

TEST REPORT

Application No.: SUCR2510001000MO

Applicant: Quectel Wireless Solutions Co., Ltd.

Address of Applicant: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

Manufacturer: Quectel Wireless Solutions Co., Ltd.

Address of Manufacturer: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

Equipment Under Test (EUT):

EUT Name: Bluetooth Low Energy and 802.15.4 wireless radio module

Model No.: KGM133S

Trade Mark: QUECTEL

FCC ID: XMR2025KGM133S

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

Date of Receipt: 2025-10-16

Date of Test: 2025-11-04 to 2025-11-07

Date of Issue: 2025-11-12

Test Result:	Pass*
---------------------	--------------

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

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

Attention: To check the authenticity of testing / inspection report & certificate, please contact us at telephone:(86-755) 8307 1443, or email: CN.Doccheck@sgs.com



Revision Record			
Version	Description	Date	Remark
01	Original	2025-11-12	/

Authorized for issue by:			
Tested By		<i>Nature Shen</i>	
		Nature_Shen/Project Engineer	
Approved By		<i>Cedar cheng</i>	
		Cedar Cheng /Reviewer	

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
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2020) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2020) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2020) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Conducted Peak Output Power		ANSI C63.10 (2020) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2020) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2020) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2020) Section 6.10.4	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2020) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass

3 Contents

	Page
1 COVER PAGE	1
2 Test Summary	3
3 Contents.....	4
4 General Information.....	5
4.1 Details of E.U.T.	5
4.2 Environment Parameter	5
4.3 Description of Support Units	5
4.4 Measurement Uncertainty & Decision Rule	6
4.5 Test Location	7
4.6 Test Facility	7
4.7 Deviation from Standards.....	7
4.8 Abnormalities from Standard Conditions.....	7
5 Equipment List	8
6 Radio Spectrum Technical Requirement.....	10
6.1 Antenna Requirement	10
7 Radio Spectrum Matter Test Results	11
7.1 Radiated Emissions which fall in the restricted bands	11
7.2 Radiated Spurious Emissions Below 1GHz	22
7.3 Radiated Spurious Emissions Above 1GHz.....	26
7.4 Conducted Peak Output Power.....	34
7.5 Minimum 6dB Bandwidth.....	36
7.6 Power Spectrum Density	37
7.7 Conducted Band Edges Measurement	38
7.8 Conducted Spurious Emissions	40
8 Test Setup Photo	42
9 EUT Constructional Details (EUT Photos).....	42
10 Appendix.....	43



4 General Information

4.1 Details of E.U.T.

Power supply:	3.3V
Operation Frequency:	2405MHz to 2480MHz
Modulation Type:	O-QPSK
Number of Channels:	16
Channel Spacing:	5MHz
Antenna Type:	External Antenna
Antenna Gain:	0.2 dBi
Antenna Number:	1

4.2 Environment Parameter

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	25	3.3
NTLV	25	1.71
NTHV	25	3.8
Note: NV:Normal Voltage LV:Low Extreme Test Voltage HV:High Extreme Test Voltage NT:Normal Temperature LT:Low Extreme Test Temperature HT:High Extreme Test Temperature		

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Computer	Lenovo	T14	2YK6GR
Mouse	Lenovo	3D optical Mouse	N/A
Motherboard	QUECTEL	N/A	N/A



4.4 Measurement Uncertainty & Decision Rule

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 3\%$
4	Conduction emission	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
5	RF conducted power	$\pm 0.75\text{dB}$
6	RF power density	$\pm 2.84\text{dB}$
7	Conducted Spurious emissions	$\pm 0.75\text{dB}$
8	RF Radiated power	$\pm 2.6\text{dB}$ (30MHz-1GHz)
		$\pm 2.7\text{dB}$ (1GHz-18GHz)
9	Temperature test	$\pm 1^\circ\text{C}$
10	Humidity test	$\pm 3\%$
11	Supply voltages	$\pm 1\%$
12	Time	$\pm 3\%$
Remark: The U_{lab} (lab Uncertainty) is less than $U_{\text{CISPR/ETSI}}$ (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.		

4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.

South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu)
Pilot Free Trade Zone

No tests were sub-contracted.

Note:

- 1.SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).
- 2.SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).
3. Sample source: sent by customer.

4.6 Test Facility

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

- **A2LA**

SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 6336.01.

- **FCC**

SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1312.

- **ISED**

SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 27594

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
RF Conducted Test						
1	Shielding Room	Brilliant-emc	N/A	SUWI-04-08-01	11/9/2022	11/8/2025
2	Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	1/20/2025	1/19/2026
3	Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-15	11/21/2024	11/20/2025
4	MXG Vector signal genitor	KEYSIGHT	N5182B	SUWI-01-38-01	1/15/2025	1/14/2026
5	Signal Generator	ROHDE&SCHWARZ	SMW200A	SUWI-01-07-08	3/27/2025	3/26/2026
6	Signal Generator	ROHDE&SCHWARZ	SMW100A	SUWI-01-8-01	1/16/2025	1/15/2026
7	MXG Vector Signal Generator	ROHDE&SCHWARZ	SMR20	SUWI-01-33-01	3/17/2025	3/16/2026
8	Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-13	5/8/2025	5/7/2026
9	Wideband Radio Communication Test Ststion	Anritsu	MT8000A	SUWI-01-34-02	8/25/2025	8/24/2026
10	Wideband Radio Communication Tester	Anritsu	MT8821C	SUWI-01-26-03	8/25/2025	8/24/2026
11	Power meter	Anritsu	ML2495A	SUWI-01-31-01	8/25/2025	8/24/2026
12	Pulse power sensor	Anritsu	MA2411B	SUWI-01-32-01	8/25/2025	8/24/2026
13	DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	1/15/2025	1/14/2026
14	Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2/13/2025	2/12/2026
15	Temperature Chamber	GIANT FORCE	ICT-017-40-SP-SD	SUWI-01-13-02	5/7/2025	5/6/2026
16	Measurement Software	TST	TST 272 V2.0	SUWI-03-55-03	NCR	NCR
RF Radiated Test						
1	Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	6/3/2023	6/2/2026
2	Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	1/20/2025	1/19/2026
3	Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-09	11/21/2024	11/20/2025
4	Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	1/15/2025	1/14/2026
5	Signal Generator	ROHDE&SCHWARZ	SMW100A	SUWI-01-18-01	1/16/2025	1/15/2026
6	Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9168	SUWI-01-11-04	9/10/2025	9/9/2027
7	Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	5/7/2025	5/6/2027
8	Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9170	SUWI-01-11-03	5/7/2025	5/6/2027
9	Active Loop Antenna	SCHWRZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	5/7/2025	5/6/2027
10	Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	1/16/2025	1/15/2026
11	Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	1/16/2025	1/15/2026
12	Amplifier	Tonscend	TAP18040048	SUWI-01-14-03	1/20/2025	1/19/2026



Report No.: SUCR251000100002

Page: 9 of 67

13	Wideband Radio Communication Tester	Anritsu	MT8820C	SUWI-01-26-01	8/25/2025	8/24/2026
14	Wideband Radio Communication Tester	Anritsu	MT8821C	SUWI-01-26-03	8/25/2025	8/24/2026
15	Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-09	8/26/2025	8/25/2026
16	Radio Communication Analyzer	StarPoint	SP9500E	SUWI-01-28-02	11/19/2024	11/18/2025
17	Signal Generator	ROHDE&SCHWARZ	SMB100A	SUWI-01-08-01	1/16/2025	1/15/2026
18	DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	1/15/2025	1/14/2026
19	Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2/13/2025	2/12/2026
20	Measurement Software	Tonscend	JS32-RE 4.0.0.0	SUWI-02-09-06	NCR	NCR

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 External antenna, and all no consideration of replacement. The best case gain of the antenna is 0.2dBi.

7 Radio Spectrum Matter Test Results

7.1 Radiated Emissions which fall in the restricted bands

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

Test Method: ANSI C63.10 (2020) 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.

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

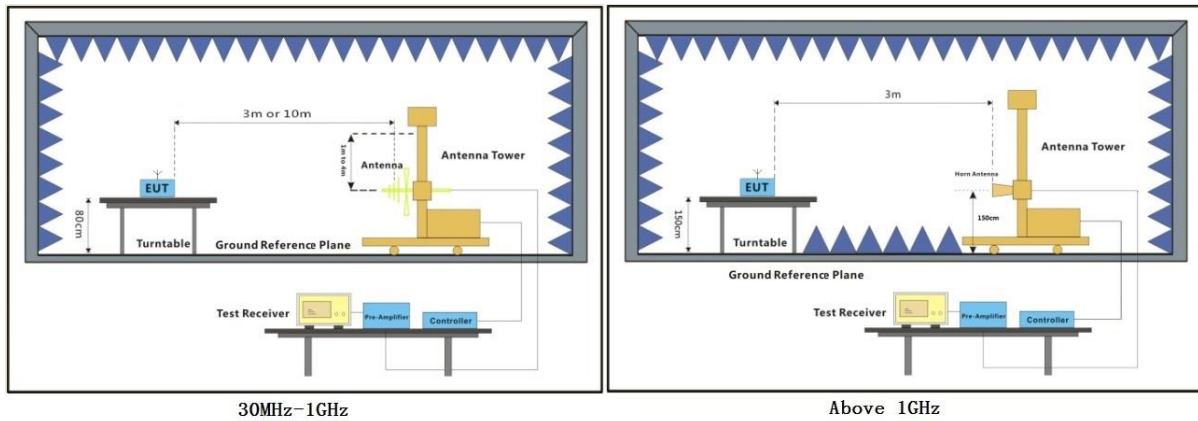
Humidity: 44 % RH

Atmospheric Pressure: 1024 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.1.3 Test Setup Diagram



7.1.4 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

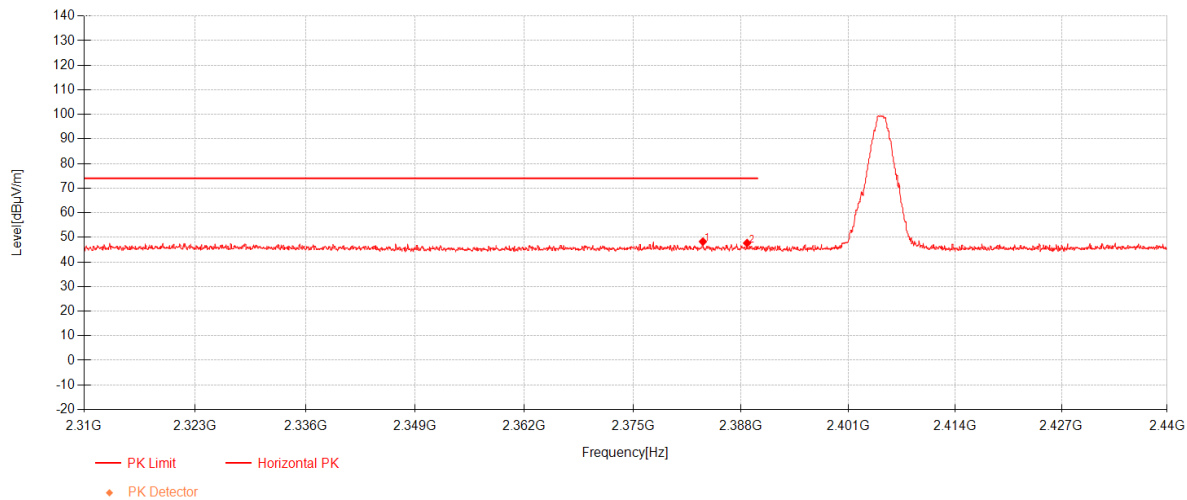
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level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

Remark 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.

Remark 4: For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.



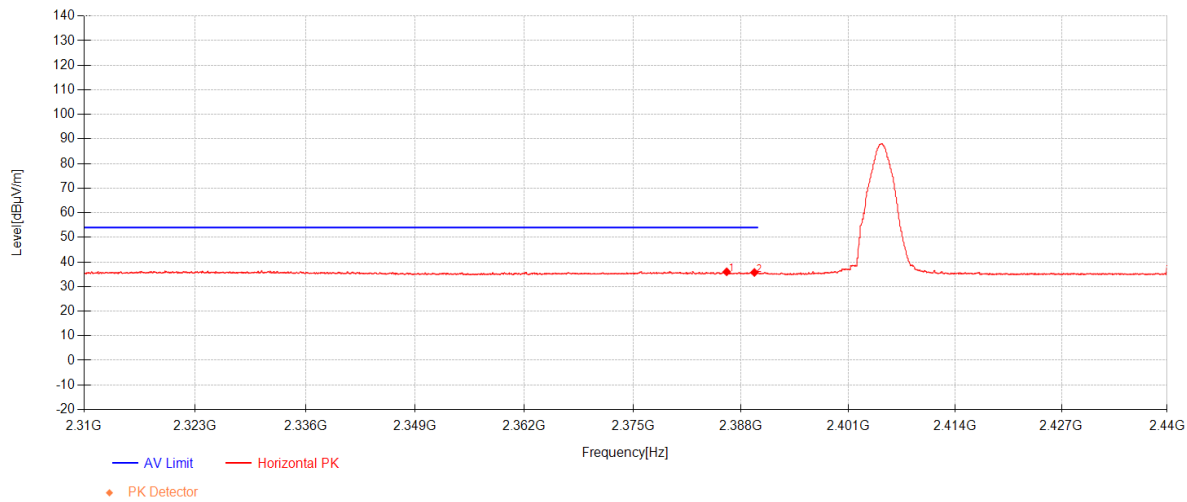
Thread_TX_CH_11_Horizontal_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2383.4067	44.80	26.99	-23.51	48.28	74.00	25.72	Horizontal
2	2388.7367	44.19	27.00	-23.52	47.67	74.00	26.33	Horizontal



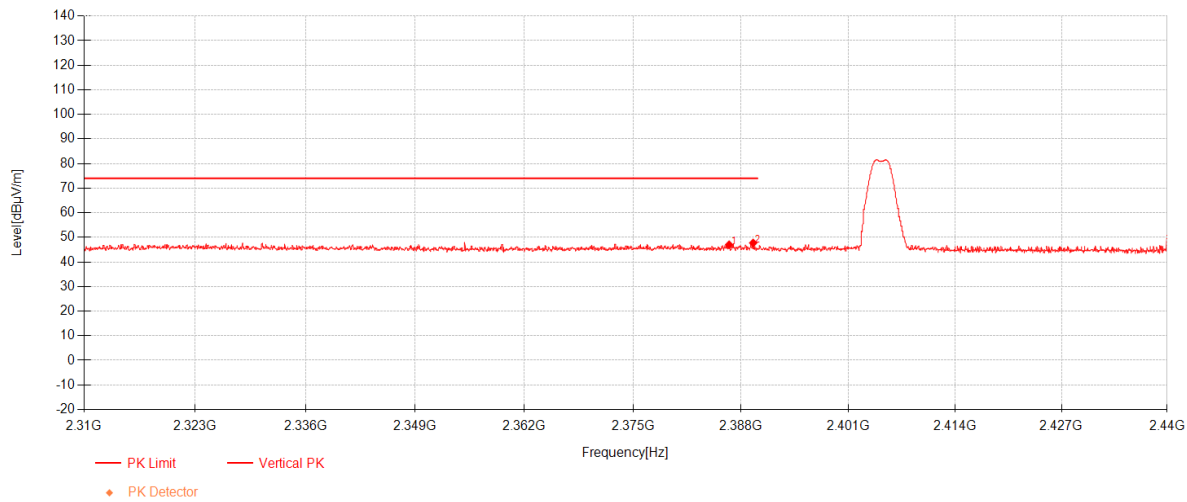
Thread_TX_CH_11_Horizontal_Average



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2386.2775	32.52	27.00	-23.51	36.00	54.00	18.00	Horizontal
2	2389.625	32.24	27.00	-23.52	35.72	54.00	18.28	Horizontal



