

Report No.: SZEM210200203602

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## TEST REPORT

Application No.: SZEM2102002036CR

Applicant: Shenzhen DO Intelligent Technology Co., Ltd.

Address of Applicant: 11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua

District, Shenzhen, China

Manufacturer: Shenzhen DO Intelligent Technology Co., Ltd.

Address of Manufacturer: 11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua

District, Shenzhen, China

Factory: Shenzhen DO Intelligent Technology Co., Ltd.

Address of Factory: 11th Floor, 3# Building, Guole Tech Park, Lirong Road, Dalang, Longhua

District, Shenzhen, China

**Equipment Under Test (EUT):** 

EUT Name: Smart Watch
Model No.: GT01-A
Trade Mark: IDO

FCC ID: 2AHFT380

Standard(s): 47 CFR Part 15, Subpart C 15.247

**Date of Receipt:** 2021-02-24

**Date of Test:** 2021-03-02 to 2021-03-09

**Date of Issue:** 2021-03-11

Test Result: Pass\*

Keny Xu EMC Laboratory Manager



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<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



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Revision Record						
Version Chapter Date Modifier Remark						
01		2021-03-11		Original		

Authorized for issue by:		
	Bim chen	
	Bill Chen/Project Engineer	_
	EvicFu	
	Eric Fu/Reviewer	_



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## **Test Summary**

Radio Spectrum Technical Requirement						
Item Standard Method Requirement Resul						
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		

Radio Spectrum Matter Part						
Item	Standard	Method	Requirement	Result		
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass		
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass		
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass		
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass		
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass		
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 Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass		



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#### **General Information**

#### 4.1 Details of E.U.T.

Power supply:	Rechargeable battery DC 3.8V 300mAh(Charging by USB)
Cable(s):	USB cable:62cm unshielded
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 LE
Modulation Type:	GFSK
Sample Type:	Portable production
Number of Channels:	40
Channel Spacing:	2MHz
Data rate:	1M/bits
Antenna Type:	Monopole
Antenna Gain:	-1.93dBi

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

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
2	2406MHz	12	2426MHz	22	2446MHz	32	2466MHz
3	2408MHz	13	2428MHz	23	2448MHz	33	2468MHz
4	2410MHz	14	2430MHz	24	2450MHz	34	2470MHz
5	2412MHz	15	2432MHz	25	2452MHz	35	2472MHz
6	2414MHz	16	2434MHz	26	2454MHz	36	2474MHz
7	2416MHz	17	2436MHz	27	2456MHz	37	2476MHz
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz



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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 (C19)	2440MHz			
The highest channel (CH39)	2480MHz			

#### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.			
The EUT has been tested as an independent unit.						

#### 4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 2.84dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Radiated Emissions which fall in the restricted bands	± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz)
Radiated Spurious Emissions	± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz)

#### Remark:

The Ulab (lab Uncertainty) is less than Ucispr (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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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**

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	FSU43	SEM004-08	2020-04-01	2021-03-31	
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020-09-23	2021-09-22	
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09	
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2020-05-21	2021-05-20	

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No Cal I		Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
EXA Signal Analyzer	Agilent Technologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2020-09-23	2021-09-22
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020-07-10	2021-07-09
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2020-11-14	2023-11-13
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31



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Radiated Spurious Emissions					
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	Agilent Technologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2020-09-23	2021-09-22
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020-07-10	2021-07-09
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2020-11-14	2023-11-13
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI receiver(3Hz- 3.6GHz)	KEYSIGHT	N9038A	SEM004-15	2020-11-02	2021-11-01
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-02	2019-05-24	2022-05-23
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	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	2020-07-10	2021-07-09

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2020-09-15	2021-09-14
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2020-09-15	2021-09-14
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)

Limit:

#### 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 -1.93dBi.

Antenna location: Refer to Internal photos.





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#### **Radio Spectrum Matter Test Results** 7

#### 7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3) Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
	1 for ≥50 hopping channels
902-928	0.25 for 25≤ hopping channels <50
	1 for digital modulation
	1 for ≥75 non-overlapping hopping channels
2400-2483.5	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850 1 for frequency hopping systems and digital modulati	

#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20.0 °C Humidity: 63.1 % RH Atmospheric Pressure: 1010 mbar

#### 7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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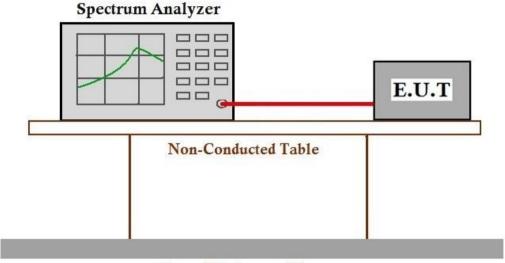
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#### 7.1.3 Test Setup Diagram



Ground Reference Plane

#### 7.1.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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#### 7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit:

≥500 kHz

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

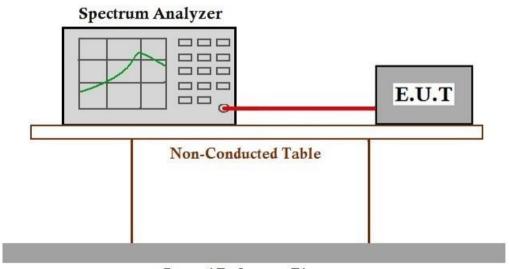
Operating Environment:

Temperature: 20.0 °C Humidity: 63.1 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description	
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.	1

#### 7.2.3 Test Setup Diagram



**Ground Reference Plane** 

#### 7.2.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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#### 7.3 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)
Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit:

