



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 1 of 78

TEST REPORT

Application No.: KSCR2406001151AT
FCC ID: 2BG9R-H010
Applicant: H-zLink (Nanjing) Electronics Co., Ltd.
Address of Applicant: Room 2106, BuildingD2, Duhui Tiandi City, No.28 Jiangnan Road, Nanjing 210028,P.R.China
Manufacturer: H-zLink (Nanjing) Electronics Co., Ltd.
Address of Manufacturer: Room 2106, BuildingD2, Duhui Tiandi City, No.28 Jiangnan Road, Nanjing 210028,P.R.China
Factory: Shenzhen JLC Technology Group Co., Ltd.
Address of Factory: 27 Floor,Olympic Building,No.2 ShangBao Road,Futian District,Shenzhen Guangdong Province, China
Equipment Under Test (EUT):
EUT Name: Bluetooth Low Energy module H9518Fx
Model No.: H9518Fx
Trade Mark: H-zLink
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2024-06-21
Date of Test: 2024-07-26 to 2024-08-16
Date of Issue: 2024-08-19

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.aspx> 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.aspx>. 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.



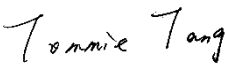
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 2 of 78

Revision Record			
Version	Description	Date	Remark
00	Original	2024-08-19	/

Authorized for issue by:				
Tested By				
		Tommie Tang /Project Engineer		
Approved By				
		Terry Hou /Reviewer		



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 3 of 78

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 Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
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
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) 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 Description of Support Units	5
4.3 Power level setting using in test	5
4.4 Measurement Uncertainty.....	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	9
6.1 Antenna Requirement	9
7 Radio Spectrum Matter Test Results.....	10
7.1 Conducted Emissions at AC Power Line (150kHz-30MHz).....	10
7.2 Radiated Emissions which fall in the restricted bands.....	14
7.3 Radiated Spurious Emissions Below 1GHz.....	26
7.4 Radiated Spurious Emissions Above 1GHz	30
7.5 Conducted Peak Output Power	44
7.6 Minimum 6dB Bandwidth	46
7.7 Power Spectrum Density	47
7.8 Conducted Band Edges Measurement.....	48
7.9 Conducted Spurious Emissions.....	49
8 Test Setup Photo	50
9 EUT Constructional Details (EUT Photos)	50
10 Appendix	51

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.3V
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi (Provided by the manufacturer)

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	LENOVO	80H1	/
Adapter	SHENZHEN HONOR ELECTRONIC CO., LTD.	ADS-12AM-12 12012EPCU	/
Serial port adapter plate	/	Test Plate 3	/
Development board	/	/	/

4.3 Power level setting using in test

Channel	BLE 1M	BLE 2M
	Ant 1	Ant 1
0	default	default
19	default	default
39	default	default

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.5 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

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**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

- **FCC**

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

- **ISED**

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 2324E

- **VCCI**

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 8 of 78

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
Conducted Emission at Mains Terminals						
1	EMI Test Receive	R&S	ESCI	KS301101	01/15/2024	01/14/2025
2	LISN	R&S	ENV216	KS301197	01/15/2024	01/14/2025
3	LISN	Schwarzbeck	NNLK 8129	KS301091	01/15/2024	01/14/2025
4	Pulse Limiter	R&S	ESH3-Z2	KUS1902E001	01/15/2024	01/14/2025
5	CE test Cable	Thermax	/	CZ301102	01/15/2024	01/14/2025
6	Test Software	Farad	EZ-EMC	/	N.C.R	N.C.R
RF Conducted Test						
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	08/24/2023	08/23/2024
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	08/24/2023	08/23/2024
3	Spectrum Analyzer	Keysight	N9030B	KSEM021-1	01/15/2024	01/14/2025
4	Signal Generator	R&S	SMBV100B	KSEM032	03/19/2024	03/18/2025
5	Signal Generator	R&S	SMW200A	KSEM020-1	08/24/2023	08/23/2024
6	Signal Generator	Agilent	N5182A	KUS2001M001-1	08/24/2023	08/23/2024
7	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	08/24/2023	08/23/2024
8	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	03/19/2024	03/18/2025
9	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	08/24/2023	08/23/2024
10	Switcher	TST	FY562	KUS2001M001-4	01/15/2024	01/14/2025
11	AC Power Source	EXTECH	6605	KS301178	N.C.R	N.C.R
12	DC Power Supply	Aglient	E3632A	KS301180	N.C.R	N.C.R
13	Conducted Test Cable	Thermax	RF01-RF04	CZ301111-CZ301120	01/15/2024	01/14/2025
14	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	08/24/2023	08/23/2024
15	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	03/19/2024	03/18/2025
16	Software	BST	TST-PASS	/	NCR	NCR
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/24/2023	08/23/2024
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	03/19/2024	03/18/2025
3	Signal Generator	Agilent	E8257C	KS301066	08/24/2023	08/23/2024
4	Loop Antenna	COM-POWER	AL-130R	KUS1806E001	03/18/2023	03/17/2025
5	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E005	06/29/2023	06/28/2025
6	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E006	03/19/2024	03/18/2025
7	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	KS301079	08/24/2023	08/23/2024
8	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	KS301186	04/07/2023	04/06/2025
9	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	CZ301058	01/07/2024	01/06/2026
10	Amplifier(30MHz~18GHz)	PANSHAN TECHNOLOGY	LNA:1~18G	KSEM010-1	01/15/2024	01/14/2025
11	Amplifier(18~40GHz)	PANSHAN TECHNOLOGY	LNA180400G40	KSEM038	08/24/2023	08/23/2024
12	RE Test Cable	REBES MICROWAVE	/	CZ301097	08/24/2023	08/23/2024
13	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	03/19/2024	03/18/2025
14	Software	Faratronic	EZ_EMG-v 3A1	/	NCR	NCR
15	Software	ESE	E3_V 6.111221a	/	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 PCB Antenna integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0 dBi.

Antenna location: Refer to internal photo.

7 Radio Spectrum Matter Test Results

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

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C

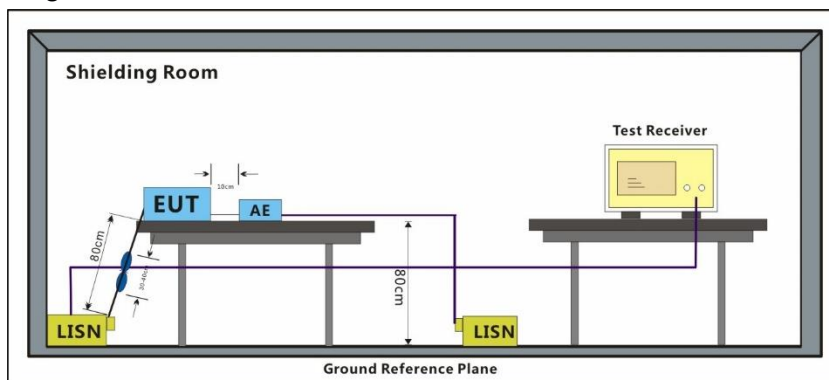
Humidity: 50.8 % RH

Atmospheric Pressure: 1010 mbar

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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

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

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

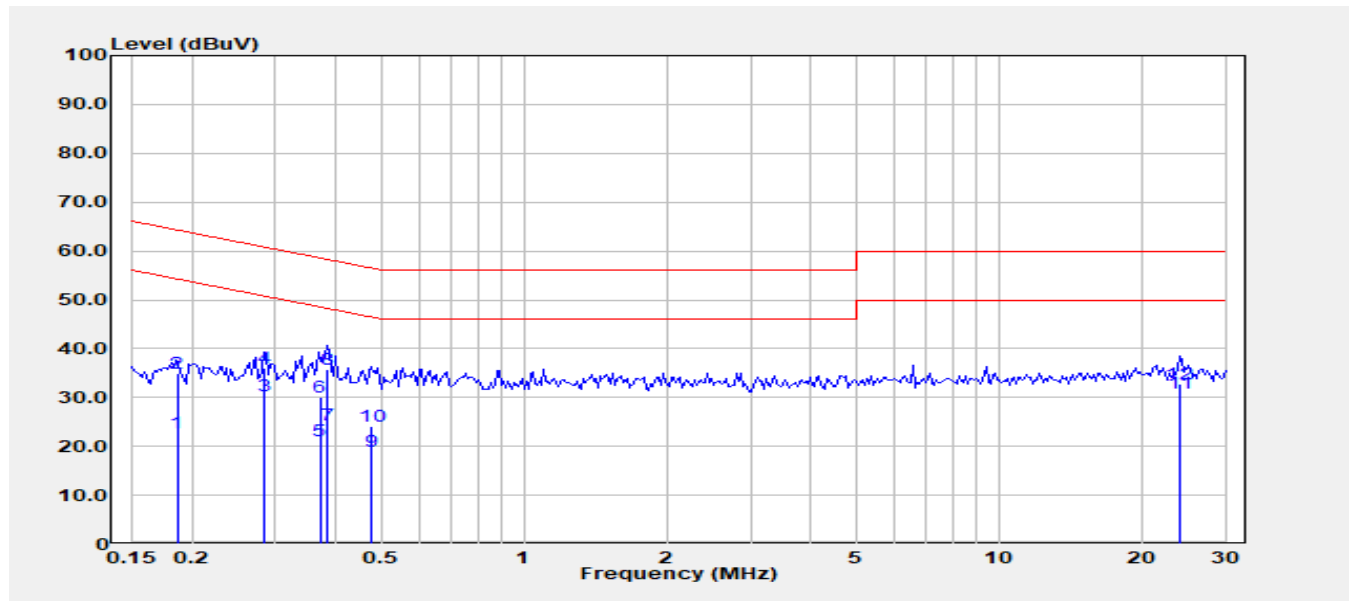
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 12 of 78

Test Mode: 00; Line: Live line



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1860	2.54	20.10	22.64	54.21	-31.57	Average
2	0.1860	14.77	20.10	34.87	64.21	-29.34	QP
3	0.2850	10.38	20.08	30.46	50.67	-20.21	Average
4	0.2850	16.03	20.08	36.11	60.67	-24.56	QP
5	0.3719	1.13	20.07	21.20	48.46	-27.26	Average
6	0.3719	10.01	20.07	30.08	58.46	-28.38	QP
7	0.3841	4.33	20.07	24.40	48.19	-23.79	Average
8	0.3841	15.75	20.07	35.82	58.19	-22.37	QP
9	0.4773	-1.19	20.04	18.85	46.39	-27.54	Average
10	0.4773	4.15	20.04	24.19	56.39	-32.20	QP
11	23.9600	11.17	19.76	30.93	50.00	-19.07	Average
12	23.9600	13.15	19.76	32.91	60.00	-27.09	QP

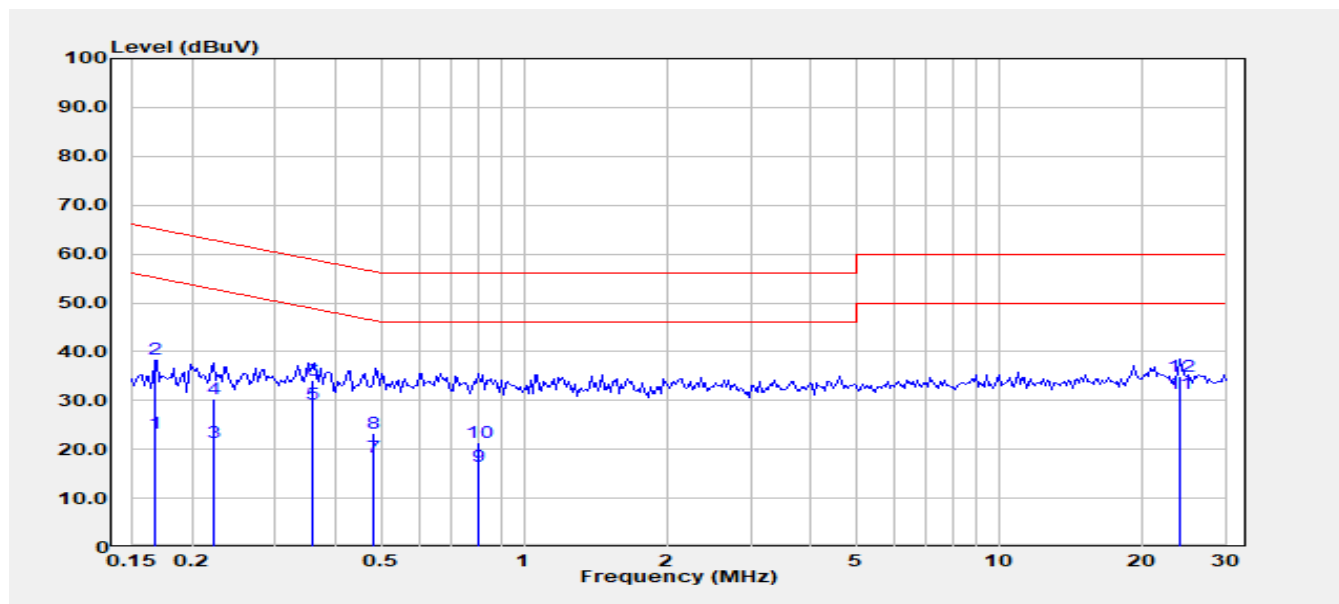
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 13 of 78

Test Mode: 00; Line: Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1672	3.16	20.16	23.32	55.10	-31.78	Average
2	0.1672	18.32	20.16	38.48	65.10	-26.62	QP
3	0.2212	1.40	20.11	21.51	52.77	-31.26	Average
4	0.2212	10.33	20.11	30.44	62.77	-32.33	QP
5	0.3579	9.14	20.10	29.24	48.78	-19.54	Average
6	0.3579	14.18	20.10	34.28	58.78	-24.50	QP
7	0.4843	-1.50	19.96	18.46	46.27	-27.81	Average
8	0.4843	3.41	19.96	23.37	56.27	-32.90	QP
9	0.8007	-3.26	19.86	16.60	46.00	-29.40	Average
10	0.8007	1.43	19.86	21.29	56.00	-34.71	QP
11	24.0020	11.76	19.80	31.56	50.00	-18.44	Average
12	24.0020	15.21	19.80	35.01	60.00	-24.99	QP



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 14 of 78

7.2 Radiated Emissions which fall in the restricted bands

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

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

Measurement Distance: 3M

Limit:

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

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

7.2.1 E.U.T. Operation

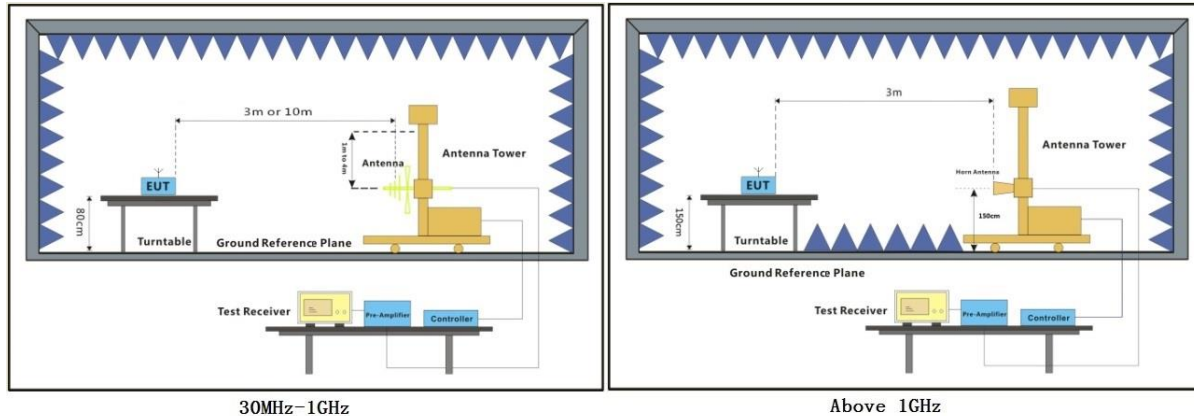
Operating Environment:

Temperature: °C Humidity: % RH Atmospheric Pressure: 1010 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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

- 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.
- 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.
- 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.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- 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.
- 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.

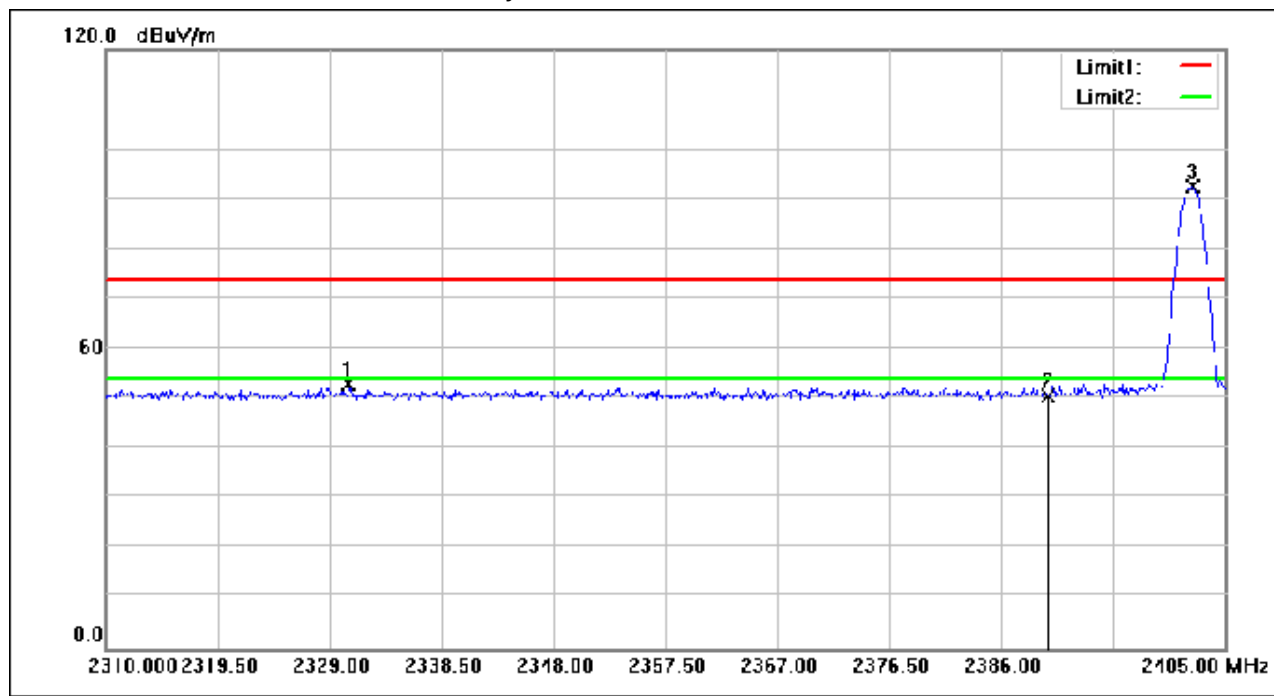
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 16 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2330.615	78.00	-24.97	53.03	74.00	-20.97	peak
2	2390.000	75.29	-24.71	50.58	74.00	-23.42	peak
3	2402.245	117.06	-24.65	92.41	74.00	18.41	peak

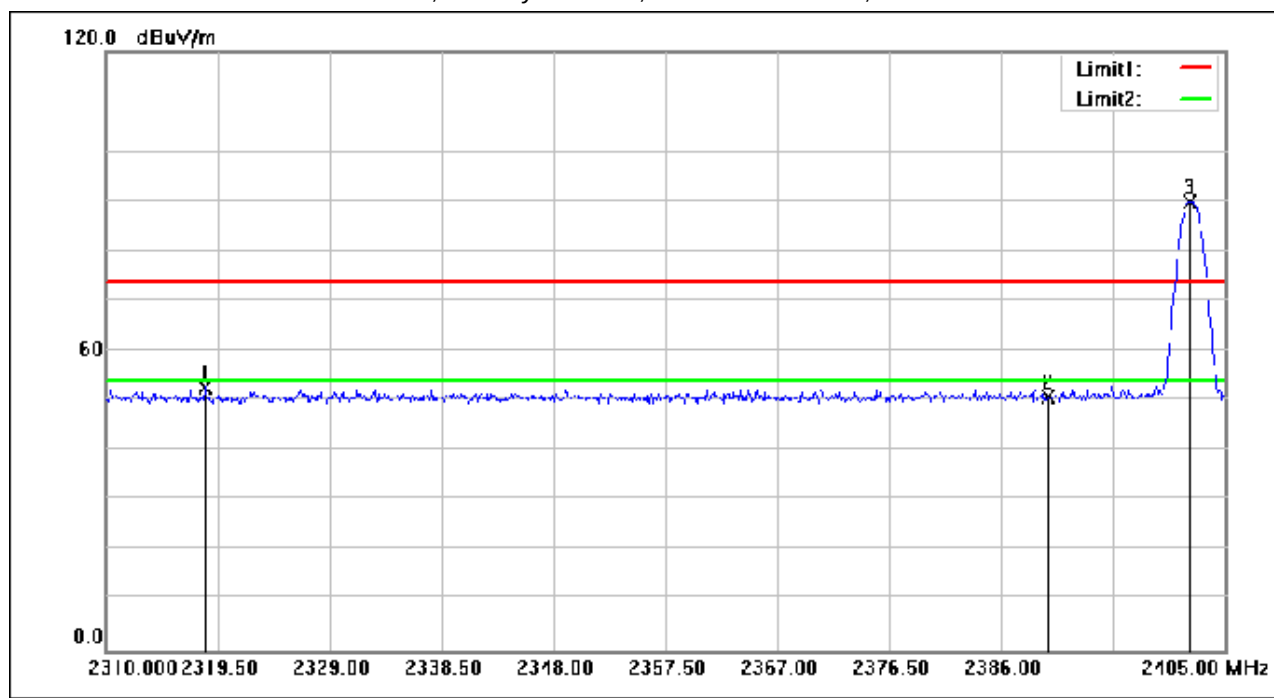
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 17 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2318.455	77.82	-25.02	52.80	74.00	-21.20	peak
2	2390.000	75.41	-24.71	50.70	74.00	-23.30	peak
3	2402.055	114.63	-24.65	89.98	74.00	15.98	peak

