

Report No.: SZCR210402048303

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TEST REPORT

Application No.: SZCR2104020483AT

Applicant: Edifier International Limited

Address of Applicant: P.O. Box 6264 General Post Office Hong Kong

Manufacturer: Beijing Edifier Technology Co., Ltd.

Address of Manufacturer: 8th floor, ZuoAn Building, NO.68 BeiSiHuanXiLu, Haidian District, Beijing

100080, CHINA

Factory: Dongguan Edifier Technology Co., Ltd.

Address of Factory: No.2 Gongyedong Road, Songshan Lake Sci&Tech Industry Park,

Dongguan, Guangdong 523808, PR.China

Equipment Under Test (EUT):

EUT Name: Active Noise Cancelling Bluetooth Stereo Headphones

Model No.:EDF200046Trade Mark:EDIFIERFCC ID:Z9G-EDF139

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

Date of Receipt: 2021-04-12

Date of Test: 2021-04-15 to 2021-05-03

Date of Issue: 2021-05-29

Test Result: Pass*

Keny Xu



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^{*} In the configuration tested, the EUT complied with the standards specified above.



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	Revision Record						
Version	Chapter	Date	Modifier	Remark			
01		2021-05-29		Original			

Authorized for issue by:		
	Charlie Doi	
	Charlie Dai/Project Engineer	-
	Exic Fu	
	Eric Fu/Reviewer	_



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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		

Radio Spectrum Matter Part					
Item	Standard	Method	Requirement	Result	
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass	
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass	
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass	
Conducted Band Edges Measurement		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		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass	
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass	
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 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:	DC 3.8V/400mAh rechargeable lithium battery
	Charged by DC 5V/1A from USB port.
Cable(s):	USB Cable 120cm shielded
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 Dual mode
Modulation Type:	GFSK
Data Rate:	Support 1M/bit only
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	PCB Antenna
Antenna Gain:	2.2dBi

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 Below 1GHz	± 4.5dB
Radiated Spurious Emissions Above 1GHz	± 4.8dB

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

Conducted Peak Output Power					
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	2021-03-23	2022-03-22
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-17	2021-04-08	2022-04-07
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2021-04-08	2022-04-07

Minimum 6dB Bandwidth						
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	2021-03-23	2022-03-22	
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-17	2021-04-08	2022-04-07	
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-01	2020-07-10	2021-07-09	
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2021-04-08	2022-04-07	

Power Spectrum Density						
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	2021-03-23	2022-03-22	
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-17	2021-04-08	2022-04-07	
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-01	2020-07-10	2021-07-09	
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2021-04-08	2022-04-07	



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Conducted Band Edges Measurement						
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	Rohde & Schwarz NGSM 32/10 SEM011-04 2021-03-23	de & Schwarz NGSM 32/10 SEM011-04 2021-03-	SEM011-04 2021-03-23		2022-03-22
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-17	2021-04-08	2022-04-07	
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM031-01	2020-07-10	2021-07-09	
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2021-04-08	2022-04-07	

Conducted Spurious Emissions						
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	2021-03-23	2022-03-22	
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-17	2021-04-08	2022-04-07	
Measurement Software	TST	TST PASS V1.0.5	N/A N/A		N/A	
Coaxial Cable	SGS	N/A	SEM031-01	2020-07-10	2021-07-09	
Attenuator	Huber+Suhner	6620_SMA-50- 1	SEM021-09	2021-04-08	2022-04-07	

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2021-03-26	2024-03-25
EXA Signal Analyzer	Agilent Technologies Inc	ies N9010A SEM004-12 2021-02-01 2022-0		2022-01-31	
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2021-04-14	2024-04-13
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	
Coaxial Cable	SGS	N/A	SEM026-01 2020-07-10		2021-07-09
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2021-03-24	2022-03-23



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Radiated Spurious Emissions Below 1GHz					
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	Agilent Technologies	N9038A	SEM004-15		2021-11-01 2022-05-23
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-02		
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2021-03-24	2022-03-23
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

Radiated Spurious Emissions Above 1GHz						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2021-03-26	2024-03-25	
EXA Signal Analyzer	Agilent Technologies Inc	N9010A	SEM004-12 2021-02-01		2022-01-31	
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2021-04-14	2024-04-13	
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	

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	2021-03-30	2022-03-29



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Radio Spectrum Technical Requirement 6

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 2.2dBi.

Antenna location: Refer to Internal photos.





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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)(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 modulation

7.1.1 E.U.T. Operation

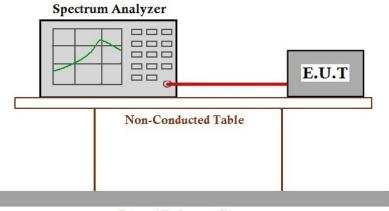
Operating Environment:

Temperature: 25.8 °C Humidity: 40.3 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



Ground Reference Plane



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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

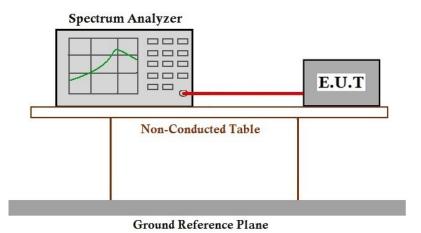
Operating Environment:

Temperature: 25.8 °C Humidity: 40.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



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

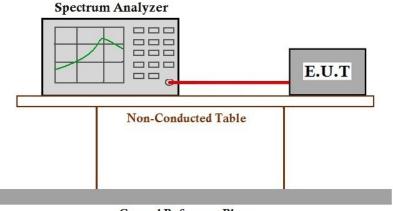
Operating Environment:

Temperature: 25.8 °C Humidity: 40.3 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	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

Please Refer to Appendix for Details



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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

