



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

SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300089502

Page: 1 of 59

## TEST REPORT

**Application No.:** SZCR2303000895AT(TJHL2303002096BC)

**Applicant:** Acer Inc

**Address of Applicant:** 8F, 88, Sec.1, Xintai 5<sup>th</sup> RD. Xizhi, New Taipei City 221, Taiwan. China

**Manufacturer:** Tianjin Fujita Bicycle Industry Co., Ltd

**Address of Manufacturer:** Inside Fujita Group Hospital, Dongjin Road, Junliangcheng Street, Dongli District, Tianjin

**Factory:** Tianjin Fujita Bicycle Industry Co., Ltd

**Address of Factory:** Inside Fujita Group Hospital, Dongjin Road, Junliangcheng Street, Dongli District, Tianjin

**Equipment Under Test (EUT):**

**EUT Name:** Acer Electric ES Series 5

**Model No.:** AES015

**Trade Mark:** acer

**FCC ID:** HLZAES015

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

**Date of Receipt:** 2022-11-24(for original report of FYCR221100047702)

**Date of Test:** 2022-12-05 to 2023-03-03(for original report of FYCR221100047702)

**Date of Issue:** 2023-03-17(for original report of FYCR221100047702)

2023-03-31(for new report SZCR230300089502)

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu  
EMC Laboratory Manager



SGS-CSTC Standards Technical Services Co., Ltd.  
Shenzhen Branch Inspection & Testing Services Laboratory

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SZEMC-TRF-01 Rev. A/0 Aug01,2022

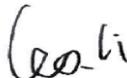
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### Revision Record

Version	Chapter	Date	Modifier	Remark
01		2023-03-31		Original

### Authorized for issue by:

	 _____ <b>Leo Li/Project Engineer</b>	
	 _____ <b>Eric Fu/Reviewer</b>	

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## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

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		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		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

### Remark:

Original model No. in report FYCR221100047702: XES015

The model XES015 was only tested in report FYCR221100047702.

New model No. in report SZCR230300089502: AES015

This report was an additional report copied from the report FYCR221100047702, just changed the information of applicant, manufacture, factory, product name and model No., and added trade mark. Since the electrical circuit design, layout, components used and internal wiring for the model XES015 in the report FYCR221100047702 was exactly same as the model AES015 in this report, only the model No. is different.

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## 4 General Information

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

Power supply:	DC 36V rechargeable battery which charged from AC/DC adapter Adapter information: Model: FY-4202000 Input: AC 100-240V, 50/60Hz 2.5A Output: DC 42.0V, 2.0A
Cable(s):	DC Cable: 120cm unshielded AC Cable: 120cm unshielded
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 LE
Data Rate:	1M/bps
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	PCB Antenna
Antenna Gain:	2.48 dBi

Remark: The information in this section is provided by the applicant or manufacturer, CCS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--

The EUT has been tested as an independent unit.



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### 4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	± 0.8dB
Minimum 6dB Bandwidth	± 0.3%
Power Spectrum Density	± 0.4dB
Conducted Band Edges Measurement	± 2.7dB
Conducted Spurious Emissions	± 2.7dB
Radiated Emissions which fall in the restricted bands	± 4.4dB (Above 1GHz)
Radiated Spurious Emissions Below 1GHz	± 3.1dB (Below 1GHz)
Radiated Spurious Emissions Above 1GHz	± 4.4dB (Above 1GHz)

Remark:  
The  $U_{lab}$  (lab Uncertainty) is less than  $U_{cisp/ETSI}$  (CISPR/ETSI 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:

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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 (Member No. 1937)**

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. Shenzhen EMC laboratory 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: CN1336**

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

Designation Number: CN1336. Test Firm Registration Number: 787754.

- **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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## 5 Equipment List

Conducted Peak Output Power					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-25	2022/5/30	2023/5/29
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2022/7/12	2023/7/11
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2022/7/12	2023/7/11
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2022/7/12	2023/7/11
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022/7/12	2023/7/11
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-25	2022/5/30	2023/5/29
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022/7/12	2023/7/11
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A

Power Spectrum Density					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-25	2022/5/30	2023/5/29
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022/7/12	2023/7/11
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-25	2022/5/30	2023/5/29
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022/7/12	2023/7/11
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A



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## Conducted Spurious Emissions

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-25	2022/5/30	2023/5/29
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022/7/12	2023/7/11
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A

## Radiated Emissions which fall in the restricted bands

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2024/7/12
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	SEM003-32	2021/9/26	2024/9/25
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-23	2022/4/24	2023/4/23
Coaxial Cable	CCS	N/A	SEM035-02	2022/5/16	2023/5/15
Pre-amplifier	TST PASS	LNA04080G30	SEM005-27	2022/4/15	2023/4/14
Pre-amplifier	TST PASS	LNA10180G45	SEM005-28	2022/4/15	2023/4/14
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

## Radiated Spurious Emissions Below 1GHz

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2024/7/12
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-33	2021/9/25	2024/9/24
Loop Antenna	ETS-LINDGREN	6502	SEM003-36	2021/9/26	2024/9/25
MXE EMI receiver	Agilent	N9038A	SEM004-05	2022/7/12	2023/7/11
Pre-amplifier	HP	8447D	SEM005-02	2022/7/12	2023/7/11
Coaxial Cable	CCS	N/A	SEM035-01	2022/5/16	2023/5/15
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

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SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230300089502

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<b>Radiated Spurious Emissions Above 1GHz</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2024/7/12
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	SEM003-32	2021/9/26	2024/9/25
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-23	2022/4/24	2023/4/23
Coaxial Cable	CCS	N/A	SEM035-03	2022/5/16	2023/5/15
Pre-amplifier	TST PASS	LNA04080G30	SEM005-27	2022/4/15	2023/4/14
Pre-amplifier	TST PASS	LNA10180G45	SEM005-28	2022/4/15	2023/4/14
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

**General used equipment**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
Humidity/ Temperature Indicator	Mingle	TH607	SEM002-22	2022/7/12	2023/7/11
Humidity/ Temperature Indicator	Mingle	TH607	SEM002-23	2022/7/12	2023/7/11
Barometer	DUMAI	DYM3	SEM002-24	2022/7/12	2023/7/11

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## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

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

#### 6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

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

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.48 dBi.

Antenna location: Refer to internal photo.



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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)
902-928	1 for $\geq 50$ hopping channels
	0.25 for $25 \leq$ hopping channels $< 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ non-overlapping hopping channels
	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: 24.8 °C

Humidity: 46.8 % RH

Atmospheric Pressure: 1020 mbar

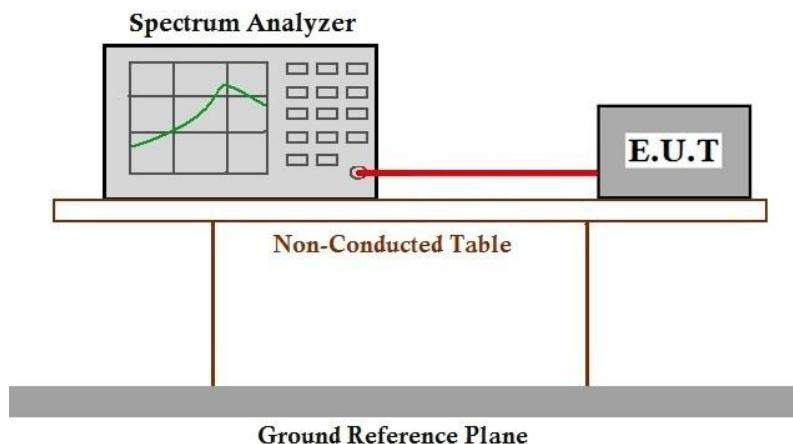


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**7.1.2 Test Mode Description**

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

**7.1.3 Test Setup Diagram****7.1.4 Measurement Procedure and Data**

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

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

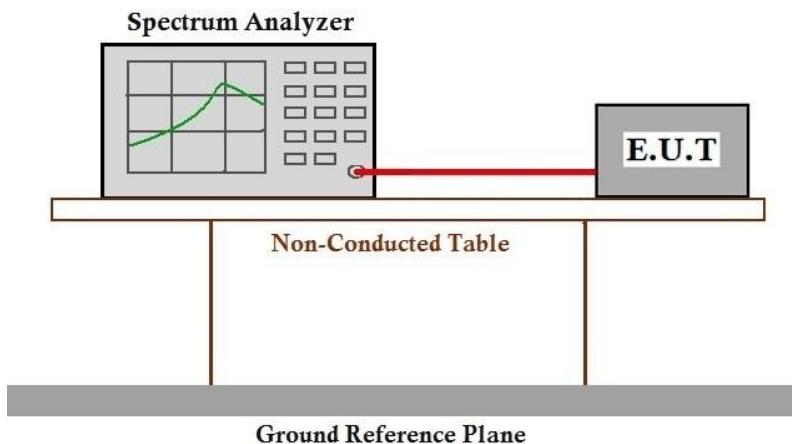
Operating Environment:

Temperature: 24.8 °C      Humidity: 46.8 % RH      Atmospheric Pressure: 1020 mbar

### 7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_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

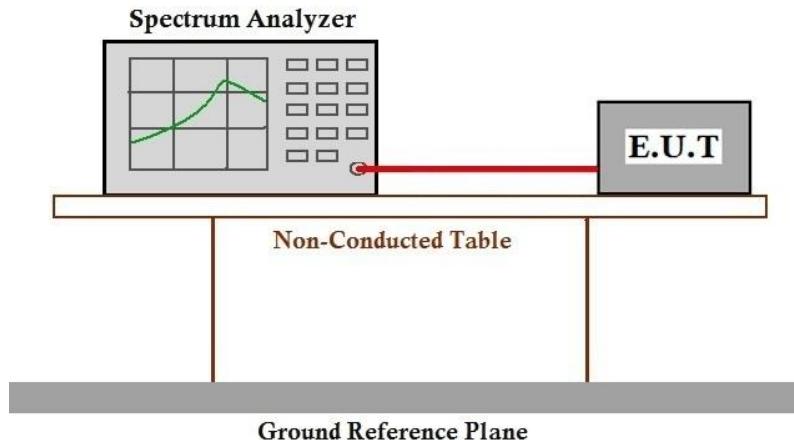
Operating Environment:

Temperature: 24.8 °C Humidity: 46.8 % RH Atmospheric Pressure: 1020 mbar

#### 7.3.2 Test Mode Description

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

#### 7.3.3 Test Setup Diagram



#### 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: 24.8 °C      Humidity: 46.8 % RH      Atmospheric Pressure: 1020 mbar

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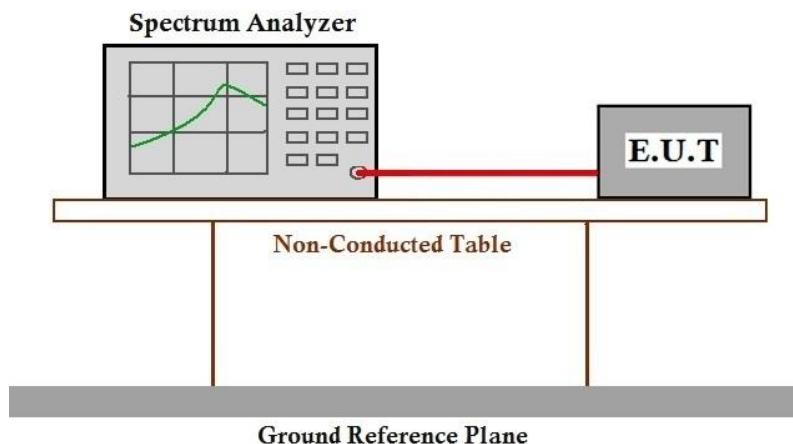
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**7.4.2 Test Mode Description**

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

**7.4.3 Test Setup Diagram****7.4.4 Measurement Procedure and Data**

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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: 24.8 °C      Humidity: 46.8 % RH      Atmospheric Pressure: 1020 mbar