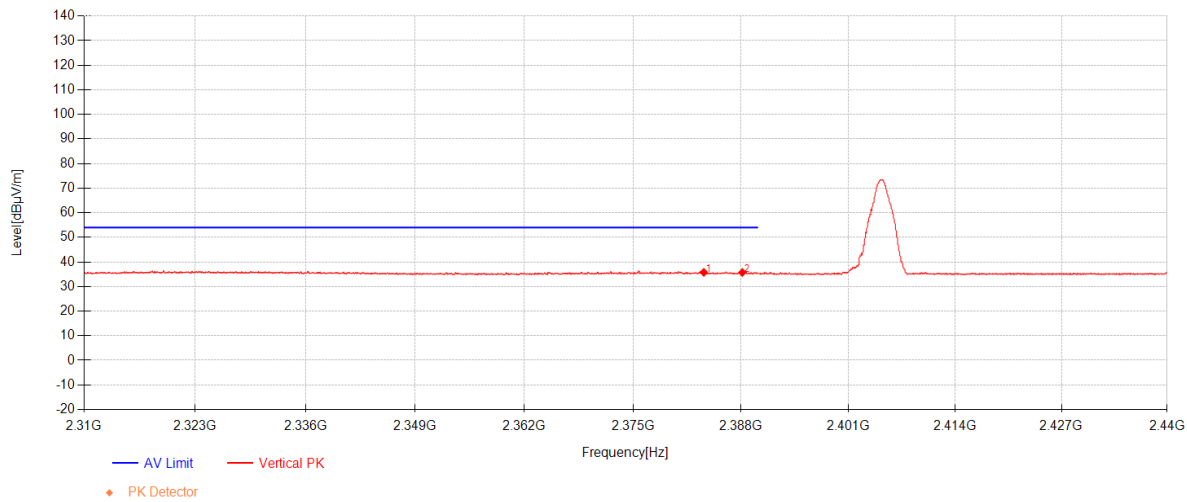
Thread_TX_CH_11_Vertical_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2386.57	43.52	27.00	-23.51	47.00	74.00	27.00	Vertical
2	2389.4733	44.25	27.00	-23.52	47.73	74.00	26.27	Vertical

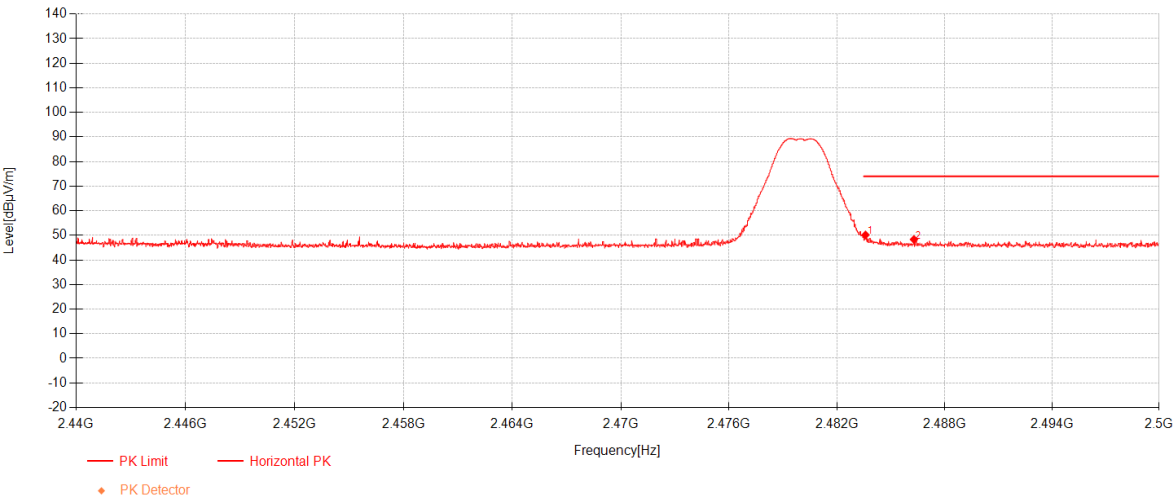


Thread_TX_CH_11_Vertical_Average



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2383.515	32.29	26.99	-23.51	35.77	54.00	18.23	Vertical
2	2388.1625	32.23	27.00	-23.51	35.71	54.00	18.29	Vertical

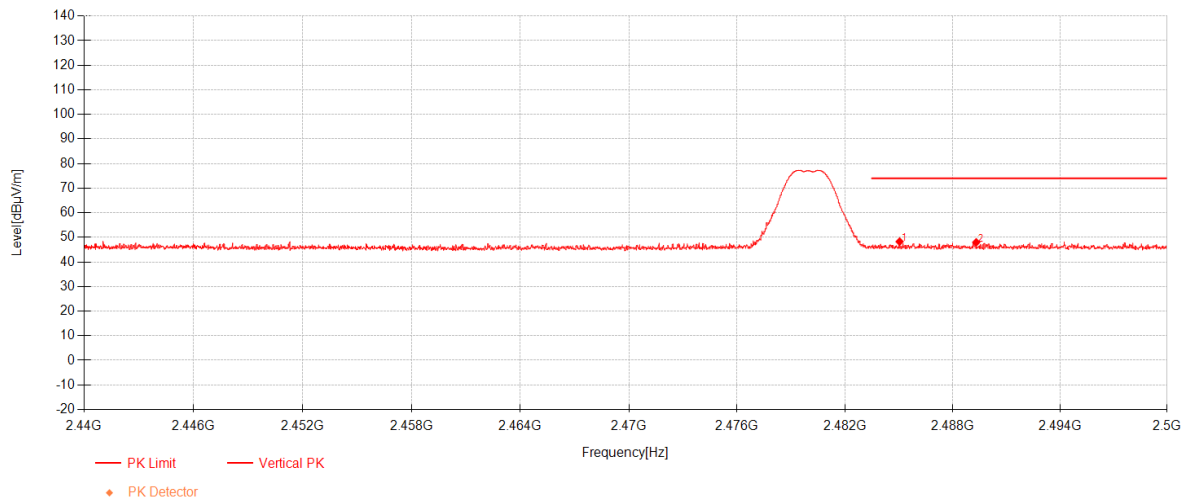
Thread_TX_CH_26_Horizontal_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.59	46.18	27.17	-23.18	50.17	74.00	23.83	Horizontal
2	2486.29	44.34	27.18	-23.17	48.35	74.00	25.65	Horizontal



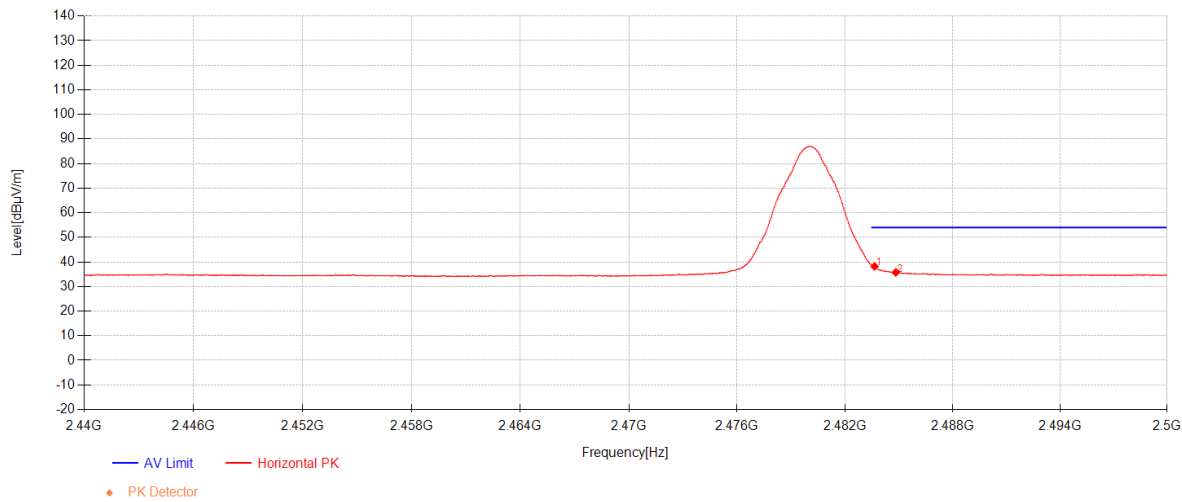
Thread_TX_CH_26_Horizontal_Average



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2485.045	44.26	27.17	-23.17	48.26	74.00	25.74	Vertical
2	2489.32	43.94	27.18	-23.15	47.97	74.00	26.03	Vertical



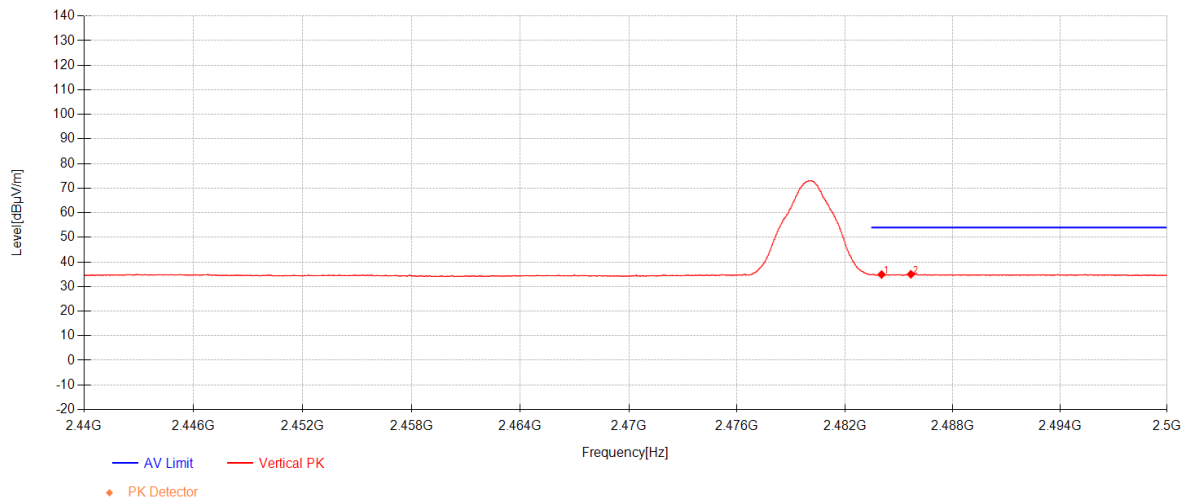
Thread_TX_CH_26_Vertical_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.65	34.20	27.17	-23.18	38.19	54.00	15.81	Horizontal
2	2484.835	31.75	27.17	-23.17	35.75	54.00	18.25	Horizontal



Thread_TX_CH_26_Vertical_Average



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2484.04	30.88	27.17	-23.18	34.87	54.00	19.13	Vertical
2	2485.675	30.98	27.17	-23.17	34.98	54.00	19.02	Vertical

7.2 Radiated Spurious Emissions Below 1GHz

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

Test Method: ANSI C63.10 (2020) Section 6.4,6.5

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
960-1000	500	3

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

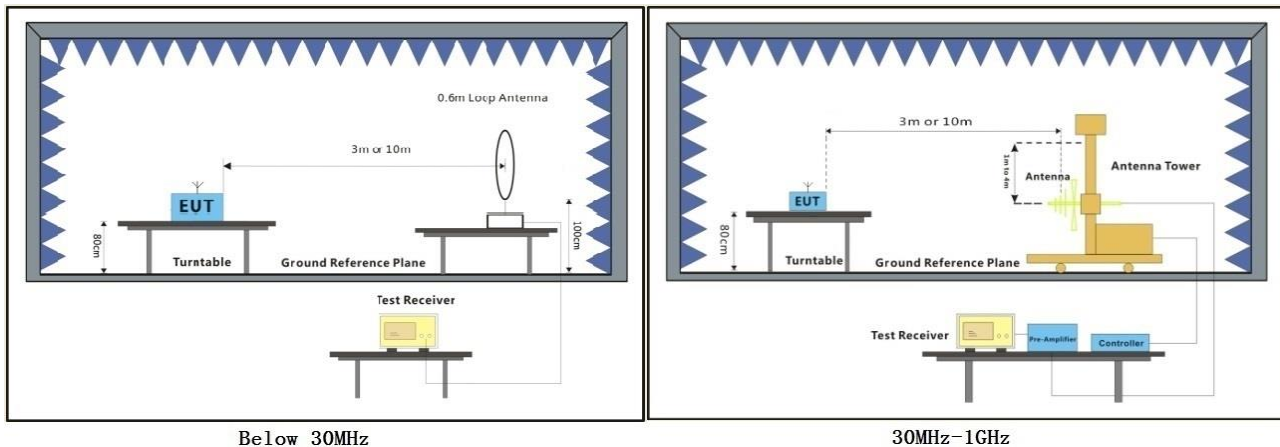
Humidity: 44 % RH

Atmospheric Pressure: 1024 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_ Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.2.3 Test Setup Diagram



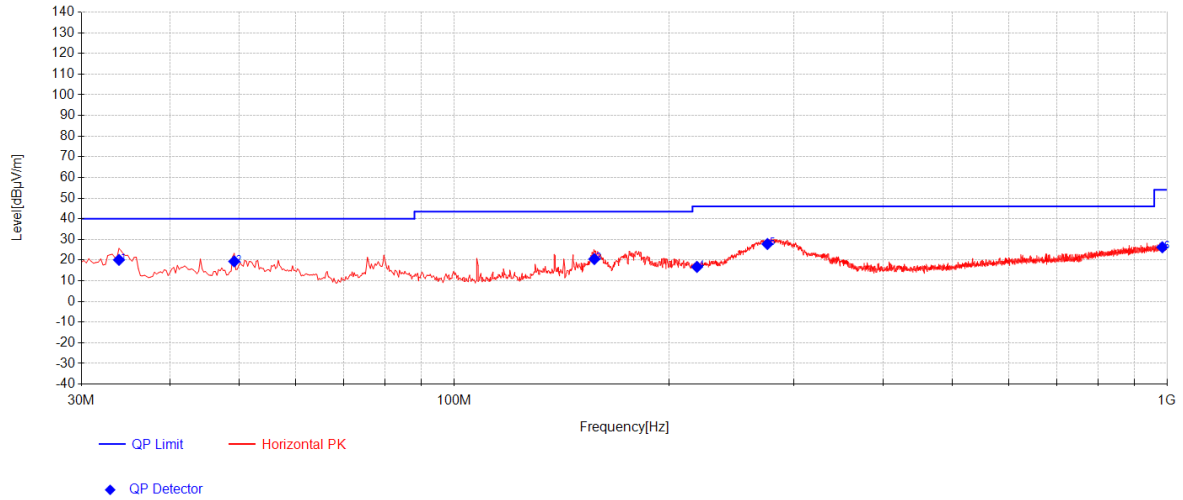
7.2.4 Measurement Procedure and Data

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

Thread_TX_CH_11_Horizontal

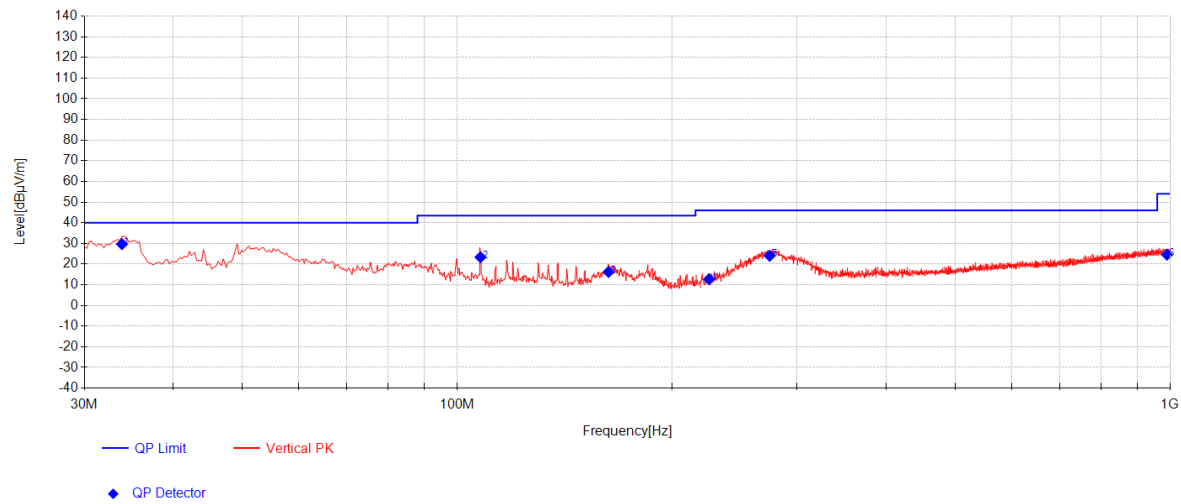


Final Data List

NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.88	41.35	12.73	-33.96	20.12	40.00	19.88	125	339	Horizontal
2	49.1575	39.62	13.47	-33.70	19.39	40.00	20.61	138	339	Horizontal
3	157.3125	40.32	12.79	-32.59	20.52	43.50	22.98	165	61	Horizontal
4	219.15	38.48	10.37	-32.14	16.72	46.00	29.28	136	339	Horizontal
5	275.1675	47.35	12.23	-31.77	27.81	46.00	18.19	182	113	Horizontal
6	985.2075	29.79	24.38	-27.94	26.23	54.00	27.77	194	123	Horizontal



