

Report No.: SZEM2010001075502

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# **TEST REPORT**

**Application No.:** SZEM20100010755CR **Applicant:** Creative Labs Pte. Ltd.

Address of Applicant: 31 International Business Park, #03-01, Singapore 609921

Manufacturer: Creative Labs Pte. Ltd.

Address of Manufacturer: 31 International Business Park, #03-01, Singapore 609921

**Equipment Under Test (EUT):** 

**EUT Name:** Sound Blaster GC7

Model No.:SB1850Trade Mark:CREATIVEFCC ID:2AJIV-SB1850

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

**Date of Receipt:** 2020-10-27

**Date of Test:** 2020-10-30 to 2020-12-06

**Date of Issue:** 2020-12-08

Test Result: Pass\*

Keny Xu EMC Laboratory Manager



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or enait: CN\_Doccheck@sgs\_com Mo1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, China 518057 t (86-755) 26012053 f (86-755) 26710594 www.sgsgroup.com.cn 中国 · 深圳 · 科技园中区M-10栋一号厂房 邮编: 518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

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



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	Revision Record					
Version	Version Chapter Date Modifier					
01		2020-12-08		Original		

Authorized for issue by:		
	Vincent Chen	
	Vincent Chen/Project Engineer	
	EvicFu	
	Eric Fu/Reviewer	



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#### **Test Summary** 2

Radio Spectrum Technical Requirement					
Item Standard Method Requirement Res					
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	

Emission Part					
Item	Standard	Method	Requirement	Result	
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass	



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# 4 General Information

## 4.1 Details of E.U.T.

Power adapter:	DC 5V, 500mA from USB port
Power Class:	<10mW
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 LE
Number of Channels:	40
Data Rate:	Support 2Mbit/s
Channel Spacing:	2MHz
Modulation Type:	GFSK
Antenna Gain:	0.8dBi
Antenna Type:	Chip Antenna

## 4.2 Cable

Cable	Length	Shielding	Core
Optical cable	184cm	Unshielded	Non-Core
Type-C cable	200cm	Shielded	Non-Core
Aux In cable	156	Unshielded	Non-Core

4.3 Description of Support Units

Description Manufacturer		Model No.	Serial No.
Adapter	Apple	A1357	REF. No.SEA0501A



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# 4.4 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	± 3.0dB (150kHz to 30MHz)
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 U<sub>lab</sub> (lab Uncertainty) is less than U<sub>cispr</sub> (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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## 4.5 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.

## 4.6 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.

#### VCC

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.

### 4.7 Deviation from Standards

None

## 4.8 Abnormalities from Standard Conditions

None





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# 5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)						
Equipment	Cal Date	Cal Due Date				
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2022-06-12	
EMI Test Receiver	Rohde&Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23	
Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A	
Coaxial Cable	SGS	N/A	SEM024-01	2020-07-10	2021-07-09	
LISN	Rohde&Schwarz	ENV216	SEM007-01	2020-09-23	2021-09-22	
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31	

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	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				

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	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				



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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	2020-03-24	2021-03-23				
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2020-04-01	2021-03-31				
Signal Generator	KEYSIGHT	N5173B	N5173B SEM006-05		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				

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	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			

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	2020-03-24	2021-03-23			
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2020-04-01	2021-03-31			
Signal Generator	KEYSIGHT	N5173B	5173B SEM006-05 202		2021-09-22			
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A			
Coaxial Cable	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			



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Radiated Emissions which fall in the restricted bands									
Equipment	Equipment Manufacturer Model No Inventory No Cal Date Cal Du								
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				
Llows Antonna	Cabusarrhaals	DDIIA 0470	CEM002 45	2017-10-17	2020-10-16				
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2020-10-16	2021-10-15				
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31				

Radiated Emissions								
Equipment	Manufacturer	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	2019-12-16	2020-12-15			
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-02	2019-05-24	2022-05-23			
Pre-Amplifier	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			



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Radiated Spurious Emissions								
Equipment	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				
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			
Llows Antonno	Cabusarehaale	DDIIA 0470	CEM002 45	2017-10-17	2020-10-16			
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2020-10-16	2021-10-15			
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31			

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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# **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 0.8dBi.

Antenna location: Refer to Internal photos.



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# **Radio Spectrum Matter Test Results**

# Conducted Emissions at AC Power Line (150kHz-30MHz)

47 CFR Part 15, Subpart C 15.207 Test Requirement: Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Francisco of amicaian/MIL-)	Conducted limit(dBμV)					
Frequency of emission(MHz)	Quasi-peak	Average				
0.15-0.5	66 to 56*	56 to 46*				
0.5-5	56	46				
5-30	60	50				
*Decreases with the logarithm of t	*Decreases with the logarithm of the frequency.					
Detector: Peak for pre-scan (9kHz	resolution bandwidth) 0.15M to 30	MHz				

## 7.1.1 E.U.T. Operation

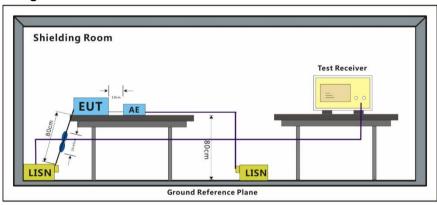
Operating Environment:

Temperature: 23.3 °C Humidity: 55.1 % RH Atmospheric Pressure: 1015 mbar

## 7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.

# 7.1.3 Test Setup Diagram





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#### 7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50µH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

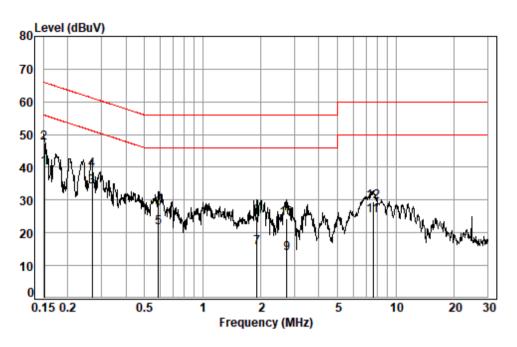




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Test Mode: 00: Line: Live line