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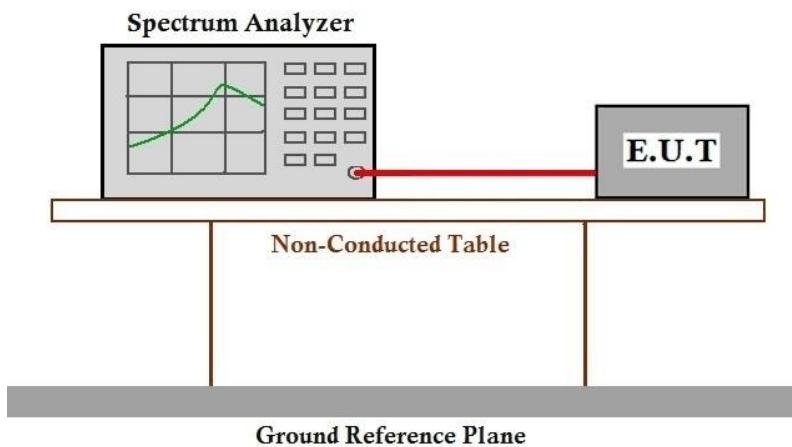
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**7.5.2 Test Mode Description**

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

**7.5.3 Test Setup Diagram****7.5.4 Measurement Procedure and Data**

Please Refer to Appendix for Details



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**7.6 Radiated Emissions which fall in the restricted bands**

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

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement Distance: 3m

Limit:

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

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



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### 7.6.1 E.U.T. Operation

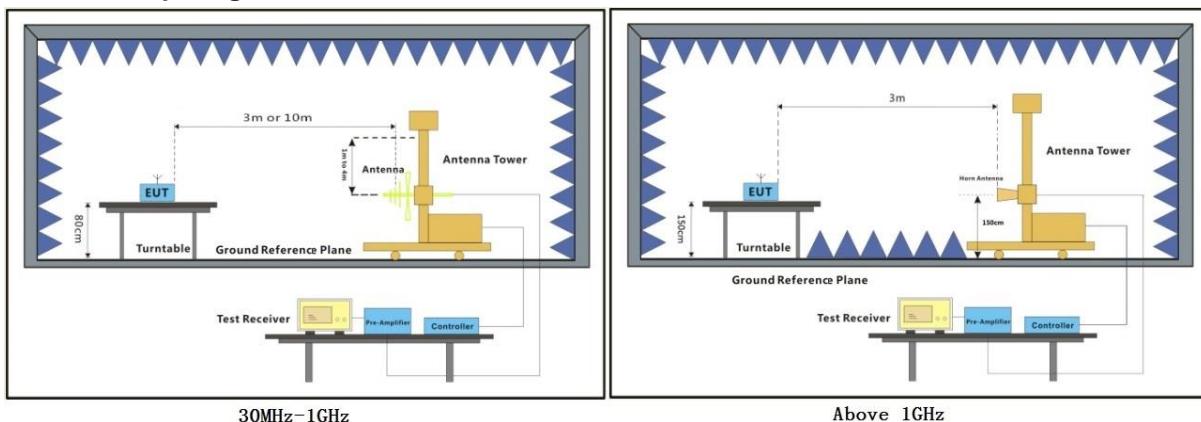
Operating Environment:

Temperature: 22.2 °C      Humidity: 51.3 % RH      Atmospheric Pressure: 1020 mbar

### 7.6.2 Test Mode Description

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

### 7.6.3 Test Setup Diagram



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**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.



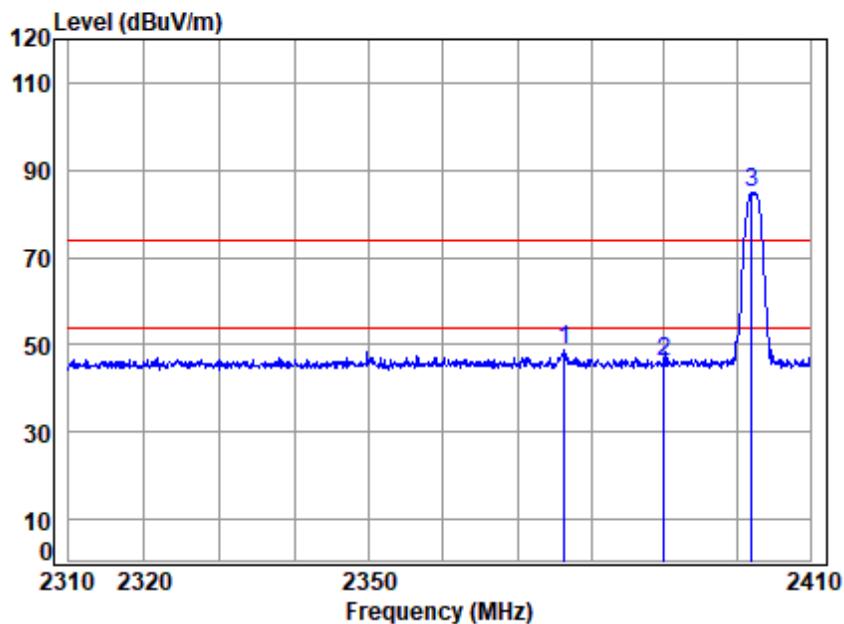
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Shenzhen Branch Inspection & Testing Services Laboratory

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



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00477AT/00478AT

Mode : 2402 Band edge

Note : BLE

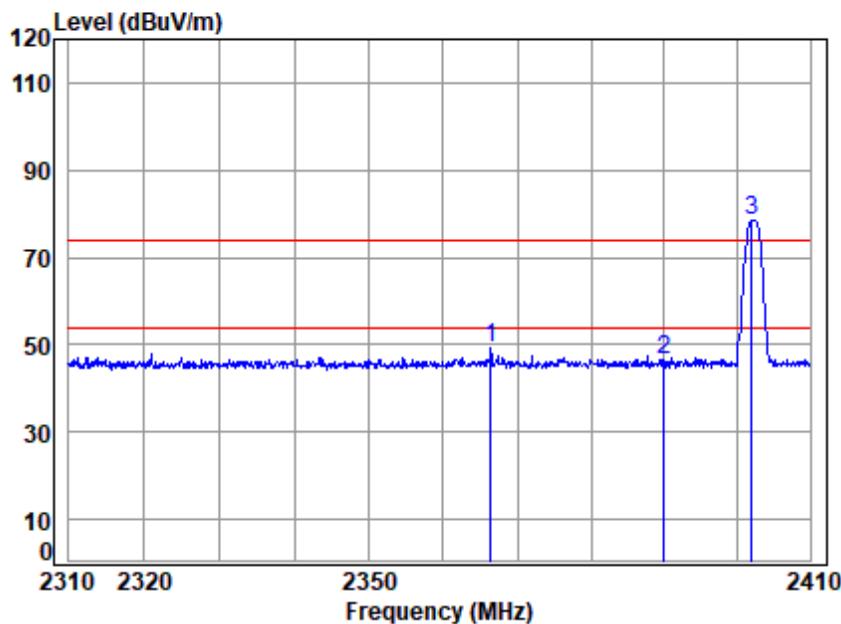
		Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Line Level	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2376.430	5.04	27.13	32.50	48.94	48.61	74.00	-25.39	peak
2	2390.000	5.05	27.16	32.50	46.29	46.00	74.00	-28.00	peak
3	2402.000	5.06	27.18	32.50	84.95	84.69	74.00	10.69	peak



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



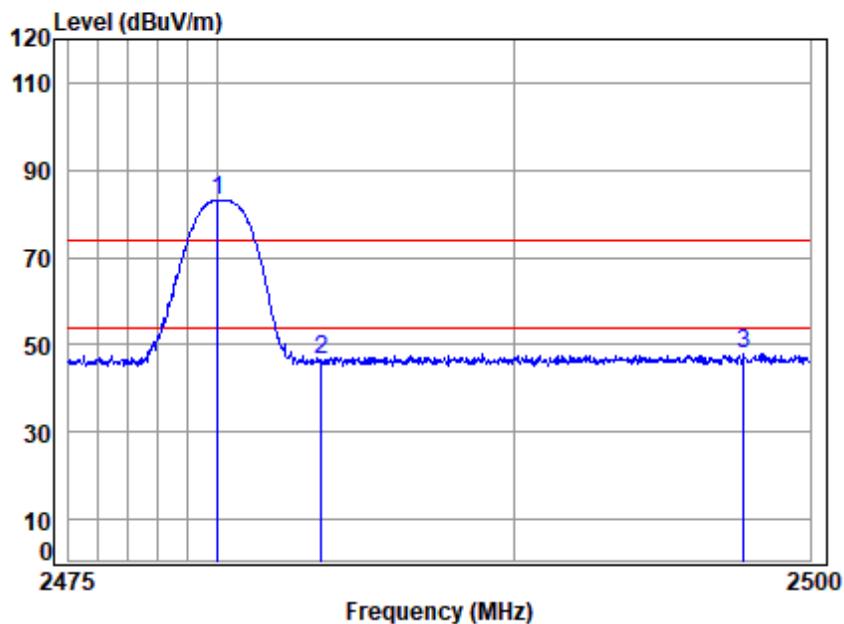
Site : chamber  
Condition: 3m VERTICAL  
Job No : 00477AT/00478AT  
Mode : 2402 Band edge  
Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit Remark	
							dB	dB
1 2366.380	5.04	27.10	32.50	49.70	49.34	74.00	-24.66	peak
2 2390.000	5.05	27.16	32.50	46.72	46.43	74.00	-27.57	peak
3 2402.000	5.06	27.18	32.50	78.81	78.55	74.00	4.55	peak

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



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00477AT/00478AT  
Mode : 2480 Band edge  
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over Limit	Remark
	MHz	dB	dB/m		dB	dBuV	dBuV/m	dBuV/m	dB
1	2480.000	5.12	27.36	32.50	82.96	82.94	74.00	8.94	peak
2	2483.500	5.12	27.36	32.50	46.45	46.43	74.00	-27.57	peak
3	2497.765	5.13	27.40	32.50	47.99	48.02	74.00	-25.98	peak

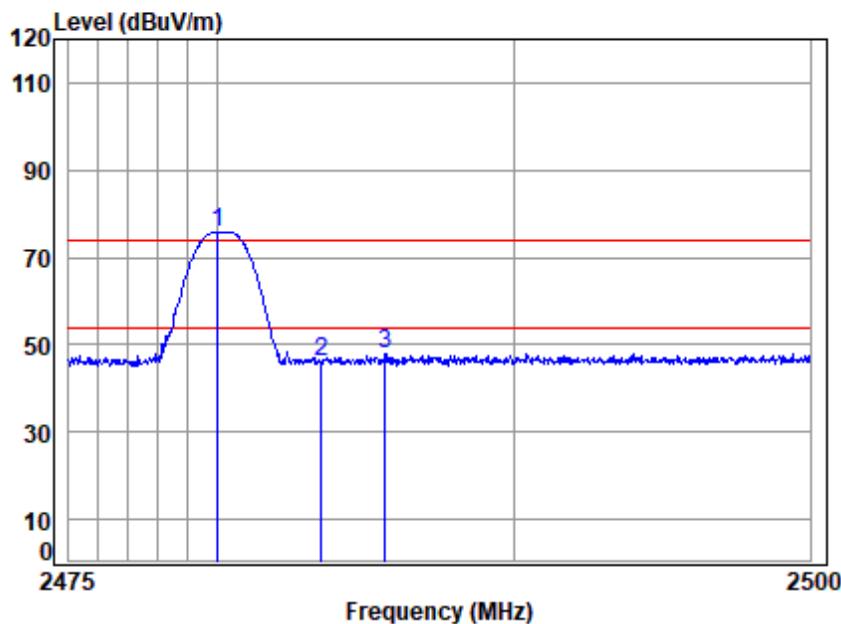
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00477AT/00478AT  
Mode : 2480 Band edge  
Note : BLE

