	79	≥15	PASS
	Pi/4DQPSK	SISO	1	79	≥15	PASS

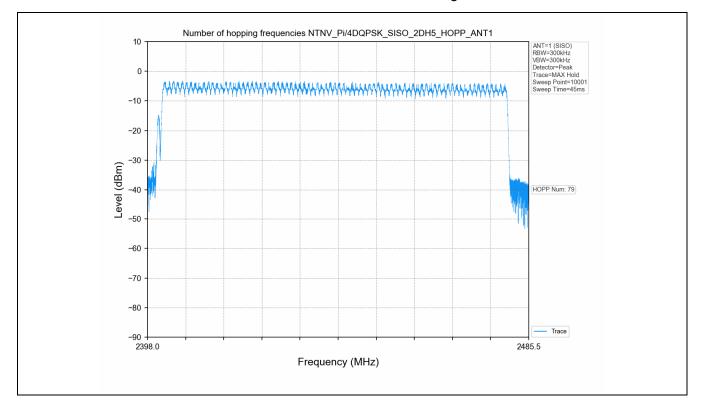
#### 4.2 Test Graph







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### 5. Time of Occupancy (Dwell Time)

#### 5.1 Test Result

Test Mode	Packet Type	ТХ Туре	ANT No.	Duration of Single Pulse (ms)	ation Period	Num of Pulse in Observation Period	Dwell Time (ms)	Limits (ms)	Verdict
	DH1	SISO	1	0.426	31.6	315	134.190	≤400	PASS
GFSK	DH3	SISO	1	1.679	31.6	168	282.072	≤400	PASS
	DH5	SISO	1	2.927	31.6	107	313.189	≤400	PASS
	2DH1	SISO	1	0.435	31.6	319	138.765	≤400	PASS
Pi/4DQ PSK	2DH3	SISO	1	1.688	31.6	161	271.768	≤400	PASS
	2DH5	SISO	1	2.935	31.6	90	264.150	≤400	PASS



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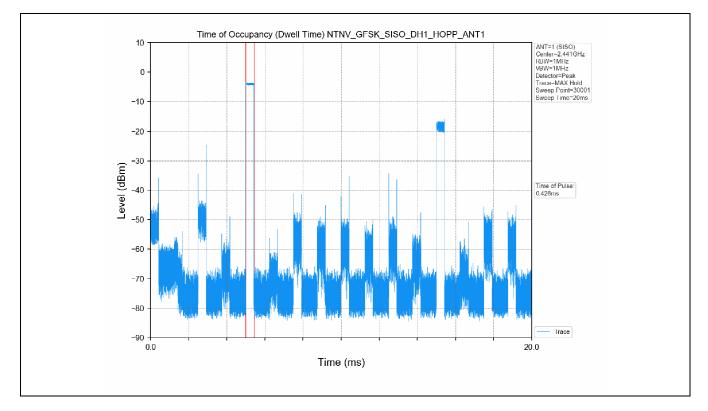
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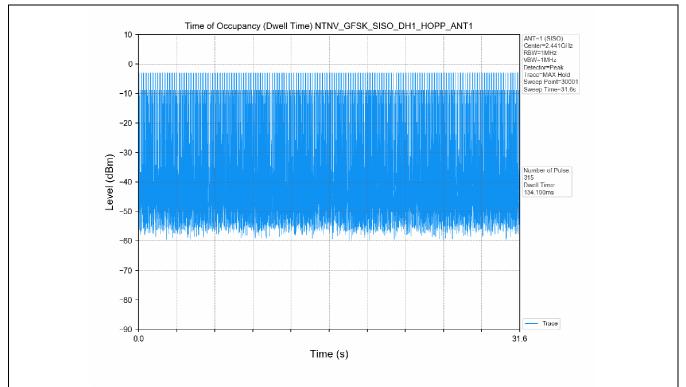
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#### 5.2 Test Graph





