



Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 1 of 167

TEST REPORT

Application No.: KSCR2407001217AT
FCC ID: RF41761B
IC: 5798A-1761B
Applicant: KEYENCE CORPORATION
Address of Applicant: 1-3-14, Higashinakajima, Higashiyodogawa-ku, Osaka, 533-8555 Japan
Manufacturer: KEYENCE CORPORATION
Address of Manufacturer: 1-3-14, Higashinakajima, Higashiyodogawa-ku, Osaka, 533-8555 Japan
Factory: KEYENCE CORPORATION
Address of Factory: 1-3-14, Higashinakajima, Higashiyodogawa-ku, Osaka, 533-8555 Japan
Equipment Under Test (EUT):
EUT Name: Handheld Terminal
Model No.: BT-A600
Trade Mark: KEYENCE
Standard(s) : 47 CFR Part 15, Subpart C 15.247
RSS-247 Issue 3, August 2023
RSS-Gen Issue 5 Amendment 2 (February 2021)
Date of Receipt: 2024-07-02
Date of Test: 2024-08-27 to 2024-09-12
Date of Issue: 2024-09-12

Test Result:

Pass*

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

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Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 2 of 167

Revision Record			
Version	Description	Date	Remark
00	Original	2024-09-12	/

Authorized for issue by:			
Tested By		Maker Qi	
		Maker_Qi/Project Engineer	
Approved By		Terry Hou	
		Terry Hou /Reviewer	

Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 3 of 167

2 Test Summary

Radio Spectrum Technical Requirement				
Item	FCC Requirement	IC Requirement	Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	RSS-Gen Clause 6.8	N/A	Customer Declaration
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	RSS-247 Section 5.1(a)	N/A	Pass

N/A: Not applicable

Radio Spectrum Matter Part				
Item	FCC Requirement	IC Requirement	Method	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.207	RSS-Gen Section 8.8	ANSI C63.10 (2013) Section 6.2	Pass
Conducted Average Output Power	47 CFR Part 15, Subpart C 15.247(b)(1)	RSS-247 Section 5.4(b)	ANSI C63.10 (2013) Section 7.8.5	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247(a)(1)	RSS-247 Section 5.1(a)	ANSI C63.10 (2013) Section 7.8.7	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247a(1)	RSS-247 Section 5.1(b)	ANSI C63.10 (2013) Section 7.8.2	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247a(1)(iii)	RSS-247 Section 5.1(d)	ANSI C63.10 (2013) Section 7.8.3	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247a(1)(iii)	RSS-247 Section 5.1(d)	ANSI C63.10 (2013) Section 7.8.4	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247(d)	RSS-247 Section 5.5	ANSI C63.10 (2013) Section 7.8.6	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247(d)	RSS-247 Section 5.5	ANSI C63.10 (2013) Section 7.8.8	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.205 & 15.209	RSS-247 Section 3.3 & RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.10.5	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.205 & 15.209	RSS-247 Section 3.3 & RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4,6.5,6.6	Pass
99% Bandwidth	-	RSS-Gen Section 6.7	ANSI C63.10 Section 6.9.3	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 Power level setting using in test	5
4.3 Description of Support Units	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
6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	10
7 Radio Spectrum Matter Test Results.....	11
7.1 Conducted Emissions at AC Power Line (150kHz-30MHz).....	11
7.2 Radiated Emissions which fall in the restricted bands.....	15
7.3 Radiated Spurious Emissions Below 1GHz.....	29
7.4 Radiated Spurious Emissions Above 1GHz	33
7.5 Conducted Peak Output Power	53
7.6 20dB Bandwidth.....	55
7.7 Carrier Frequencies Separation.....	56
7.8 Hopping Channel Number	57
7.9 Dwell Time	58
7.10 Conducted Band Edges Measurement.....	59
7.11 Conducted Spurious Emissions.....	61
7.12 99% Bandwidth	62
8 Test Setup Photo	63
9 EUT Constructional Details (EUT Photos)	63
10 Appendix	64

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.6V by Rechargeable Battery Battery information: Model: DX-BC6 Rate Capacity: 6270mAh Rate Energy: 22.57Wh Normal Voltage: DC 3.6V
Bluetooth Version:	V5.0 Dual mode
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, Pi/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	FPC Antenna
Antenna Gain:	Ant1: 1.69dBi(Provided by the manufacturer) Ant5: 1.98dBi(Provided by the manufacturer)
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)

4.2 Power level setting using in test

Ant1 & Ant5

Channel	DH	2DH	3DH
	Ant 1	Ant 1	Ant 1
00	9	9	9
39	9	9	9
78	9	9	9

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--
The EUT has been tested as an independent unit.			

Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 6 of 167

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.		

Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 7 of 167

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.: KSCR240700121703

Page: 8 of 167

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	ESE	E3_V 6.111221a	/	N.C.R	N.C.R
RF Conducted Test						
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	08/01/2024	07/31/2025
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	08/01/2024	07/31/2025
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	08/02/2024	08/01/2025
6	Signal Generator	Agilent	N5182A	KUS2001M001-1	08/01/2024	07/31/2025
7	Signal Generator	Agilent	E8257C	KS301066	08/06/2024	08/05/2025
8	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	08/01/2024	07/31/2025
9	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	03/19/2024	03/18/2025
10	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	08/12/2024	08/11/2025
11	Switcher	TST	FY562	KUS2001M001-4	01/15/2024	01/14/2025
12	Conducted Test Cable	Thermax	RF01-RF04	CZ301111-CZ301120	01/15/2024	01/14/2025
13	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	08/26/2024	08/25/2025
14	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	03/19/2024	03/18/2025
15	Software	BST	TST-PASS	/	NCR	NCR
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	08/06/2024	08/05/2025
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	03/19/2024	03/18/2025
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	03/23/2024	08/22/2026
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	08/12/2024	08/11/2025
12	RE Test Cable	REBES MICROWAVE	/	CZ301097	08/12/2024	08/11/2025
13	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	03/21/2024	03/20/2025
14	Software	Faratronic	EZ_EMC-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 integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is Ant1: 1.69dBi; Ant5: 1.98dBi.

Antenna location: Refer to internal photo.

6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence: $2^9 - 1 = 511$ bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

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: 25.3 °C

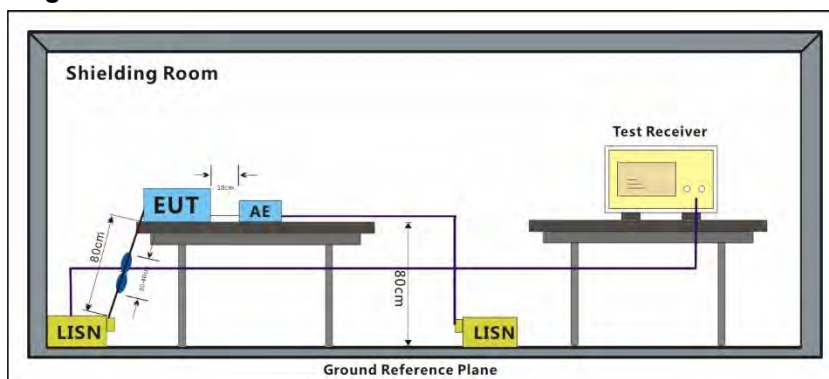
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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

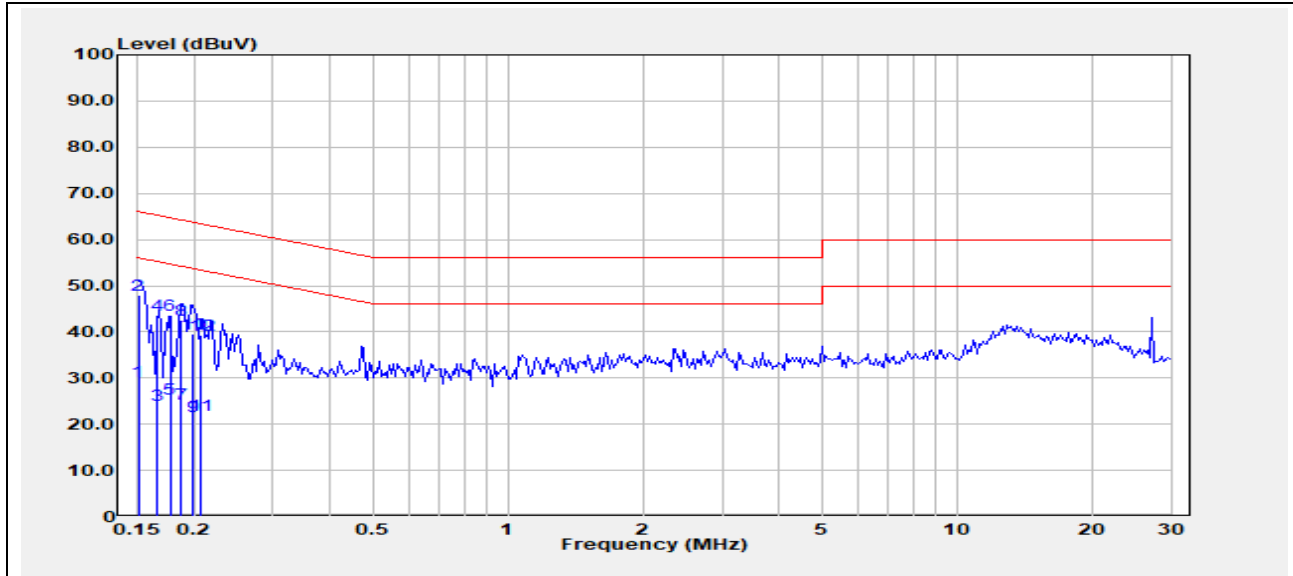
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 13 of 167

Test Mode: 06; Line: Live line



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1502	9.03	20.25	29.28	55.99	-26.71	Average
2	0.1502	27.79	20.25	48.04	65.99	-17.95	QP
3	0.1661	3.82	20.18	24.00	55.15	-31.15	Average
4	0.1661	23.37	20.18	43.55	65.15	-21.60	QP
5	0.1768	5.34	20.14	25.48	54.64	-29.16	Average
6	0.1768	23.38	20.14	43.52	64.64	-21.12	QP
7	0.1860	4.42	20.10	24.52	54.21	-29.69	Average
8	0.1860	22.34	20.10	42.44	64.21	-21.77	QP
9	0.1983	1.58	20.06	21.64	53.68	-32.04	Average
10	0.1983	19.56	20.06	39.62	63.68	-24.06	QP
11	0.2067	1.83	20.06	21.89	53.34	-31.45	Average
12	0.2067	19.35	20.06	39.41	63.34	-23.93	QP

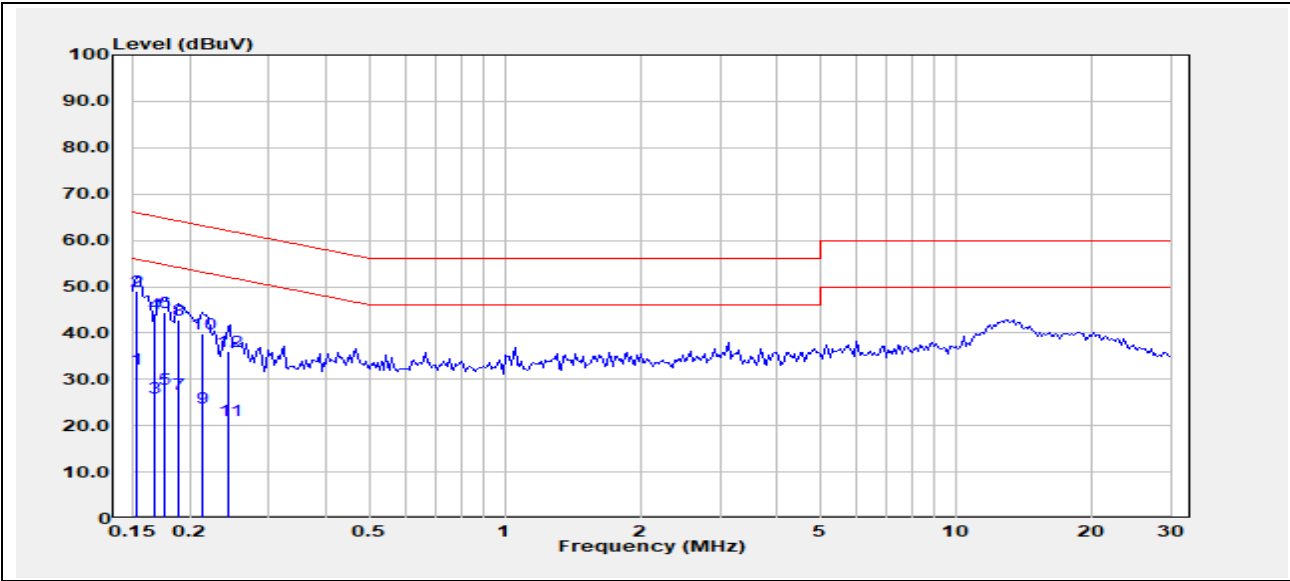
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 14 of 167

Test Mode: 06; Line: Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1523	12.02	20.18	32.20	55.88	-23.68	Average
2	0.1523	28.83	20.18	49.01	65.88	-16.87	QP
3	0.1675	5.88	20.16	26.04	55.08	-29.04	Average
4	0.1675	24.08	20.16	44.24	65.08	-20.84	QP
5	0.1757	7.69	20.15	27.84	54.69	-26.85	Average
6	0.1757	24.29	20.15	44.44	64.69	-20.25	QP
7	0.1884	6.74	20.13	26.87	54.11	-27.24	Average
8	0.1884	22.79	20.13	42.92	64.11	-21.19	QP
9	0.2128	3.72	20.11	23.83	53.10	-29.27	Average
10	0.2128	19.81	20.11	39.92	63.10	-23.18	QP
11	0.2444	1.01	20.10	21.11	51.94	-30.83	Average
12	0.2444	16.06	20.10	36.16	61.94	-25.78	QP

Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 15 of 167

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

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: 21.6 °C

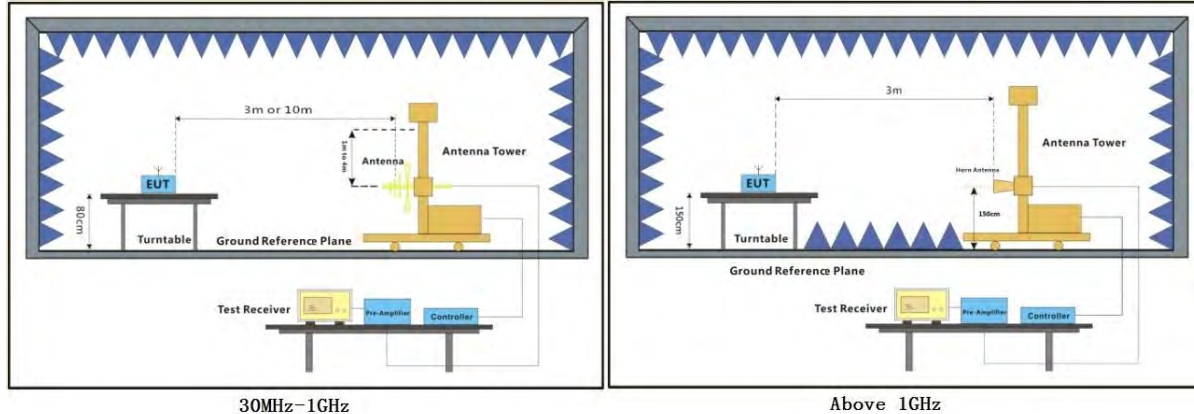
Humidity: 48.2 % RH

Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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.

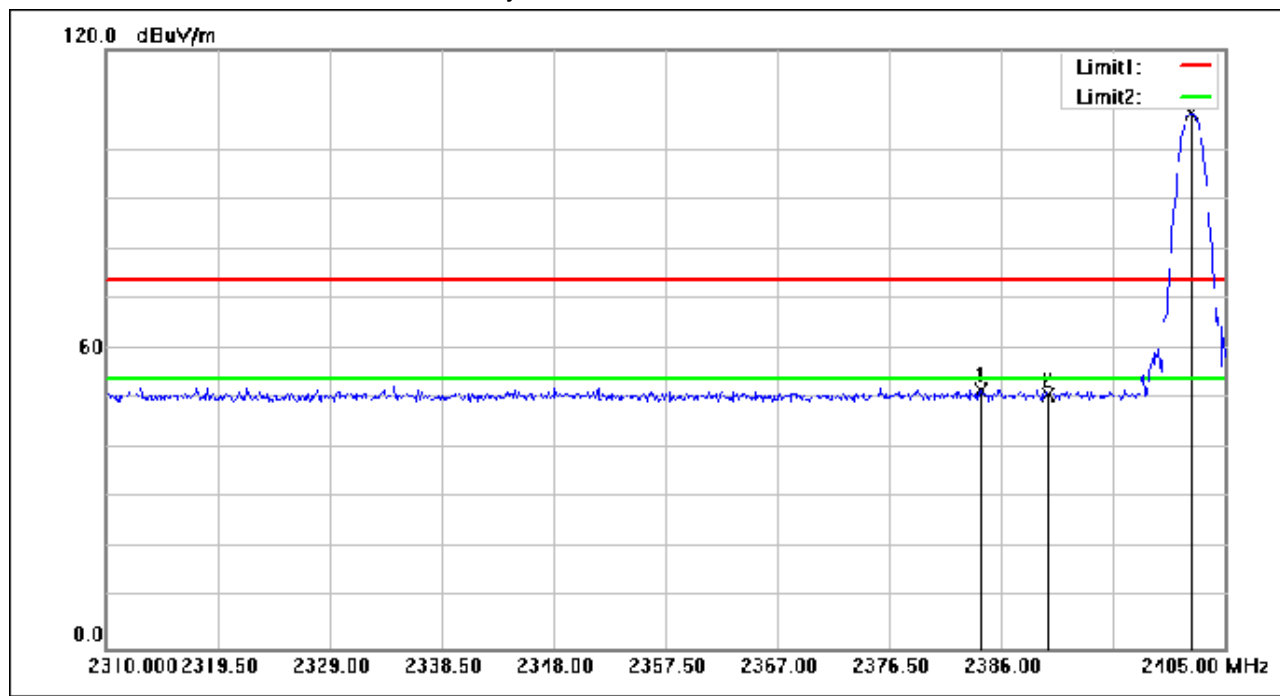
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 17 of 167

Test Mode: 06; 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	2384.290	76.55	-24.73	51.82	74.00	-22.18	peak
2	2390.000	75.48	-24.71	50.77	74.00	-23.23	peak
3	2402.150	131.79	-24.65	107.14	74.00	33.14	peak

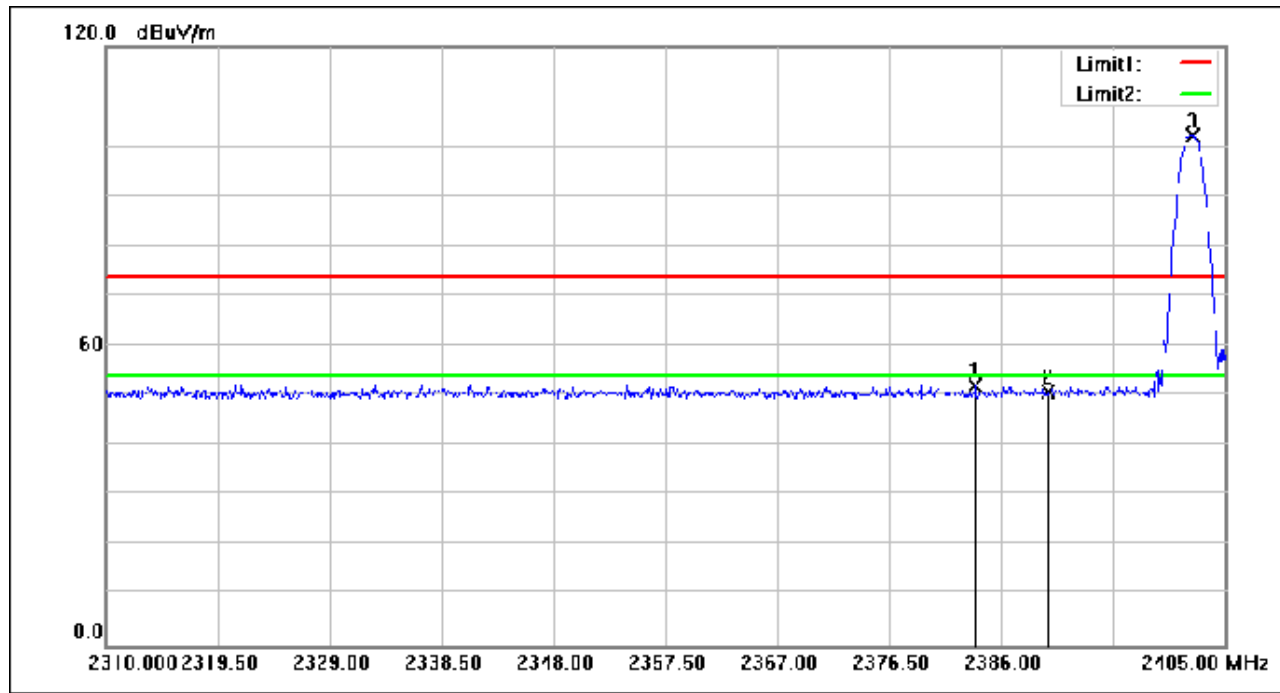
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 18 of 167

Test Mode: 06; 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	2383.815	76.67	-24.73	51.94	74.00	-22.06	peak
2	2390.000	75.68	-24.71	50.97	74.00	-23.03	peak
3	2402.245	126.92	-24.65	102.27	74.00	28.27	peak

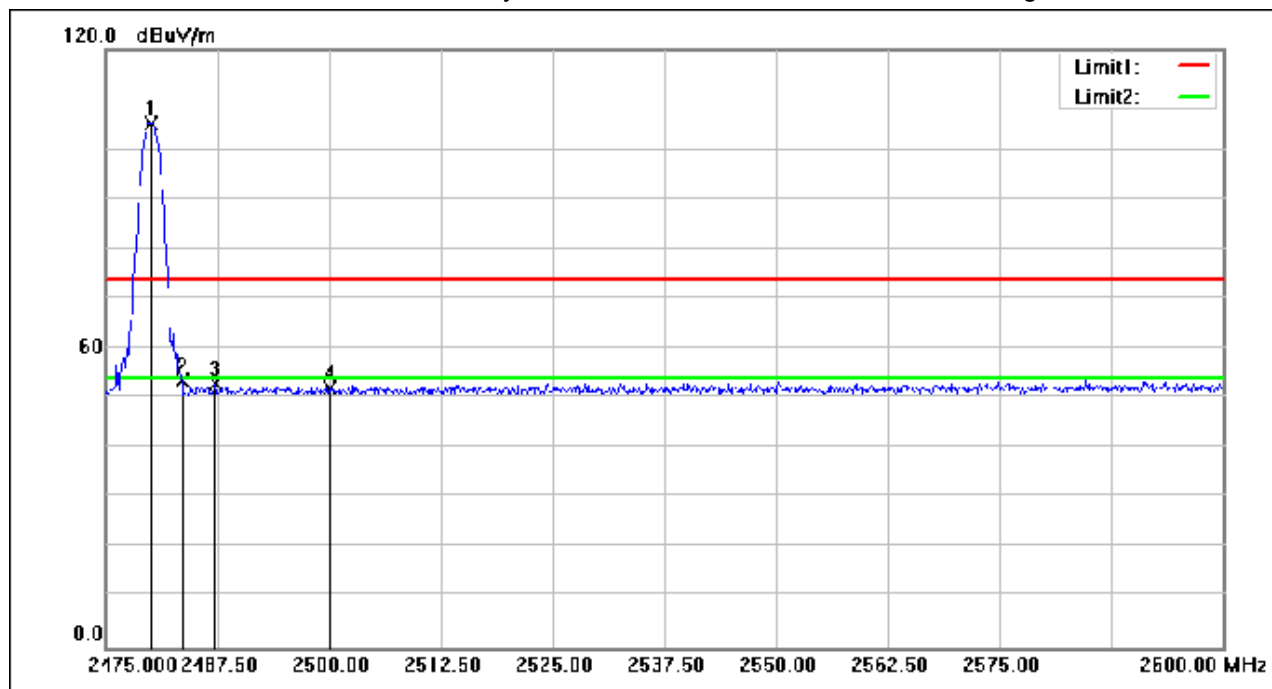
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 19 of 167

Test Mode: 06; 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	129.57	-24.28	105.29	74.00	31.29	peak
2	2483.500	77.79	-24.27	53.52	74.00	-20.48	peak
3	2487.250	77.16	-24.25	52.91	74.00	-21.09	peak
4	2500.000	76.34	-24.19	52.15	74.00	-21.85	peak

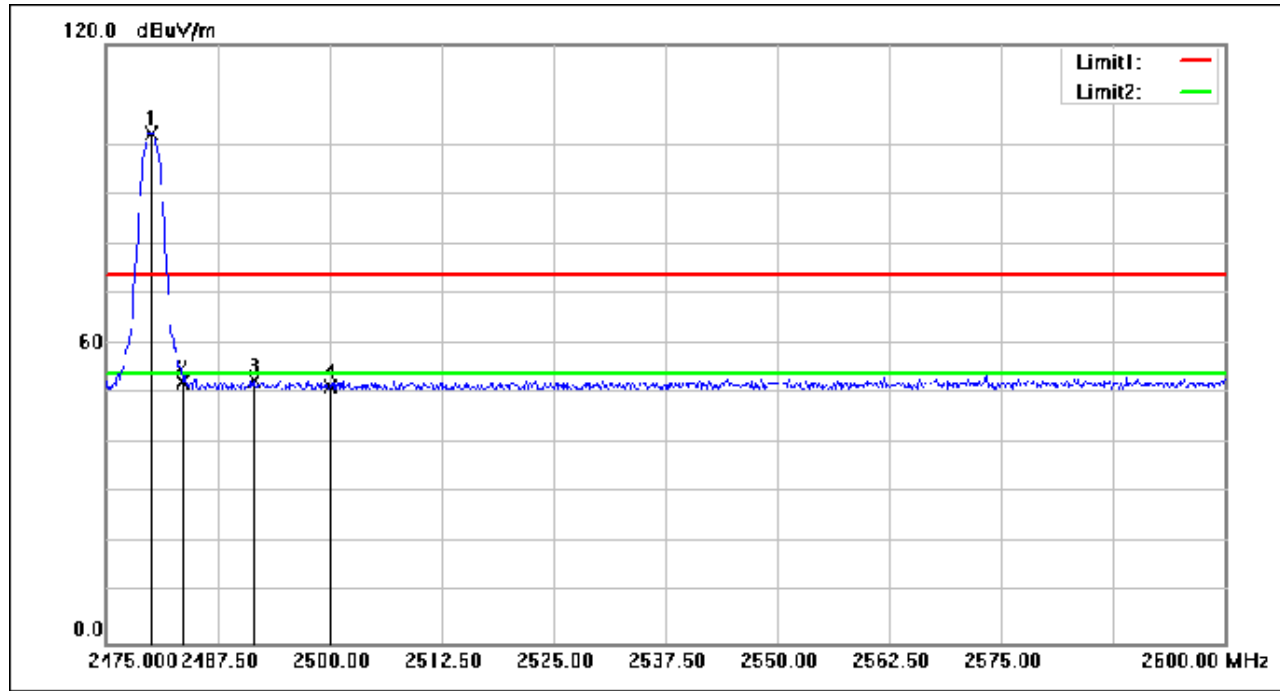
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 20 of 167

Test Mode: 06; 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	2480.125	126.47	-24.28	102.19	74.00	28.19	peak
2	2483.500	76.54	-24.27	52.27	74.00	-21.73	peak
3	2491.500	76.81	-24.23	52.58	74.00	-21.42	peak
4	2500.000	75.66	-24.19	51.47	74.00	-22.53	peak

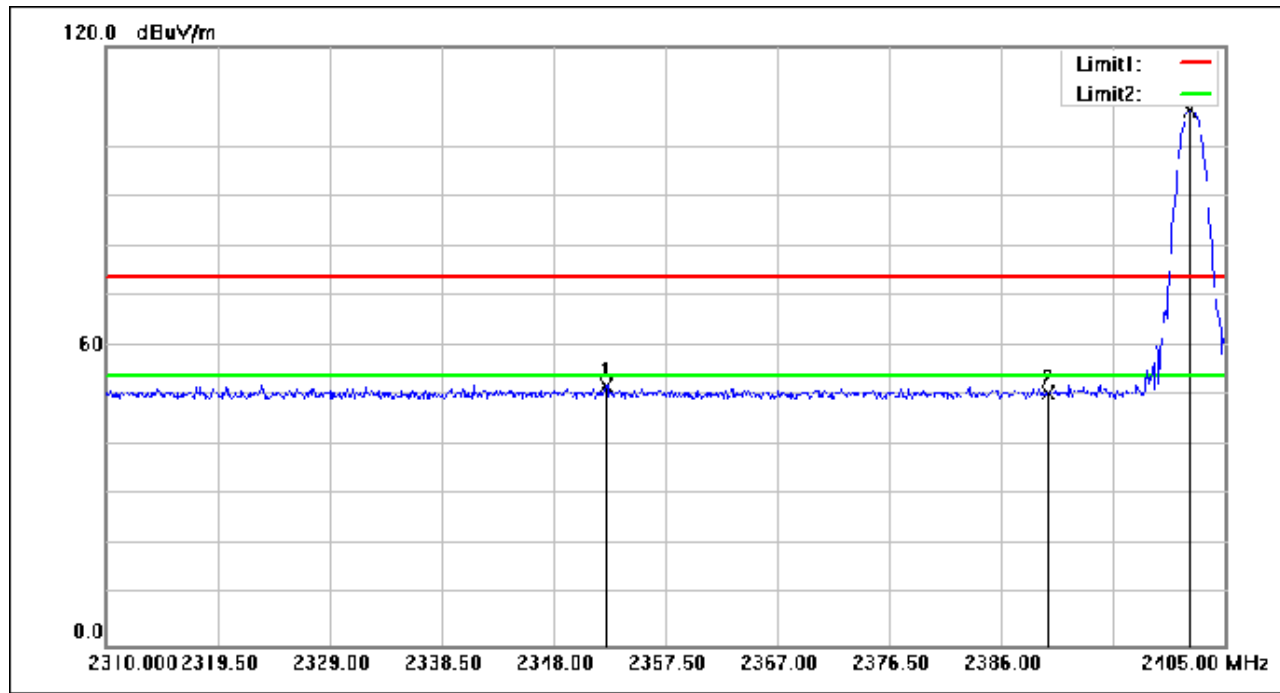
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 21 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: $\pi/4$ DQPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2352.465	76.98	-24.88	52.10	74.00	-21.90	peak
2	2390.000	75.19	-24.71	50.48	74.00	-23.52	peak
3	2401.960	131.79	-24.65	107.14	74.00	33.14	peak

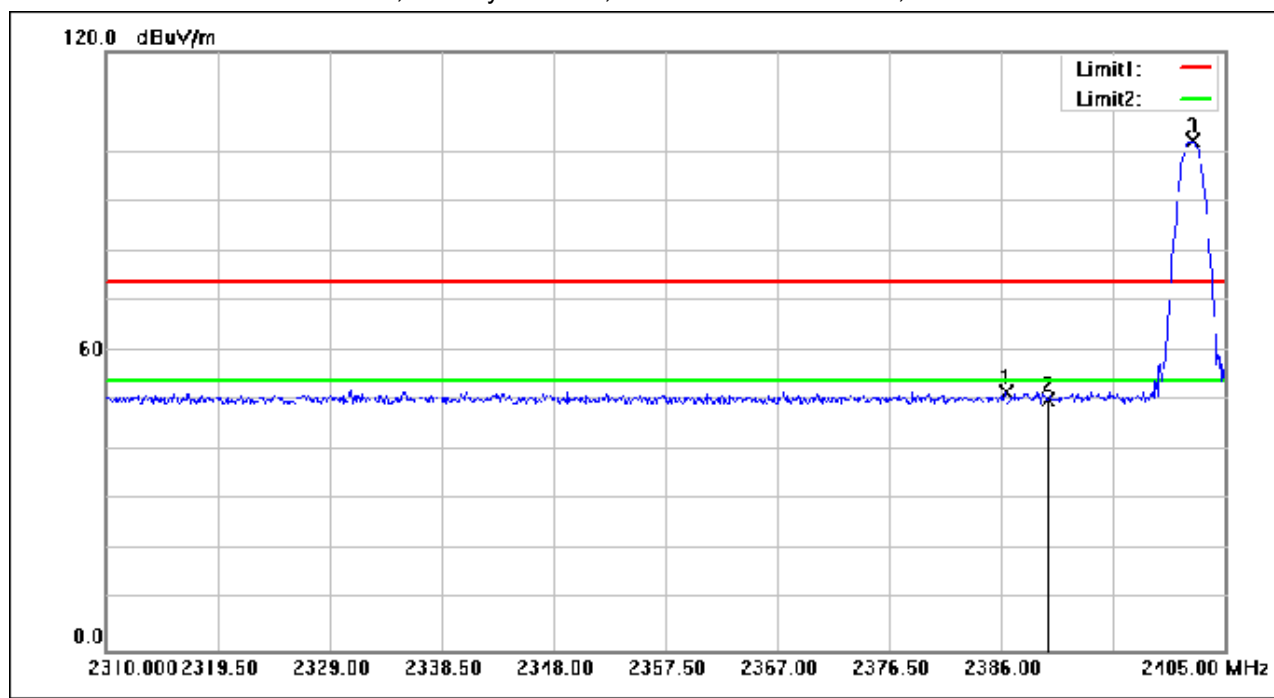
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 22 of 167

Test Mode: 06; Polarity: Vertical; Modulation: $\pi/4$ DQPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2386.380	76.50	-24.72	51.78	74.00	-22.22	peak
2	2390.000	75.11	-24.71	50.40	74.00	-23.60	peak
3	2402.245	126.66	-24.65	102.01	74.00	28.01	peak

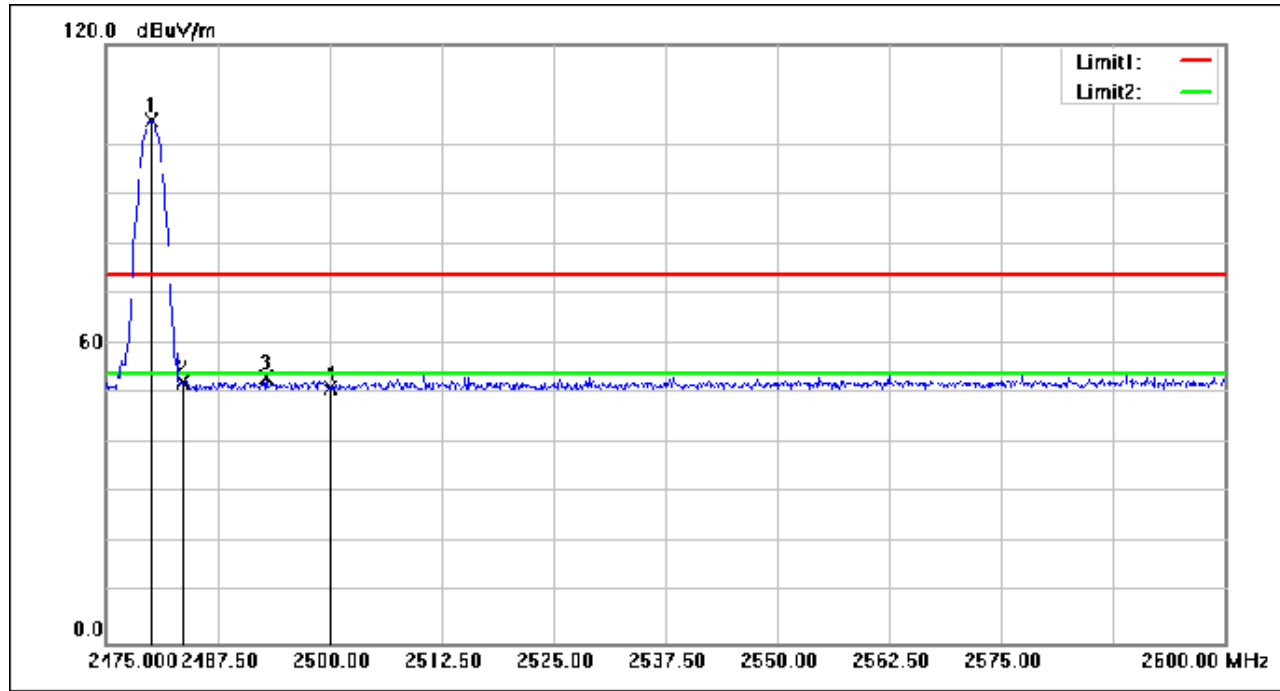
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 23 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: $\pi/4$ DQPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	129.04	-24.28	104.76	74.00	30.76	peak
2	2483.500	76.49	-24.27	52.22	74.00	-21.78	peak
3	2492.875	77.44	-24.22	53.22	74.00	-20.78	peak
4	2500.000	75.36	-24.19	51.17	74.00	-22.83	peak

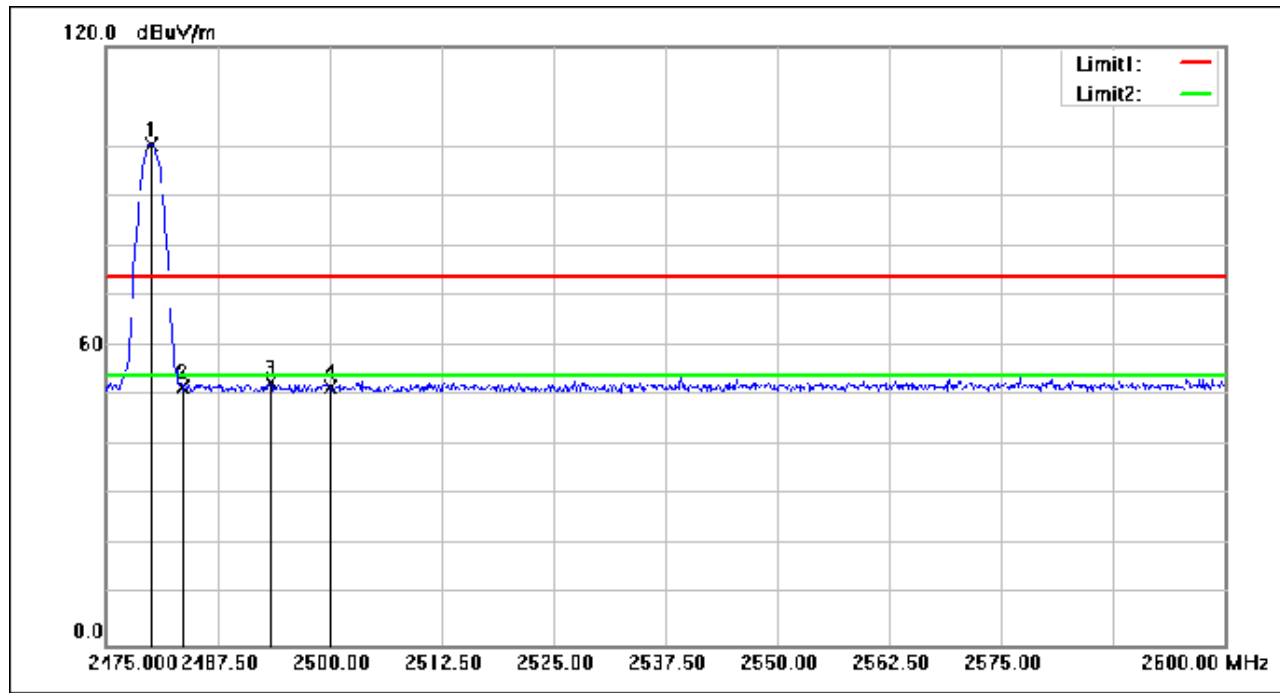
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 24 of 167

Test Mode: 06; Polarity: Vertical; Modulation: $\pi/4$ DQPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.125	124.76	-24.28	100.48	74.00	26.48	peak
2	2483.500	76.09	-24.27	51.82	74.00	-22.18	peak
3	2493.375	76.98	-24.22	52.76	74.00	-21.24	peak
4	2500.000	76.08	-24.19	51.89	74.00	-22.11	peak

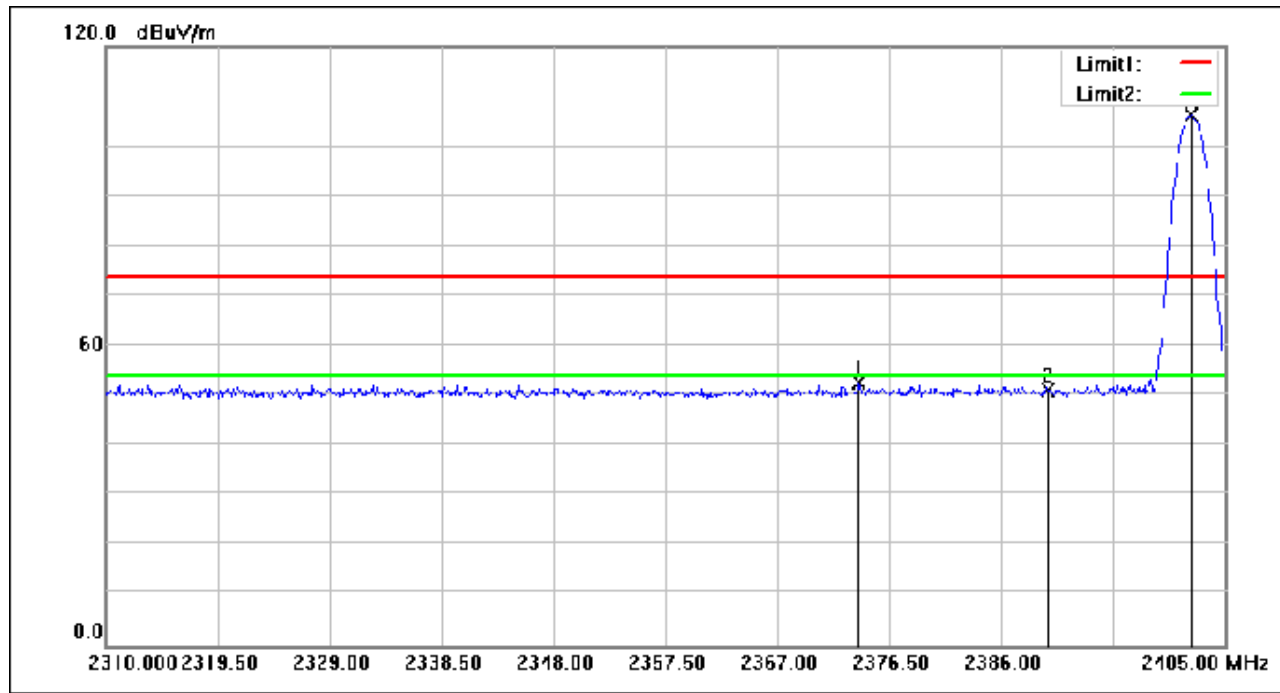
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 25 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: 8DPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2373.840	77.42	-24.78	52.64	74.00	-21.36	peak
2	2390.000	75.91	-24.71	51.20	74.00	-22.80	peak
3	2402.150	130.92	-24.65	106.27	74.00	32.27	peak