≤8dBm in any 3 kHz band during any time interval of continuous transmission

#### 7.3.1 E.U.T. Operation

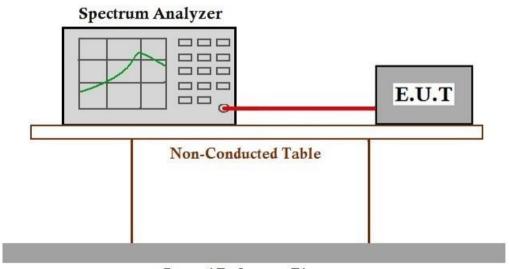
Operating Environment:

Temperature: 20.0 °C Humidity: 63.1 % RH Atmospheric Pressure: 1010 mbar

#### 7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

#### 7.3.3 Test Setup Diagram



Ground Reference Plane

#### 7.3.4 Measurement Procedure and Data

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#### 7.4 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d) Test Method: ANSI C63.10 (2013) Section 11.13.3.2

Limit:

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

#### 7.4.1 E.U.T. Operation

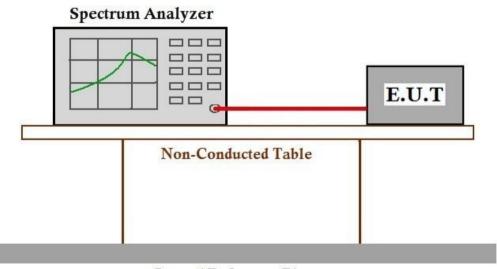
Operating Environment:

Temperature: 20.0 °C Humidity: 63.1 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

#### 7.4.3 Test Setup Diagram



Ground Reference Plane



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#### 7.4.4 Measurement Procedure and Data

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#### 7.5 Conducted Spurious Emissions

47 CFR Part 15, Subpart C 15.247(d) Test Requirement ANSI C63.10 (2013) Section 11.11 Test Method:

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in \$15,209(a) (see \$15,205(c).

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

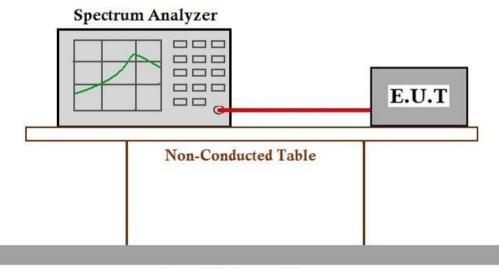
Operating Environment:

Temperature: 20.0 °C Humidity: 63.1 % RH Atmospheric Pressure: 1010 mbar

#### 7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description			
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.			

#### 7.5.3 Test Setup Diagram



Ground Reference Plane



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#### 7.5.4 Measurement Procedure and Data

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#### 7.6 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.

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

Operating Environment:

Temperature: 22.6 °C Humidity: 52.1 % RH Atmospheric Pressure: 1010 mbar

#### 7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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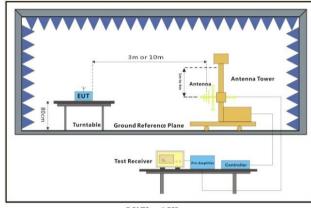
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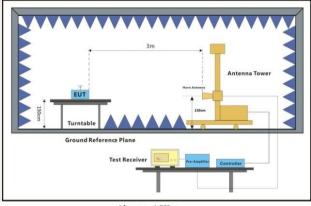


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#### 7.6.3 Test Setup Diagram





30MHz-1GHz

Above 1GHz

#### 7.6.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position
- 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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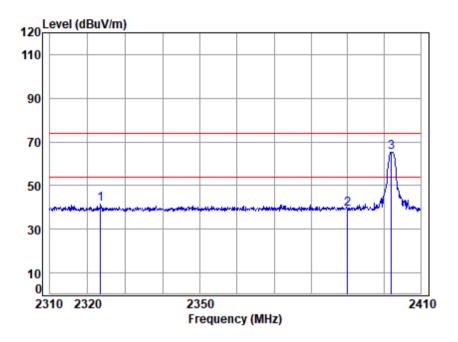
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No : 02036CR

Mode : 2402 Band edge

Note : BLE

		_								
		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	2323.352	4.23	28.40	40.38	49.29	41.54	74.00	-32.46	peak	
2	2390.000	4.34	28.52	40.42	46.75	39.19	74.00	-34.81	peak	
3	2402.000	4.36	28.54	40.43	72.96	65.43	74.00	-8.57	peak	



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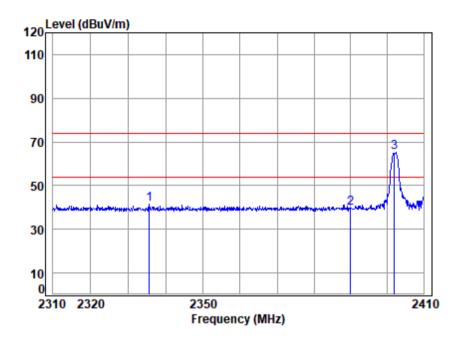
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL Job No : 02036CR

Mode : 2402 Band edge

Note : BLE

		_								
		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	2335.594	4.25	28.43	40.39	49.00	41.29	74.00	-32.71	peak	
2	2390.000	4.34	28.52	40.42	47.03	39.47	74.00	-34.53	peak	
3	2402.000	4.36	28.54	40.43	72.65	65.12	74.00	-8.88	peak	



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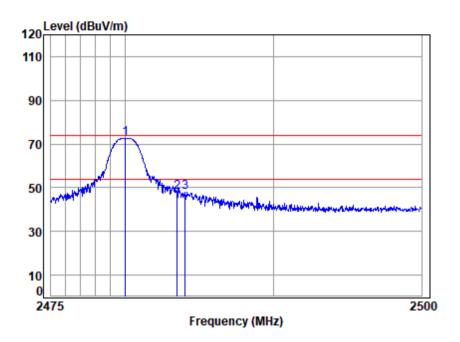
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL