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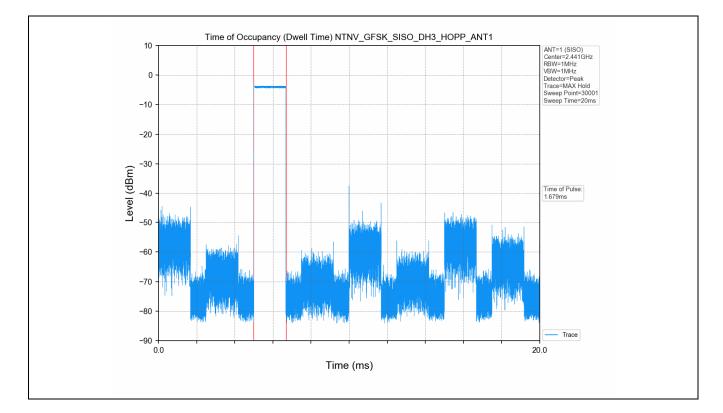
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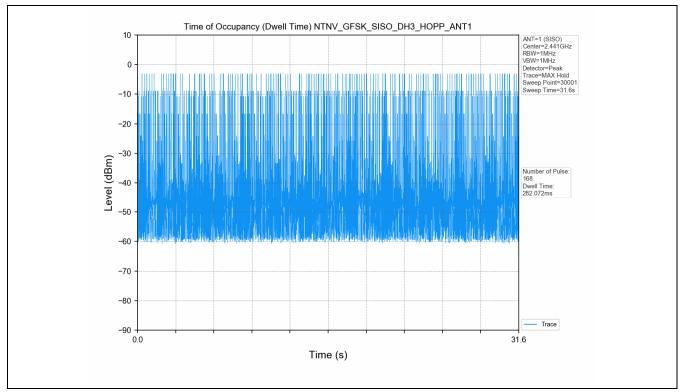
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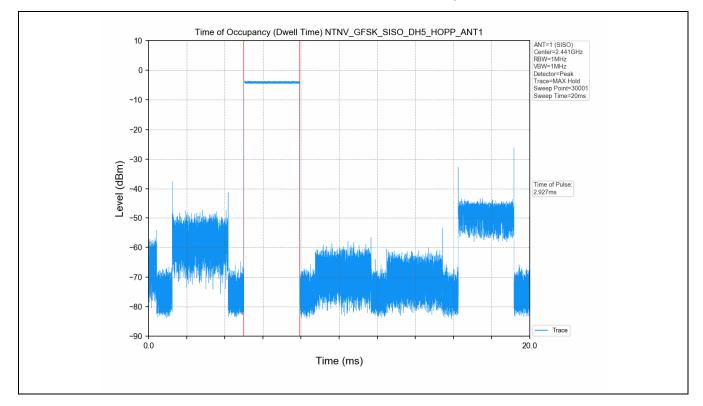


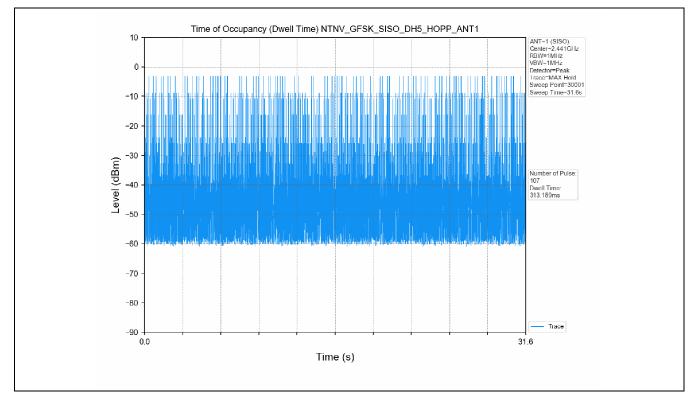
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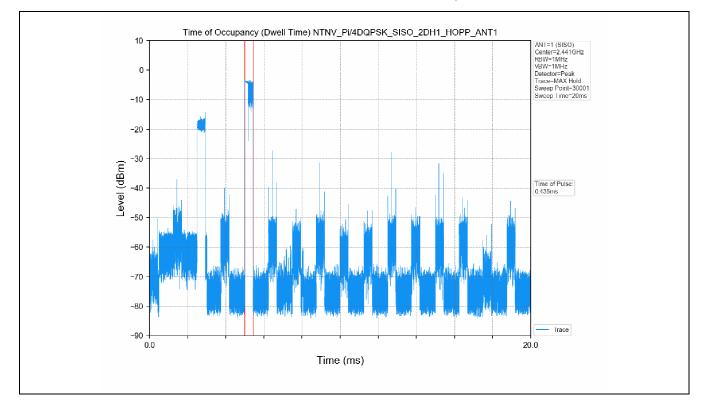