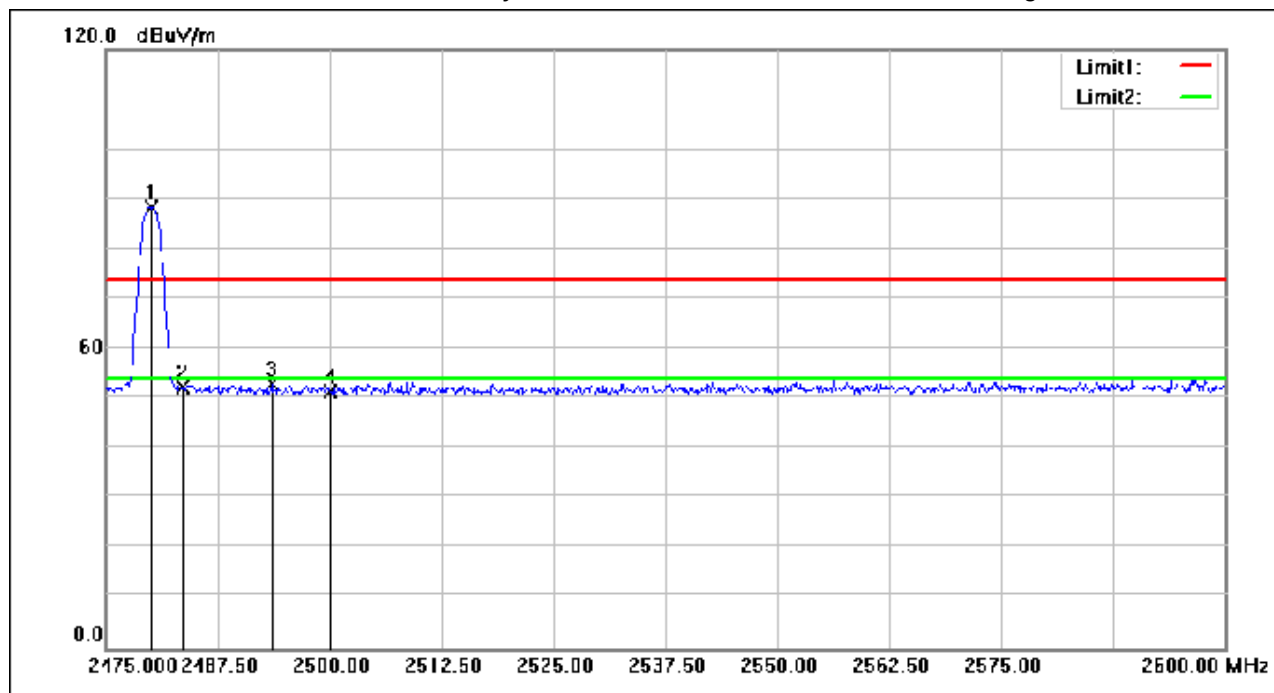
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 18 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	112.50	-24.28	88.22	74.00	14.22	peak
2	2483.500	76.71	-24.27	52.44	74.00	-21.56	peak
3	2493.500	77.27	-24.22	53.05	74.00	-20.95	peak
4	2500.000	75.57	-24.19	51.38	74.00	-22.62	peak

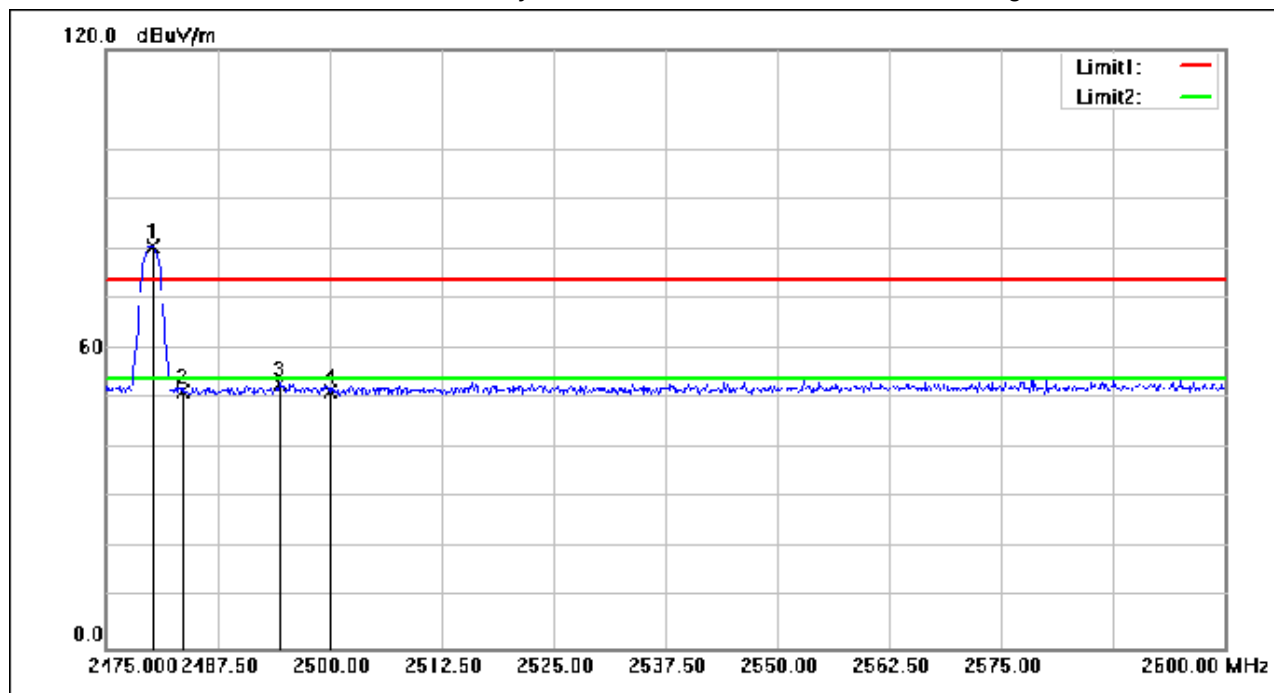
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 19 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.250	104.74	-24.28	80.46	74.00	6.46	peak
2	2483.500	75.63	-24.27	51.36	74.00	-22.64	peak
3	2494.375	77.31	-24.21	53.10	74.00	-20.90	peak
4	2500.000	75.61	-24.19	51.42	74.00	-22.58	peak

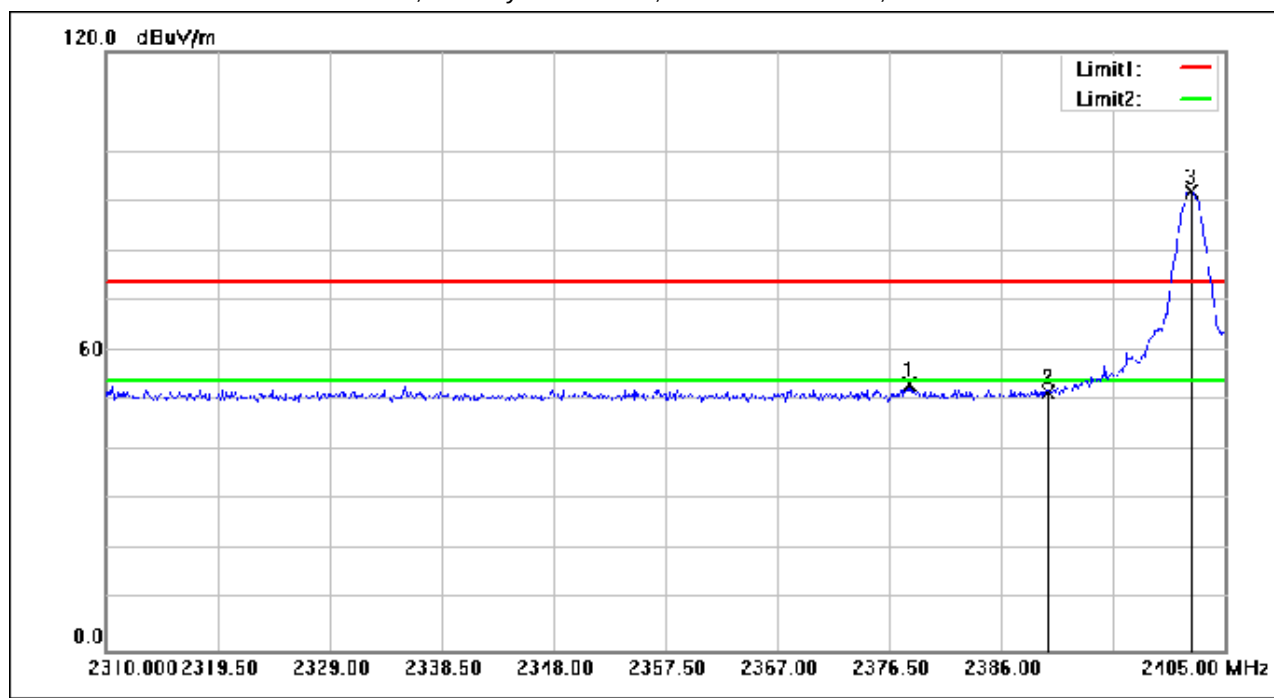
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 20 of 78

Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2378.210	78.10	-24.77	53.33	74.00	-20.67	peak
2	2390.000	76.49	-24.71	51.78	74.00	-22.22	peak
3	2402.150	116.70	-24.65	92.05	74.00	18.05	peak

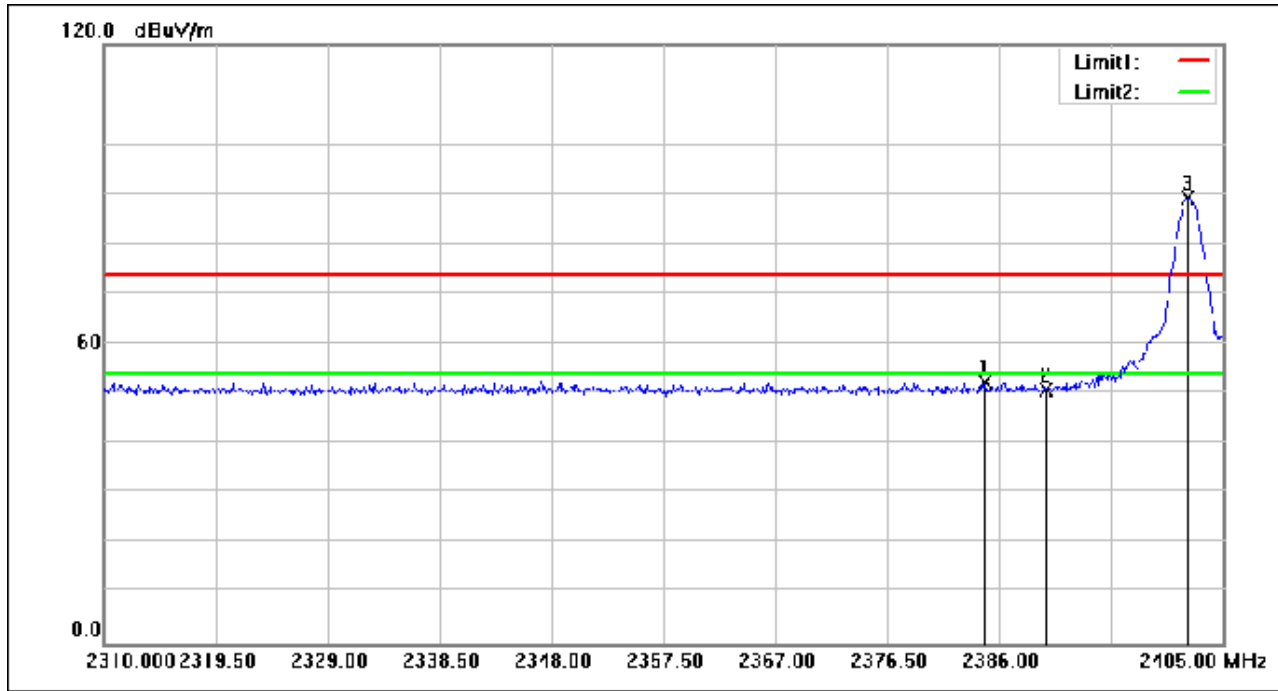
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 21 of 78

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2384.765	77.15	-24.73	52.42	74.00	-21.58	peak
2	2390.000	75.57	-24.71	50.86	74.00	-23.14	peak
3	2402.055	113.81	-24.65	89.16	74.00	15.16	peak

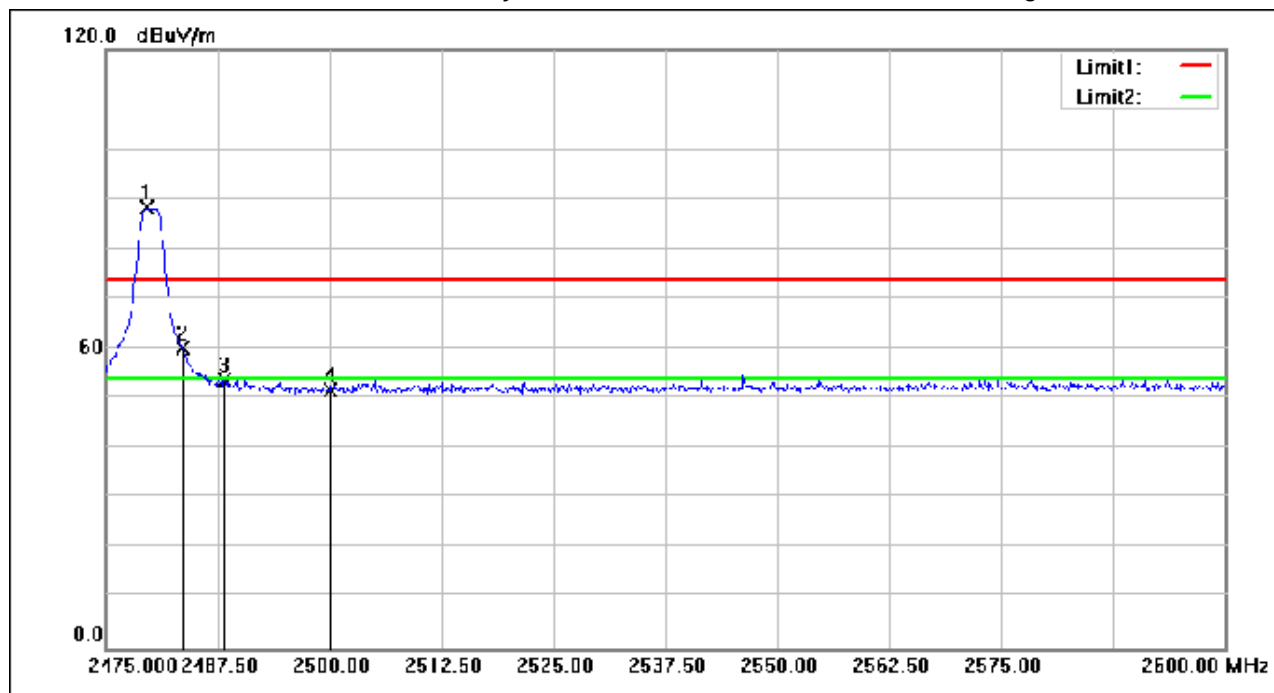
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 22 of 78

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.625	112.49	-24.28	88.21	74.00	14.21	peak
2	2483.500	84.30	-24.27	60.03	74.00	-13.97	peak
3	2488.250	78.22	-24.25	53.97	74.00	-20.03	peak
4	2500.000	75.83	-24.19	51.64	74.00	-22.36	peak

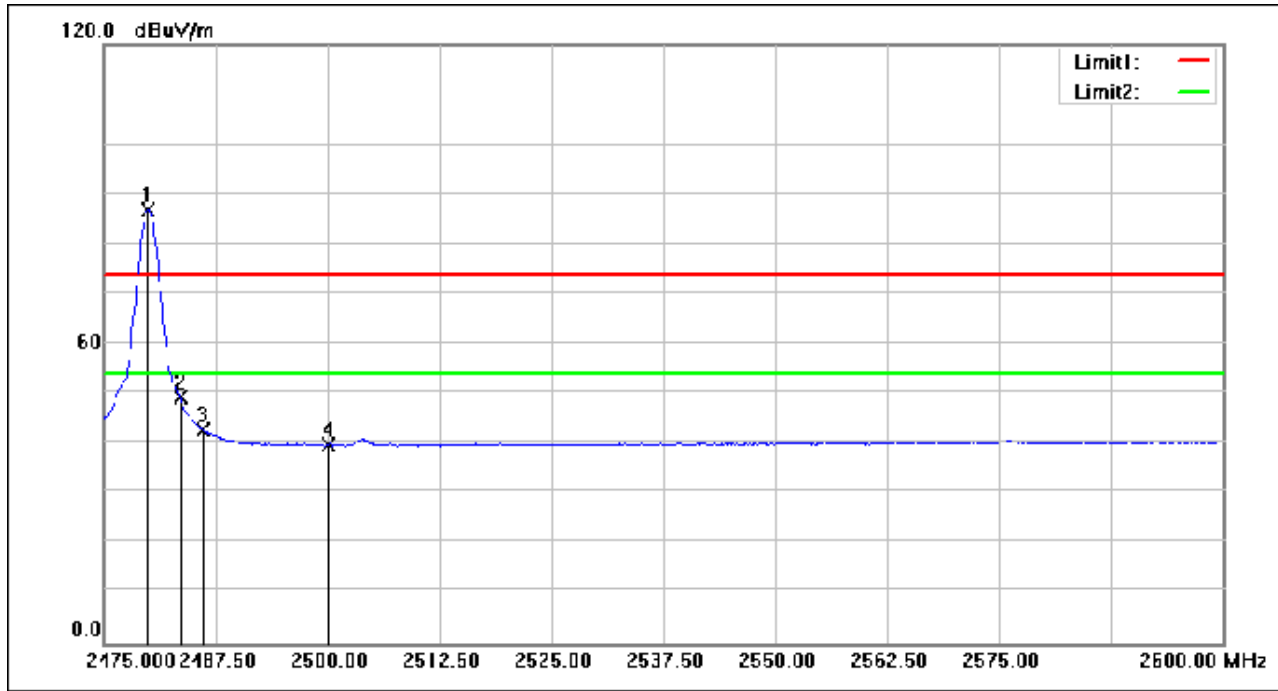
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 23 of 78

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.875	111.22	-24.28	86.94	54.00	32.94	AVG
2	2483.500	73.61	-24.27	49.34	54.00	-4.66	AVG
3	2486.125	66.88	-24.26	42.62	54.00	-11.38	AVG
4	2500.000	63.90	-24.19	39.71	54.00	-14.29	AVG

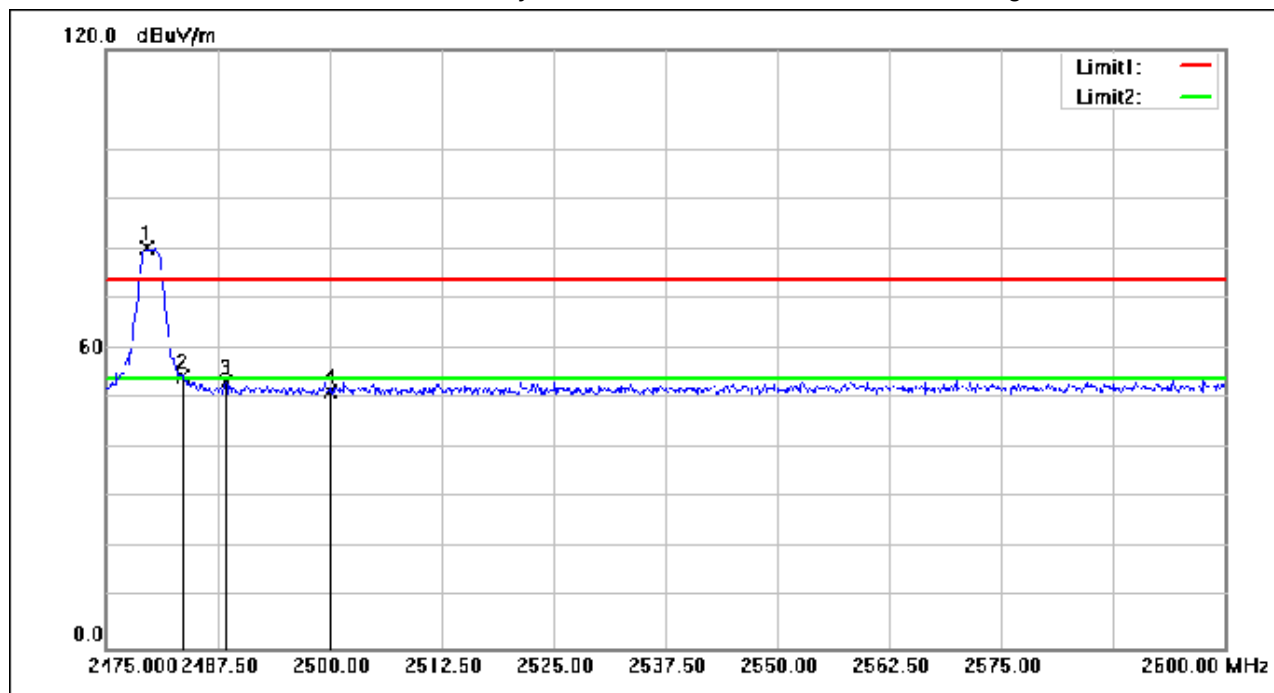
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 24 of 78