Job No : 02036CR

Mode : 2480 Band edge

Note : BLE

		_								
		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	2480.000	4.49	28.67	40.47	79.87	72.56	74.00	-1.44	peak	
2	2483.500	4.49	28.67	40.47	55.43	48.12	74.00	-25.88	peak	
3	2484.021	4.50	28.67	40.47	55.36	48.06	74.00	-25.94	peak	



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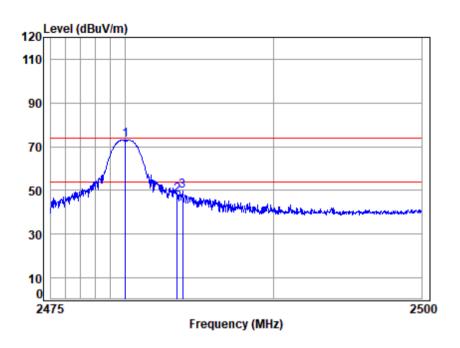
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL Job No : 02036CR

Mode : 2480 Band edge

Note : BLE

		_								
		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	2480.000	4.49	28.67	40.47	80.22	72.91	74.00	-1.09	peak	
2	2483.500	4.49	28.67	40.47	55.23	47.92	74.00	-26.08	peak	
3	2483.846	4.49	28.67	40.47	56.85	49.54	74.00	-24.46	peak	



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#### 7.7 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.

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

Operating Environment:

Temperature: 22.6 °C Humidity: 52.1 % RH Atmospheric Pressure: 1010 mbar

#### 7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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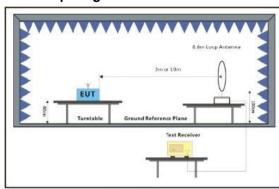
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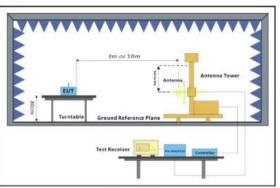


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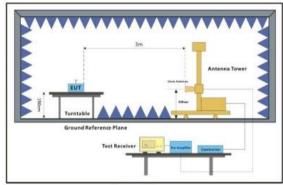
#### 7.7.3 Test Setup Diagram





Below 30MHz

30MHz-1GHz



Above 1GHz



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#### 7.7.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the 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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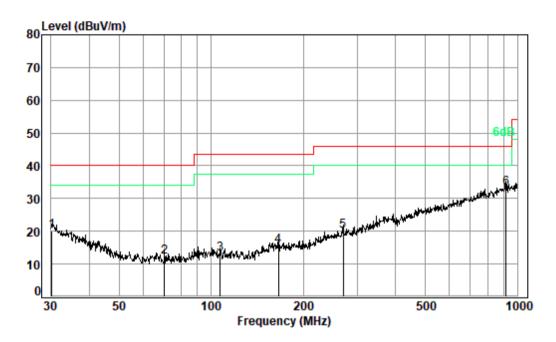


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Below 1GHz

Test Mode: 00; Polarity: Horizontal



Condition: 3m HORIZONTAL

Job No. : 02036CR

Test mode: 00

iest	mode. 00								
		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	30.21	0 60	22 84	27.73	24 37	20 08	40 00	-19 92	ΩP
2				27.65					-
3									_
5	107.13								•
4	166.07	1.17	15.52	27.27	26.19	15.61	43.50	-27.89	QP
5	269.43	1.79	18.57	26.94	26.55	19.97	46.00	-26.03	QP
6 p	p 919.29	3.52	29.19	27.06	27.63	33.28	46.00	-12.72	OP



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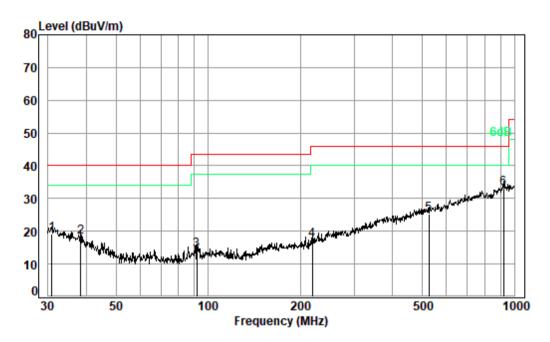


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Test Mode: 00; Polarity: Vertical



Condition: 3m VERTICAL Job No. : 02036CR

Test mode: 00

	Freq			Preamp Factor					Remark
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	——dB	
1	30.85	0.61	22.35	27.73	23.95	19.18	40.00	-20.82	QP
2	38.35	0.69	18.99	27.71	26.26	18.23	40.00	-21.77	QP
3	91.82	1.26	13.46	27.62	27.11	14.21	43.50	-29.29	QP
4	219.08	1.38	16.66	27.08	26.32	17.28	46.00	-28.72	QP
5	526.40	2.56	24.66	27.89	25.94	25.27	46.00	-20.73	QP
6 pp	922.52	3.52	29.20	27.05	27.60	33.27	46.00	-12.73	QP



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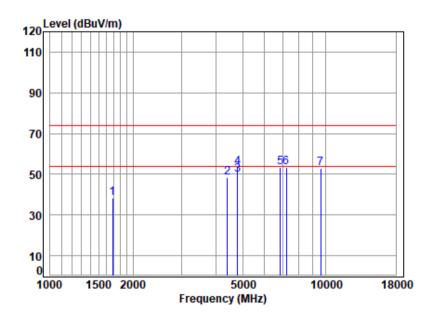