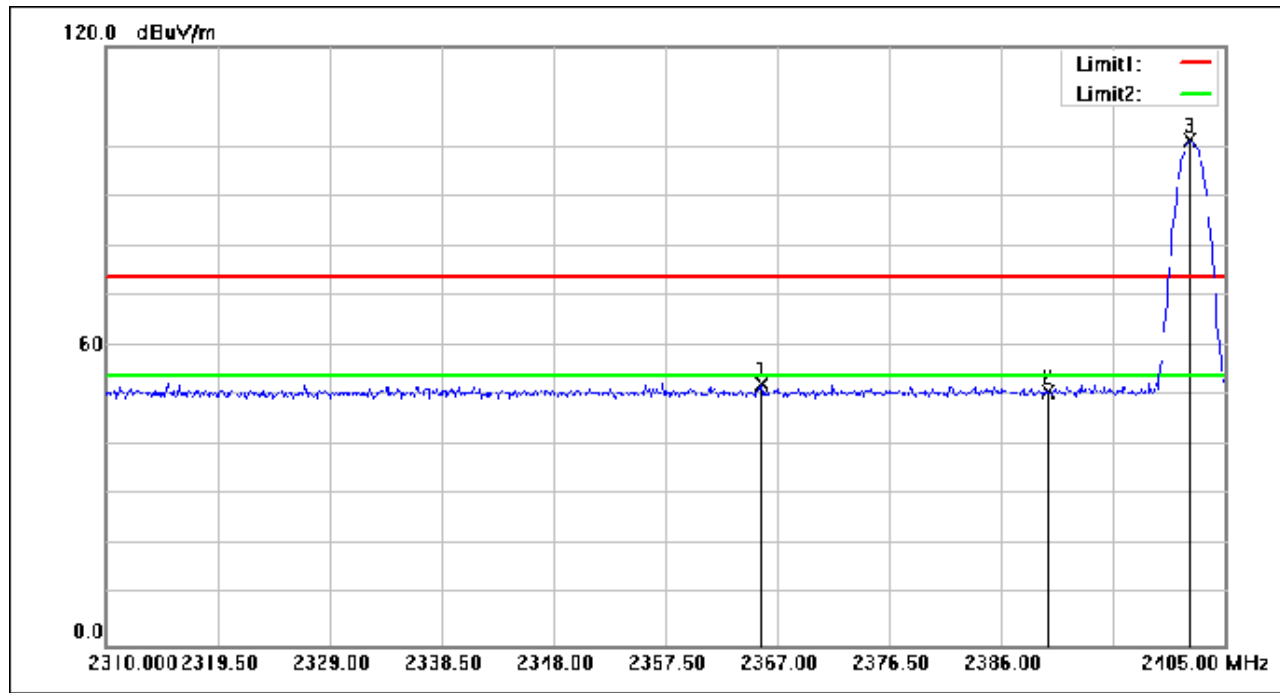
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 26 of 167

Test Mode: 06; Polarity: Vertical; Modulation: 8DPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2365.670	77.04	-24.82	52.22	74.00	-21.78	peak
2	2390.000	75.68	-24.71	50.97	74.00	-23.03	peak
3	2402.055	125.76	-24.65	101.11	74.00	27.11	peak

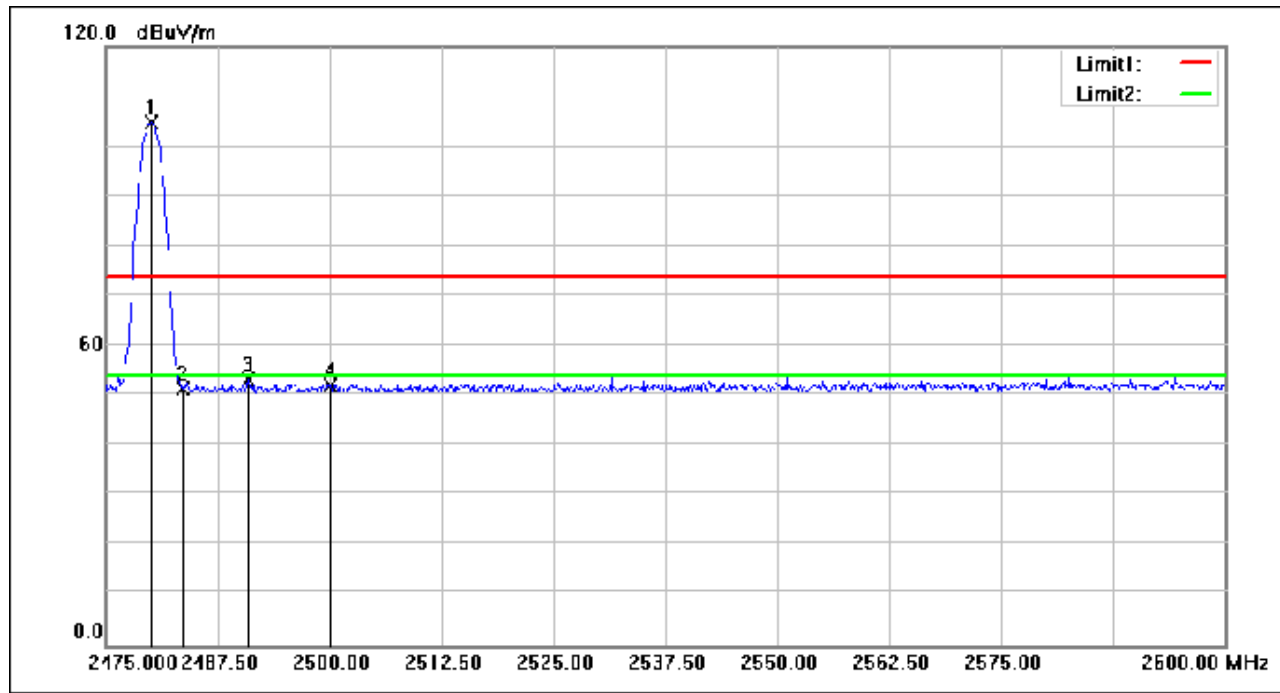
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 27 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: 8DPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	129.17	-24.28	104.89	74.00	30.89	peak
2	2483.500	75.73	-24.27	51.46	74.00	-22.54	peak
3	2490.875	77.48	-24.24	53.24	74.00	-20.76	peak
4	2500.000	76.20	-24.19	52.01	74.00	-21.99	peak

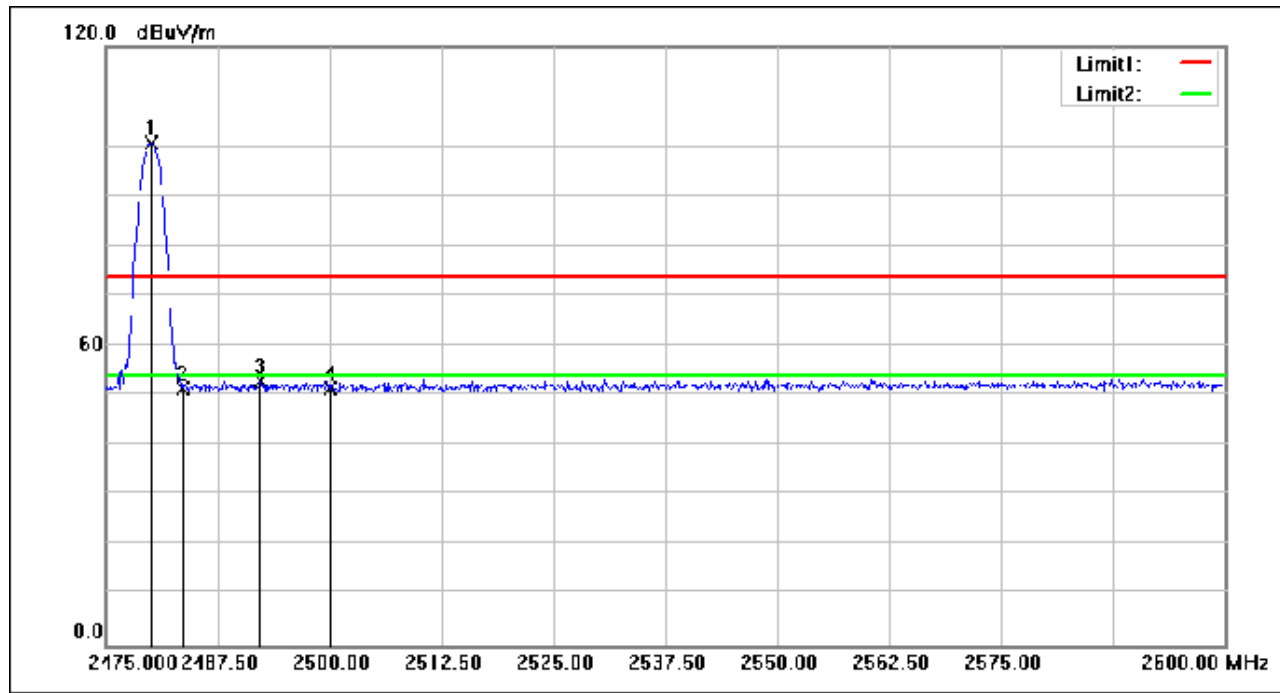
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 28 of 167

Test Mode: 06; Polarity: Vertical; Modulation: 8DPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	125.01	-24.28	100.73	74.00	26.73	peak
2	2483.500	75.87	-24.27	51.60	74.00	-22.40	peak
3	2492.250	77.06	-24.23	52.83	74.00	-21.17	peak
4	2500.000	75.58	-24.19	51.39	74.00	-22.61	peak

Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 29 of 167

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

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

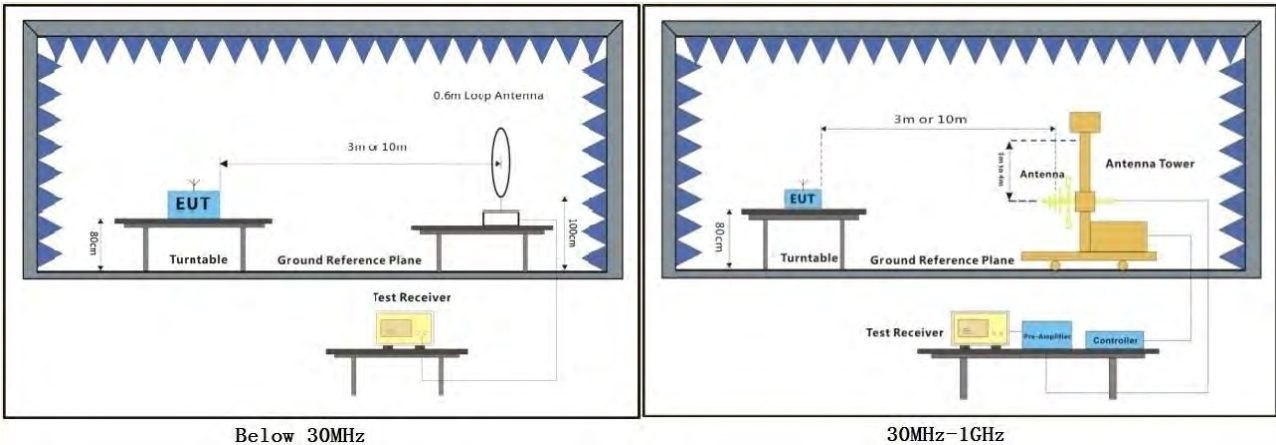
7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 21.5 °C Humidity: 46.9 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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.

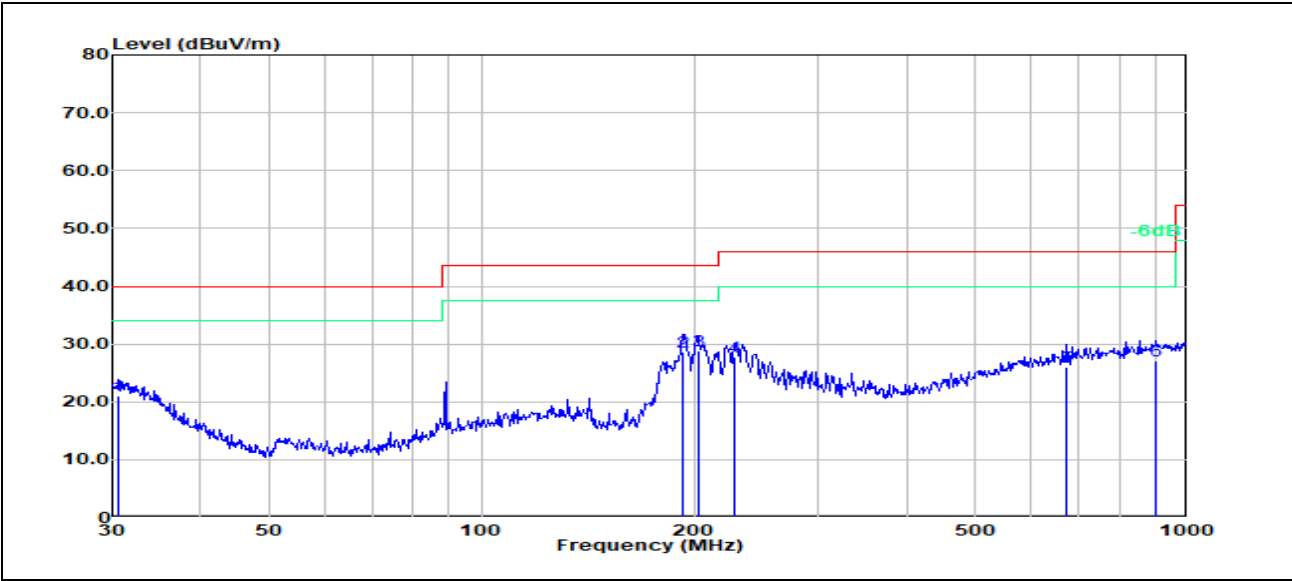
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 31 of 167

Test Mode: 06; 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	30.6379	2.05	18.91	20.96	40.00	-19.04	100	0	QP
2	193.0945	16.97	11.66	28.63	43.50	-14.87	200	32	QP
3	202.8104	17.23	11.51	28.74	43.50	-14.76	100	53	QP
4	228.4904	14.76	12.93	27.69	46.00	-18.31	100	32	QP
5	675.2080	2.41	23.64	26.05	46.00	-19.95	100	294	QP
6	903.3094	1.42	25.69	27.11	46.00	-18.89	100	146	QP

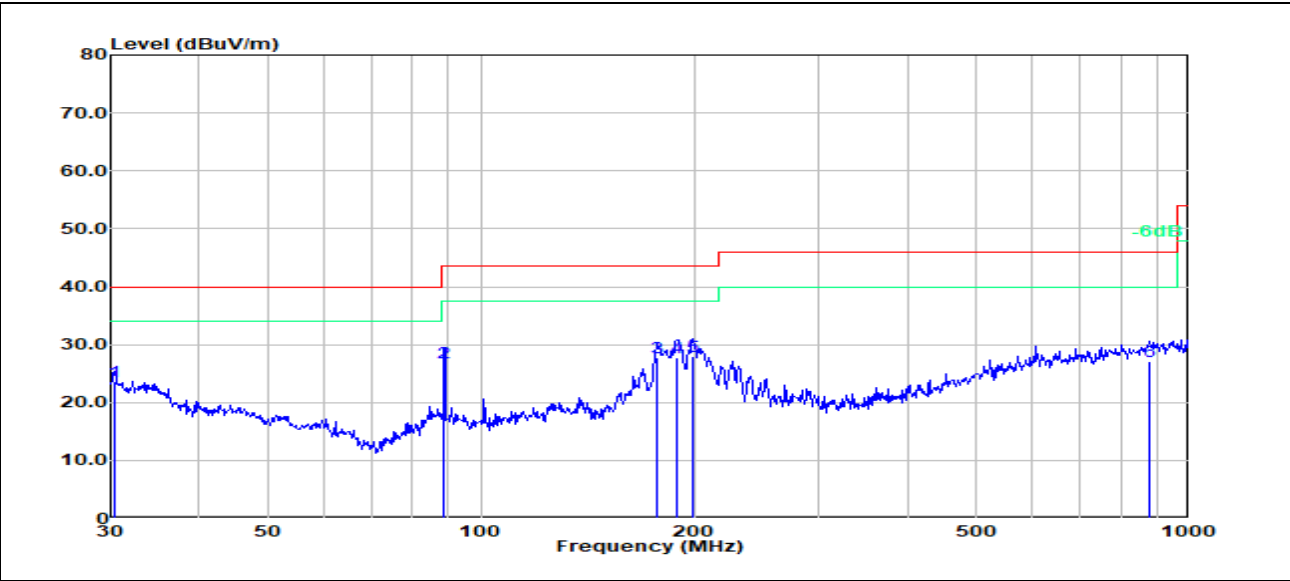
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 32 of 167

Test Mode: 06; 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	30.3173	4.46	19.17	23.63	40.00	-16.37	100	120	QP
2	88.6525	15.35	11.50	26.85	43.50	-16.65	100	299	QP
3	176.8878	15.31	12.50	27.81	43.50	-15.69	100	177	QP
4	189.0743	15.90	11.94	27.84	43.50	-15.66	100	170	QP
5	198.5880	16.08	11.78	27.86	43.50	-15.64	100	360	QP
6	878.3215	1.71	25.48	27.19	46.00	-18.81	100	228	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

Limit:

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

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 21.8 °C

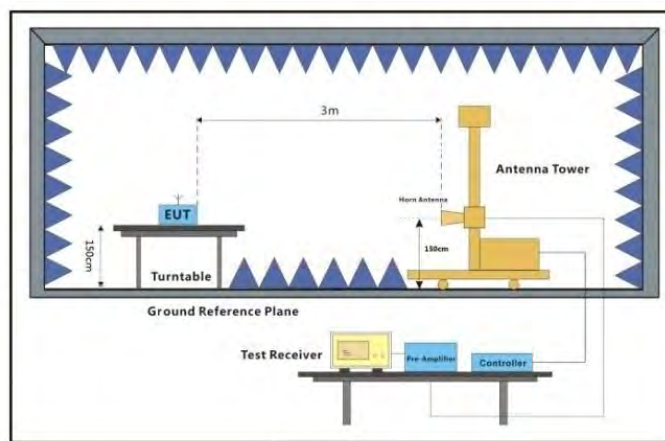
Humidity: 49.3 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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.

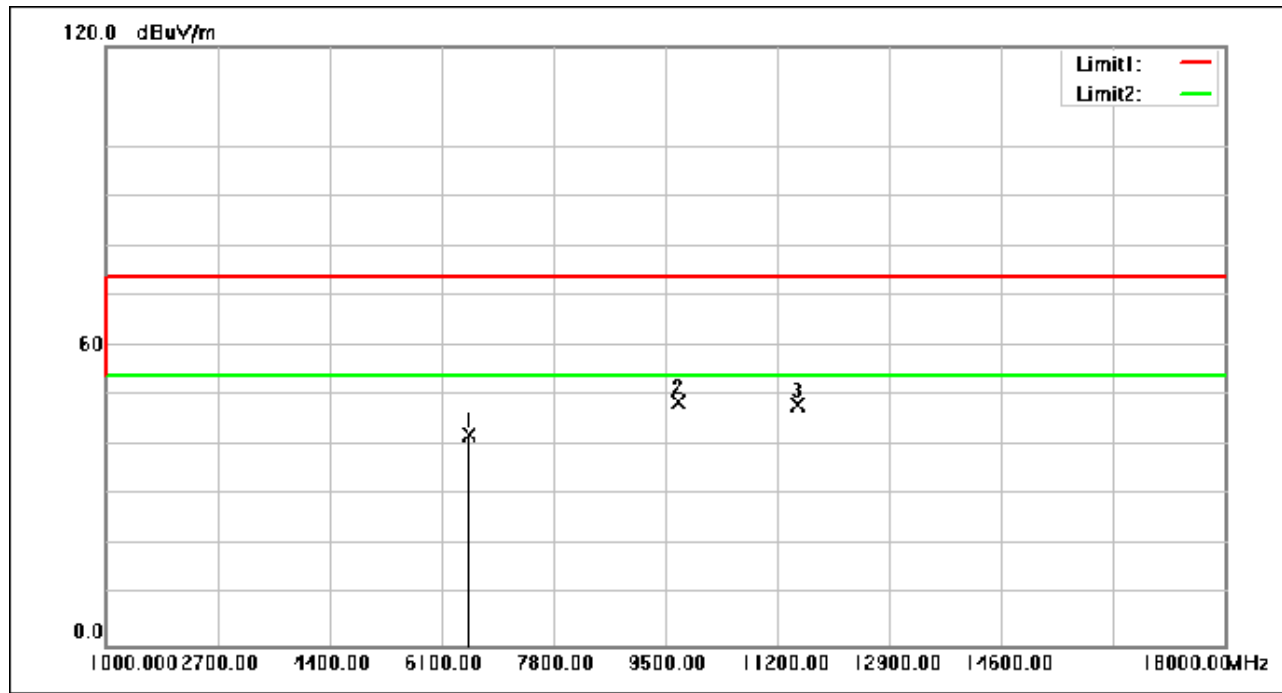
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 35 of 167

Test Mode: 06; 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	6541.320	55.14	-13.00	42.14	74.00	-31.86	peak
2	9695.840	56.24	-7.58	48.66	74.00	-25.34	peak
3	11518.920	54.57	-6.34	48.23	74.00	-25.77	peak

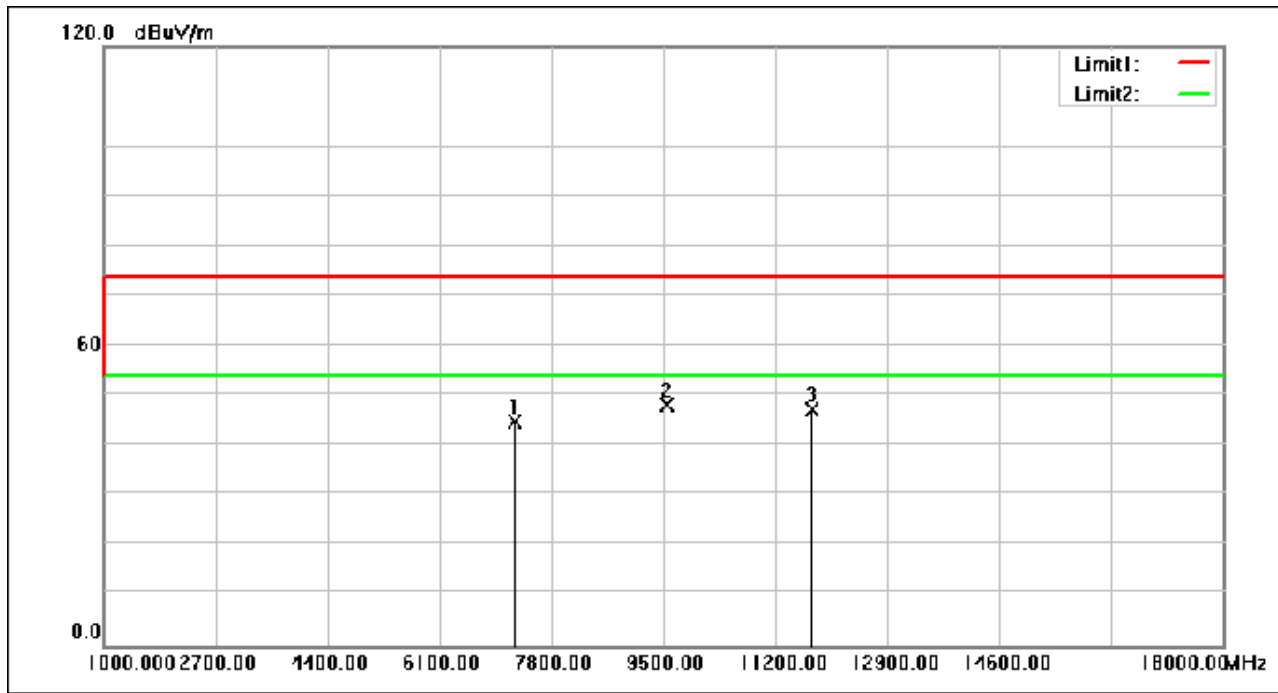
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 36 of 167

Test Mode: 06; 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	7246.480	56.43	-11.46	44.97	74.00	-29.03	peak
2	9558.480	56.08	-7.85	48.23	74.00	-25.77	peak
3	11763.040	53.53	-6.15	47.38	74.00	-26.62	peak

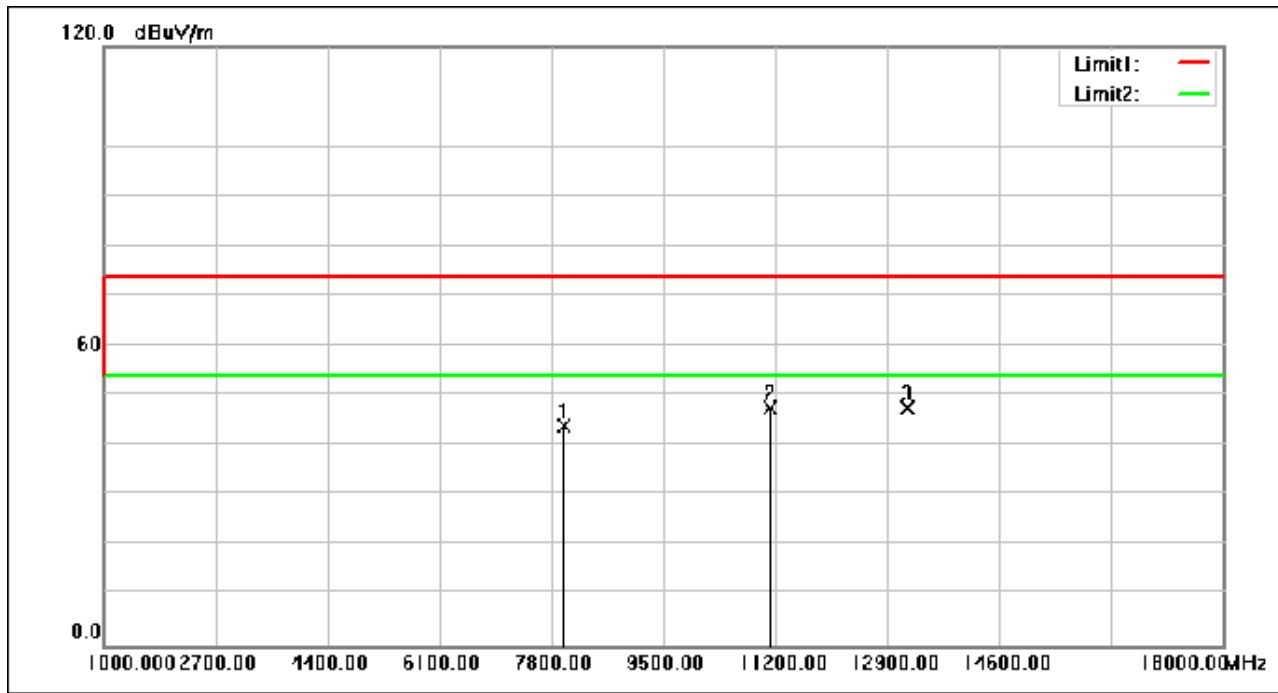
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCR240700121703

Page: 37 of 167

Test Mode: 06; 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	7992.440	54.69	-10.61	44.08	74.00	-29.92	peak
2	11130.640	54.24	-6.66	47.58	74.00	-26.42	peak
3	13209.400	53.89	-6.29	47.60	74.00	-26.40	peak

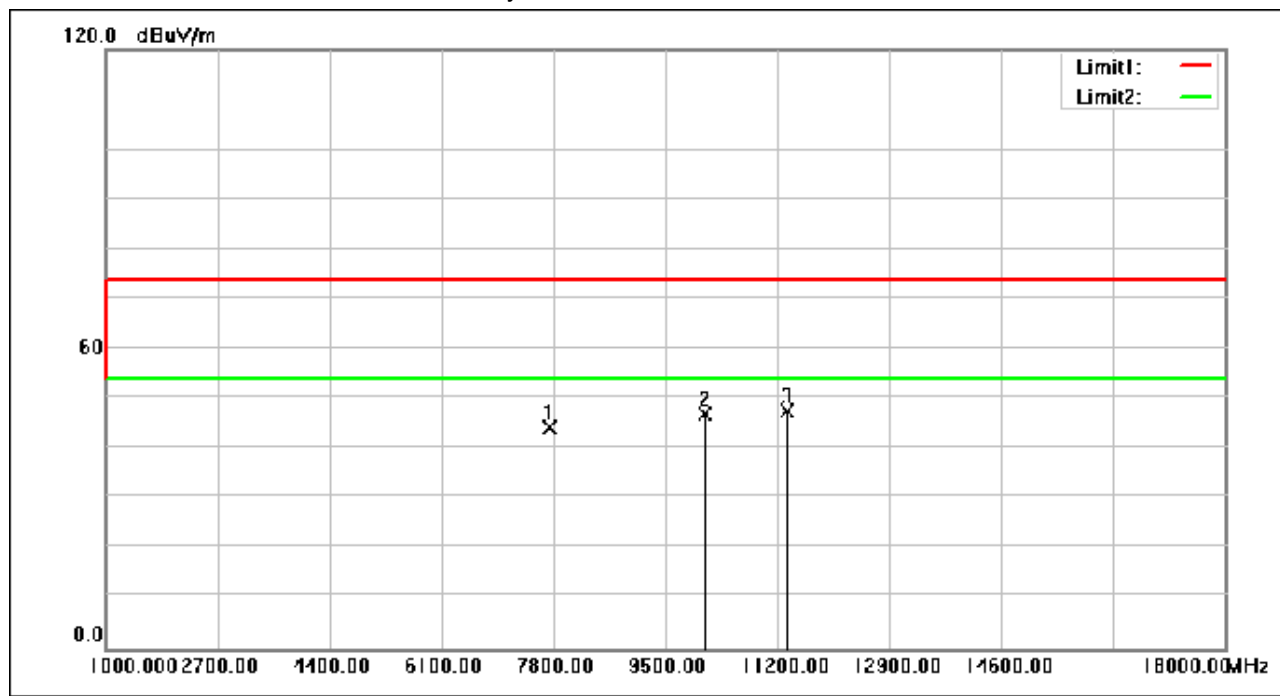
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 38 of 167

Test Mode: 06; 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	7765.320	55.08	-10.91	44.17	74.00	-29.83	peak
2	10102.480	54.10	-7.27	46.83	74.00	-27.17	peak
3	11354.360	53.95	-6.48	47.47	74.00	-26.53	peak

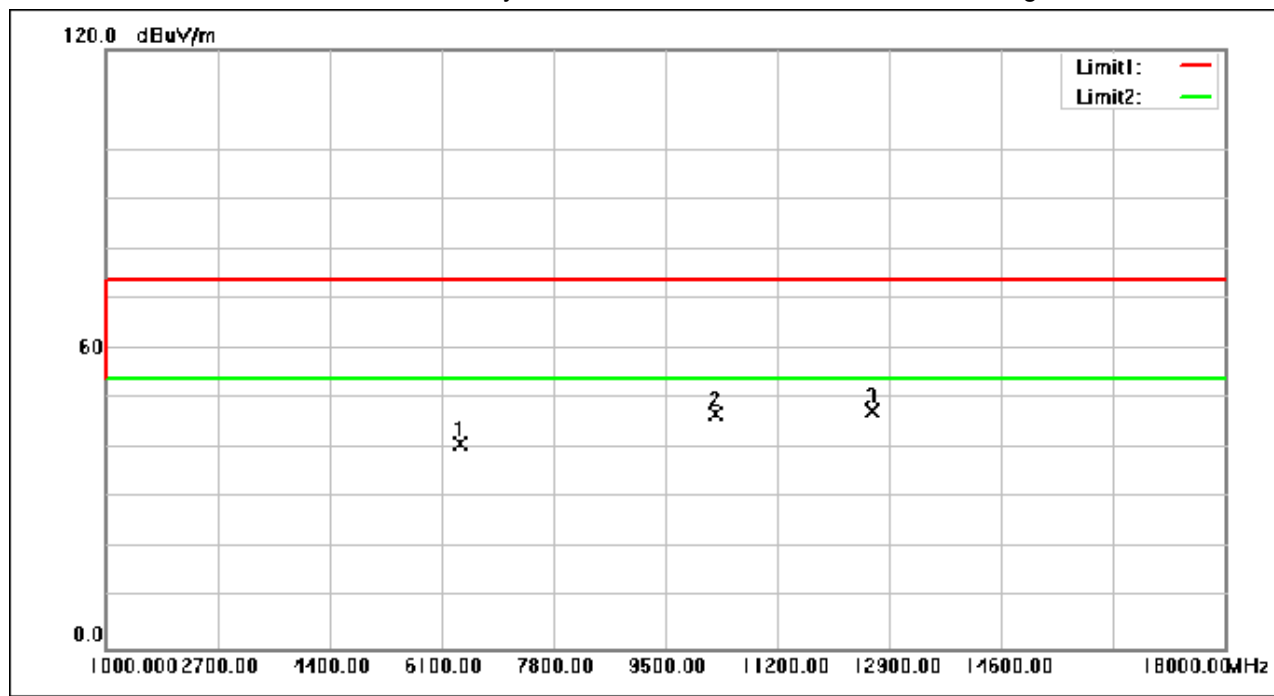
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 39 of 167

Test Mode: 06; 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	6380.840	54.92	-13.85	41.07	74.00	-32.93	peak
2	10254.800	54.03	-7.18	46.85	74.00	-27.15	peak
3	12651.800	53.62	-6.19	47.43	74.00	-26.57	peak

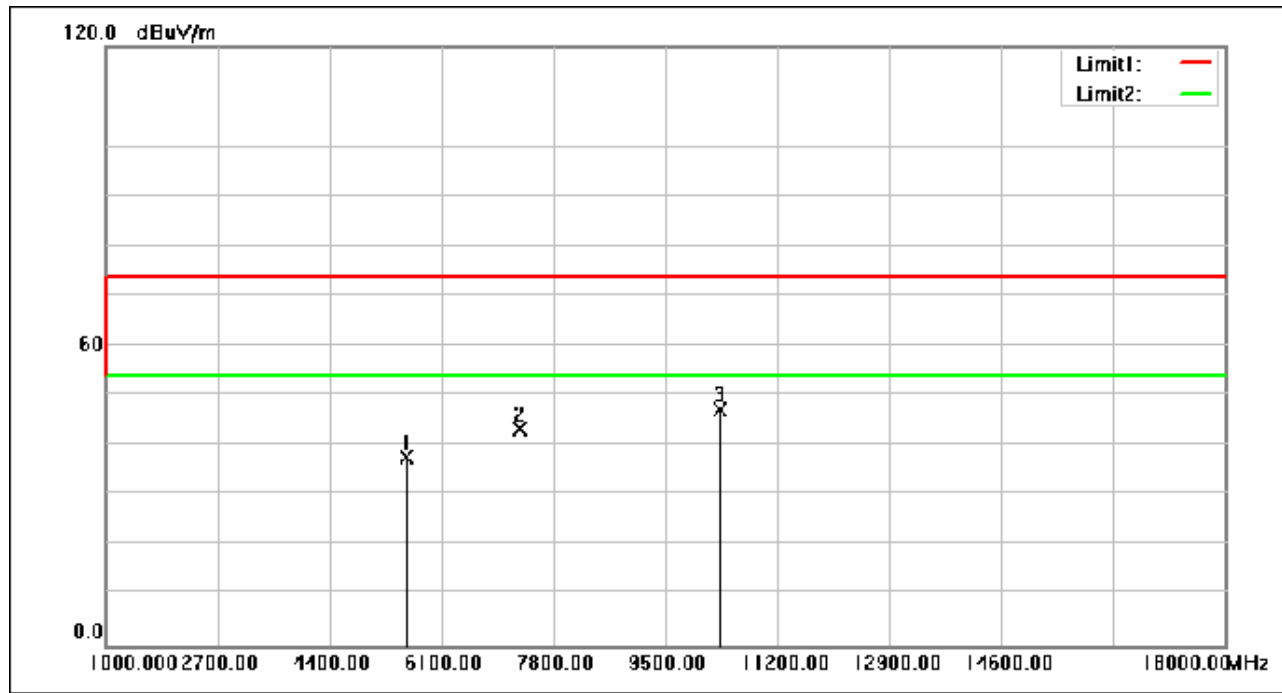
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 40 of 167

Test Mode: 06; 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	5577.080	55.20	-17.53	37.67	74.00	-36.33	peak
2	7294.080	54.83	-11.44	43.39	74.00	-30.61	peak
3	10337.760	54.41	-7.13	47.28	74.00	-26.72	peak

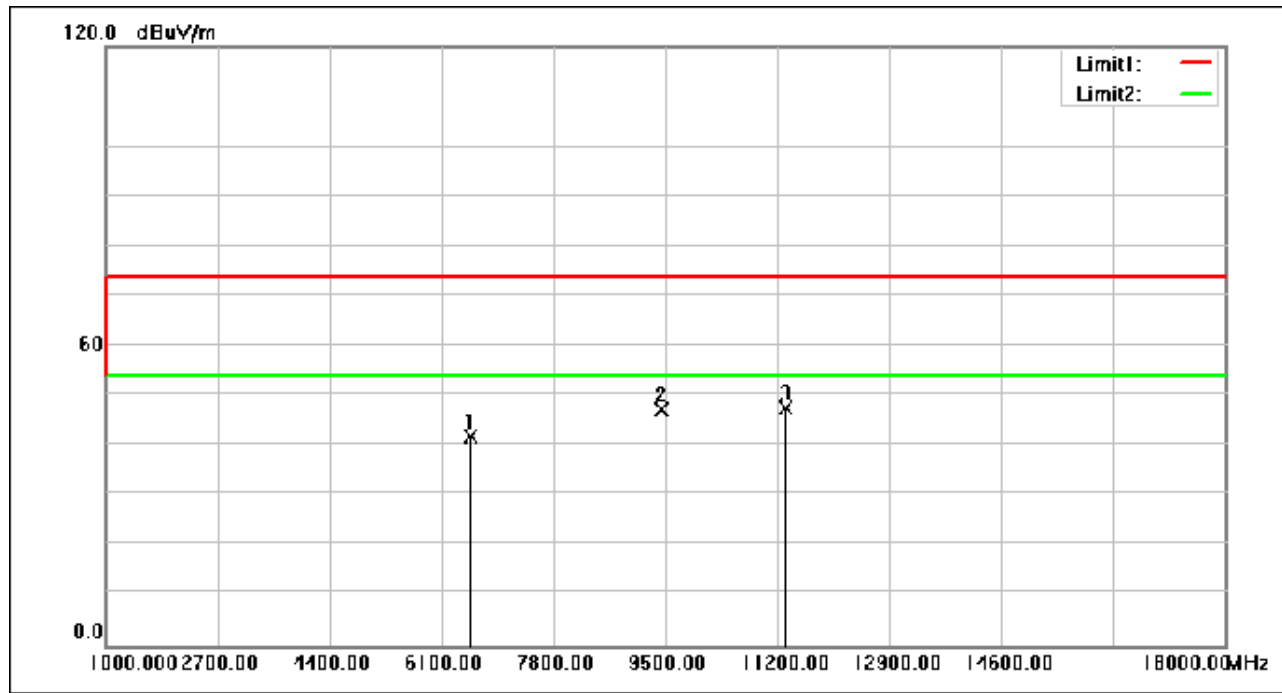
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 41 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: $\pi/4$ DQPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6550.840	54.96	-12.96	42.00	74.00	-32.00	peak
2	9459.880	55.36	-8.03	47.33	74.00	-26.67	peak
3	11333.960	53.95	-6.50	47.45	74.00	-26.55	peak

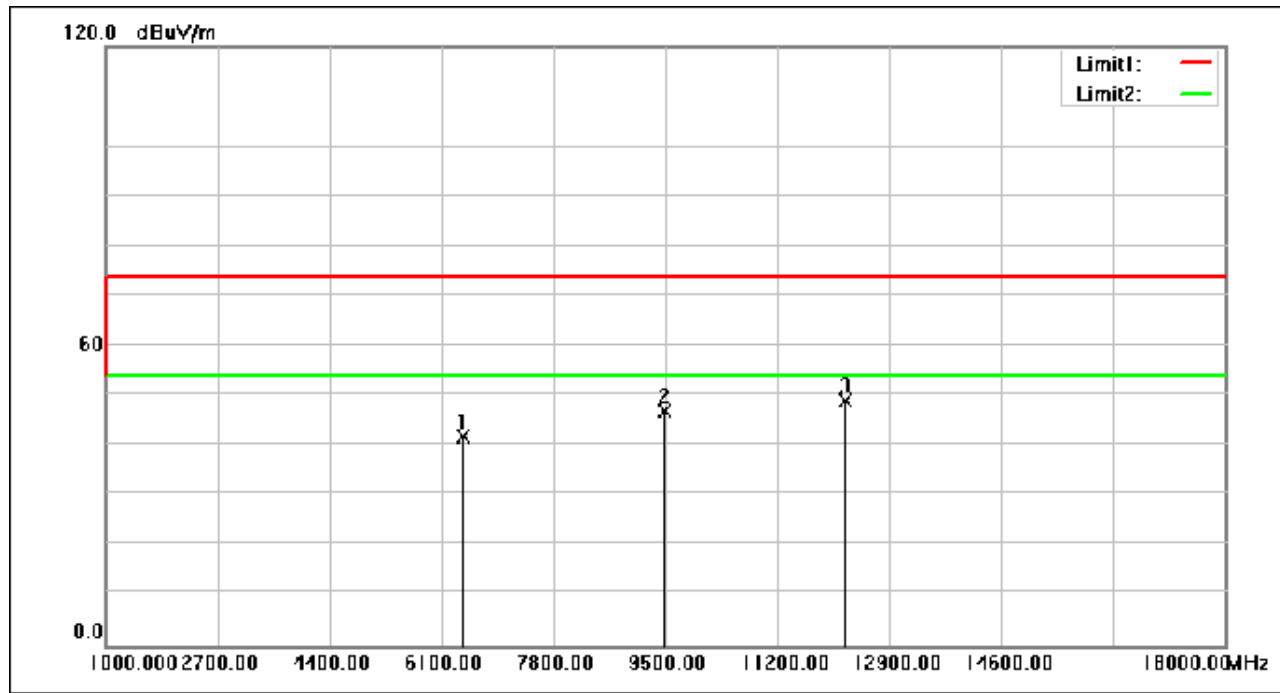
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 42 of 167