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over Limit	Remark
	MHz	dB	dB/m		dB	dBuV	dBuV/m	dBuV/m	dB
1	2480.000	5.12	27.36	32.50	75.98	75.96	74.00	1.96	peak
2	2483.500	5.12	27.36	32.50	46.14	46.12	74.00	-27.88	peak
3	2485.644	5.12	27.37	32.50	47.99	47.98	74.00	-26.02	peak

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**7.7 Radiated Spurious Emissions Below 1GHz**

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

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

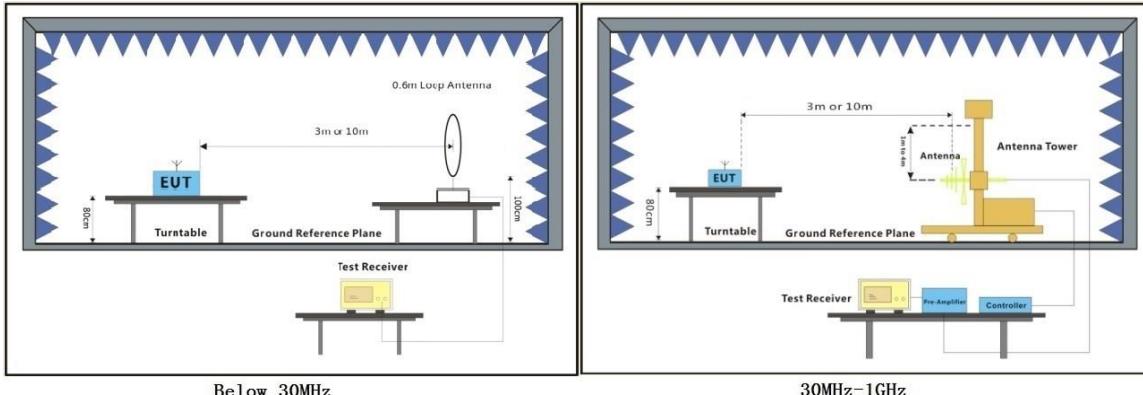
**7.7.1 E.U.T. Operation**

Operating Environment:

Temperature: 23.2 °C      Humidity: 52.6 % RH      Atmospheric Pressure: 1020 mbar

**7.7.2 Test Mode Description**

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

**7.7.3 Test Setup Diagram**

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**7.7.4 Measurement Procedure and Data**

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

Remark:

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.



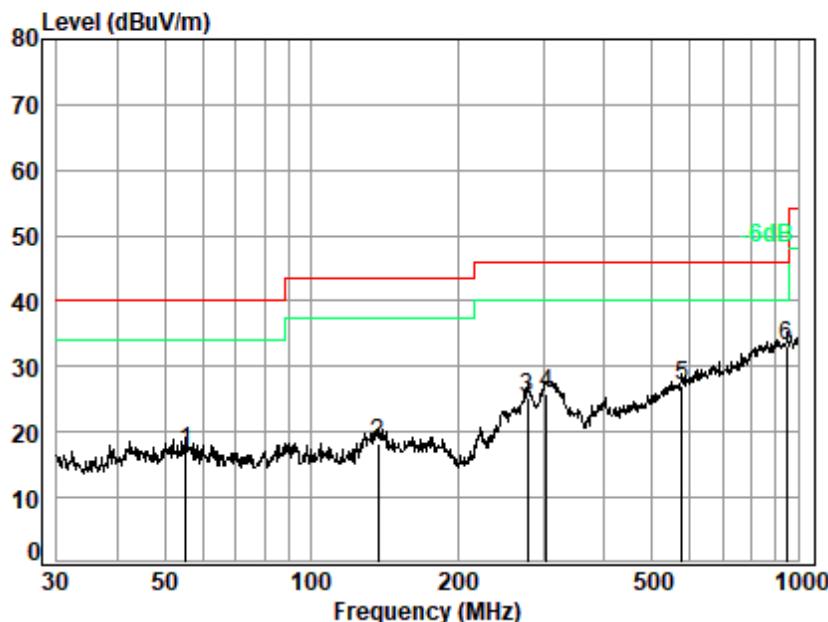
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00477AT

Mode : 00

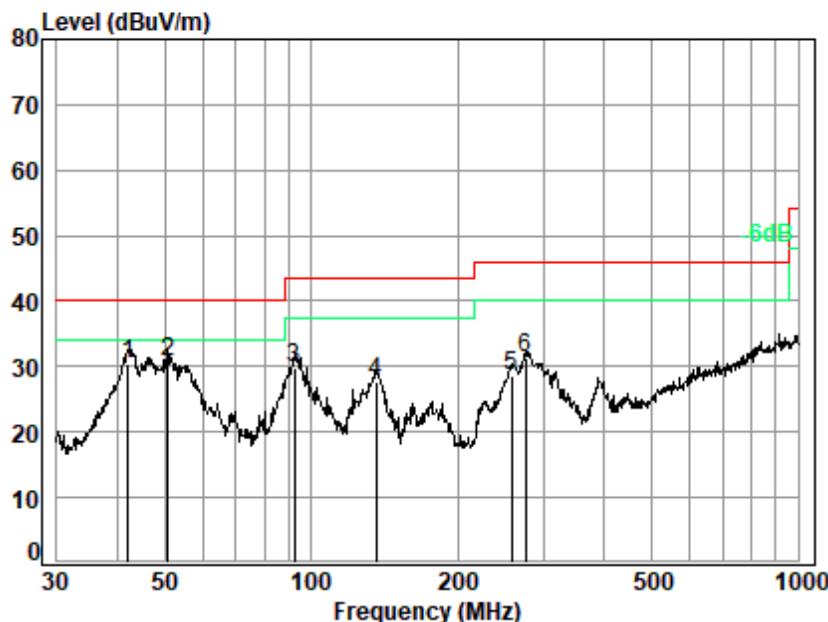
Freq	Cable	Ant	Preamp	Read	Limit	Over	Remark
	Loss	Factor	Factor	Level			
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	55.221	0.25	17.25	25.96	25.51	17.05	40.00 -22.95 QP
2	136.939	0.97	17.20	25.54	25.76	18.39	43.50 -25.11 QP
3	278.067	0.94	17.67	25.41	32.07	25.27	46.00 -20.73 QP
4	303.544	1.05	18.48	25.40	31.61	25.74	46.00 -20.26 QP
5	576.644	2.08	23.91	25.11	26.12	27.00	46.00 -19.00 QP
6	948.761	2.18	29.26	24.05	25.81	33.20	46.00 -12.80 QP



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



Site : chamber

Condition: 3m VERTICAL

Job No : 00477AT

Mode : 00

Freq	Cable	Ant	Preamp	Read	Limit	Over	Remark
	Loss	Factor	Factor	Level			
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	42.007	0.21	17.16	26.01	39.21	30.57	40.00 -9.43 QP
2	50.764	0.22	17.35	25.99	39.11	30.69	40.00 -9.31 QP
3	92.462	0.72	13.85	25.67	40.91	29.81	43.50 -13.69 QP
4	135.982	0.97	17.12	25.54	35.06	27.61	43.50 -15.89 QP
5	257.422	0.88	16.78	25.43	36.24	28.47	46.00 -17.53 QP
6	276.124	0.94	17.57	25.42	38.17	31.26	46.00 -14.74 QP

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## 7.8 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 &amp; 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

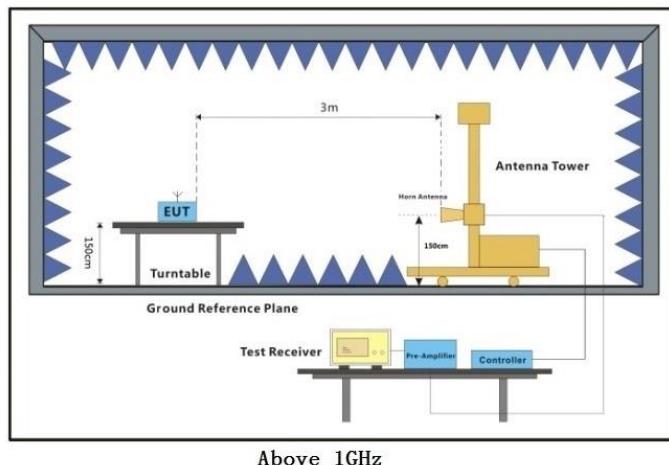
Operating Environment:

Temperature: 22.2 °C      Humidity: 51.3 % RH      Atmospheric Pressure: 1020 mbar

### 7.8.2 Test Mode Description

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

### 7.8.3 Test Setup Diagram

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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.

Remark:

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.



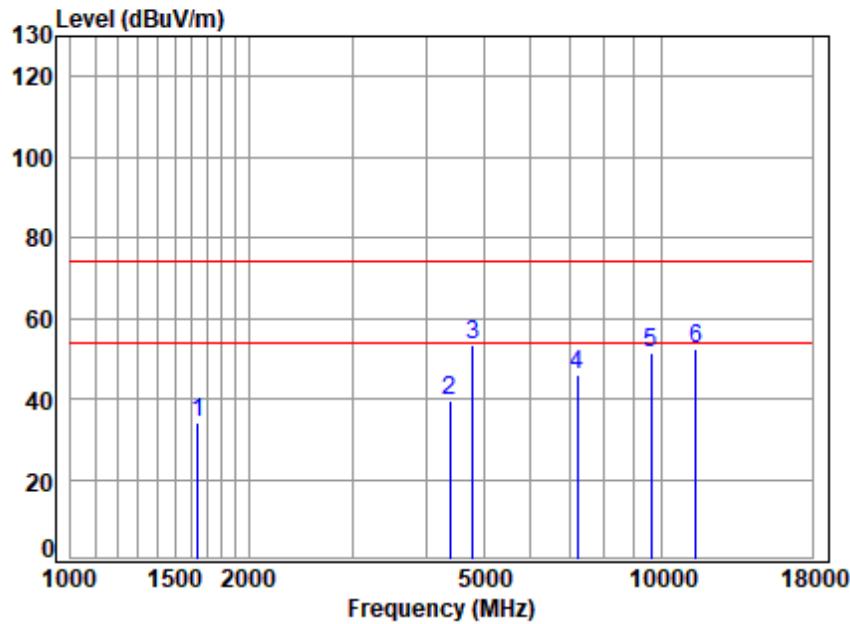
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



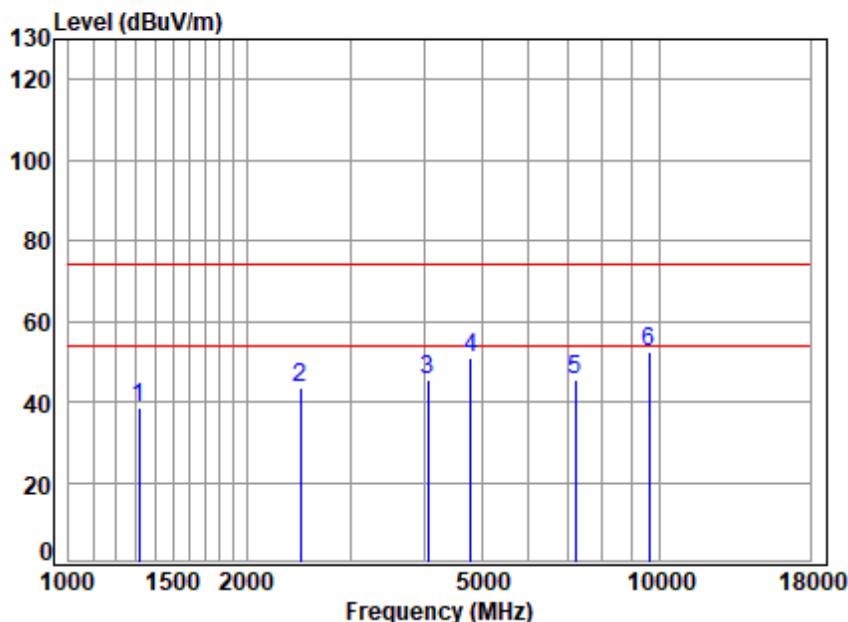
Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00477AT/00478AT  
Mode : 2402 TX RSE  
Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over Limit	Remark	
								MHz	dB
								dB	dB/m
1	1644.019	4.08	24.89	52.93	57.95	33.99	74.00	-40.01	peak
2	4392.376	7.47	30.06	52.93	54.77	39.37	74.00	-34.63	peak
3	4804.000	7.98	30.94	53.05	67.53	53.40	74.00	-20.60	peak
4	7206.000	8.29	36.05	53.52	55.29	46.11	74.00	-27.89	peak
5	9608.000	11.41	37.53	53.58	55.84	51.20	74.00	-22.80	peak
6	11433.910	11.57	39.69	53.78	55.00	52.48	74.00	-21.52	Peak