Site : Shielding Room

Condition: Line Job No. : 10755CR

Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1516	0.01	9.70	30.16	39.87	55.91	-16.04	Average
2	0.1516	0.01	9.70	37.88	47.59	65.91	-18.32	QP
3	0.2672	0.03	9.74	24.22	33.99	51.20	-17.21	Average
4	0.2672	0.03	9.74	29.45	39.22	61.20	-21.98	QP
5	0.5916	0.07	9.77	11.61	21.45	46.00	-24.55	Average
6	0.5916	0.07	9.77	17.59	27.43	56.00	-28.57	QP
7	1.9080	0.15	9.81	5.41	15.37	46.00	-30.63	Average
8	1.9080	0.15	9.81	14.94	24.90	56.00	-31.10	QP
9	2.7356	0.16	9.83	3.66	13.65	46.00	-32.35	Average
10	2.7356	0.16	9.83	14.34	24.33	56.00	-31.67	QP
11	7.6060	0.17	10.07	14.88	25.12	50.00	-24.88	Average
12	7.6060	0.17	10.07	19.32	29.56	60.00	-30.44	QP



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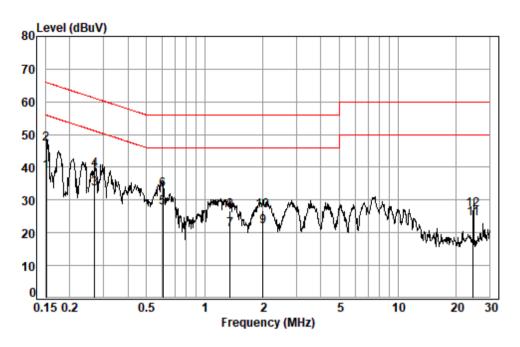
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Test Mode: 00: Line: Neutral Line



: Shielding Room

Condition: Neutral Job No. : 10755CR

Test mode: 00

	mouc. oo							
		Cable	LISN	Read		Limit	0ver	
	Freq	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1516	0.01	9.71	29.03	38.75	55 91	-17 16	Average
								_
2	0.1516	0.01	9.71	37.33	47.05	65.91	-18.86	QР
3	0.2687	0.03	9.73	23.70	33.46	51.16	-17.70	Average
4	0.2687	0.03	9.73	29.52	39.28	61.16	-21.88	QP
5	0.6075	0.07	9.77	17.98	27.82	46.00	-18.18	Average
6	0.6075	0.07	9.77	23.34	33.18	56.00	-22.82	QP
7	1.3521	0.12	9.79	11.23	21.14	46.00	-24.86	Average
8	1.3521	0.12	9.79	16.74	26.65	56.00	-29.35	QP
9	2.0012	0.16	9.81	11.82	21.79	46.00	-24.21	Average
10	2.0012	0.16	9.81	16.77	26.74	56.00	-29.26	QP
11	24.5760	0.26	10.91	13.30	24.47	50.00	-25.53	Average
12	24.5760	0.26	10.91	16.00	27.17	60.00	-32.83	QP



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# 7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247
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

## 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.1 °C Humidity: 54.9 % RH Atmospheric Pressure: 1015 mbar

## 7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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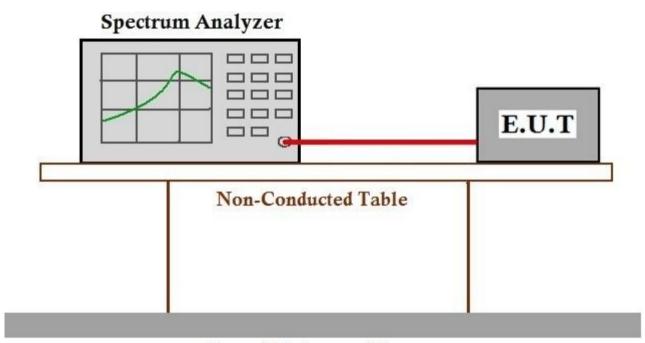
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## 7.2.3 Test Setup Diagram



# Ground Reference Plane

### 7.2.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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## 7.3 Minimum 6dB Bandwidth

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

Limit:

≥500 kHz

## 7.3.1 E.U.T. Operation

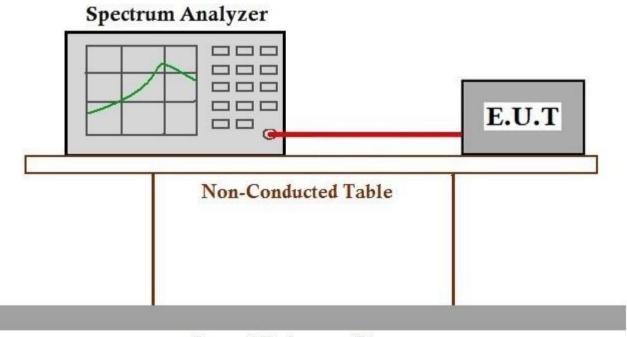
Operating Environment:

Temperature: 23.1 °C Humidity: 54.9 % RH Atmospheric Pressure: 1015 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description							
Final test	00	TX mode(2Mbit/s)_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 Power Spectrum Density

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

Limit:

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

## 7.4.1 E.U.T. Operation

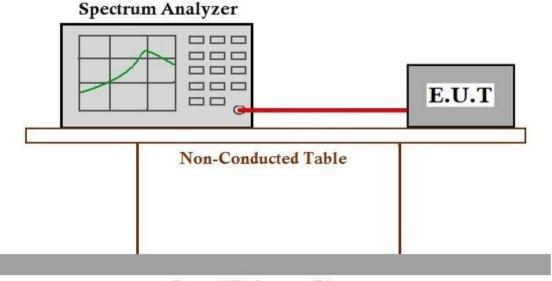
Operating Environment:

Temperature: 23.1 °C Humidity: 54.9 % RH Atmospheric Pressure: 1015 mbar

### 7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.

## 7.4.3 Test Setup Diagram



Ground Reference Plane

### 7.4.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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## 7.5 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247
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).