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Above 1GHz

Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

: 02036CR Job No Mode : 2402 TX SE

Note : BLE

		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	3.42	26.62	40.05	48.53	38.52	74.00	-35.48	peak
2	4405.090	6.67	33.44	41.79	50.04	48.36	74.00	-25.64	peak
3	4804.000	7.10	33.97	42.14	50.98	49.91	74.00	-24.09	Average
4	4804.000	7.10	33.97	42.14	54.29	53.22	74.00	-20.78	peak
5	6855.063	8.47	35.82	41.80	50.77	53.26	74.00	-20.74	peak
6	7206.000	8.74	36.07	41.50	50.03	53.34	74.00	-20.66	peak
7	9608.000	10.81	37.67	37.76	42.43	53.15	74.00	-20.85	peak



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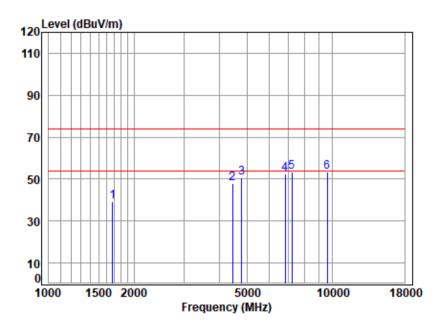
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

Job No : 02036CR Mode : 2402 TX SE

Note : BLE

		_							
		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	1682.477	3.42	26.60	40.05	49.13	39.10	74.00	-34.90	peak
2	4456.315	6.72	33.53	41.84	49.31	47.72	74.00	-26.28	peak
3	4804.000	7.10	33.97	42.14	51.59	50.52	74.00	-23.48	peak
4	6815.551	8.45	35.79	41.82	50.05	52.47	74.00	-21.53	peak
5	7206.000	8.74	36.07	41.50	49.93	53.24	74.00	-20.76	peak
6	9608.000	10.81	37.67	37.76	42.86	53.58	74.00	-20.42	peak



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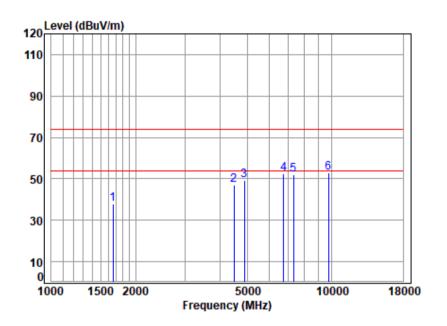
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Site : chamber

Condition: 3m HORIZONTAL

Job No : 02036CR Mode : 2440 TX SE

Note : BLE

		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	1658.337	3.40	26.50	40.04	48.00	37.86	74.00	-36.14	peak
2	4482.150	6.74	33.57	41.86	48.40	46.85	74.00	-27.15	peak
3	4880.000	7.18	34.06	42.20	50.30	49.34	74.00	-24.66	peak
4	6756.708	8.42	35.76	41.86	50.14	52.46	74.00	-21.54	peak
5	7320.000	8.84	36.16	41.40	48.44	52.04	74.00	-21.96	peak
6	9760.000	10.76	37.76	37.50	41.89	52.91	74.00	-21.09	peak



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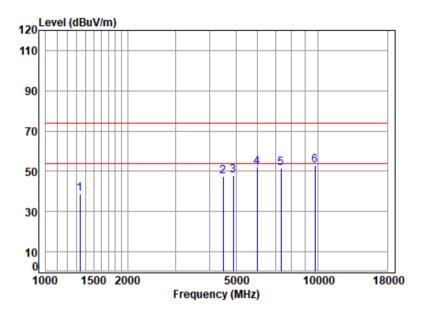
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Site : chamber Condition: 3m VERTICAL Job No : 02036CR Mode : 2440 TX SE

Note : BLE

		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	1335.141	3.00	25.17	39.85	50.66	38.98	74.00	-35.02	peak
2	4495.125	6.76	33.59	41.87	48.89	47.37	74.00	-26.63	peak
3	4880.000	7.18	34.06	42.20	48.66	47.70	74.00	-26.30	peak
4	5984.305	8.26	35.08	42.40	51.13	52.07	74.00	-21.93	peak
5	7320.000	8.84	36.16	41.40	48.14	51.74	74.00	-22.26	peak
6	9760.000	10.76	37.76	37.50	41.78	52.80	74.00	-21.20	peak



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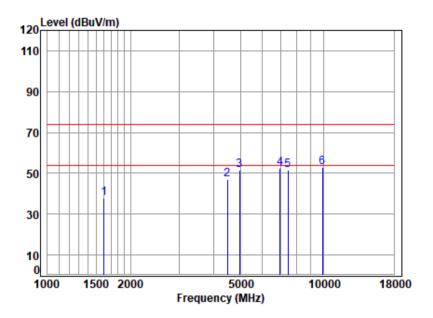
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High



Site : chamber

Condition: 3m HORIZONTAL

Job No : 02036CR Mode : 2480 TX SE

Note : BLE

		_								
		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	1601.804	3.35	26.26	40.01	48.14	37.74	74.00	-36.26	peak	
2	4482.150	6.74	33.57	41.86	48.37	46.82	74.00	-27.18	peak	
3	4960.000	7.26	34.15	42.27	52.32	51.46	74.00	-22.54	peak	
4	6954.852	8.52	35.87	41.73	49.69	52.35	74.00	-21.65	peak	
5	7440.000	8.96	36.25	41.29	47.83	51.75	74.00	-22.25	peak	
6	9920.000	10.71	37.85	37.23	41.74	53.07	74.00	-20.93	peak	