Test Mode: 06; Polarity: Vertical; Modulation: $\pi/4$ DQPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6423.680	55.51	-13.62	41.89	74.00	-32.11	peak
2	9486.400	54.83	-7.98	46.85	74.00	-27.15	peak
3	12222.040	54.93	-5.98	48.95	74.00	-25.05	peak

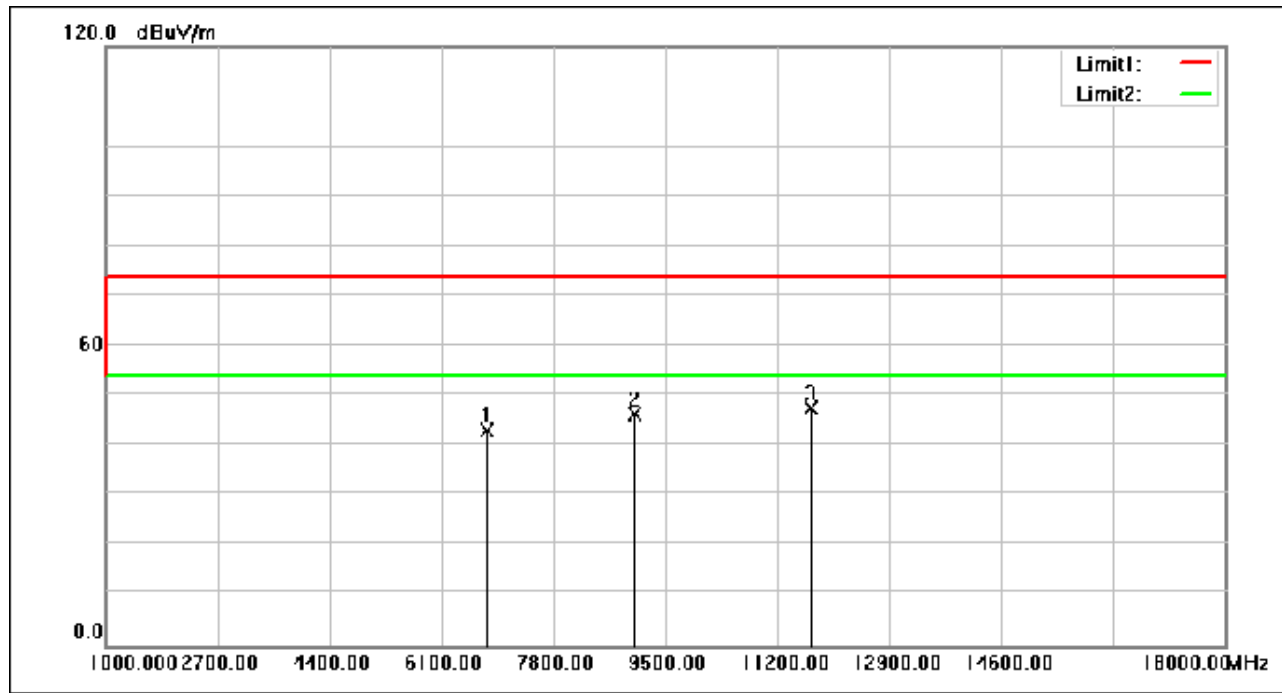
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 43 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: $\pi/4$ DQPSK; Channel: middle



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6782.040	55.05	-11.94	43.11	74.00	-30.89	peak
2	9029.440	55.04	-8.84	46.20	74.00	-27.80	peak
3	11718.160	53.81	-6.18	47.63	74.00	-26.37	peak

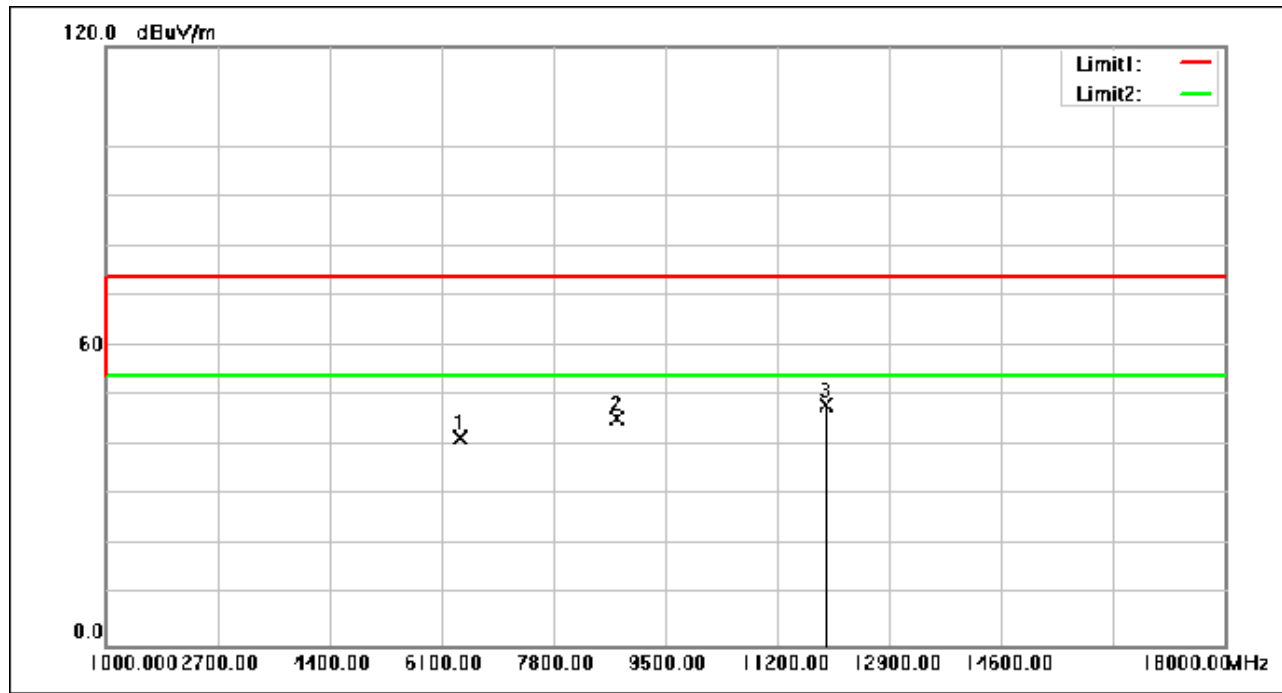
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 44 of 167

Test Mode: 06; Polarity: Vertical; Modulation: $\pi/4$ DQPSK; Channel: middle



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6400.560	55.31	-13.74	41.57	74.00	-32.43	peak
2	8773.760	54.75	-9.30	45.45	74.00	-28.55	peak
3	11941.200	54.15	-5.99	48.16	74.00	-25.84	peak

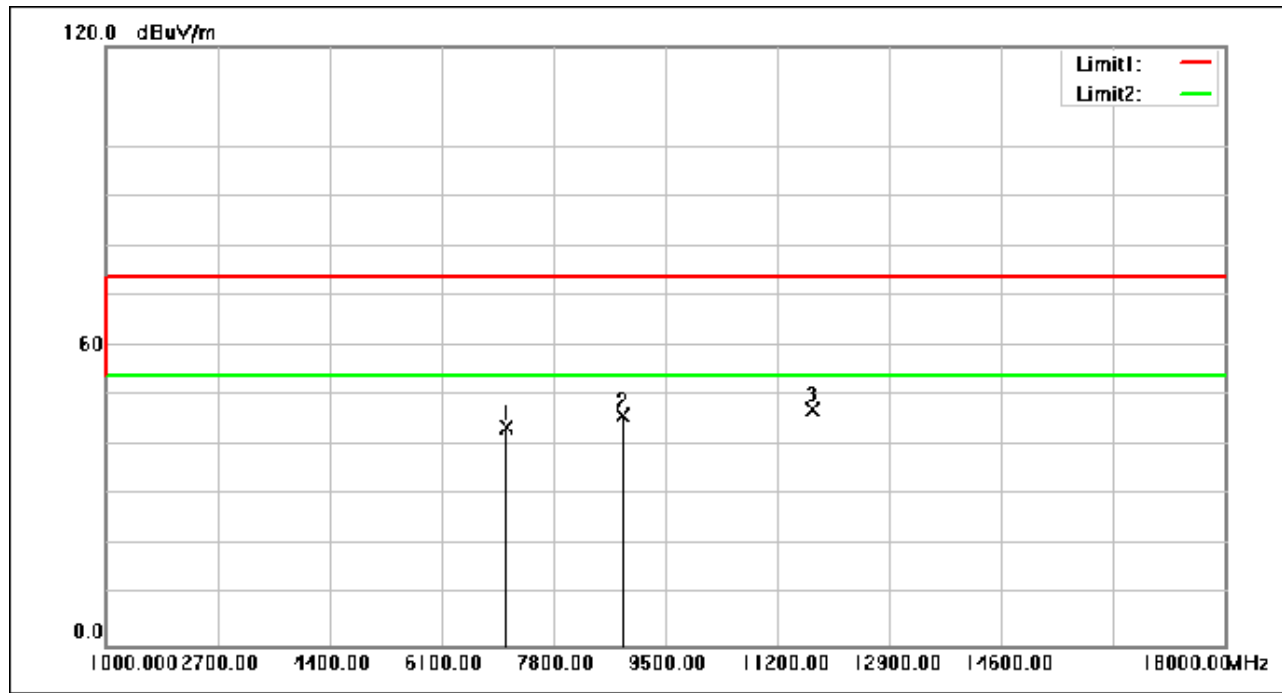
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 45 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: $\pi/4$ DQPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7097.560	55.03	-11.52	43.51	74.00	-30.49	peak
2	8862.160	55.14	-9.15	45.99	74.00	-28.01	peak
3	11729.040	53.44	-6.17	47.27	74.00	-26.73	peak

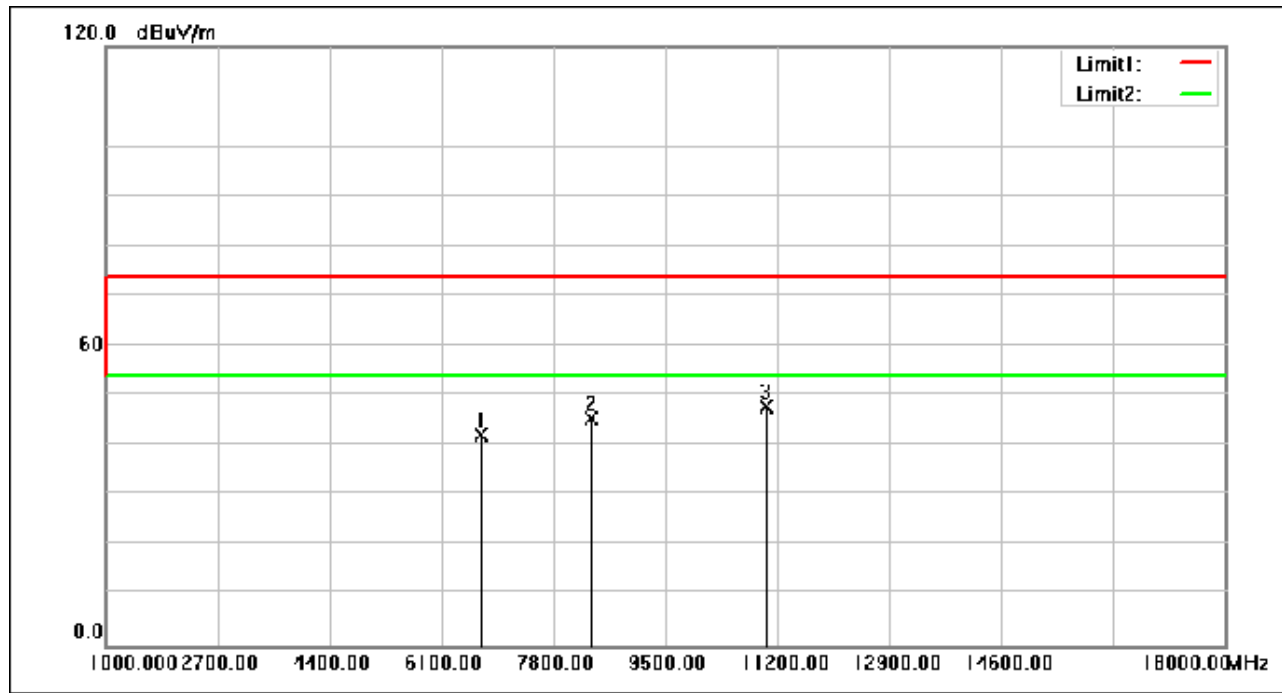
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 46 of 167

Test Mode: 06; Polarity: Vertical; Modulation: $\pi/4$ DQPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6703.160	54.39	-12.17	42.22	74.00	-31.78	peak
2	8394.320	55.51	-9.93	45.58	74.00	-28.42	peak
3	11034.080	54.62	-6.74	47.88	74.00	-26.12	peak

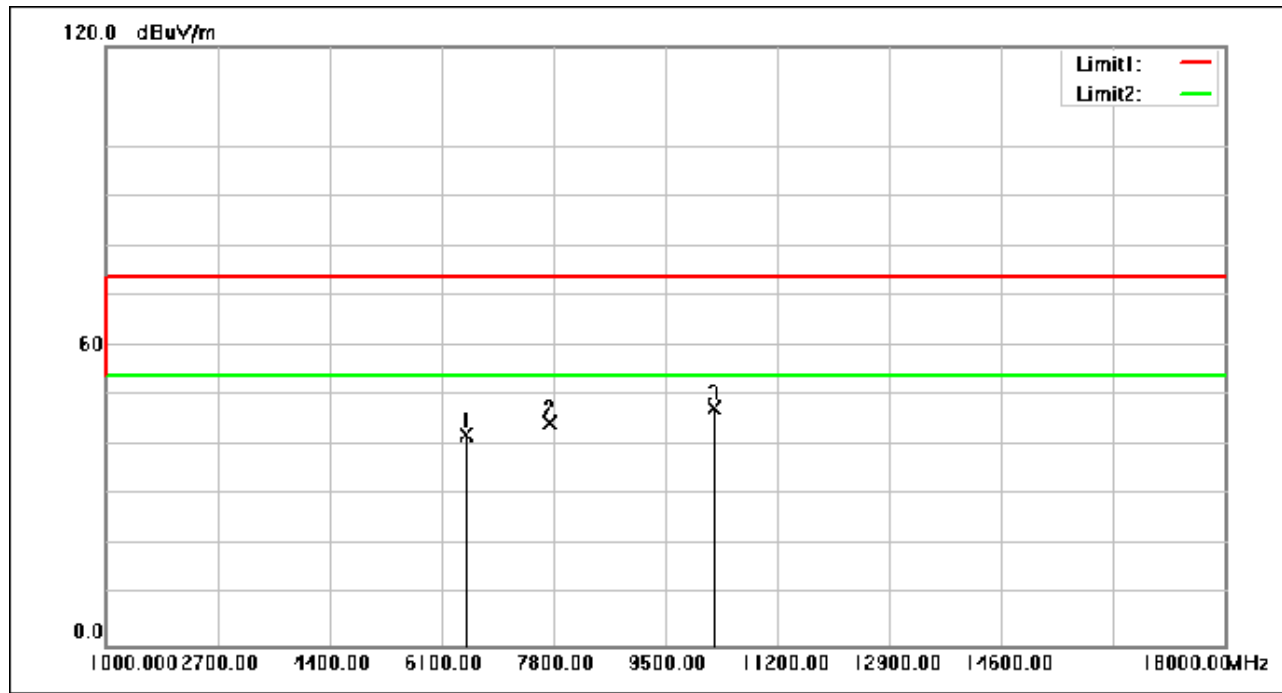
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 47 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: 8DPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6476.720	55.59	-13.35	42.24	74.00	-31.76	peak
2	7760.560	55.45	-10.91	44.54	74.00	-29.46	peak
3	10235.760	54.71	-7.19	47.52	74.00	-26.48	peak

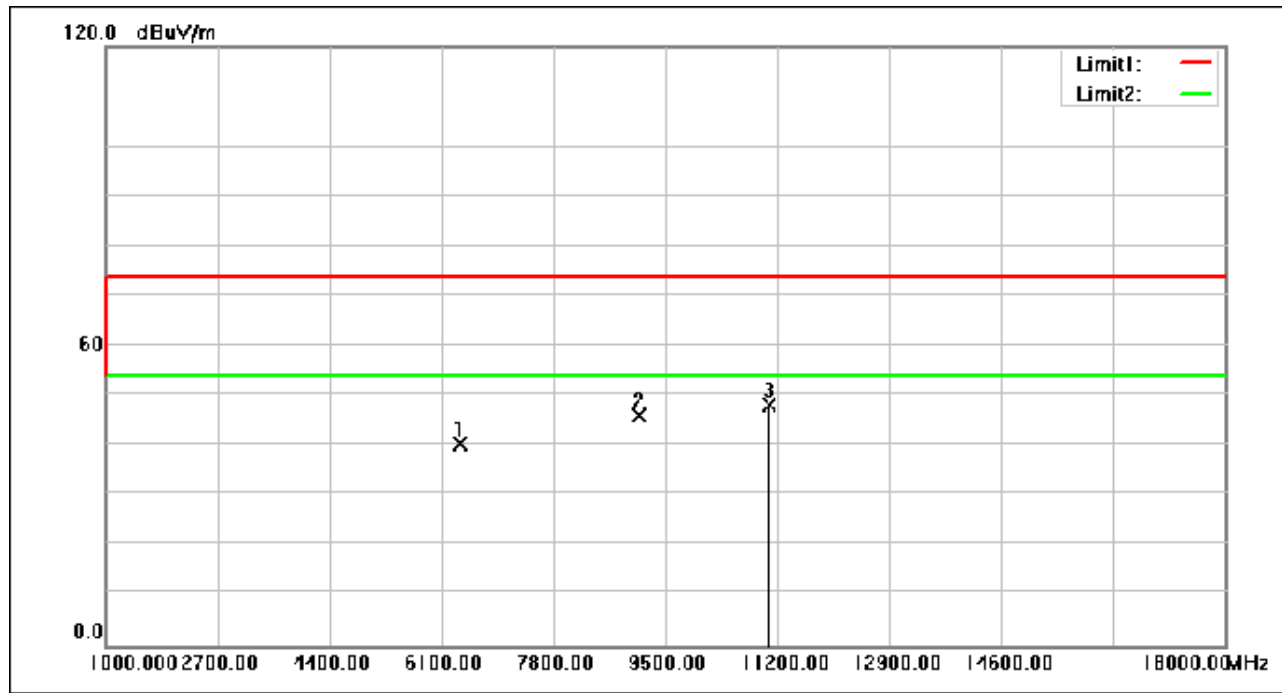
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 48 of 167

Test Mode: 06; Polarity: Vertical; Modulation: 8DPSK; Channel: Low



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6397.160	54.23	-13.76	40.47	74.00	-33.53	peak
2	9115.120	54.66	-8.68	45.98	74.00	-28.02	peak
3	11078.280	54.76	-6.70	48.06	74.00	-25.94	peak

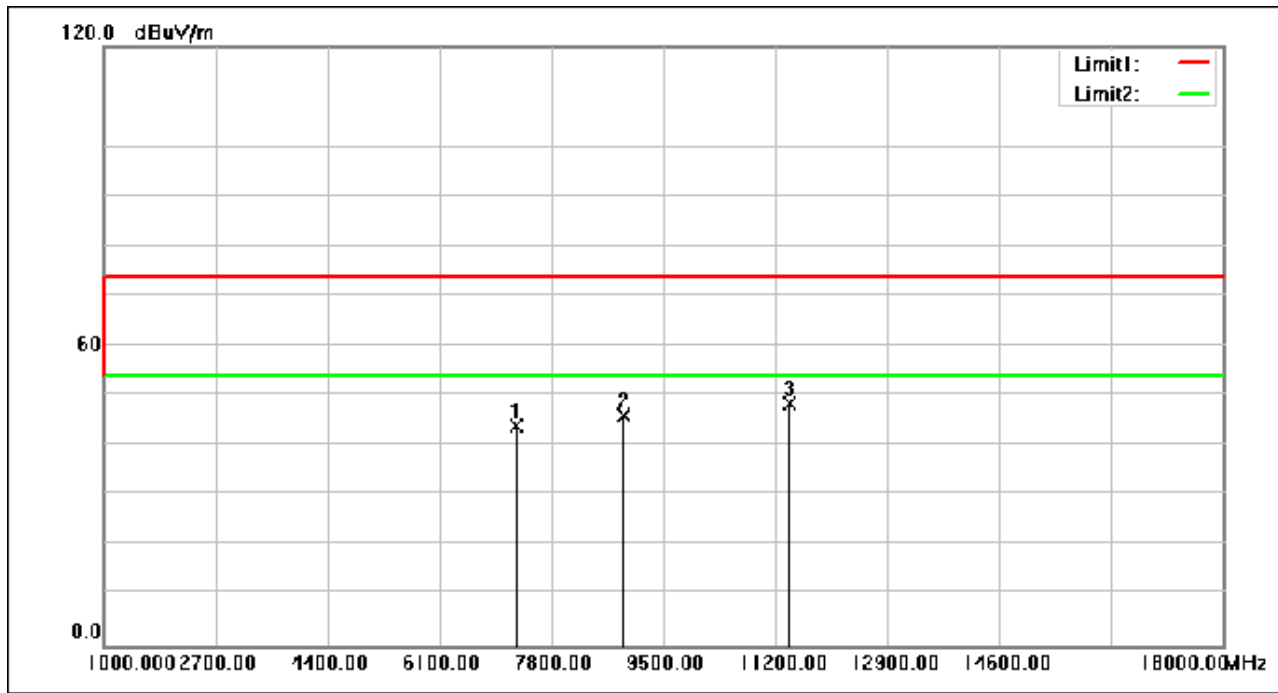
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 49 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: 8DPSK; Channel: middle



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7288.640	55.35	-11.44	43.91	74.00	-30.09	peak
2	8911.800	55.13	-9.08	46.05	74.00	-27.95	peak
3	11413.520	54.76	-6.43	48.33	74.00	-25.67	peak

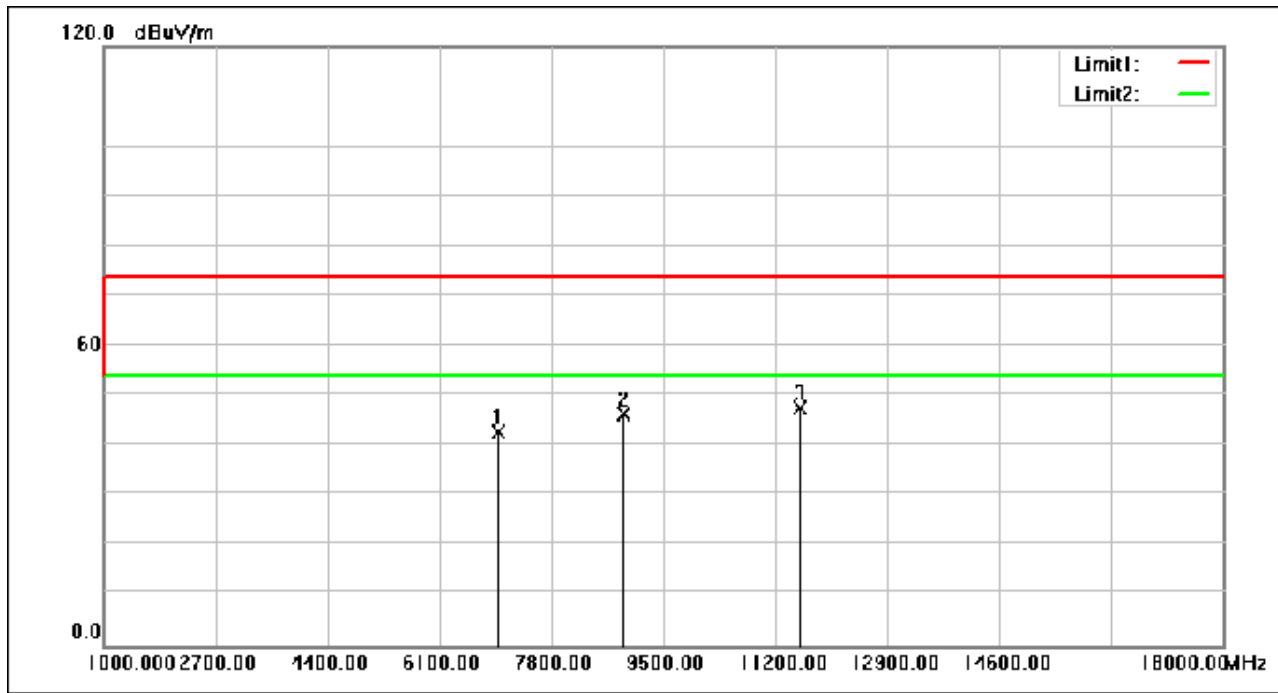
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 50 of 167

Test Mode: 06; Polarity: Vertical; Modulation: 8DPSK; Channel: middle



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7007.800	54.40	-11.56	42.84	74.00	-31.16	peak
2	8912.480	55.30	-9.08	46.22	74.00	-27.78	peak
3	11574.680	53.78	-6.30	47.48	74.00	-26.52	peak

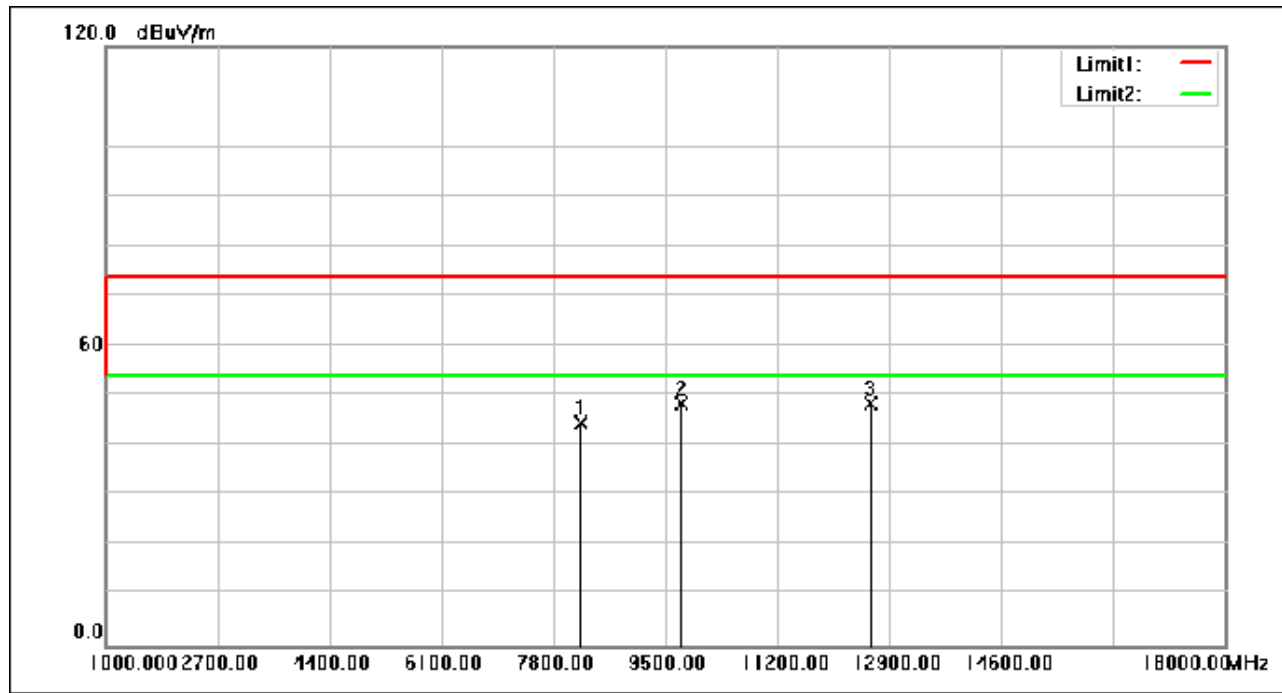
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 51 of 167

Test Mode: 06; Polarity: Horizontal; Modulation: 8DPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	8210.040	54.84	-10.24	44.60	74.00	-29.40	peak
2	9740.040	55.91	-7.50	48.41	74.00	-25.59	peak
3	12615.080	54.57	-6.17	48.40	74.00	-25.60	peak

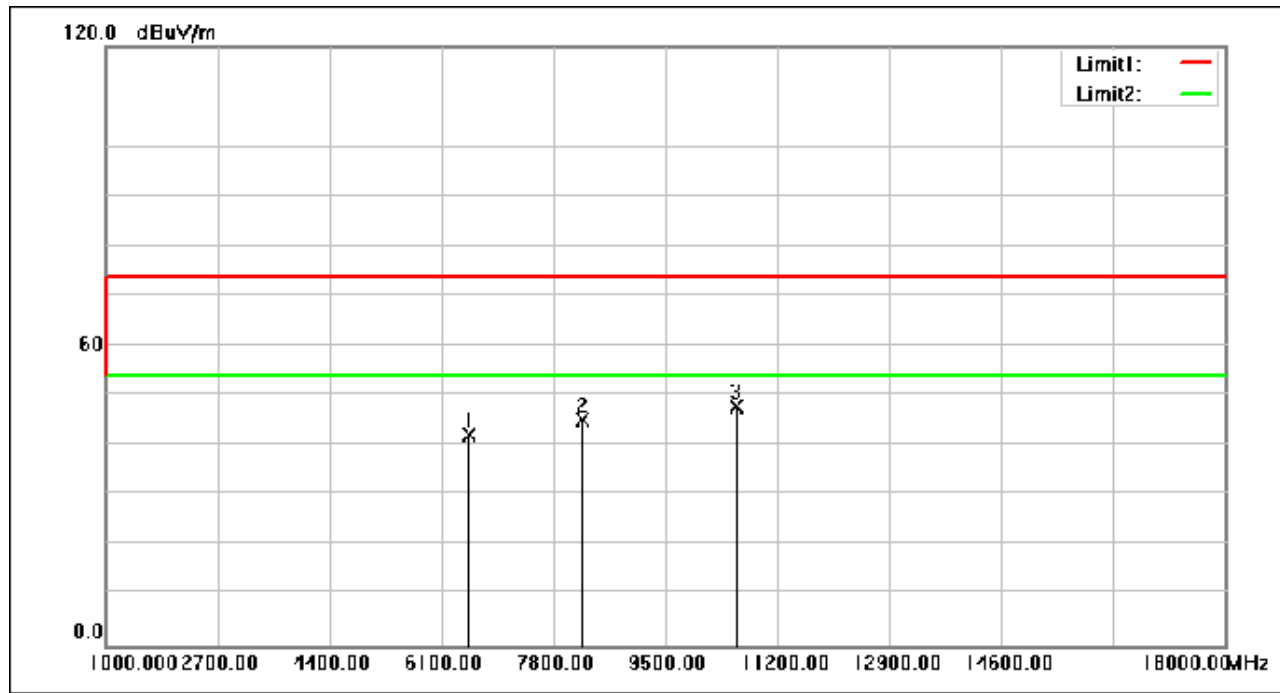
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 52 of 167

Test Mode: 06; Polarity: Vertical; Modulation: 8DPSK; Channel: High



No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6522.960	55.28	-13.10	42.18	74.00	-31.82	peak
2	8250.160	55.19	-10.16	45.03	74.00	-28.97	peak
3	10577.800	54.85	-7.00	47.85	74.00	-26.15	peak

7.5 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.5

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: 25.3 °C

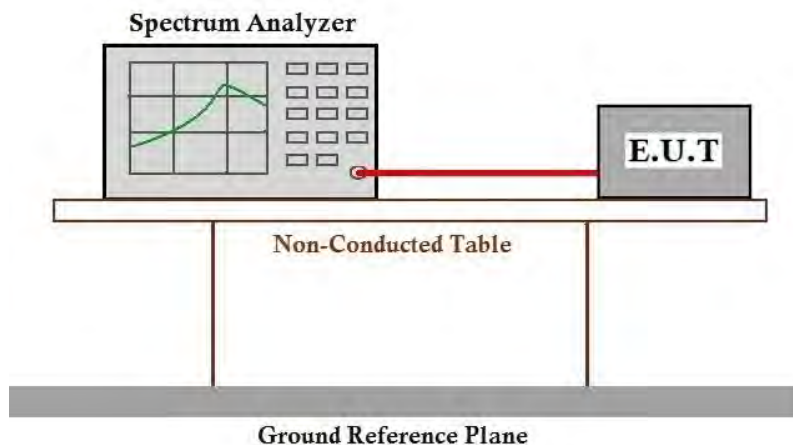
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.3 Test Setup Diagram





Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 54 of 167

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 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.7

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

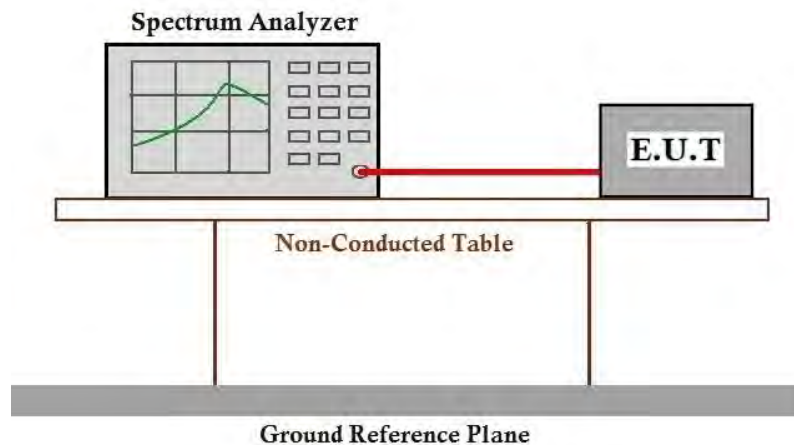
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)

Test Method: ANSI C63.10 (2013) Section 7.8.2

Limit:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

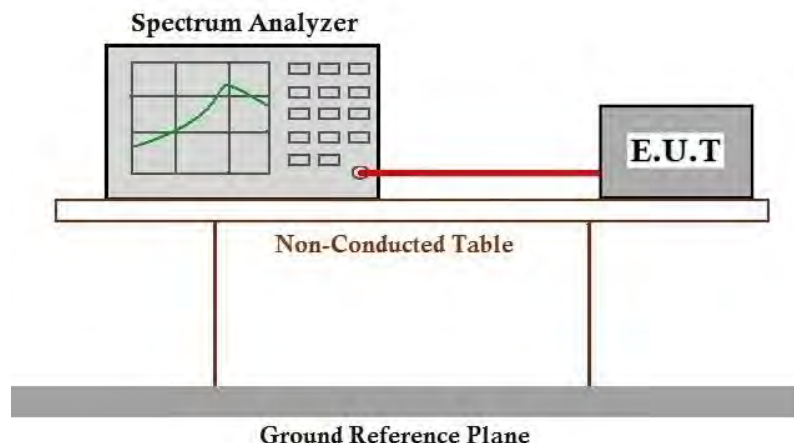
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	07	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

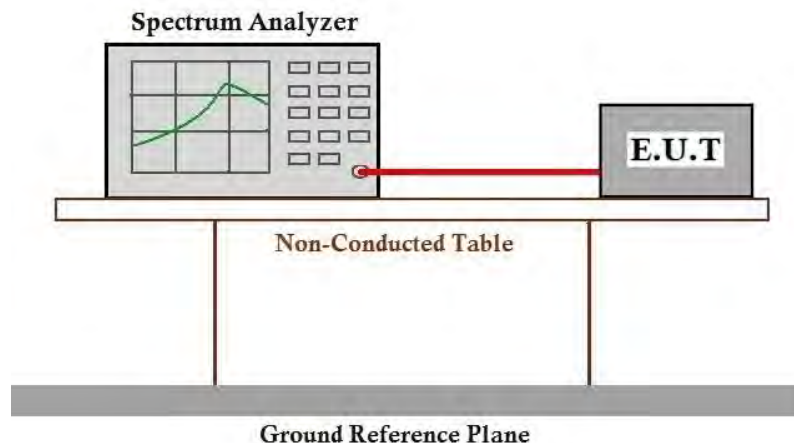
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	07	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



7.8.4 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.: KSCR240700121703

Page: 58 of 167

7.9 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

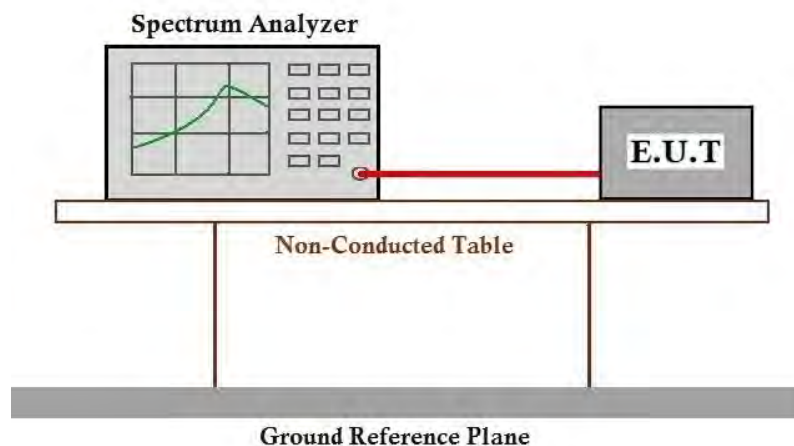
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	07	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.10 Conducted Band Edges Measurement

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

Test Method: ANSI C63.10 (2013) Section 7.8.6

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)).

7.10.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

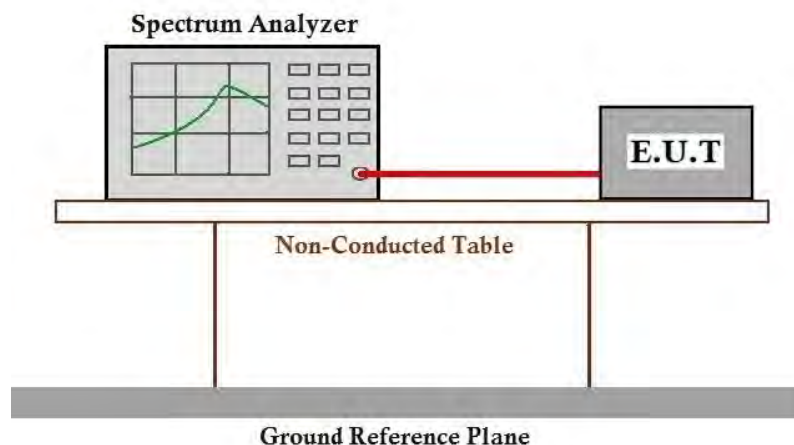
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	07	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.10.3 Test Setup Diagram





Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 60 of 167

7.10.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.11 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2013) Section 7.8.8

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)).