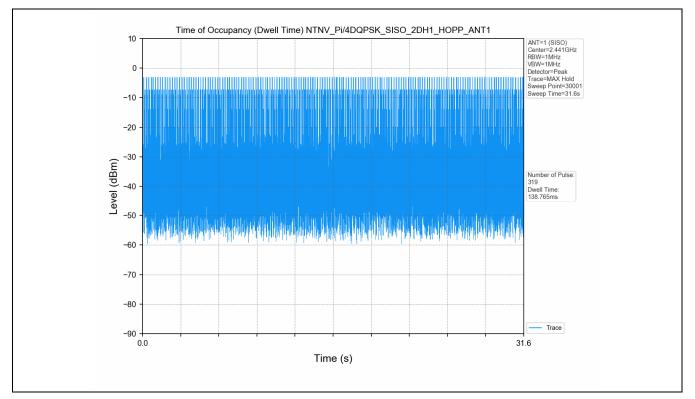






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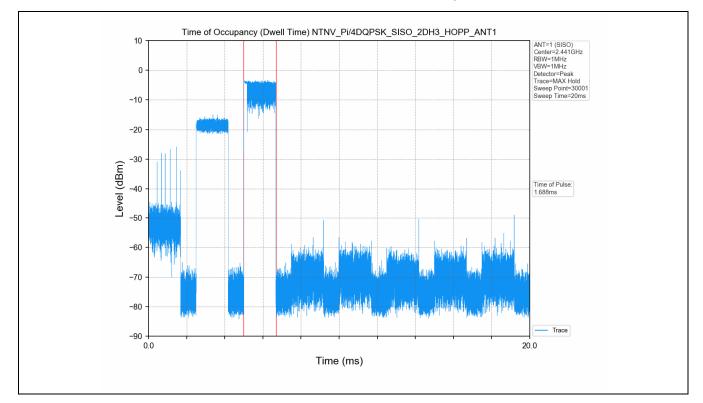


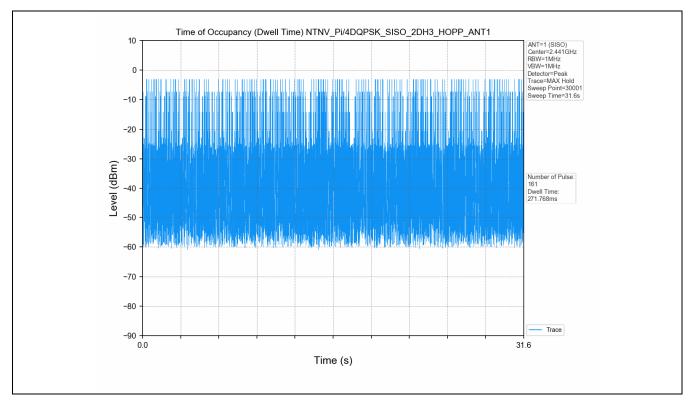
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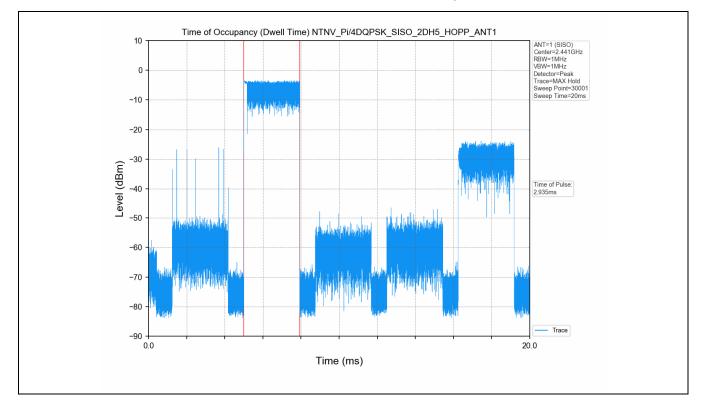