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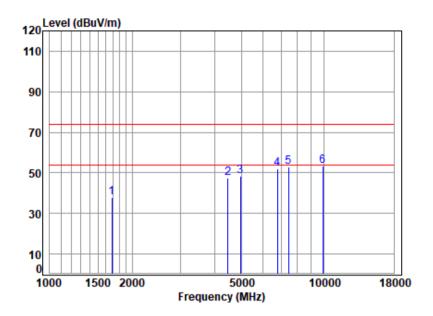
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL Job No : 02036CR Mode : 2480 TX SE

: BLE Note

,,,,		-								
		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	3.42	26.62	40.05	48.08	38.07	74.00	-35.93	peak	
2	4469.214	6.73	33.55	41.85	49.07	47.50	74.00	-26.50	peak	
3	4960.000	7.26	34.15	42.27	49.36	48.50	74.00	-25.50	peak	
4	6776.265	8.43	35.77	41.85	49.71	52.06	74.00	-21.94	peak	
5	7440.000	8.96	36.25	41.29	48.83	52.75	74.00	-21.25	peak	
6	9920.000	10.71	37.85	37.23	42.20	53.53	74.00	-20.47	peak	
									•	



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#### **Test Setup Photo** 8

Please refer to setup photos.

#### **EUT Constructional Details (EUT Photos)** 9

Please Refer to external and internal photos for details.



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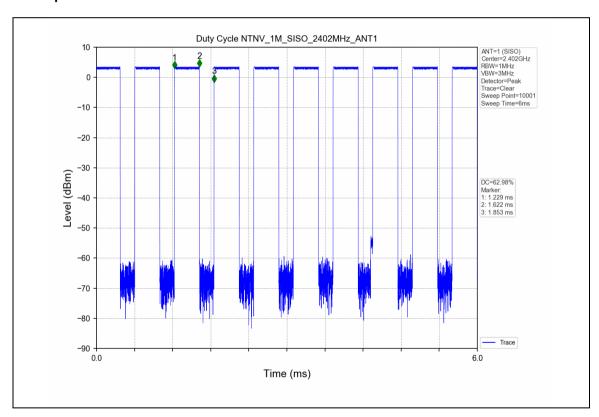
# 10 Appendix

## 1. Duty Cycle

#### 1.1 Test Result

Test Mode	Channel Frequency( MHz)	ТХ Туре	ANT No.	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
1M	2402	SISO	1	0.393	0.624	62.98	2.01
	2440	SISO	1	0.394	0.625	63.04	2.00
	2480	SISO	1	0.393	0.625	62.88	2.01

### 1.2 Test Graph





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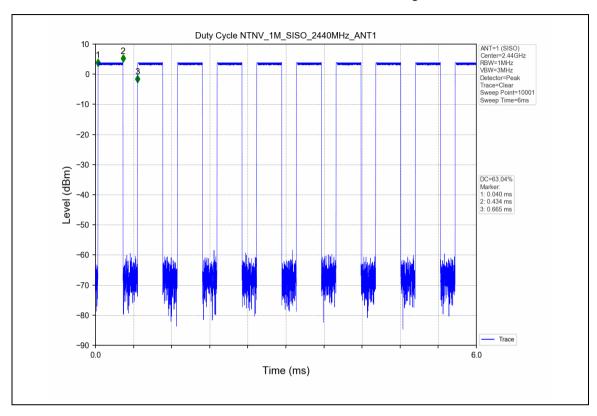
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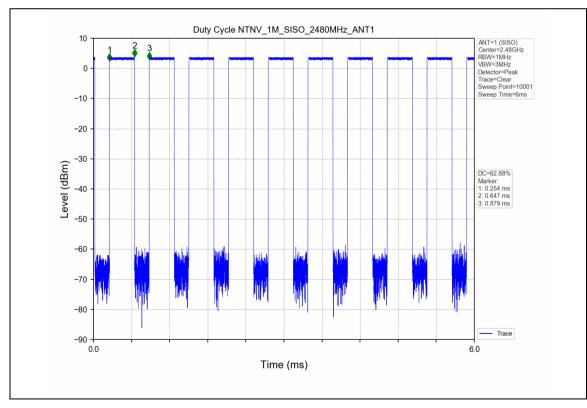
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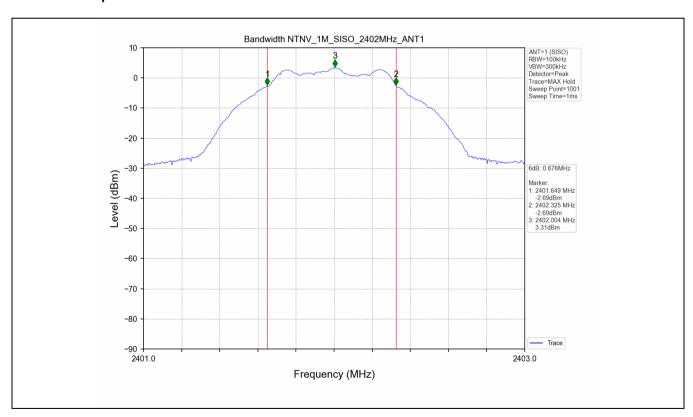
#### 2. Bandwidth

#### 2.1 Test Result

Test Mode	Frequency (MHz)	TX Type	ANT No.	6dB Ba	Vardiat	
				Test Result (MHz)	Limits (MHz)	Verdict
	2402	SISO	1	0.676	≥0.5	PASS
1M	2440	SISO	1	0.678	≥0.5	PASS
	2480	SISO	1	0.718	≥0.5	PASS

Test Mode	Frequency	TX Type	ANT No.	99% Occupied Bandwidth Test Result (MHz)			
i est Mode	(MHz)						
1M	2402	SISO	1	1.034	Only for Report Use		
	2440	SISO	1	1.049	Only for Report Use		
	2480	SISO	1	1.066	Only for Report Use		