7.11.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

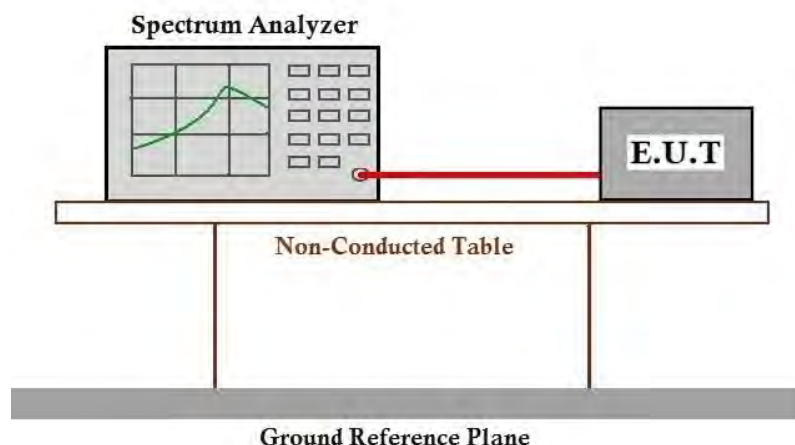
Humidity: 52.6 % RH

Atmospheric Pressure: 1010 mbar

7.11.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.11.3 Test Setup Diagram



7.11.4 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.: KSCR240700121703

Page: 62 of 167

7.12 99% Bandwidth

Test Requirement RSS-Gen Section 6.7
 Test Method: ANSI C63.10 (2013) Section 6.9.3

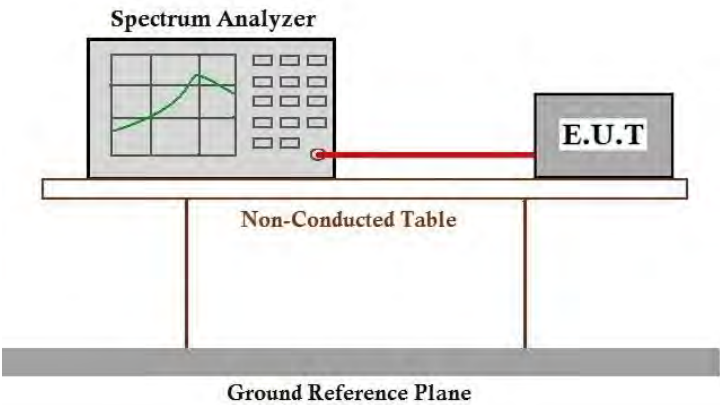
7.12.1 E.U.T. Operation

Operating Environment:
 Temperature: 25.3 °C Humidity: 52.6 % RH Atmospheric Pressure: 1010 mbar

7.12.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.12.3 Test Setup Diagram



7.12.4 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.: KSCR240700121703

Page: 63 of 167

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2407001217AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for KSCR2407001217AT

10 Appendix

Ant1

1. Bandwidth

1.1 Test Result

1.1.1 OBW

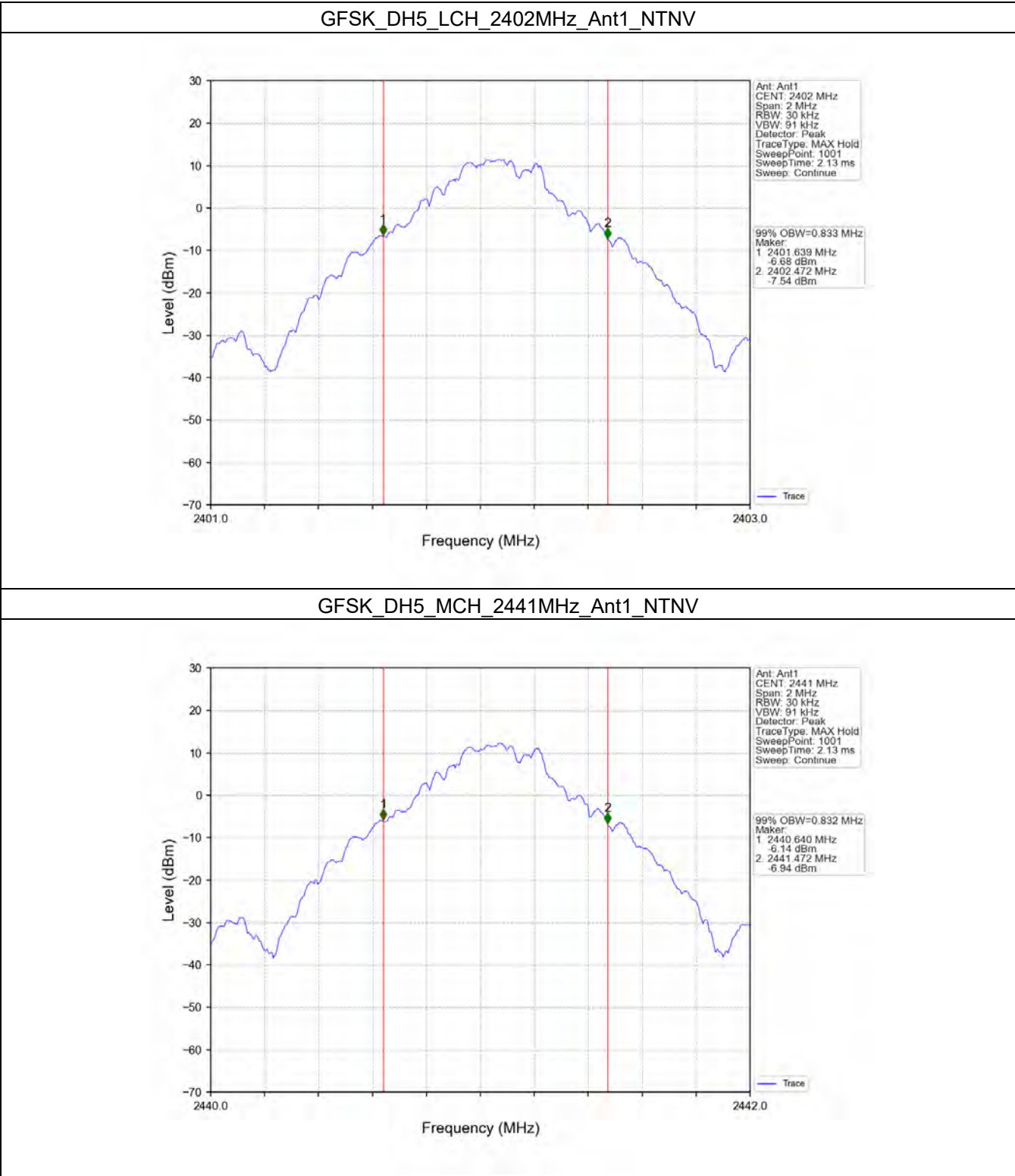
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.833	/	Pass
		2441	DH5	1	0.832	/	Pass
		2480	DH5	1	0.835	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.174	/	Pass
		2441	2DH5	1	1.176	/	Pass
		2480	2DH5	1	1.174	/	Pass
8DPSK	SISO	2402	3DH5	1	1.184	/	Pass
		2441	3DH5	1	1.182	/	Pass
		2480	3DH5	1	1.182	/	Pass

1.1.2 20dB BW

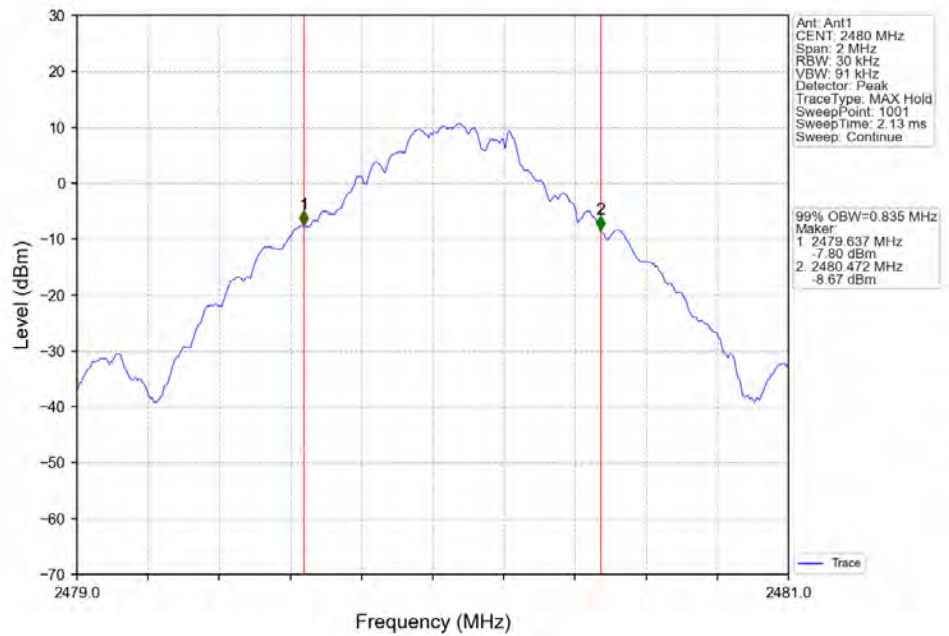
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.937	/	Pass
		2441	DH5	1	0.937	/	Pass
		2480	DH5	1	0.935	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.330	/	Pass
		2441	2DH5	1	1.338	/	Pass
		2480	2DH5	1	1.330	/	Pass
8DPSK	SISO	2402	3DH5	1	1.318	/	Pass
		2441	3DH5	1	1.319	/	Pass
		2480	3DH5	1	1.319	/	Pass

1.2 Test Graph

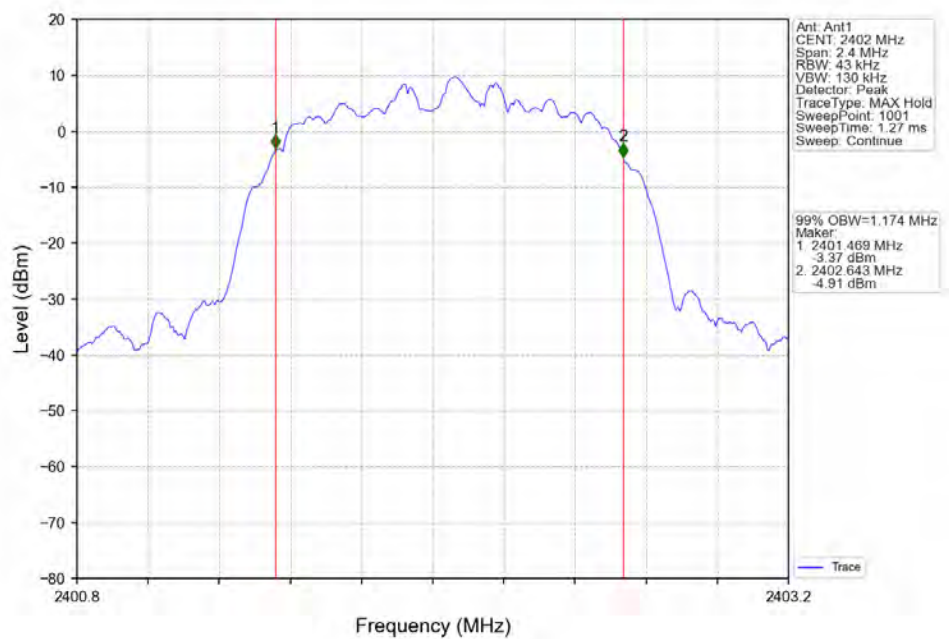
1.2.1 OBW



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



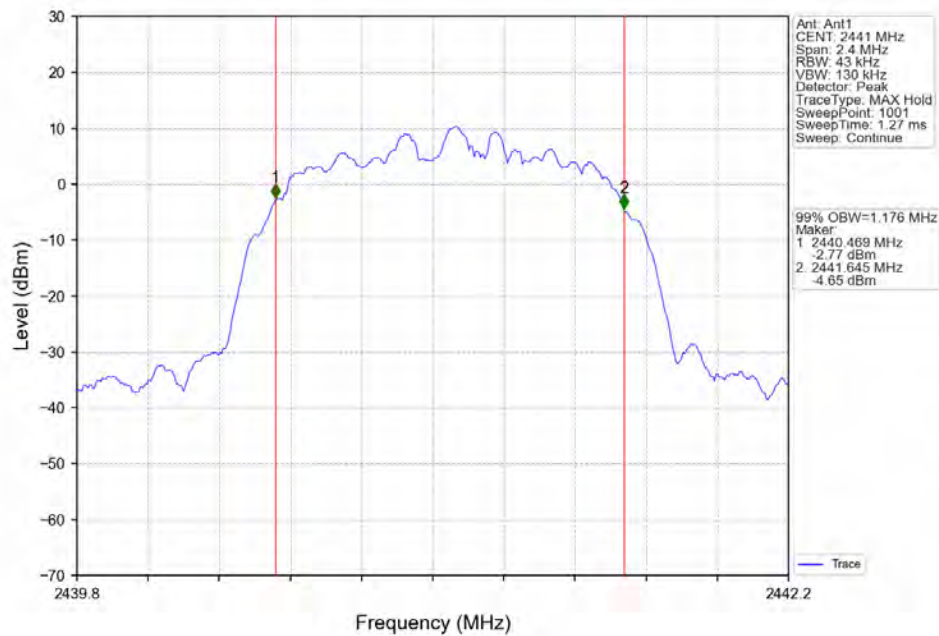
Compliance Certification Services (Kunshan) Inc.

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

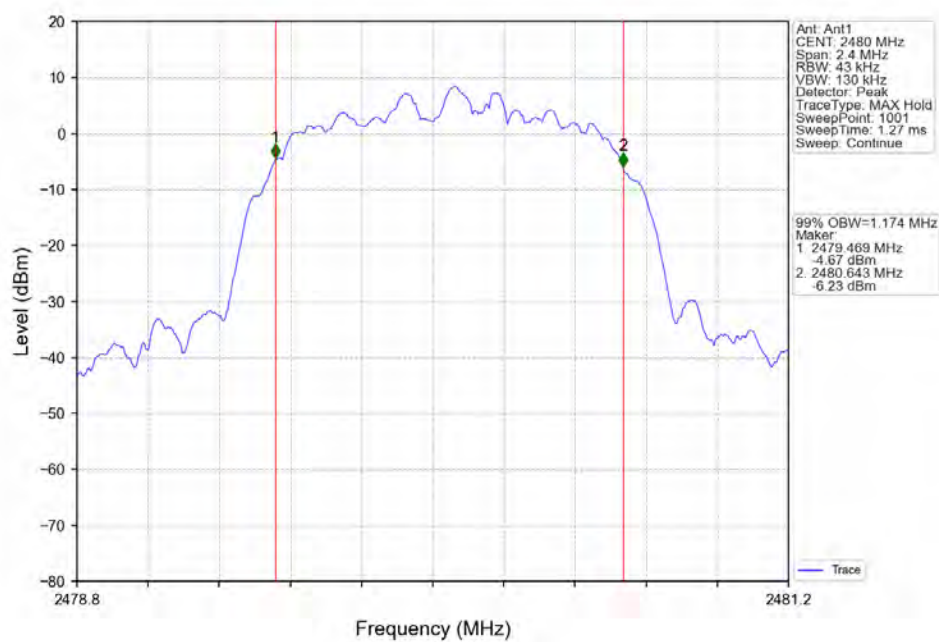
Report No.: KSCR240700121703

Page: 67 of 167

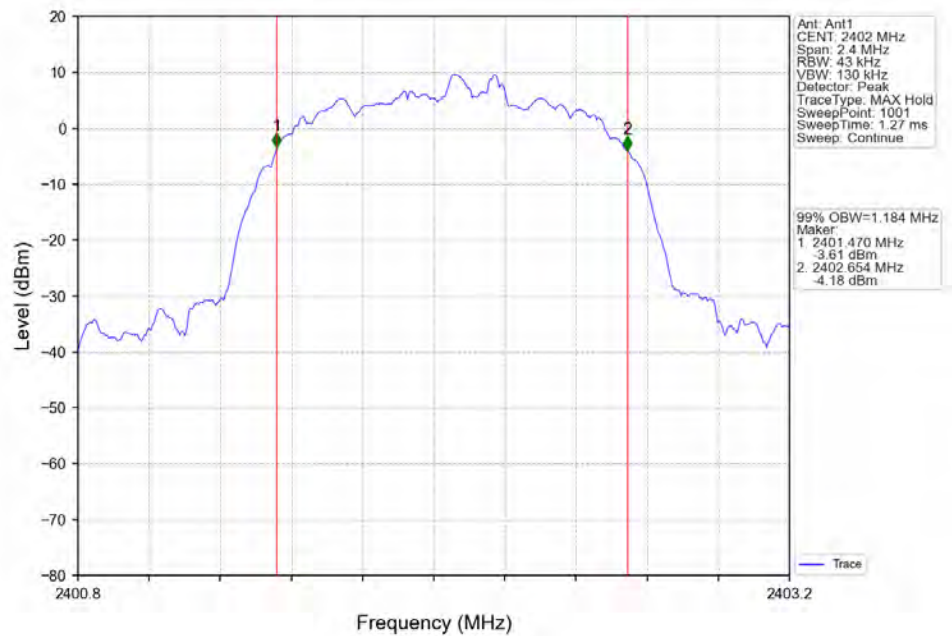
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



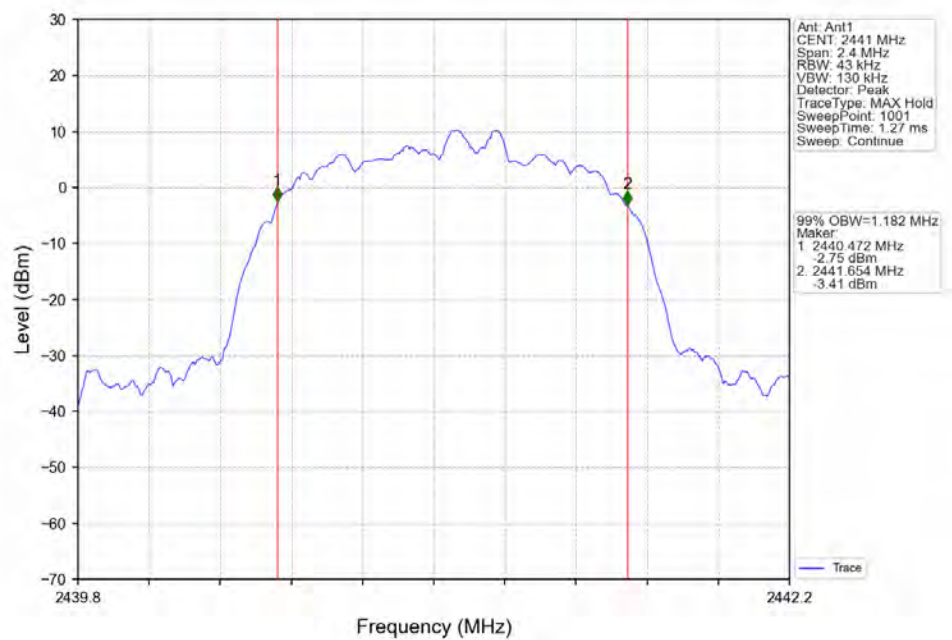
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV

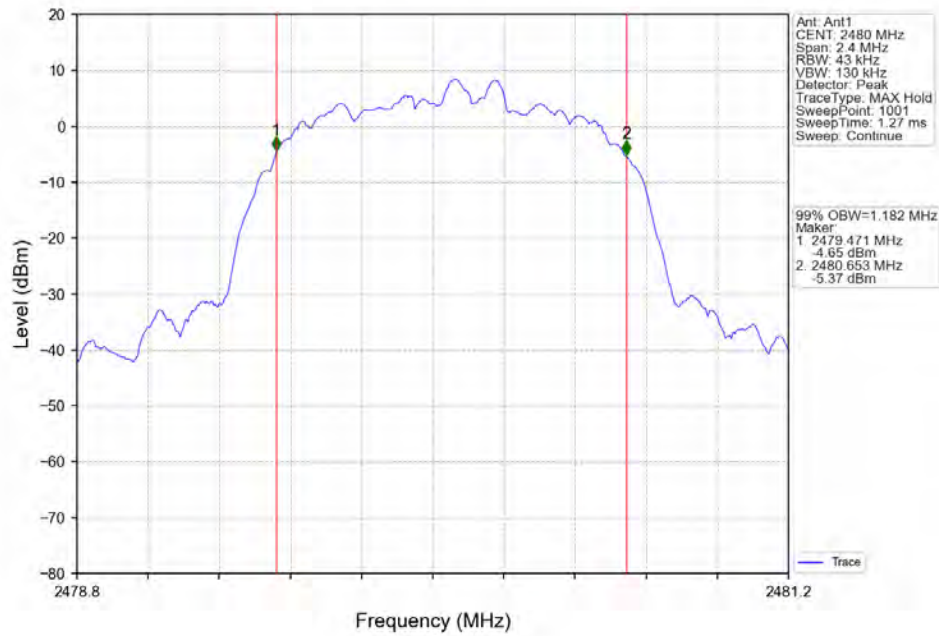


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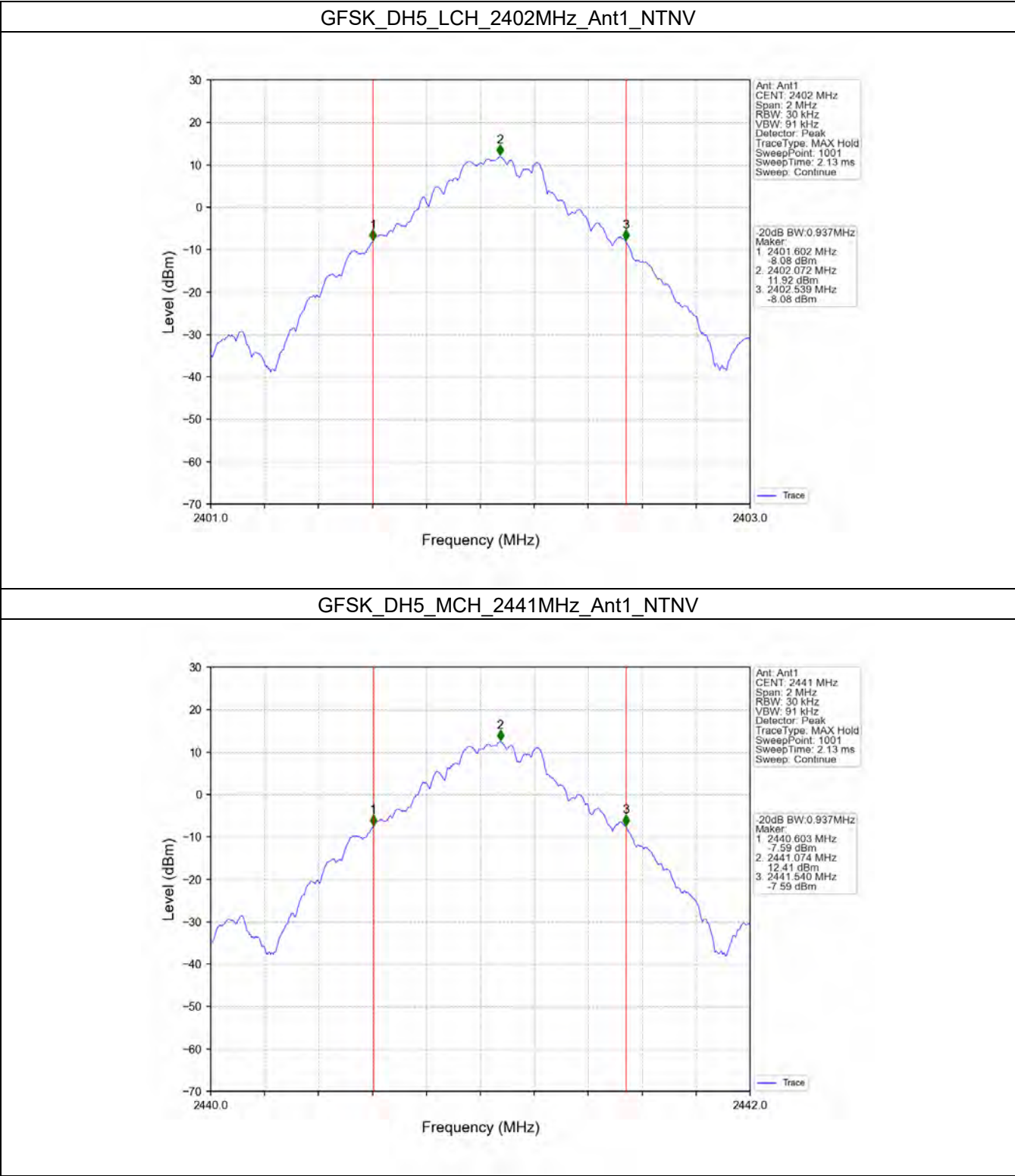
CCSEM-TRF-001 Rev. 02 Sep 01, 2023

Report No.: KSCRM240700121703

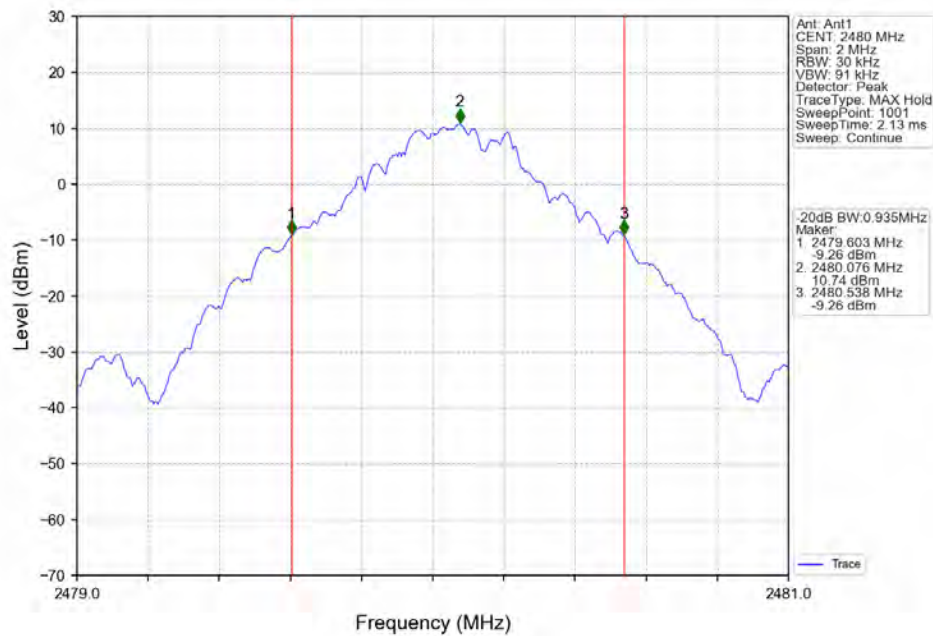
Page: 69 of 167

8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV

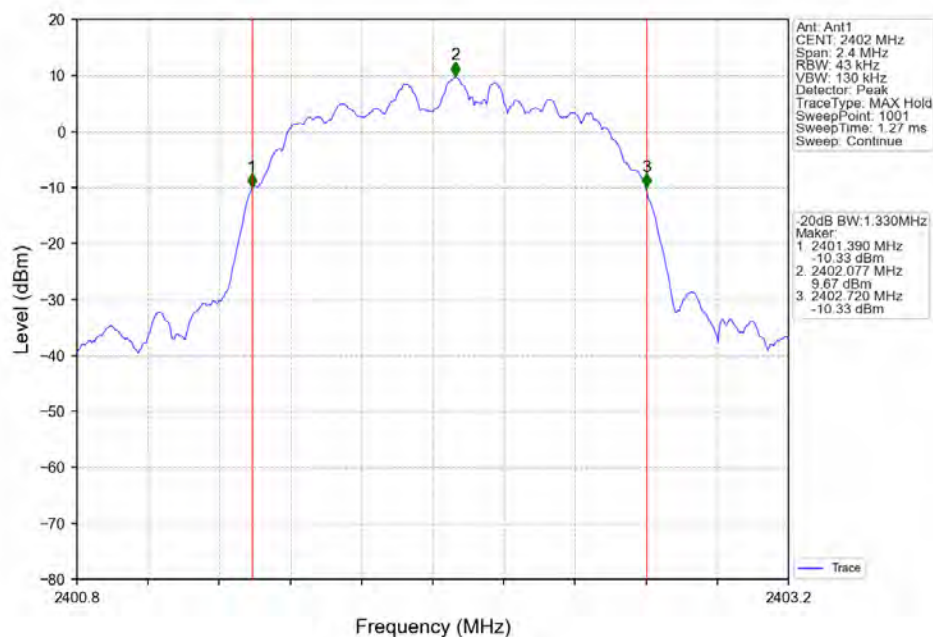
1.2.2 20dB BW



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



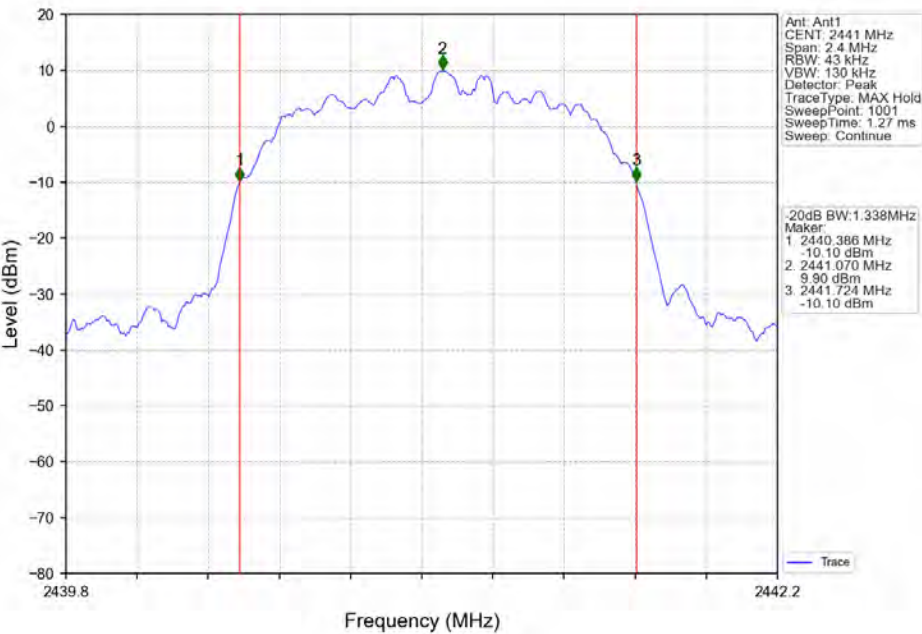
Compliance Certification Services (Kunshan) Inc.

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

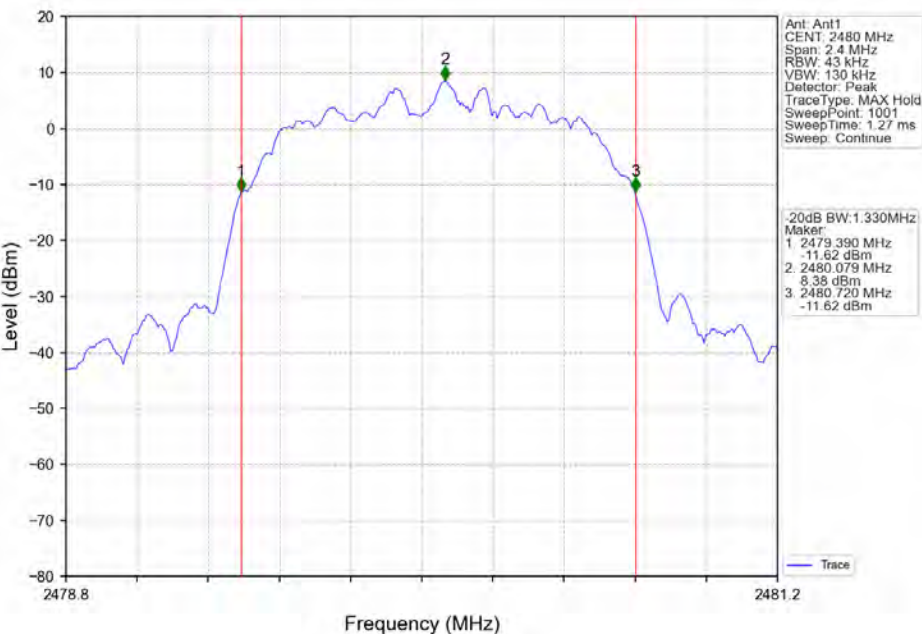
Report No.: KSCR240700121703

Page: 72 of 167

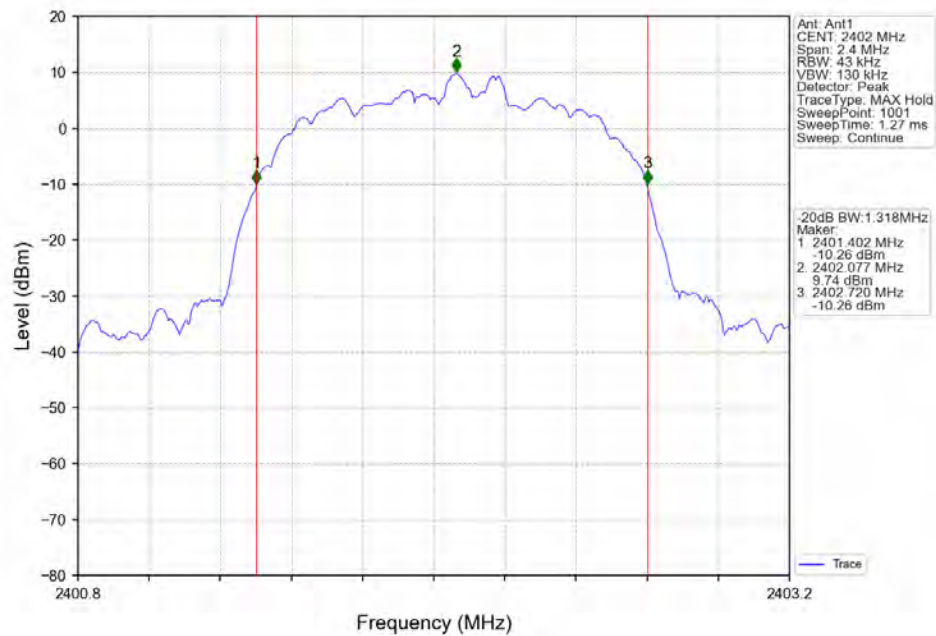
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



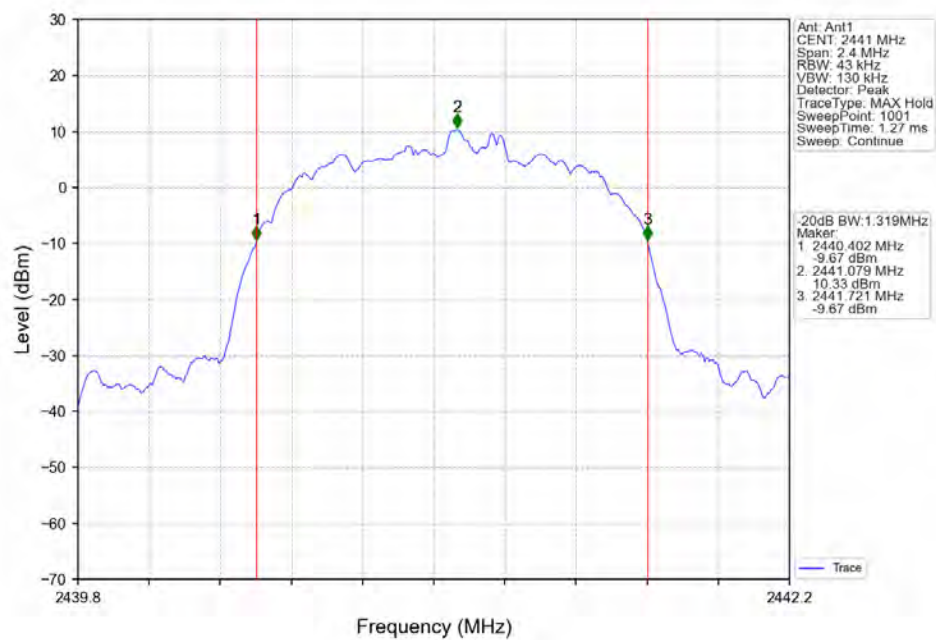
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



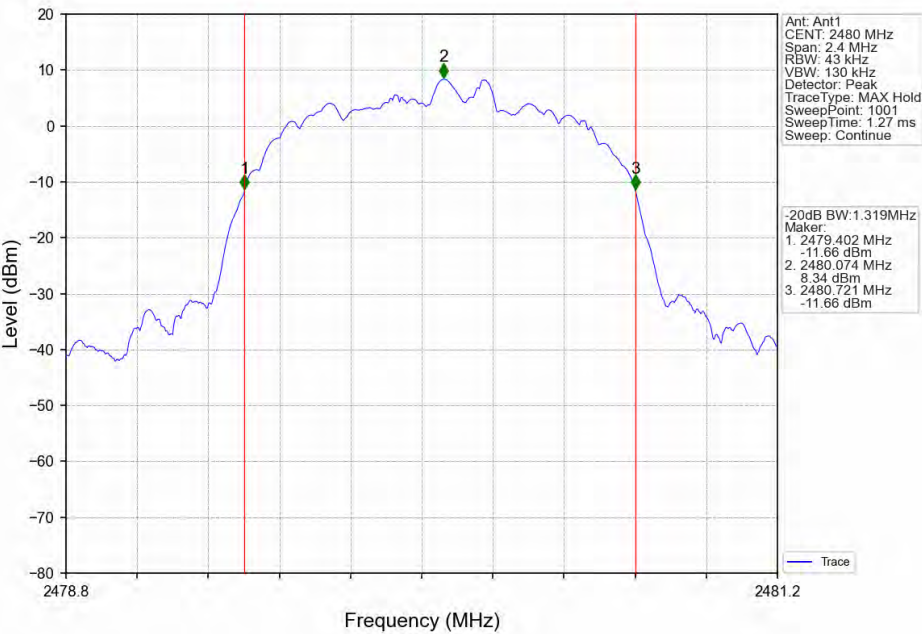
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 74 of 167

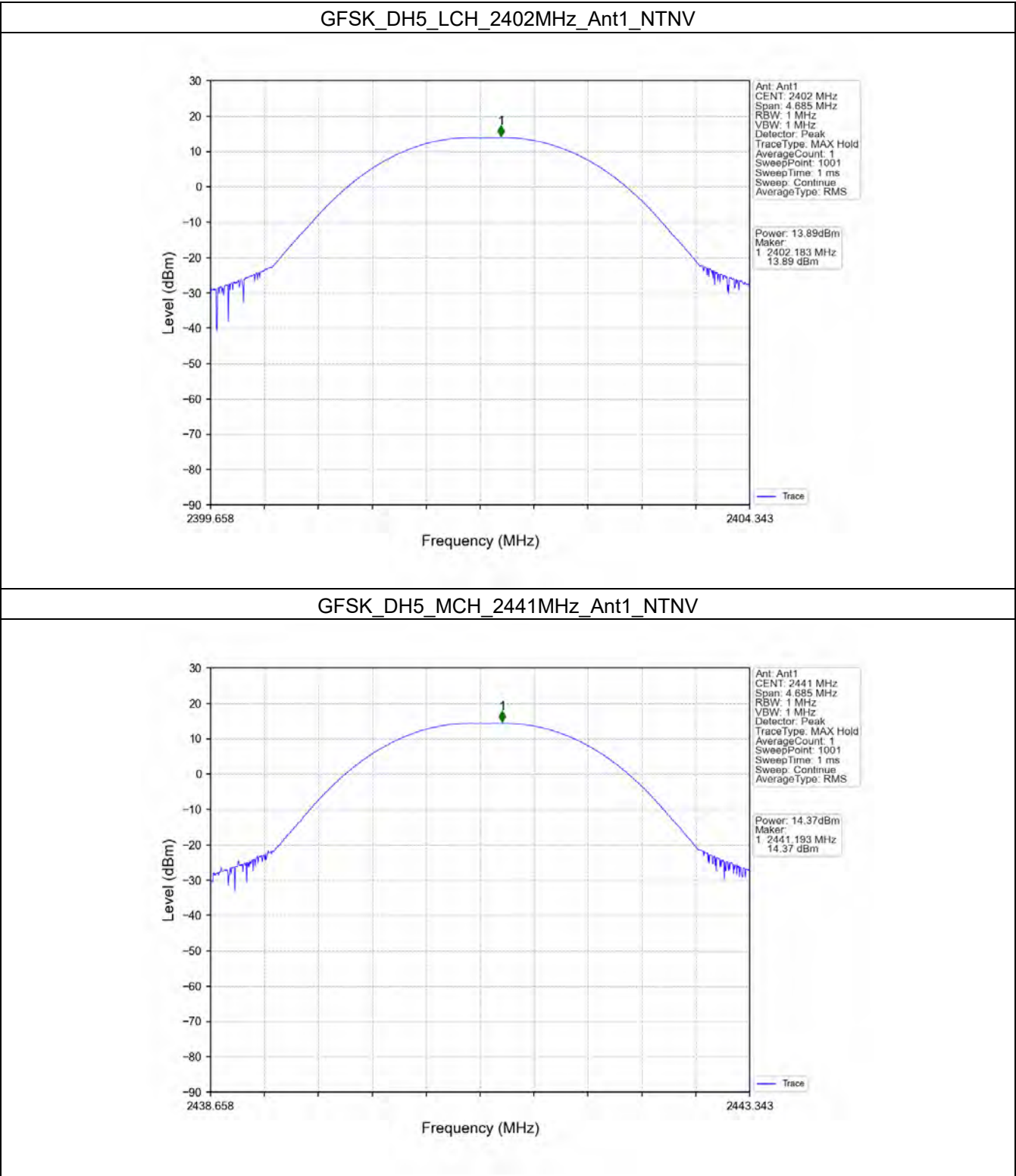
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



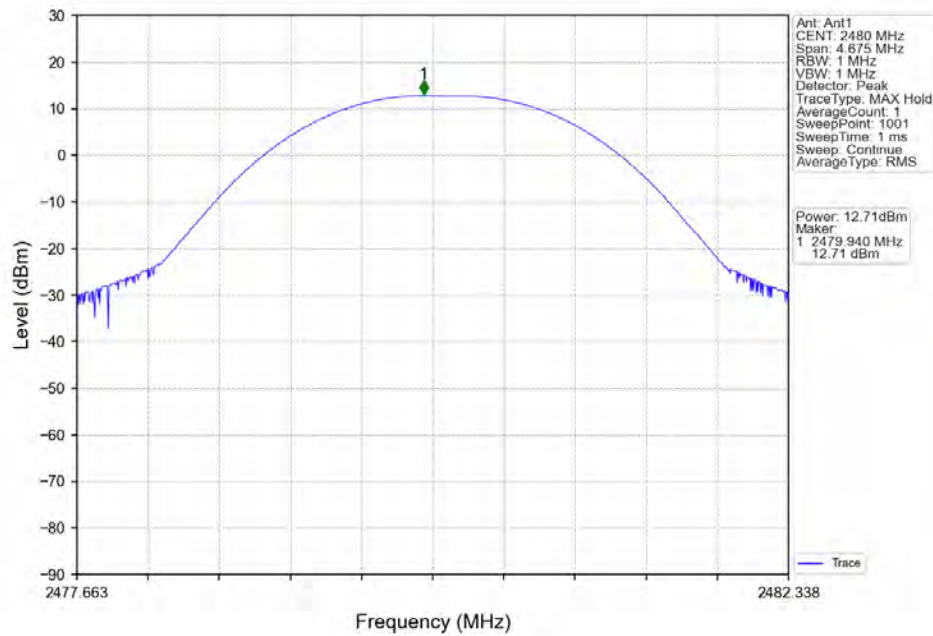
Note1: Antenna Gain: Ant1: 1.69dBi;