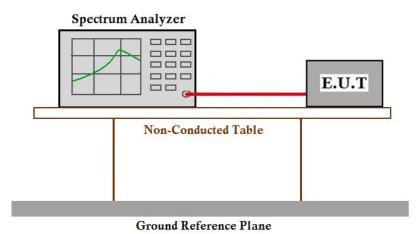
Operating Environment:

Temperature: 25.8 °C Humidity: 40.3 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.5 Conducted Spurious Emissions

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

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

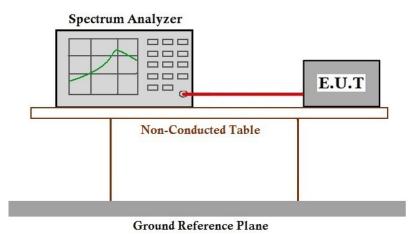
Operating Environment:

Temperature: 25.8 °C Humidity: 40.3 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description						
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.						

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

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7.6 Radiated Emissions which fall in the restricted bands

47 CFR Part 15, Subpart C 15,205 & 15,209 Test Requirement

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: 21.5 °C Humidity: 54.3 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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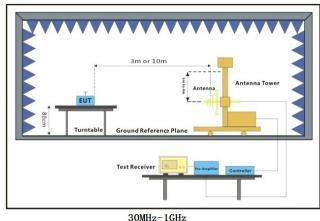
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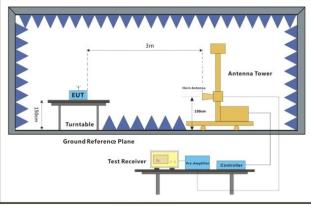


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7.6.3 Test Setup Diagram





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 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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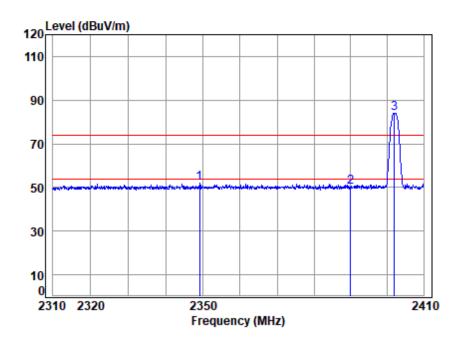
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL Job No : 20483AT/20484AT 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	2349.094	4.28	28.79	40.40	59.20	51.87	74.00	-22.13	peak
2	2390.000	4.34	28.88	40.42	57.39	50.19	74.00	-23.81	peak
3	* 2402.000	4.36	28.90	40.43	91.08	83.91	74.00	9.91	peak



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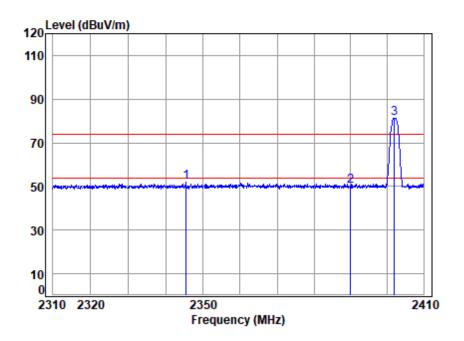
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

Job No : 20483AT/20484AT Mode : 2402 Band edge

Note : BLE

> 1 2 3

		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		
	2345.413	4.27	28.79	40.40	59.37	52.03	74.00	-21.97	peak	
2	2390.000	4.34	28.88	40.42	57.47	50.27	74.00	-23.73	peak	
*	2402.000	4.36	28.90	40.43	88.53	81.36	74.00	7.36	peak	



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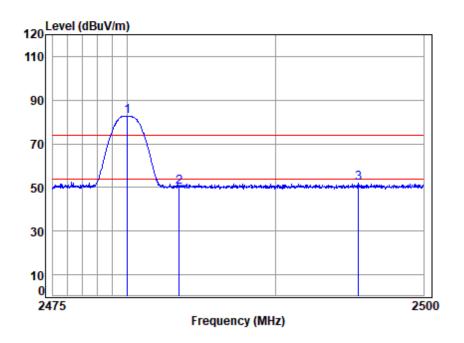
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL Job No : 20483AT/20484AT Mode : 2480 Band edge

Note : BLE

> 1 2 3

		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		
	* 2480.000	4.49	29.06	40.47	89.63	82.71	74.00	8.71	peak	
2	2483.500	4.49	29.07	40.47	56.99	50.08	74.00	-23.92	peak	
,	2495.607	4.51	29.09	40.47	58.70	51.83	74.00	-22.17	peak	



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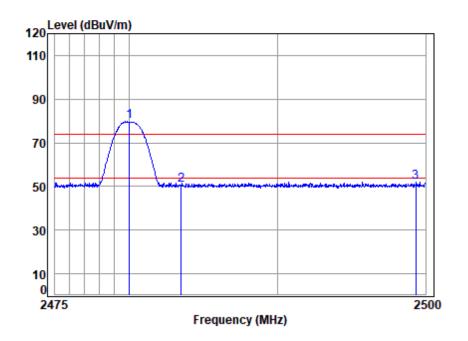
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL

Job No : 20483AT/20484AT Mode : 2480 Band edge

Note : BLE

> 1 2 3

Freq			Preamp Factor					Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
* 2480.000 2 2483.500								•



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7.7 Radiated Spurious Emissions Below 1GHz

47 CFR Part 15, Subpart C 15.205 & 15.209 Test Requirement

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

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
960-1000	500	3

7.7.1 E.U.T. Operation

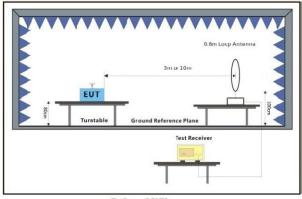
Operating Environment:

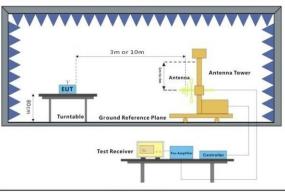
Temperature: Atmospheric Pressure: 1010 mbar 23.6 °C Humidity: 53.1 % RH

7.7.2 Test Mode Description

1.1.2 TEST IV	1.1.2 Test widde bescription								
Pre-scan / Final test	Mode Code	Description							
Final test	02	TX mode Keep the EUT in continuously transmitting mode with GFSK modulation.							