#### 2.2 Test Graph - 6dB Bandwidth





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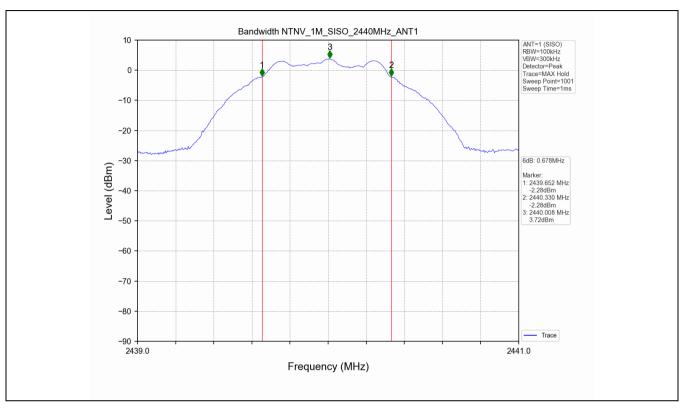
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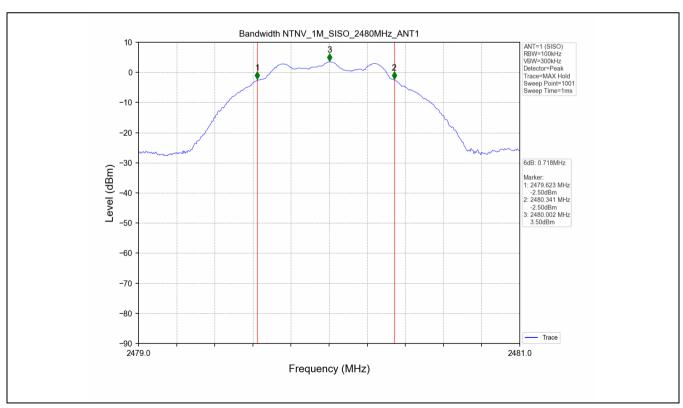
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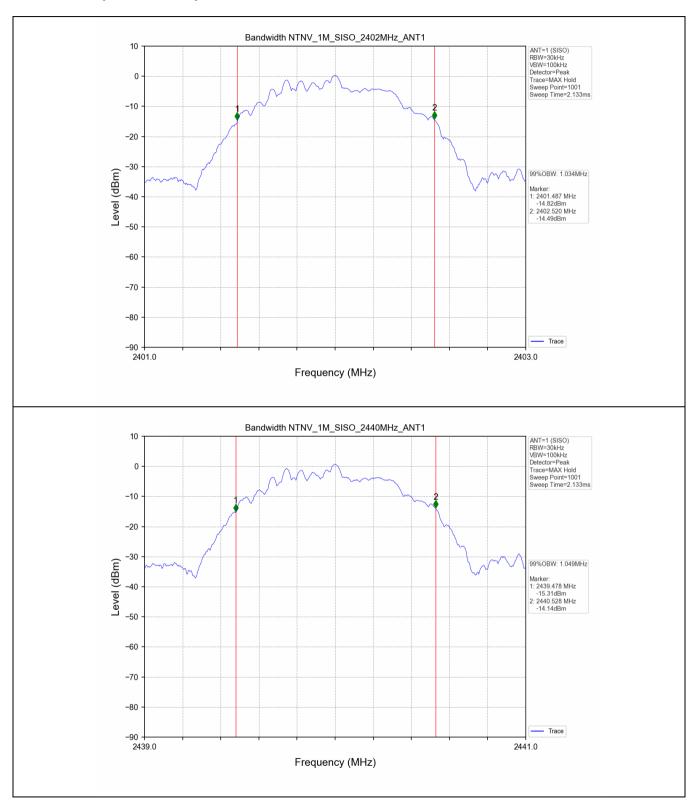
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#### 2.3 Test Graph - 99% Occupied Bandwidth





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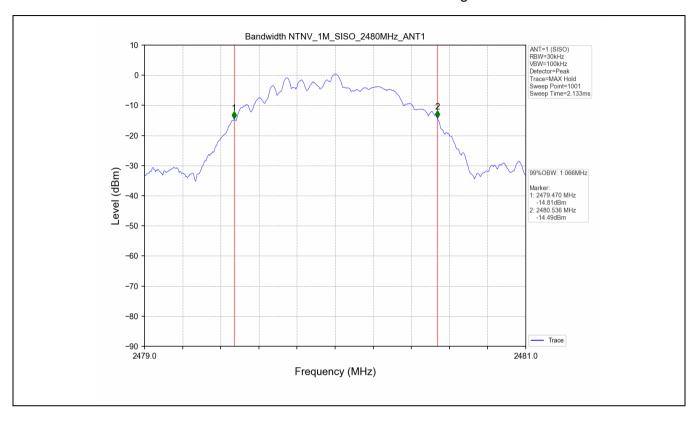
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## 3. Maximum Conducted Output Power

#### 3.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Measured Peak Output Power (dBm) Ant 1	Limits (dBm)	Verdict
1M	2402	SISO	3.55	30	PASS
	2440	SISO	3.94	30	PASS
	2480	SISO	3.76	30	PASS