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.625	104.44	-24.28	80.16	74.00	6.16	peak
2	2483.500	78.87	-24.27	54.60	74.00	-19.40	peak
3	2488.375	77.41	-24.25	53.16	74.00	-20.84	peak
4	2500.000	75.70	-24.19	51.51	74.00	-22.49	peak

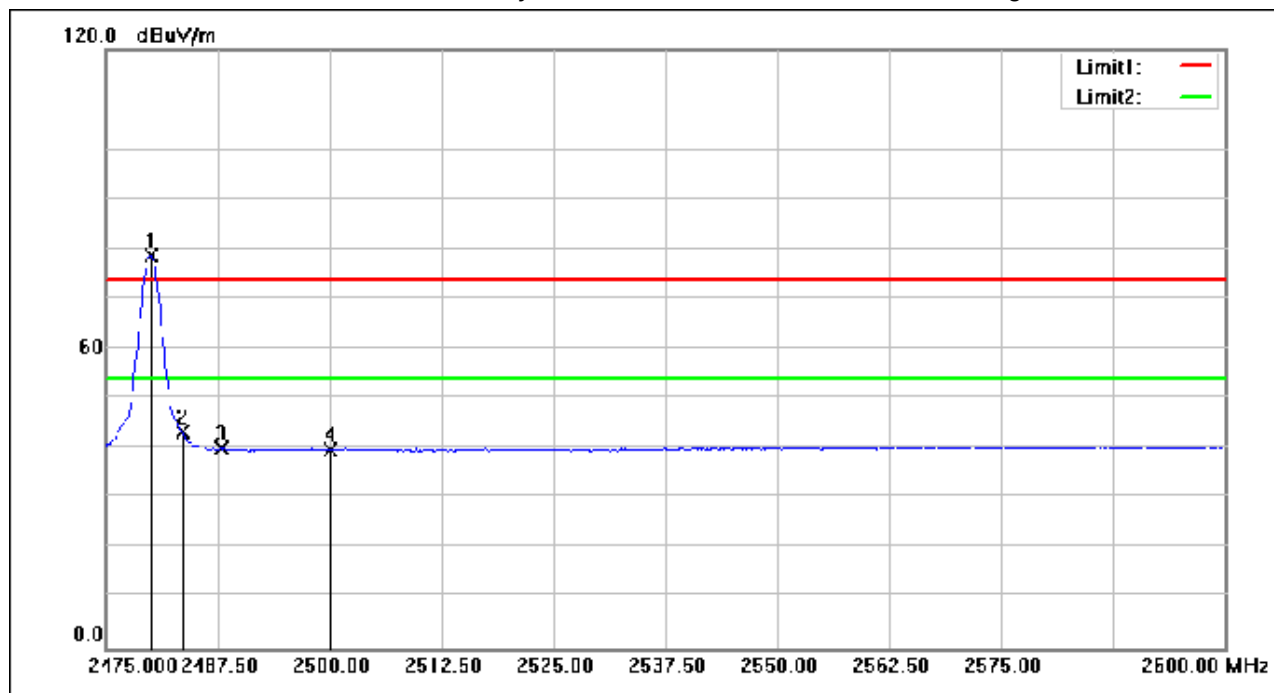
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 25 of 78

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	103.02	-24.28	78.74	54.00	24.74	AVG
2	2483.500	67.56	-24.27	43.29	54.00	-10.71	AVG
3	2487.875	64.28	-24.25	40.03	54.00	-13.97	AVG
4	2500.000	63.92	-24.19	39.73	54.00	-14.27	AVG

7.3 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 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

7.3.1 E.U.T. Operation

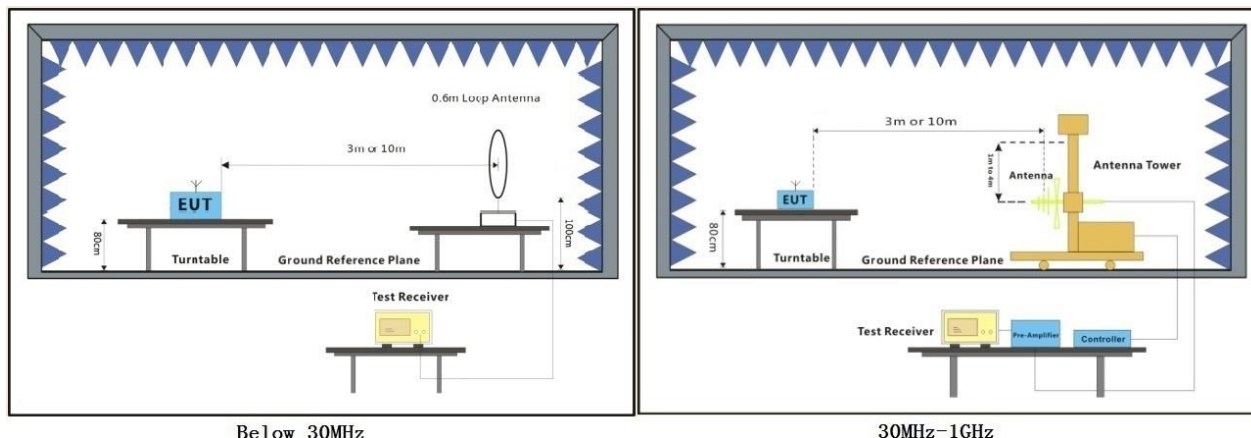
Operating Environment:

Temperature: °C Humidity: % RH Atmospheric Pressure: 1010 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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



7.3.4 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. $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamplifier Factor}$
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.

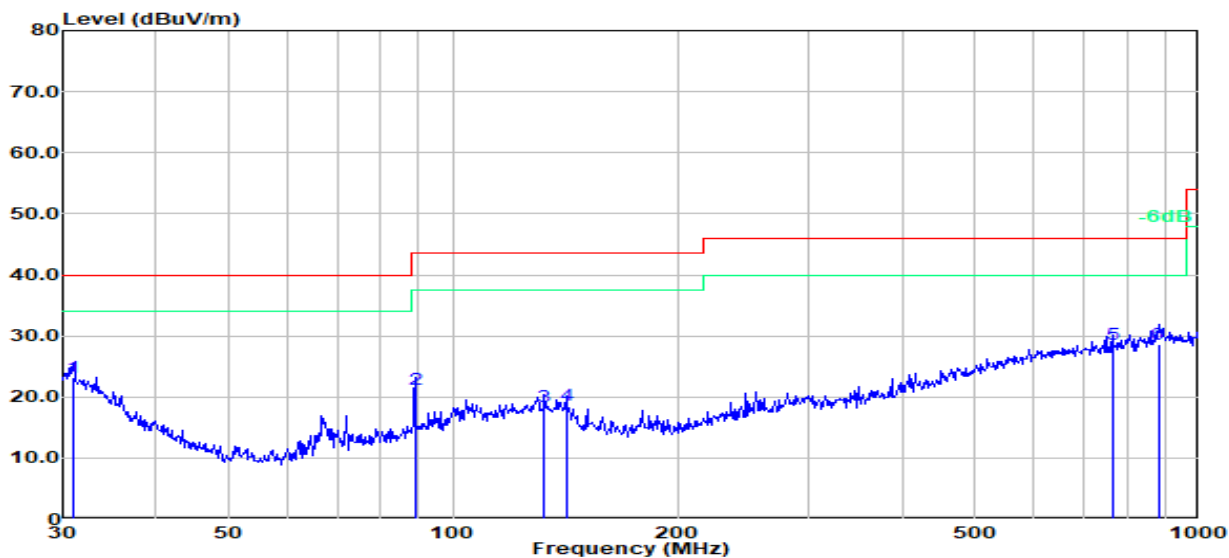
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 28 of 78

Test Mode: 00; Polarity: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	30.9619	4.51	18.66	23.17	40.00	-16.83	100	158	QP
2	88.9639	9.71	11.59	21.30	43.50	-22.20	100	27	QP
3	132.6850	4.21	14.31	18.52	43.50	-24.98	100	283	QP
4	141.8262	4.80	13.87	18.67	43.50	-24.83	200	347	QP
5	766.0573	4.43	24.26	28.69	46.00	-17.31	100	206	QP
6	881.4067	3.03	25.58	28.61	46.00	-17.39	100	268	QP

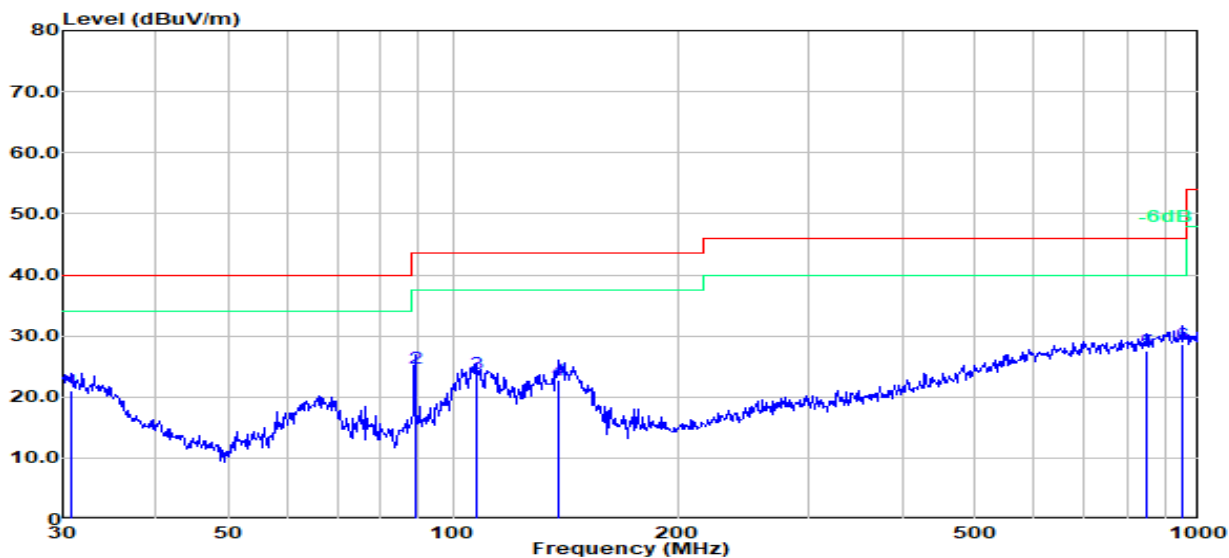
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 29 of 78

Test Mode: 00; Polarity: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	30.7450	2.20	18.83	21.03	40.00	-18.97	100	142	QP
2	88.9640	13.04	11.59	24.63	43.50	-18.87	100	360	QP
3	107.8880	10.07	13.77	23.84	43.50	-19.66	100	284	QP
4	138.8735	8.03	14.71	22.74	43.50	-20.76	200	46	QP
5	851.0353	2.50	25.01	27.51	46.00	-18.49	100	119	QP
6	952.0937	3.34	25.27	28.61	46.00	-17.39	100	239	QP

7.4 Radiated Spurious Emissions Above 1GHz

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

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

Measurement Distance: 3M

Limit:

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

7.4.1 E.U.T. Operation

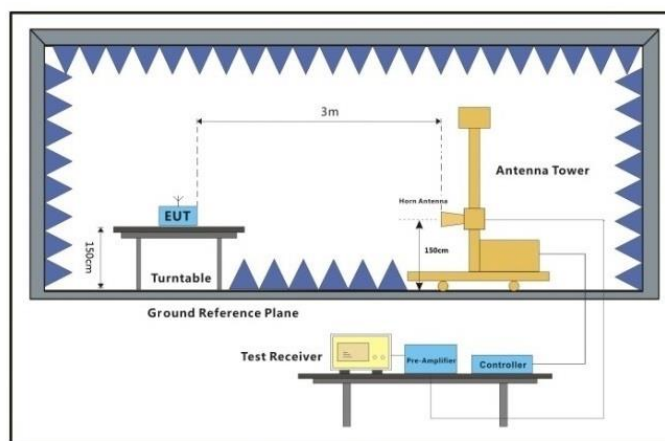
Operating Environment:

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

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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



Above 1GHz

7.4.4 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. $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamplifier Factor}$
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.

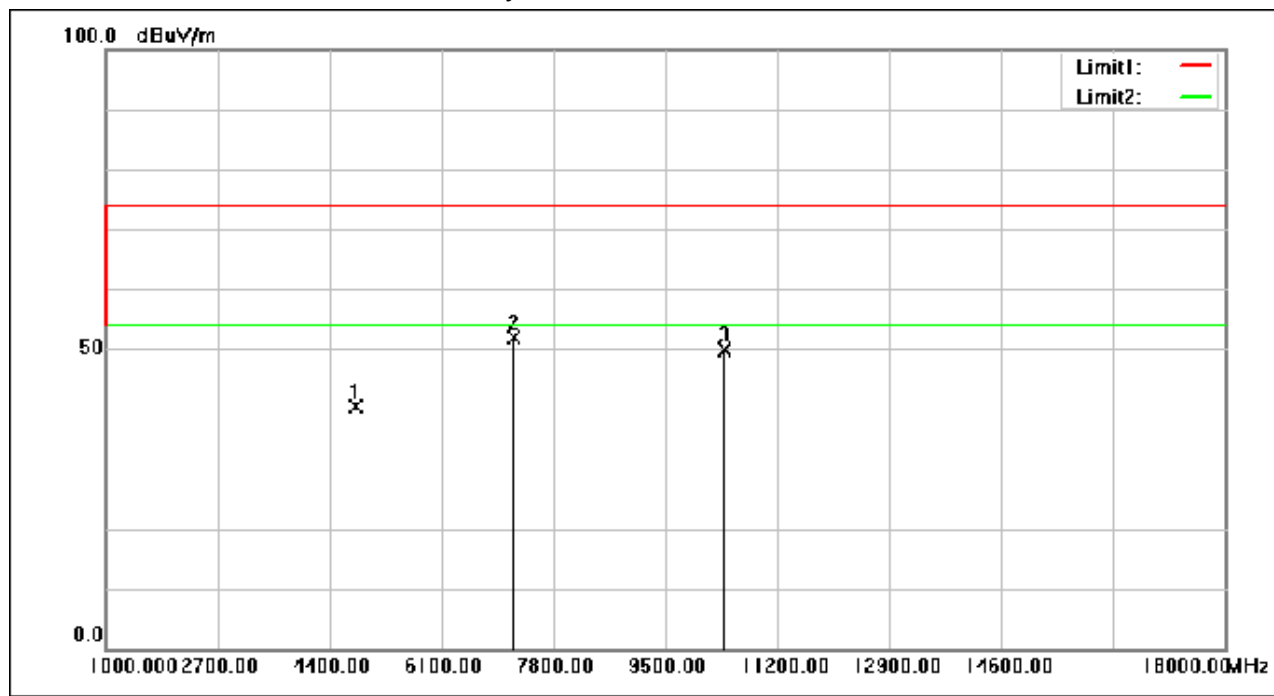
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 32 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	58.96	-18.56	40.40	74.00	-33.60	peak
2	7205.680	63.43	-11.47	51.96	74.00	-22.04	peak
3	10405.080	56.91	-7.10	49.81	74.00	-24.19	peak

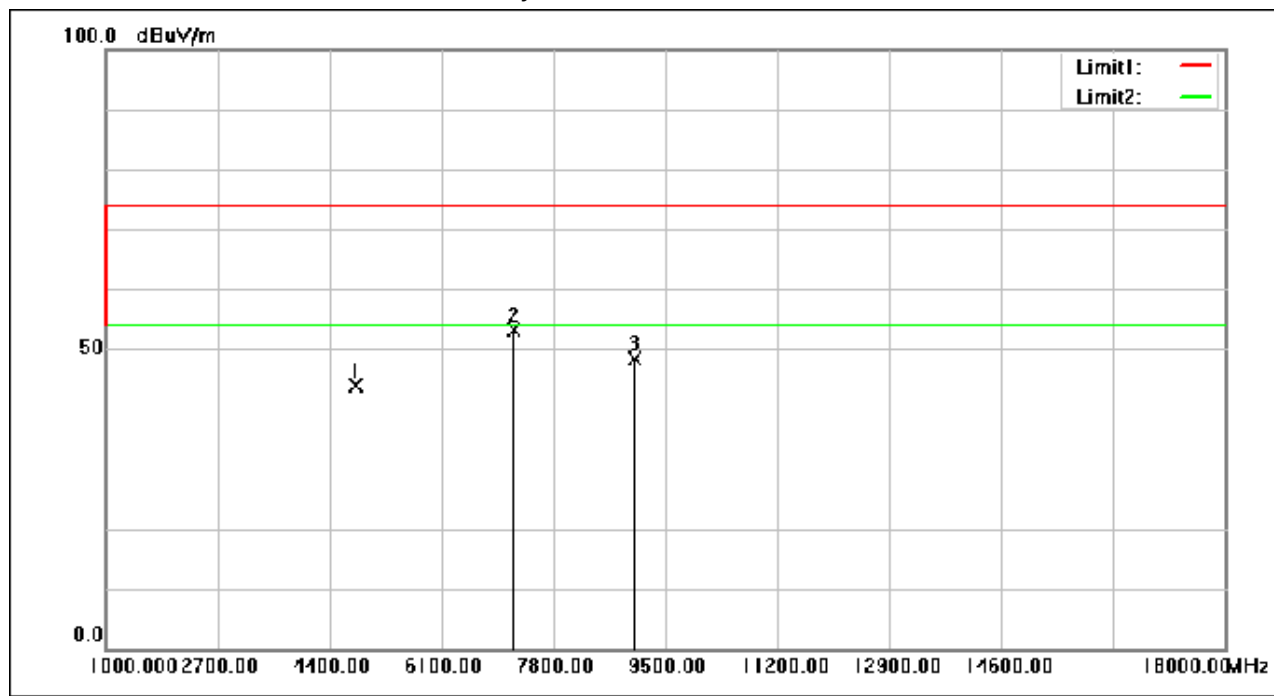
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 33 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	62.50	-18.56	43.94	74.00	-30.06	peak
2	7206.360	64.65	-11.47	53.18	74.00	-20.82	peak
3	9024.000	57.21	-8.85	48.36	74.00	-25.64	peak

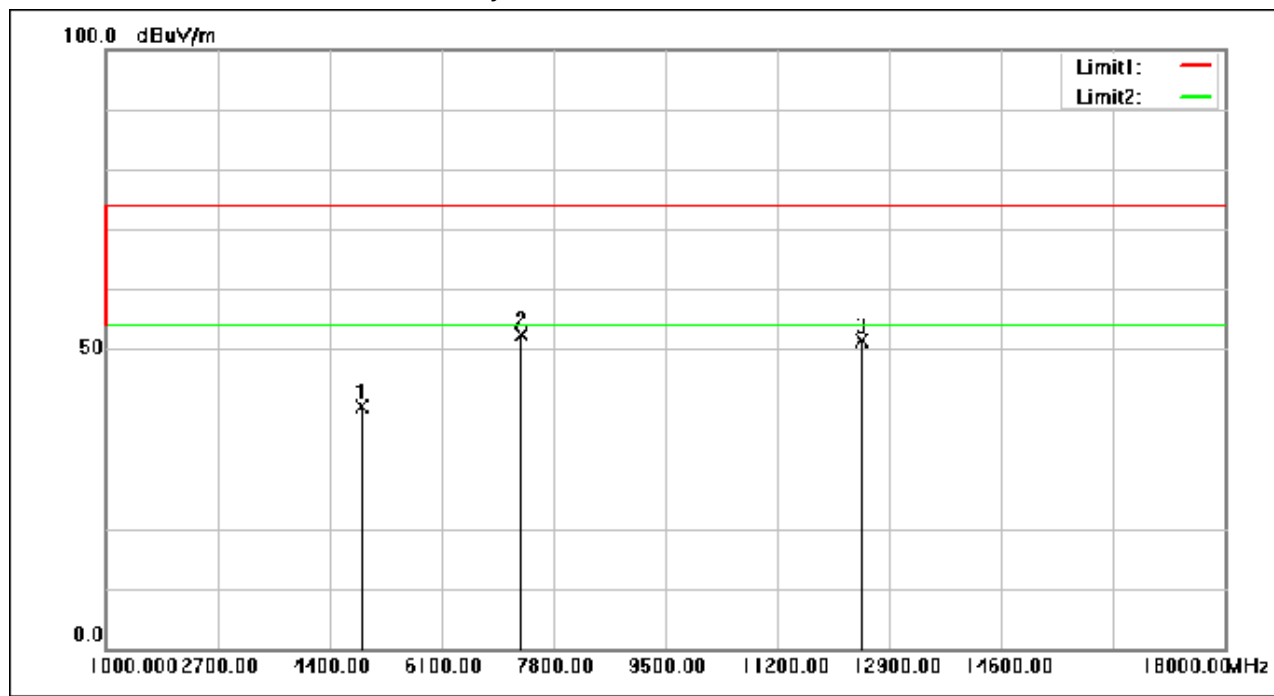
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 34 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.080	58.79	-18.52	40.27	74.00	-33.73	peak
2	7319.920	63.74	-11.42	52.32	74.00	-21.68	peak
3	12477.720	57.40	-6.11	51.29	74.00	-22.71	peak