7.7.3 Test Setup Diagram





Below 30MHz

30MHz-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 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. 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.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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 quasi-peak method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

- 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- 2. Scan from 9kHz to 30MHz, the disturbance 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.
- 3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

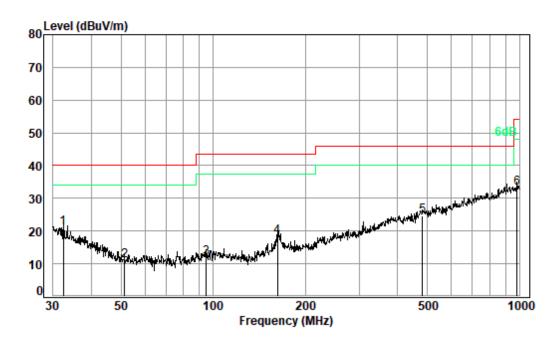




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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL

Job No. : 20483AT

Test Mode: 02

	Freq			Preamp Factor					Remark
_	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	32.41	0.63	21.38	27.73	26.73	21.01	40.00	-18.99	QP
2	51.30	0.71	13.71	27.68	24.21	10.95	40.00	-29.05	QP
3	95.09	1.20	13.66	27.62	24.61	11.85	43.50	-31.65	QP
4	162.04	1.17	15.44	27.28	28.91	18.24	43.50	-25.26	QP
5	482.22	2.47	24.30	27.73	25.54	24.58	46.00	-21.42	QP
6	982.62	3.58	29.54	26.74	26.68	33.06	54.00	-20.94	OP



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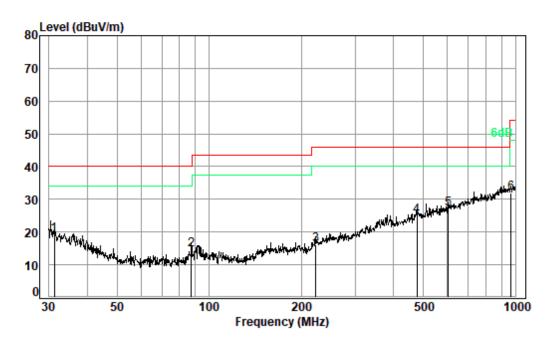
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:Low



Condition: 3m VERTICAL Job No. : 20483AT

Test Mode: 02

		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	31.18	0.61	22.10	27.73	24.32	19.30	40.00	-20.70	QP
2	87.42	1.28	12.78	27.62	28.30	14.74	40.00	-25.26	QP
3	222.95	1.41	16.95	27.07	24.83	16.12	46.00	-29.88	QP
4	477.17	2.46	24.10	27.71	26.21	25.06	46.00	-20.94	QP
5 pp	603.54	2.71	25.98	28.12	26.57	27.14	46.00	-18.86	QP
6	968.93								-



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7.8 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.8.1 E.U.T. Operation

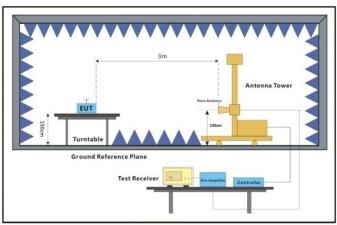
Operating Environment:

21.2 °C Temperature: Humidity: 54.3 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



Above 1GHz



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7.8.4 Measurement Procedure and Data

- a. 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.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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 or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

- 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- 2. Scan from 1GHz to 25GHz, the disturbance above 18GHz 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.
- 3. As shown in this section, 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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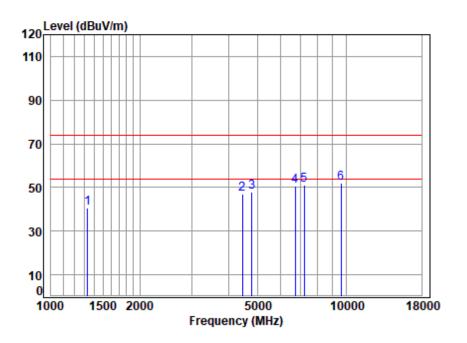
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Test Mode: 02; Polarity: Horizontal; Modulation: GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL Job No : 20483AT/20484AT

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	1331.288	3.00	25.38	39.85	52.30	40.83	74.00	-33.17	peak	
2	4456.315	6.72	32.97	41.84	49.14	46.99	74.00	-27.01	peak	
3	4804.000	7.10	33.62	42.14	49.12	47.70	74.00	-26.30	peak	
4	6717.762	8.40	35.00	41.89	49.26	50.77	74.00	-23.23	peak	
5	7206.000	8.74	35.67	41.50	48.22	51.13	74.00	-22.87	peak	
6	9608.000	10.81	37.34	37.76	41.75	52.14	74.00	-21.86	peak	



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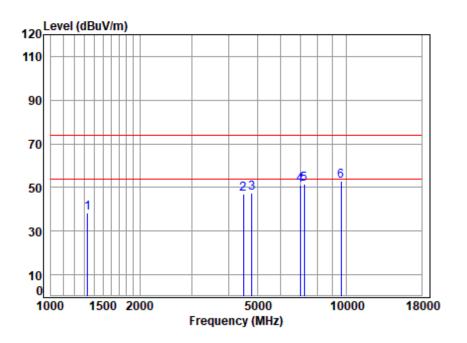
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