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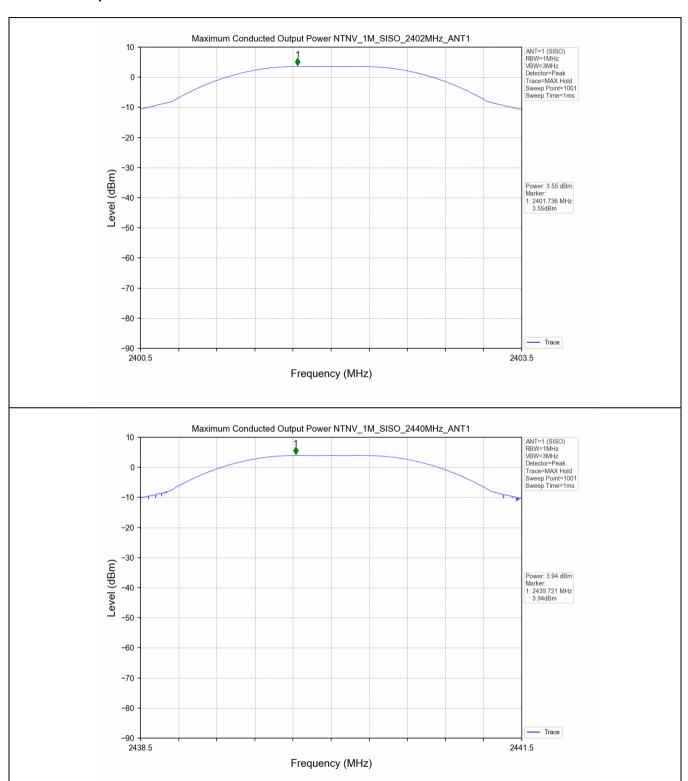
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#### 3.2 Test Graph





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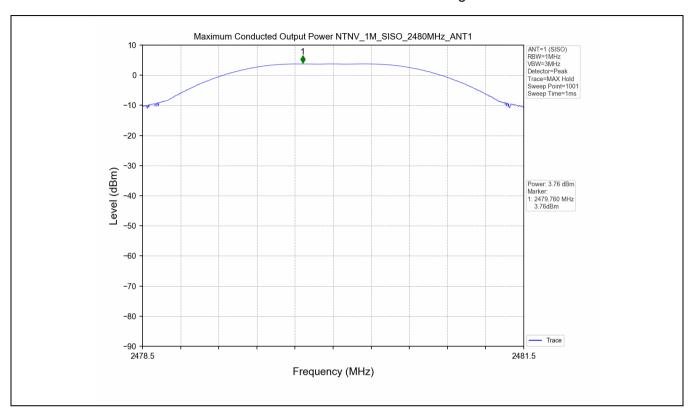
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## 4. Maximum Power Spectral Density (PSD)

#### 4.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Maximum Power Spectral Density (dBm/3KHz) Ant 1	Limits (dBm/3kHz)	Verdict
	2402	SISO	-11.72	≤8	PASS
1M	2440	SISO	-11.47	≤8	PASS
	2480	SISO	-12.17	≤8	PASS



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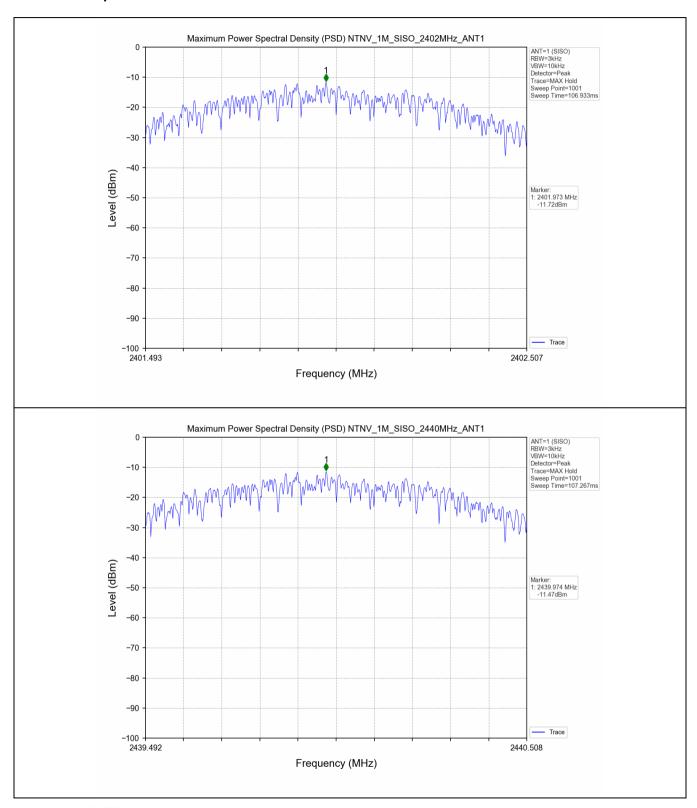
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#### 4.2 Test Graph





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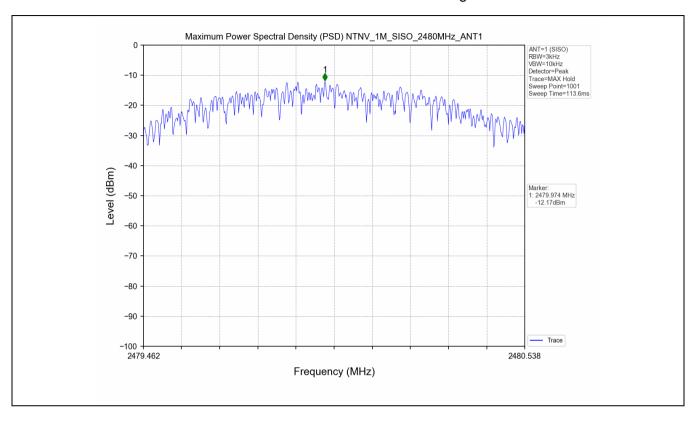
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## 5. Unwanted Emissions in Non-restricted Frequency Bands

#### 5.1 Test Result

Test Mode	Frequency (MHz)	ТХ Туре	ANT No.	Spurious Conducted Emission (dBm)	Limits (dBm)	Verdict
	2402	SISO	1	Refer to test graph	-16.31	PASS
1M	2440	SISO	1	Refer to test graph	-16.31	PASS
	2480	SISO	1	Refer to test graph	-16.31	PASS