Thread_TX_CH_11_Vertical



Final Data List										
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.88	50.93	12.73	-33.96	29.70	40.00	10.30	132	227	Vertical
2	107.8425	46.28	10.10	-33.02	23.36	43.50	20.14	161	352	Vertical
3	163.1325	36.27	12.47	-32.51	16.23	43.50	27.27	143	82	Vertical
4	225.6975	34	10.83	-32.12	12.71	46.00	33.29	136	21	Vertical
5	274.44	43.6	12.21	-31.77	24.03	46.00	21.97	198	217	Vertical
6	990.5425	28.04	24.42	-27.90	24.56	54.00	29.44	173	320	Vertical

7.3 Radiated Spurious Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2020) Section 6.6

Limit:

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

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

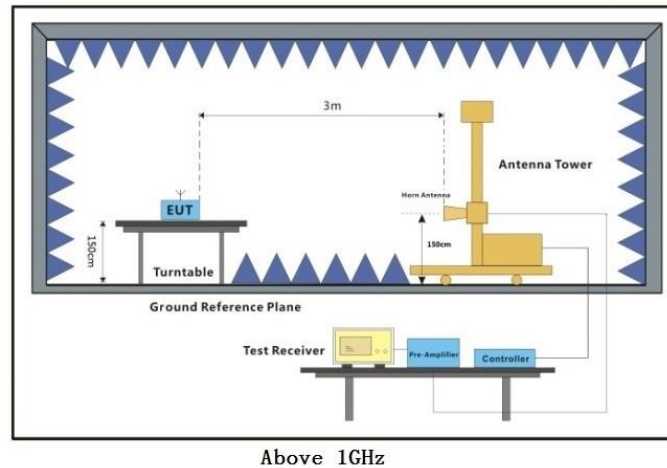
Humidity: 45 % RH

Atmospheric Pressure: 1024 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_ Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

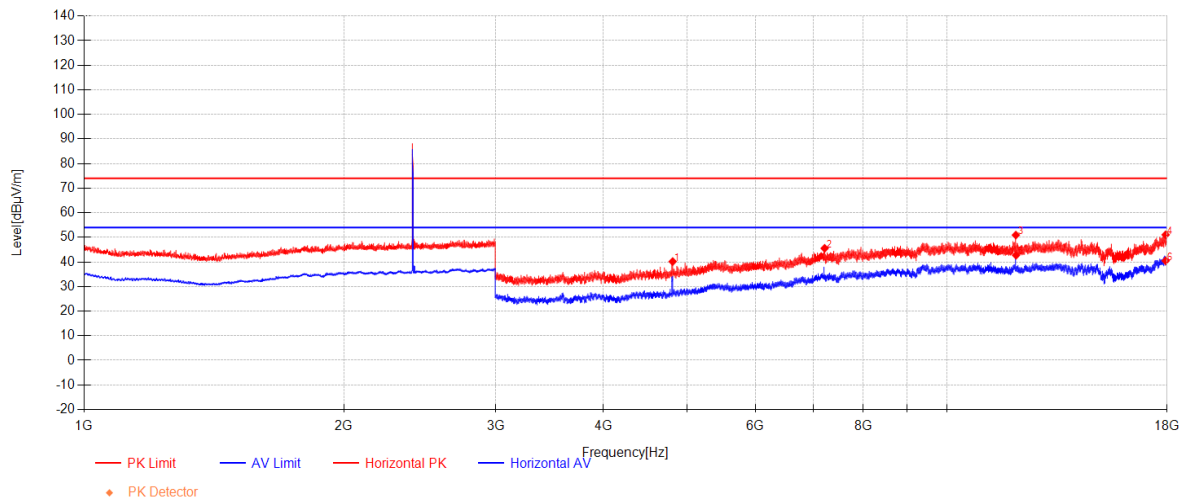
- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was 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.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.
- 5:For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle<98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.

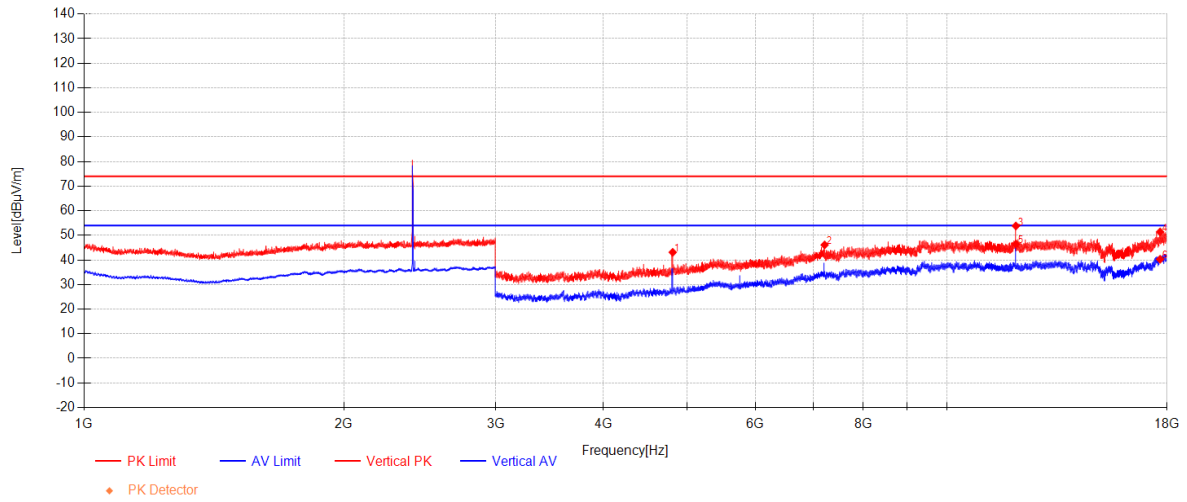


Thread_TX_CH_11_Horizonta



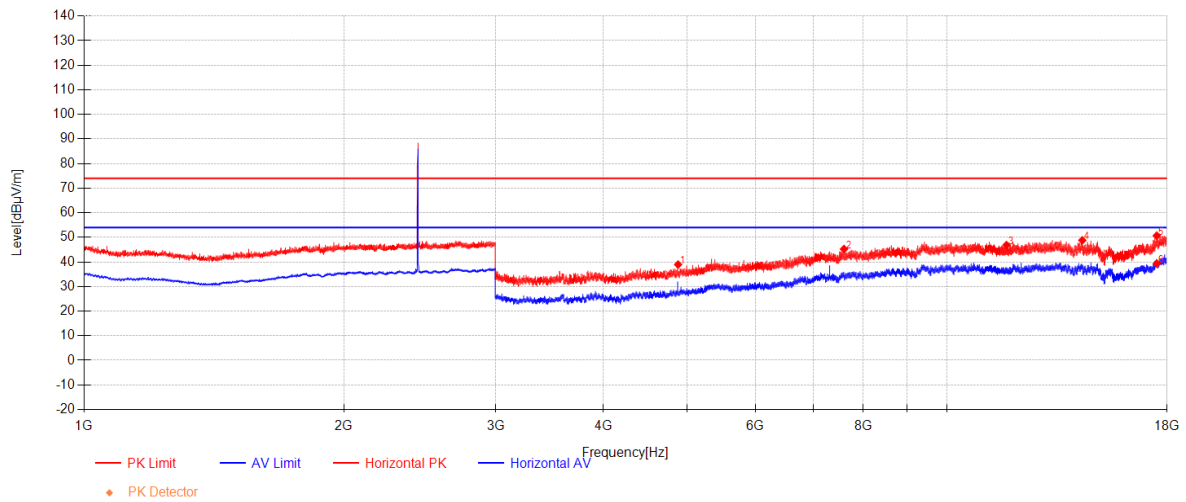
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4810.875	57.40	30.78	-48.01	40.17	74.00	33.83	Horizontal
2	7216.5	55.83	35.89	-46.19	45.53	74.00	28.47	Horizontal
3	12021.75	51.01	39.39	-39.47	50.93	74.00	23.07	Horizontal
4	17929.125	45.02	44.37	-38.37	51.03	74.00	22.97	Horizontal
5	12028.125	42.82	39.38	-39.48	42.72	54.00	11.28	Horizontal
6	17929.125	34.46	44.37	-38.37	40.47	54.00	13.53	Horizontal

Thread_TX_CH_11_Vertical



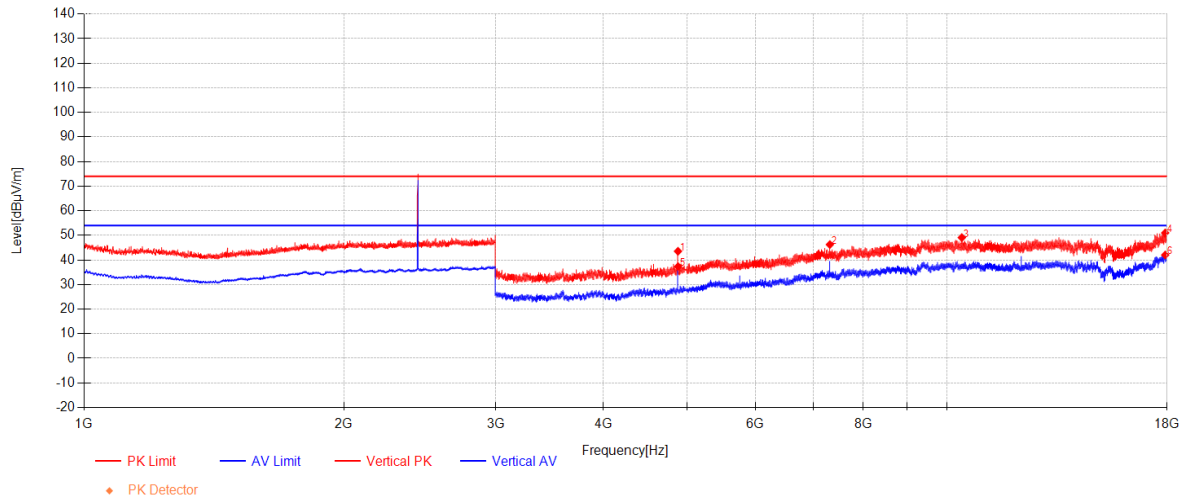
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4811.25	60.34	30.78	-48.01	43.11	74.00	30.89	Vertical
2	7216.5	56.41	35.89	-46.19	46.11	74.00	27.89	Vertical
3	12022.125	53.91	39.39	-39.47	53.83	74.00	20.17	Vertical
4	17666.625	47.09	42.80	-38.50	51.39	74.00	22.61	Vertical
5	12027.75	46.57	39.38	-39.48	46.48	54.00	7.52	Vertical
6	17666.625	35.99	42.80	-38.50	40.29	54.00	13.71	Vertical

Thread_TX_CH_18_Horizontal



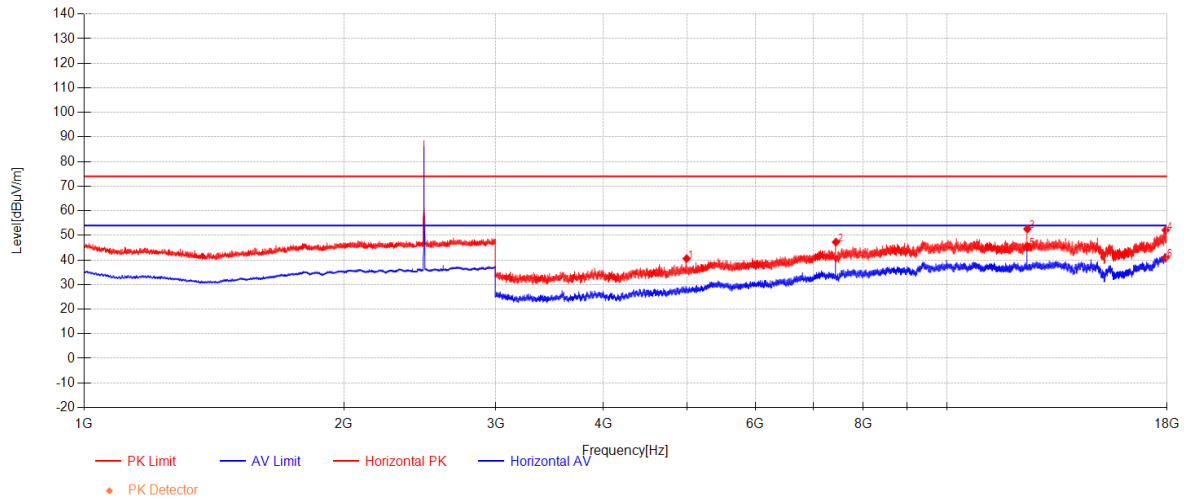
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4881	56.02	30.94	-48.03	38.93	74.00	35.07	Horizontal
2	7600.125	53.43	36.38	-44.57	45.24	74.00	28.76	Horizontal
3	11724.375	47.15	39.43	-39.71	46.87	74.00	27.13	Horizontal
4	14355.375	47.04	40.26	-38.51	48.80	74.00	25.20	Horizontal
5	17508	45.78	41.85	-36.95	50.68	74.00	23.32	Horizontal
6	17508	34.41	41.85	-36.95	39.31	54.00	14.69	Horizontal