2.2 Test Graph

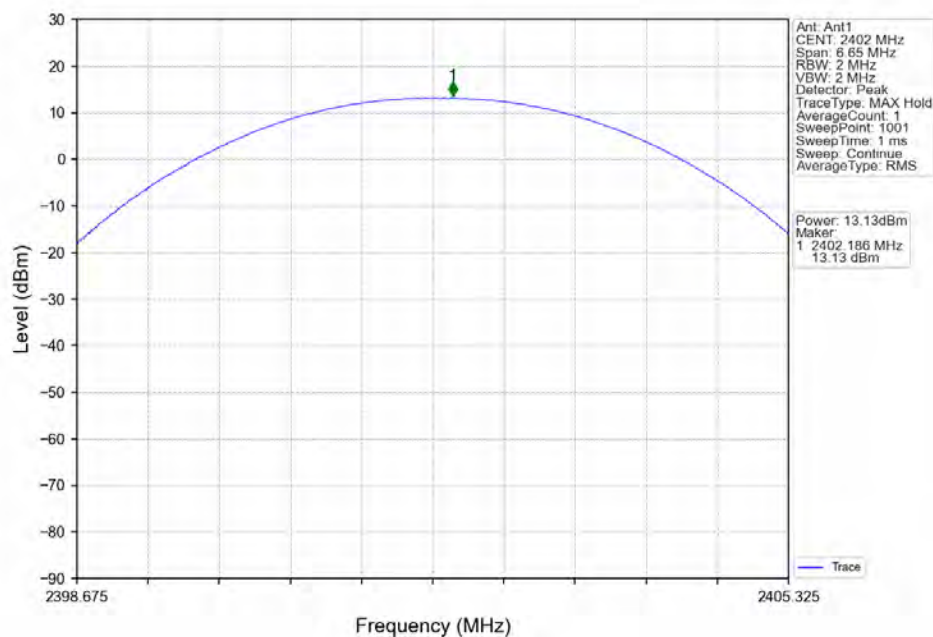
2.2.1 Power



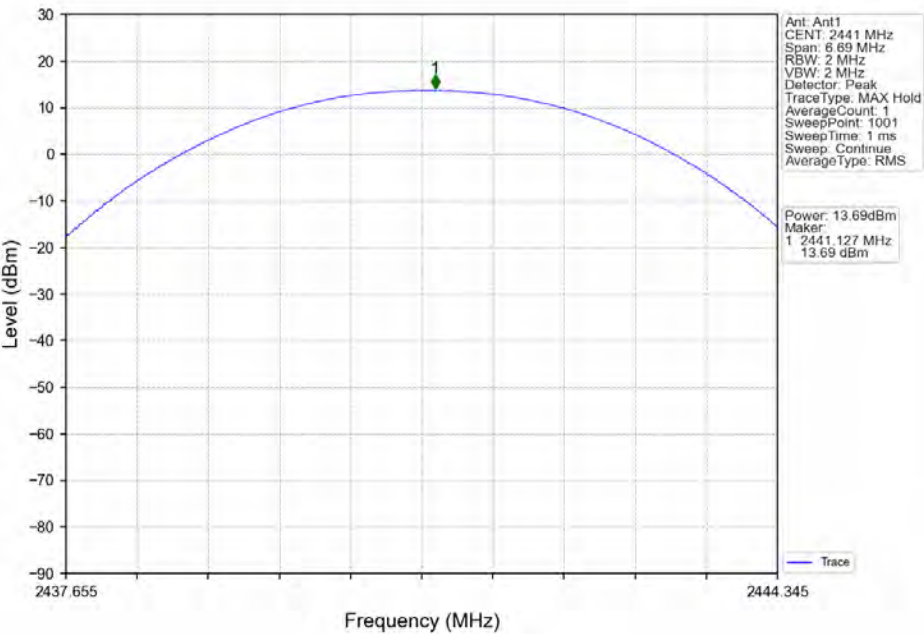
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



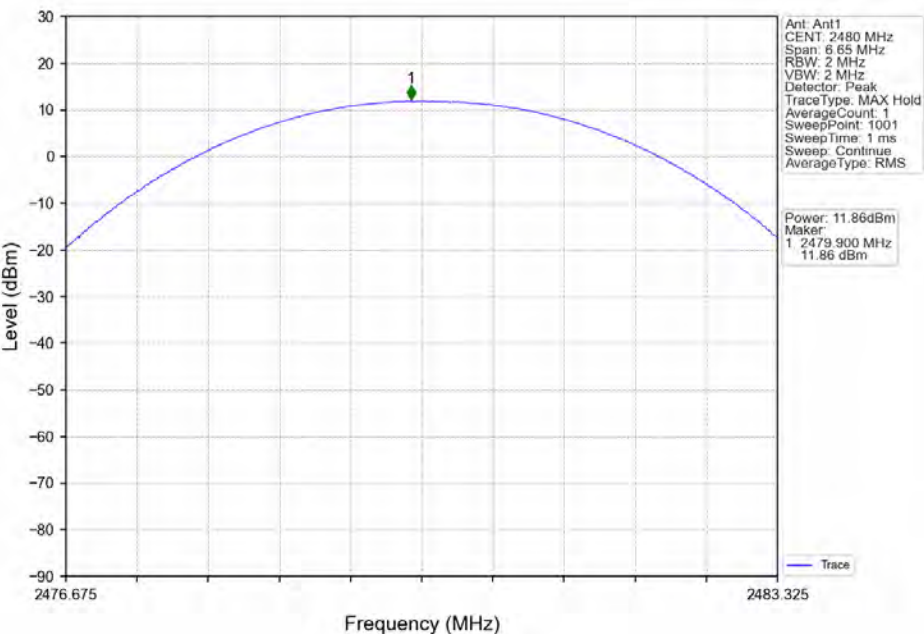
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



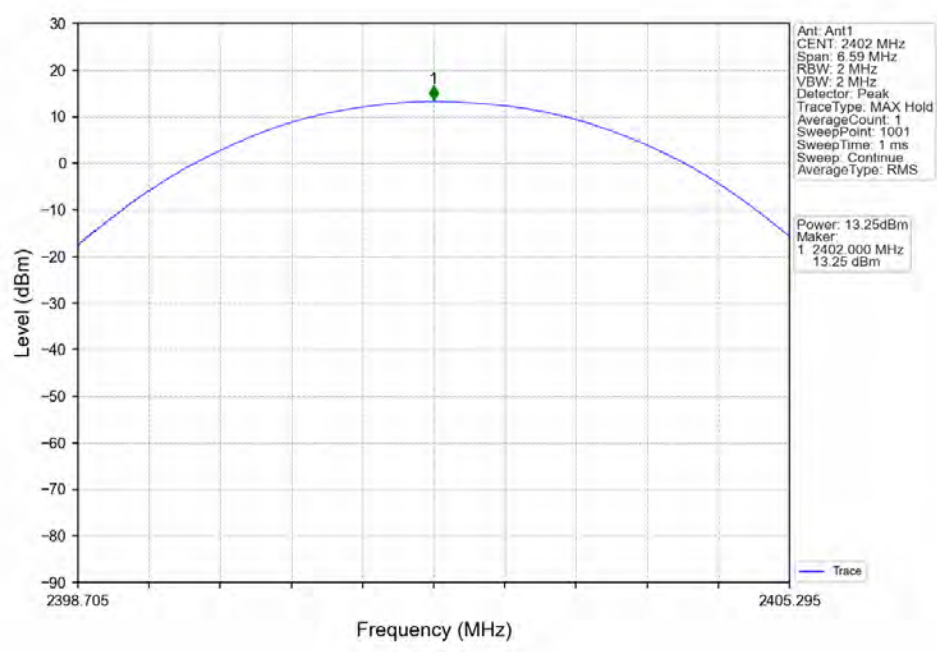
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



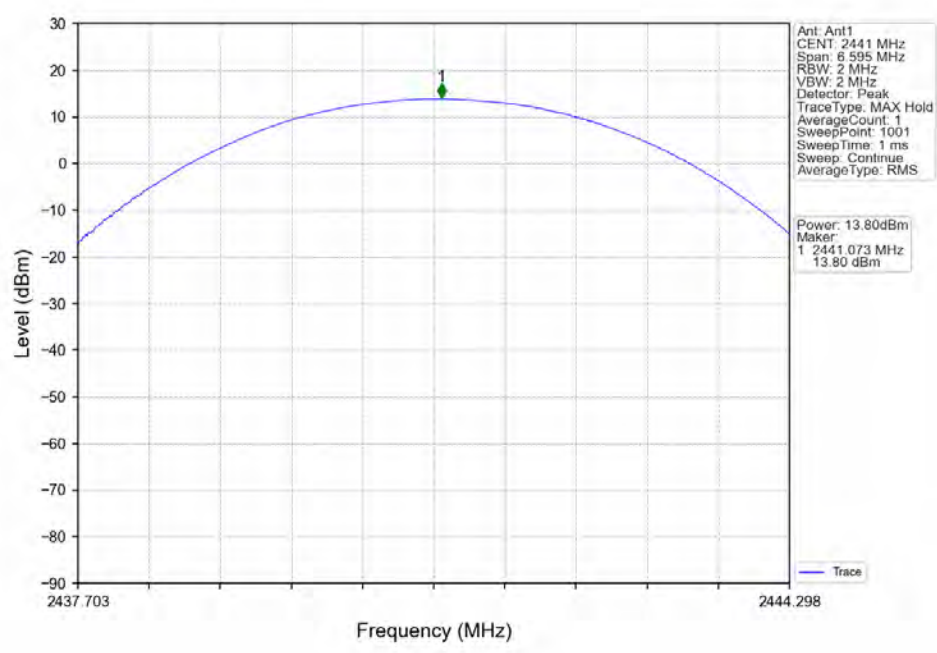
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



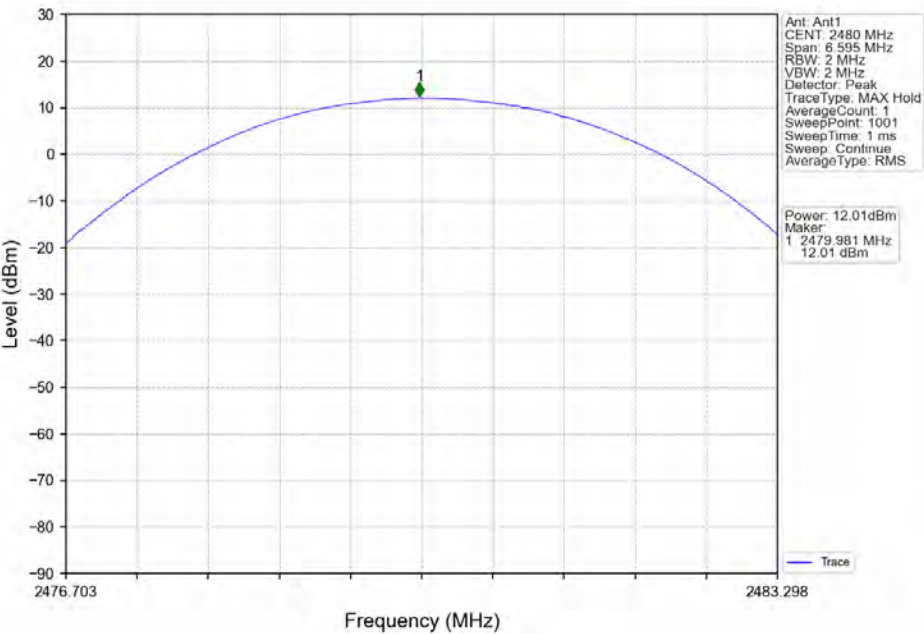
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV





Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 81 of 167

3. Carrier Frequency Separation

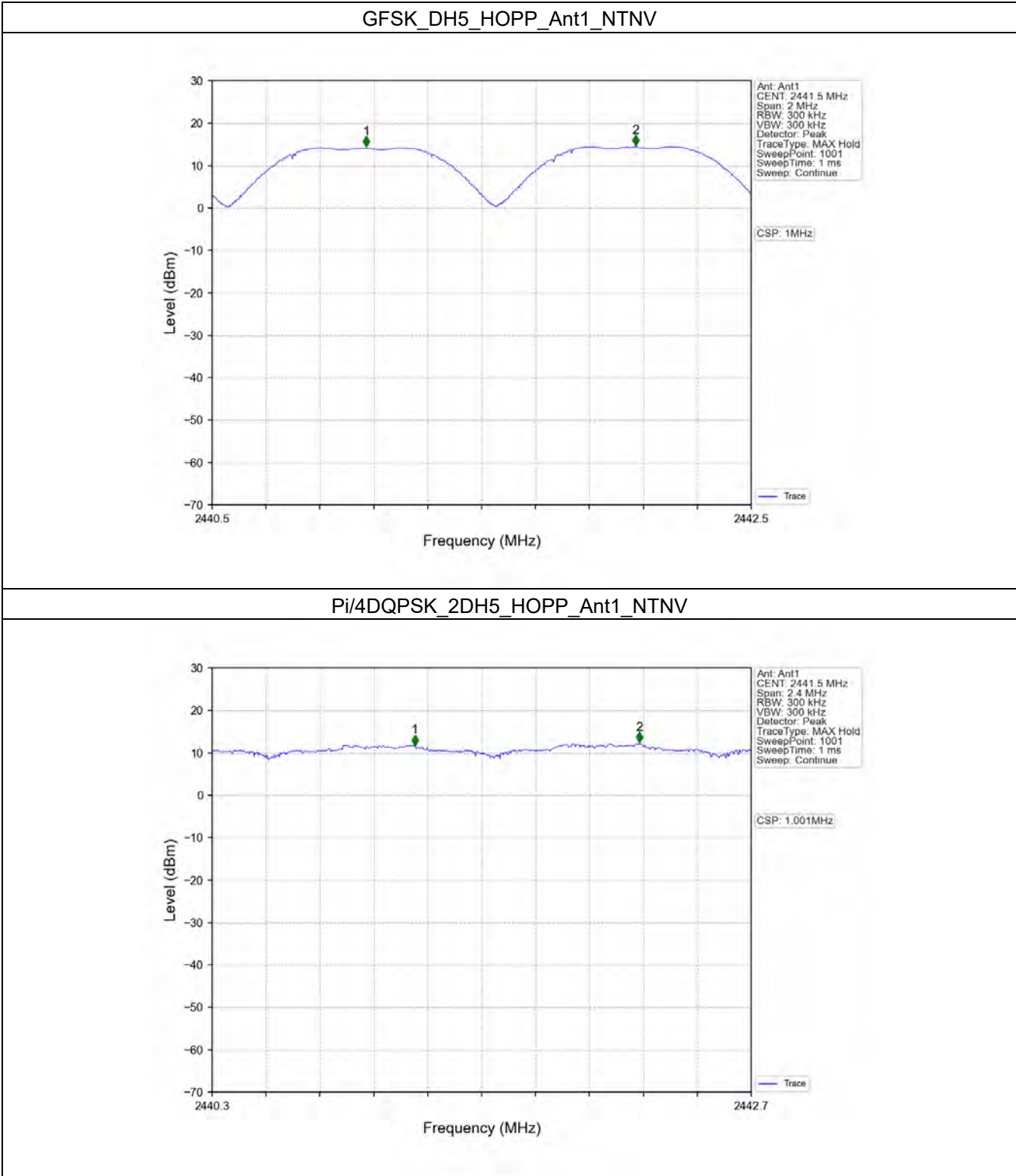
3.1 Test Result

3.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.000	0.937	>=0.937	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.338	>=0.892	Pass
8DPSK	SISO	HOPP	3DH5	0.982	1.319	>=0.879	Pass

3.2 Test Graph

3.2.1 Ant1



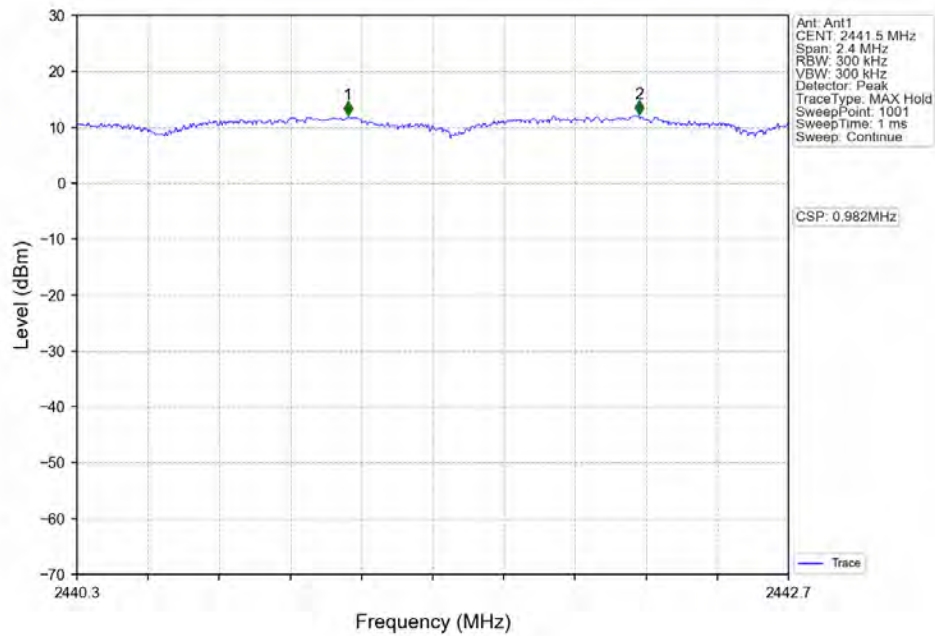
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 83 of 167

8DPSK_3DH5_HOPP_Ant1_NTNV





Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 84 of 167

4. Number of Hopping Frequencies

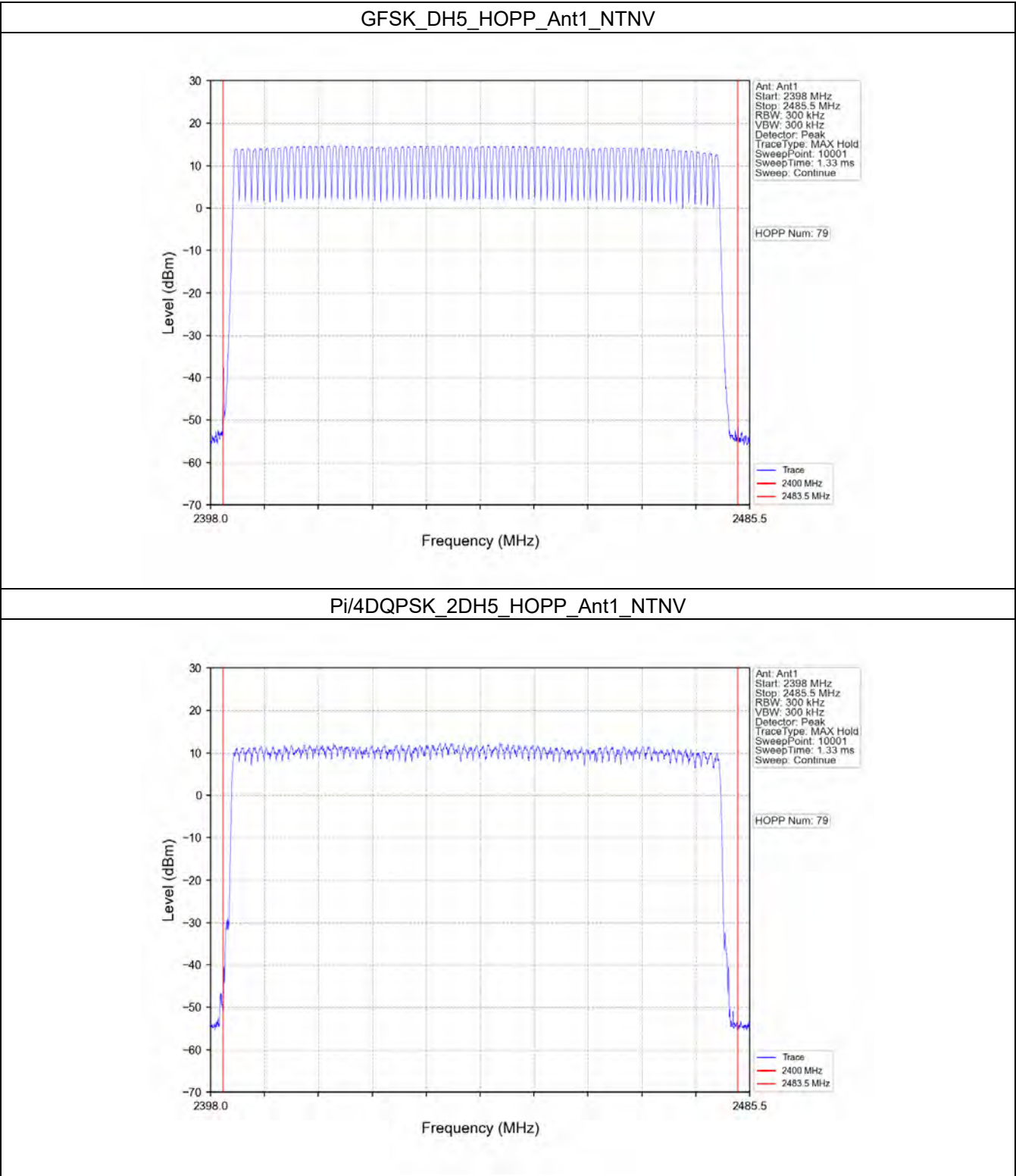
4.1 Test Result

4.1.1 HoppNum

Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT1	Limit	
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass
8DPSK	SISO	HOPP	3DH5	79	>=15	Pass

4.2 Test Graph

4.2.1 HoppNum



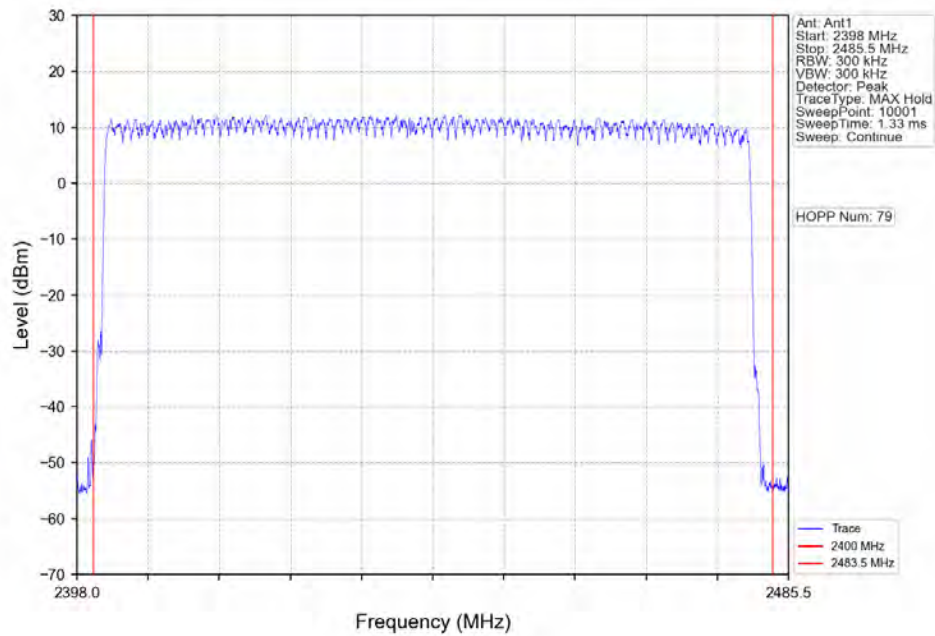
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 86 of 167

8DPSK_3DH5_HOPP_Ant1_NTNV



Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 87 of 167

5. Time of Occupancy (Dwell Time)

5.1 Test Result

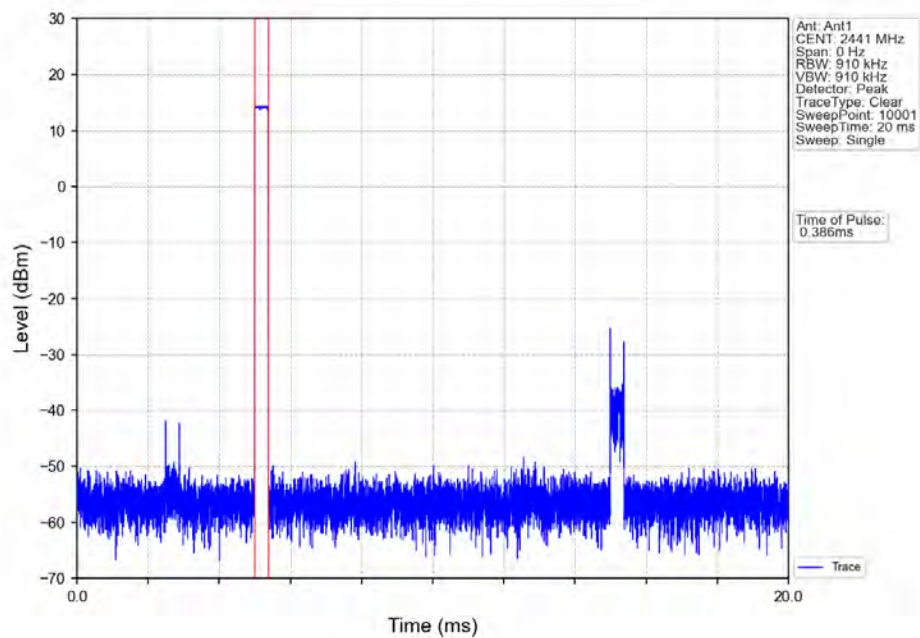
5.1.1 Ant1

Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.386	31.600	320	123.520	<=400	Pass
			DH3	1.642	31.600	159	261.078	<=400	Pass
			DH5	2.890	31.600	109	315.010	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.392	31.600	319	125.048	<=400	Pass
			2DH3	1.644	31.600	166	272.904	<=400	Pass
			2DH5	2.894	31.600	102	295.188	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.392	31.600	320	125.440	<=400	Pass
			3DH3	1.644	31.600	160	263.040	<=400	Pass
			3DH5	2.894	31.600	115	332.810	<=400	Pass

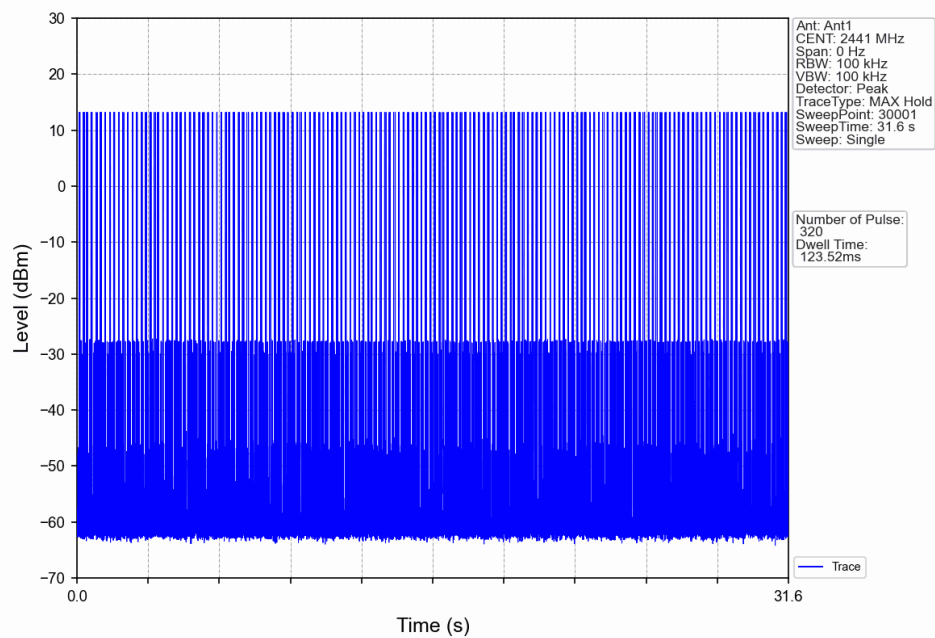
5.2 Test Graph

5.2.1 Ant1

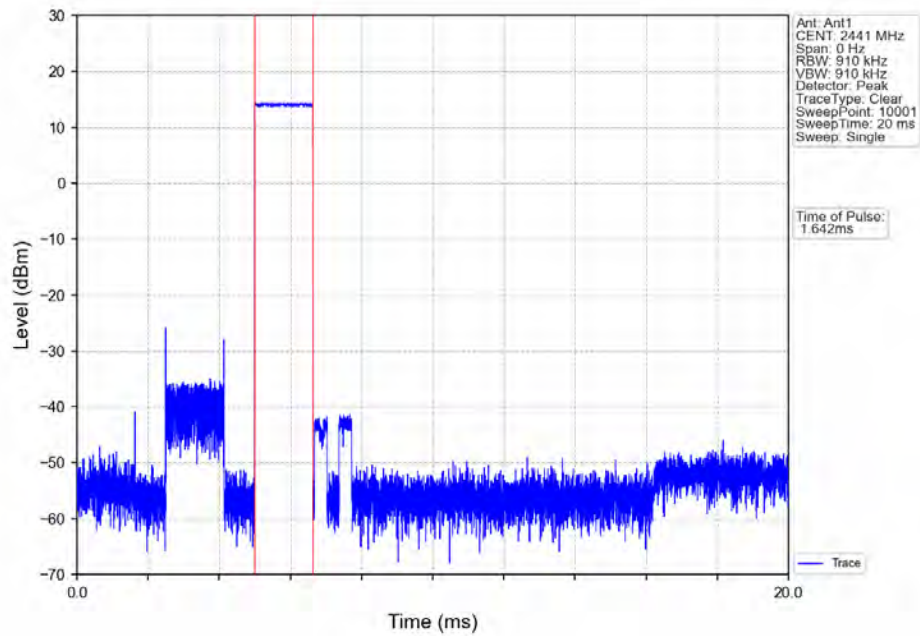
GFSK_DH1_HOPP_Ant1_NTNV



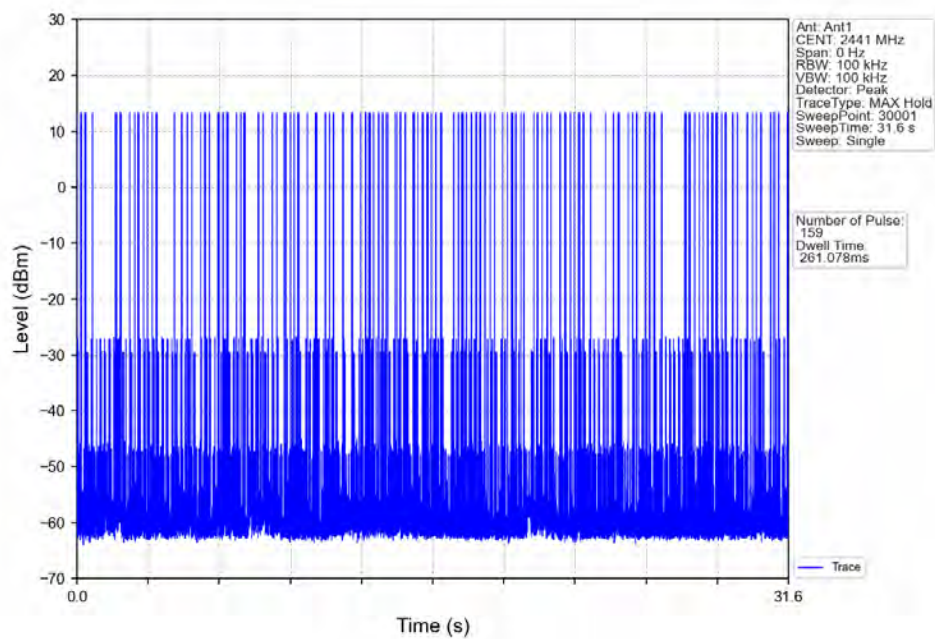
GFSK_DH1_HOPP_Ant1_NTNV



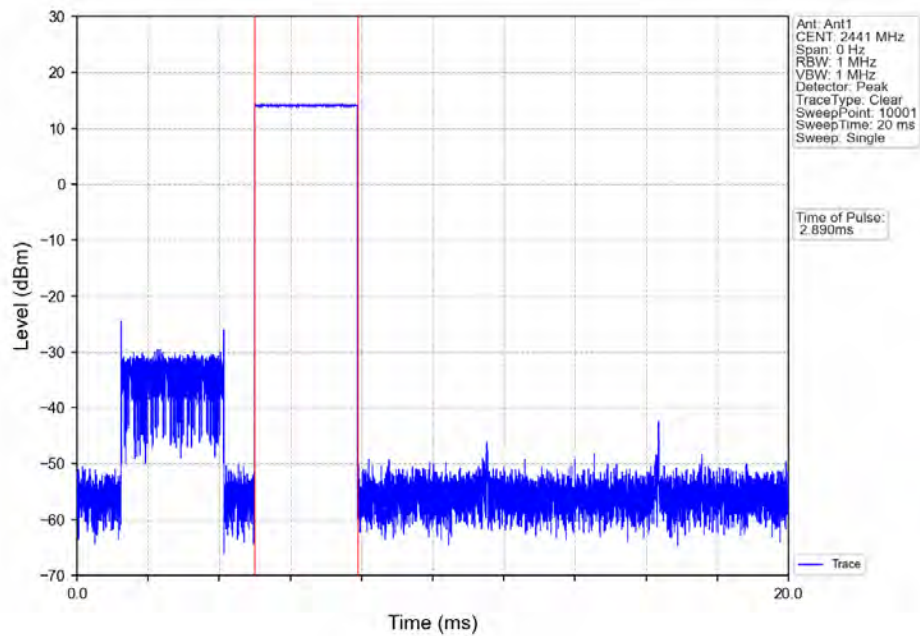
GFSK_DH3_HOPP_Ant1_NTNV



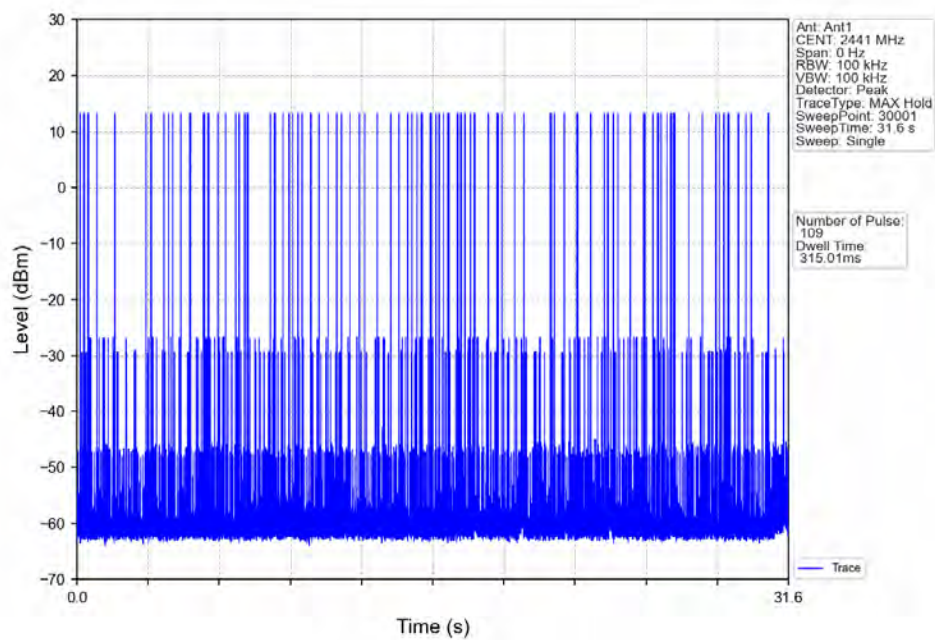
GFSK_DH3_HOPP_Ant1_NTNV



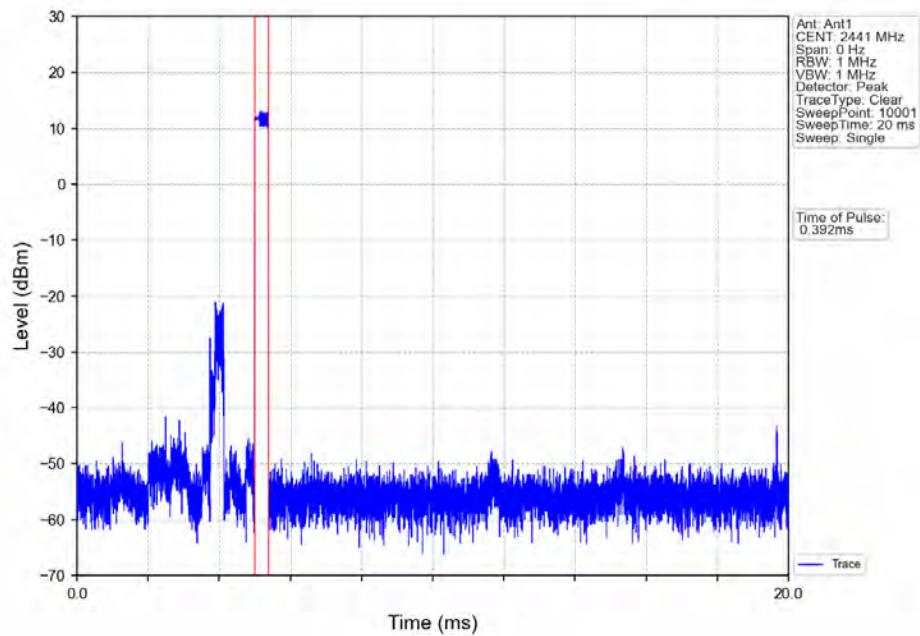
GFSK_DH5_HOPP_Ant1_NTNV



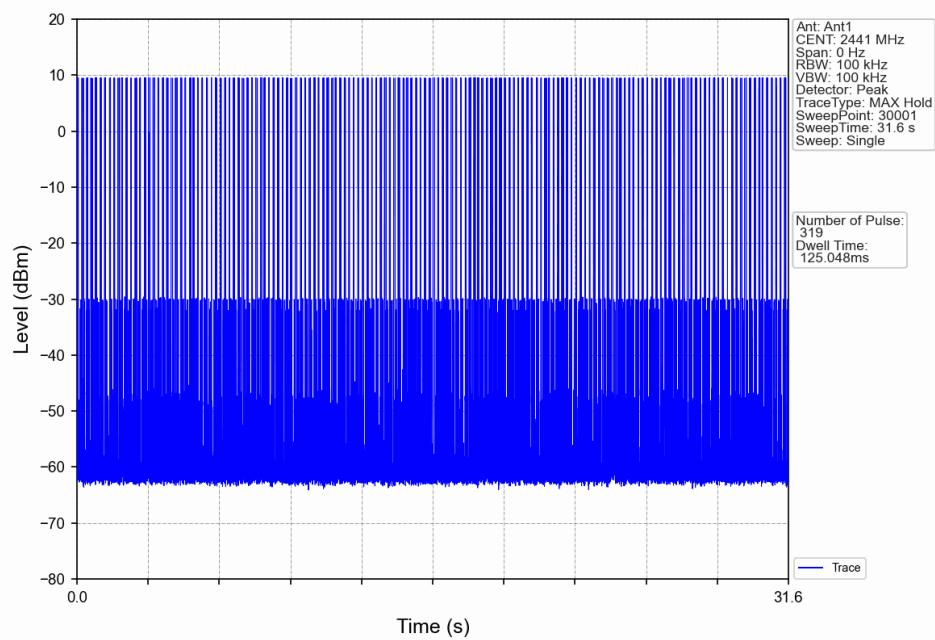
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



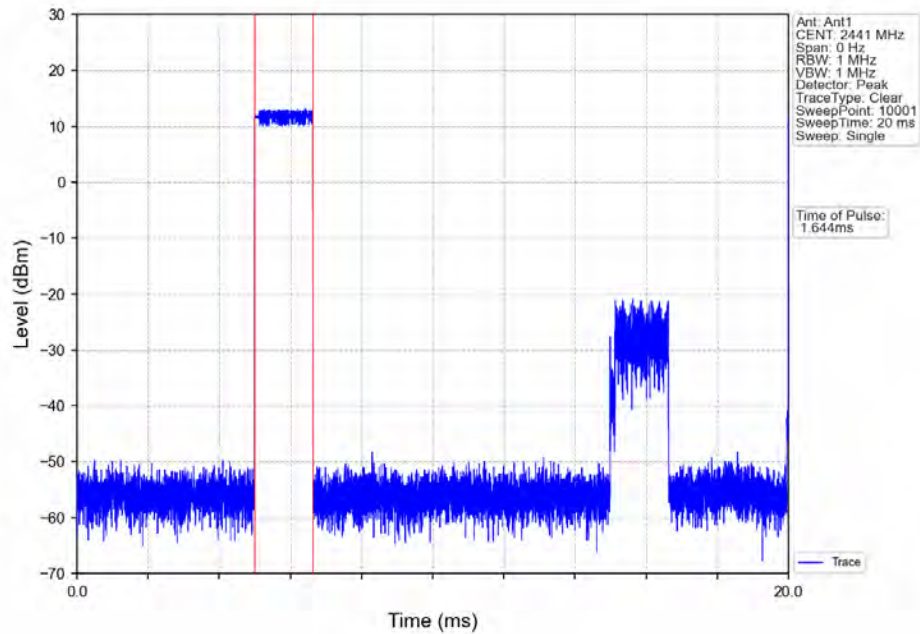
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

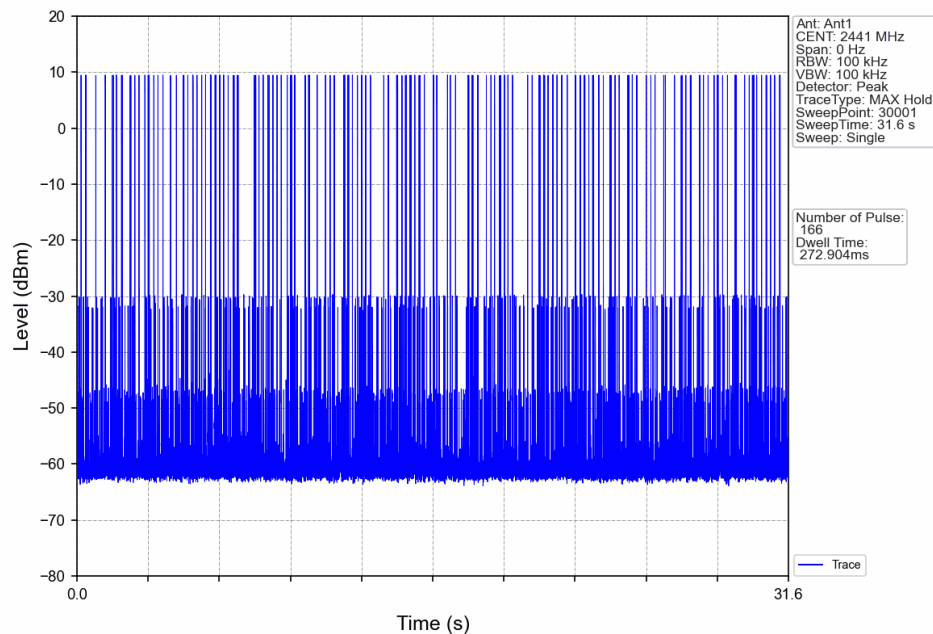
Report No.: KSCR240700121703

Page: 92 of 167

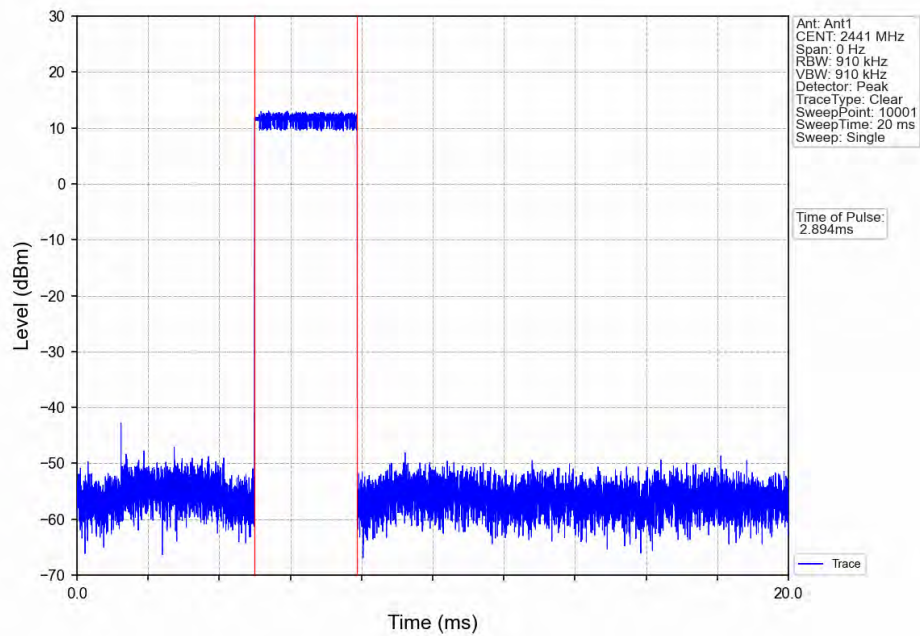
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