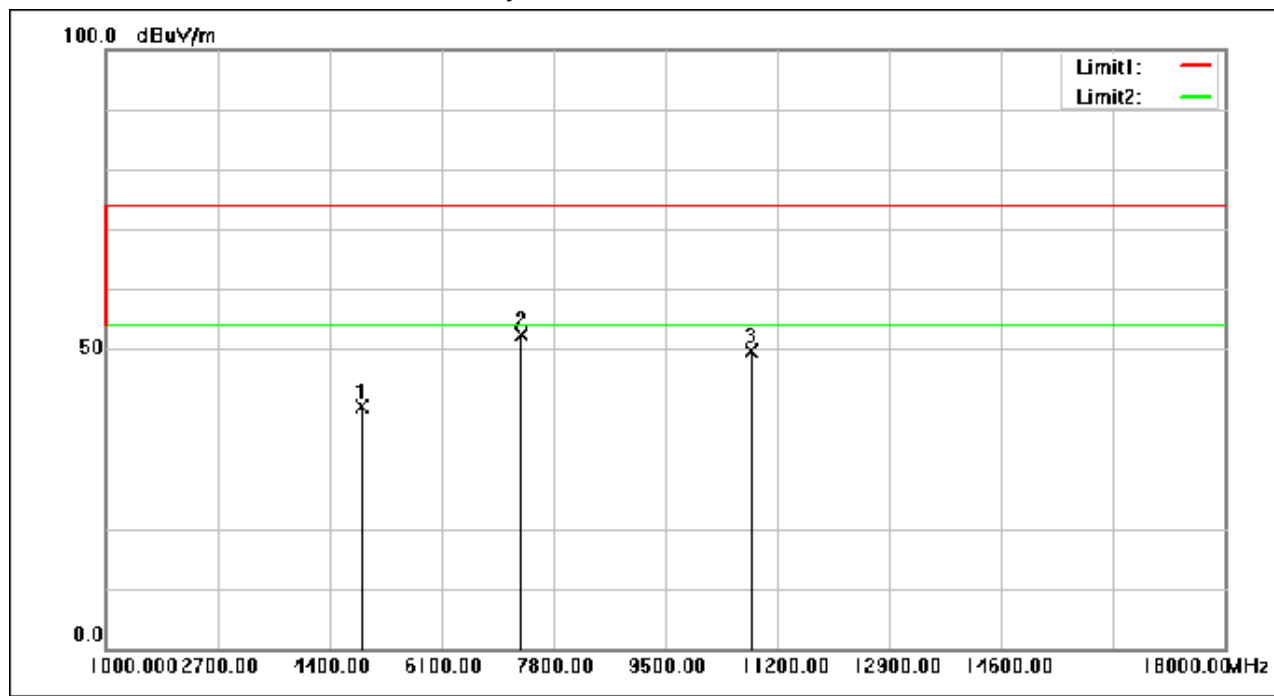
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 35 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.760	58.86	-18.52	40.34	74.00	-33.66	peak
2	7319.240	63.77	-11.42	52.35	74.00	-21.65	peak
3	10805.600	56.48	-6.87	49.61	74.00	-24.39	peak

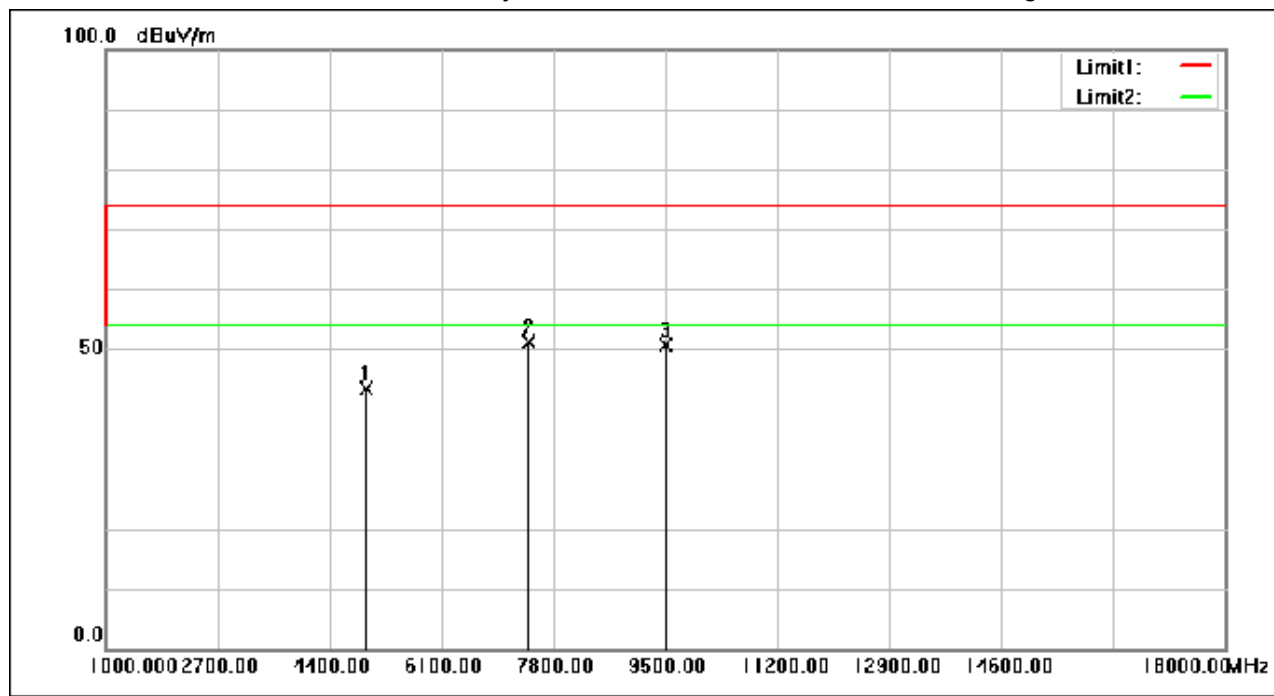
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 36 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.320	61.90	-18.47	43.43	74.00	-30.57	peak
2	7439.600	62.44	-11.34	51.10	74.00	-22.90	peak
3	9508.840	58.61	-7.94	50.67	74.00	-23.33	peak

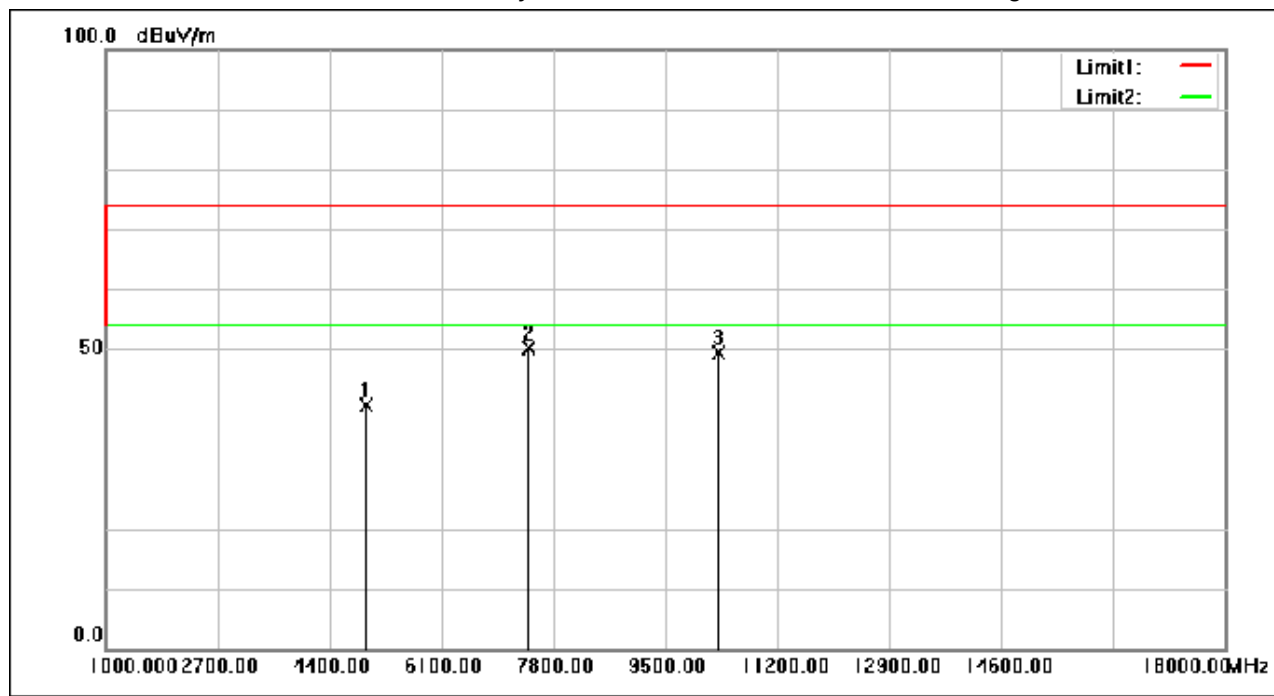
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 37 of 78

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



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.320	59.20	-18.47	40.73	74.00	-33.27	peak
2	7440.280	61.45	-11.34	50.11	74.00	-23.89	peak
3	10311.920	56.43	-7.15	49.28	74.00	-24.72	peak

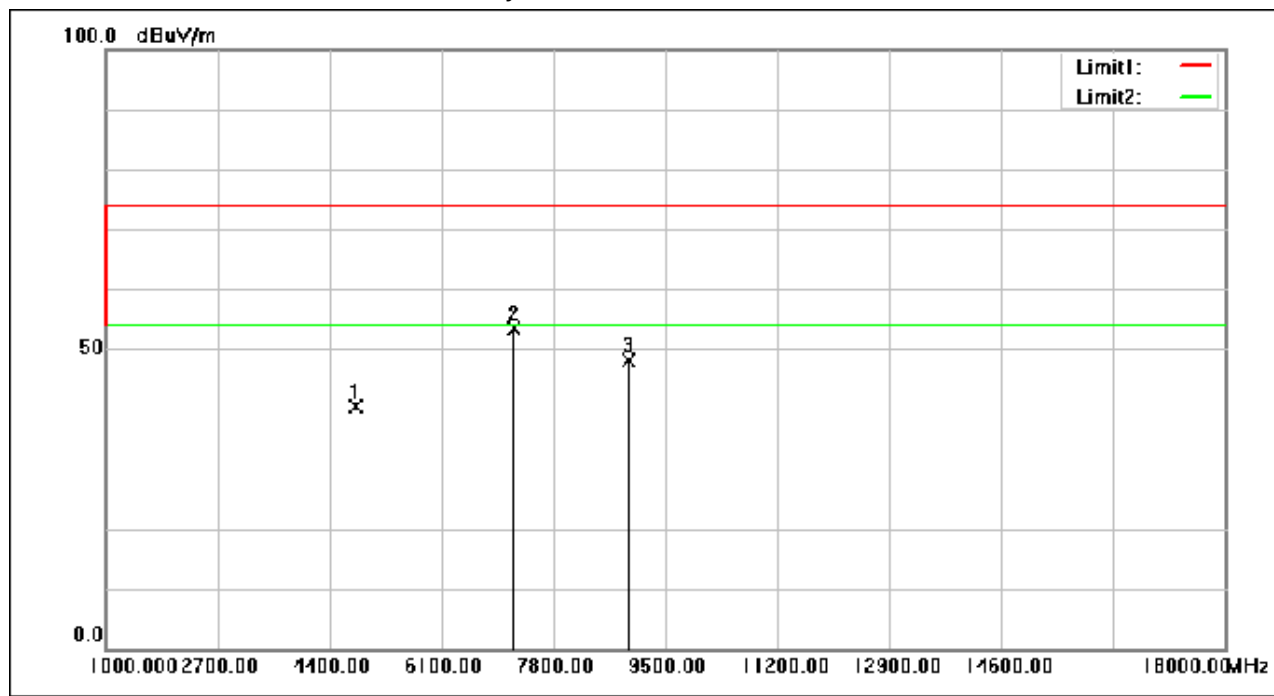
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 38 of 78

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	58.90	-18.56	40.34	74.00	-33.66	peak
2	7206.360	64.77	-11.47	53.30	74.00	-20.70	peak
3	8955.320	57.03	-9.00	48.03	74.00	-25.97	peak

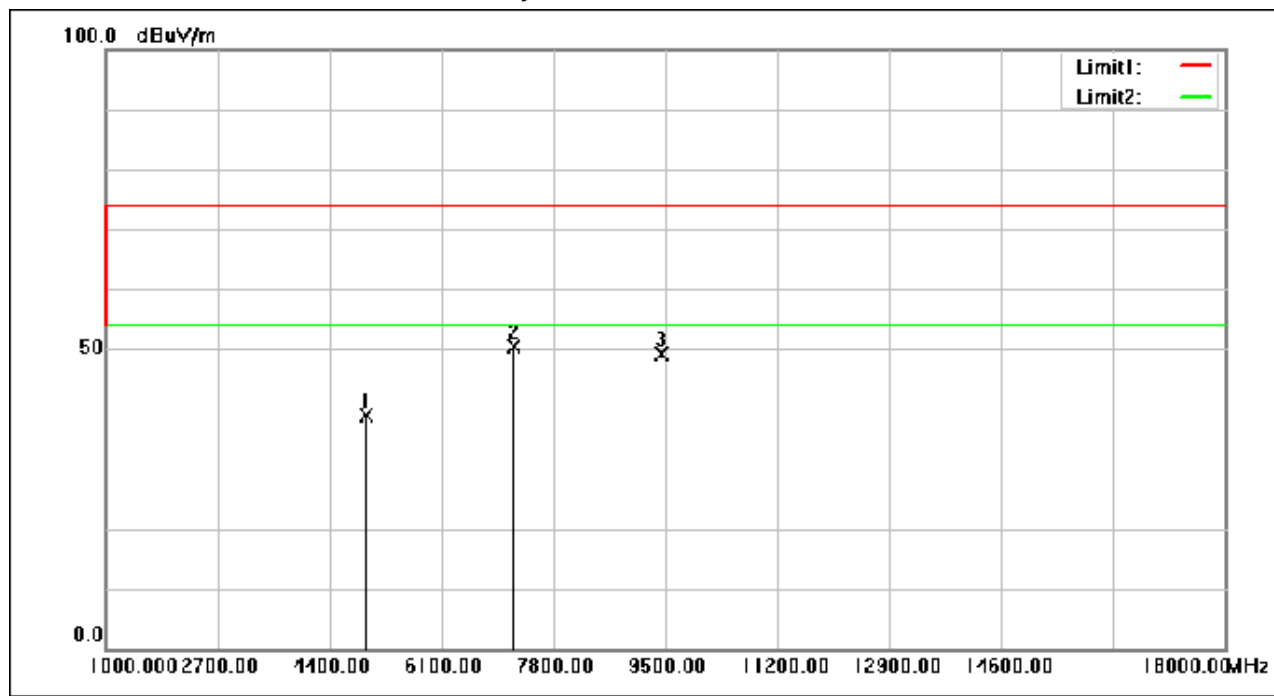
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 39 of 78

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4961.680	57.27	-18.47	38.80	74.00	-35.20	peak
2	7206.360	61.84	-11.47	50.37	74.00	-23.63	peak
3	9461.240	57.10	-8.03	49.07	74.00	-24.93	peak

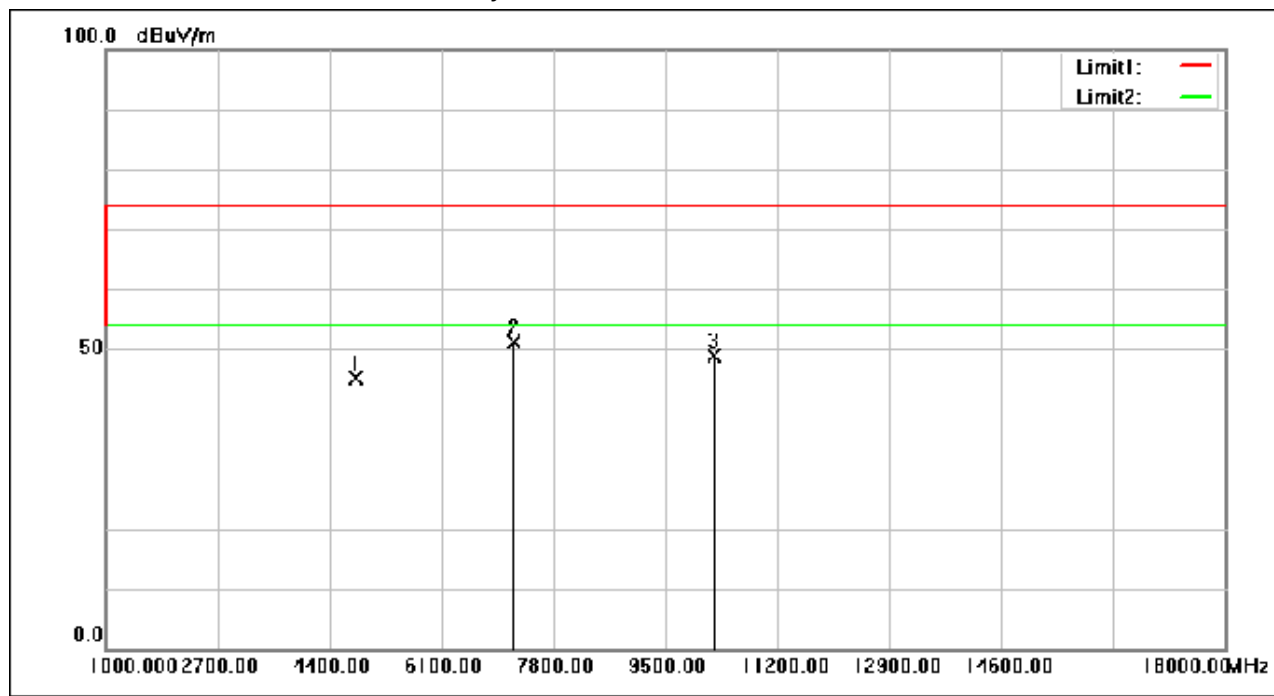
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 40 of 78

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	63.66	-18.56	45.10	74.00	-28.90	peak
2	7205.680	62.52	-11.47	51.05	74.00	-22.95	peak
3	10231.680	56.16	-7.20	48.96	74.00	-25.04	peak

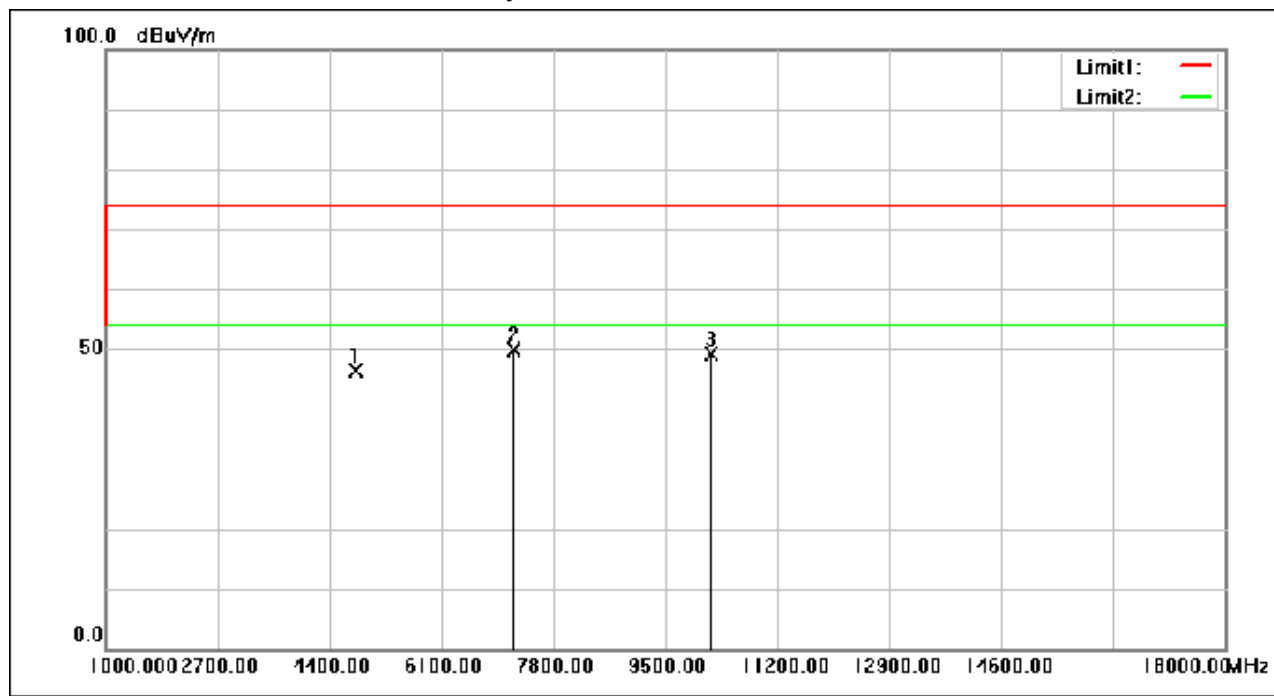
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 41 of 78

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	64.87	-18.56	46.31	74.00	-27.69	peak
2	7206.360	61.42	-11.47	49.95	74.00	-24.05	peak
3	10211.960	56.32	-7.20	49.12	74.00	-24.88	peak