Thread_TX_CH_18_Vertical



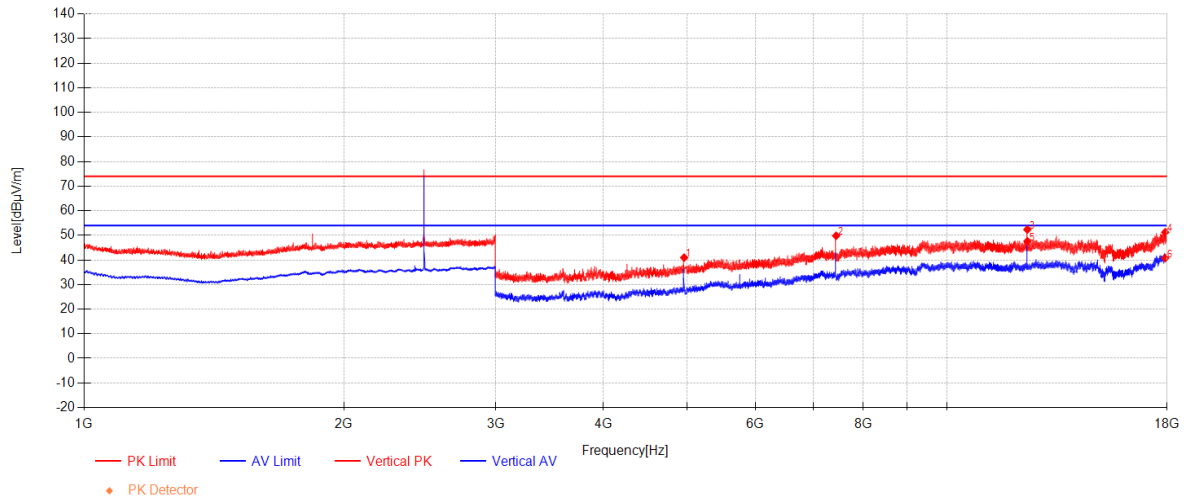
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4879.125	60.62	30.93	-48.03	43.53	74.00	30.47	Vertical
2	7318.125	56.34	36.07	-46.16	46.25	74.00	27.75	Vertical
3	10407	51.21	39.08	-41.20	49.10	74.00	24.90	Vertical
4	17908.875	44.97	44.25	-38.22	51.01	74.00	22.99	Vertical
5	4881	54.40	30.94	-48.03	37.31	54.00	16.69	Vertical
6	17908.875	35.99	44.25	-38.22	42.03	54.00	11.97	Vertical

Thread_TX_CH_26_Horizontal



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4993.5	57.38	31.19	-48.01	40.55	74.00	33.45	Horizontal
2	7438.125	57.13	36.29	-46.17	47.25	74.00	26.75	Horizontal
3	12397.5	52.98	39.16	-39.56	52.58	74.00	21.42	Horizontal
4	17932.125	46.11	44.39	-38.39	52.11	74.00	21.89	Horizontal
5	12403.125	45.92	39.16	-39.57	45.51	54.00	8.49	Horizontal
6	17932.125	34.96	44.39	-38.39	40.96	54.00	13.04	Horizontal

Thread_TX_CH_26_Vertical



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4960.875	57.85	31.11	-48.02	40.95	74.00	33.05	Vertical
2	7441.5	59.70	36.29	-46.17	49.82	74.00	24.18	Vertical
3	12397.5	52.76	39.16	-39.56	52.36	74.00	21.64	Vertical
4	17911.125	45.22	44.27	-38.23	51.25	74.00	22.75	Vertical
5	12397.875	48.00	39.16	-39.56	47.60	54.00	6.40	Vertical
6	17911.125	34.73	44.27	-38.23	40.76	54.00	13.24	Vertical

7.4 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2020) Section 11.9.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 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

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

Humidity: 45 % RH

Atmospheric Pressure: 1024 mbar

7.4.2 Test Mode Description

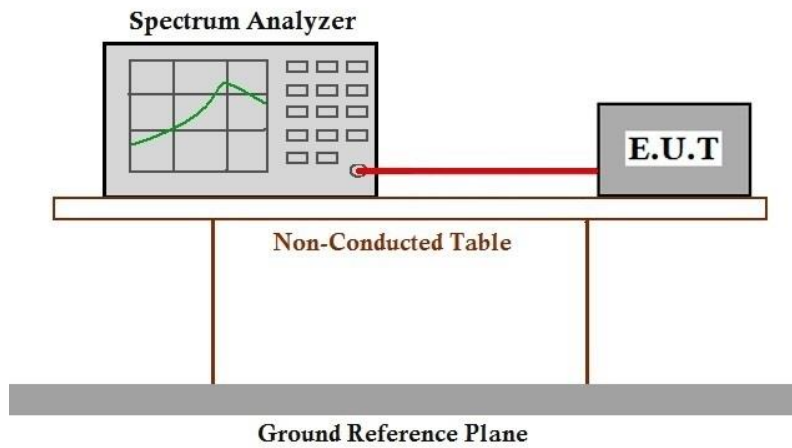
Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.4.3 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

7.4.4 Test Setup Diagram



7.5 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)

Test Method: ANSI C63.10 (2020) Section 11.8.1

Limit:

≥500 kHz

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

Humidity: 45 % RH

Atmospheric Pressure: 1024 mbar

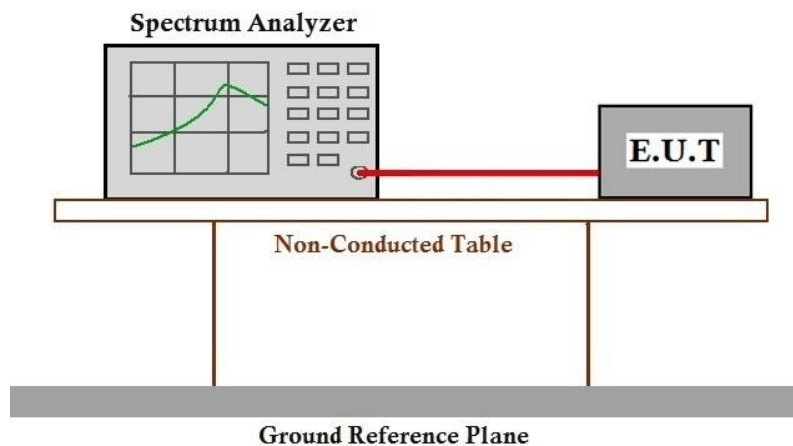
7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.5.3 Measurement Procedure and Data

Please Refer to Appendix for Details

7.5.4 Test Setup Diagram



7.6 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)

Test Method: ANSI C63.10 (2020) Section 11.10.2

Limit:

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

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

Humidity: 45 % RH

Atmospheric Pressure: 1024 mbar

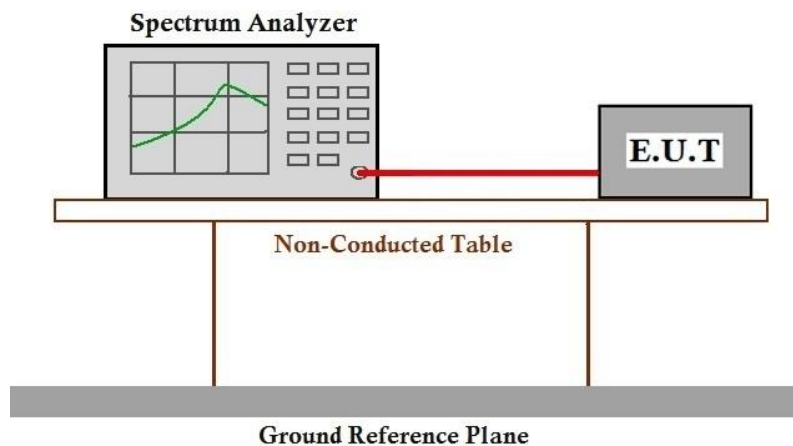
7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.6.3 Measurement Procedure and Data

Please Refer to Appendix for Details

7.6.4 Test Setup Diagram





7.7 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2020) Section 6.10.4

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)).

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

Humidity: 45 % RH

Atmospheric Pressure: 1024 mbar

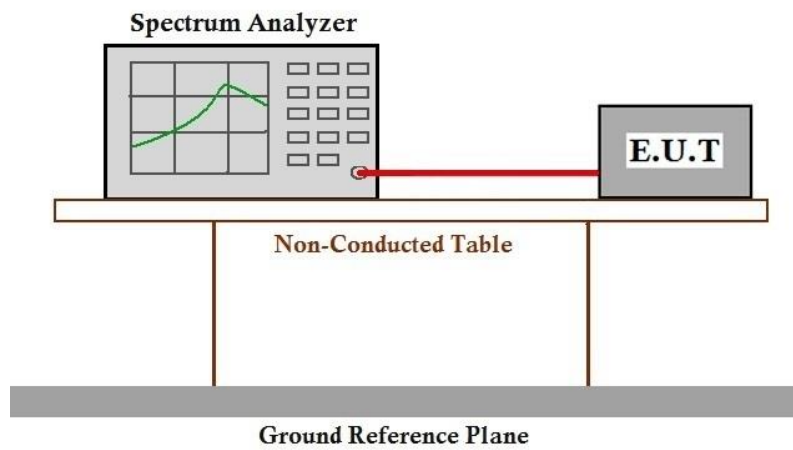
7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.7.3 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7.4 Test Setup Diagram





7.8 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2020) 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)).

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

Humidity: 45 % RH

Atmospheric Pressure: 1024 mbar

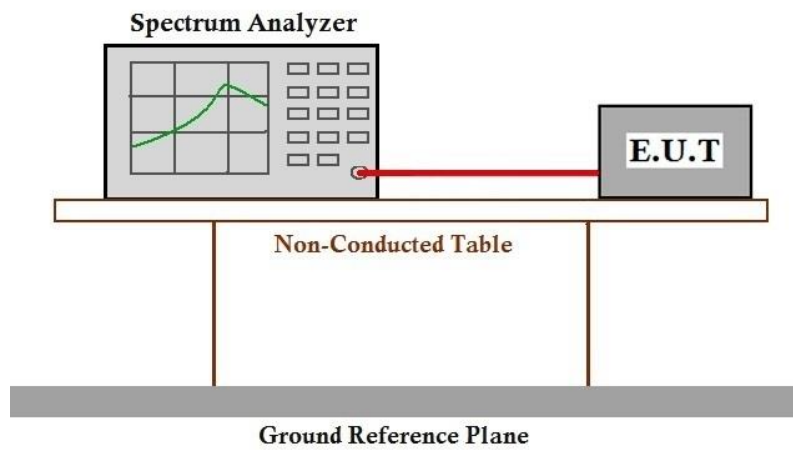
7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.8.3 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8.4 Test Setup Diagram





Report No.: SUCR251000100002

Page: 42 of 67

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SUCR2510001000MO

9 EUT Constructional Details (EUT Photos)

Refer to Appendix_Photographs of EUT Constructional Details for SUCR2510001000MO



10 Appendix

1. Duty Cycle

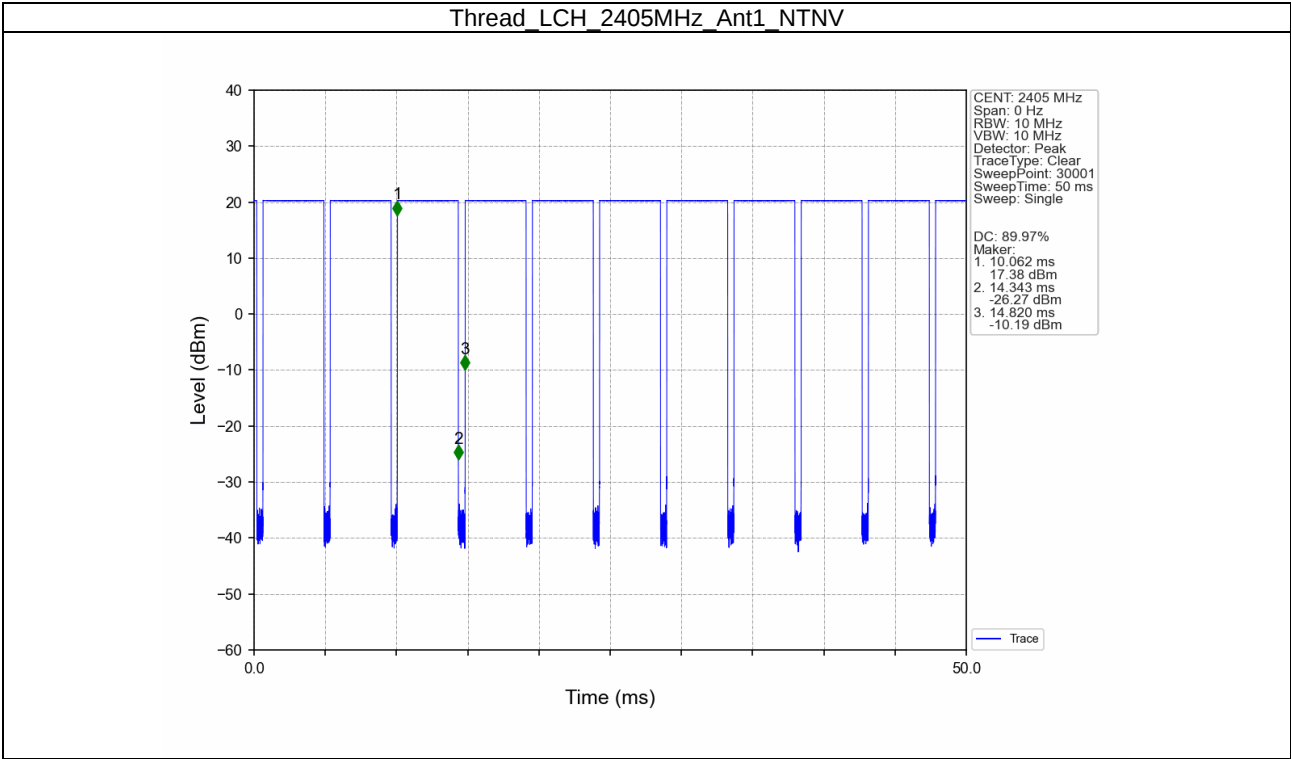
1.1 Test Result

1.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
Thread	SISO	2405	4.281	4.758	89.97	0.46	0.80