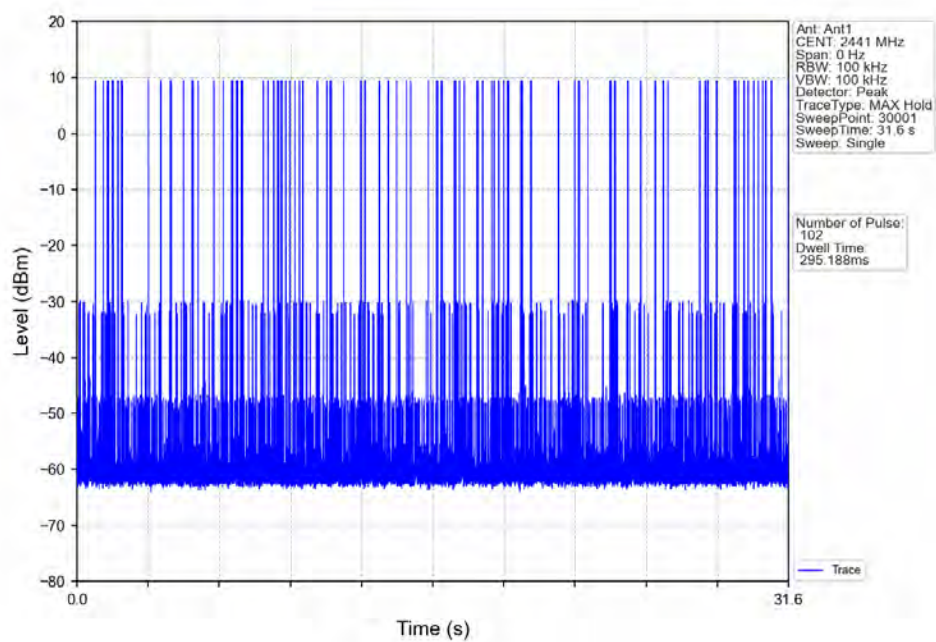
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



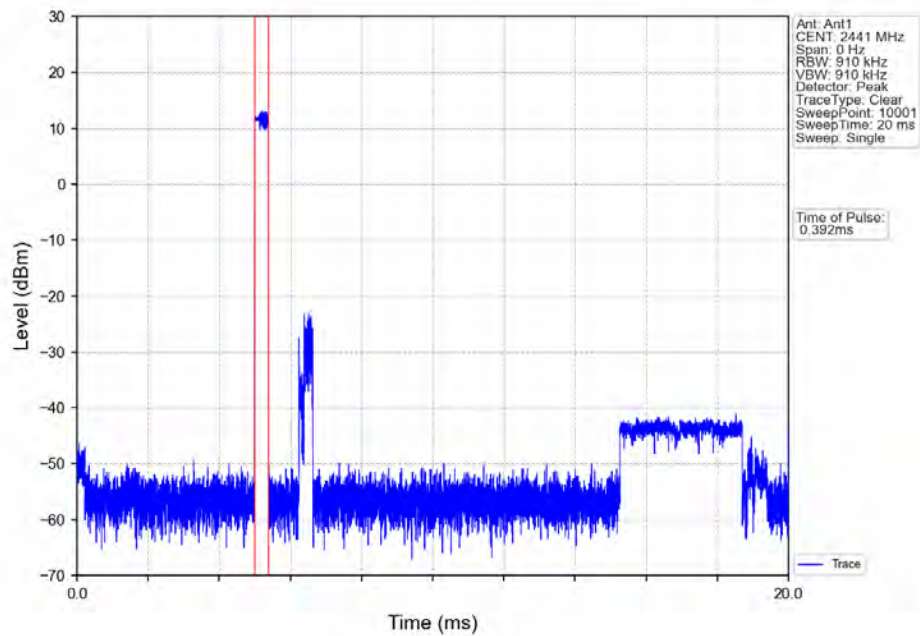
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



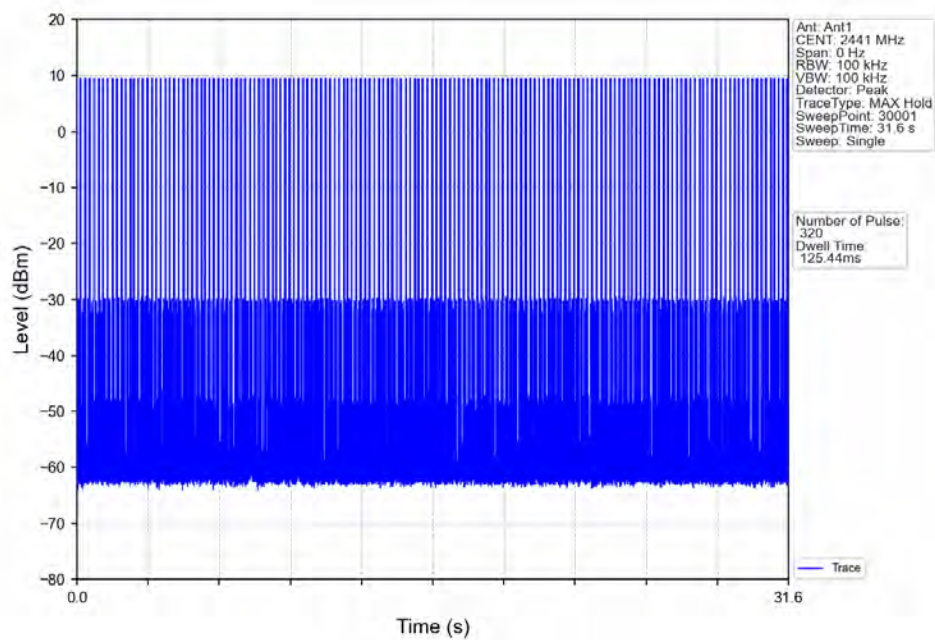
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



8DPSK_3DH1_HOPP_Ant1_NTNV



8DPSK_3DH1_HOPP_Ant1_NTNV



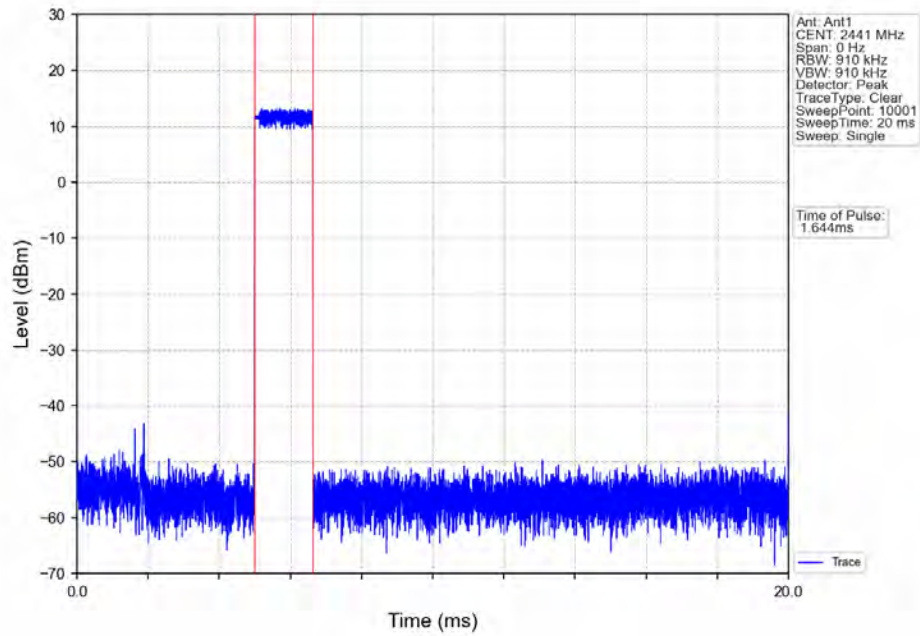
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

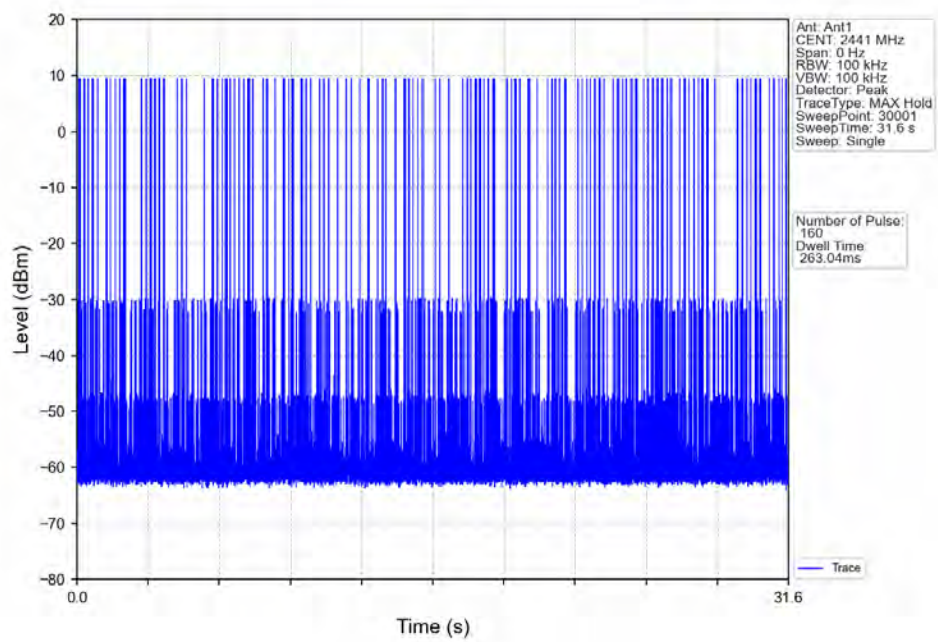
Report No.: KSCR240700121703

Page: 95 of 167

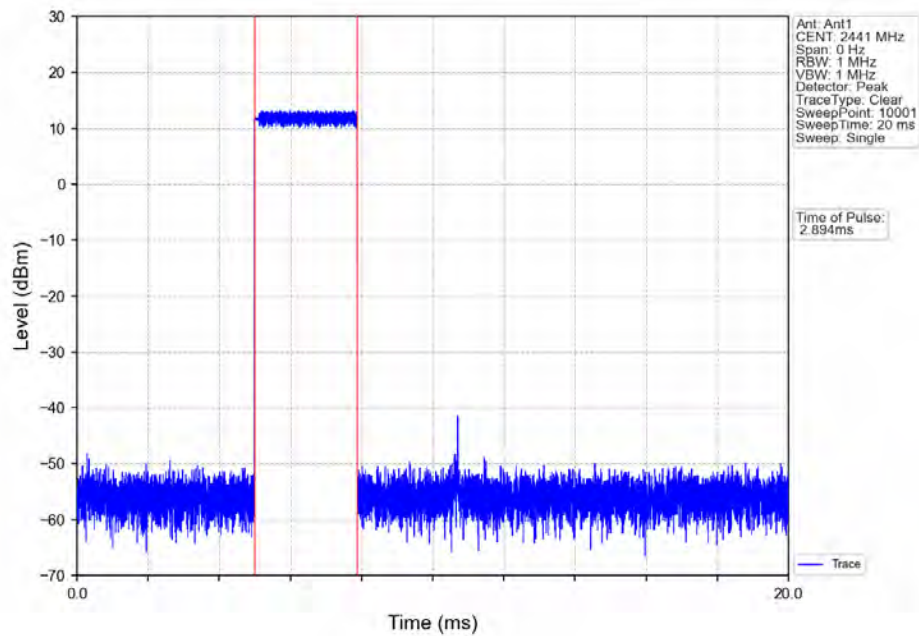
8DPSK_3DH3_HOPP_Ant1_NTNV



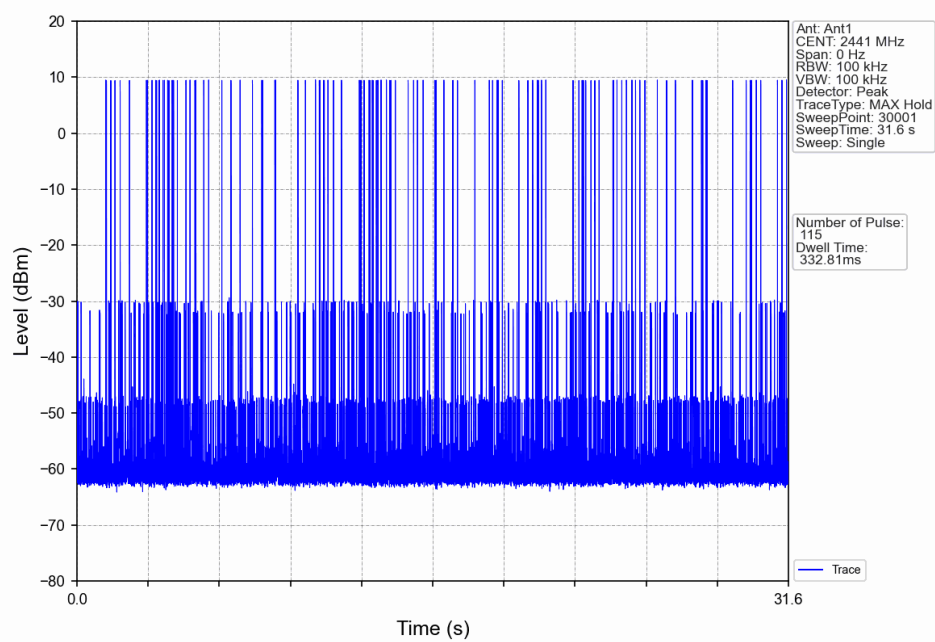
8DPSK_3DH3_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



6. Unwanted Emissions In Non-restricted Frequency Bands

6.1 Test Result

6.1.1 Ref

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	13.68
		2441	DH5	1	14.17
		2480	DH5	1	12.40
Pi/4DQPSK	SISO	2402	2DH5	1	11.02
		2441	2DH5	1	11.67
		2480	2DH5	1	9.72
8DPSK	SISO	2402	3DH5	1	11.10
		2441	3DH5	1	11.73
		2480	3DH5	1	9.73

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.

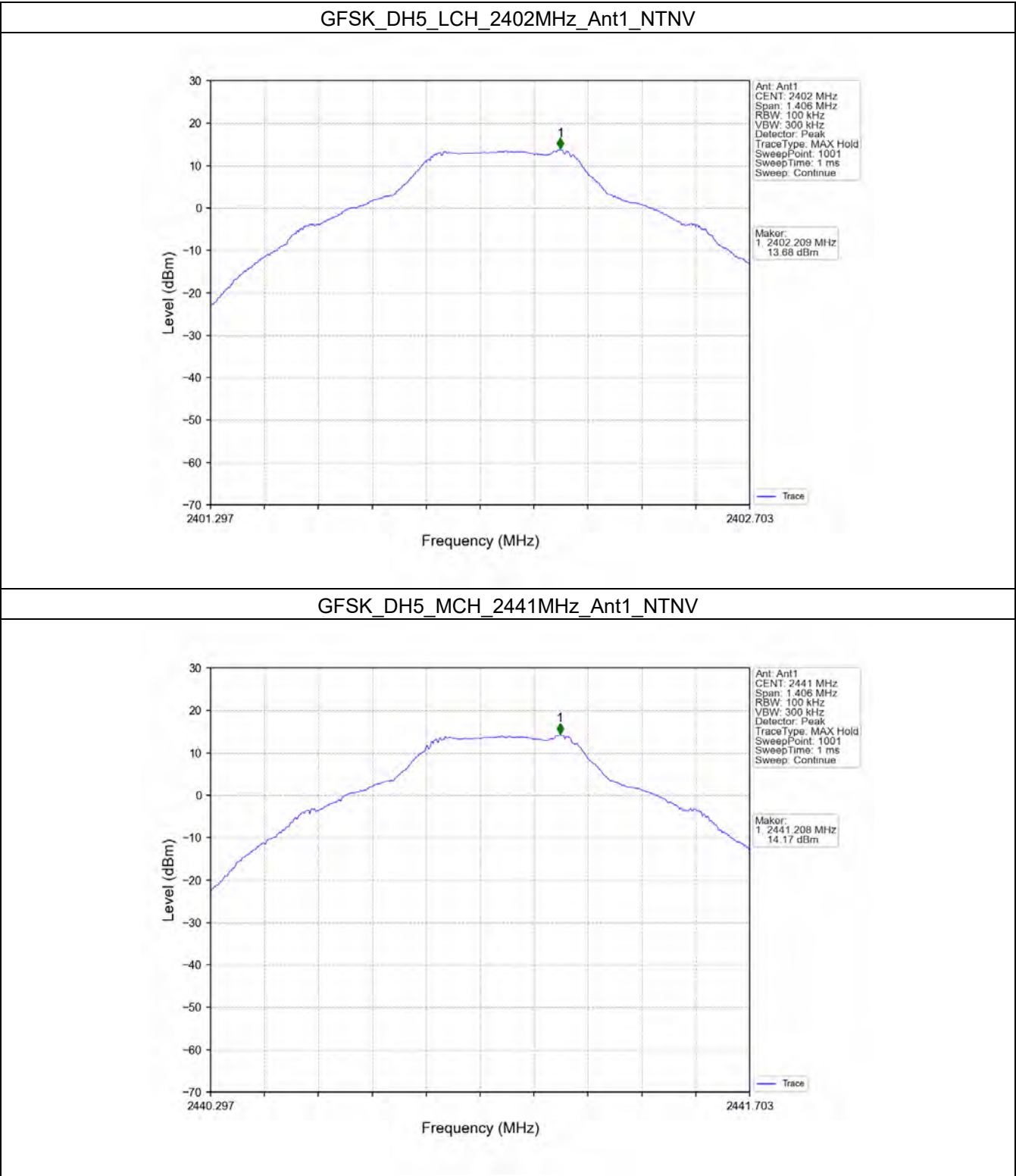
6.1.2 CSE

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	14.17	-5.83	Pass
		2441	DH5	1	14.17	-5.83	Pass
		2480	DH5	1	14.17	-5.83	Pass
		HOPP	DH5	1	14.17	-5.83	Pass
					14.17	-5.83	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	11.67	-8.33	Pass
		2441	2DH5	1	11.67	-8.33	Pass
		2480	2DH5	1	11.67	-8.33	Pass
		HOPP	2DH5	1	11.67	-8.33	Pass
					11.67	-8.33	Pass
8DPSK	SISO	2402	3DH5	1	11.73	-8.27	Pass
		2441	3DH5	1	11.73	-8.27	Pass
		2480	3DH5	1	11.73	-8.27	Pass
		HOPP	3DH5	1	11.73	-8.27	Pass
					11.73	-8.27	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.

6.2 Test Graph

6.2.1 Ref



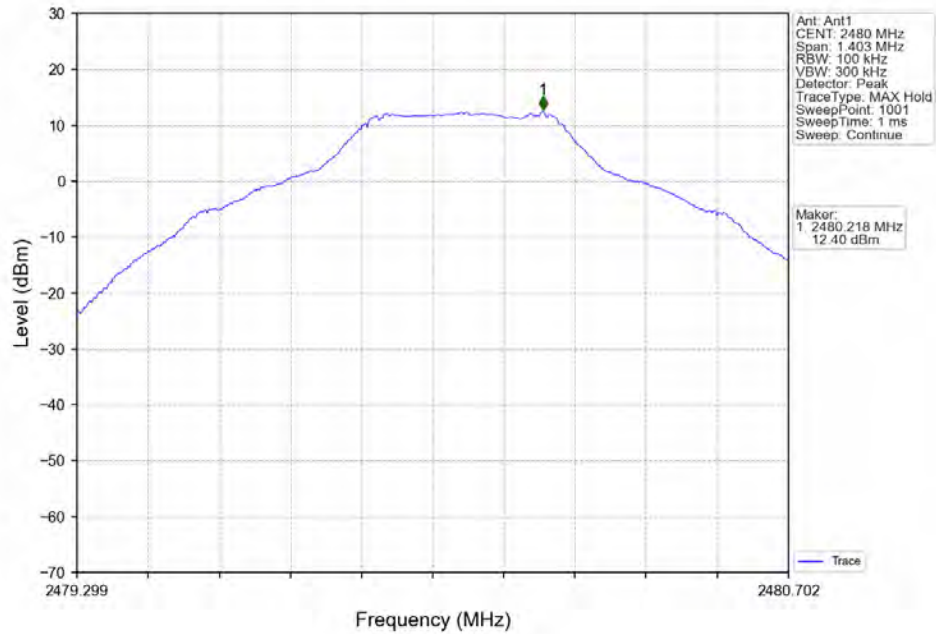
Compliance Certification Services (Kunshan) Inc.

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

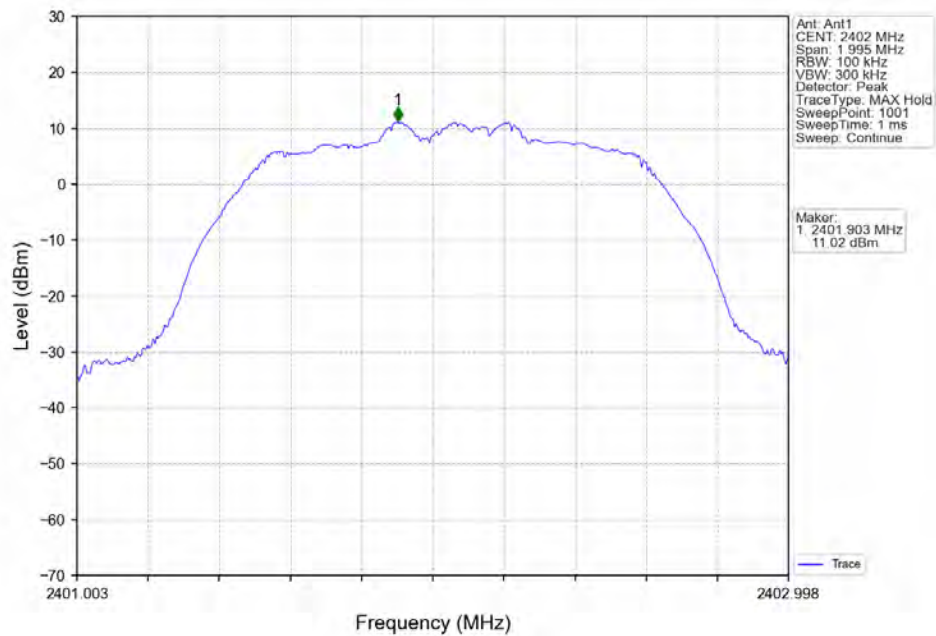
Report No.: KSCR240700121703

Page: 99 of 167

GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



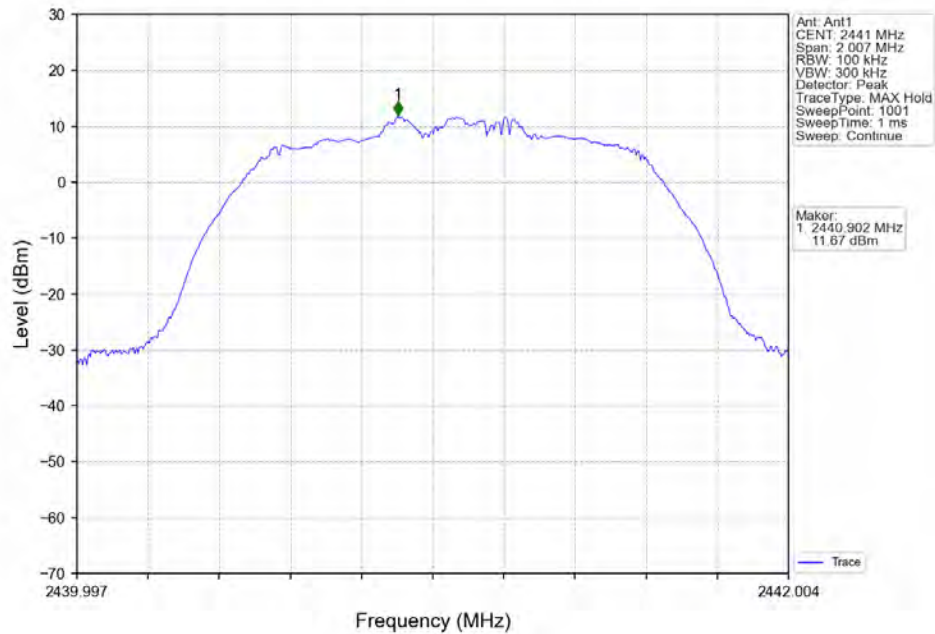
Compliance Certification Services (Kunshan) Inc.

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

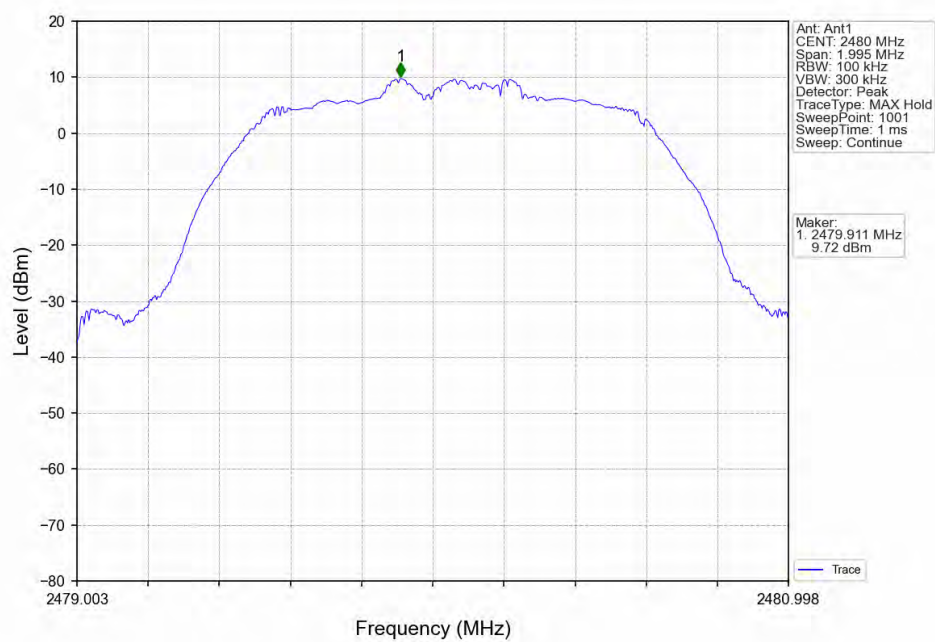
Report No.: KSCR240700121703

Page: 100 of 167

Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



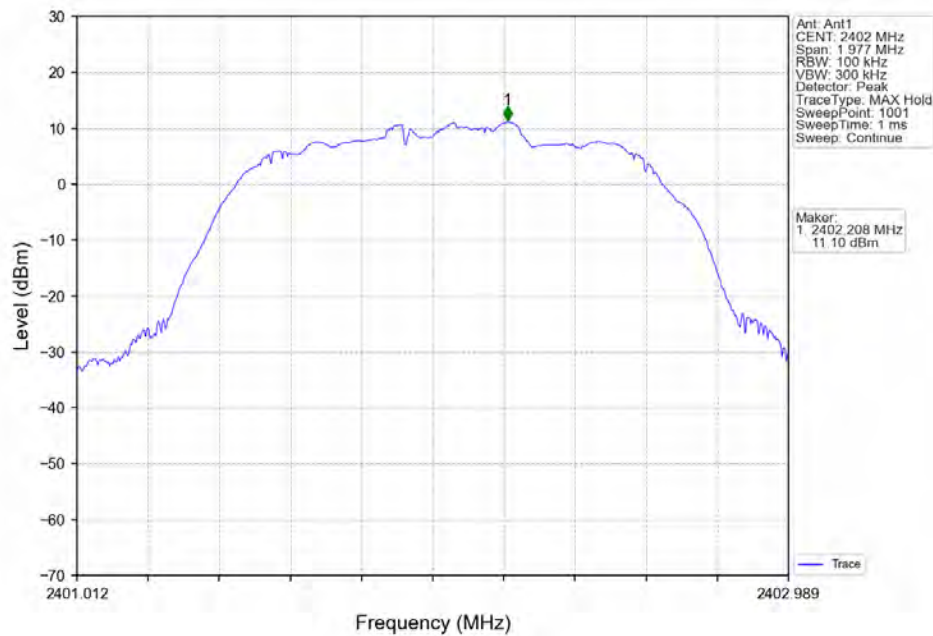
Compliance Certification Services (Kunshan) Inc.

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

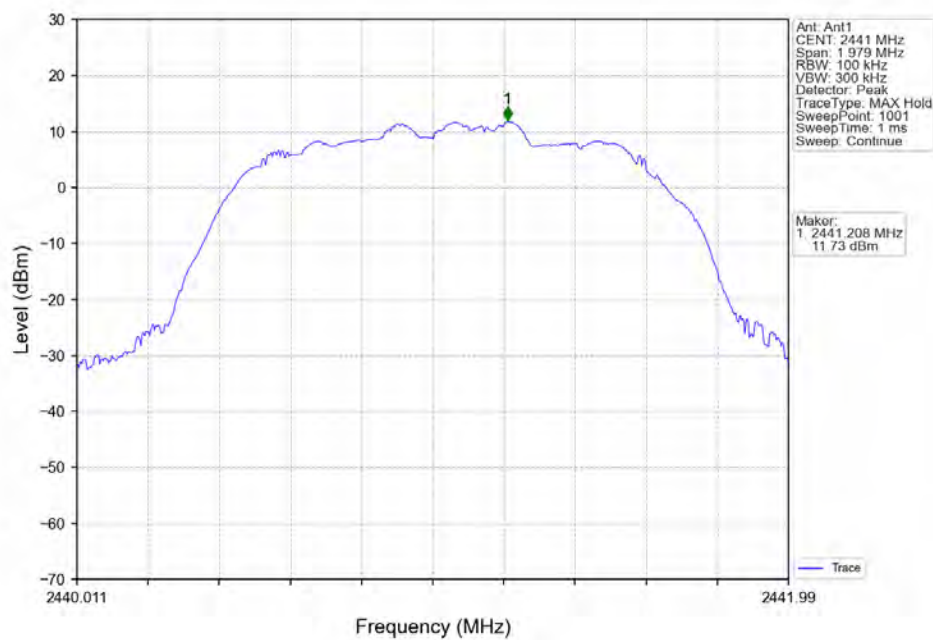
Report No.: KSCR240700121703

Page: 101 of 167

8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



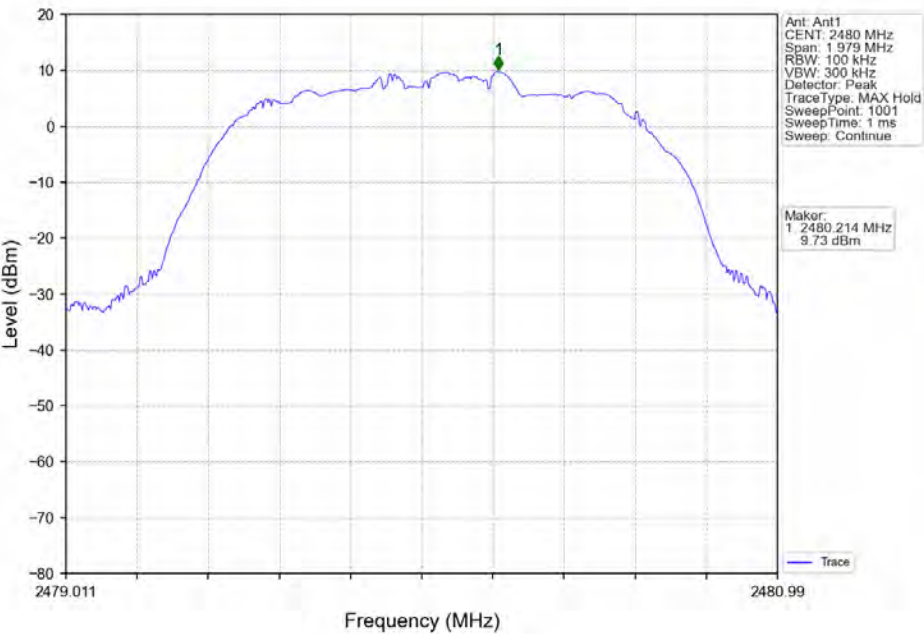
Compliance Certification Services (Kunshan) Inc.

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

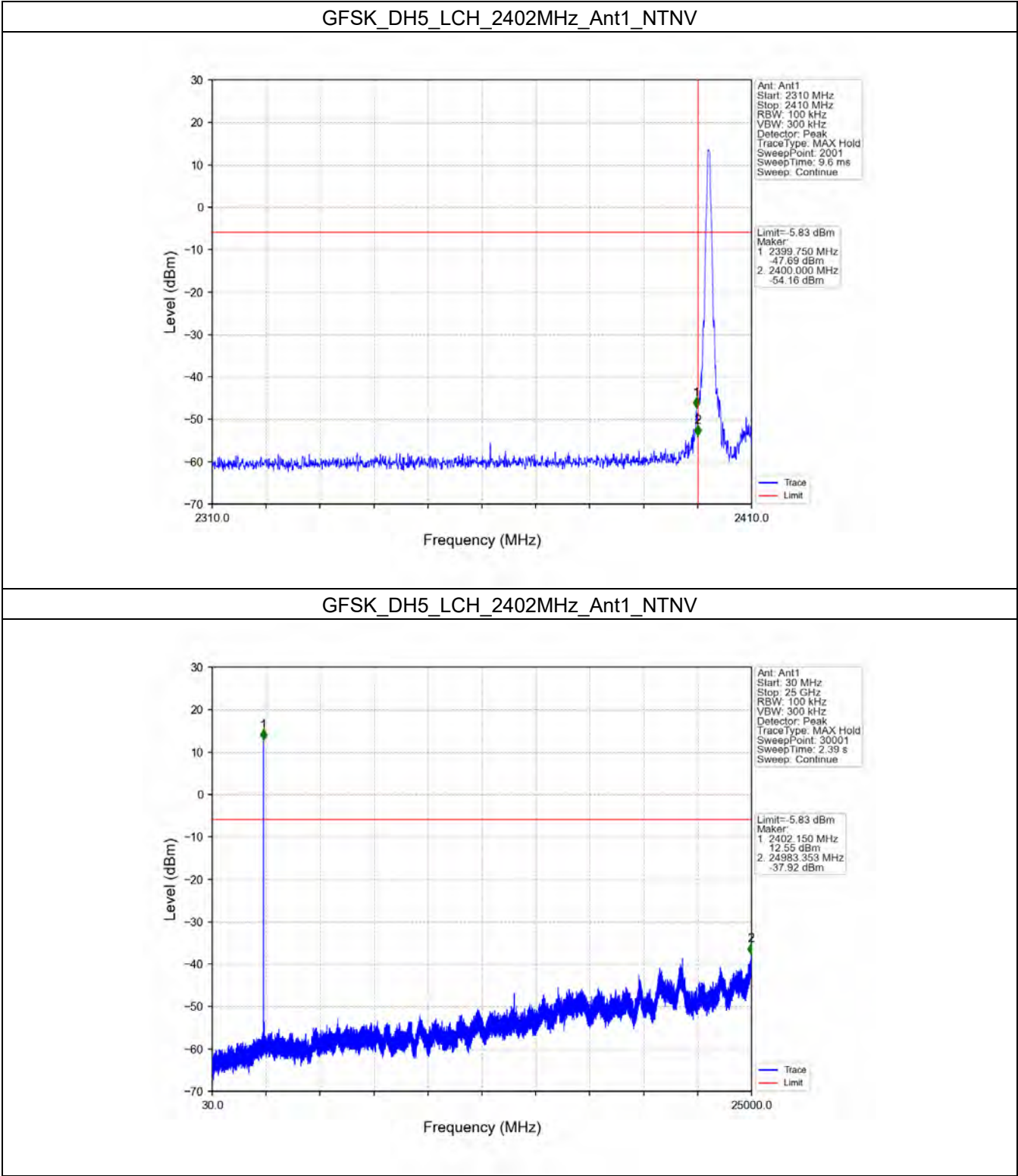
Report No.: KSCR240700121703

Page: 102 of 167

8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



6.2.2 CSE



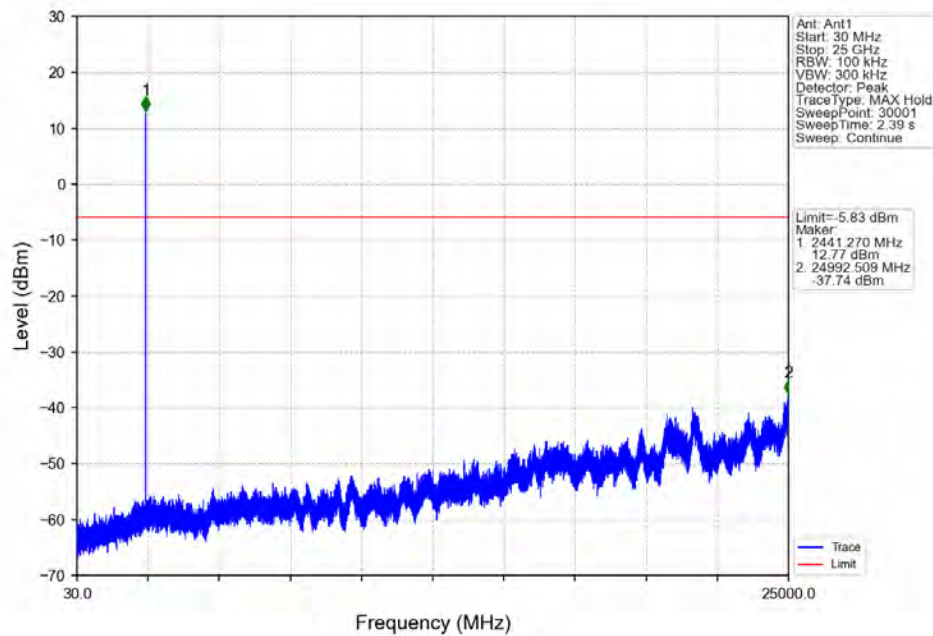
Compliance Certification Services (Kunshan) Inc.