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



Site : chamber  
 Condition: 3m VERTICAL  
 Job No : 00477AT/00478AT  
 Mode : 2402 TX RSE  
 Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over Limit	Remark	
								MHz	dB
								dB	dB/m
1	1315.985	3.41	24.24	52.74	63.65	38.56	74.00	-35.44	peak
2	2464.024	5.11	27.32	53.10	64.00	43.33	74.00	-30.67	Peak
3	4050.904	7.49	29.58	52.82	60.98	45.23	74.00	-28.77	peak
4	4804.000	7.98	30.94	53.05	64.85	50.72	74.00	-23.28	peak
5	7206.000	8.29	36.05	53.52	54.73	45.55	74.00	-28.45	peak
6	9608.000	11.41	37.53	53.58	56.82	52.18	74.00	-21.82	peak

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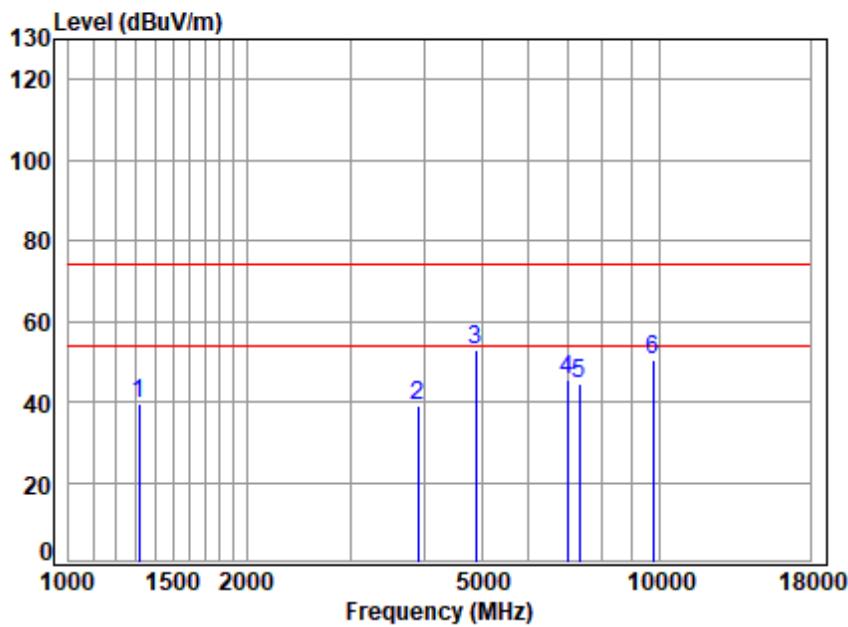
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00477AT/00478AT  
Mode : 2440 TX RSE  
Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over Limit	Remark	
								MHz	dB
								dB	dB
1	1315.985	3.41	24.24	52.74	64.77	39.68	74.00	-34.32	peak
2	3901.516	7.40	29.35	52.83	55.26	39.18	74.00	-34.82	peak
3	4880.000	8.11	31.12	53.07	66.81	52.97	74.00	-21.03	peak
4	6974.982	8.17	35.74	53.48	55.07	45.50	74.00	-28.50	peak
5	7320.000	8.35	36.19	53.53	53.52	44.53	74.00	-29.47	peak
6	9760.000	11.30	37.87	53.43	54.83	50.57	74.00	-23.43	peak

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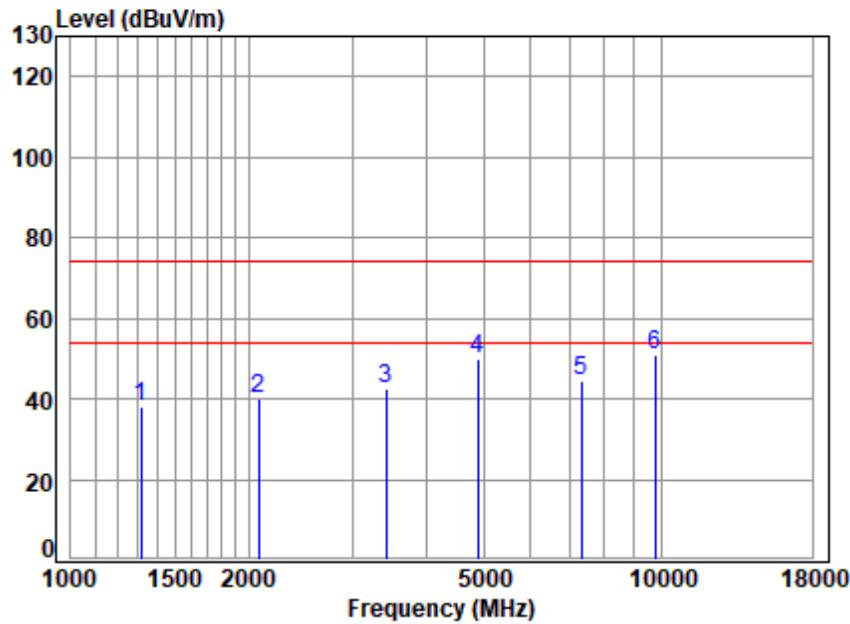
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



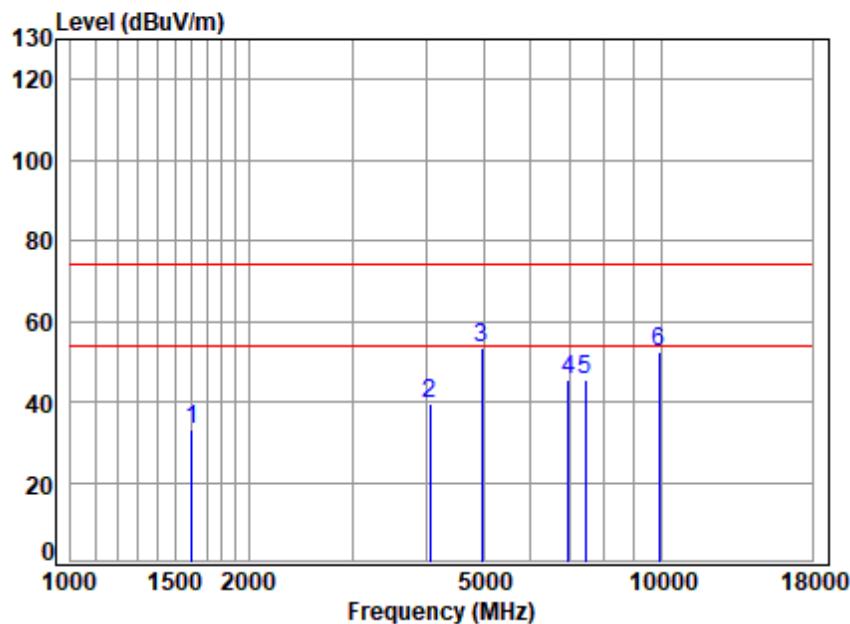
Site : chamber  
Condition: 3m VERTICAL  
Job No : 00477AT/00478AT  
Mode : 2440 TX RSE  
Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over	Remark	
								MHz	dB
								dB	dB
1	1315.985	3.41	24.24	52.74	63.29	38.20	74.00	-35.80	peak
2	2077.705	4.81	26.40	53.10	62.01	40.12	74.00	-33.88	Peak
3	3425.675	6.81	28.69	52.96	60.00	42.54	74.00	-31.46	Peak
4	4880.000	8.11	31.12	53.07	63.66	49.82	74.00	-24.18	peak
5	7320.000	8.35	36.19	53.53	53.29	44.30	74.00	-29.70	peak
6	9760.000	11.30	37.87	53.43	55.06	50.80	74.00	-23.20	peak

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



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00477AT/00478AT  
Mode : 2480 TX RSE  
Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark	
								dB	
1 1606.441	4.00	24.81	52.91	57.36	33.26	74.00	-40.74	peak	
2 4050.904	7.49	29.58	52.82	55.26	39.51	74.00	-34.49	peak	
3 4960.000	8.24	31.31	53.09	66.80	53.26	74.00	-20.74	peak	
4 6954.852	8.15	35.70	53.47	55.28	45.66	74.00	-28.34	peak	
5 7440.000	8.40	36.33	53.55	54.53	45.71	74.00	-28.29	peak	
6 9920.000	11.18	38.22	53.28	56.41	52.53	74.00	-21.47	peak	

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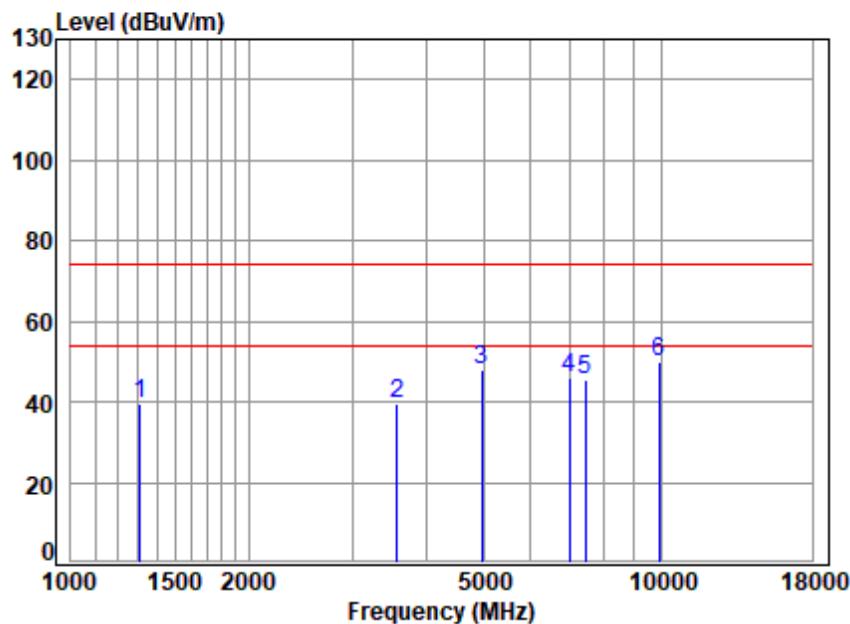
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00477AT/00478AT  
Mode : 2480 TX RSE  
Note : BLE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark	
								MHz	dB
								dB	dB/m
1	1312.187	3.40	24.24	52.74	64.79	39.69	74.00	-34.31	peak
2	3567.138	7.06	28.81	52.92	56.78	39.73	74.00	-34.27	peak
3	4960.000	8.24	31.31	53.09	61.53	47.99	74.00	-26.01	peak
4	6995.172	8.19	35.79	53.50	55.68	46.16	74.00	-27.84	peak
5	7440.000	8.40	36.33	53.55	54.31	45.49	74.00	-28.51	peak
6	9920.000	11.18	38.22	53.28	53.91	50.03	74.00	-23.97	peak

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## 8 Test Setup Photo

Refer to Appendix - Test Setup Photo

## 9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos



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## 10 Appendix

### 1. Duty Cycle

#### 1.1 Ant1

##### 1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	0.408	0.626	65.18	1.86	0.04
		2440	0.407	0.625	65.12	1.86	0.03
		2480	0.407	0.625	65.12	1.86	0.03