## 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.1 °C Humidity: 54.9 % RH Atmospheric Pressure: 1015 mbar

## 7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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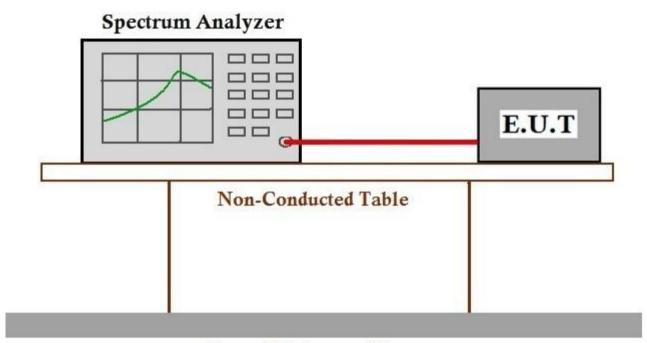
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## 7.5.3 Test Setup Diagram



# Ground Reference Plane

### 7.5.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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## 7.6 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247
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).

## 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.1 °C Humidity: 54.9 % RH Atmospheric Pressure: 1015 mbar

## 7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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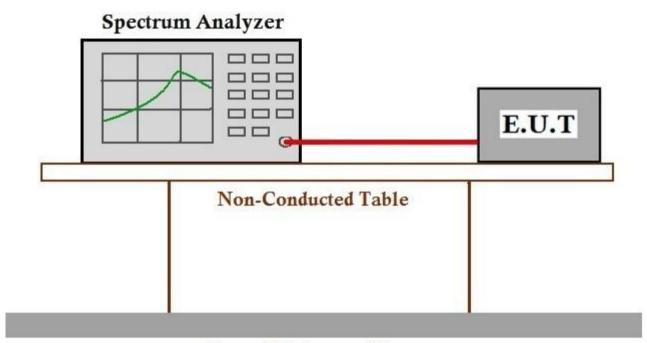
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## 7.6.3 Test Setup Diagram



# Ground Reference Plane

### 7.6.4 Measurement Procedure and Data

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## 7.7 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

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:

23.7 °C Temperature: Humidity: 57.0 % RH Atmospheric Pressure: 1015 mbar

## 7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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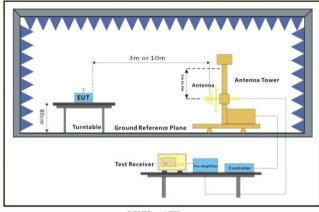
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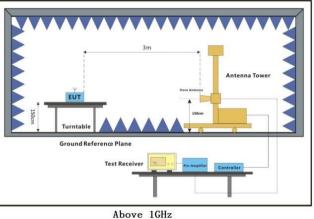


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#### 7.7.3 Test Setup Diagram





30MHz-1GHz

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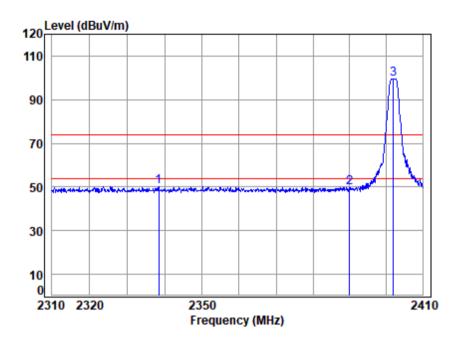
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL Job No : 10755CR\10756CR Mode : 2402 Band edge

Note : BLE

0.00										
		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	2338.466	4.26	28.43	40.95	58.45	50.19	74.00	-23.81	peak	
2	2390.000	4.34	28.52	40.97	57.72	49.61	74.00	-24.39	peak	
3 *	2402.000	4.36	28.54	40.98	107.67	99.59	74.00	25.59	peak	



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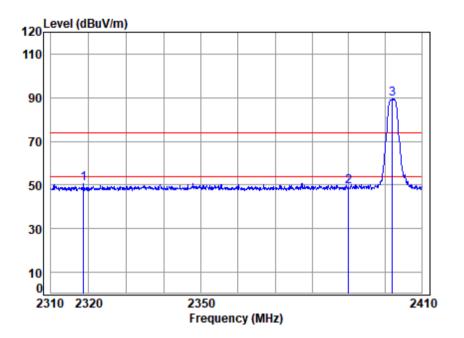
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Report No.: SZEM2010001075502

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



Site : chamber Condition: 3m VERTICAL

Job No : 10755CR\10756CR Mode : 2402 Band edge

Note : BLE

0.0										
		Cable	Ant	Preamp	Read		Limit	0ver		
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark	
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2318.631	4.23	28.40	40.94	59.10	50.79	74.00	-23.21	peak	
2	2390.000	4.34	28.52	40.97	57.39	49.28	74.00	-24.72	peak	
3 *	2402.000	4.36	28.54	40.98	97.35	89.27	74.00	15.27	peak	



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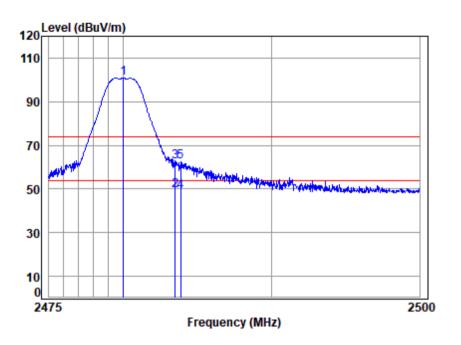
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: High