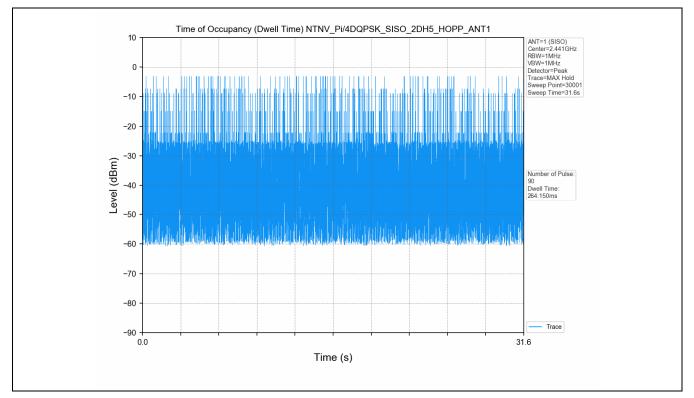






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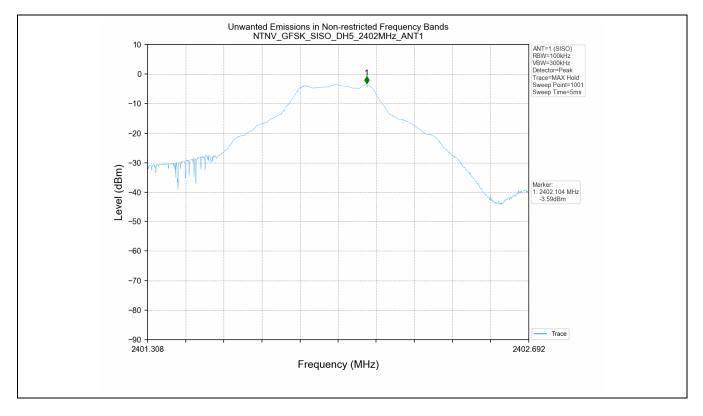
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#### 6. Unwanted Emissions in Non-restricted Frequency Bands

#### 6.1 Test Result

Test Mode	Frequency (MHz)	ТХ Туре	ANT No.	Spurious Conducted Emission (dBm)	Limits (dBm)	Verdict
GFSK	2402	SISO	1	Refer to test graph	-23.59	PASS
	2441	SISO	1	Refer to test graph	-23.59	PASS
	2480	SISO	1	Refer to test graph	-23.59	PASS
	Hopping	SISO	1	Refer to test graph	-23.59	PASS
Pi/4DQPSK	2402	SISO	1	Refer to test graph	-23.77	PASS
	2441	SISO	1	Refer to test graph	-23.77	PASS
	2480	SISO	1	Refer to test graph	-23.77	PASS
	Hopping	SISO	1	Refer to test graph	-23.77	PASS