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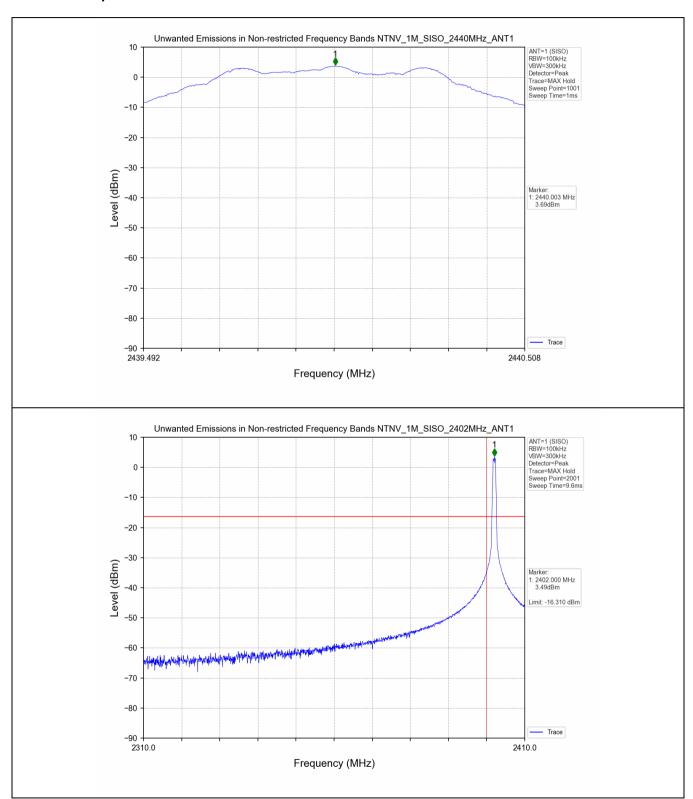
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#### 5.2 Test Graph





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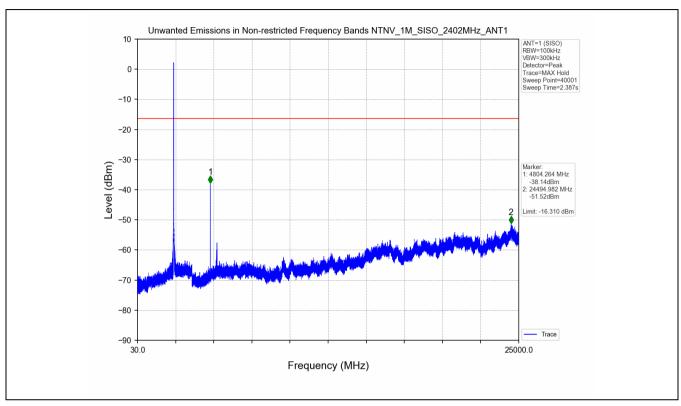
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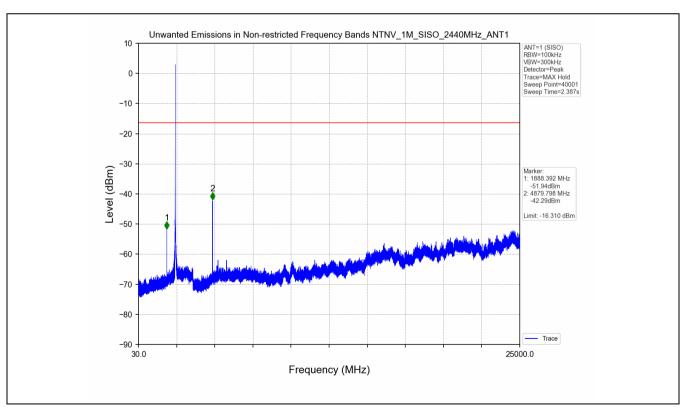
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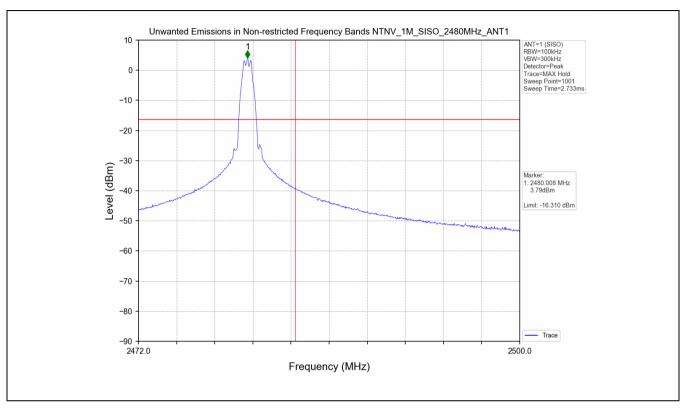
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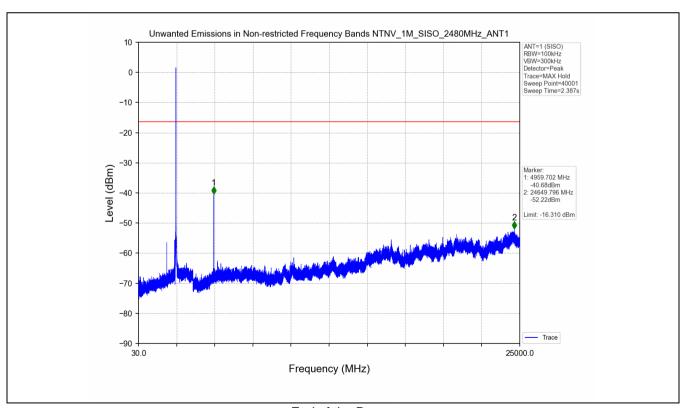
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