Job No : 20483AT/20484AT

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	1331.288	3.00	25.38	39.85	49.85	38.38	74.00	-35.62	peak
2	4482.150	6.74	32.99	41.86	49.14	47.01	74.00	-26.99	peak
3	4804.000	7.10	33.62	42.14	48.89	47.47	74.00	-26.53	peak
4	6974.982	8.53	35.46	41.72	48.73	51.00	74.00	-23.00	peak
5	7206.000	8.74	35.67	41.50	48.49	51.40	74.00	-22.60	peak
6	9608.000	10.81	37.34	37.76	42.58	52.97	74.00	-21.03	peak



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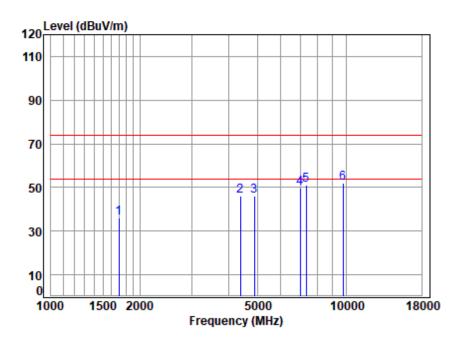
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Site : chamber

Condition: 3m HORIZONTAL Job No : 20483AT/20484AT

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	
1697.129	3.43	26.69	40.06	46.12	36.18	74.00	-37.82	peak
4392.376	6.66	32.92	41.78	48.15	45.95	74.00	-28.05	peak
4880.000	7.18	33.77	42.20	47.20	45.95	74.00	-28.05	peak
6974.982	8.53	35.46	41.72	47.35	49.62	74.00	-24.38	peak
7320.000	8.84	35.76	41.40	47.75	50.95	74.00	-23.05	peak
9760.000	10.76	37.41	37.50	41.50	52.17	74.00	-21.83	peak
	MHz 1697.129 4392.376 4880.000 6974.982 7320.000	Freq Loss MHz dB 1697.129 3.43 4392.376 6.66 4880.000 7.18 6974.982 8.53 7320.000 8.84	Freq Loss Factor MHz dB dB/m 1697.129 3.43 26.69 4392.376 6.66 32.92 4880.000 7.18 33.77 6974.982 8.53 35.46 7320.000 8.84 35.76	Freq Loss Factor Factor MHz dB dB/m dB 1697.129 3.43 26.69 40.06 4392.376 6.66 32.92 41.78 4880.000 7.18 33.77 42.20 6974.982 8.53 35.46 41.72 7320.000 8.84 35.76 41.40	Freq Loss Factor Factor Level MHz dB dB/m dB dBuV 1697.129 3.43 26.69 40.06 46.12 4392.376 6.66 32.92 41.78 48.15 4880.000 7.18 33.77 42.20 47.20 6974.982 8.53 35.46 41.72 47.35 7320.000 8.84 35.76 41.40 47.75	Freq Loss Factor Factor Level Level MHz dB dB/m dB dBuV dBuV/m 1697.129 3.43 26.69 40.06 46.12 36.18 4392.376 6.66 32.92 41.78 48.15 45.95 4880.000 7.18 33.77 42.20 47.20 45.95 6974.982 8.53 35.46 41.72 47.35 49.62 7320.000 8.84 35.76 41.40 47.75 50.95	Freq Loss Factor Factor Level Level Line MHz dB dB/m dB dBuV dBuV/m dBuV/m dBuV/m 1697.129 3.43 26.69 40.06 46.12 36.18 74.00 4392.376 6.66 32.92 41.78 48.15 45.95 74.00 4880.000 7.18 33.77 42.20 47.20 45.95 74.00 6974.982 8.53 35.46 41.72 47.35 49.62 74.00 7320.000 8.84 35.76 41.40 47.75 50.95 74.00	MHz dB dB/m dB dBuV dBuV/m dBuV/m dB



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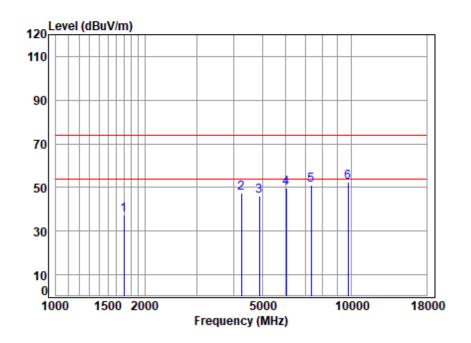
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:middle



Site : chamber

Condition: 3m VERTICAL

Job No : 20483AT/20484AT

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	1697.129	3.43	26.69	40.06	47.47	37.53	74.00	-36.47	peak
2	4242.641	6.52	32.80	41.64	49.84	47.52	74.00	-26.48	peak
3	4880.000	7.18	33.77	42.20	47.19	45.94	74.00	-28.06	peak
4	6036.421	8.26	34.60	42.37	49.11	49.60	74.00	-24.40	peak
5	7320.000	8.84	35.76	41.40	47.74	50.94	74.00	-23.06	peak
6	9760 000	10 76	37 /11	37 50	/11 80	52 /17	7/ 00	_21 53	neak



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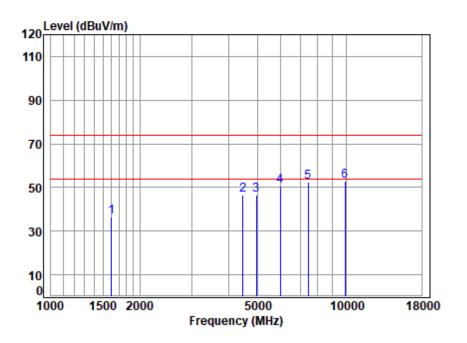
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL Job No : 20483AT/20484AT