1.2 Test Graph

1.2.1 Ant1





2. Bandwidth

2.1 Test Result

2.1.1 OBW

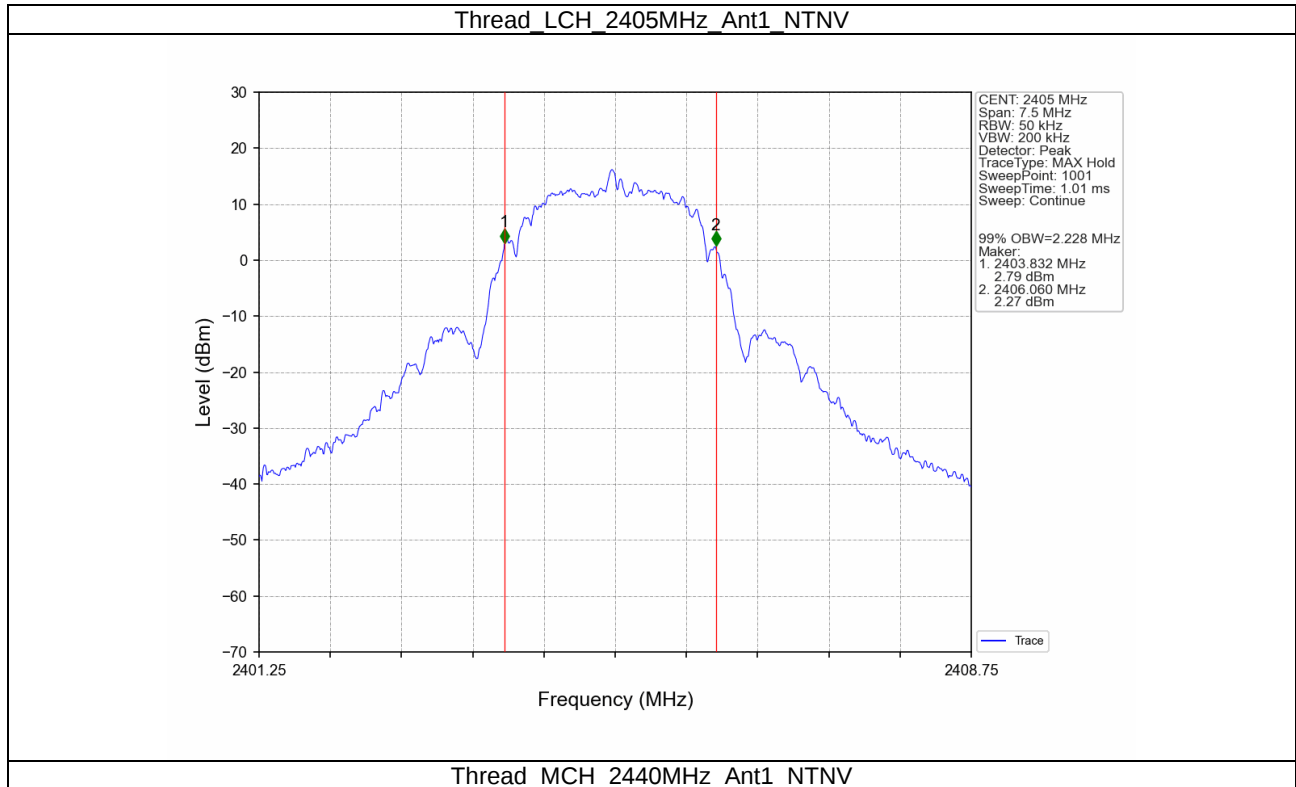
Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
Thread	SISO	2405	1	2.228	/	Pass
		2440	1	2.234	/	Pass
		2480	1	2.241	/	Pass

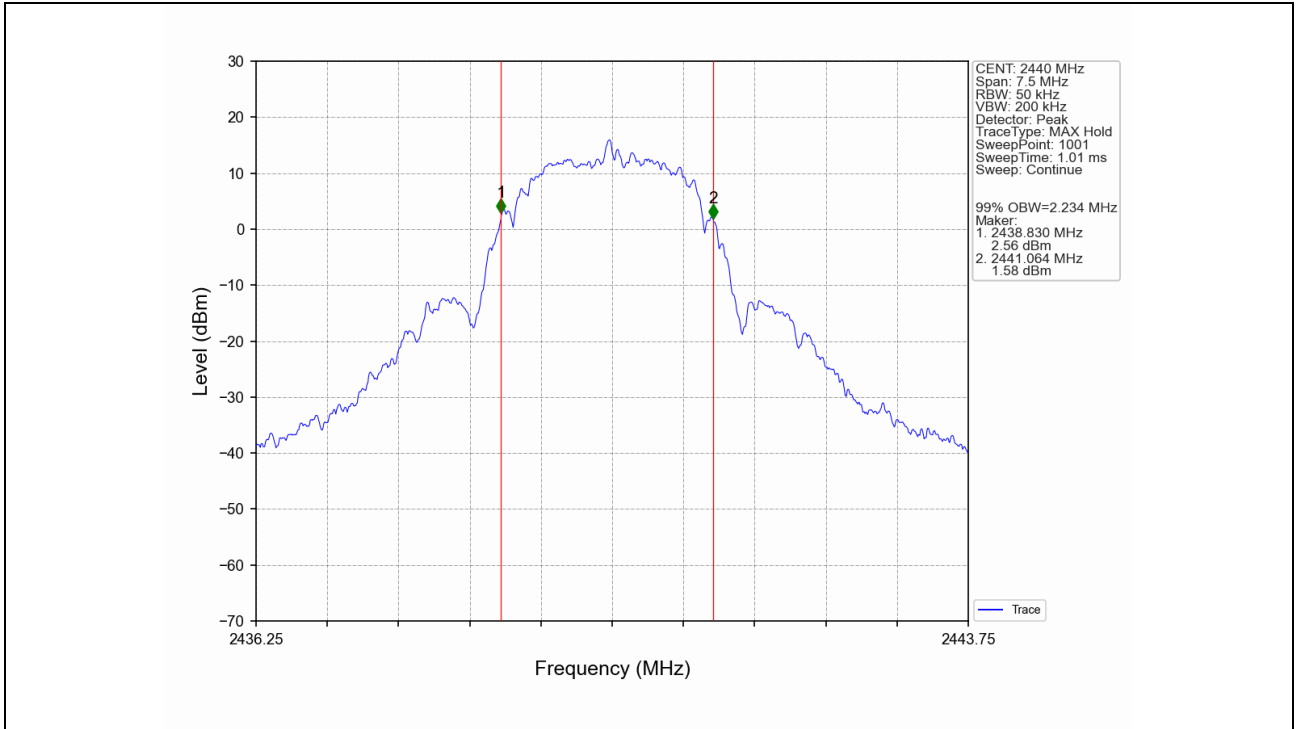
2.1.2 6dB BW

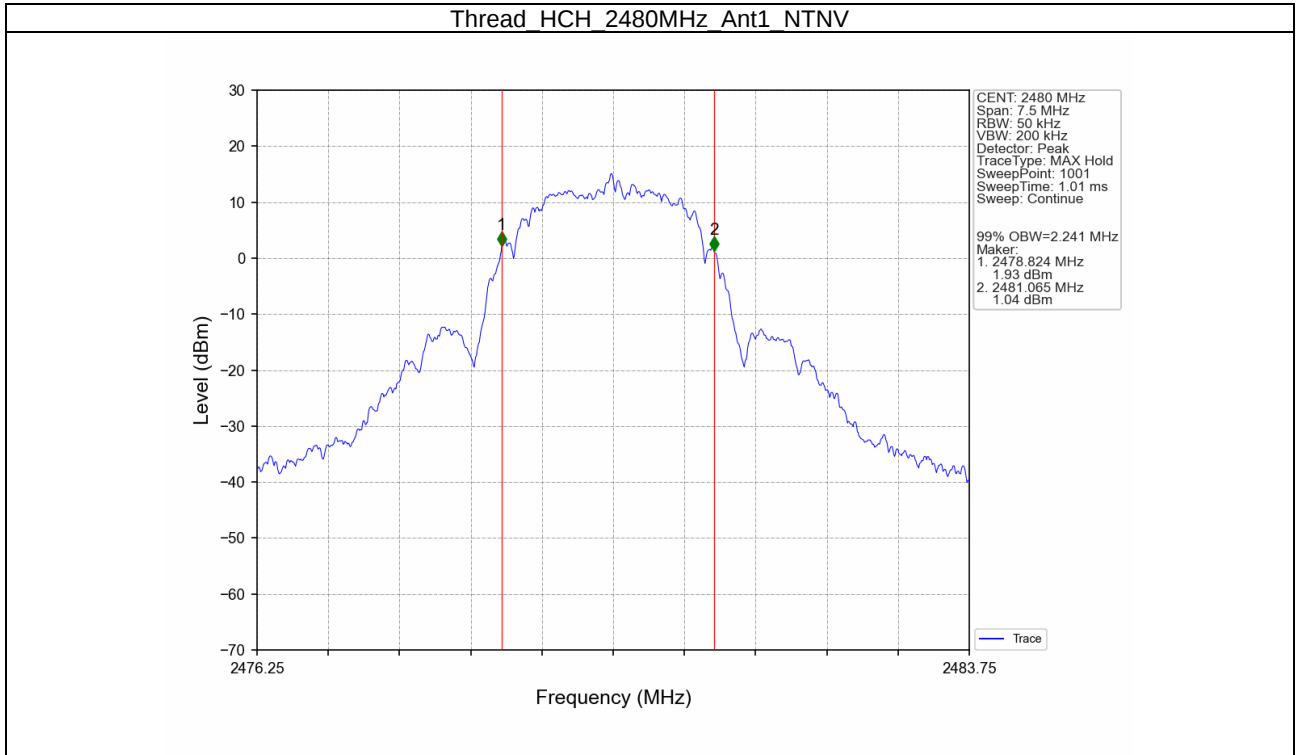
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
Thread	SISO	2405	1	1.448	≥ 0.5	Pass
		2440	1	1.504	≥ 0.5	Pass
		2480	1	1.440	≥ 0.5	Pass