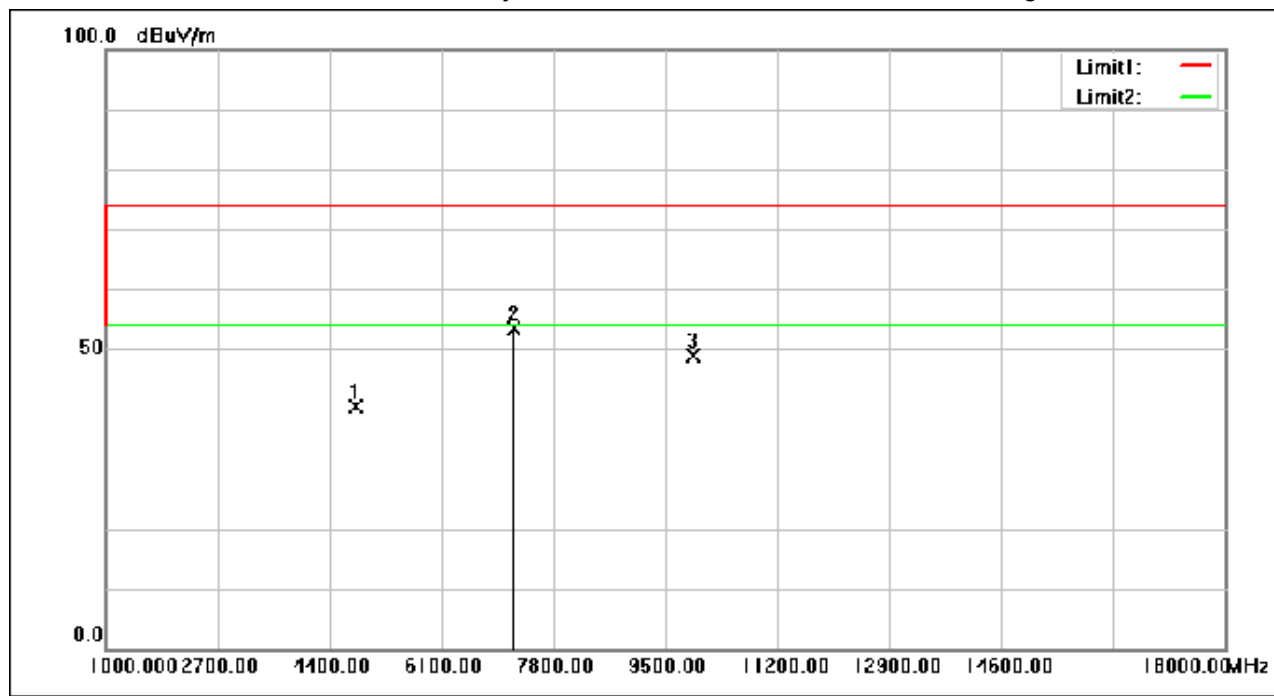
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 42 of 78

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	58.86	-18.56	40.30	74.00	-33.70	peak
2	7205.680	64.81	-11.47	53.34	74.00	-20.66	peak
3	9933.840	56.31	-7.31	49.00	74.00	-25.00	peak

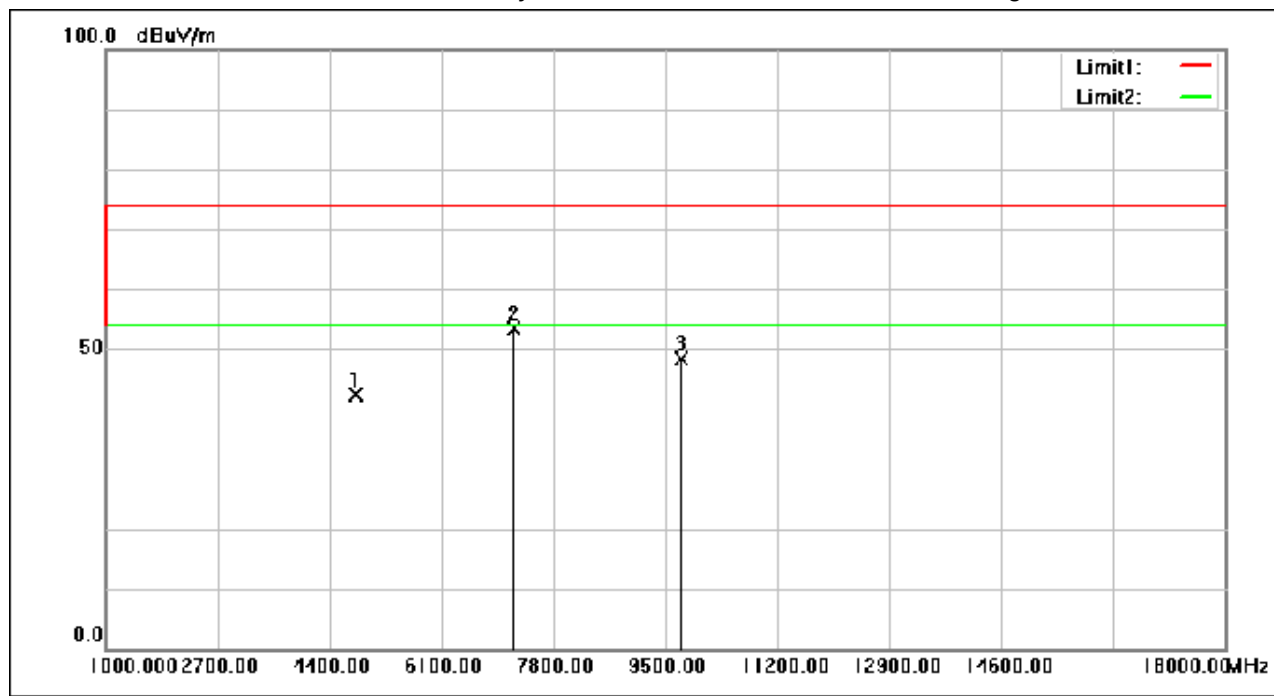
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 43 of 78

Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4803.920	61.05	-18.56	42.49	74.00	-31.51	peak
2	7205.680	64.75	-11.47	53.28	74.00	-20.72	peak
3	9750.920	55.84	-7.49	48.35	74.00	-25.65	peak

7.5 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 ≥ 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

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

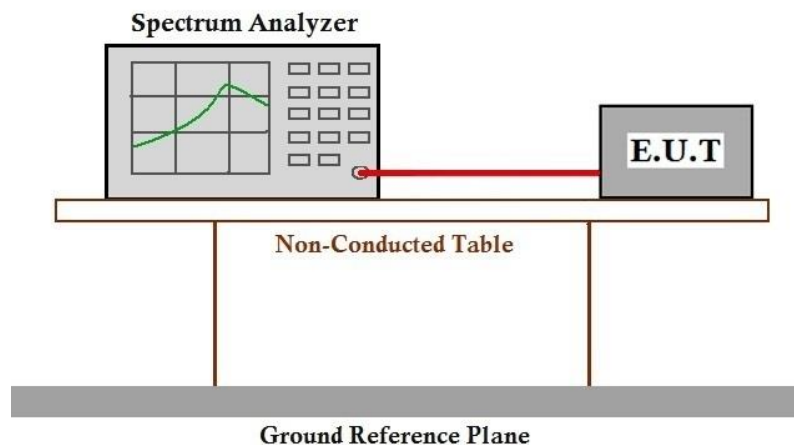
Humidity: 48.3 % RH

Atmospheric Pressure: 1010 mbar

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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.5.3 Test Setup Diagram





Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 45 of 78

7.5.4 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

7.6 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

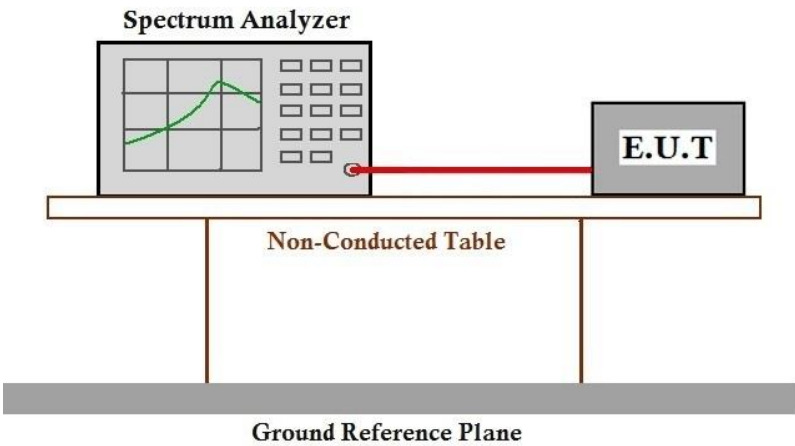
7.6.1 E.U.T. Operation

Operating Environment:
Temperature: 25.5 °C Humidity: 48.3 % RH Atmospheric Pressure: 1010 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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7 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

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

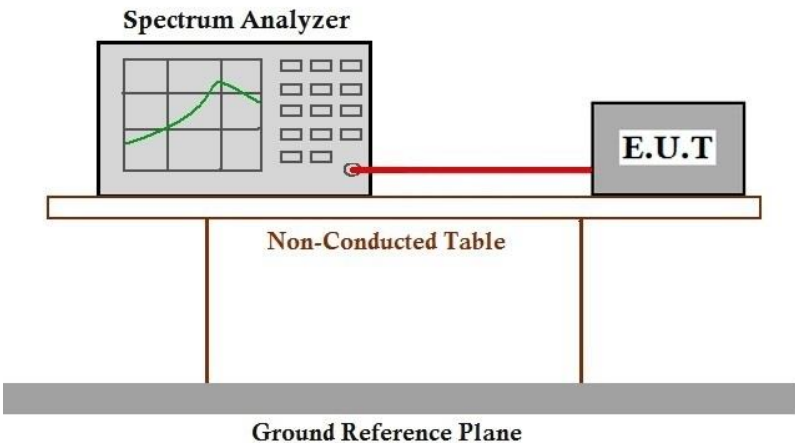
Humidity: 48.3 % RH

Atmospheric Pressure: 1010 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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8 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)).

7.8.1 E.U.T. Operation

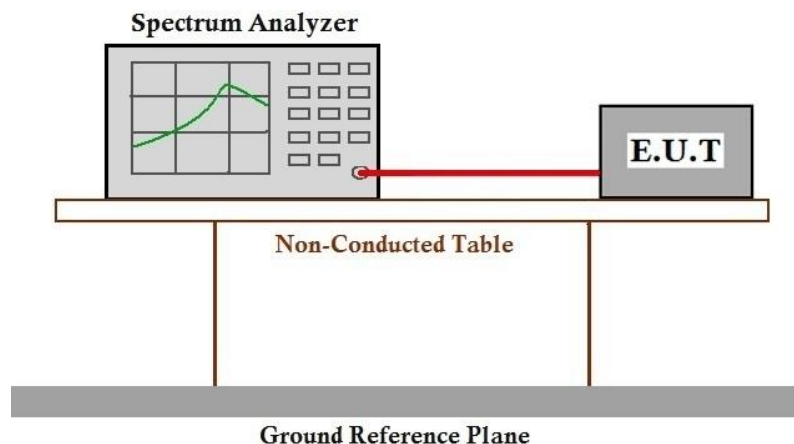
Operating Environment:

Temperature: 25.5 °C Humidity: 48.3 % RH Atmospheric Pressure: 1010 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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.9 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)).

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

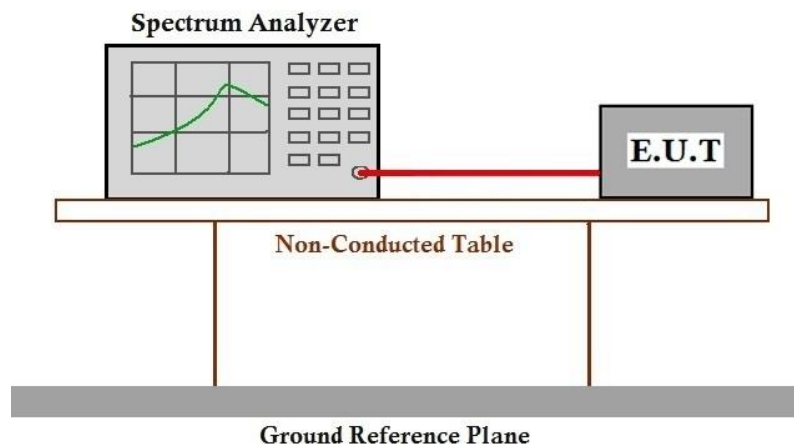
Humidity: 48.3 % RH

Atmospheric Pressure: 1010 mbar

7.9.2 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.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 50 of 78

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2406001151AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for KSCR2406001151AT

10 Appendix

1. Form731

1.1 Test Result

1.1.1 Form731

Lower Freq (MHz)	High Freq (MHz)	MAX Power (W)	MAX Power (dBm)
2402	2480	0.0028	4.45

1. Duty Cycle

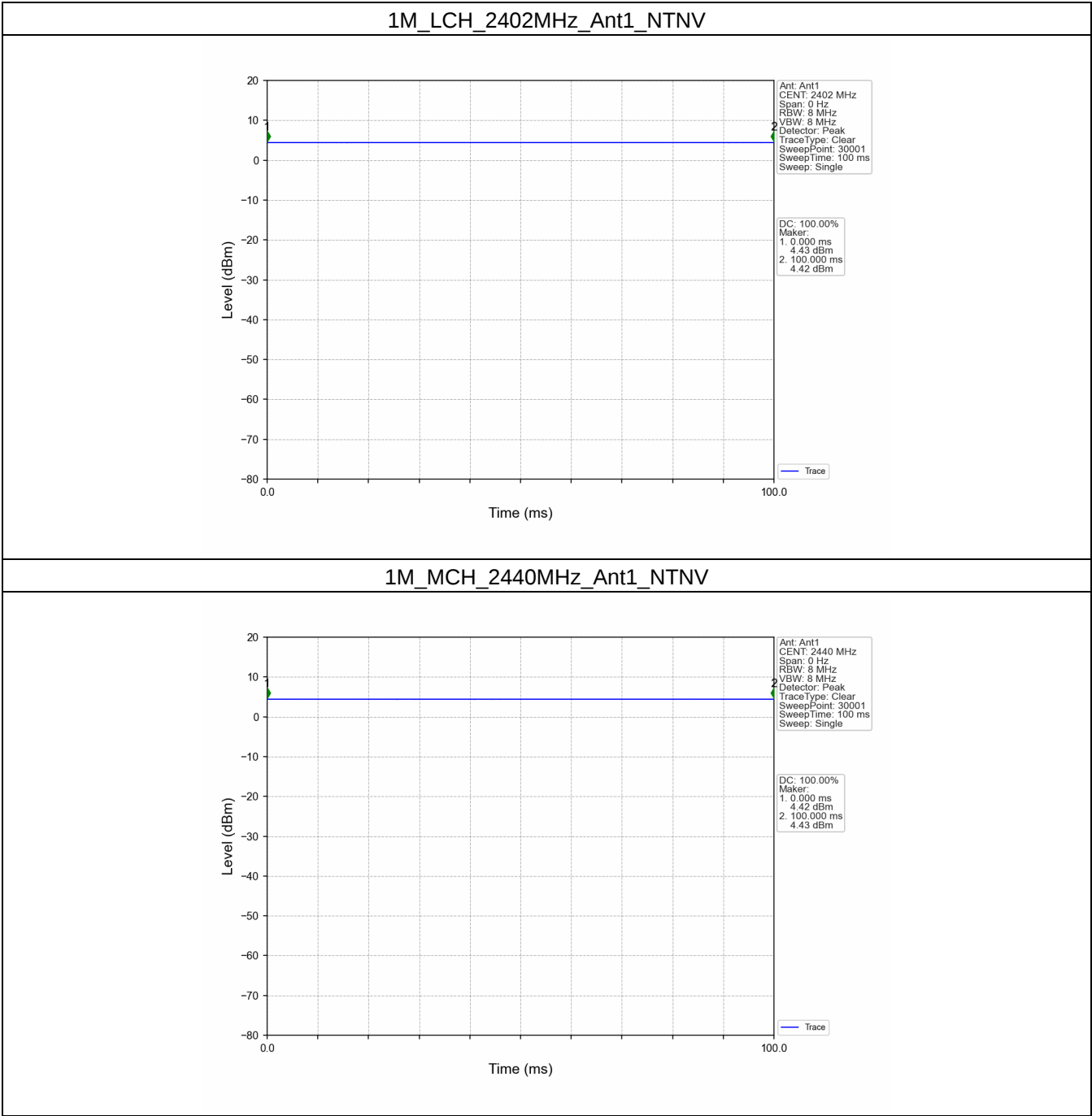
1.1 Test Result

1.1.1 Ant1

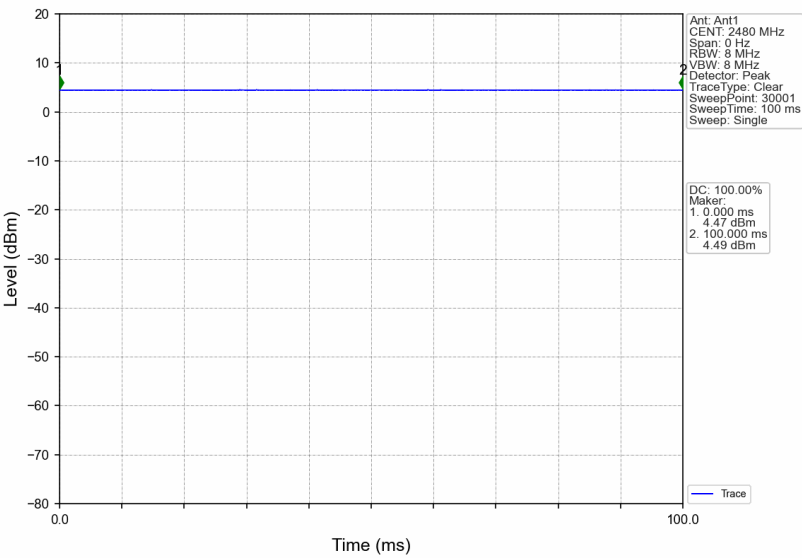
Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	100.000	100.000	100.00	0.00	0.00
		2440	100.000	100.000	100.00	0.00	0.00
		2480	100.000	100.000	100.00	0.00	0.00
2M	SISO	2402	100.000	100.000	100.00	0.00	0.00
		2440	100.000	100.000	100.00	0.00	0.00
		2480	100.000	100.000	100.00	0.00	0.00

1.2 Test Graph

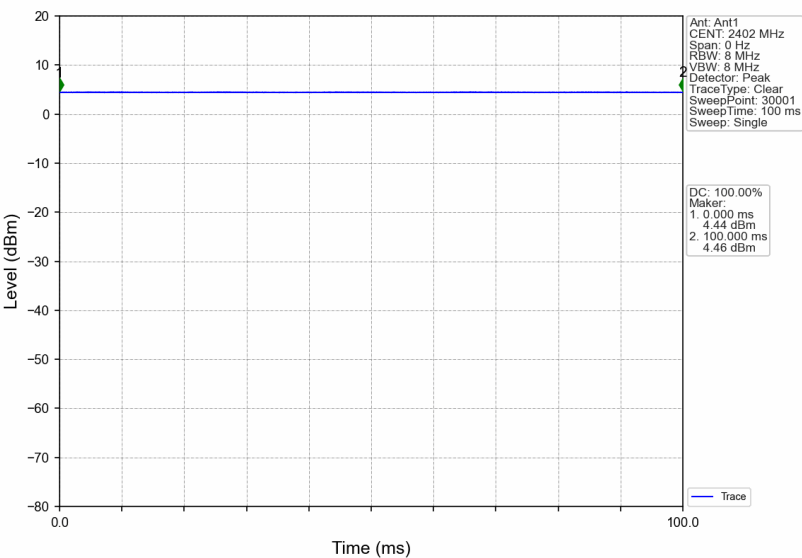
1.2.1 Ant1



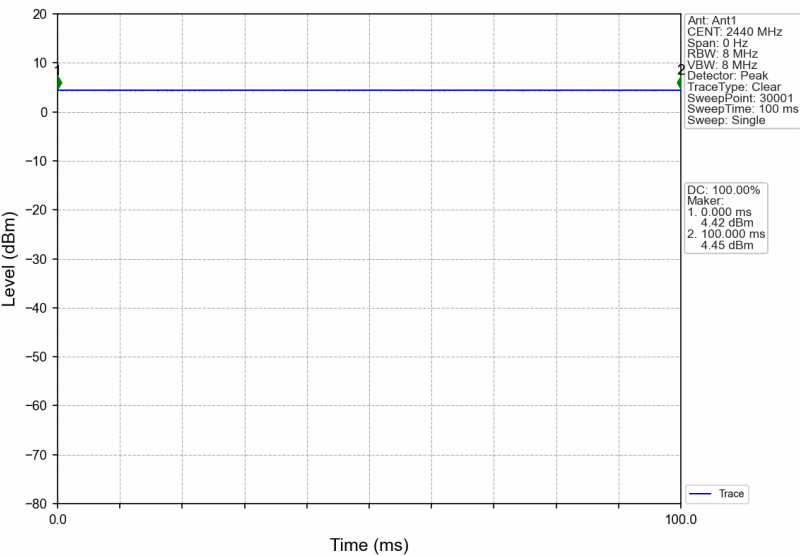
1M_HCH_2480MHz_Ant1_NTNV



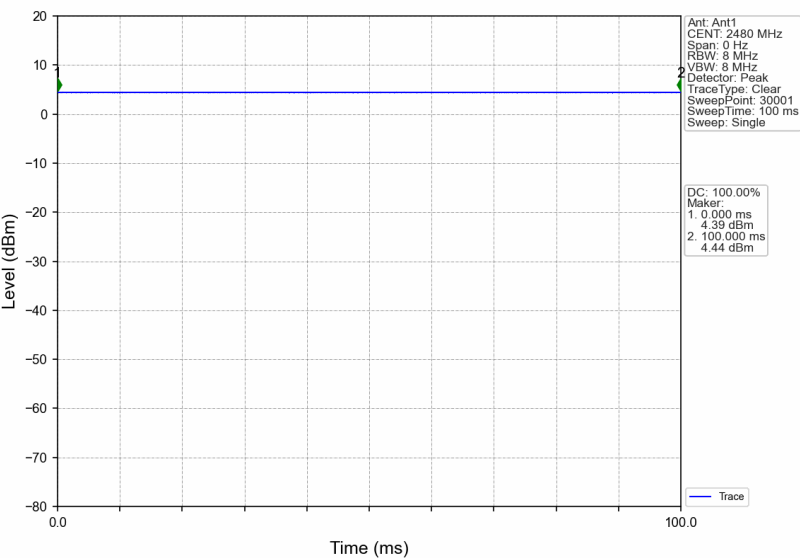
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