Site : chamber

Condition: 3m HORIZONTAL Job No : 10755CR\10756CR Mode : 2480 Band edge

Note : BLE

	Freq		Ant Factor						Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2480.000	4.49	28.67	41.01	108.63	100.78	74.00	26.78	peak
2	2483.500	4.49	28.67	41.01	56.92	49.07	54.00	-4.93	Average
3	2483.500	4.49	28.67	41.01	70.23	62.38	74.00	-11.62	peak
4	2483.871	4.49	28.67	41.01	56.89	49.04	54.00	-4.96	Average
5	2483.871	4.49	28.67	41.01	70.26	62.41	74.00	-11.59	peak



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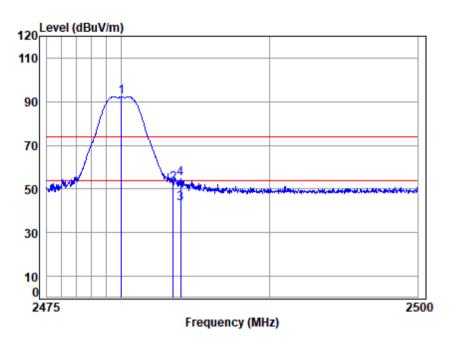
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber Condition: 3m VERTICAL

Job No : 10755CR\10756CR Mode : 2480 Band edge

Note · RIF

uce		LL							
		Cable	Ant	Preamp	Read		Limit	0ver	
	Fred	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	41.01	100.14	92.29	74.00	18.29	peak
2	2483.500	4.49	28.67	41.01	60.54	52.69	74.00	-21.31	peak
3	2483.996	4.49	28.67	41.01	51.29	43.44	54.00	-10.56	Average
4	2483.996	4.49	28.67	41.01	62.40	54.55	74.00	-19.45	peak



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## 7.8 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

Limit:

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

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

## 7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 25.2 °C Humidity: 51.0 % RH Atmospheric Pressure: 1015 mbar

## 7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(2Mbit/s)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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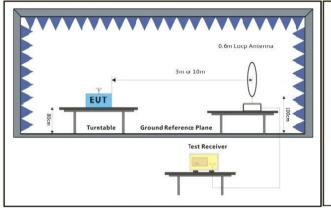
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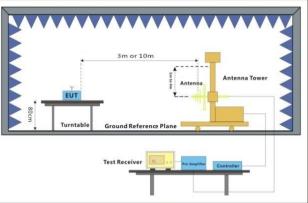


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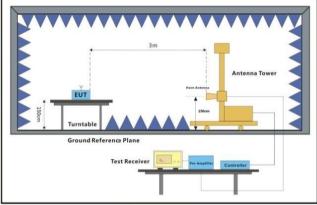
## 7.8.3 Test Setup Diagram





Below 30MHz

30MHz-1GHz



Above 1GHz



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#### 7.8.4 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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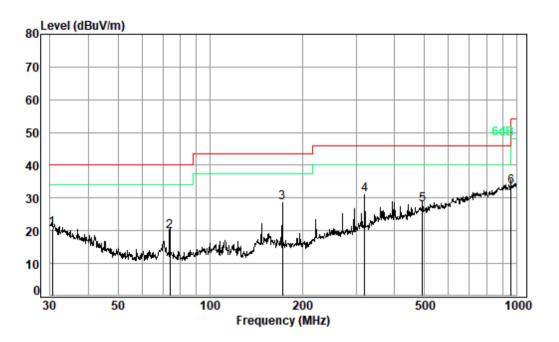
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Test Mode: 00; Polarity: Horizontal



Condition: 3m HORIZONTAL

Job No. : 10755CR

Test 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	20 52	0 61	22 50	27 72	25 22	20 90	40.00	10 20	OB
1	30.33	0.01	22.59	27.73	25.55	20.00	40.00	-19.20	٧٢
2	73.88	0.96	12.41	27.64	34.14	19.87	40.00	-20.13	QP
3	171.99	1.18	15.56	27.24	39.18	28.68	43.50	-14.82	QP
4	319.94	2.07	19.80	26.99	36.18	31.06	46.00	-14.94	QP
5	492.47	2.49	24.25	27.77	29.15	28.12	46.00	-17.88	QP
6 p	p 958.79	3.56	29.48	26.86	27.29	33.47	46.00	-12.53	<b>OP</b>



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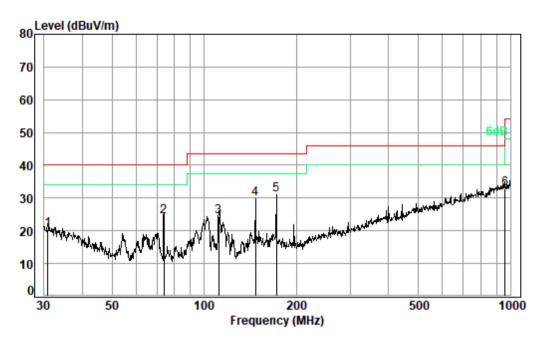
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Test Mode: 00; Polarity: Vertical



Condition: 3m VERTICAL Job No. : 10755CR

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	25.02	20.25	40.00	-19.75	QP
2	73.88	0.96	12.41	27.64	38.60	24.33	40.00	-15.67	QP
3	111.74	1.12	13.57	27.54	37.10	24.25	43.50	-19.25	QP
4	147.40								_
5 pp	171.99	1.18	15.56	27.24	41.47	30.97	43.50	-12.53	QP
6	958.79	3.56	29.48	26.86	26.67	32.85	46.00	-13.15	OP



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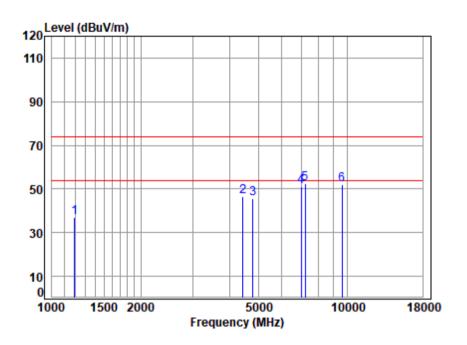
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL Job No : 10755CR\10756CR