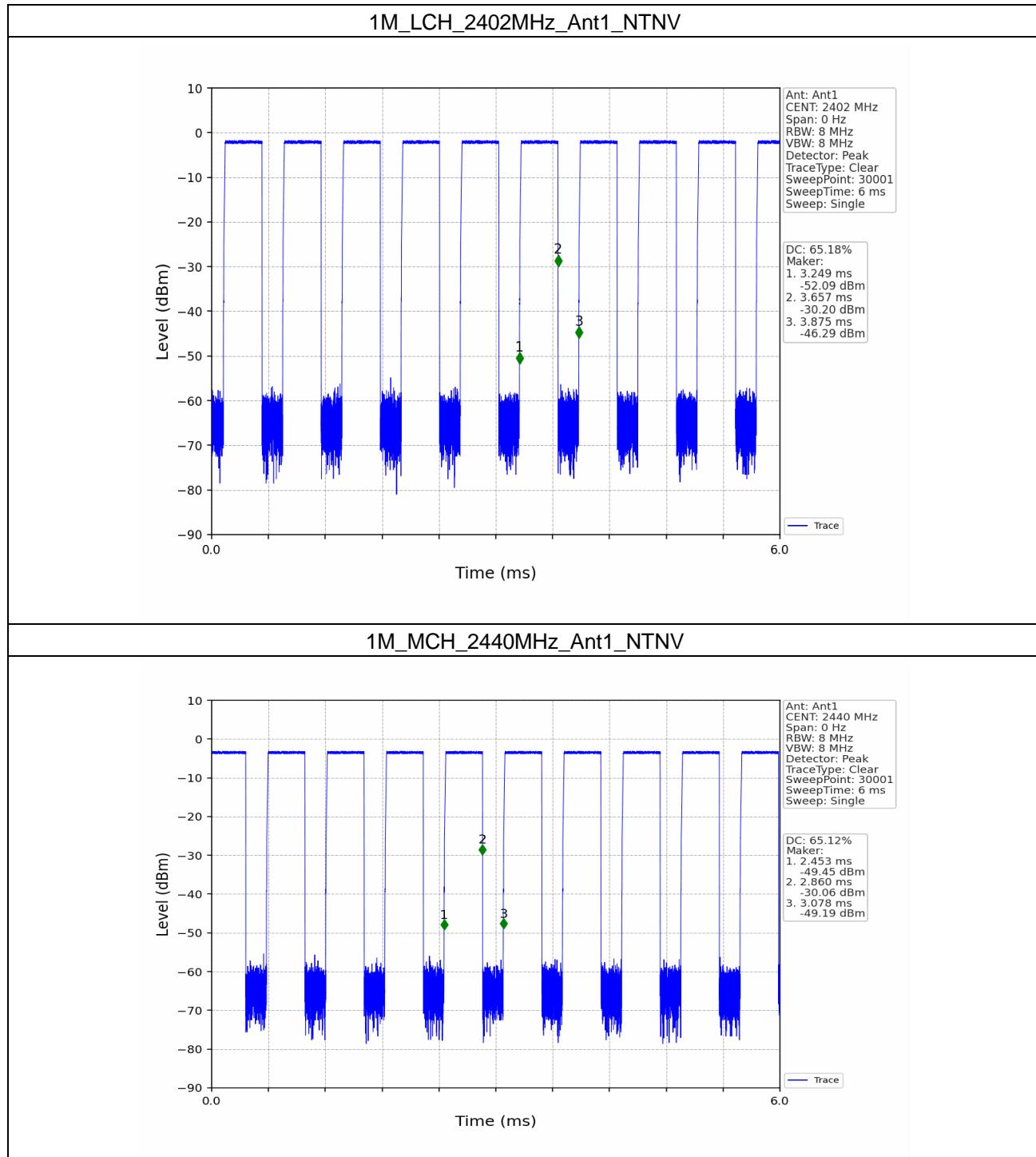


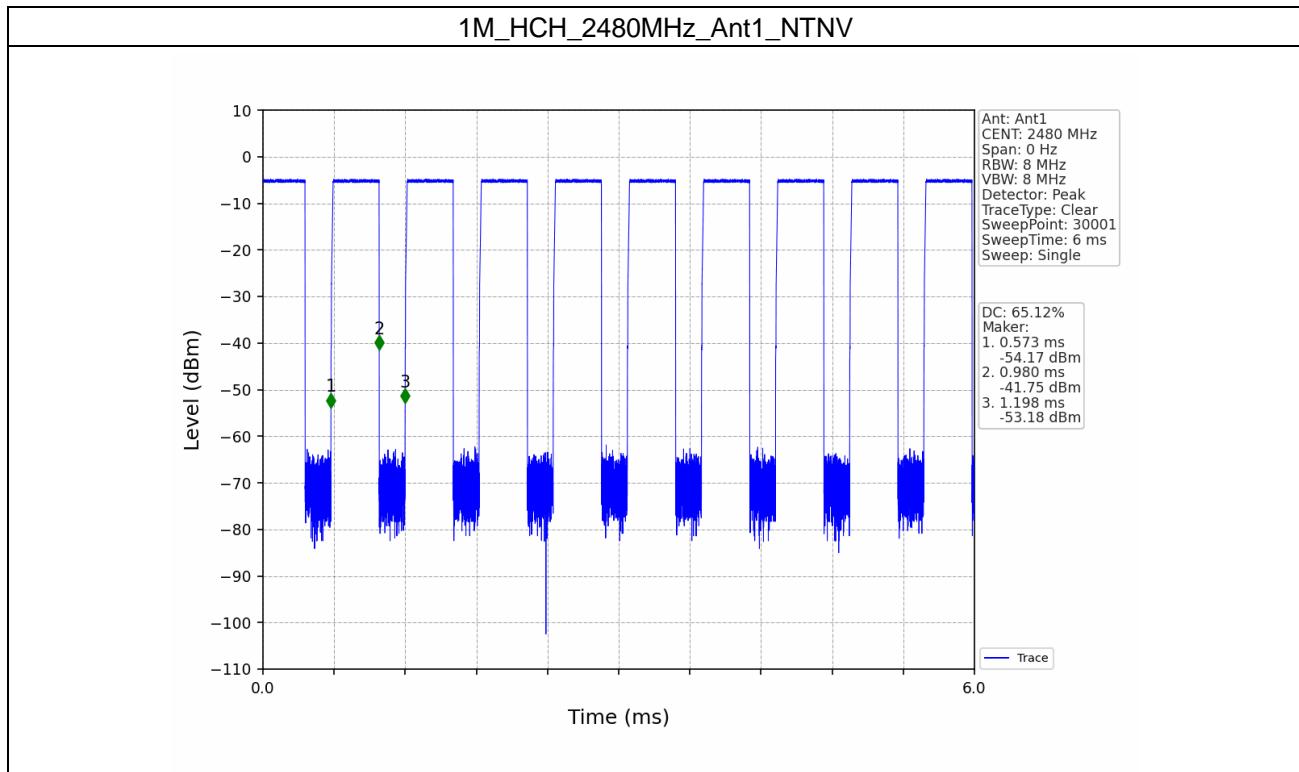
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### 1.1.2 Test Graph





## 2. Bandwidth

### 2.1 OBW

#### 2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)	Verdict
				Result	
1M	SISO	2402	1	1.023	Pass
		2440	1	1.022	Pass
		2480	1	1.023	Pass



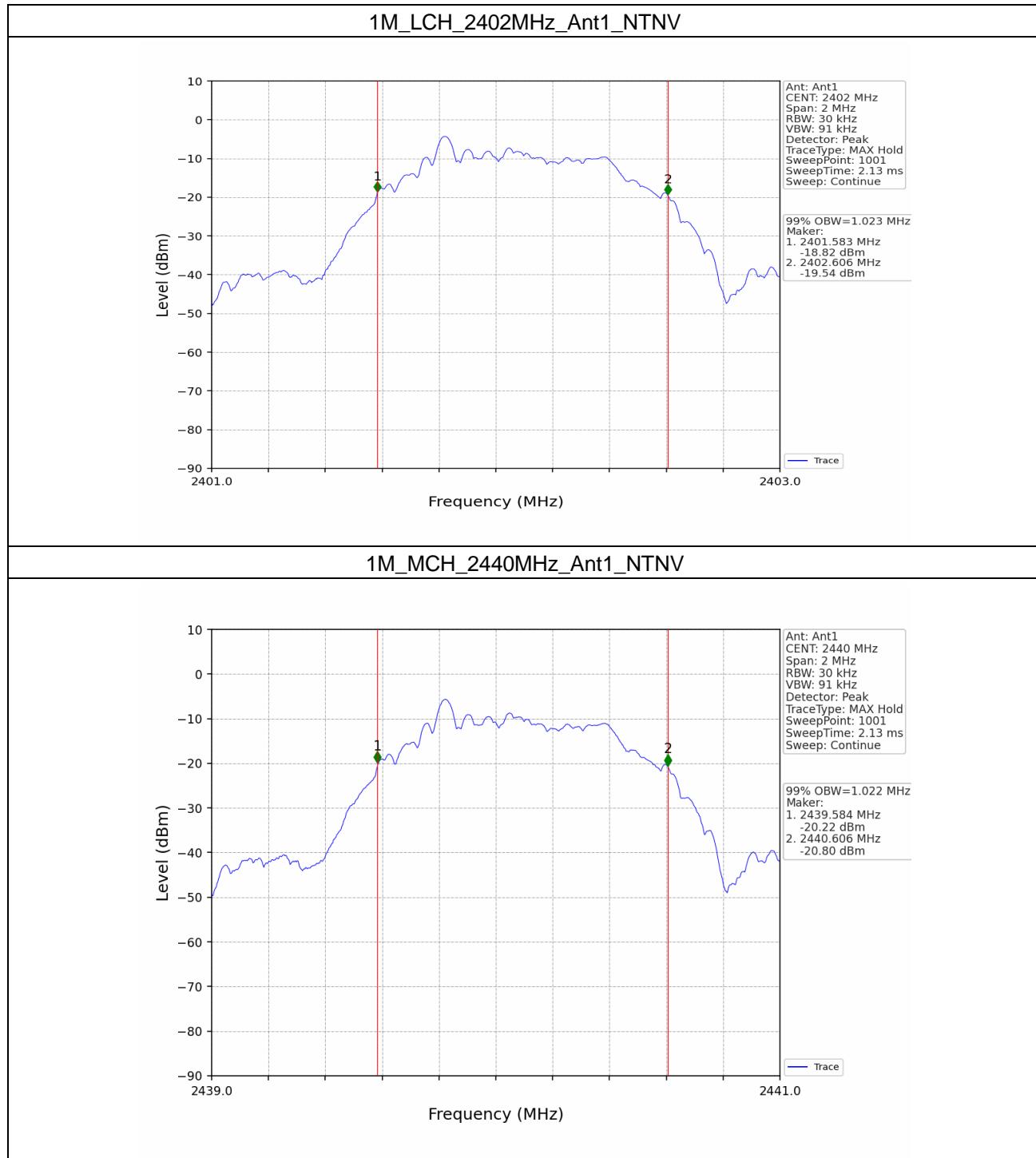
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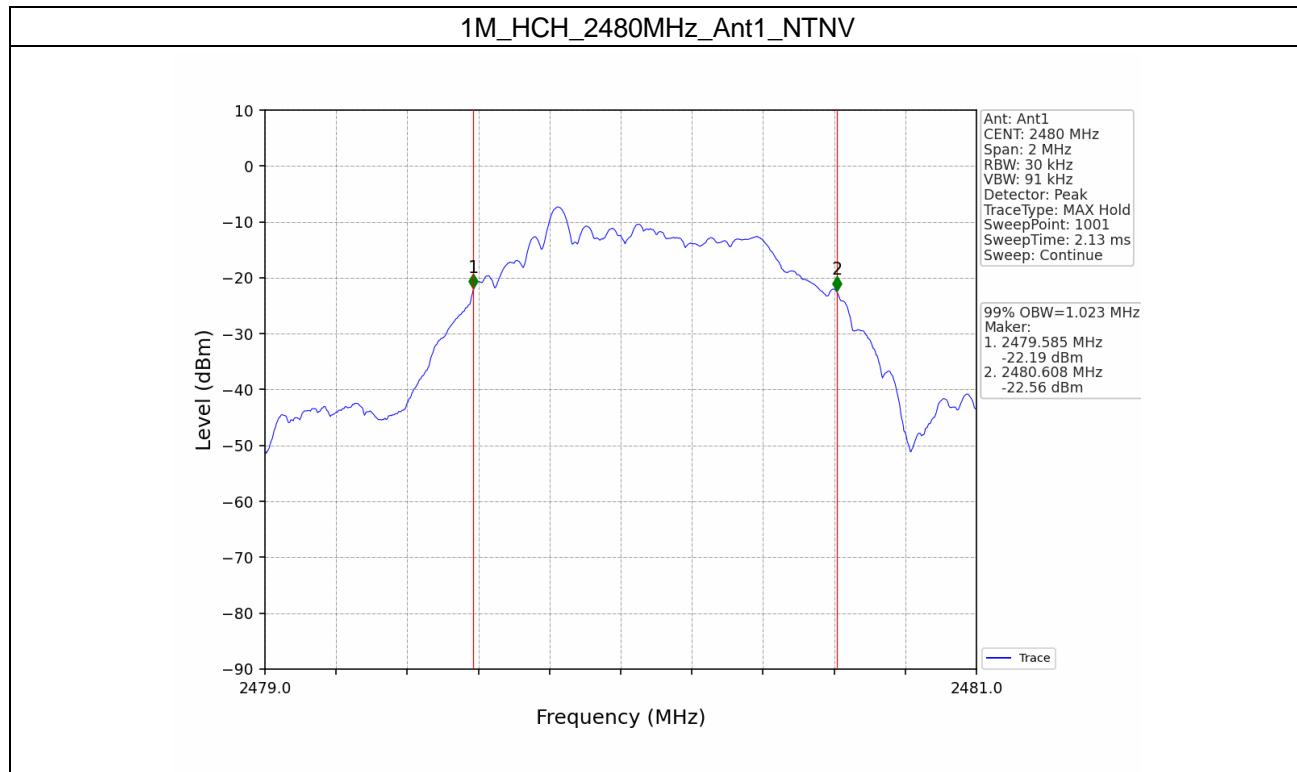
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### 2.1.2 Test Graph