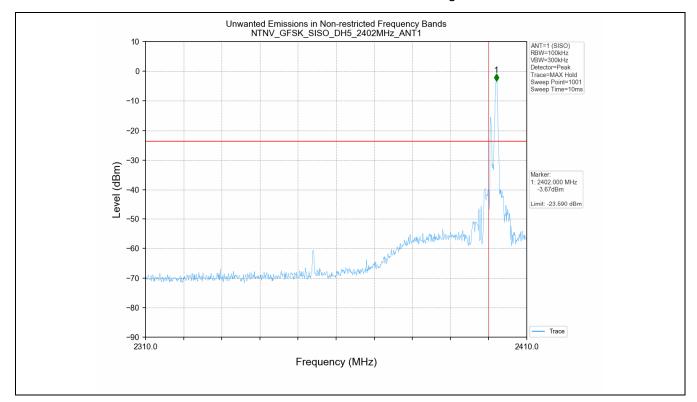
#### 6.2 Test Graph

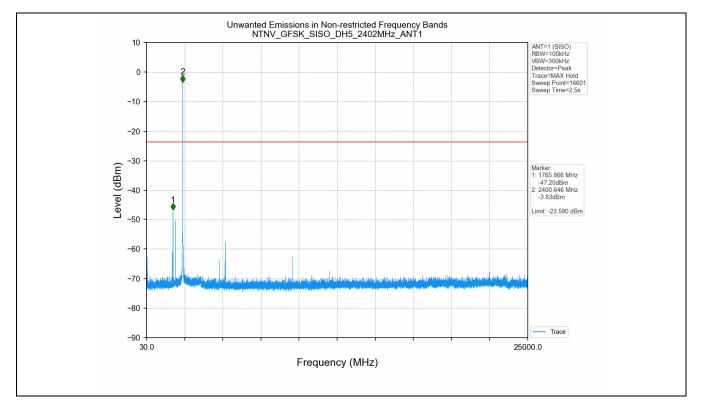






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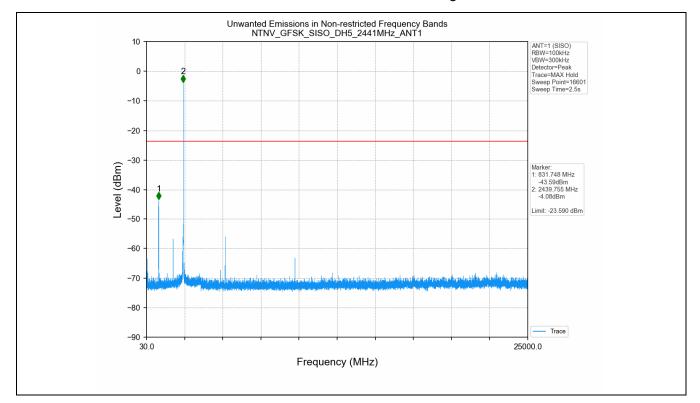
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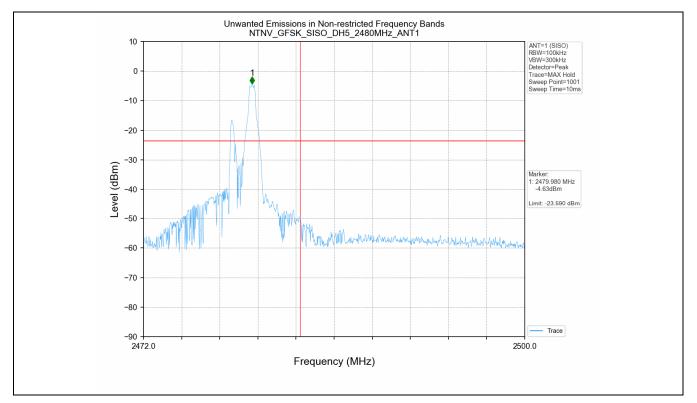
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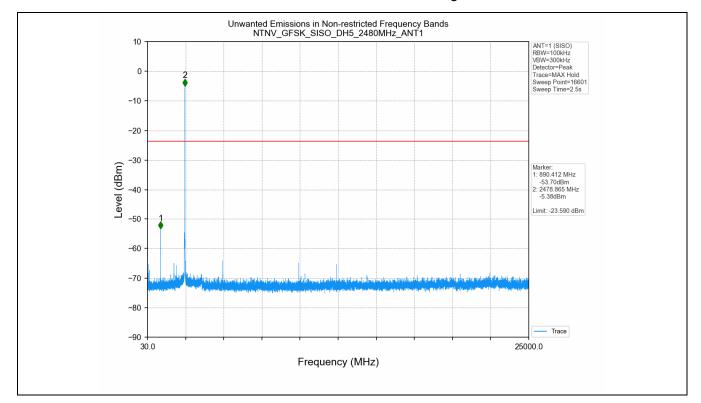