Mode : 2402 TX SE

Note : BLE

	Freq			Preamp Factor		Level			Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1192.811	2.75	24.56	40.28	50.14	37.17	74.00	-36.83	peak
2	4443.453	6.71	33.50	42.51	48.89	46.59	74.00	-27.41	peak
3	4804.000	7.10	33.97	42.77	47.14	45.44	74.00	-28.56	peak
4	6974.982	8.53	35.89	41.70	48.51	51.23	74.00	-22.77	peak
5	7206.000	8.74	36.07	41.58	49.29	52.52	74.00	-21.48	peak
6	9608.000	10.81	37.67	38.57	42.29	52.20	74.00	-21.80	peak



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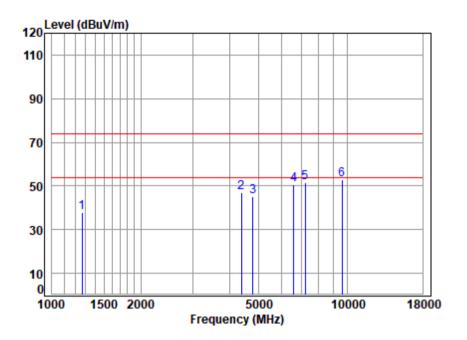
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Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: Low



Site : chamber Condition: 3m VERTICAL

Job No : 10755CR\10756CR

Mode : 2402 TX SE

Note : BLE

	Freq			Preamp Factor					Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1267.454	2.89	24.89	40.34	50.59	38.03	74.00	-35.97	peak
2	4392.376	6.66	33.42	42.47	49.27	46.88	74.00	-27.12	peak
3	4804.000	7.10	33.97	42.77	46.91	45.21	74.00	-28.79	peak
4	6583.209	8.32	35.65	41.91	48.71	50.77	74.00	-23.23	peak
5	7206.000	8.74	36.07	41.58	48.32	51.55	74.00	-22.45	peak
6	9608.000	10.81	37.67	38.57	43.12	53.03	74.00	-20.97	peak



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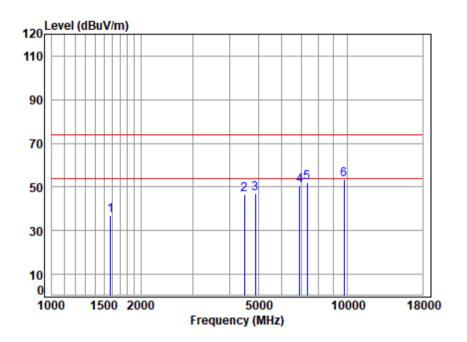
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Test Mode: 00; Polarity: Horizontal; Modulation: GFSK; Channel: middle



Site : chamber

Condition: 3m HORIZONTAL Job No : 10755CR\10756CR

Mode : 2440 TX SE

Note : BLE

				Preamp					
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1578.822	3.33	26.16	40.56	48.12	37.05	74.00	-36.95	peak
2	4495.125	6.76	33.59	42.55	48.86	46.66	74.00	-27.34	peak
3	4880.000	7.18	34.06	42.82	48.42	46.84	74.00	-27.16	peak
4	6914.763	8.50	35.85	41.73	48.19	50.81	74.00	-23.19	peak
5	7320.000	8.84	36.16	41.52	48.47	51.95	74.00	-22.05	peak
6	9760.000	10.76	37.76	38.35	43.13	53.30	74.00	-20.70	peak



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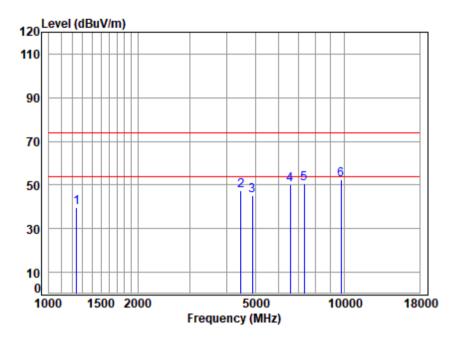
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Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: middle



Site : chamber Condition: 3m VERTICAL

Job No : 10755CR\10756CR

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	1242.068	2.84	24.78	40.32	52.55	39.85	74.00	-34.15	peak
2	4469.214	6.73	33.55	42.53	49.53	47.28	74.00	-26.72	peak
3	4880.000	7.18	34.06	42.82	46.71	45.13	74.00	-28.87	peak
4	6564.209	8.31	35.64	41.92	48.26	50.29	74.00	-23.71	peak
5	7320.000	8.84	36.16	41.52	47.26	50.74	74.00	-23.26	peak
6	9760.000	10.76	37.76	38.35	42.43	52.60	74.00	-21.40	peak



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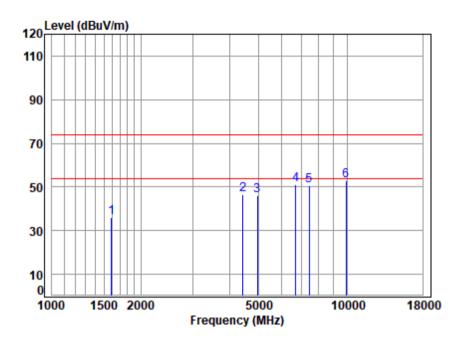
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL
Job No : 10755CR\10756CR

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	1592.571	3.34	26.22	40.57	47.09	36.08	74.00	-37.92	peak	
2	4443.453	6.71	33.50	42.51	48.62	46.32	74.00	-27.68	peak	
3	4960.000	7.26	34.15	42.87	47.43	45.97	74.00	-28.03	peak	
4	6698.373	8.39	35.72	41.84	48.98	51.25	74.00	-22.75	peak	
5	7440.000	8.96	36.25	41.46	46.99	50.74	74.00	-23.26	peak	
6	9920.000	10.71	37.85	38.12	42.68	53.12	74.00	-20.88	peak	