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**2.2 6dB BW****2.2.1 Test Result**

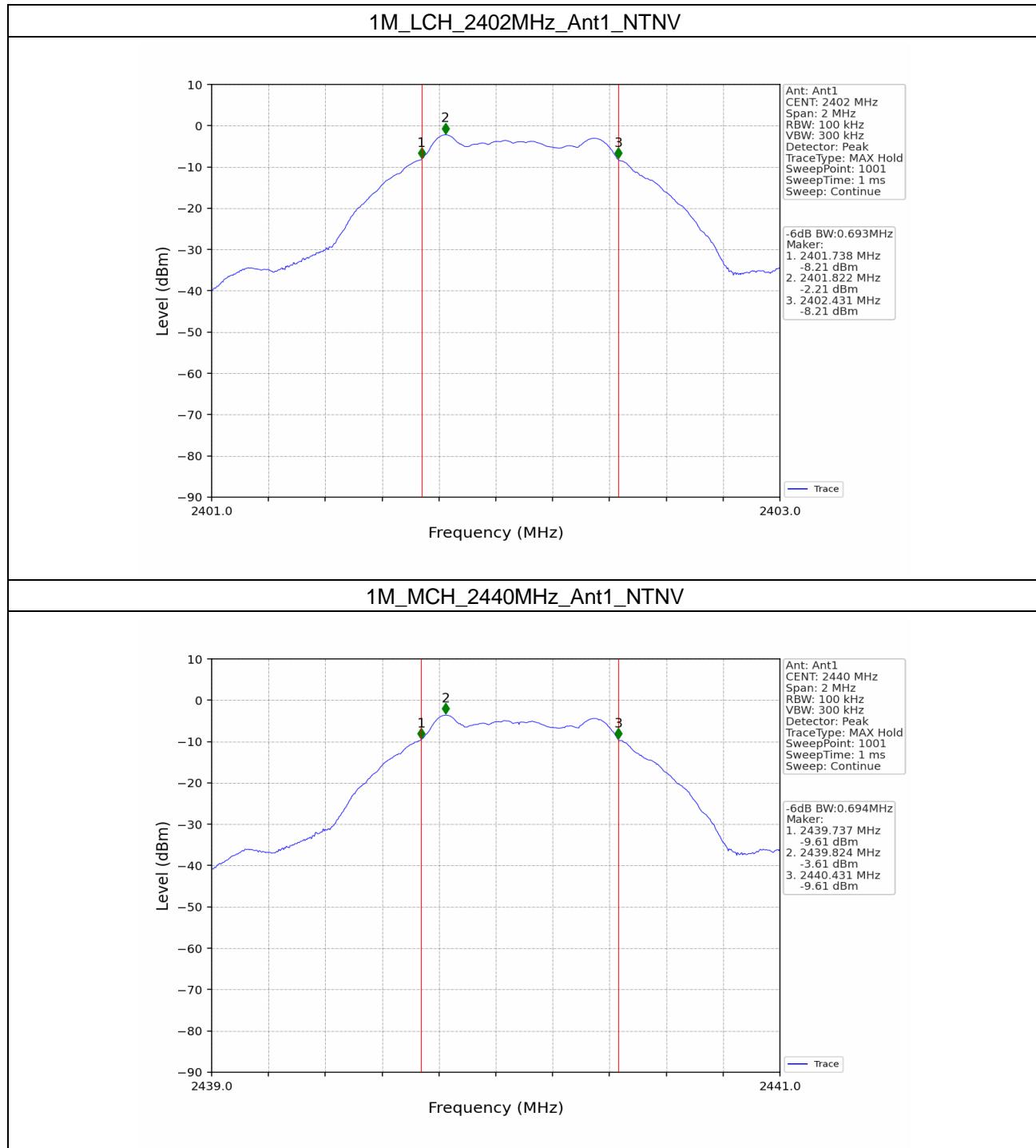
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.693	>=0.5	Pass
		2440	1	0.694	>=0.5	Pass
		2480	1	0.692	>=0.5	Pass

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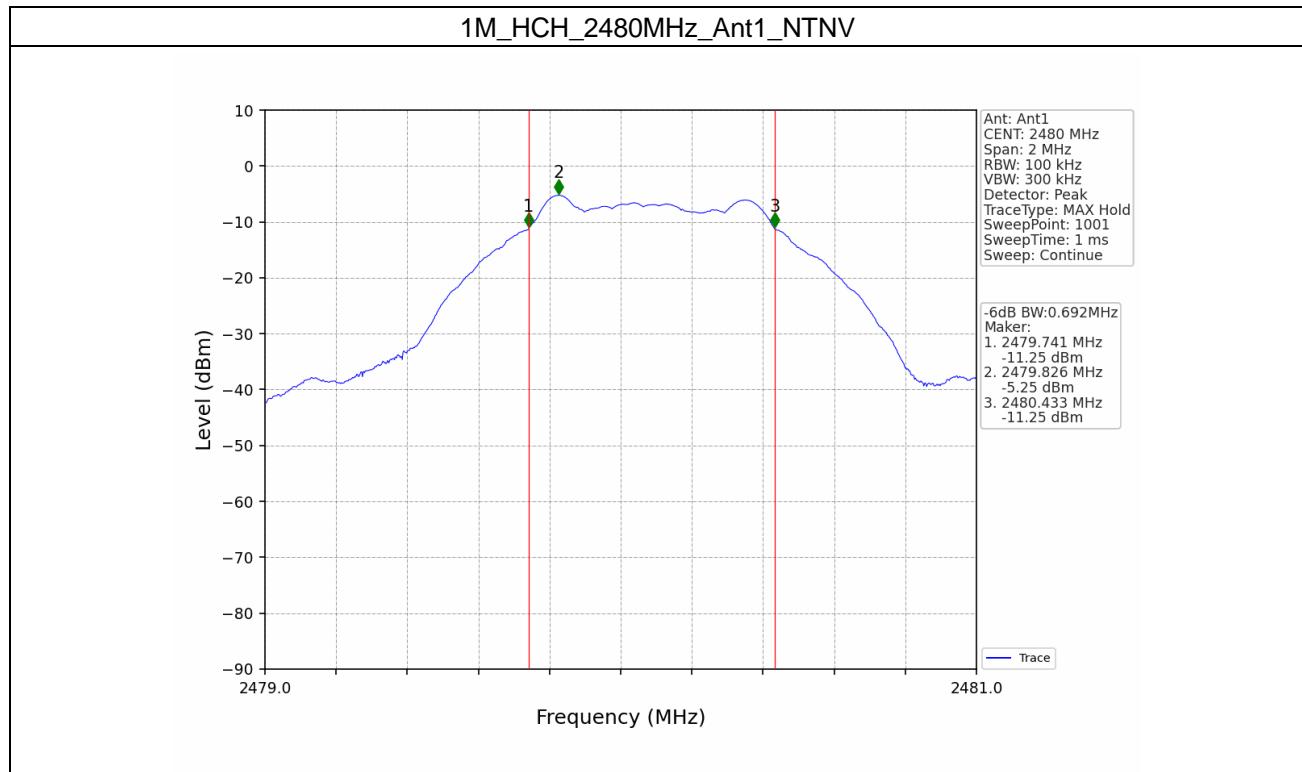
**2.2.2 Test Graph**

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SZEMC-TRF-01 Rev. A/0 Aug01,2022

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### 3. Maximum Conducted Output Power

#### 3.1 Power

##### 3.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	-1.83	<=30	Pass
		2440	-3.21	<=30	Pass
		2480	-4.86	<=30	Pass