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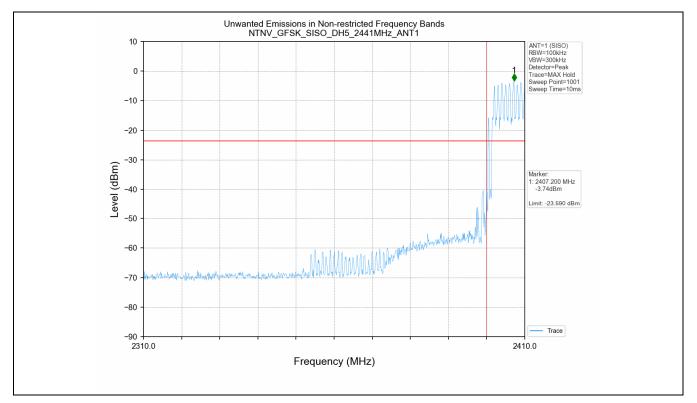
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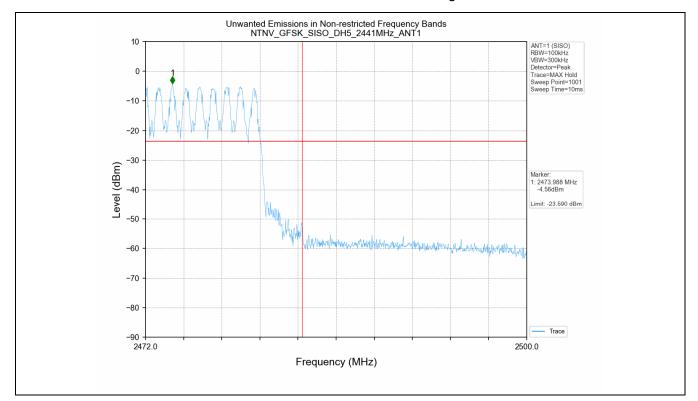
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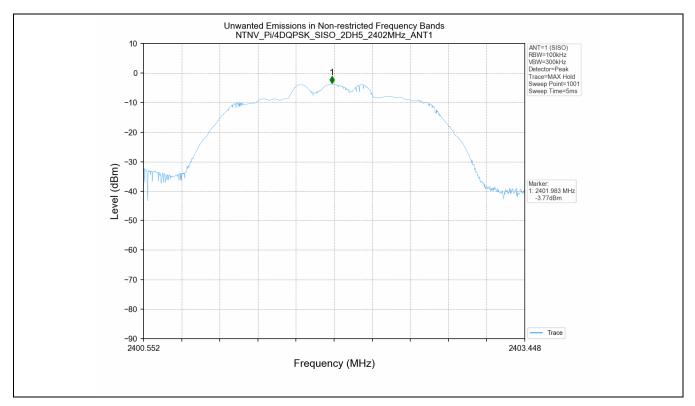
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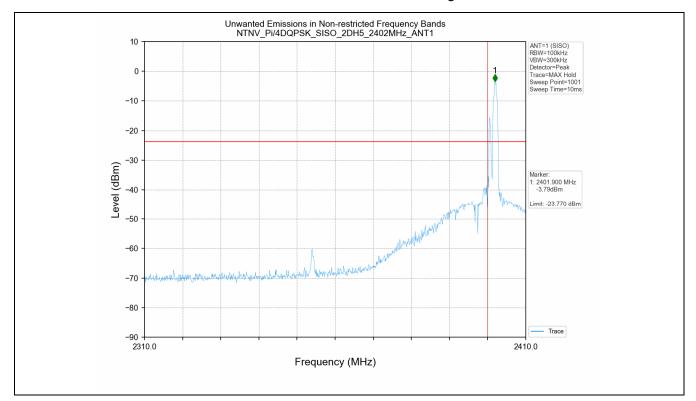