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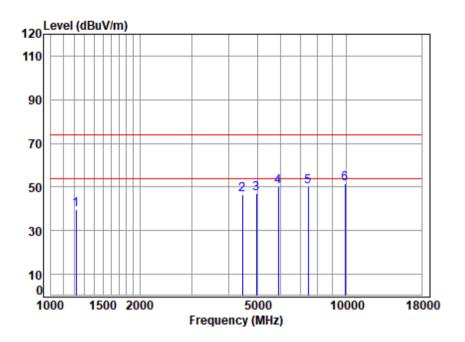
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber Condition: 3m VERTICAL

Job No : 10755CR\10756CR

Mode : 2480 TX SE

Note : BLE

	Freq			Preamp Factor					Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1217.190	2.80	24.67	40.30	52.36	39.53	74.00	-34.47	peak
2	4456.315	6.72	33.53	42.52	48.99	46.72	74.00	-27.28	peak
3	4960.000	7.26	34.15	42.87	48.65	47.19	74.00	-26.81	peak
4	5898.442	8.24	35.00	42.30	49.47	50.41	74.00	-23.59	peak
5	7440.000	8.96	36.25	41.46	46.61	50.36	74.00	-23.64	peak
6	9920.000	10.71	37.85	38.12	41.07	51.51	74.00	-22.49	peak



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

Refer to test setup photos.

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

Refer to external and internal photos.



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# 10 Appendix

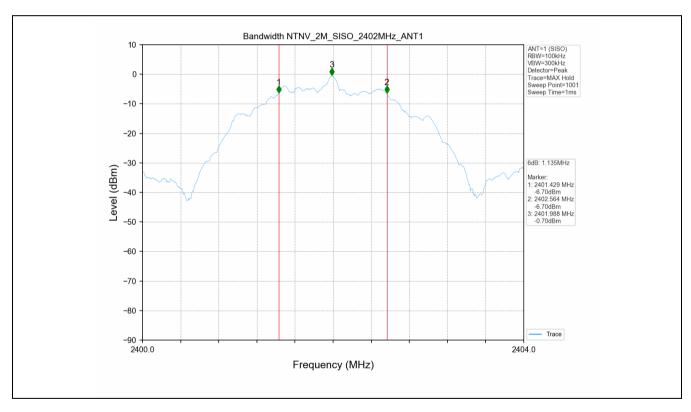
### Appendix for 15.247

### 1. Bandwidth

#### 1.1 Test Result

Toot Mode	Frequency	TV Tuno	ANT No	6dB Bai	Verdict	
Test Mode	(MHz)	TX Type	ANT No.	Test Result (MHz)	Limits (MHz)	verdict
	2402	SISO	1	1.135	≥0.5	PASS
2M	2440	SISO	1	1.141	≥0.5	PASS
	2480	SISO	1	1.144	≥0.5	PASS

### 1.2 Test Graph - 6dB Bandwidth





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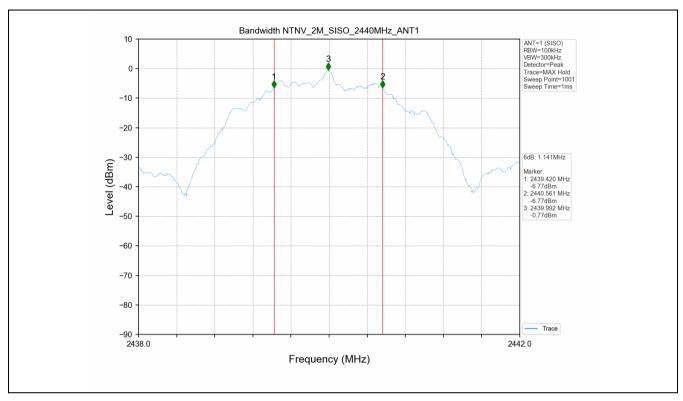
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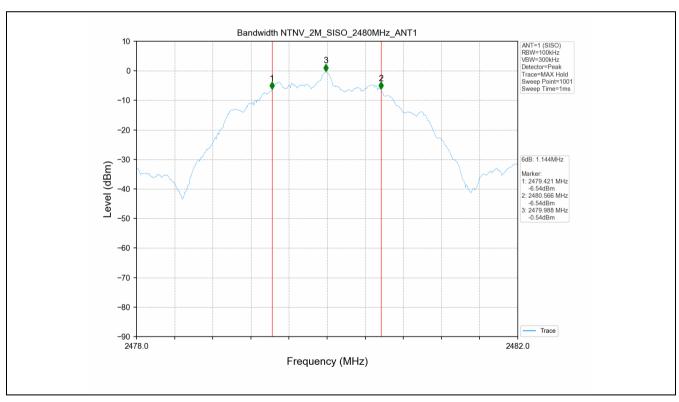
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### 2. Maximum Conducted Output Power

#### 2.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Measured Peak Output Power (dBm) Ant 1	Limits (dBm)	Verdict
	2402	SISO	-0.62	30	PASS
2M	2440	SISO	-0.68	30	PASS
	2480	SISO	-0.46	30	PASS