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

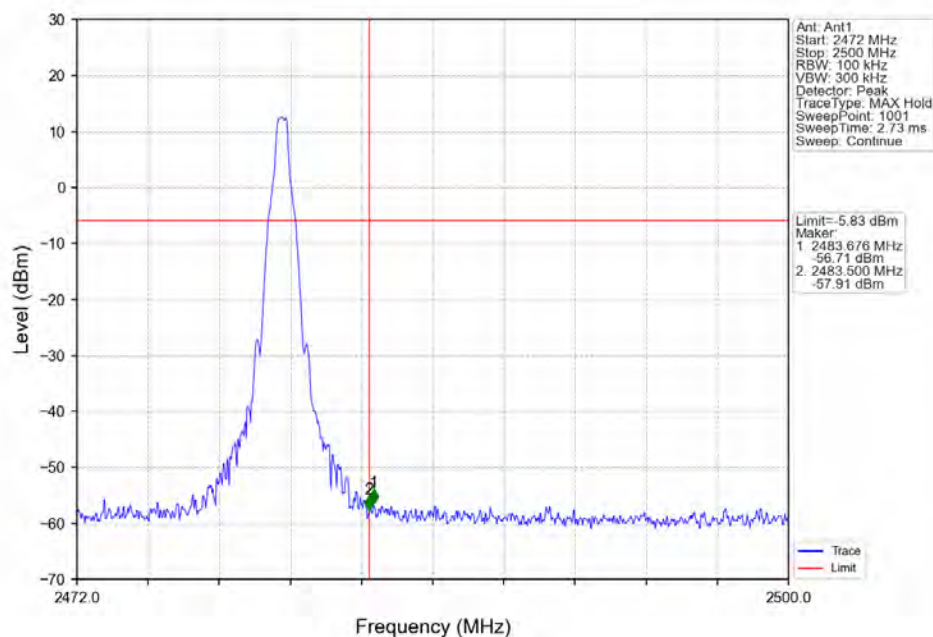
Report No.: KSCR240700121703

Page: 104 of 167

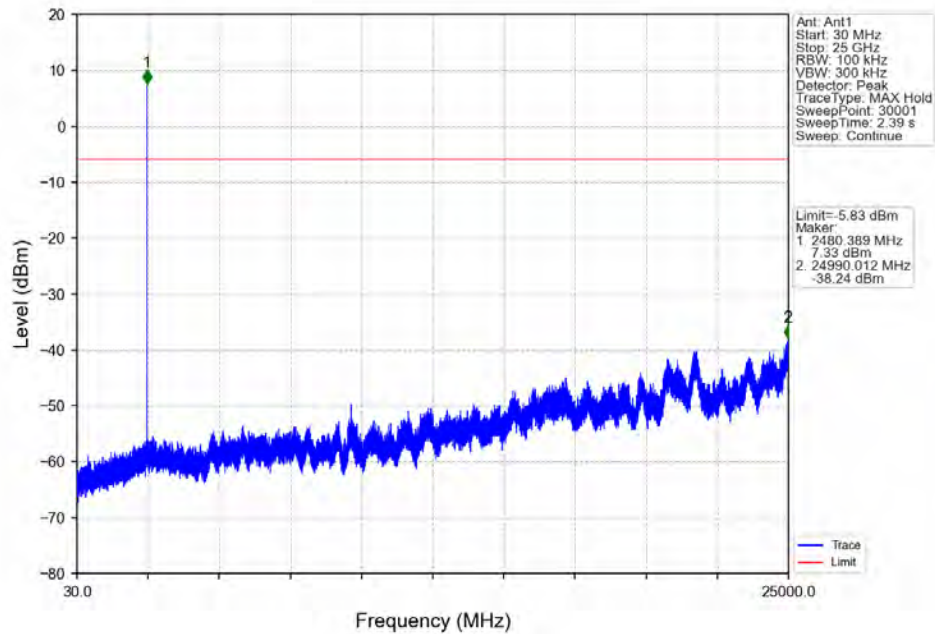
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



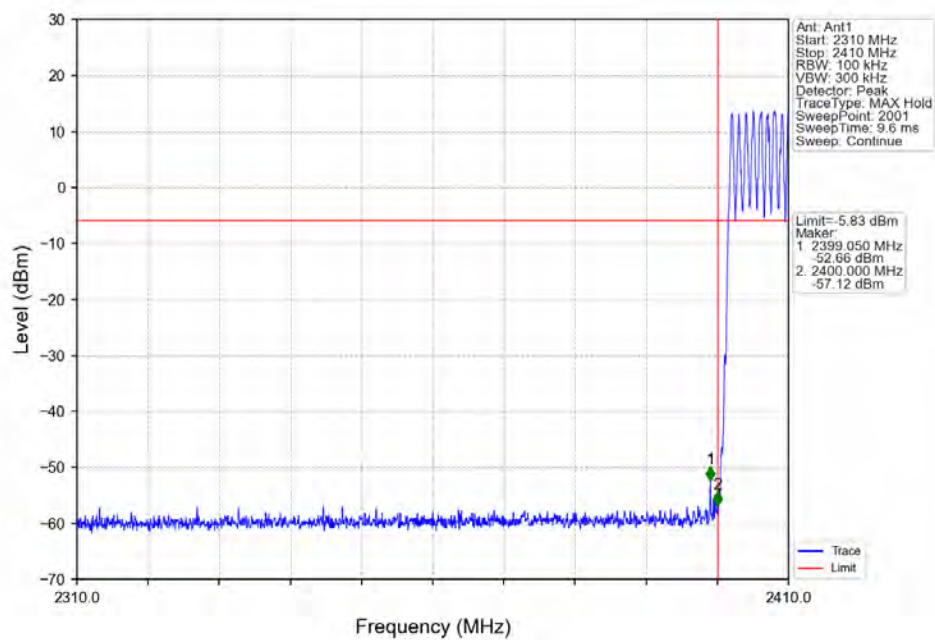
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



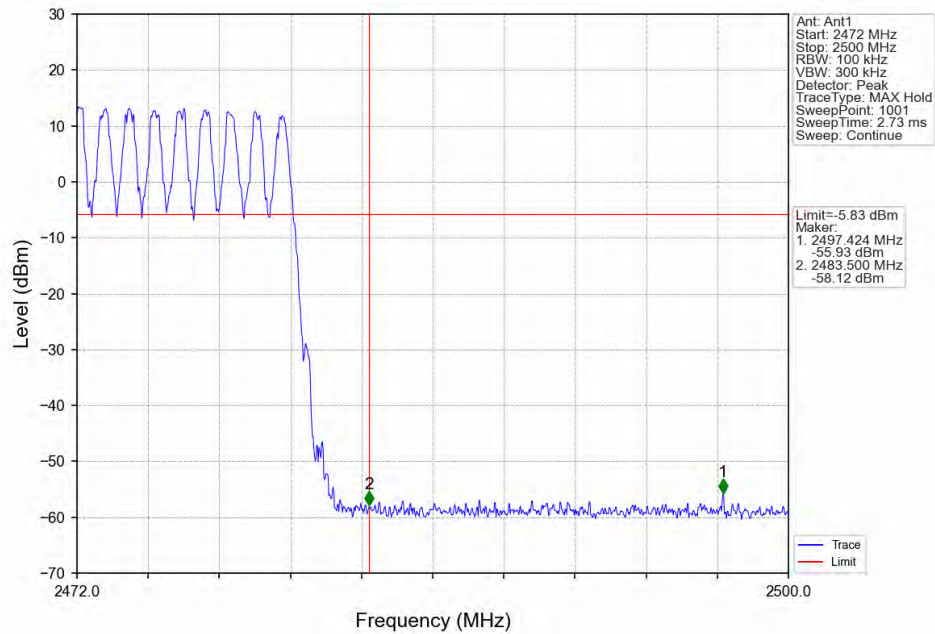
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



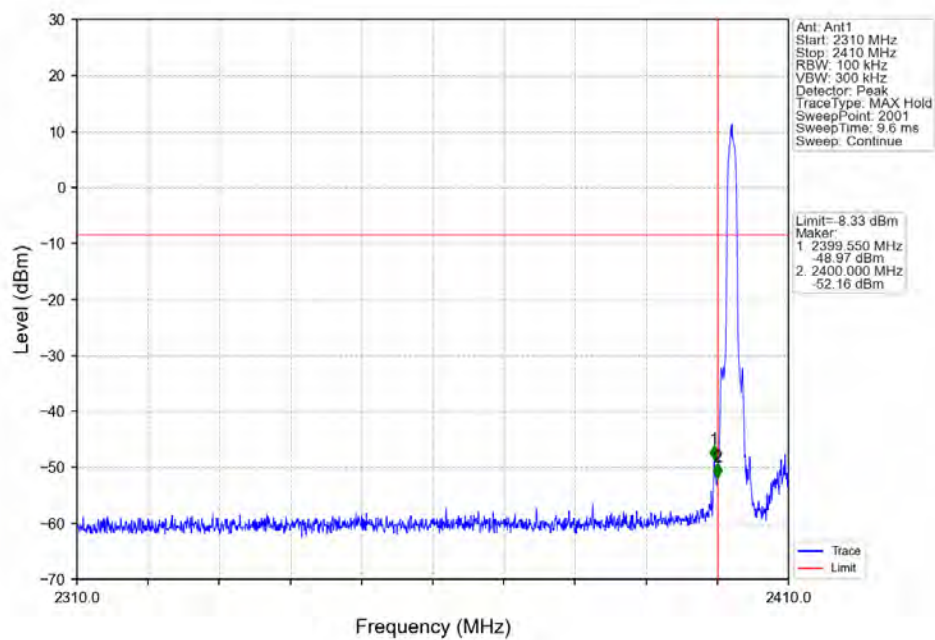
GFSK_DH5_HOPP_Ant1_NTNV



GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



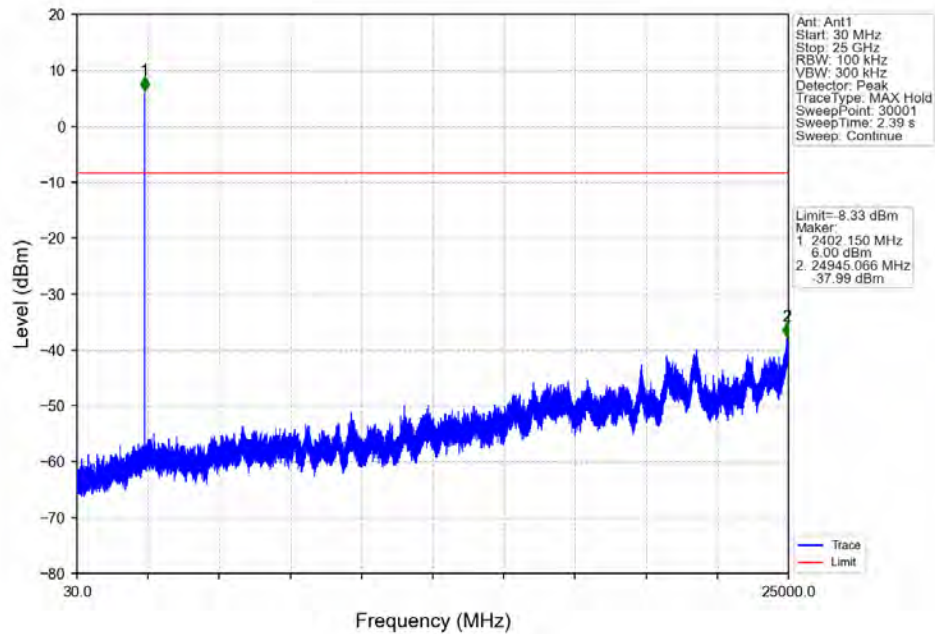
Compliance Certification Services (Kunshan) Inc.

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

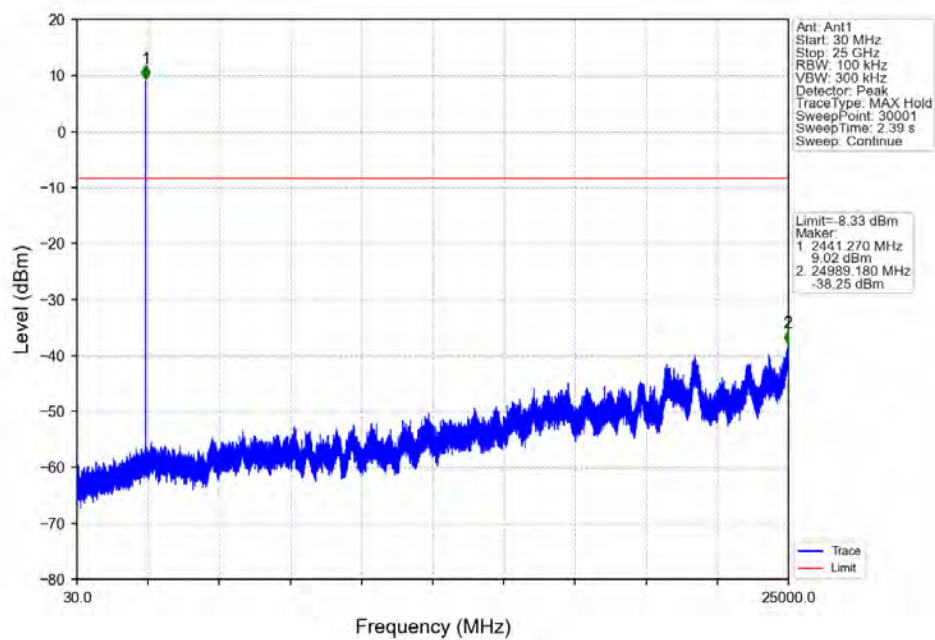
Report No.: KSCR240700121703

Page: 107 of 167

Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



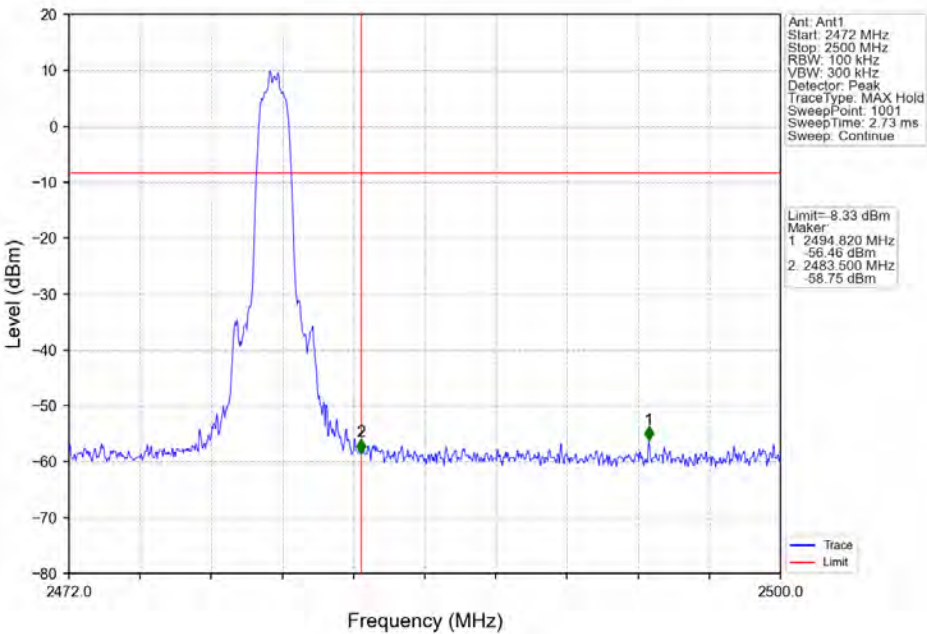
Compliance Certification Services (Kunshan) Inc.

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

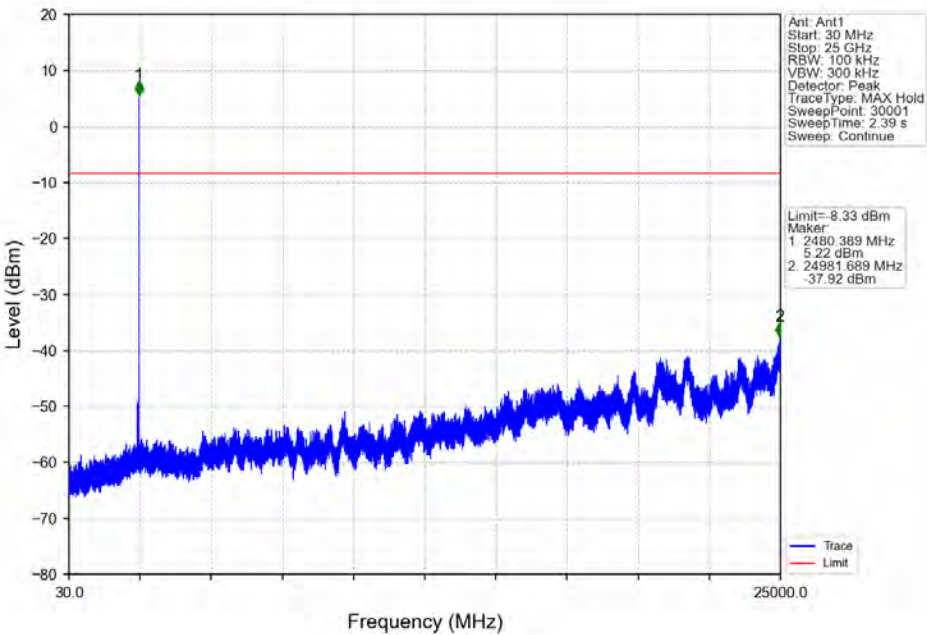
Report No.: KSCR240700121703

Page: 108 of 167

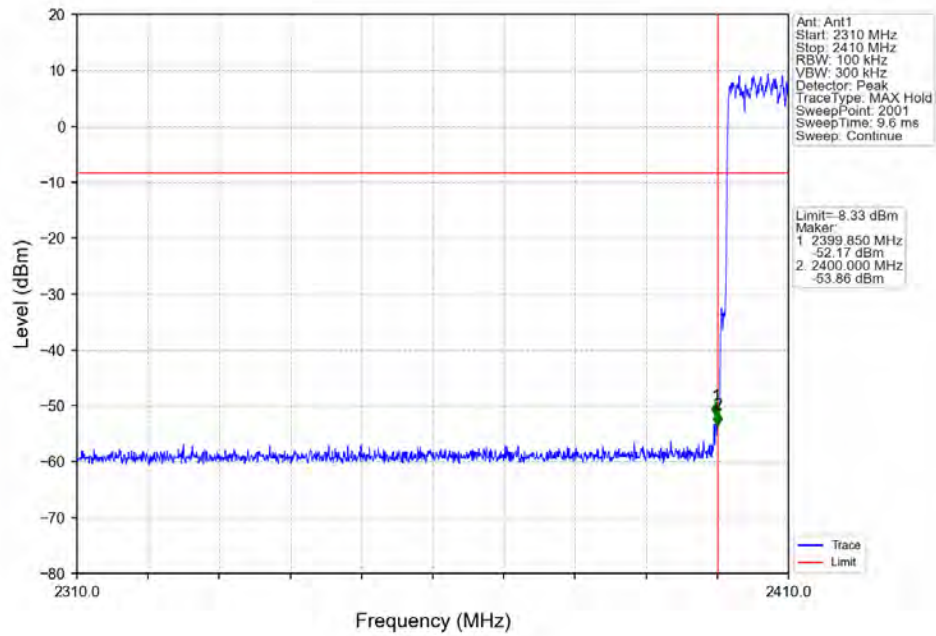
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



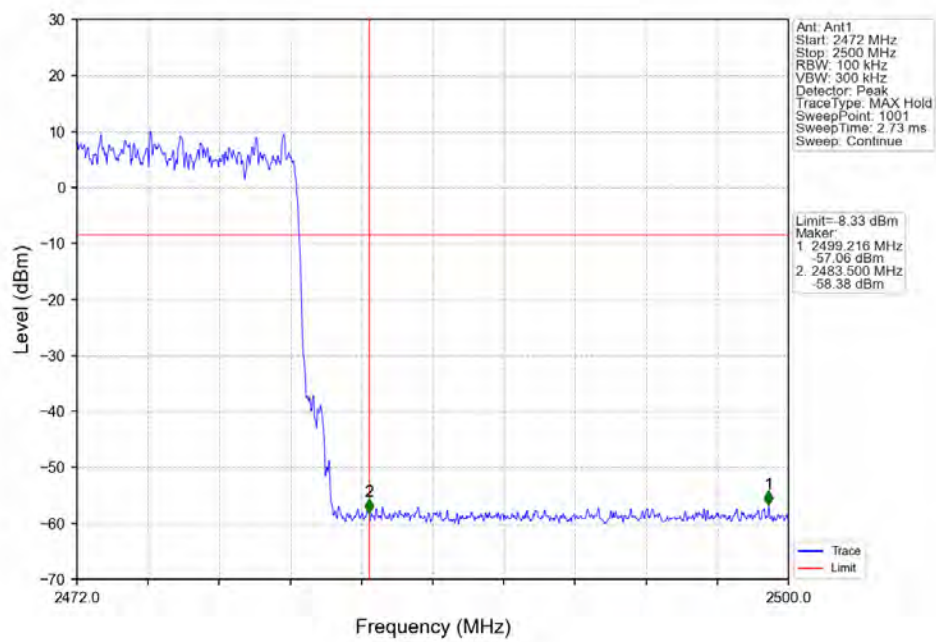
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



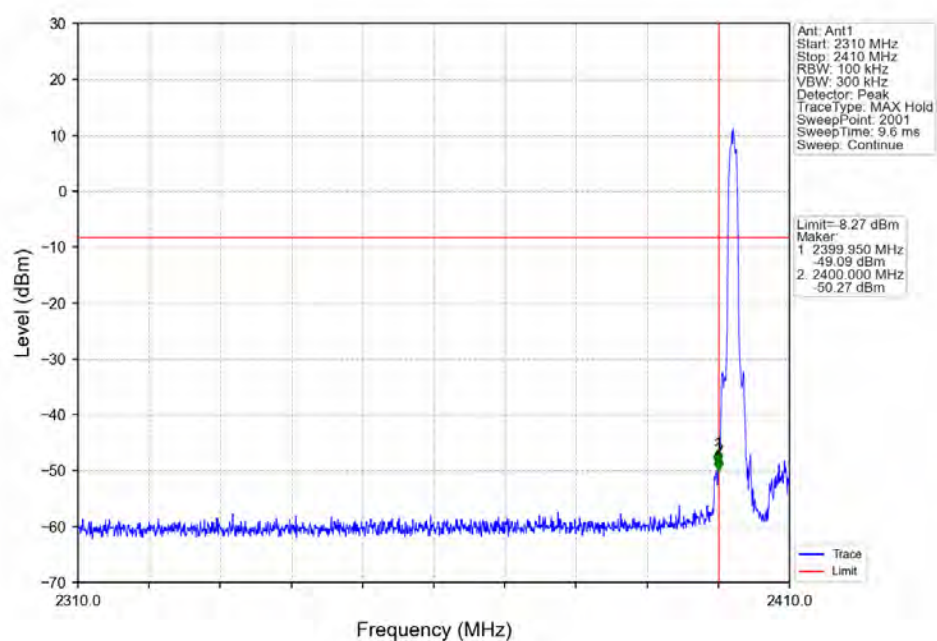
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



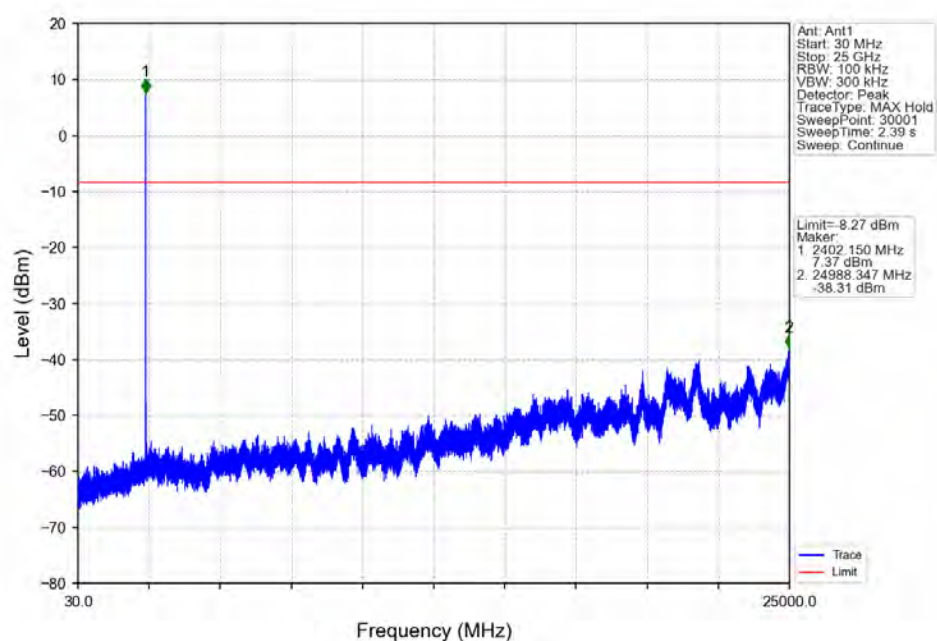
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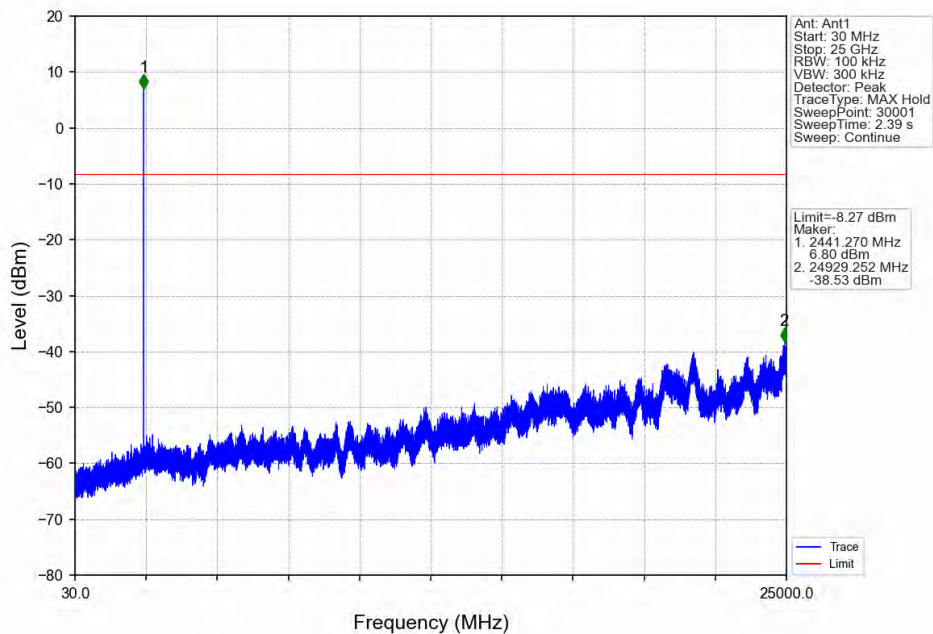
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



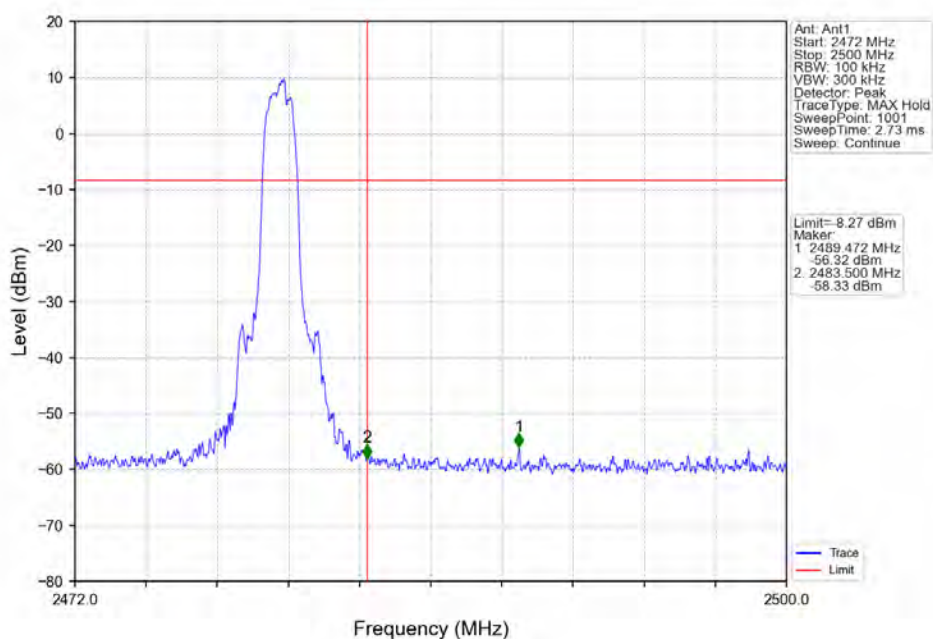
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



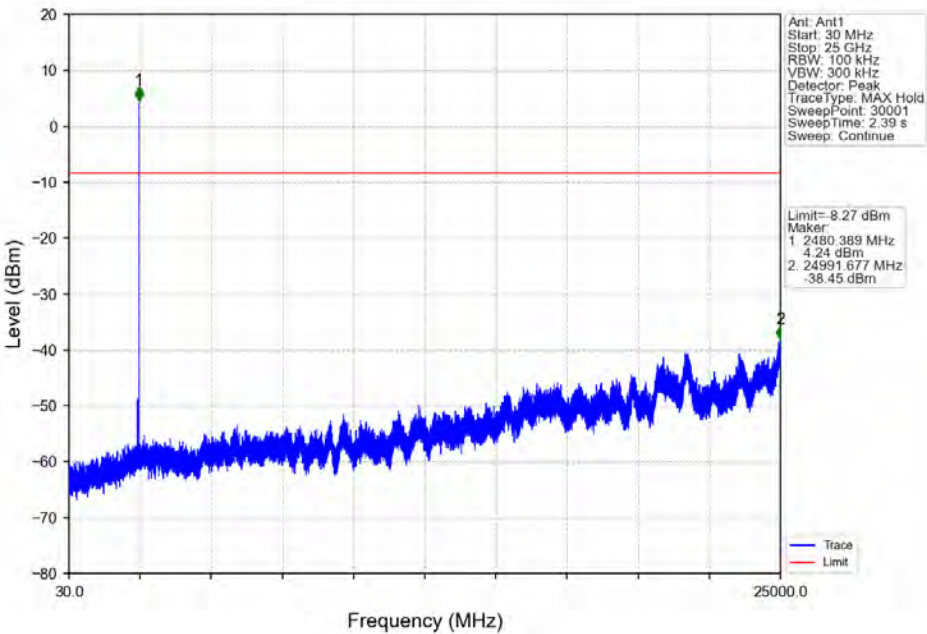
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

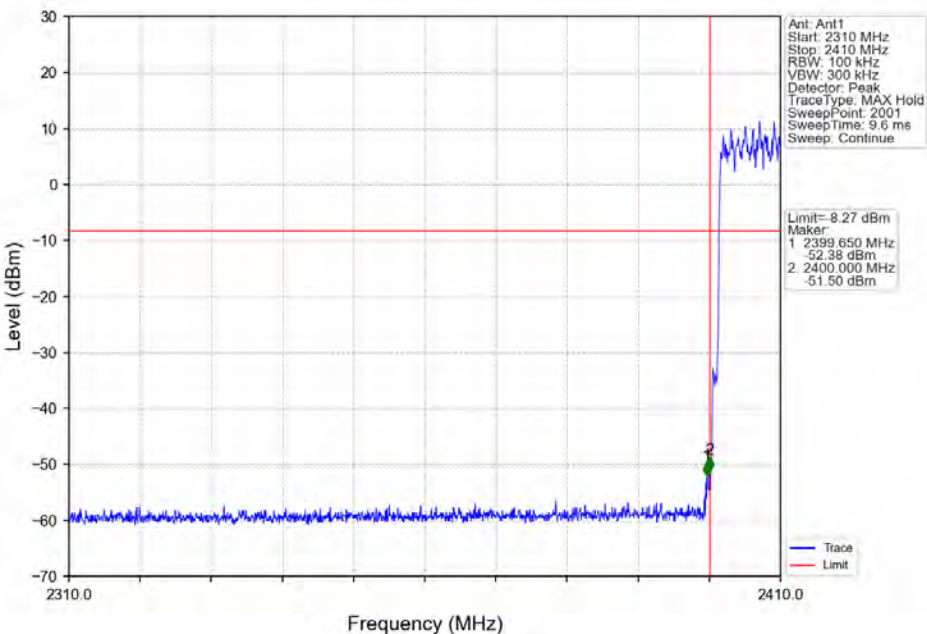
Report No.: KSCR240700121703

Page: 112 of 167

8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



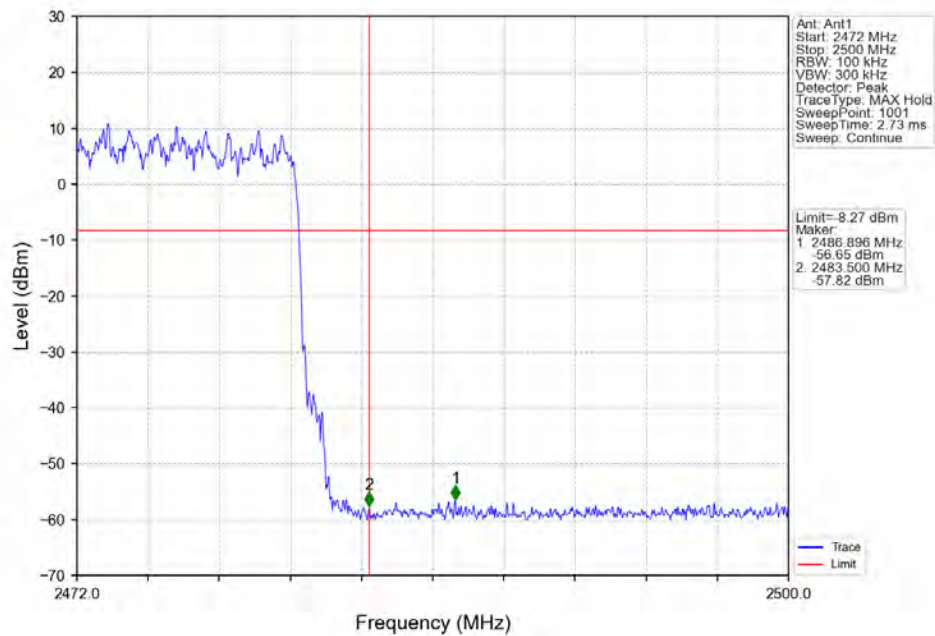
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 113 of 167

8DPSK_3DH5_HOPP_Ant1_NTNV



7. Frequency Error

7.1 Test Result

7.1.1 Ant1

Ant1								
Mode	TX Type	Frequency (MHz)	Packet Type	Temperature (°C)	Voltage (VAC)	Measured Frequency (MHz)	Limit (MHz)	Verdict
GFSK	SISO	2402	DH5	20	102	2402.054	2401.667 to 2402.333	Pass
					120	2402.056	2401.667 to 2402.333	Pass
					138	2402.055	2401.667 to 2402.333	Pass
				-20	120	2402.056	2401.667 to 2402.333	Pass
				50	120	2402.055	2401.667 to 2402.333	Pass
		2441	DH5	20	102	2441.055	2440.667 to 2441.333	Pass
					120	2441.056	2440.667 to 2441.333	Pass
					138	2441.055	2440.667 to 2441.333	Pass
				-20	120	2441.056	2440.667 to 2441.333	Pass
				50	120	2441.058	2440.667 to 2441.333	Pass
		2480	DH5	20	102	2480.056	2479.666 to 2480.334	Pass
					120	2480.057	2479.666 to 2480.334	Pass
					138	2480.056	2479.666 to 2480.334	Pass
				-20	120	2480.056	2479.666 to 2480.334	Pass
				50	120	2480.058	2479.666 to 2480.334	Pass
Pi/4DQPSK	SISO	2402	2DH5	20	102	2402.055	2401.53 to 2402.47	Pass
					120	2402.054	2401.53 to 2402.47	Pass
					138	2402.055	2401.53 to 2402.47	Pass
				-20	120	2402.056	2401.53 to 2402.47	Pass
				50	120	2402.054	2401.53 to 2402.47	Pass
		2441	2DH5	20	102	2441.058	2440.53 to 2441.47	Pass
					120	2441.058	2440.53 to 2441.47	Pass
					138	2441.054	2440.53 to 2441.47	Pass
				-20	120	2441.056	2440.53 to 2441.47	Pass
				50	120	2441.056	2440.53 to 2441.47	Pass
		2480	2DH5	20	102	2480.056	2479.53 to 2480.47	Pass
					120	2480.054	2479.53 to 2480.47	Pass
					138	2480.056	2479.53 to 2480.47	Pass
				-20	120	2480.058	2479.53 to 2480.47	Pass
				50	120	2480.054	2479.53 to 2480.47	Pass
8DPSK	SISO	2402	3DH5	20	102	2402.053	2401.526 to 2402.474	Pass
					120	2402.050	2401.526 to 2402.474	Pass
					138	2402.050	2401.526 to 2402.474	Pass
				-20	120	2402.049	2401.526 to 2402.474	Pass



Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 115 of 167

				50	120	2402.056	2401.526 to 2402.474	Pass
		2441	3DH5	20	102	2441.054	2440.527 to 2441.473	Pass
					120	2441.055	2440.527 to 2441.473	Pass
					138	2441.053	2440.527 to 2441.473	Pass
					-20	2441.049	2440.527 to 2441.473	Pass
				50	120	2441.053	2440.527 to 2441.473	Pass
		2480	3DH5	20	102	2480.054	2479.527 to 2480.473	Pass
					120	2480.048	2479.527 to 2480.473	Pass
					138	2480.053	2479.527 to 2480.473	Pass
					-20	2480.053	2479.527 to 2480.473	Pass
				50	120	2480.052	2479.527 to 2480.473	Pass

Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 116 of 167

Ant5

1. Bandwidth

1.1 Test Result

1.1.1 OBW

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	5	0.833	/	Pass
		2441	DH5	5	0.832	/	Pass
		2480	DH5	5	0.832	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	5	1.173	/	Pass
		2441	2DH5	5	1.174	/	Pass
		2480	2DH5	5	1.173	/	Pass
8DPSK	SISO	2402	3DH5	5	1.183	/	Pass
		2441	3DH5	5	1.180	/	Pass
		2480	3DH5	5	1.181	/	Pass

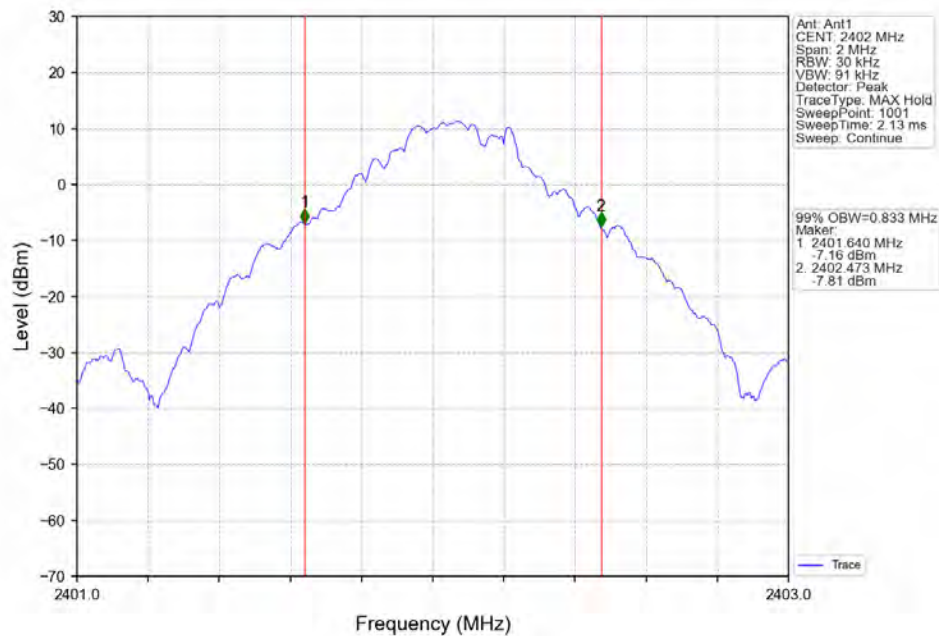
1.1.2 20dB BW

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	5	0.936	/	Pass
		2441	DH5	5	0.937	/	Pass
		2480	DH5	5	0.939	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	5	1.327	/	Pass
		2441	2DH5	5	1.332	/	Pass
		2480	2DH5	5	1.330	/	Pass
8DPSK	SISO	2402	3DH5	5	1.319	/	Pass
		2441	3DH5	5	1.320	/	Pass
		2480	3DH5	5	1.320	/	Pass

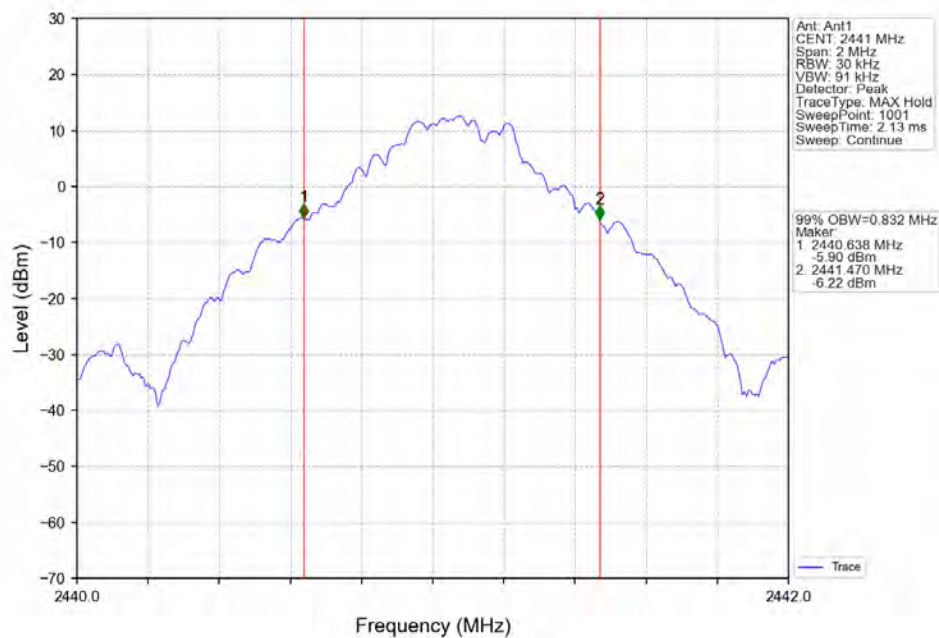
1.2 Test Graph

1.2.1 OBW

GFSK_DH5_LCH_2402MHz_Ant5_NTNV



GFSK_DH5_MCH_2441MHz_Ant5_NTNV



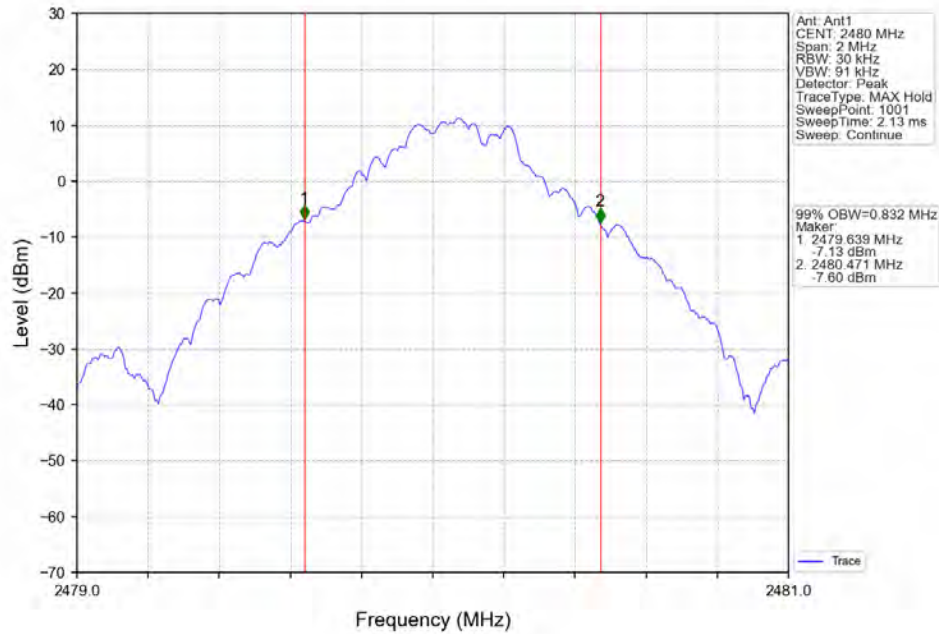
Compliance Certification Services (Kunshan) Inc.