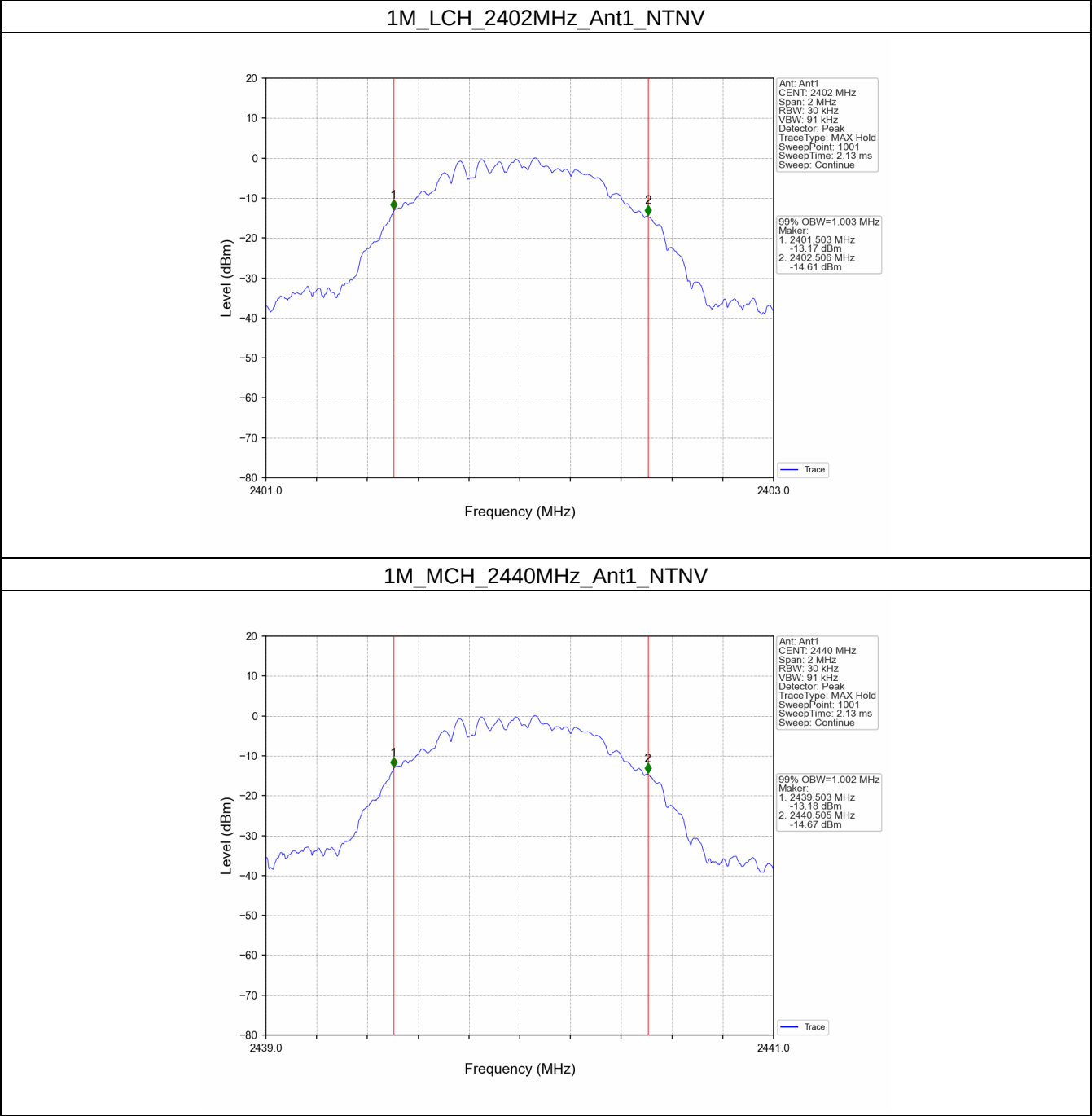
Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	1.003	/	Pass
		2440	1	1.002	/	Pass
		2480	1	1.015	/	Pass
2M	SISO	2402	1	2.055	/	Pass
		2440	1	2.101	/	Pass
		2480	1	2.139	/	Pass

2.1.2 6dB BW

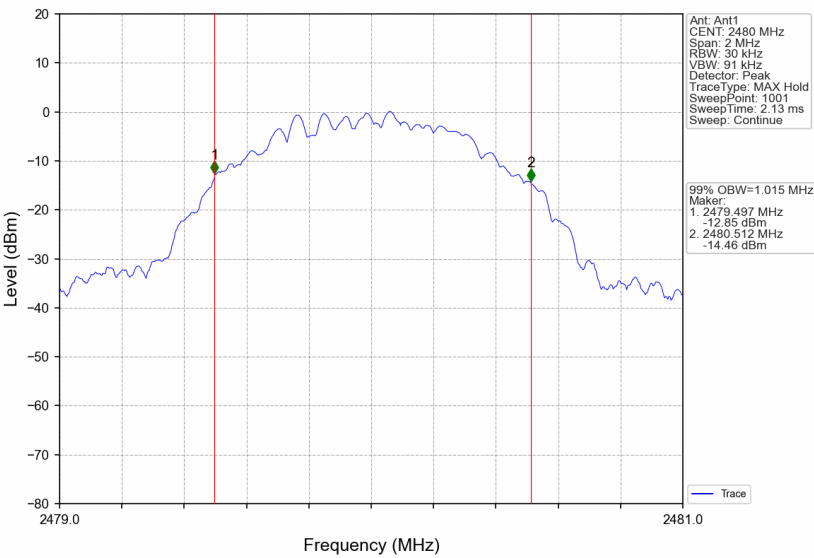
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.691	≥ 0.5	Pass
		2440	1	0.693	≥ 0.5	Pass
		2480	1	0.696	≥ 0.5	Pass
2M	SISO	2402	1	1.251	≥ 0.5	Pass
		2440	1	1.276	≥ 0.5	Pass
		2480	1	1.300	≥ 0.5	Pass

2.2 Test Graph

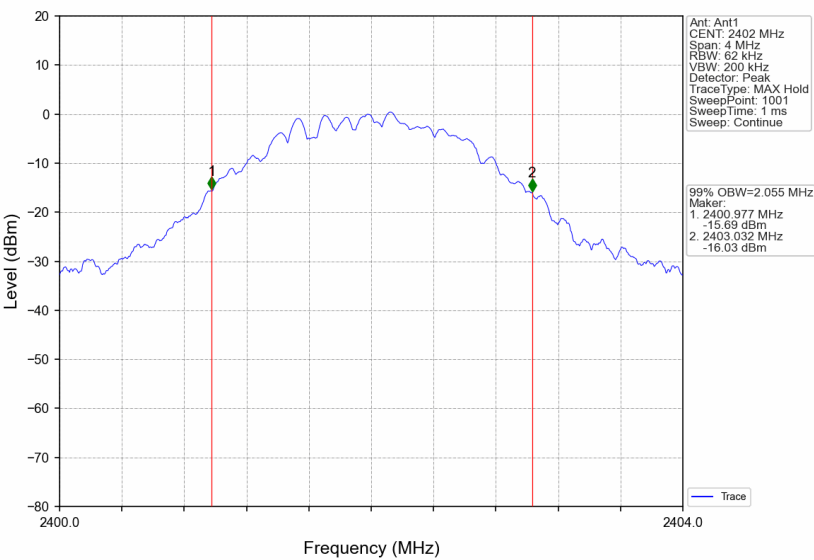
2.2.1 OBW



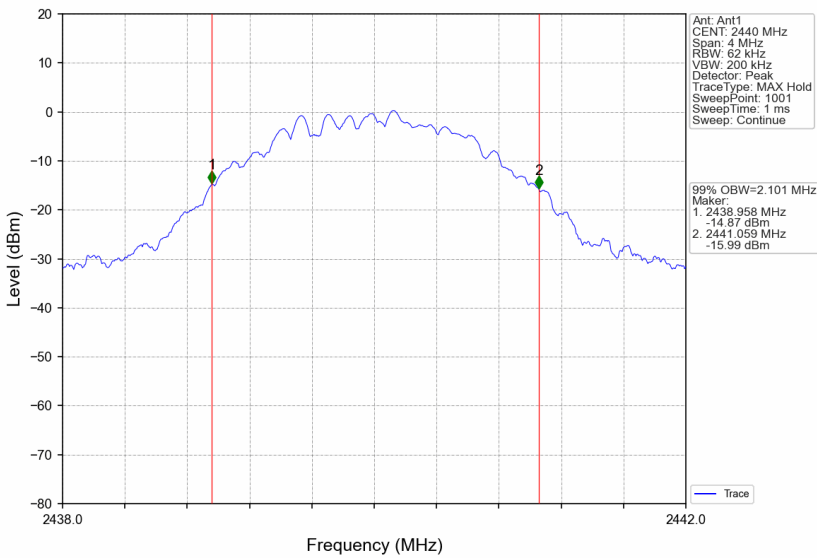
1M_HCH_2480MHz_Ant1_NTNV



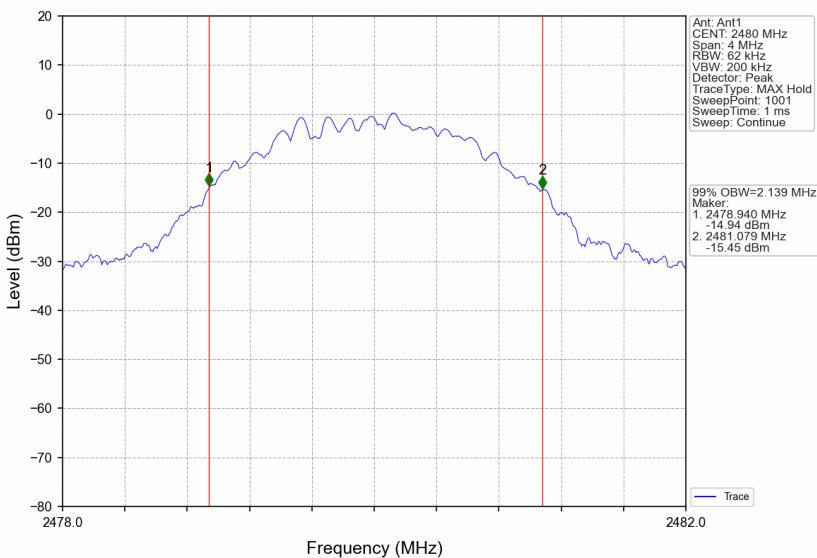
2M_LCH_2402MHz_Ant1_NTNV



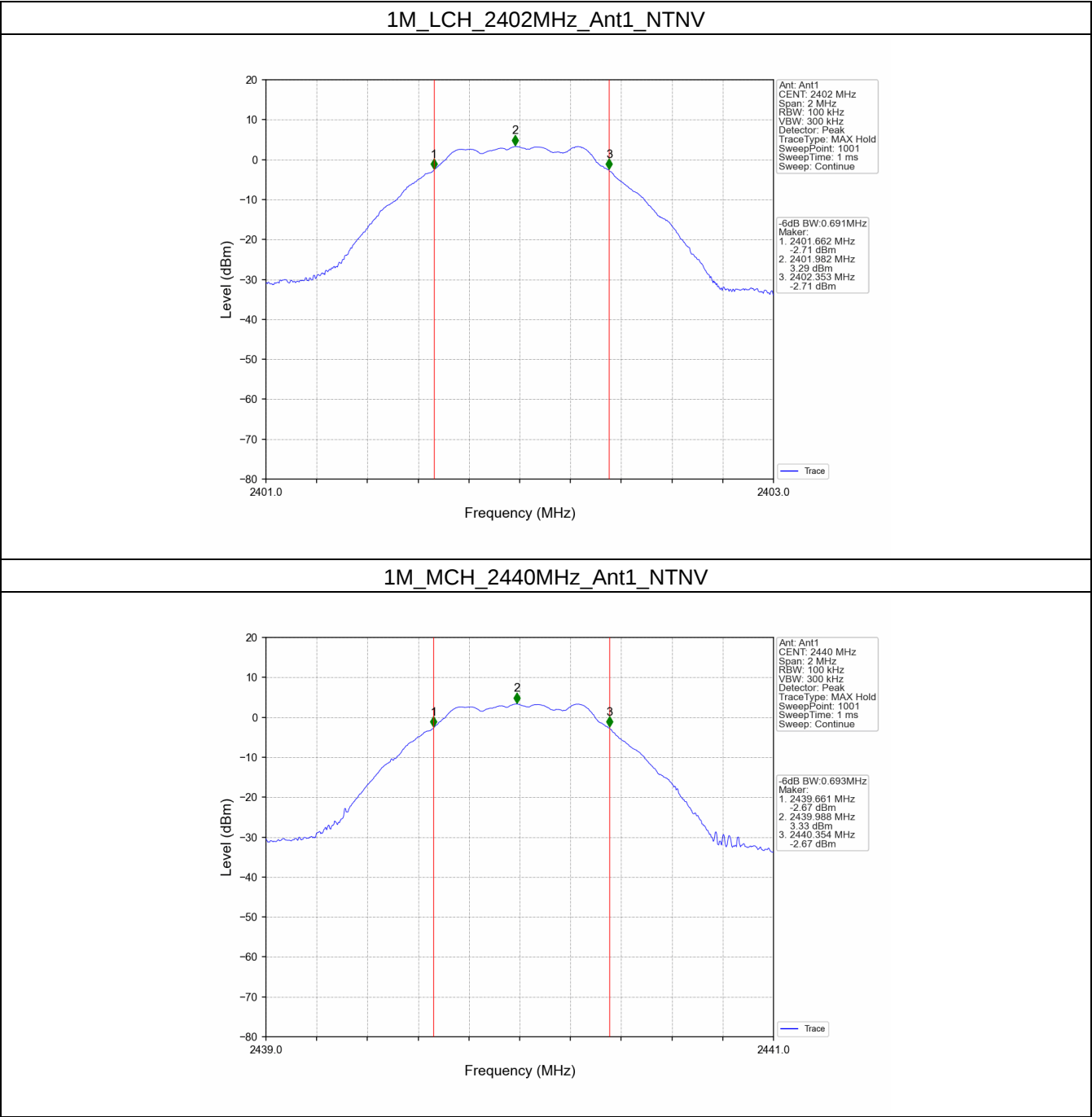
2M_MCH_2440MHz_Ant1_NTNV



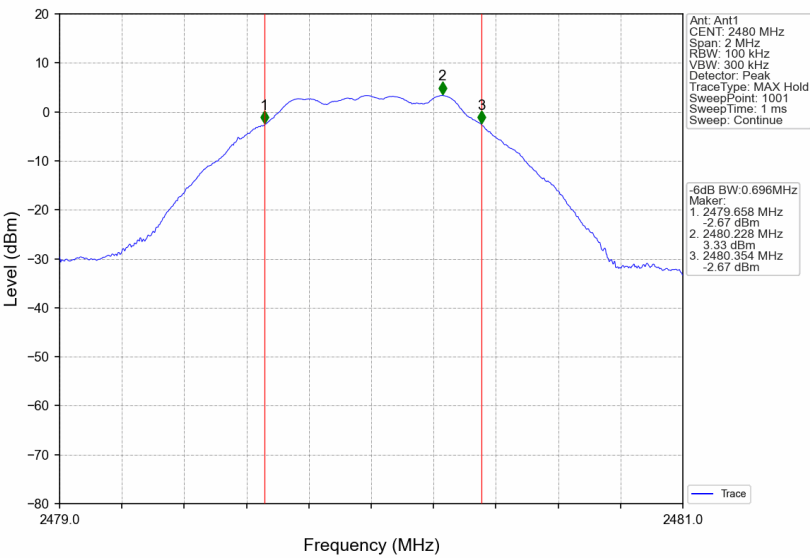
2M_HCH_2480MHz_Ant1_NTNV



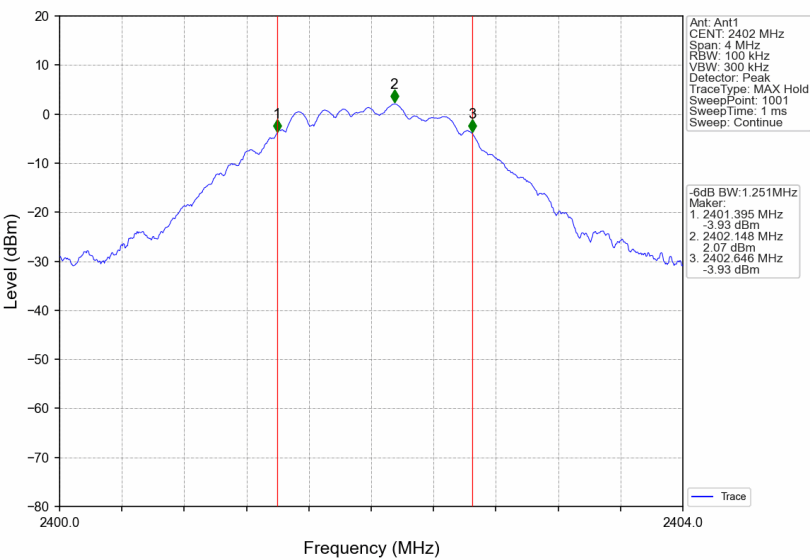
2.2.2 6dB BW



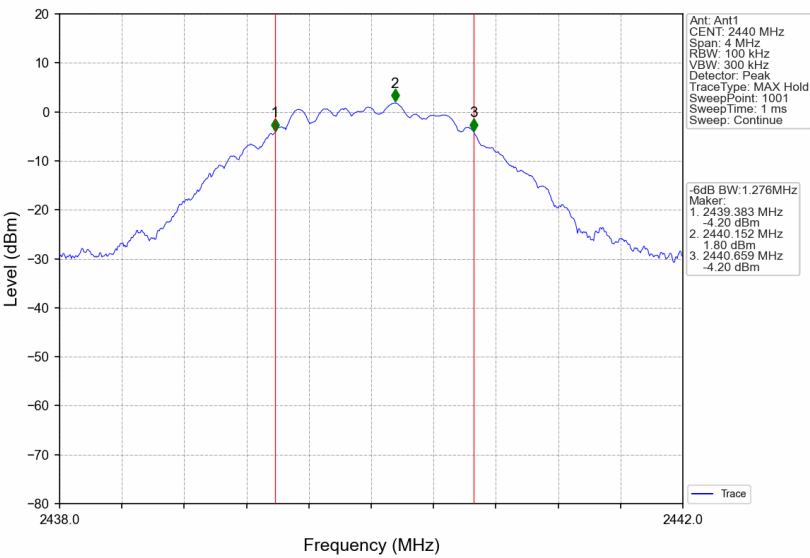
1M_HCH_2480MHz_Ant1_NTNV



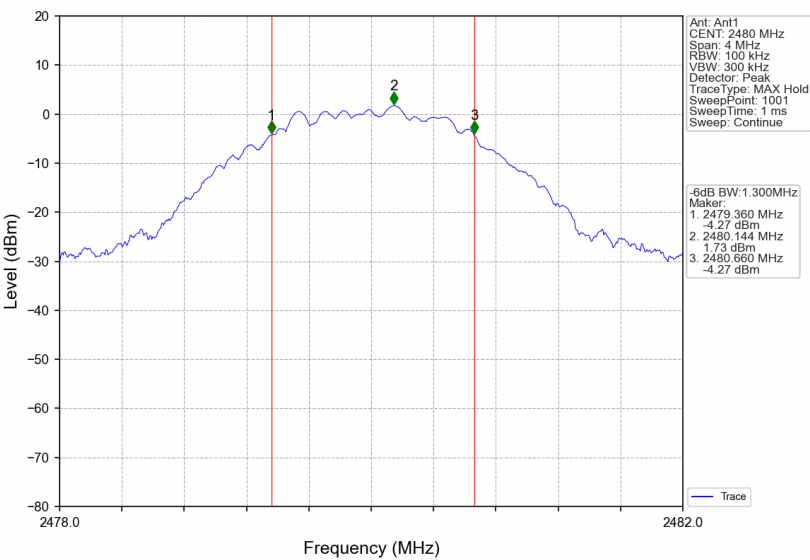
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV





Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 62 of 78

3. Maximum Conducted Output Power

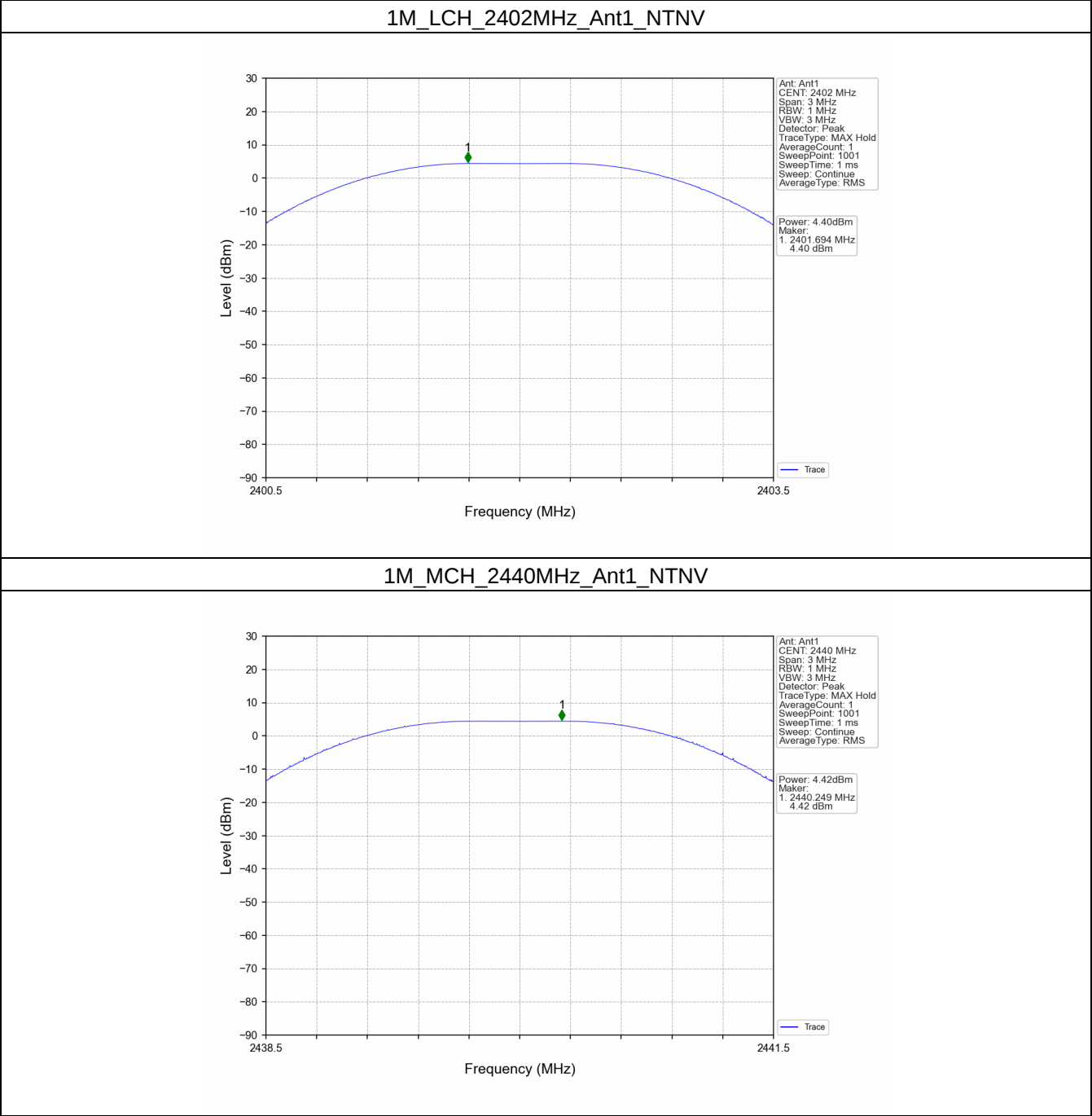
3.1 Test Result

3.1.1 Power

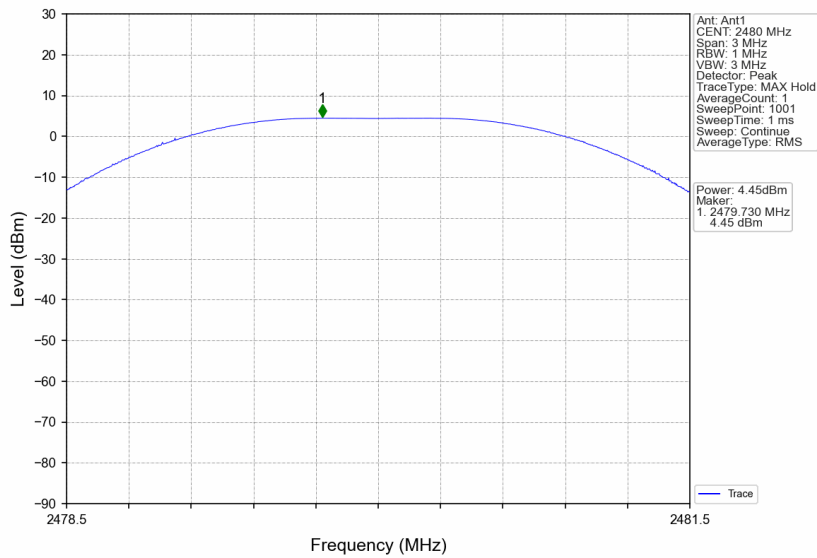
Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	4.40	<=30	Pass
		2440	4.42	<=30	Pass
		2480	4.45	<=30	Pass
2M	SISO	2402	4.33	<=30	Pass
		2440	4.27	<=30	Pass
		2480	4.26	<=30	Pass

3.2 Test Graph

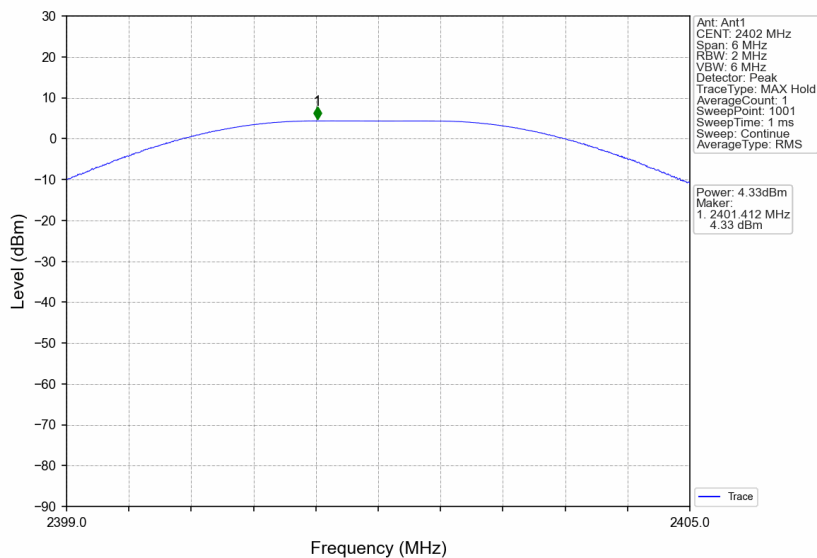
3.2.1 Power



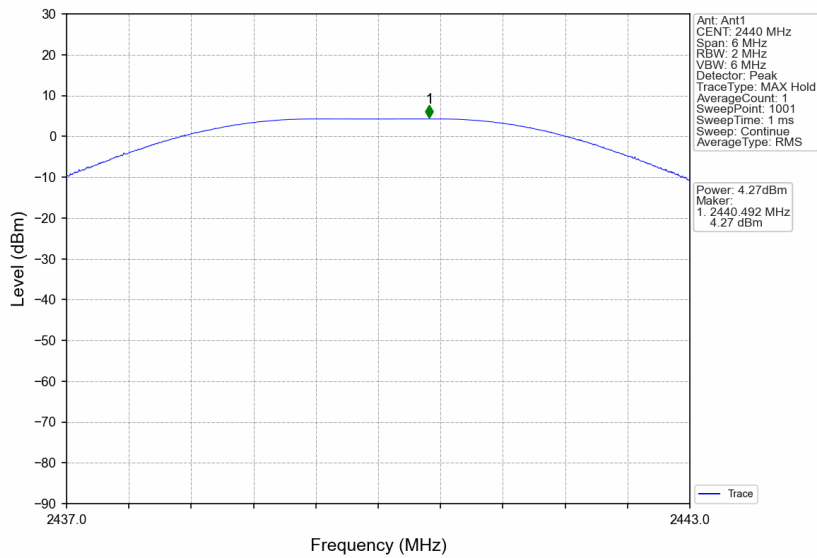
1M_HCH_2480MHz_Ant1_NTNV



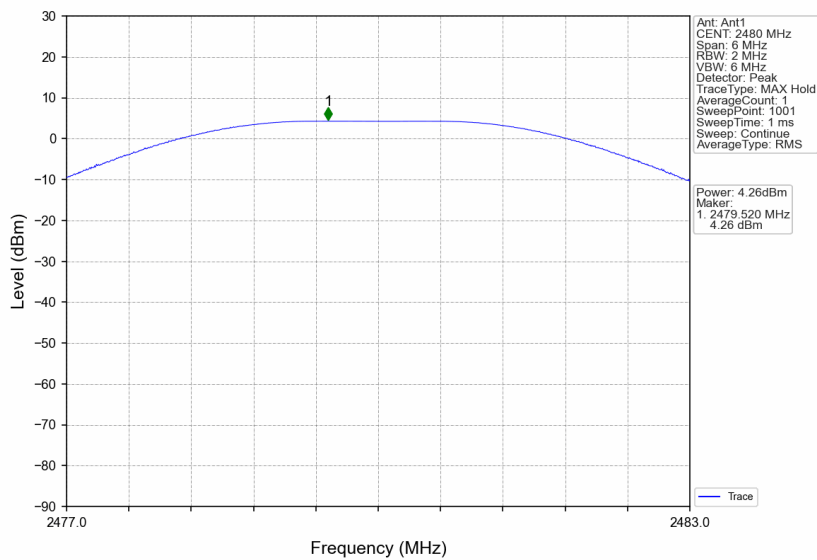
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV





Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 66 of 78

4. Maximum Power Spectral Density

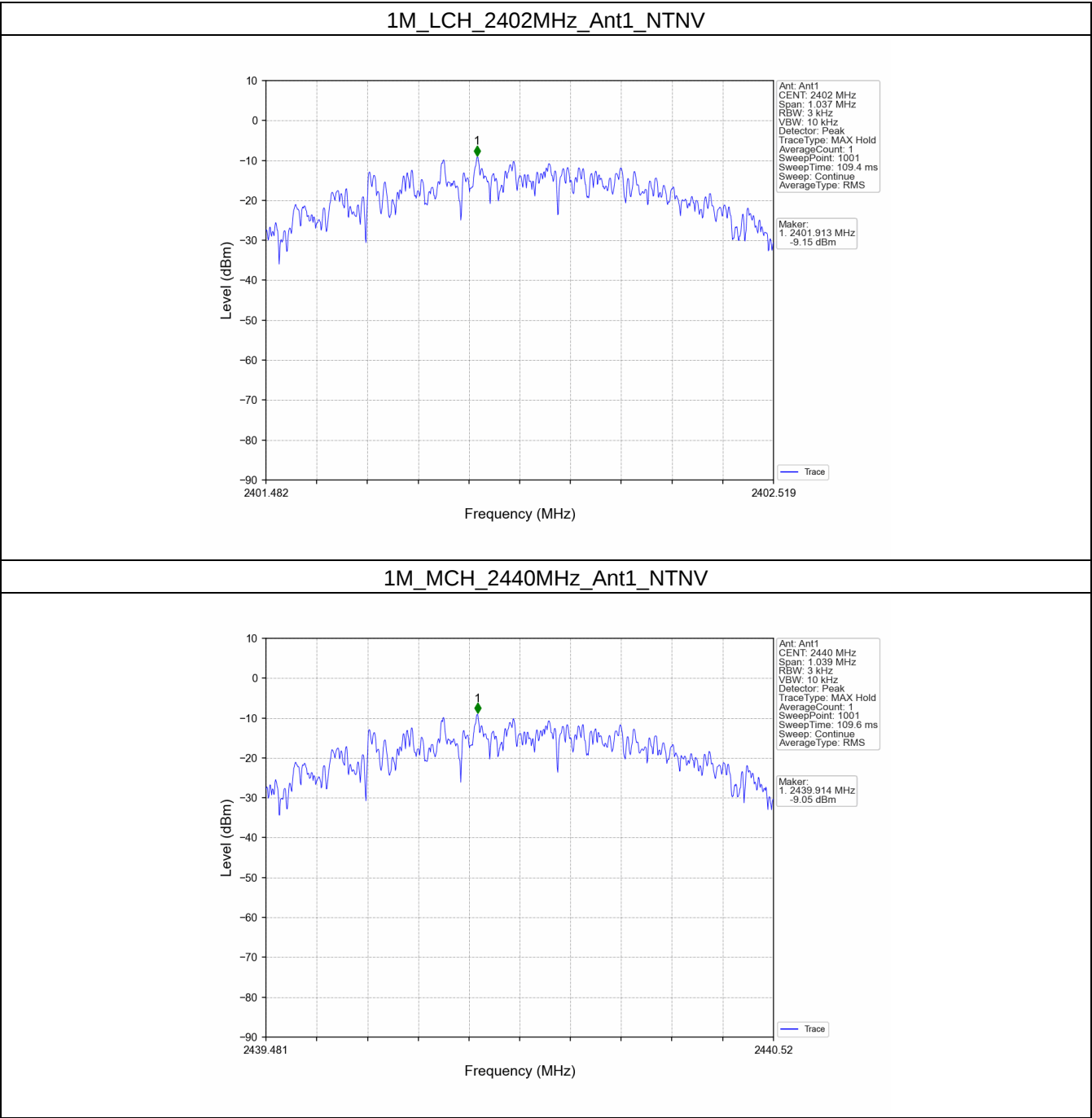
4.1 Test Result

4.1.1 PSD

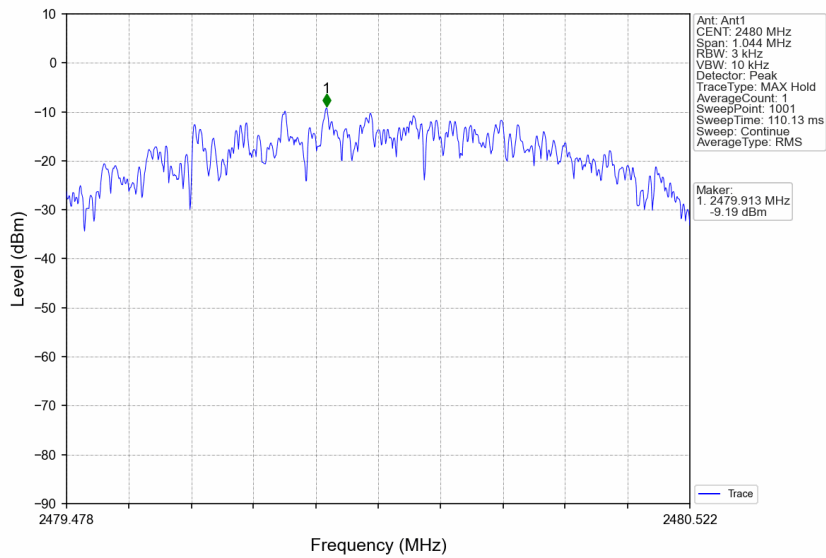
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	-9.15	<=8	Pass
		2440	-9.05	<=8	Pass
		2480	-9.19	<=8	Pass
2M	SISO	2402	-12.31	<=8	Pass
		2440	-12.48	<=8	Pass
		2480	-12.66	<=8	Pass

4.2 Test Graph

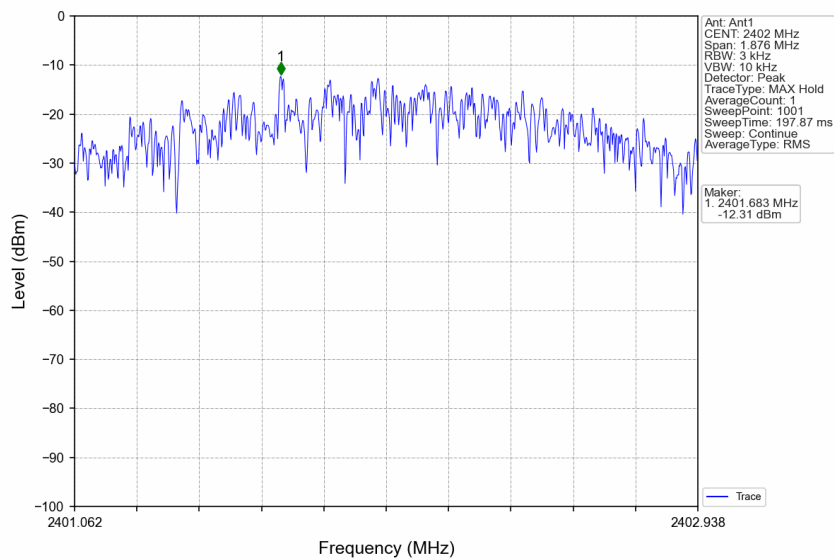
4.2.1 PSD



1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV





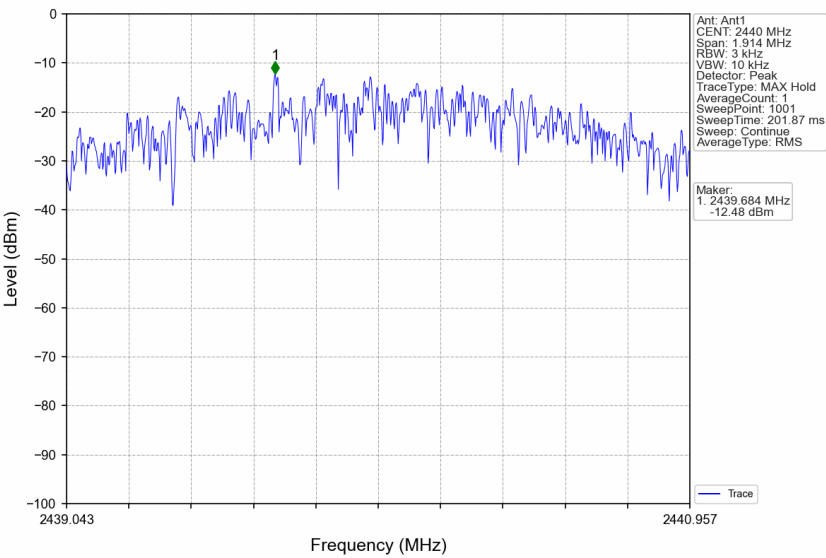
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

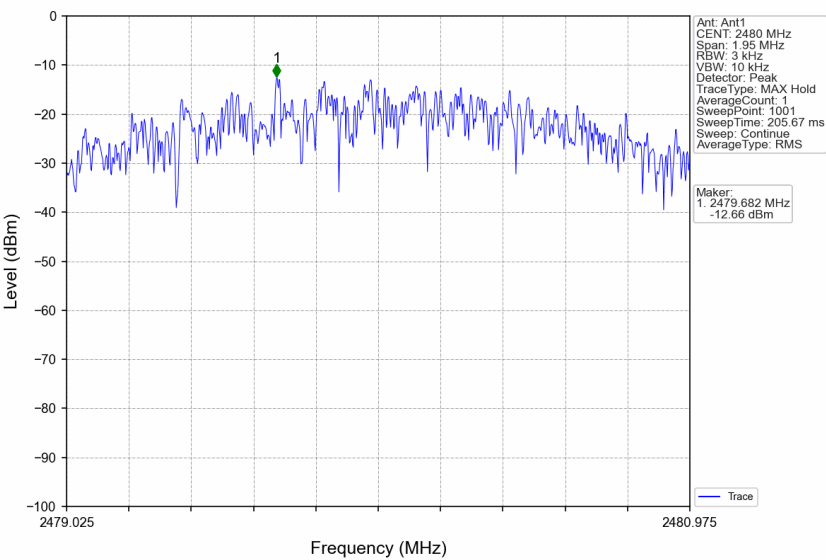
Report No.: KSCR240600115101

Page: 69 of 78

2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240600115101

Page: 70 of 78

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)
1M	SISO	2402	1	3.30
		2440	1	3.33
		2480	1	3.35
2M	SISO	2402	1	1.91
		2440	1	1.71
		2480	1	1.60

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

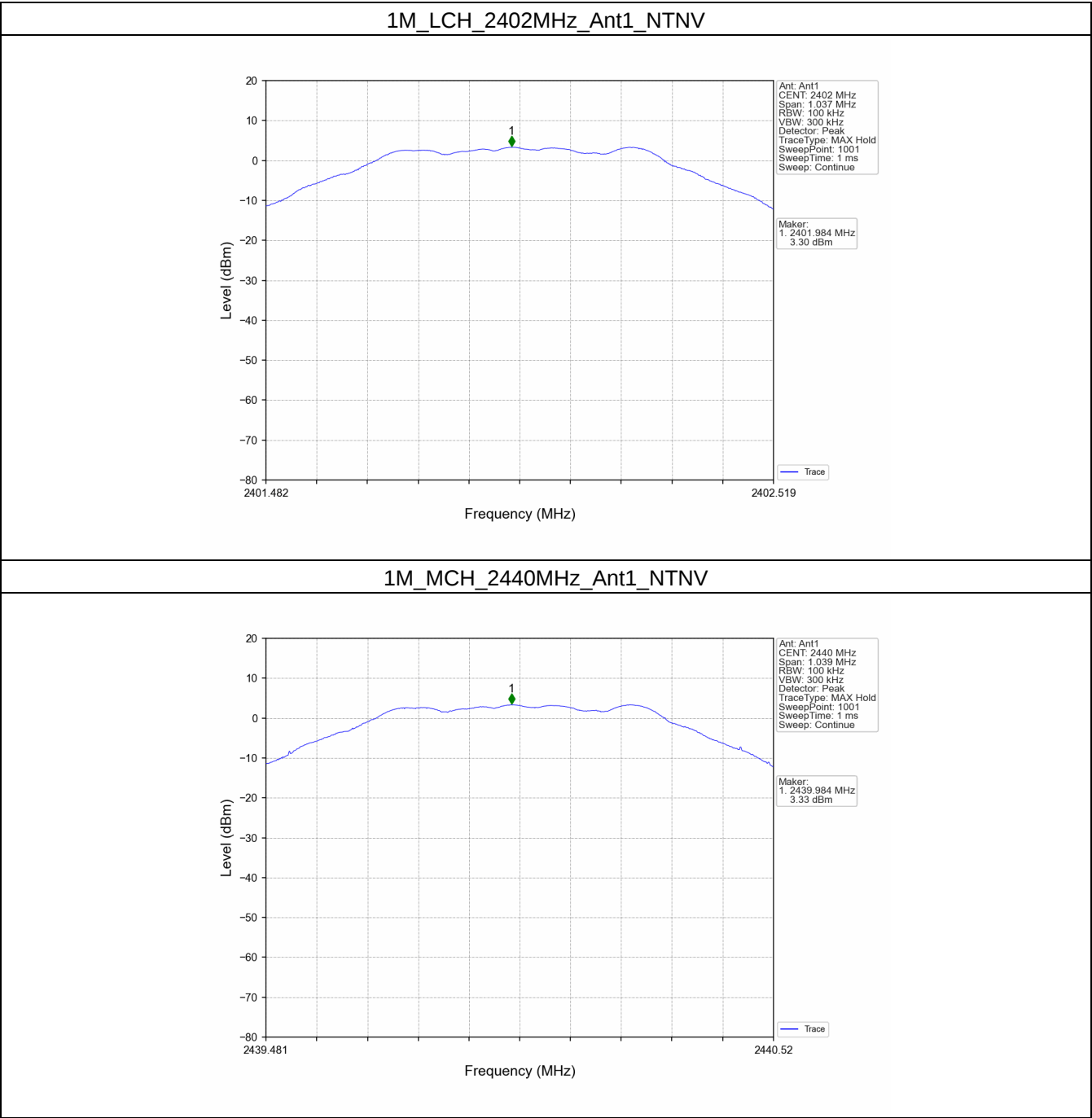
5.1.2 CSE

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	3.35	-16.65	Pass
		2440	1	3.35	-16.65	Pass
		2480	1	3.35	-16.65	Pass
2M	SISO	2402	1	1.91	-18.09	Pass
		2440	1	1.91	-18.09	Pass
		2480	1	1.91	-18.09	Pass