### 4. Maximum Power Spectral Density

#### 4.1 PSD

##### 4.1.1 Test Result

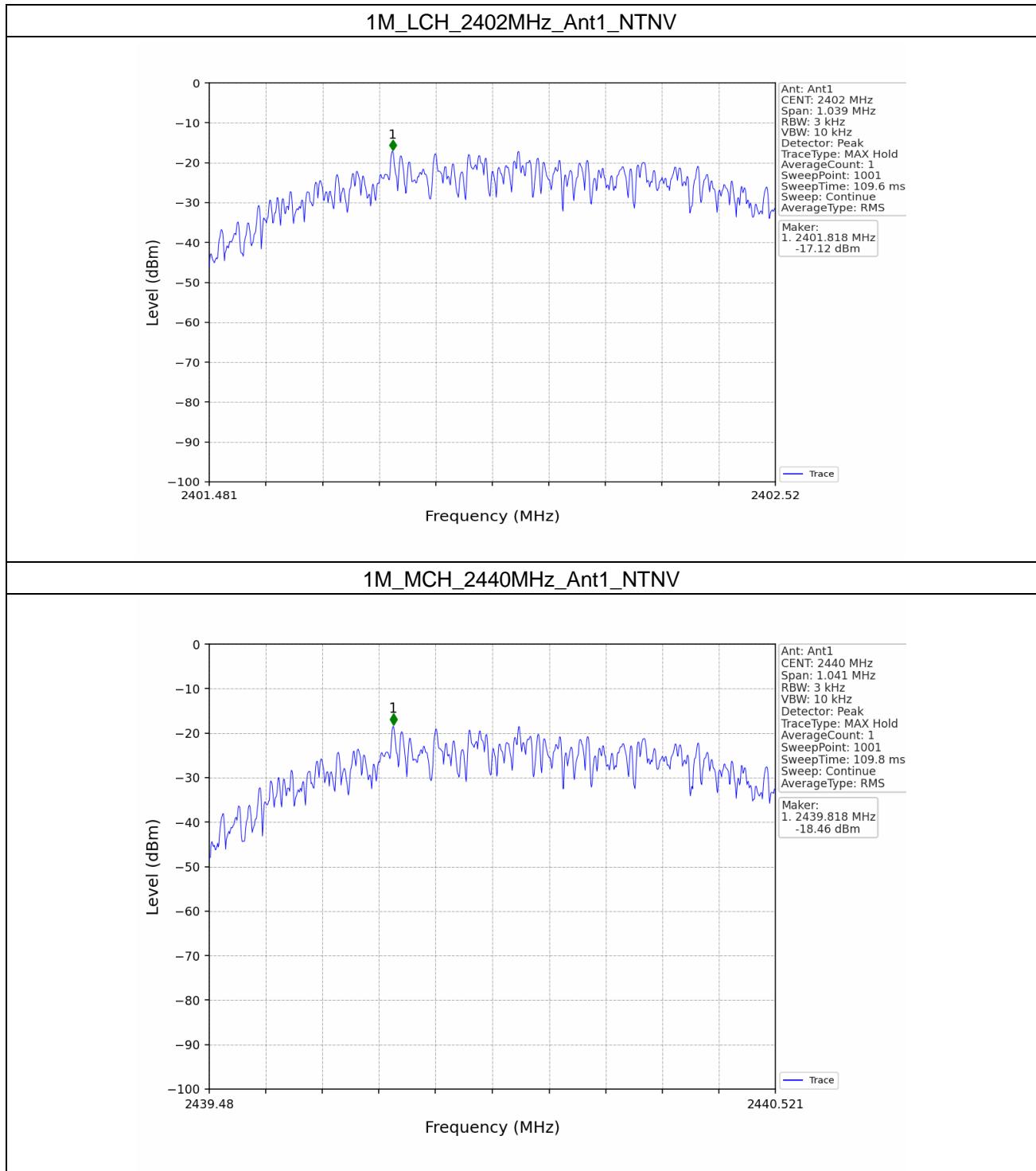
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	-17.12	<=8	Pass
		2440	-18.46	<=8	Pass
		2480	-20.08	<=8	Pass

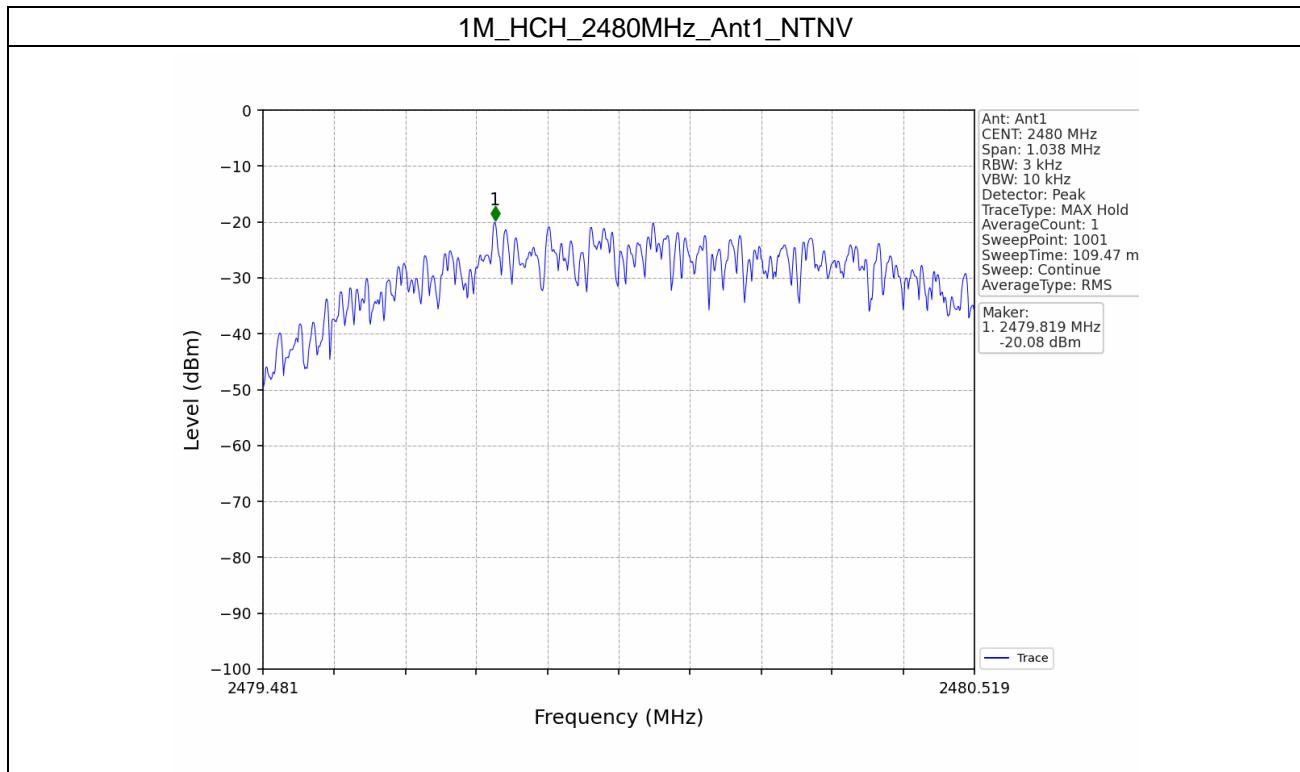
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**4.1.2 Test Graph**



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

### 5.1 Ref

#### 5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	-2.23
		2440	1	-3.61
		2480	1	-5.26

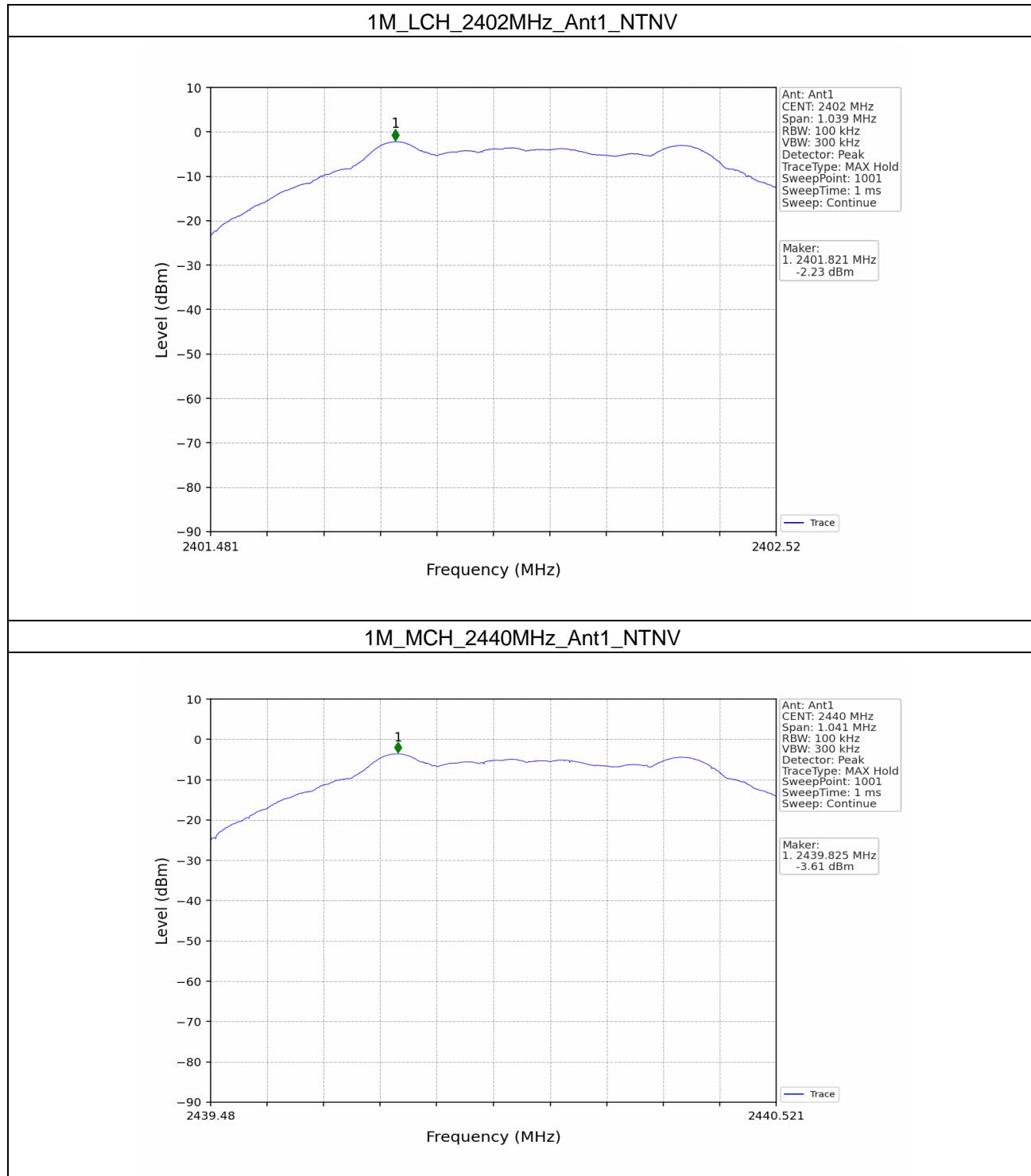


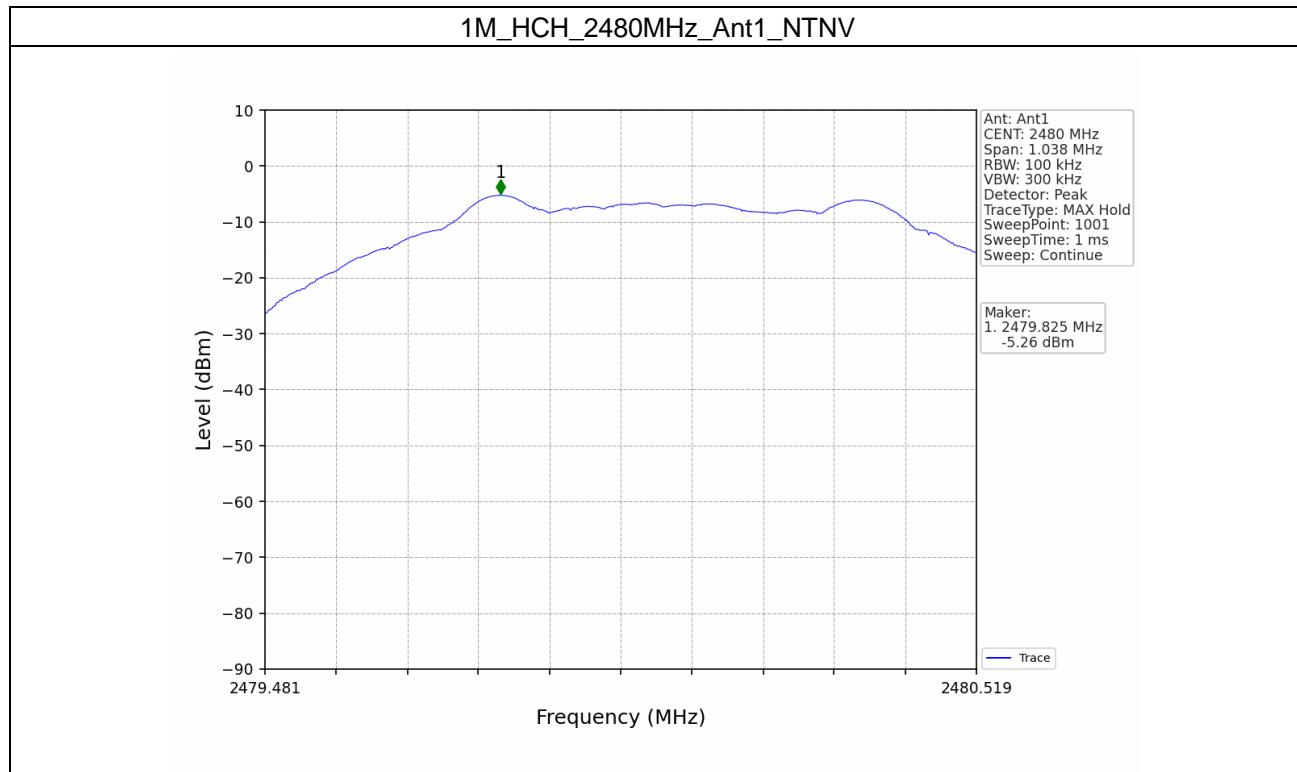
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**5.1.2 Test Graph**