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	26.22	40.01	47.16	36.72	74.00	-37.28	peak
2	4469.214	6.73	32.98	41.85	48.67	46.53	74.00	-27.47	peak
3	4960.000	7.26	33.92	42.27	47.56	46.47	74.00	-27.53	peak
4	5984.305	8.26	34.59	42.40	50.04	50.49	74.00	-23.51	peak
5	7440.000	8.96	35.85	41.29	49.00	52.52	74.00	-21.48	peak
6	9920.000	10.71	37.47	37.23	41.97	52.92	74.00	-21.08	peak



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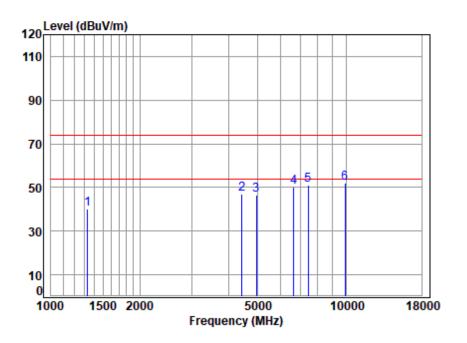
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL

Job No : 20483AT/20484AT

Mode : 2480 TX SE

Note : BLE

		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
						JD: 3//	JD: 3//		
	MHz	dB	ab/m	dB	abuv	abuv/m	abuv/m	dB	
1	1331.288	3.00	25.38	39.85	51.56	40.09	74.00	-33.91	peak
2	4443.453	6.71	32.96	41.82	49.04	46.89	74.00	-27.11	peak
3	4960.000	7.26	33.92	42.27	47.63	46.54	74.00	-27.46	peak
4	6640.542	8.36	34.86	41.94	48.70	49.98	74.00	-24.02	peak
5	7440.000	8.96	35.85	41.29	47.62	51.14	74.00	-22.86	peak
6	9920.000	10.71	37.47	37.23	41.21	52.16	74.00	-21.84	peak



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Test Setup Photo 8

Refer to Setup Photos

EUT Constructional Details (EUT Photos) 9

Refer to External and Internal Photos for SZCR2104020483AT



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10 Appendix

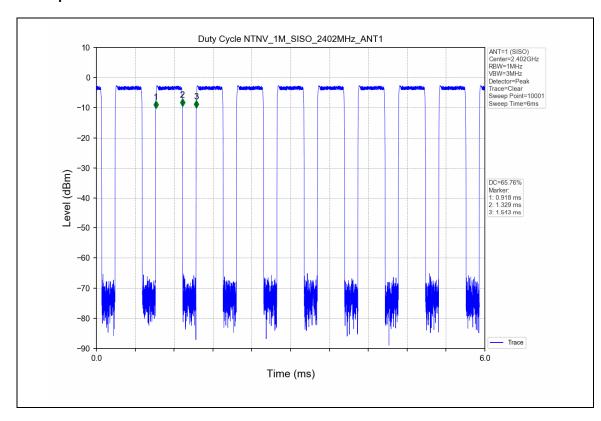
Appendix for 15.247

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	0.411	0.625	65.76	1.82
	2440	SISO	1	0.410	0.625	65.60	1.83
	2480	SISO	1	0.410	0.625	65.60	1.83

1.2 Test Graph





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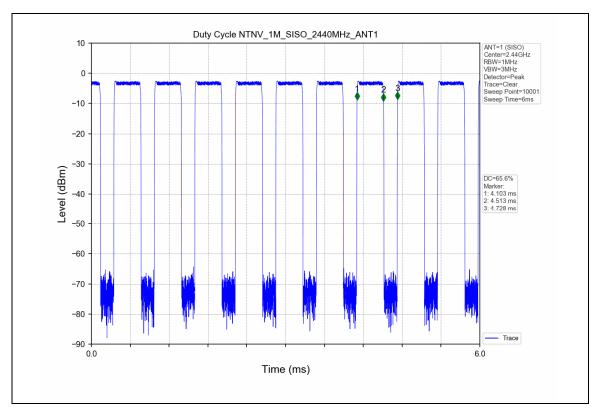
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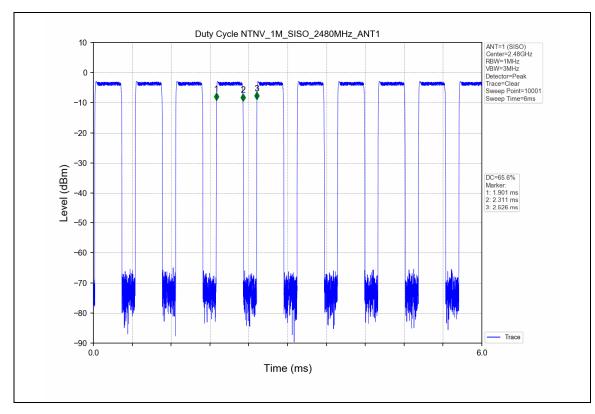
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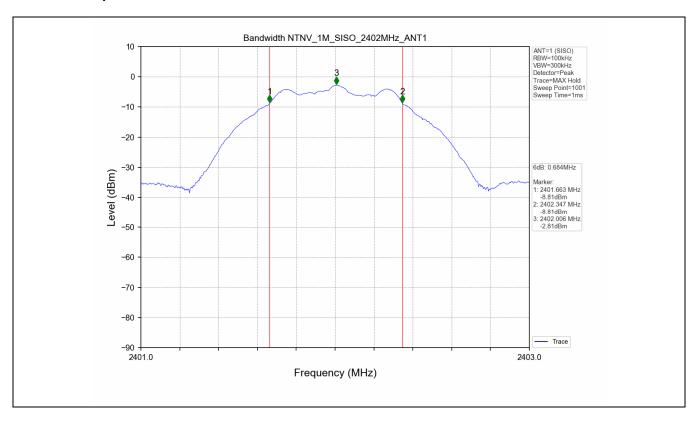
2. Bandwidth