2.2 Test Graph

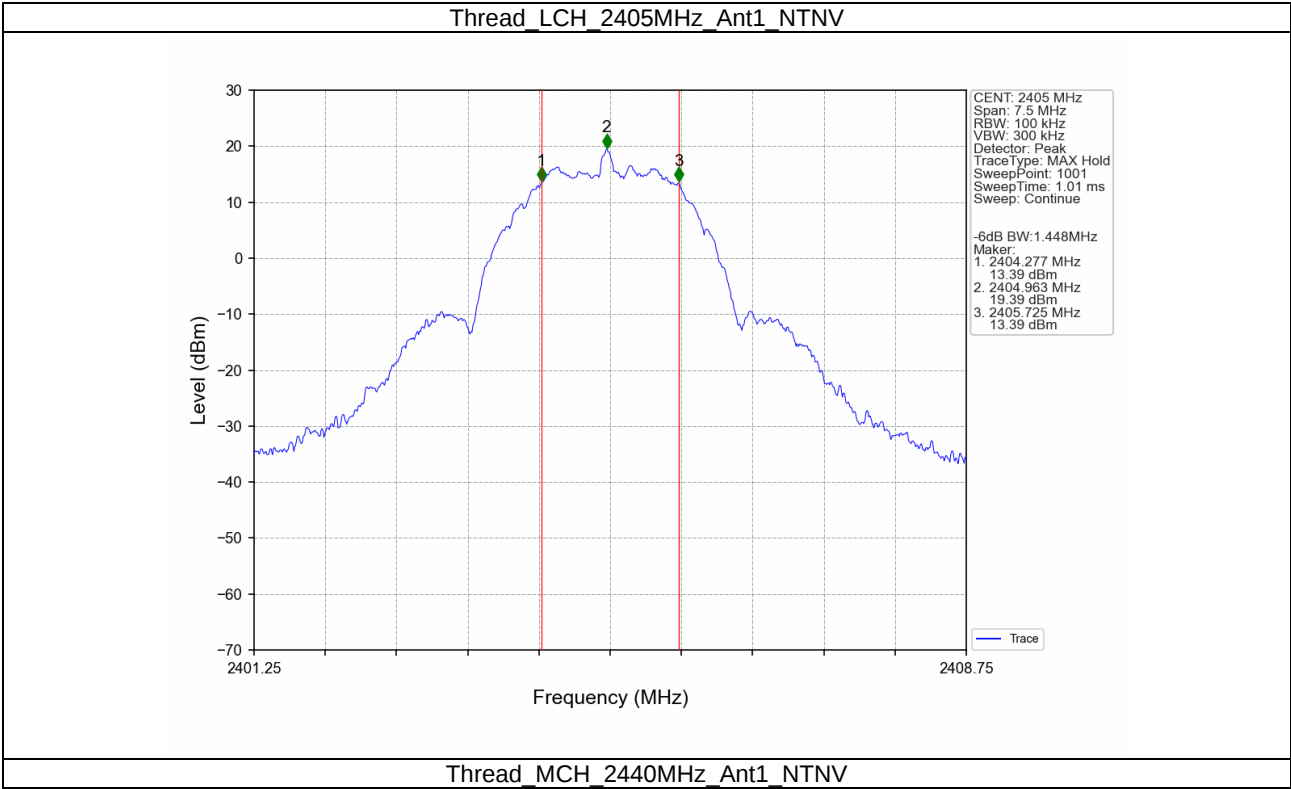
2.2.1 OBW

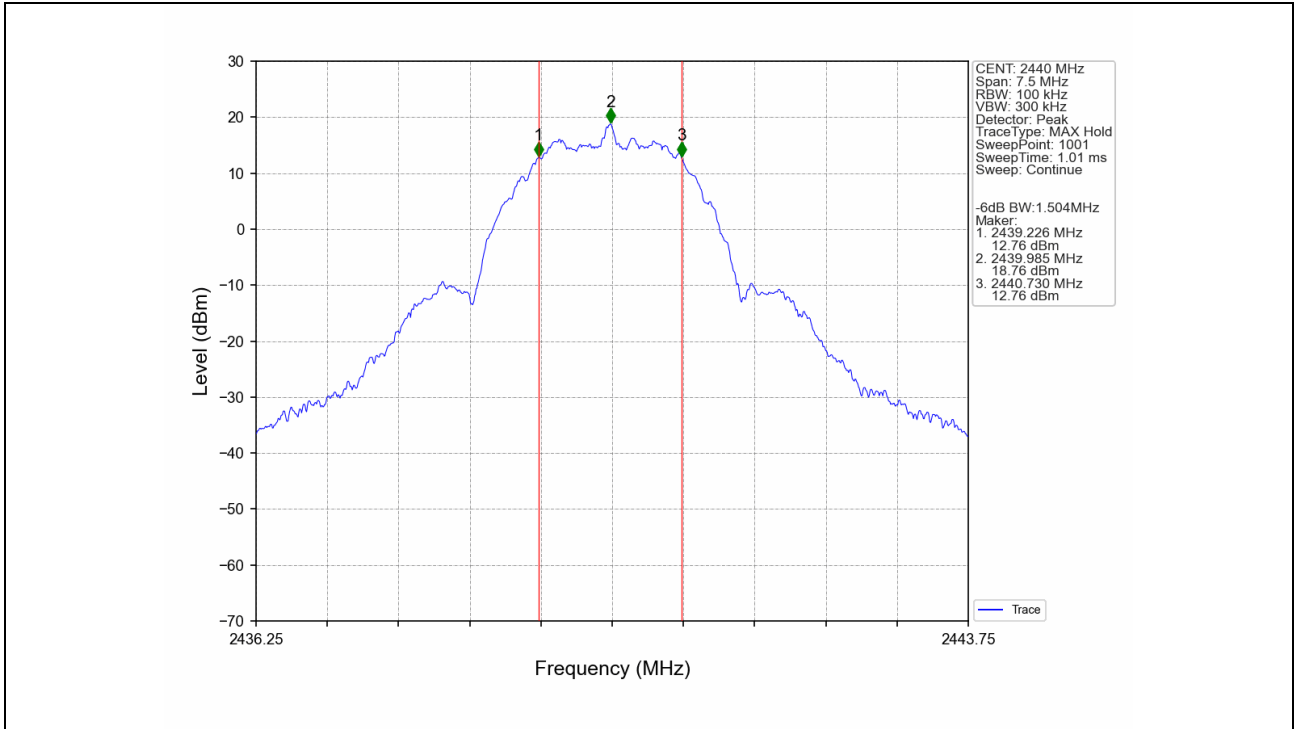


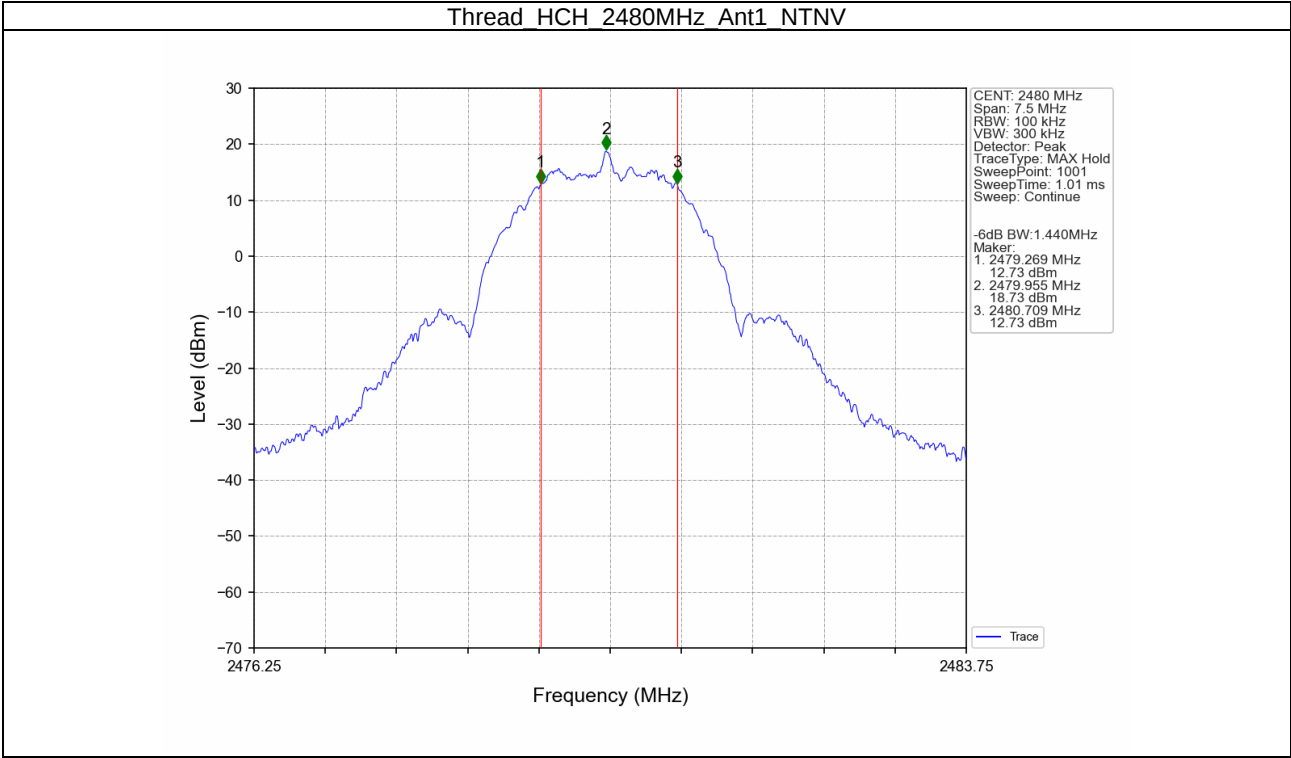




2.2.2 6dB BW









3. Maximum Conducted Output Power

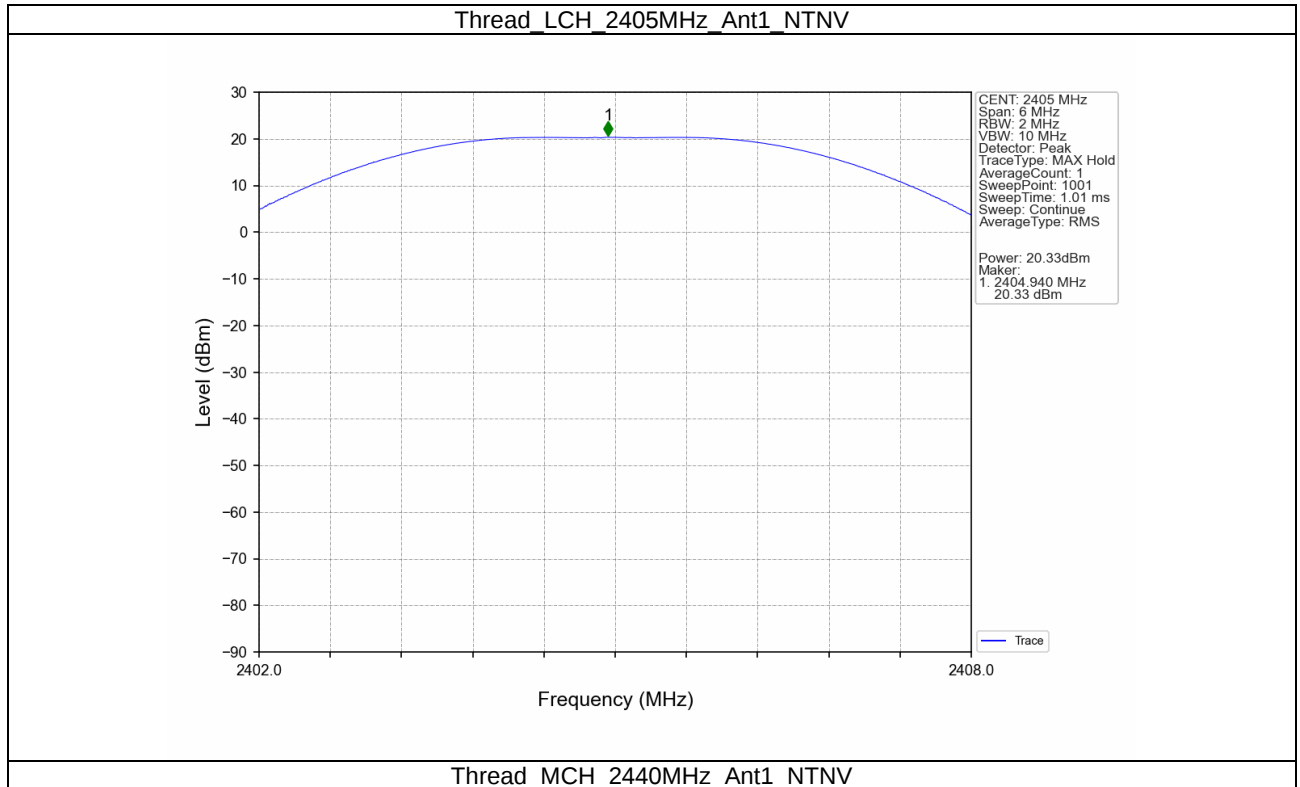
3.1 Test Result

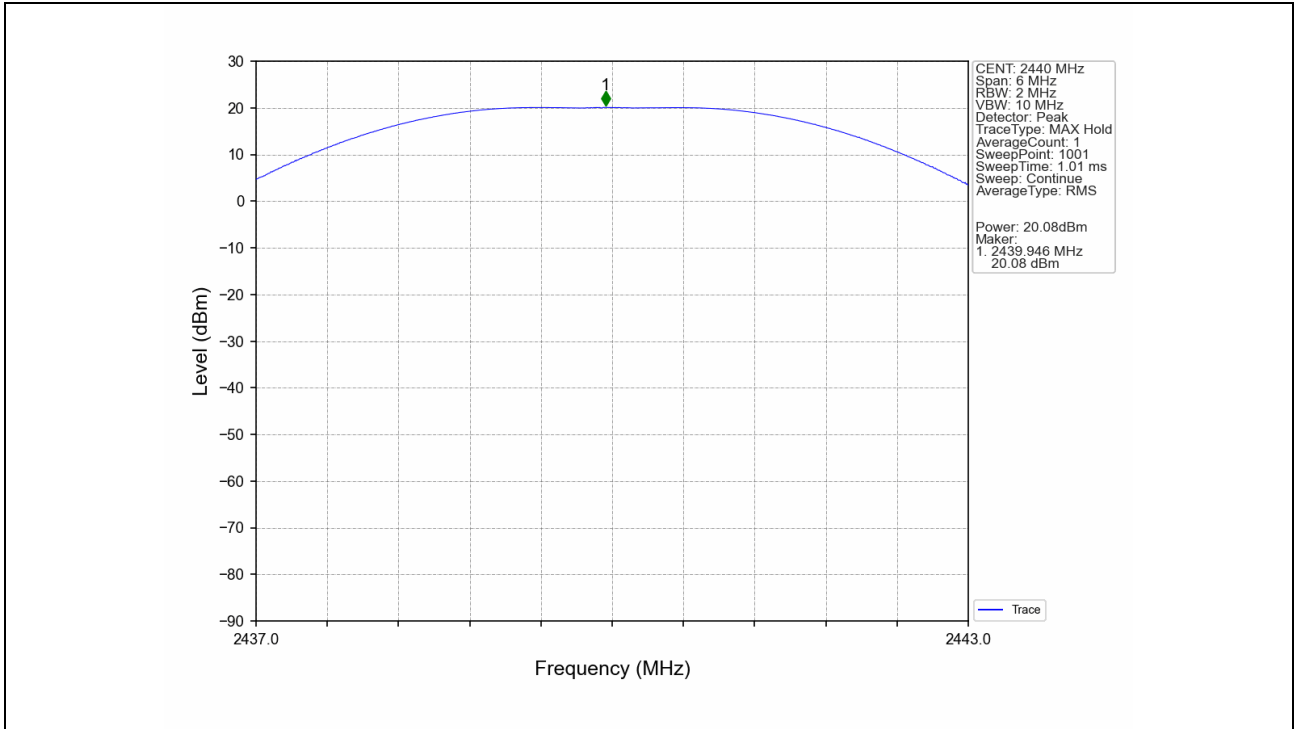
3.1.1 Power

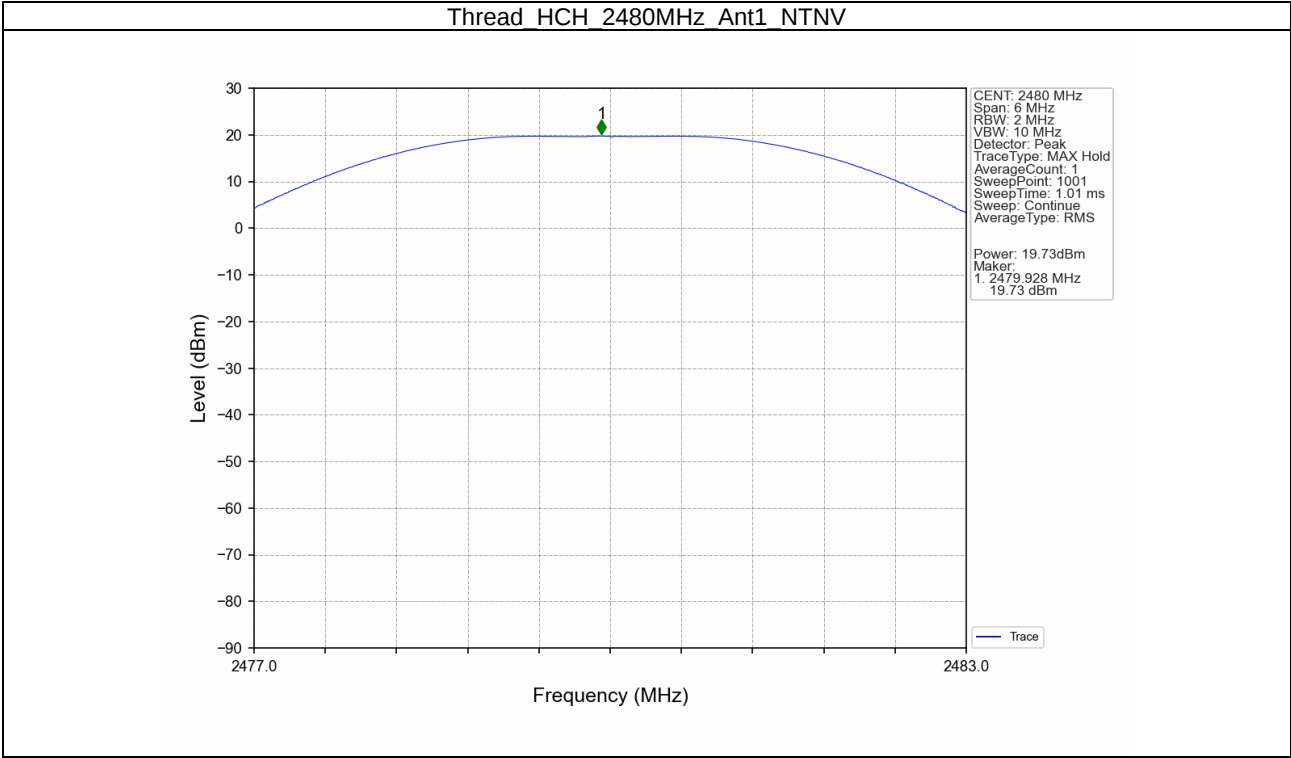
Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
Thread	SISO	2405	20.33	<=30	Pass
		2440	20.08	<=30	Pass
		2480	19.73	<=30	Pass
Note1: Antenna Gain: Ant1: 0.20dBi;					