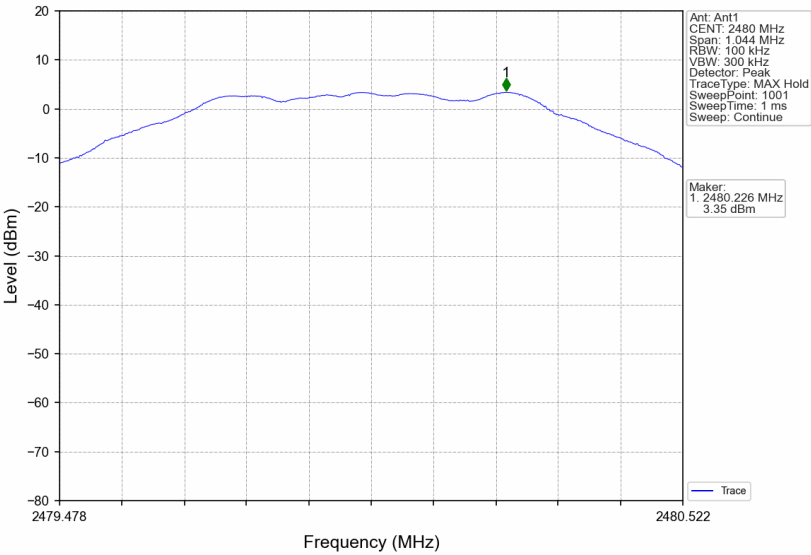
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

5.2 Test Graph

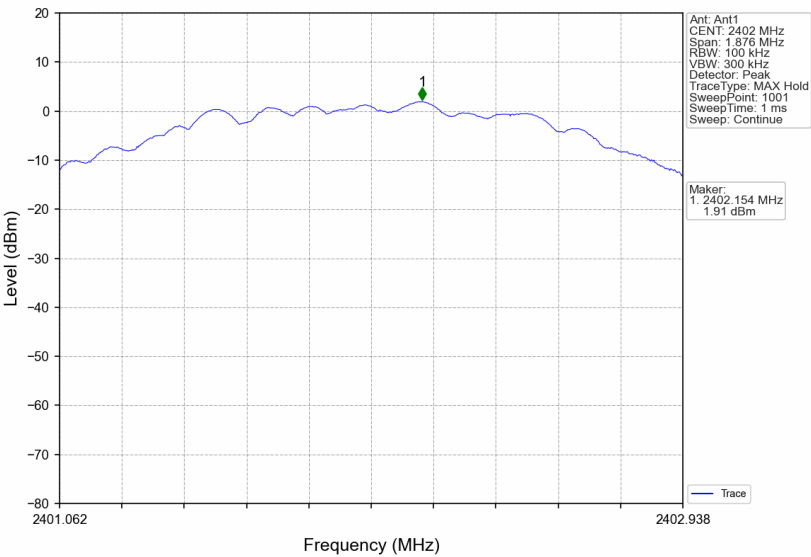
5.2.1 Ref



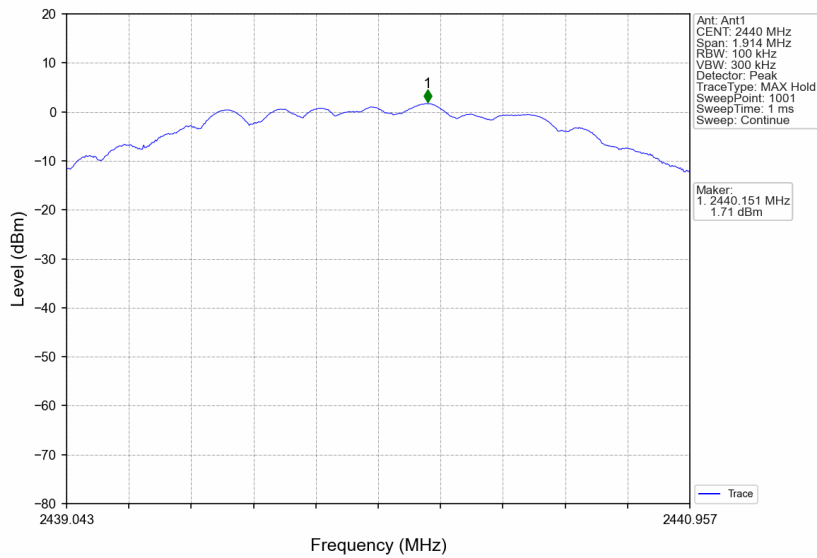
1M_HCH_2480MHz_Ant1_NTNV



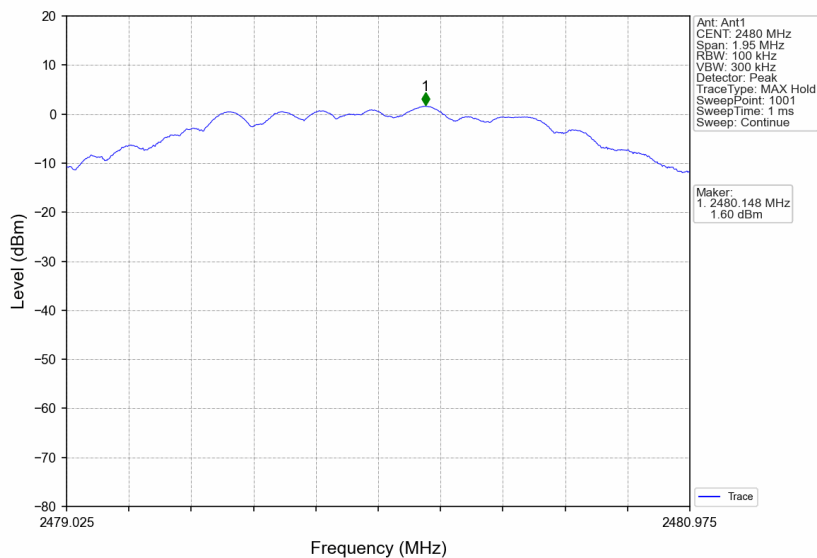
2M_LCH_2402MHz_Ant1_NTNV



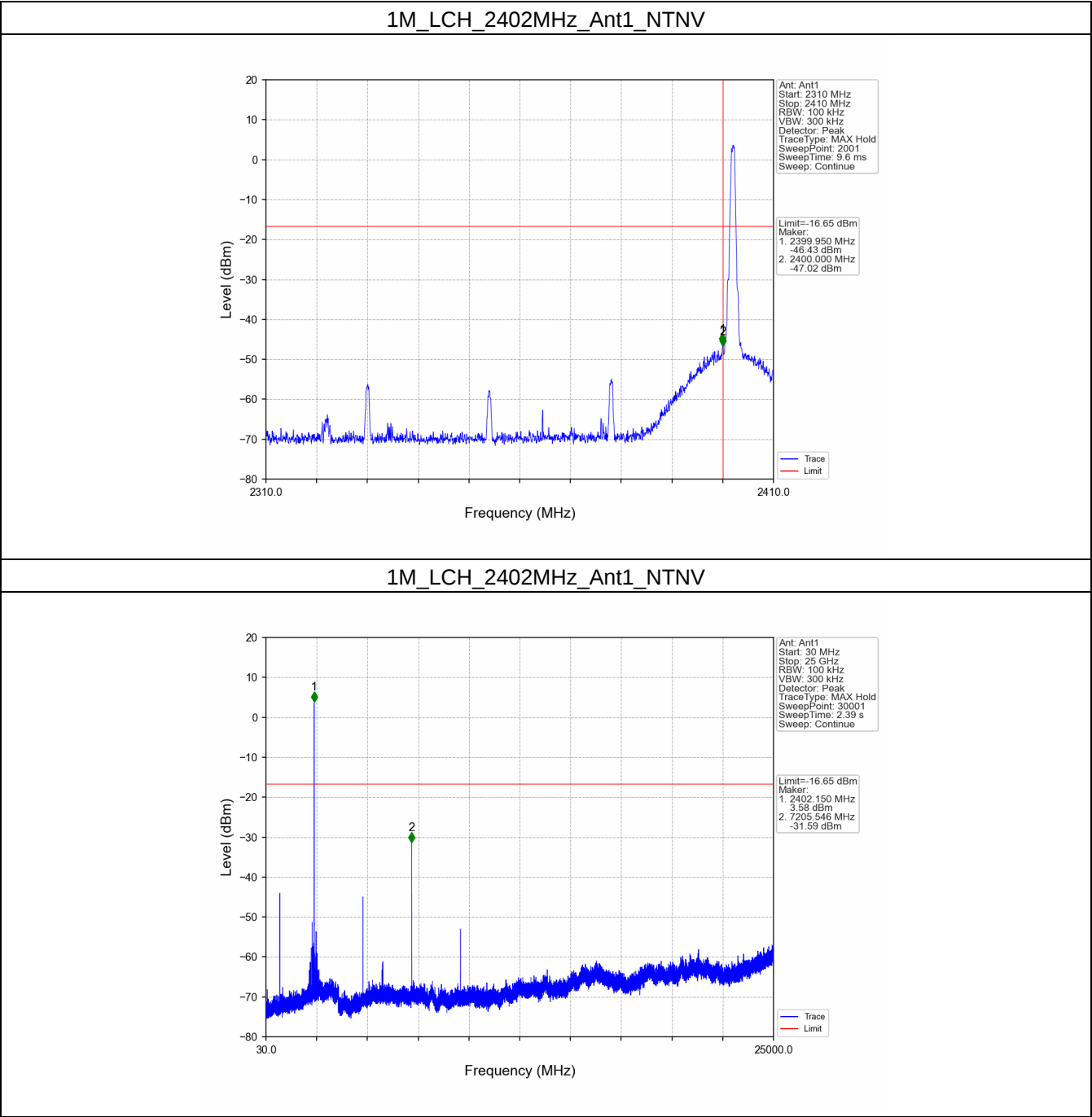
2M_MCH_2440MHz_Ant1_NTNV



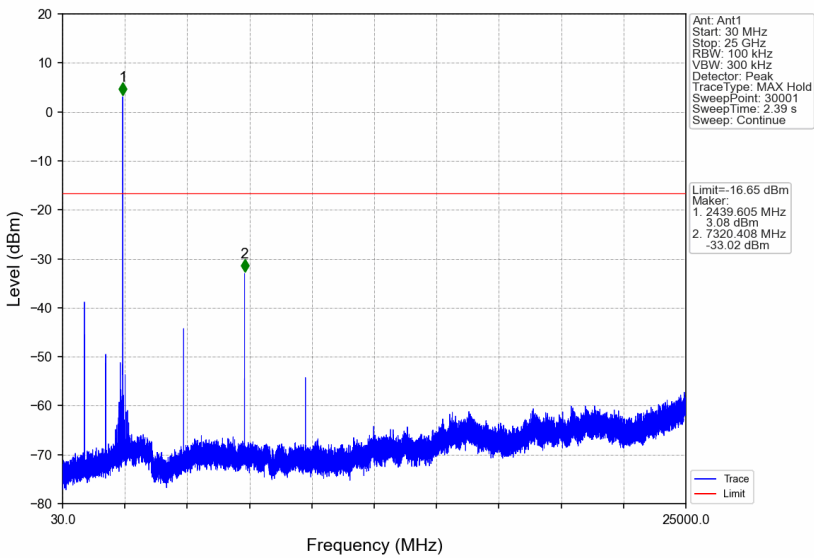
2M_HCH_2480MHz_Ant1_NTNV



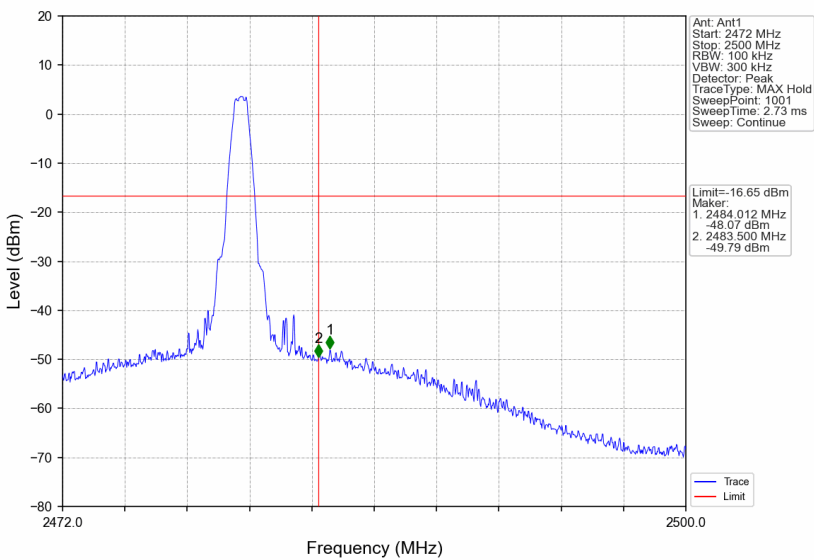
5.2.2 CSE



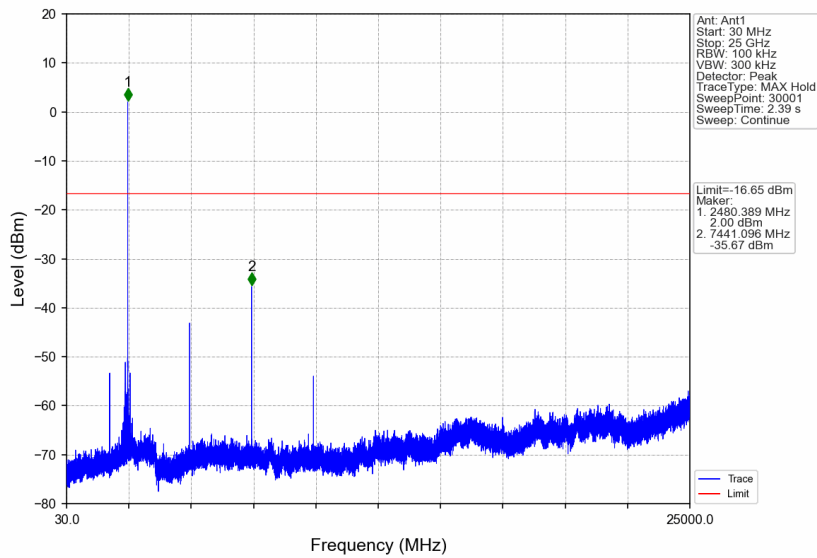
1M_MCH_2440MHz_Ant1_NTNV



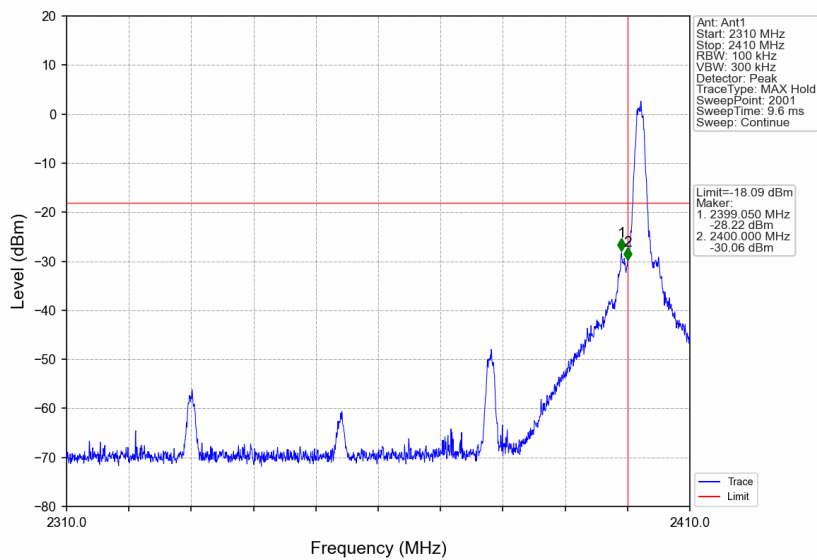
1M_HCH_2480MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV



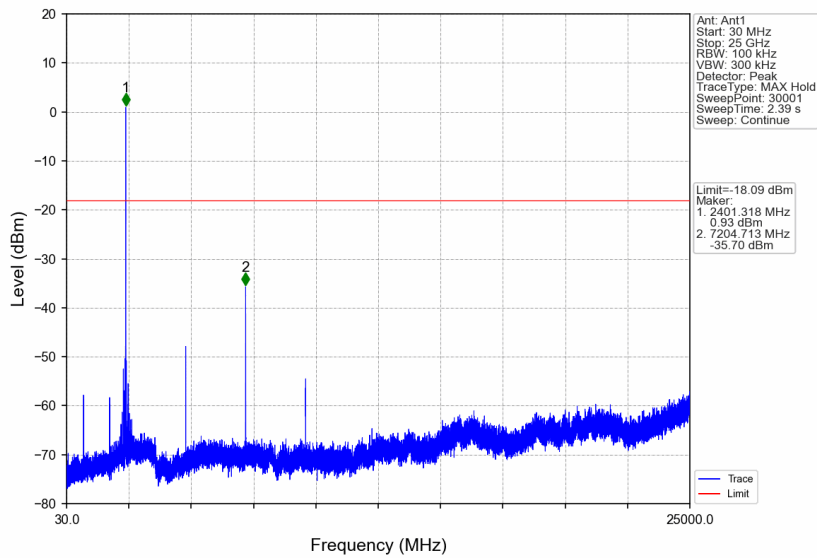
Compliance Certification Services (Kunshan) Inc.

CCSEM-TRF-001 Rev. 02 Sep 01, 2023

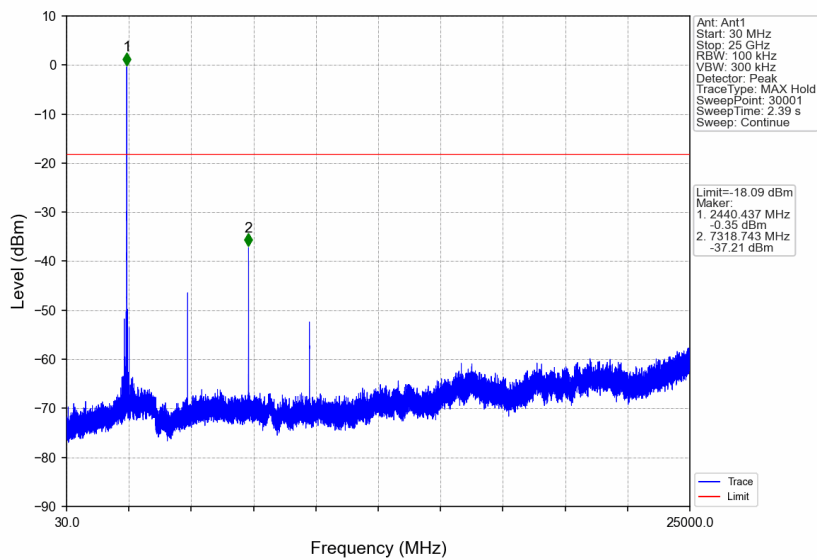
Report No.: KSCR240600115101

Page: 77 of 78

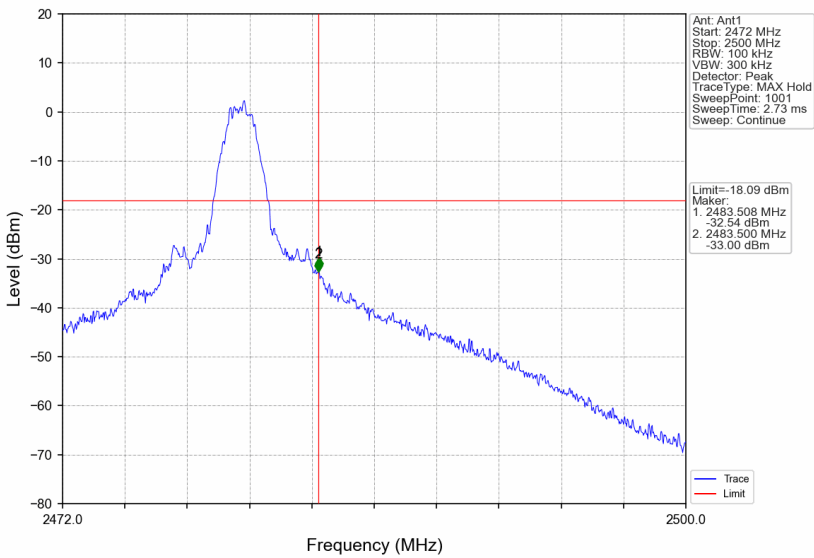
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV