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## 5.2 CSE

### 5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	-2.23	-22.23	Pass
		2440	1	-2.23	-22.23	Pass
		2480	1	-2.23	-22.23	Pass



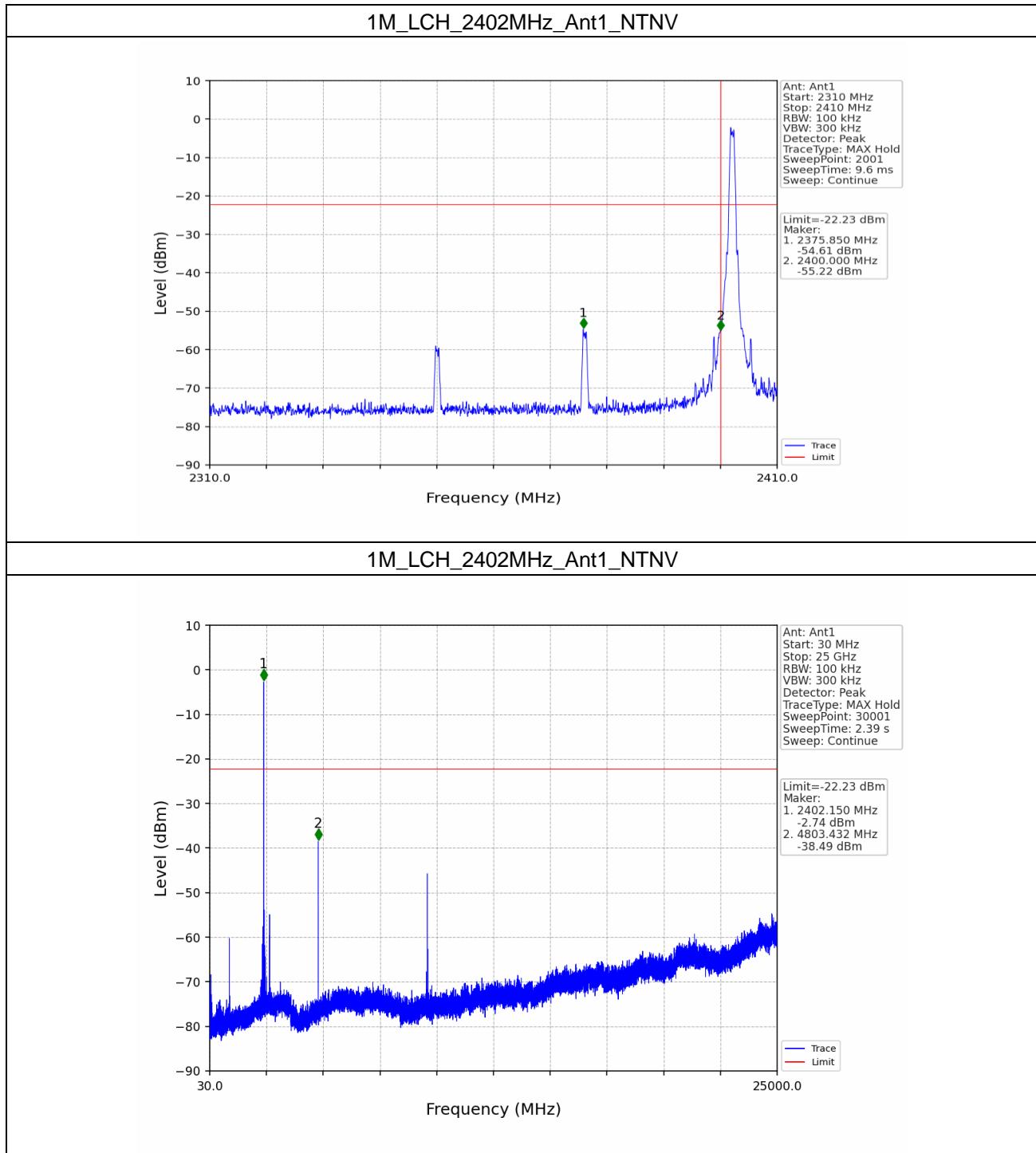
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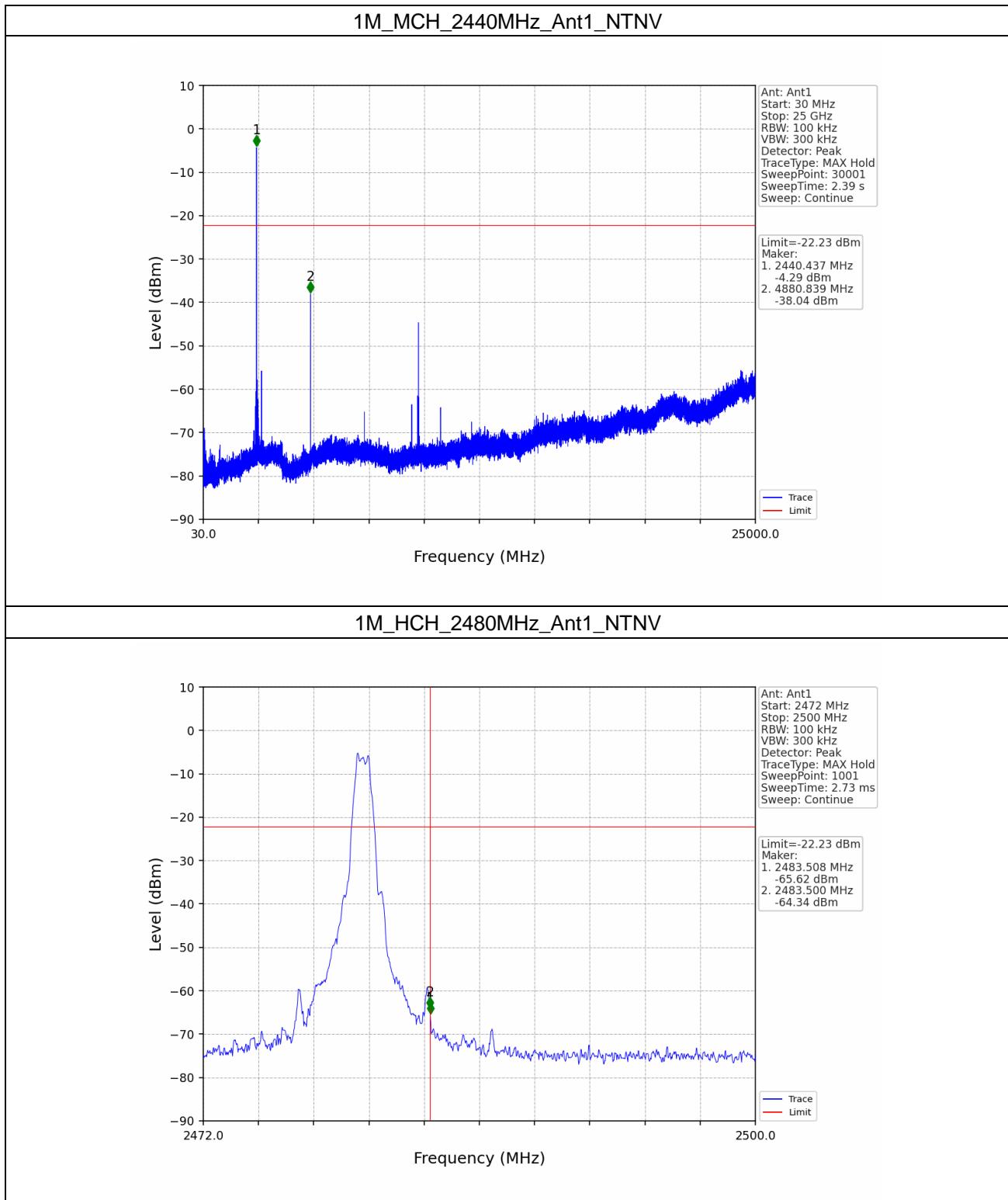
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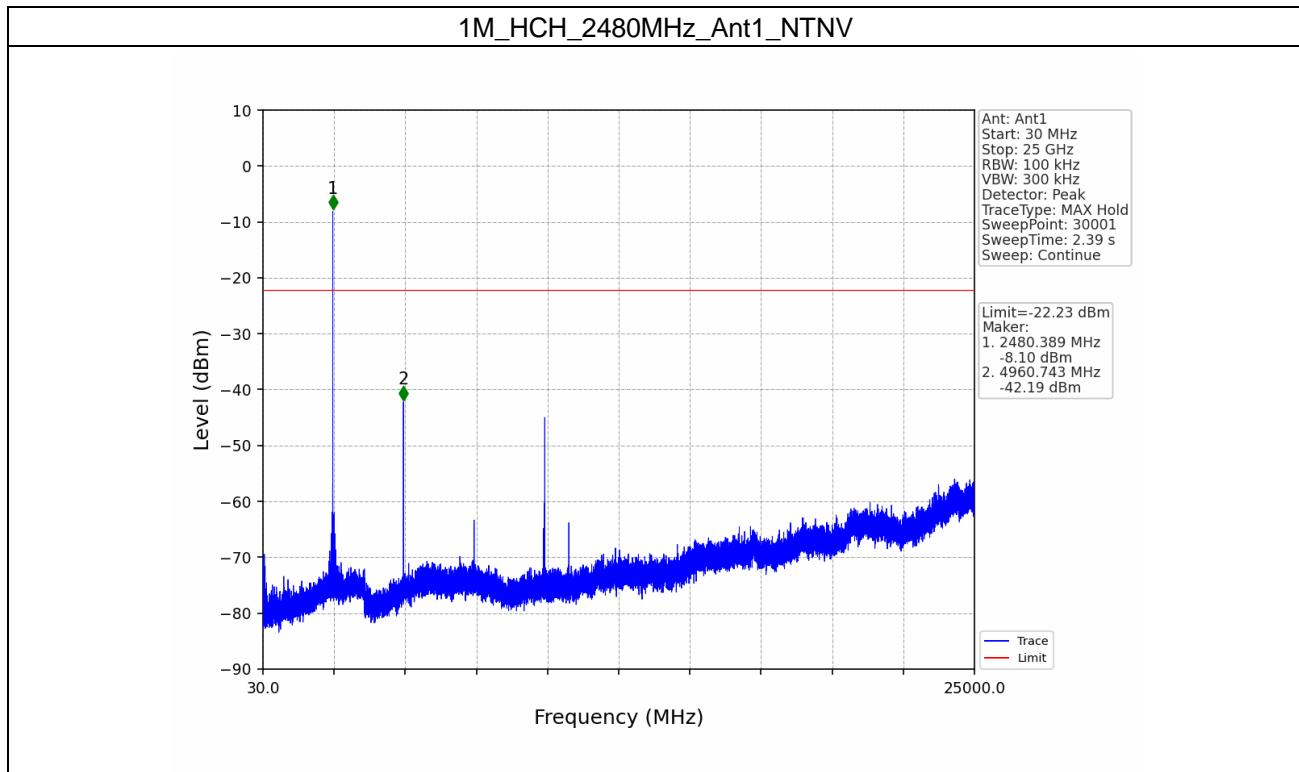
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**5.2.2 Test Graph**





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