3.2 Test Graph

3.2.1 Power









4. Maximum Power Spectral Density

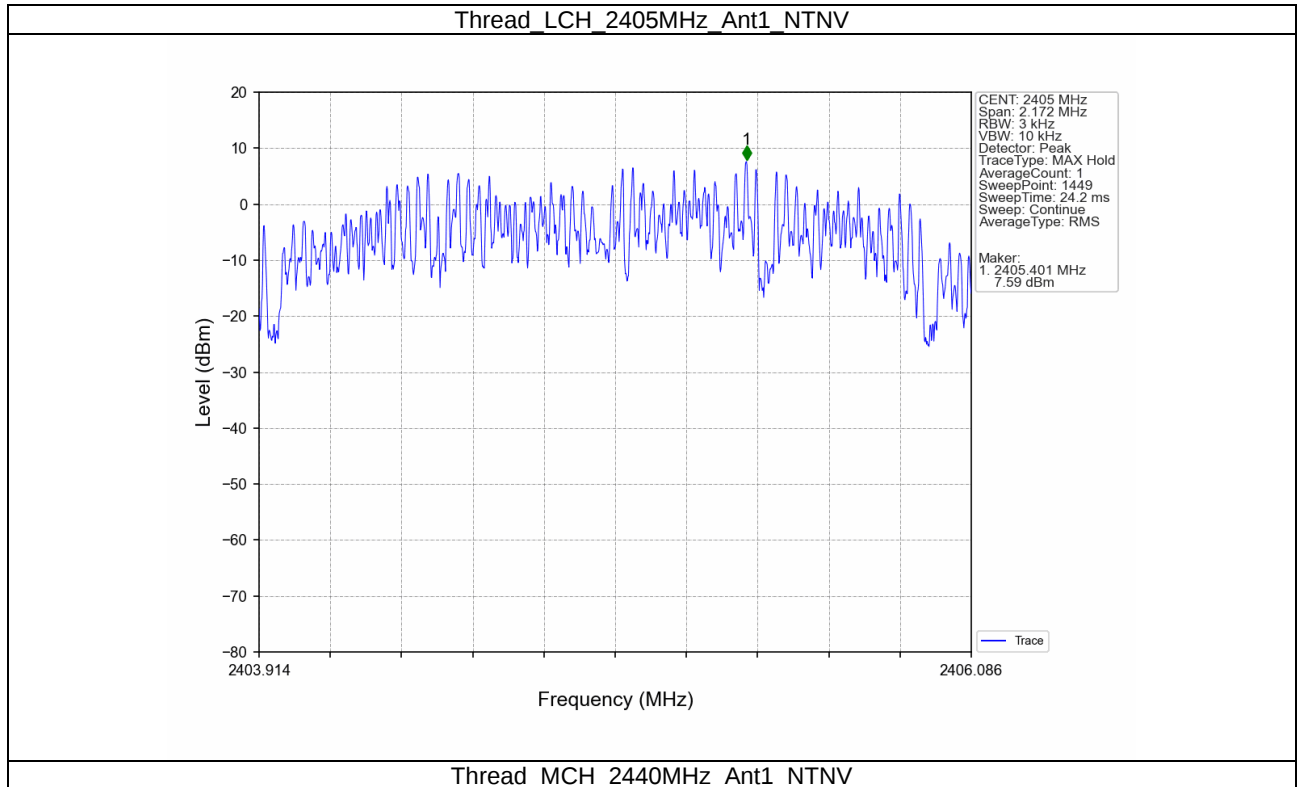
4.1 Test Result

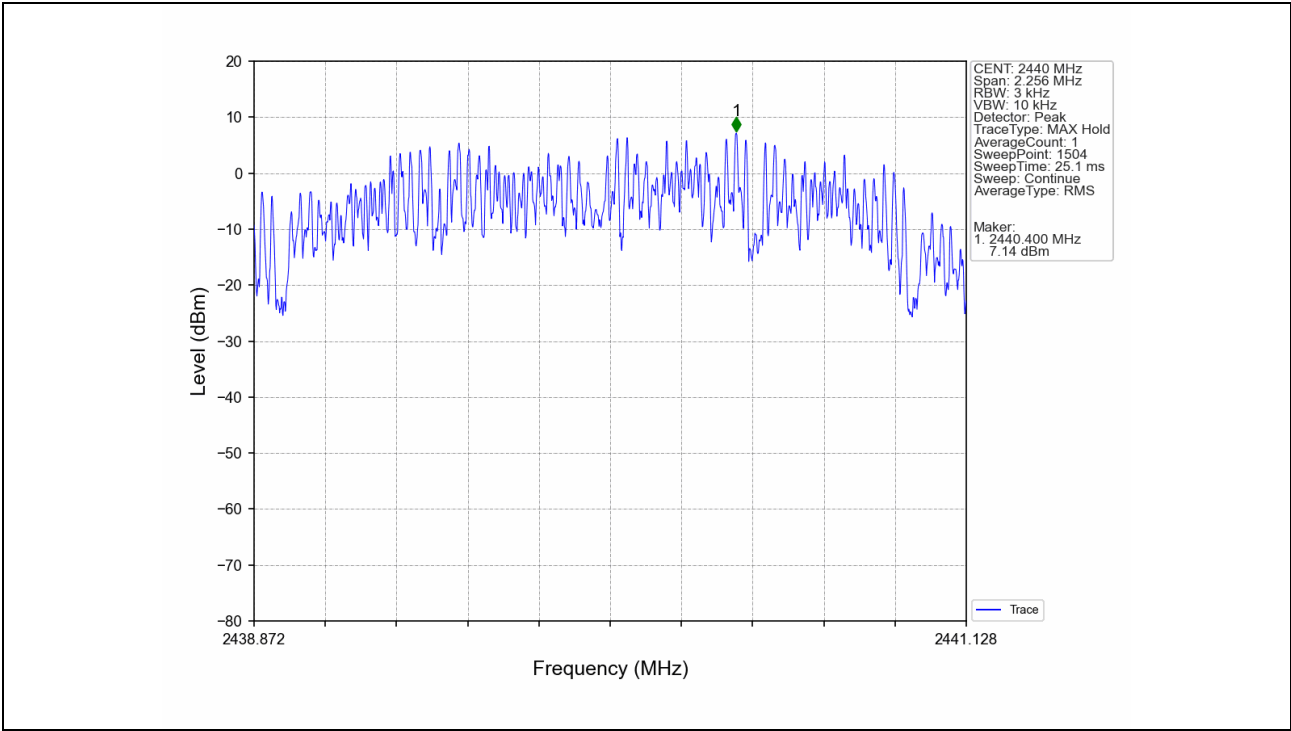
4.1.1 PSD

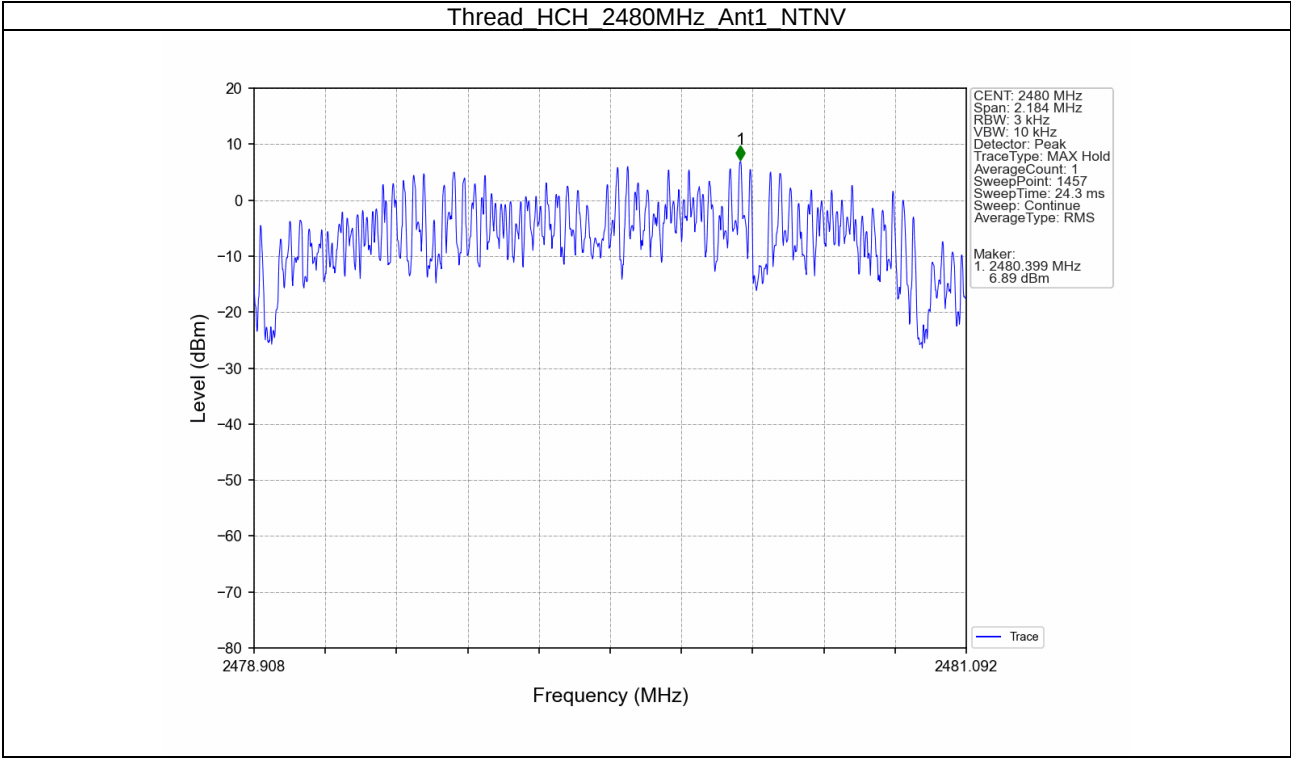
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm)		Verdict
			ANT1	Limit	
Thread	SISO	2405	7.59	<=8	Pass
		2440	7.14	<=8	Pass
		2480	6.89	<=8	Pass
Note1: Antenna Gain: Ant1: 0.20dBi;					

4.2 Test Graph

4.2.1 PSD









5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Test Result

5.1.1 Ref

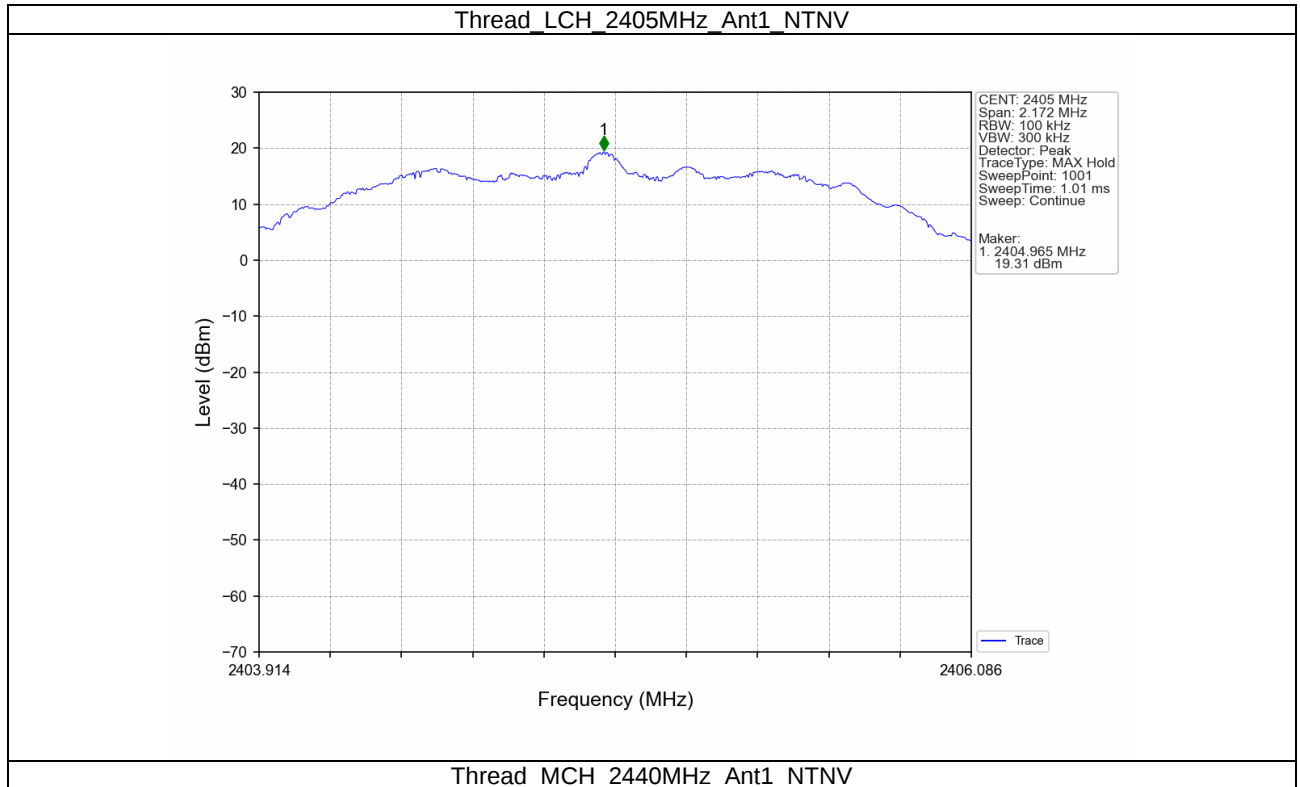
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
Thread	SISO	2405	1	19.31
		2440	1	19.05
		2480	1	18.66
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.				

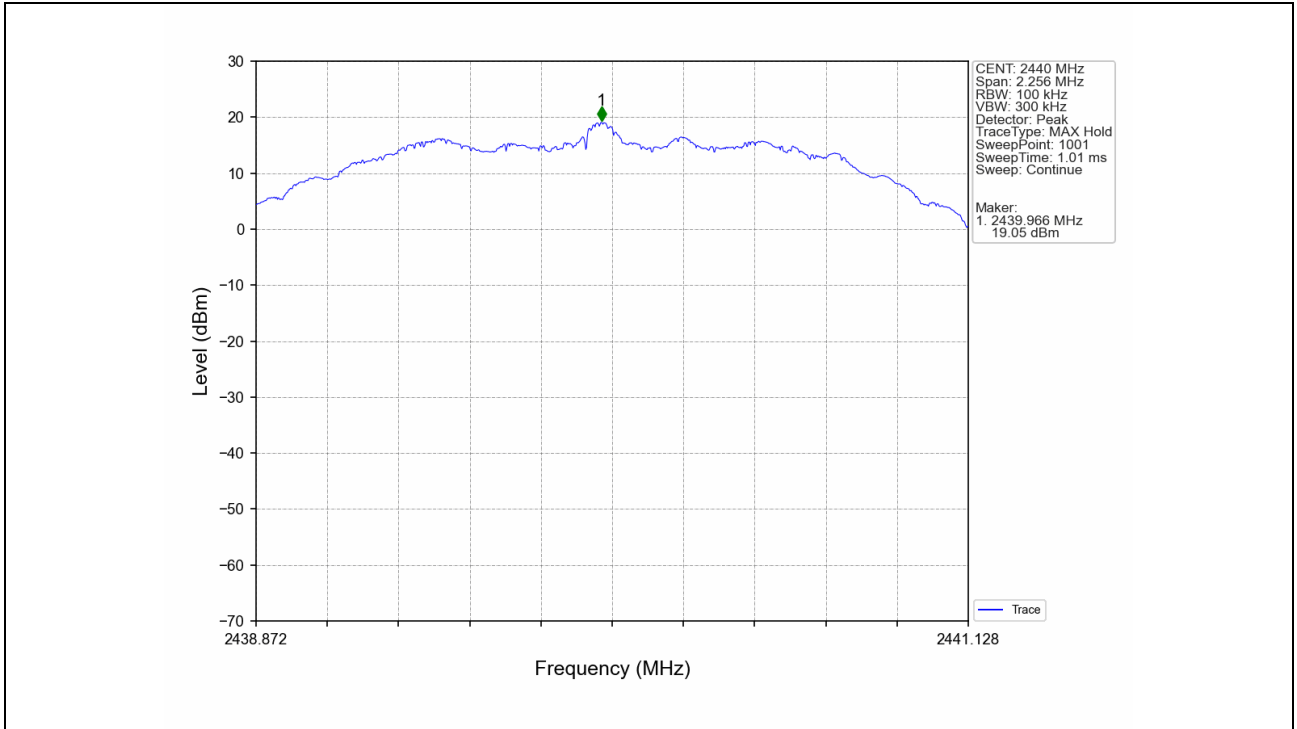
5.1.2 CSE

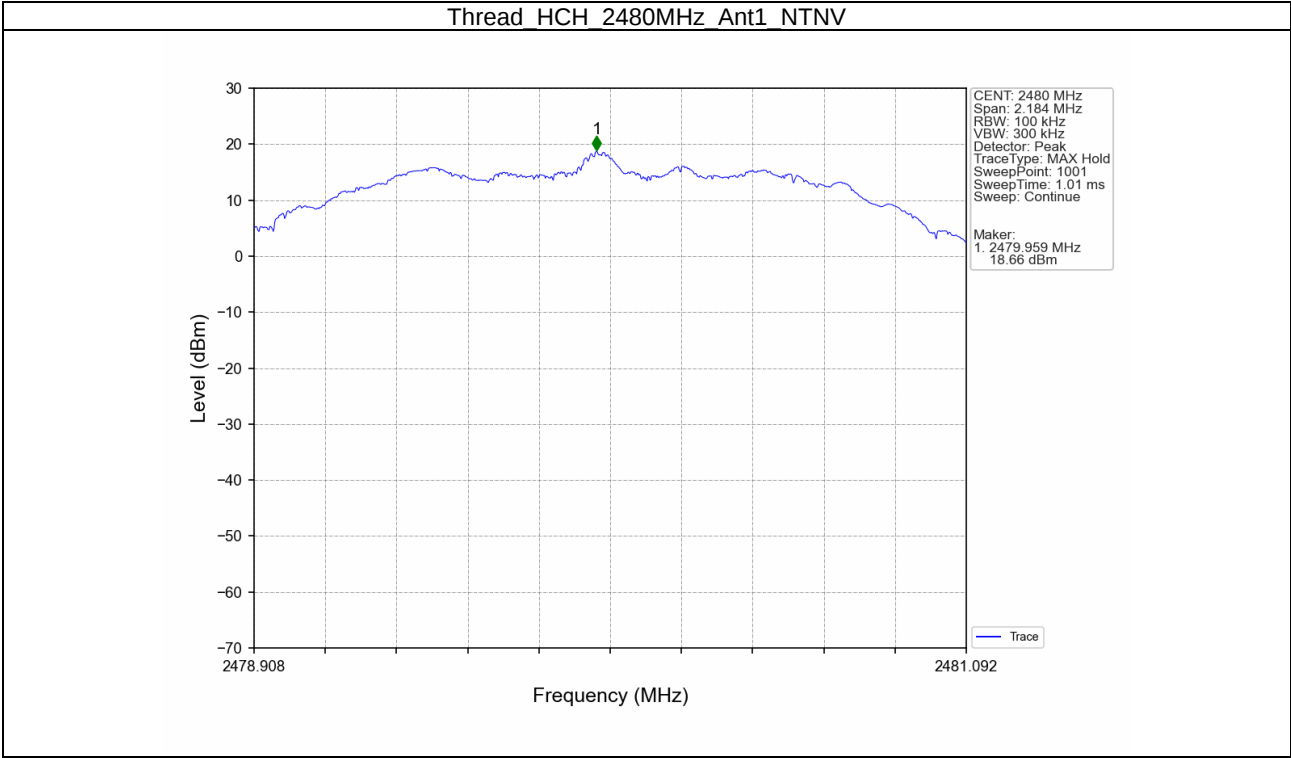
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
Thread	SISO	2405	1	19.31	-0.69	Pass
		2440	1	19.31	-0.69	Pass
		2480	1	19.31	-0.69	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.						