2.1 Test Result

Test Mode	Frequency (MHz)	TX Type	ANT No.	6dB Bandwidth	Verdict	
				Test Result (MHz)		
1M	2402	SISO	1	0.684	PASS	
	2440	SISO	1	0.682	PASS	
	2480	SISO	1	0.683	PASS	

Toot Made	Frequency (MHz)	TX Type	ANT No.	99% Occupied Bandwidth		
Test Mode				Test Result (MHz)		
1M	2402	SISO	1	1.018	Only for Report Use	
	2440	SISO	1	1.019	Only for Report Use	
	2480	SISO	1	1.020	Only for Report Use	

2.2 Test Graph - 6dB Bandwidth





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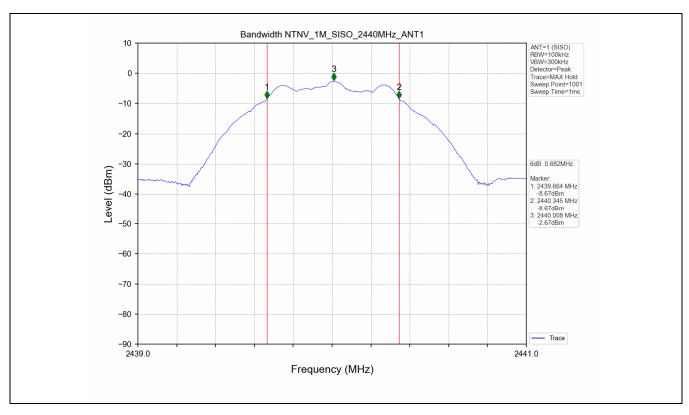
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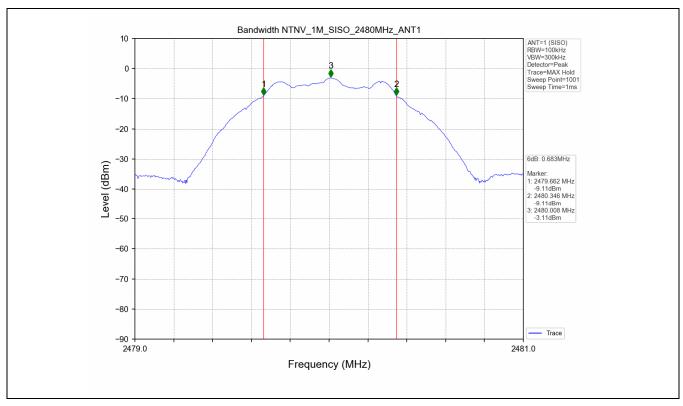
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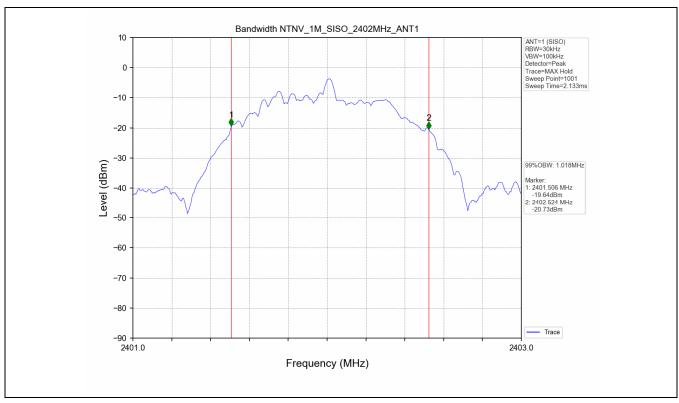
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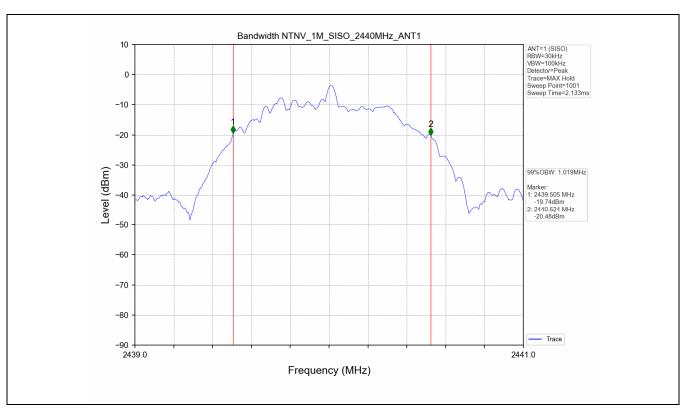


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2.3 Test Graph - 99% Occupied Bandwidth







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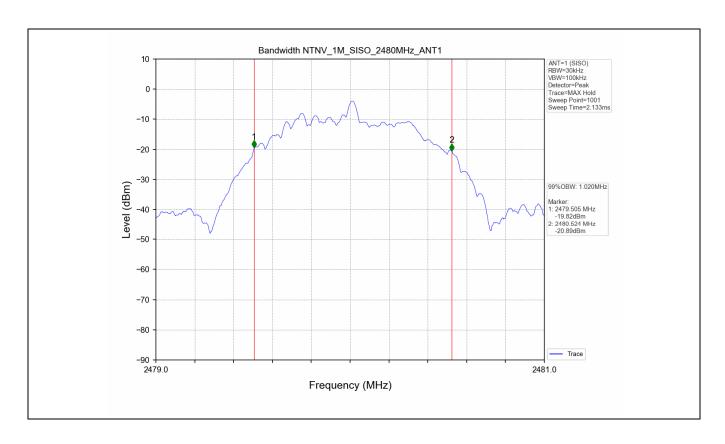
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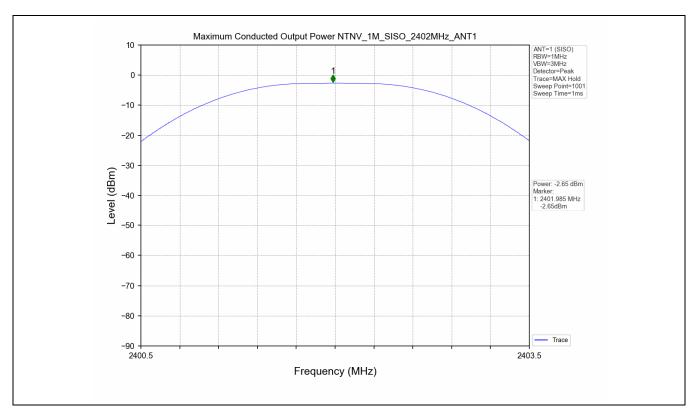
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3. Maximum Conducted Output Power