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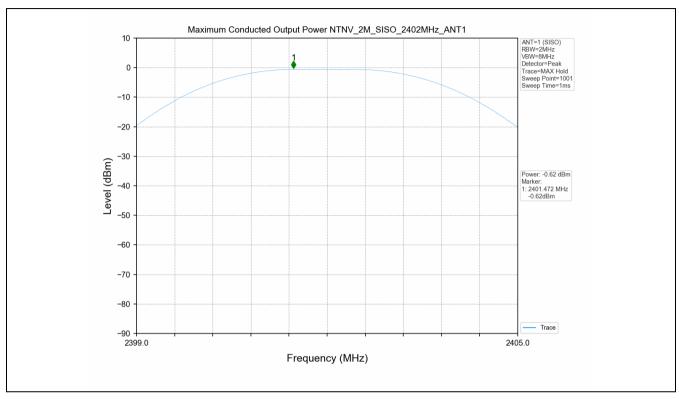
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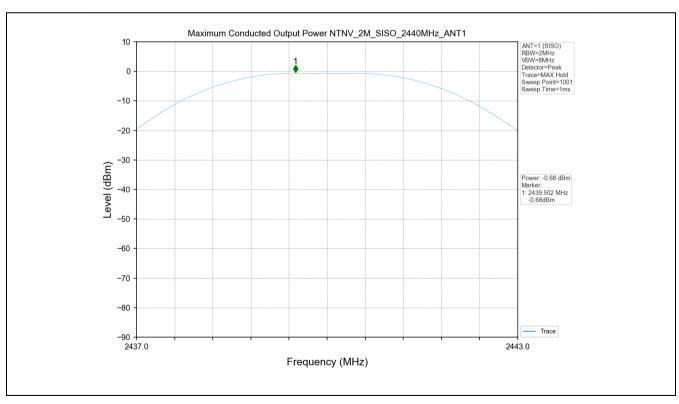


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### 2.2 Test Graph







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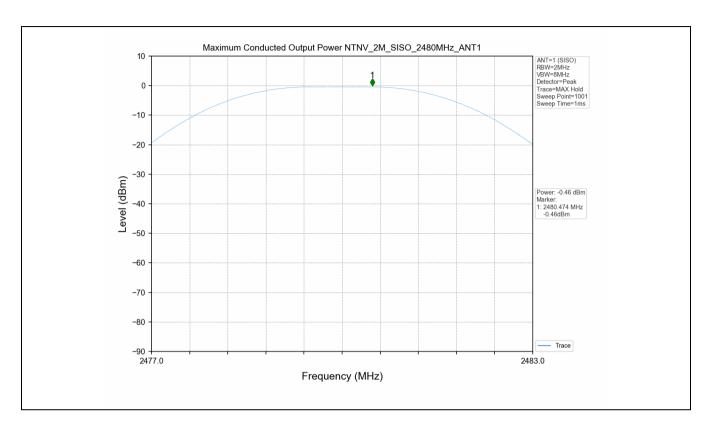
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### 3. Maximum Power Spectral Density (PSD)

#### 3.1 Test Result

Test Mode	Frequency (MHz)	Тх Туре	Maximum Power Spectral Density (dBm/3KHz) Ant 1	Limits (dBm/3kHz)	Verdict
	2402	SISO	-18.42	≤8	PASS
2M	2440	SISO	-18.47	≤8	PASS
	2480	SISO	-18.12	≤8	PASS



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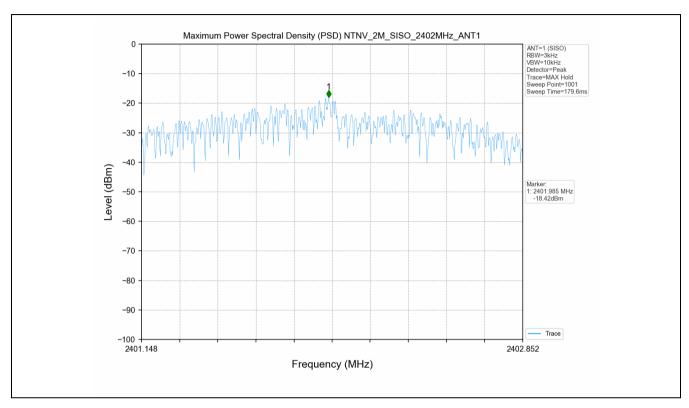
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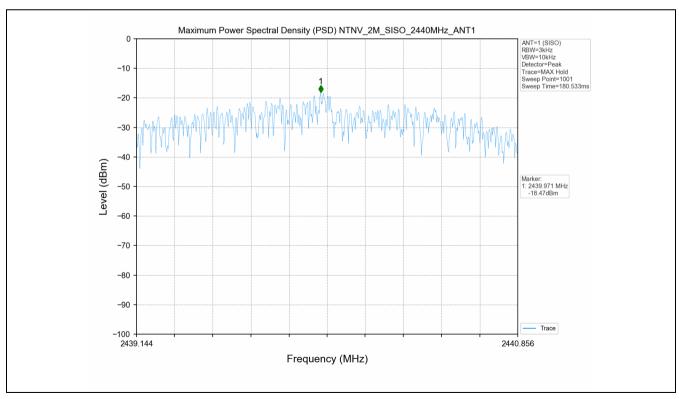


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### 3.2 Test Graph







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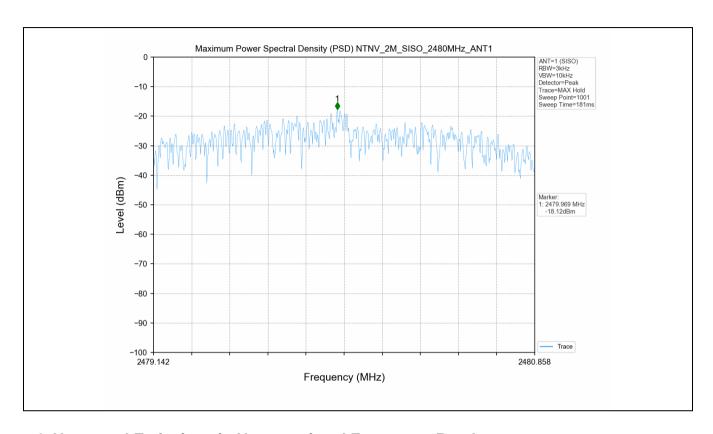
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### 4. Unwanted Emissions in Non-restricted Frequency Bands