5.2 Test Graph

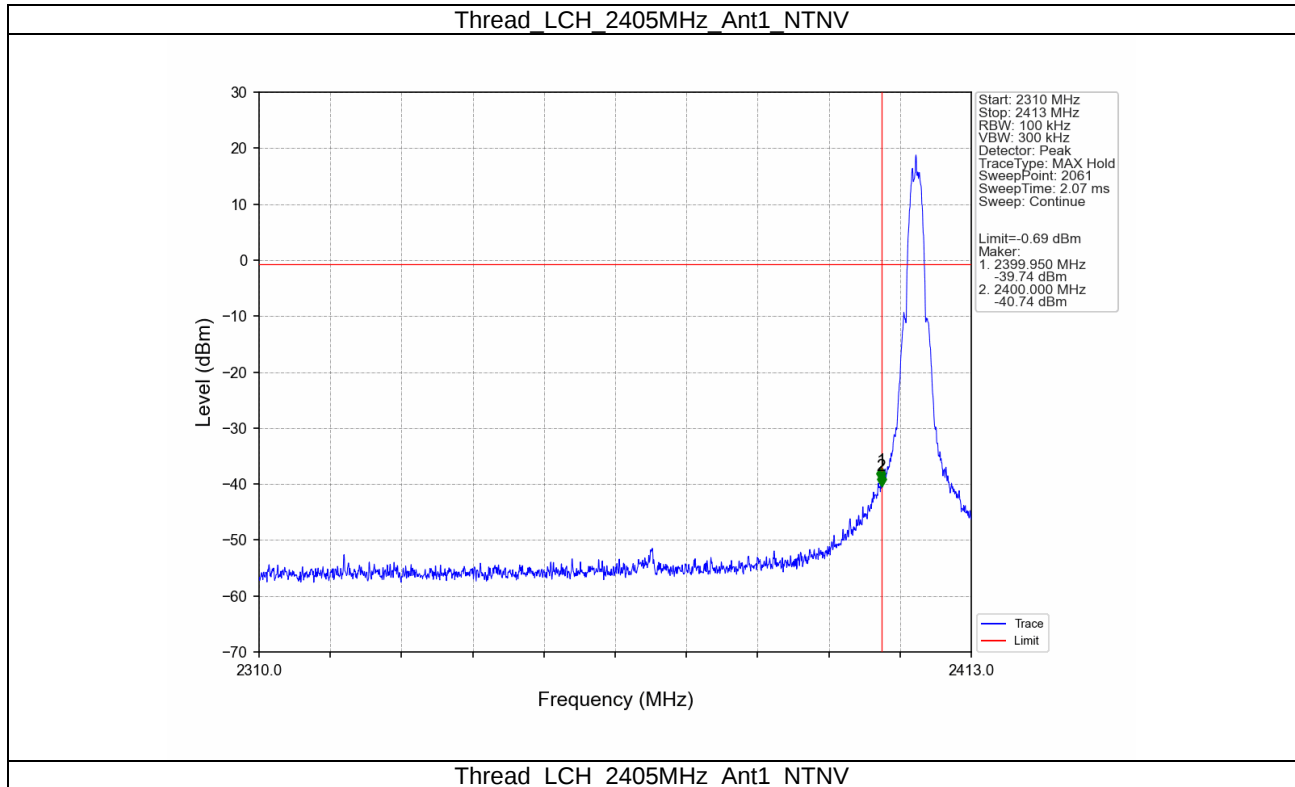
5.2.1 Ref

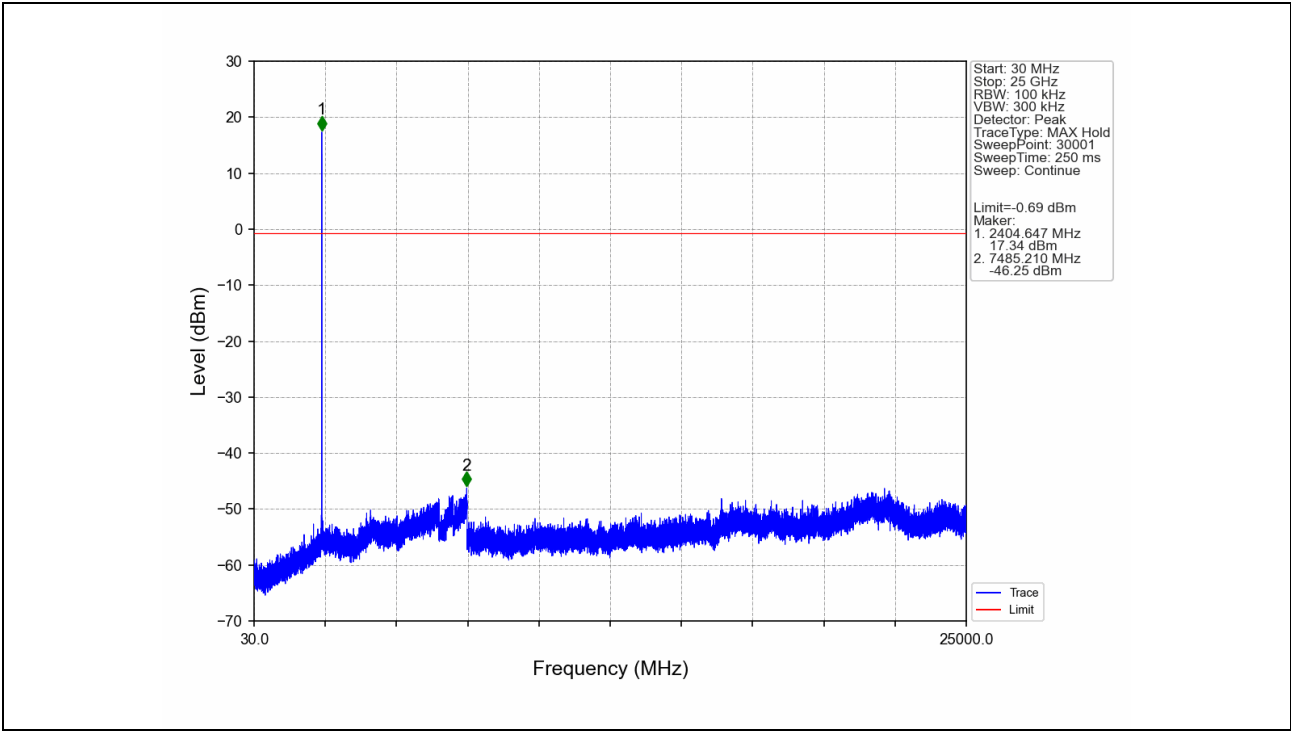




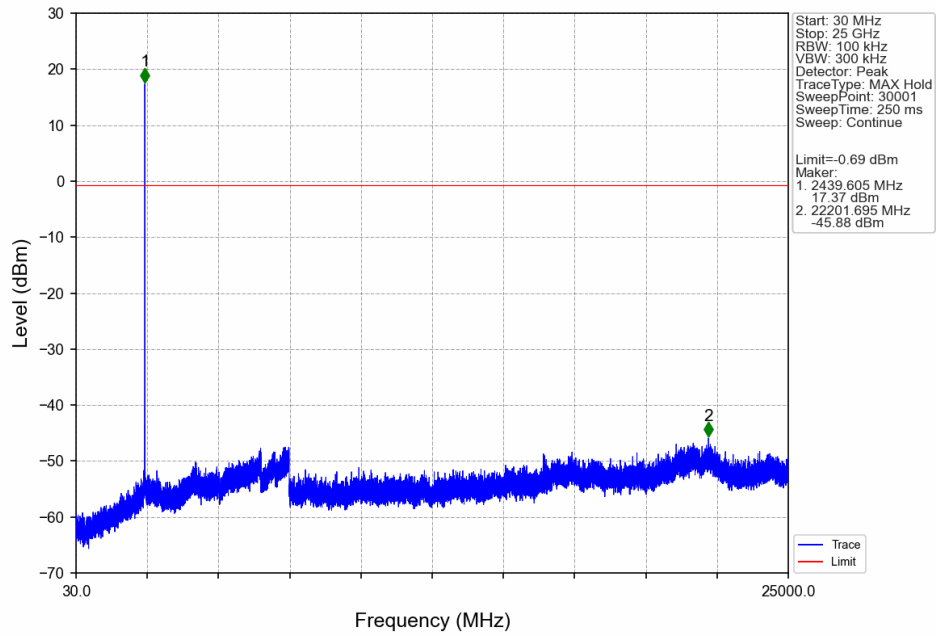


5.2.2 CSE

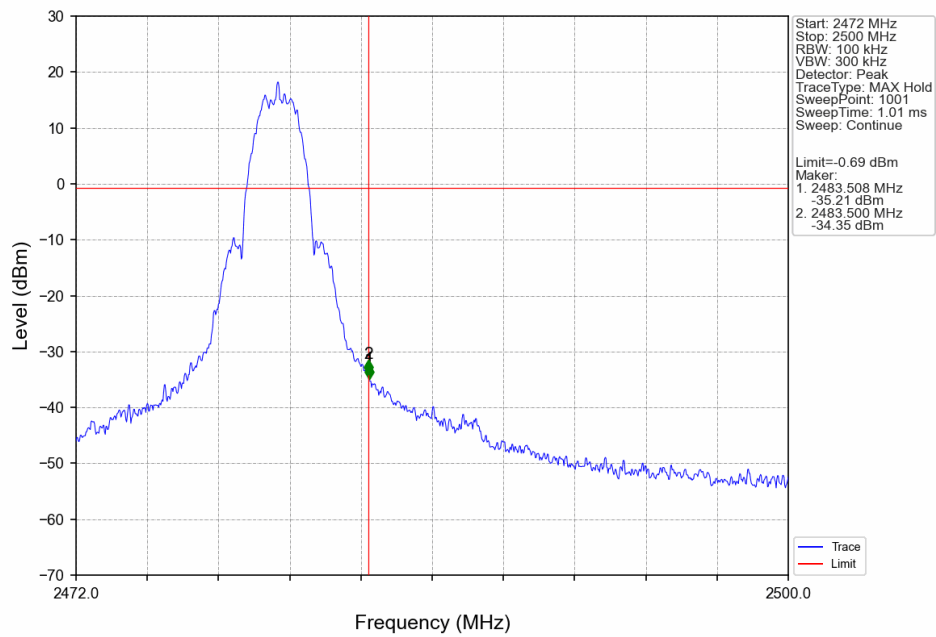


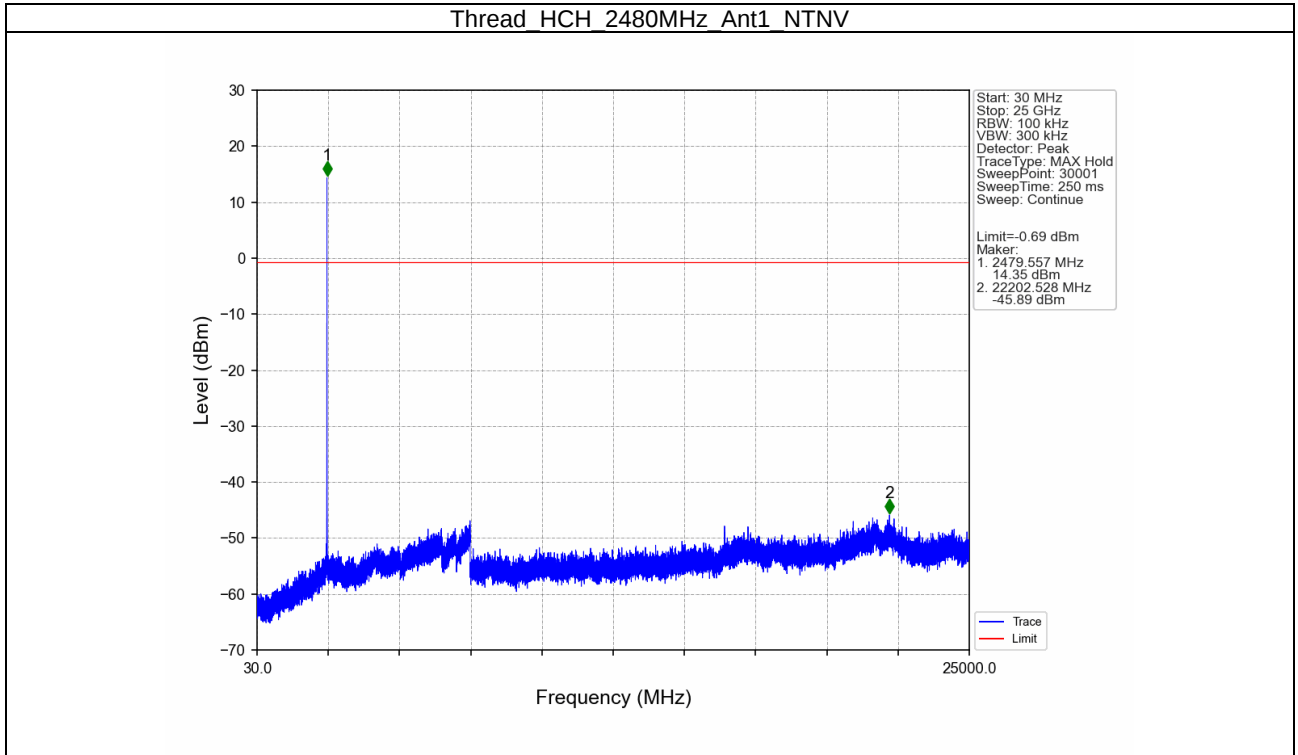


Thread_MCH_2440MHz_Ant1_NTNV



Thread_HCH_2480MHz_Ant1_NTNV





- End of the Report -