3.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Measured Peak Output Power (dBm) Ant 1	Limits (dBm)	Verdict
1M	2402	SISO	-2.65	30	PASS
	2440	SISO	-2.52	30	PASS
	2480	SISO	-2.95	30	PASS

3.2 Test Graph





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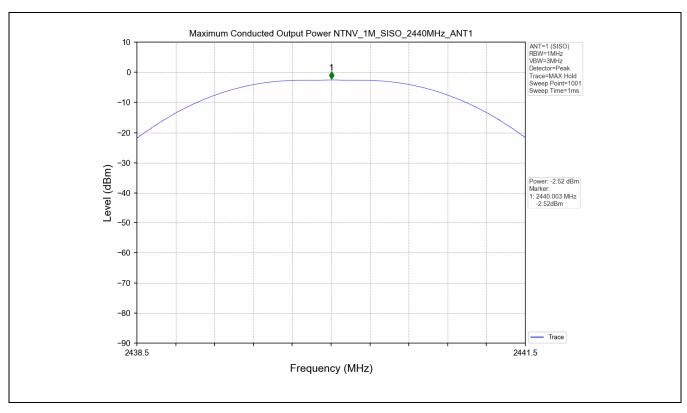
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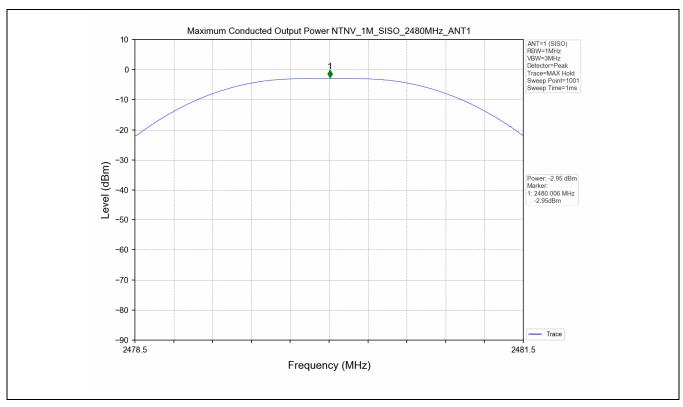
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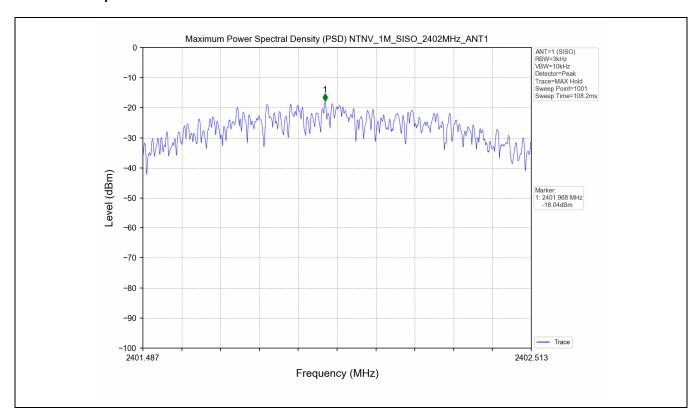
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4. Maximum Power Spectral Density (PSD)

4.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Maximum Power Spectral Density (dBm/3KHz) Ant 1	Limits (dBm/3kHz)	Verdict
1M	2402	SISO	-18.04	≤8	PASS
	2440	SISO	-17.72	≤8	PASS
	2480	SISO	-18.13	≤8	PASS

4.2 Test Graph





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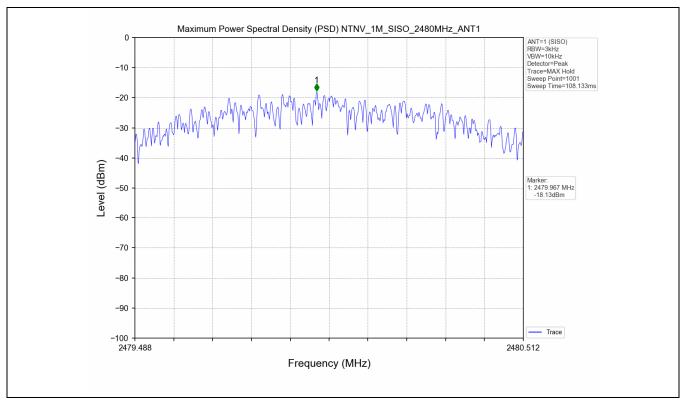
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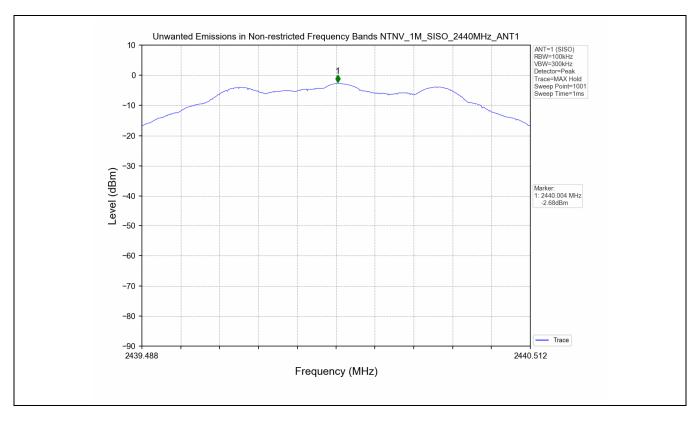
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5. Unwanted Emissions in Non-restricted Frequency Bands