#### 4.1 Test Result

Test Mode	Frequency (MHz)	TX Type	ANT No.	Spurious Conducted Emission (dBm)	Limits (dBm)	Verdict
	2402	SISO	1	Refer to test graph	-20.59	PASS
2M	2440	SISO	1	Refer to test graph	-20.59	PASS
	2480	SISO	1	Refer to test graph	-20.59	PASS



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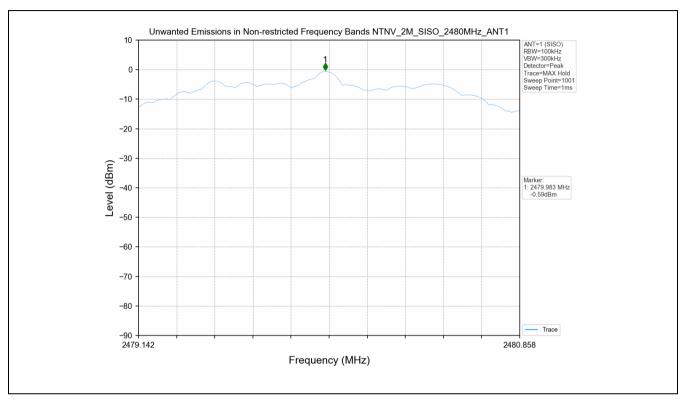
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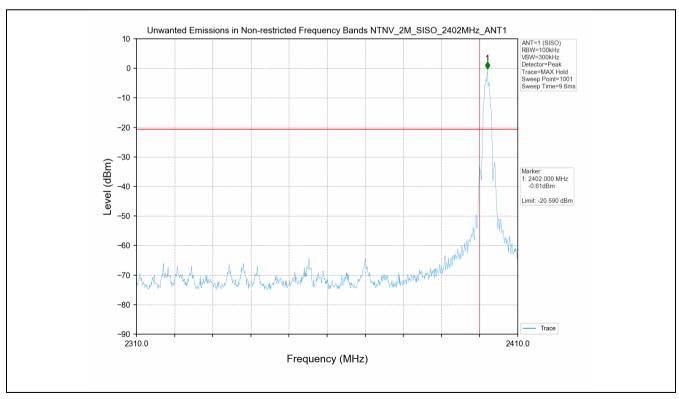


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### 4.2 Test Graph







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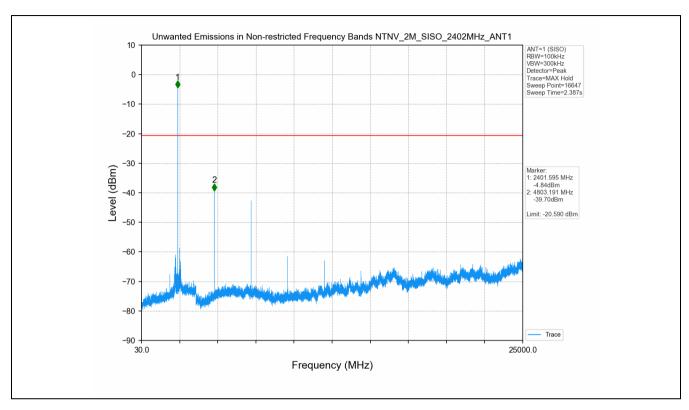
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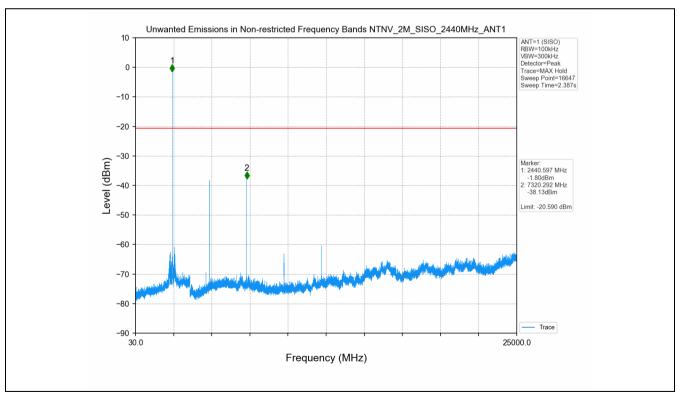
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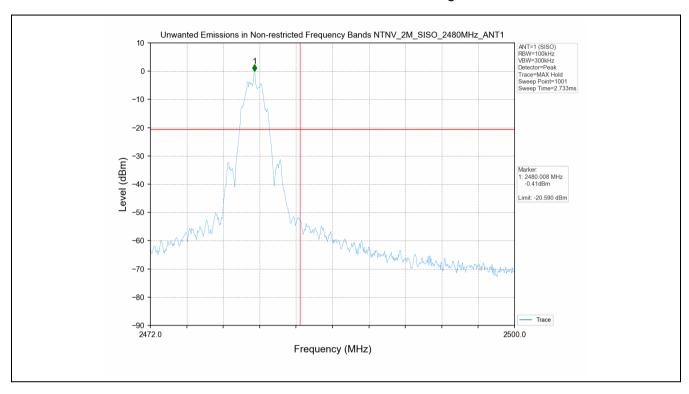
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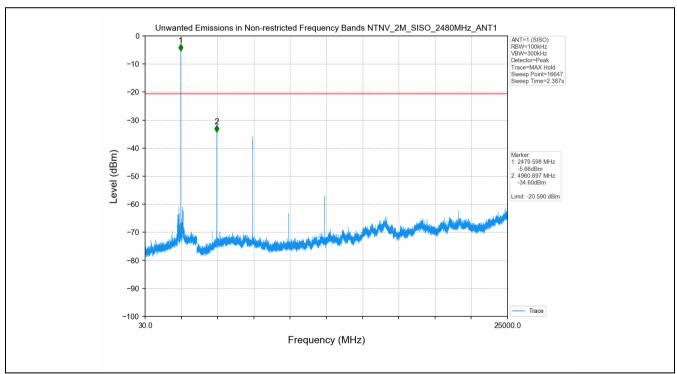
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