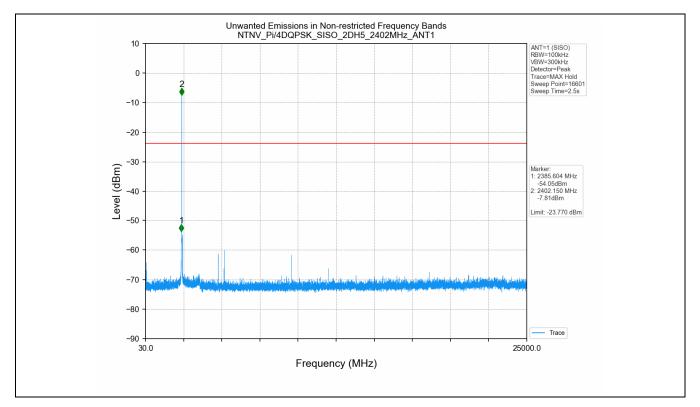






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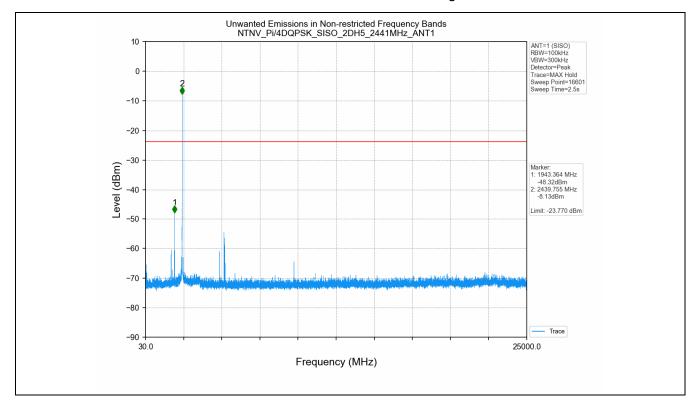
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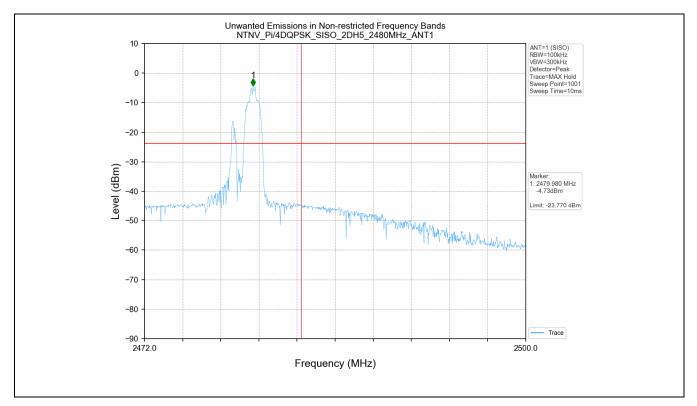


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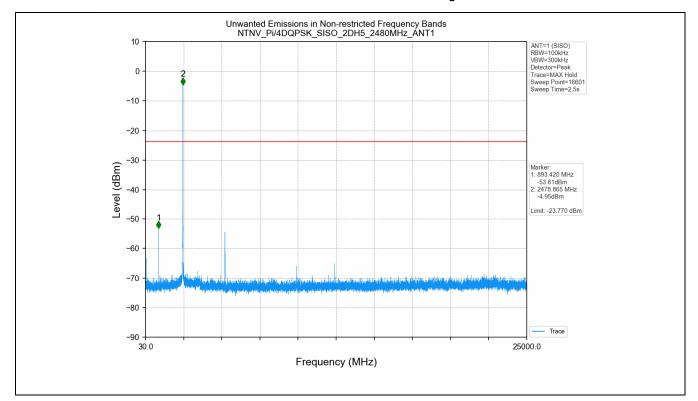
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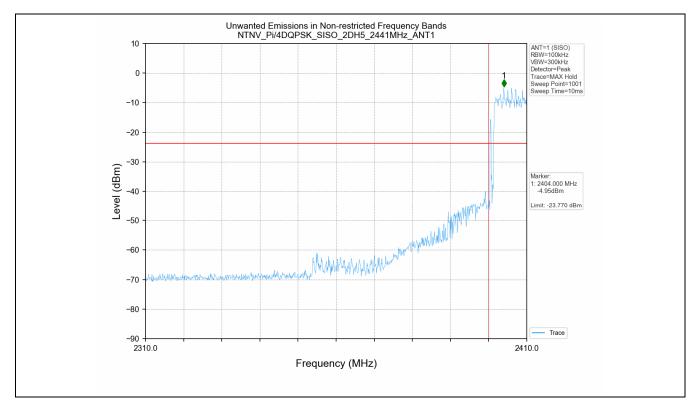
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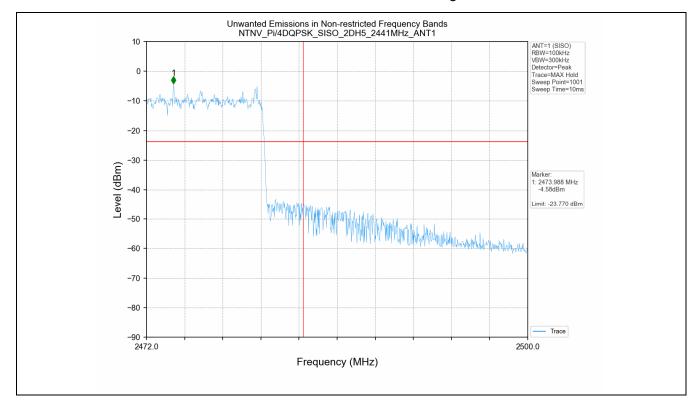








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