5.1 Test Result

Test Mode	Frequency (MHz)	TX Type	ANT No.	Spurious Conducted Emission (dBm)	Limits (dBm)	Verdict
	2402	SISO	1	Refer to test graph	-22.68	PASS
1M	2440	SISO	1	Refer to test graph	-22.68	PASS
	2480	SISO	1	Refer to test graph	-22.68	PASS

5.2 Test Graph





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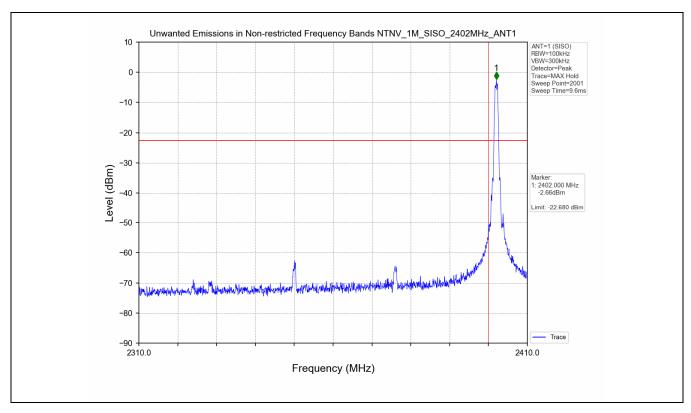
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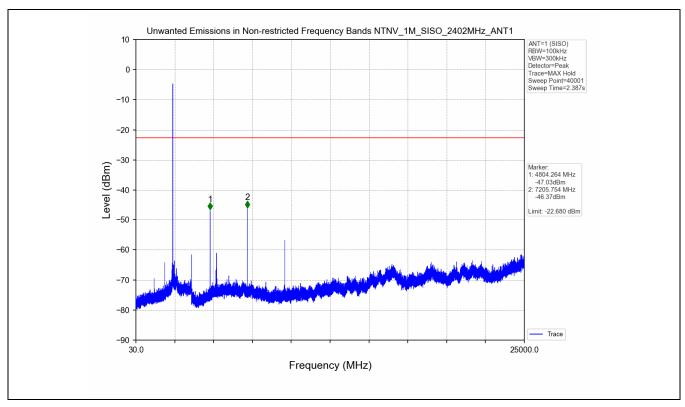
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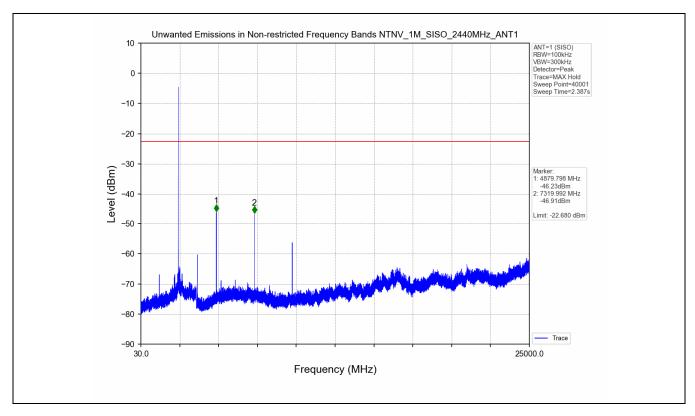
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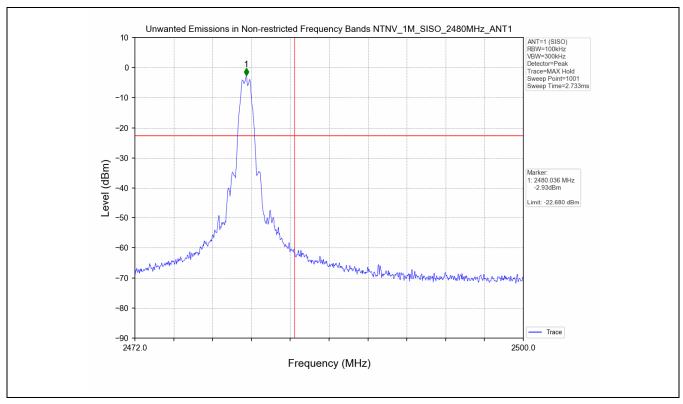
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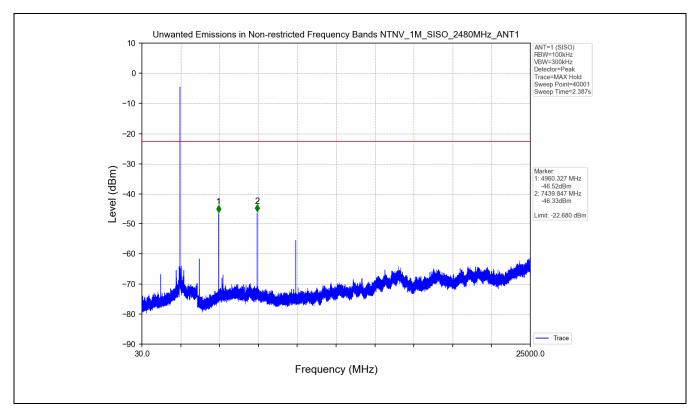
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