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

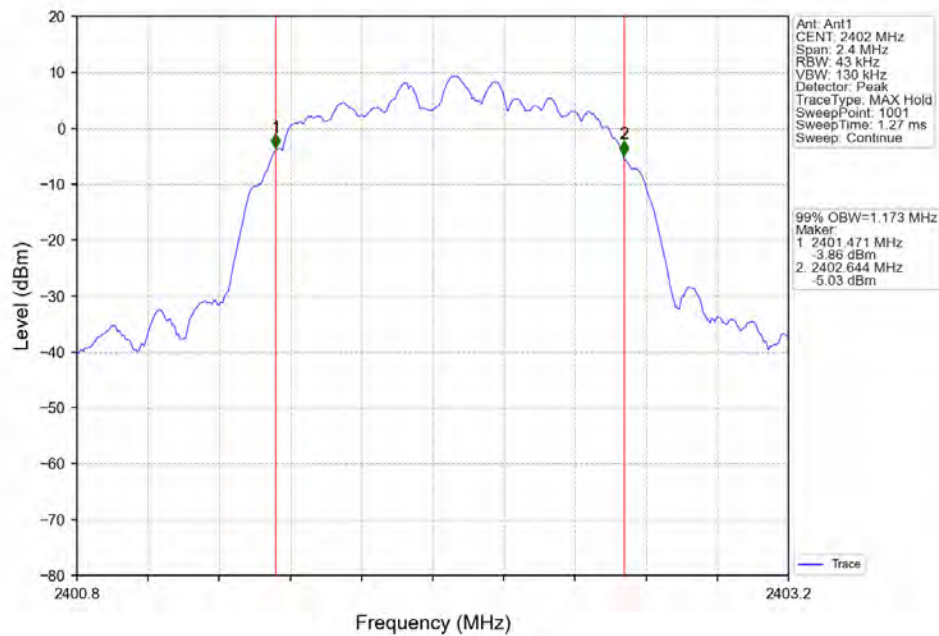
Report No.: KSCR240700121703

Page: 118 of 167

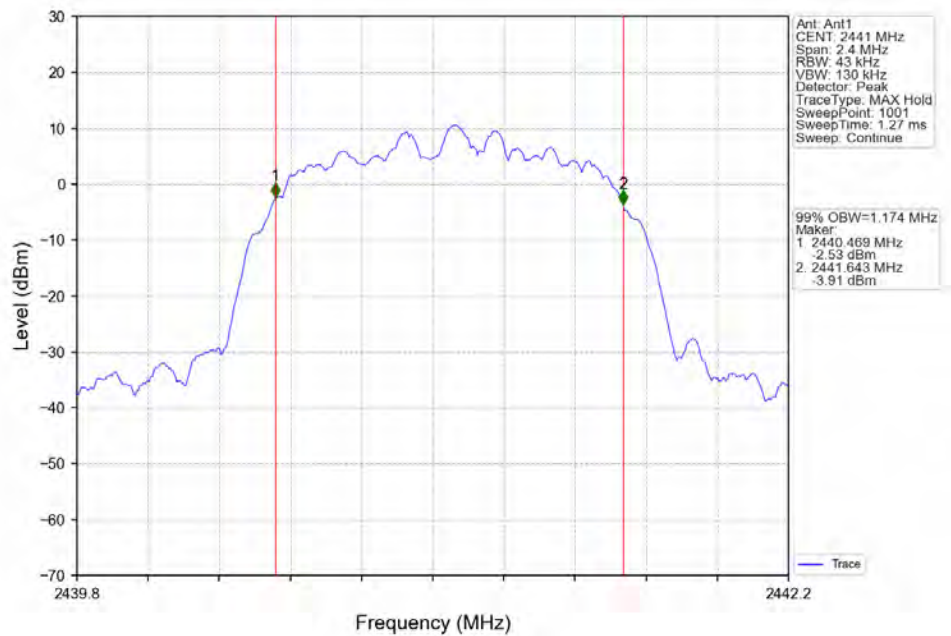
GFSK_DH5_HCH_2480MHz_Ant5_NTNV



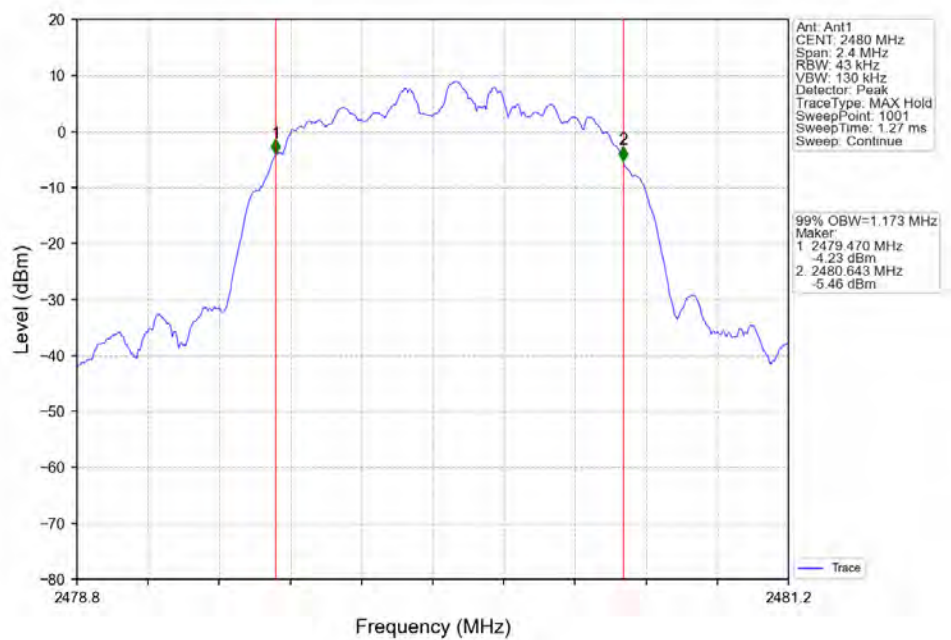
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant5_NTNV



Pi/4DQPSK_2DH5_MCH_2441MHz_Ant5_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant5_NTNV



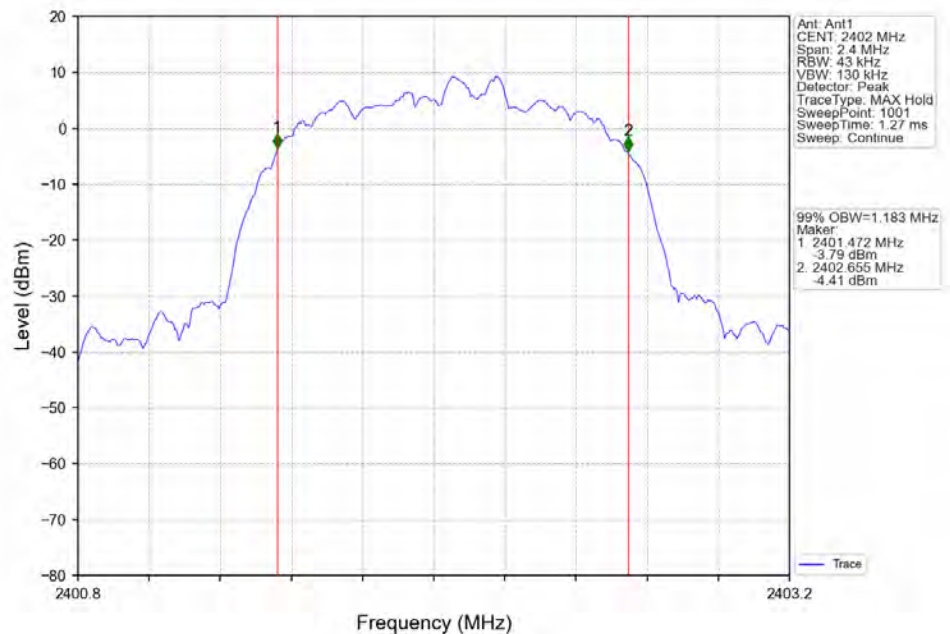
Compliance Certification Services (Kunshan) Inc.

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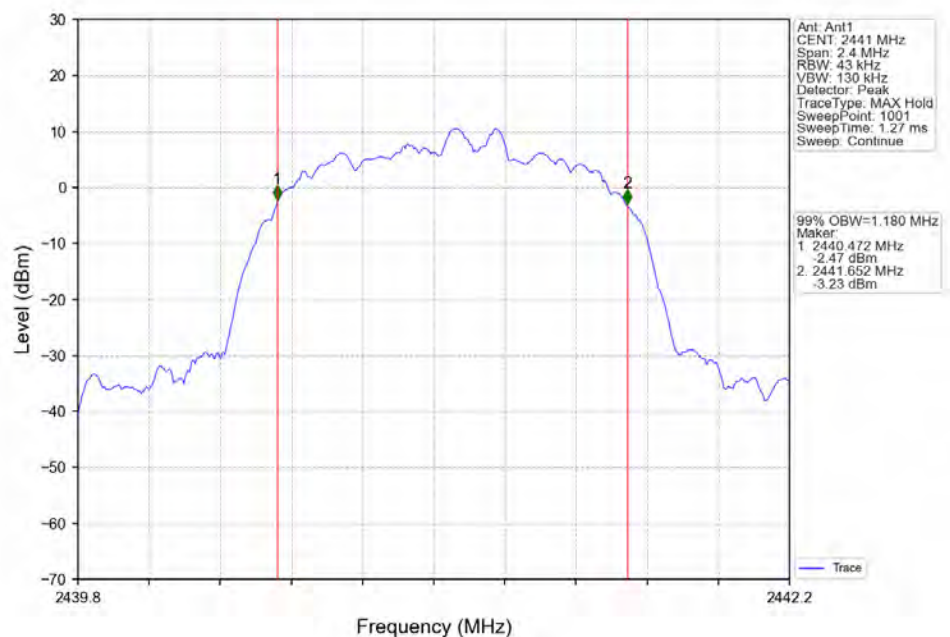
Report No.: KSCR240700121703

Page: 120 of 167

8DPSK_3DH5_LCH_2402MHz_Ant5_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant5_NTNV



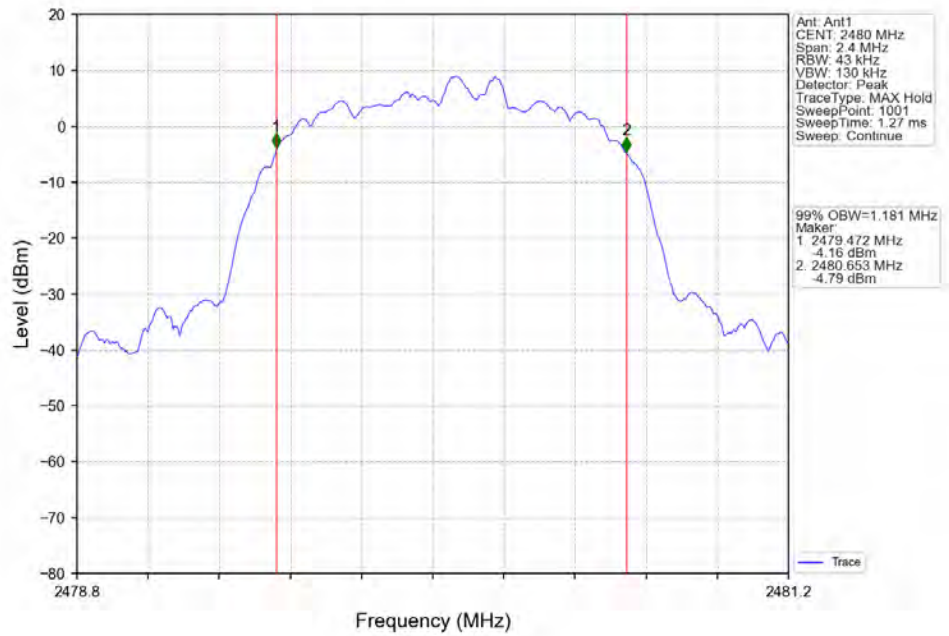
Compliance Certification Services (Kunshan) Inc.

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

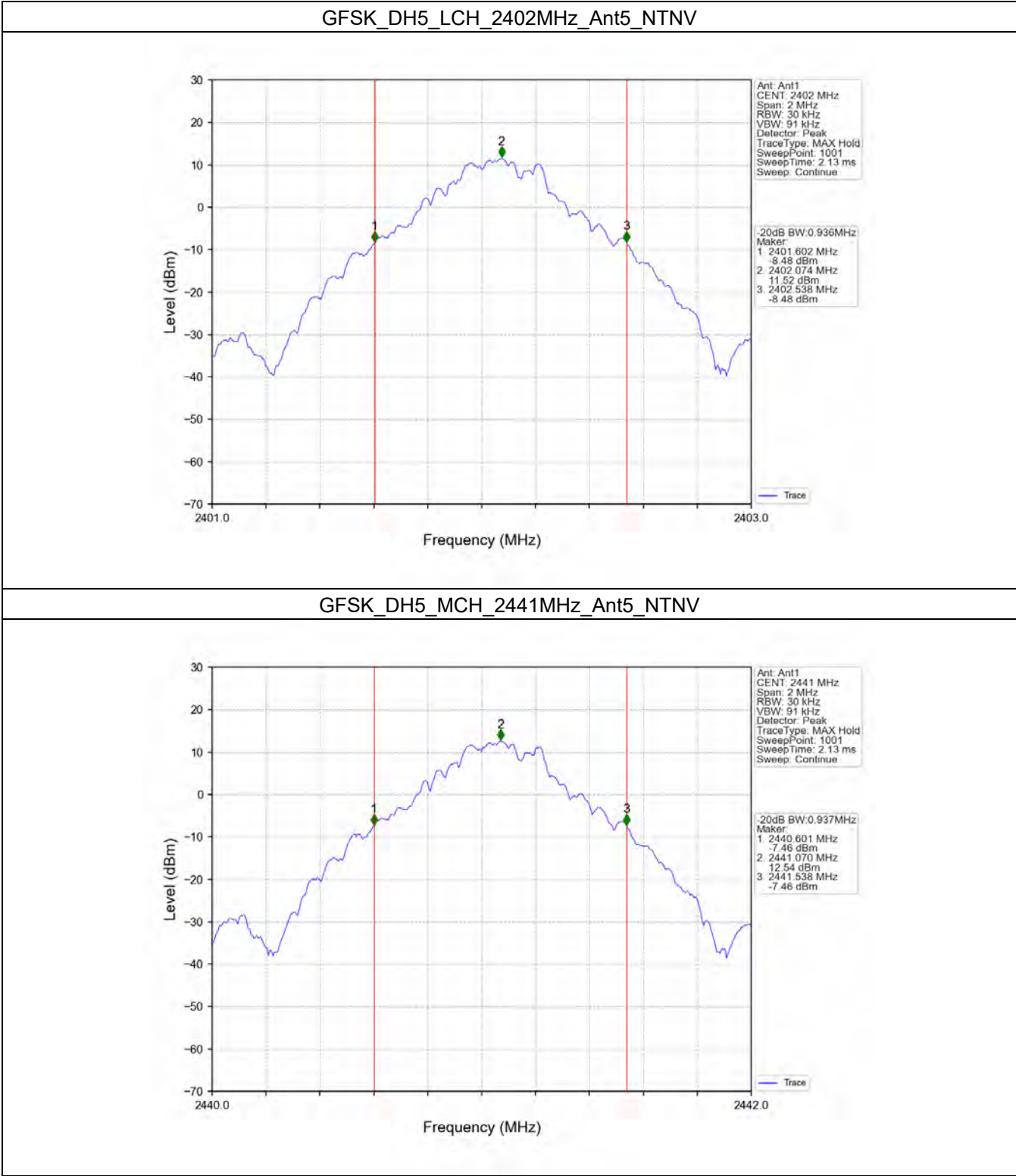
Report No.: KSCR240700121703

Page: 121 of 167

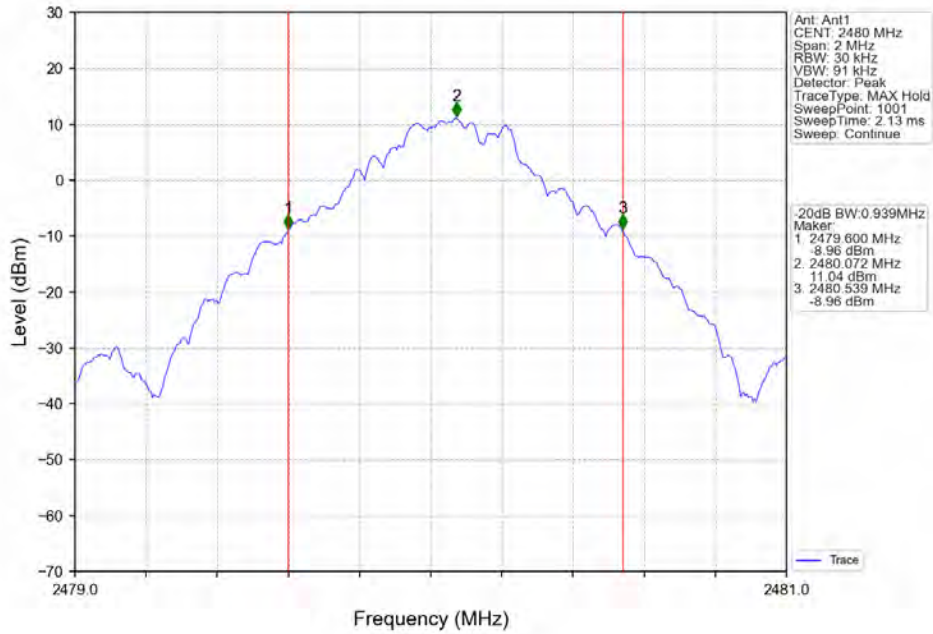
8DPSK_3DH5_HCH_2480MHz_Ant5_NTNV



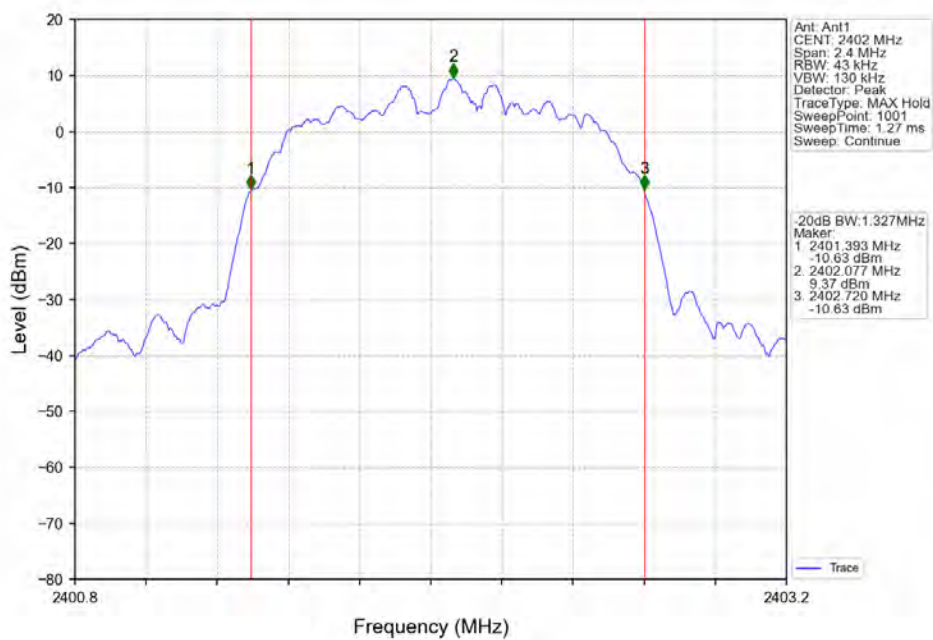
1.2.2 20dB BW



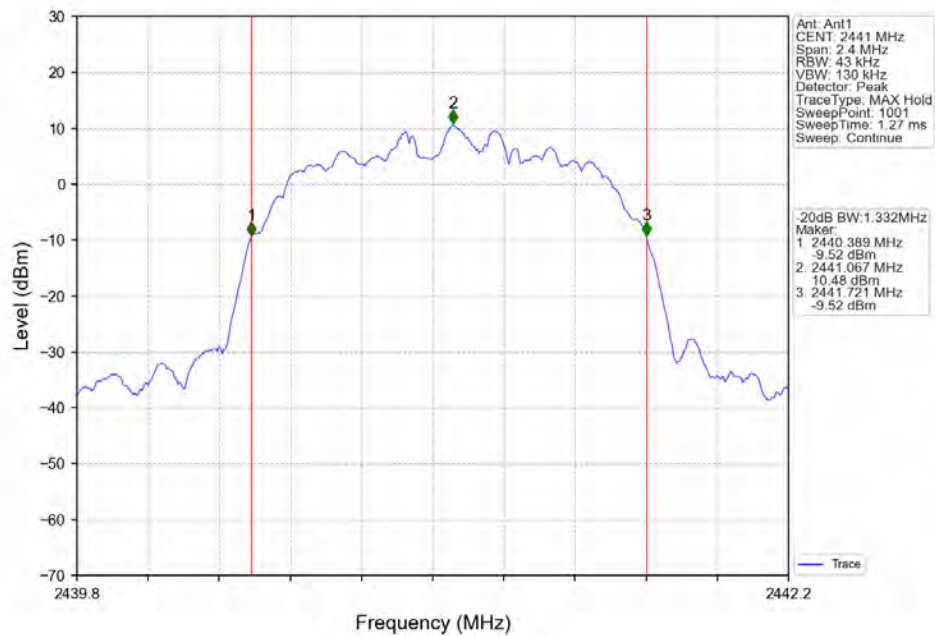
GFSK_DH5_HCH_2480MHz_Ant5_NTNV



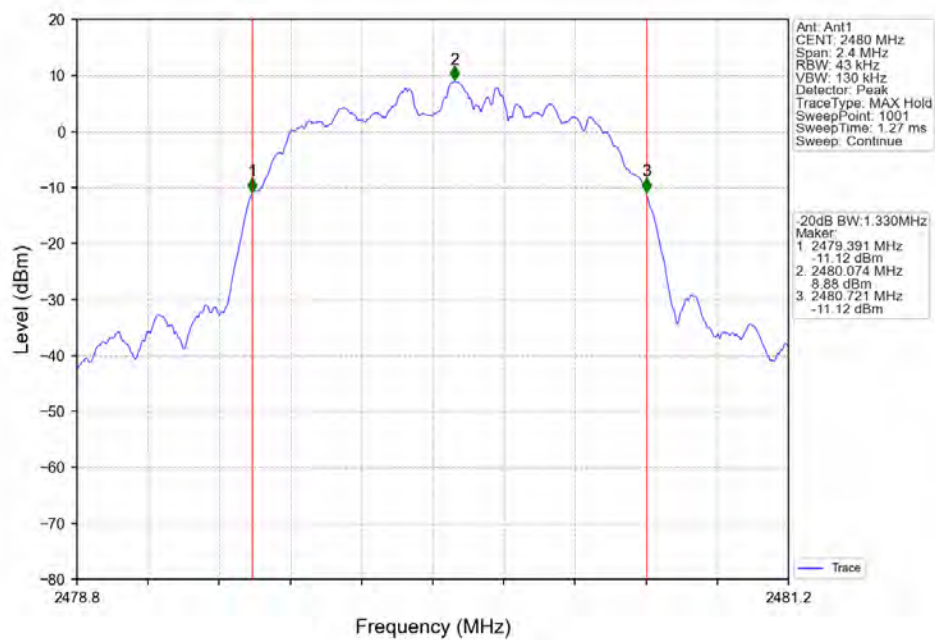
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant5_NTNV



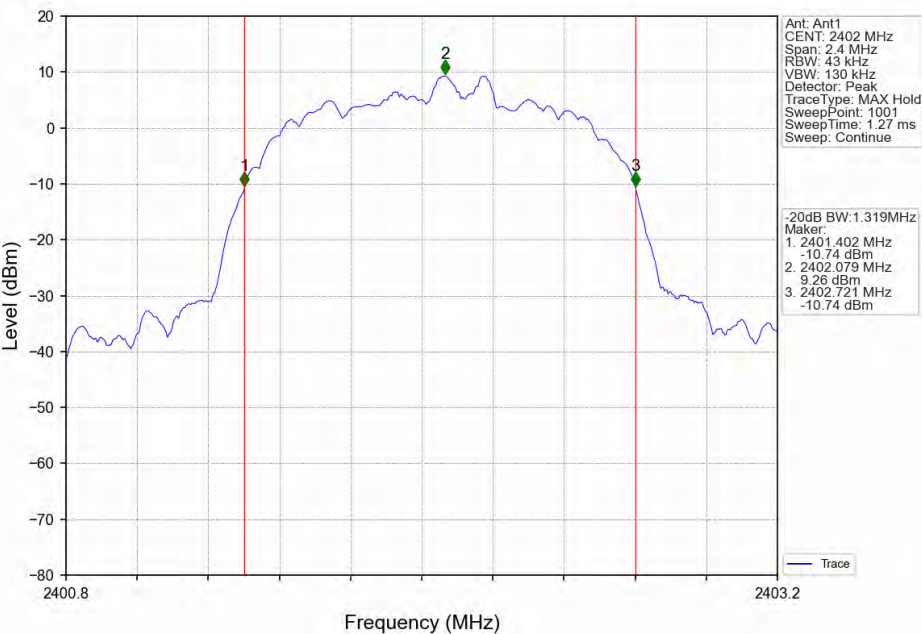
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant5_NTNV



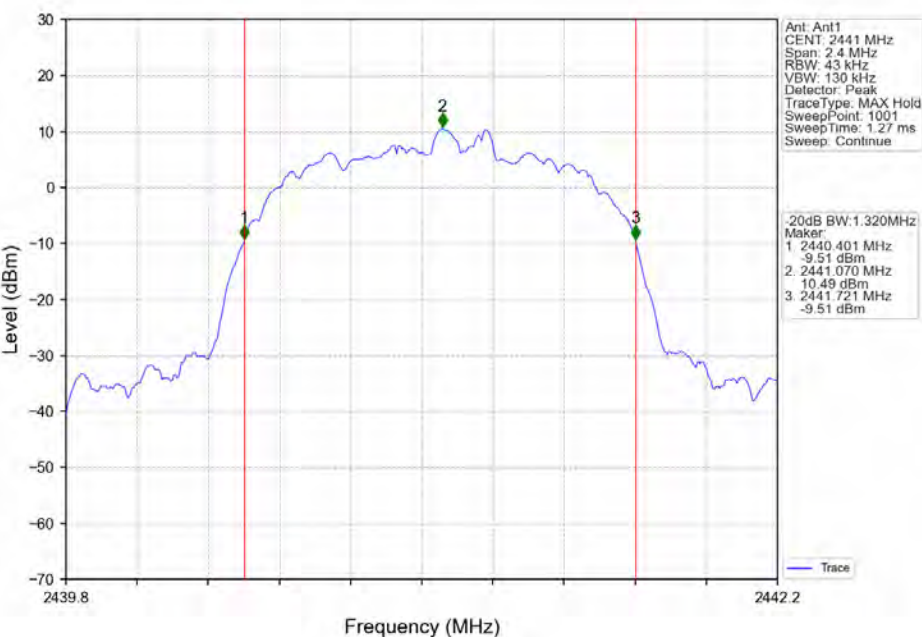
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant5_NTNV



8DPSK_3DH5_LCH_2402MHz_Ant5_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant5_NTNV



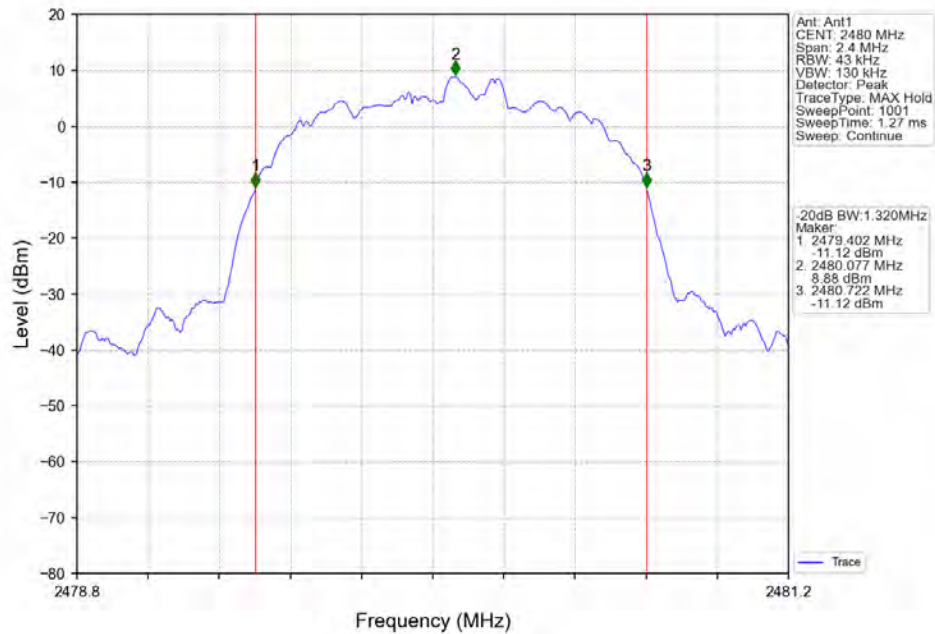
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 126 of 167

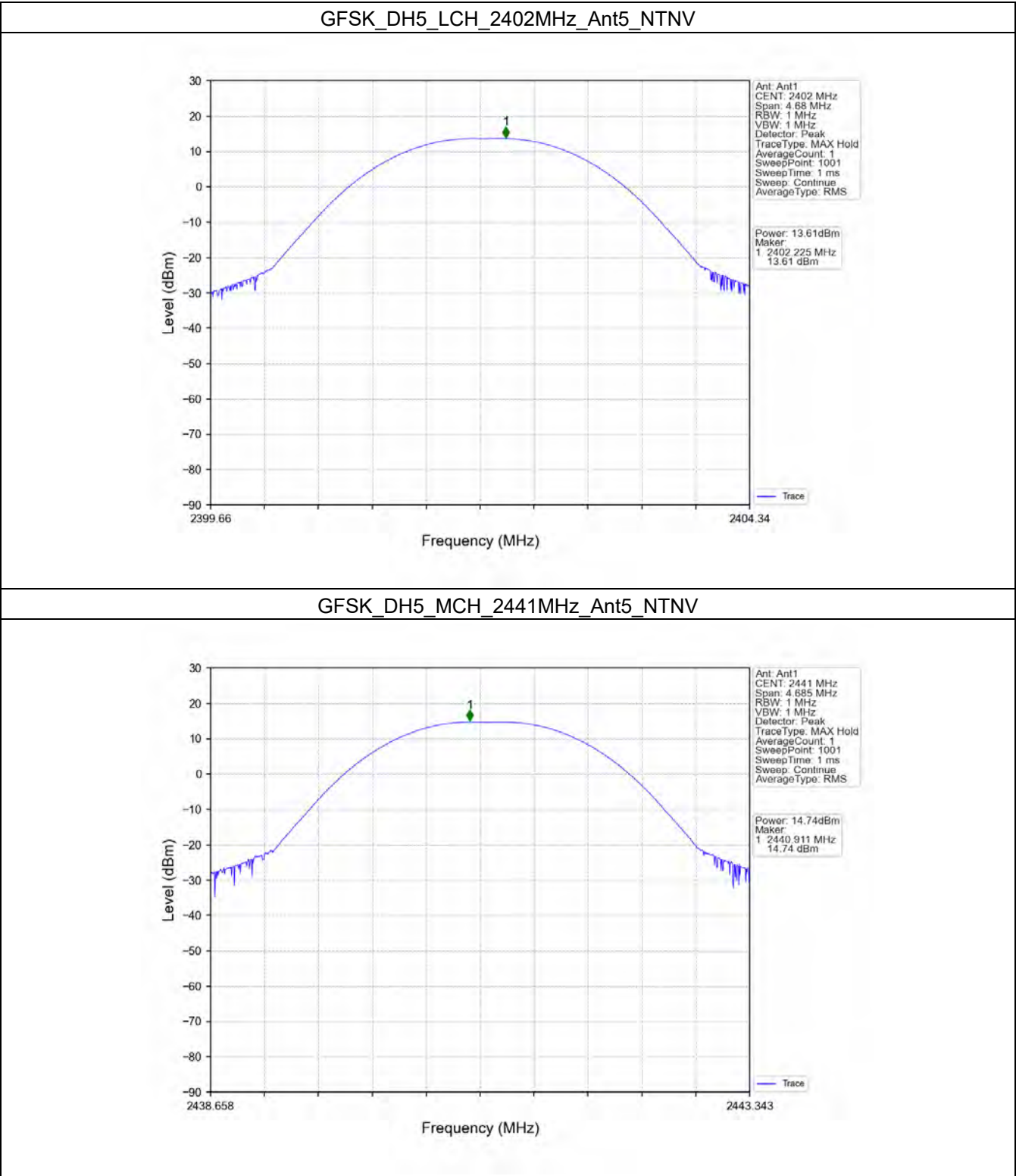
8DPSK_3DH5_HCH_2480MHz_Ant5_NTNV



Note1: Antenna Gain: Ant5: 1.98dBi;

2.2 Test Graph

2.2.1 Power



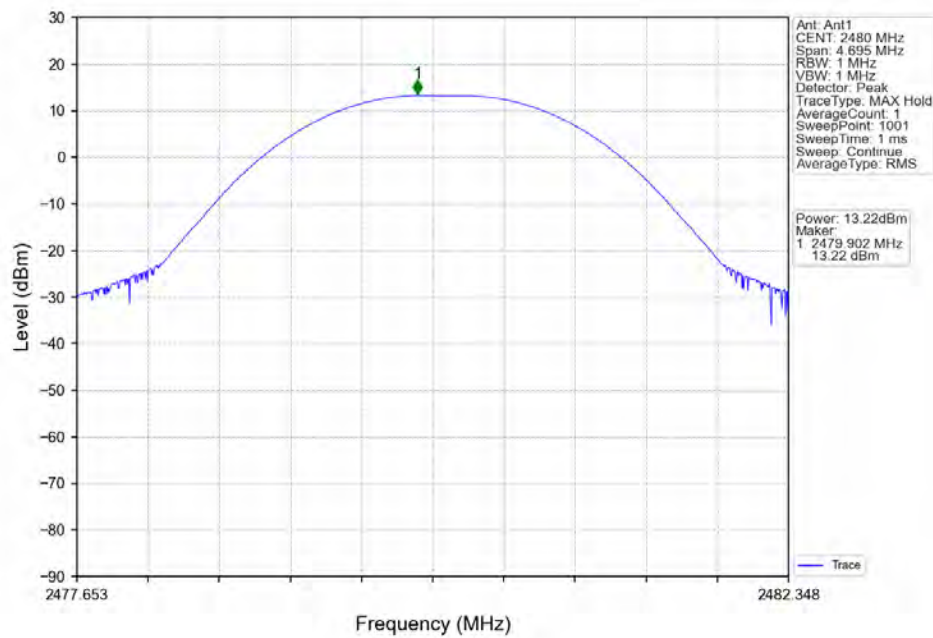
Compliance Certification Services (Kunshan) Inc.

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

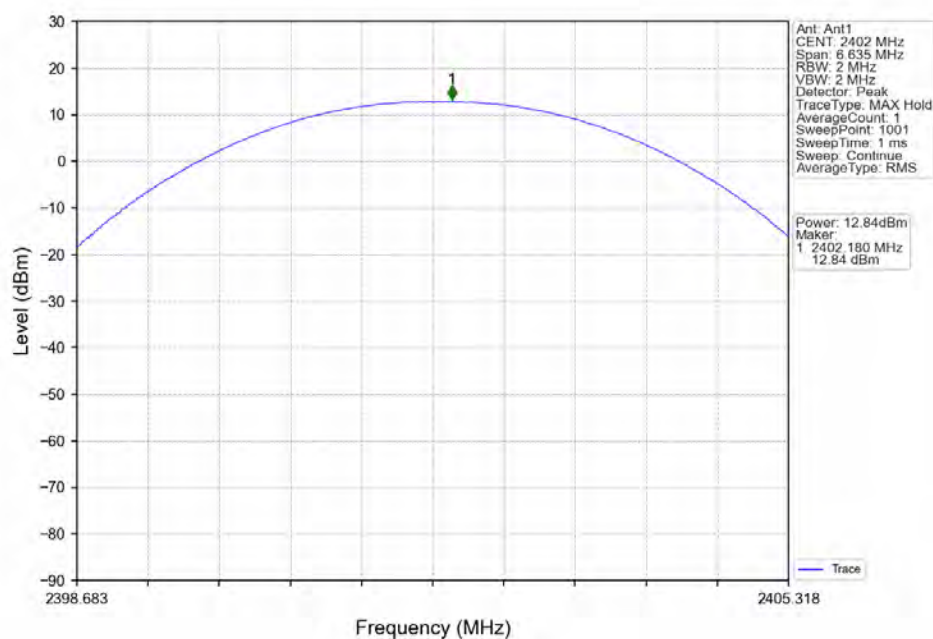
Report No.: KSCR240700121703

Page: 129 of 167

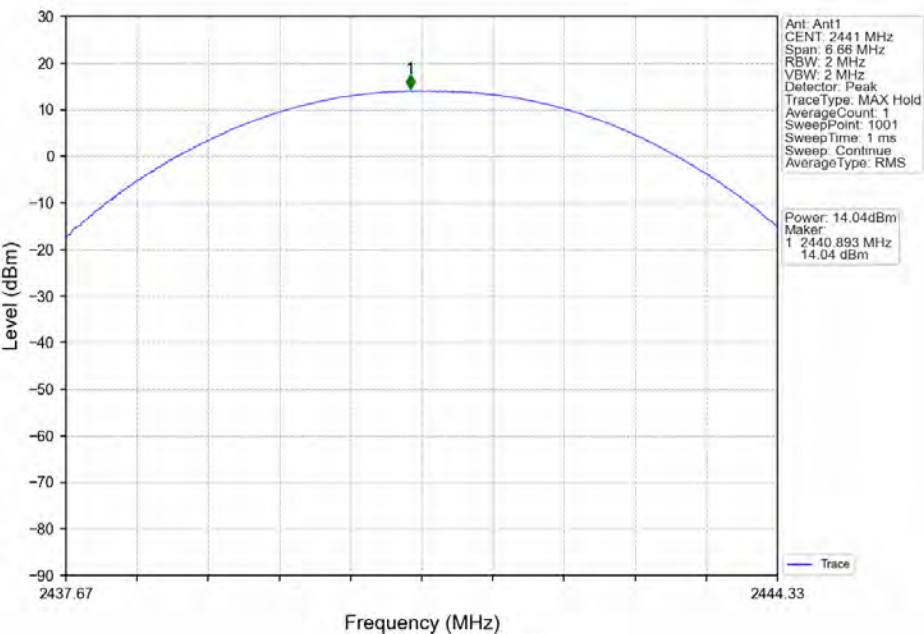
GFSK_DH5_HCH_2480MHz_Ant5_NTNV



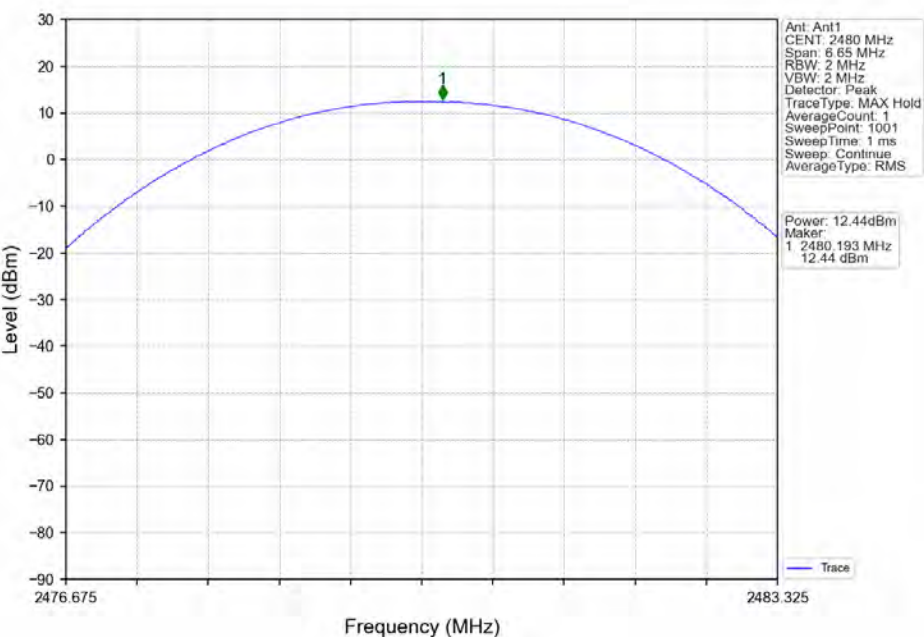
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant5_NTNV



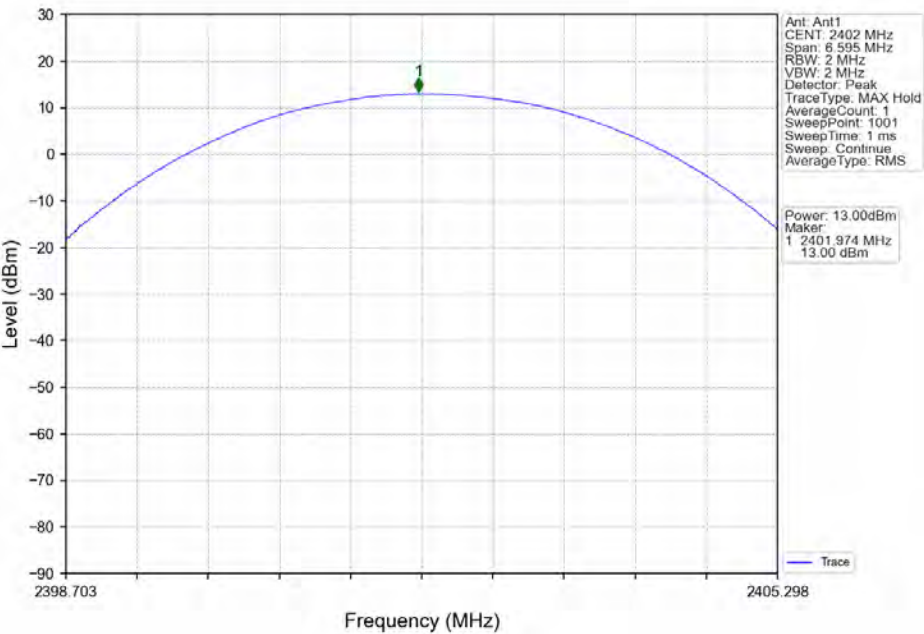
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant5_NTNV



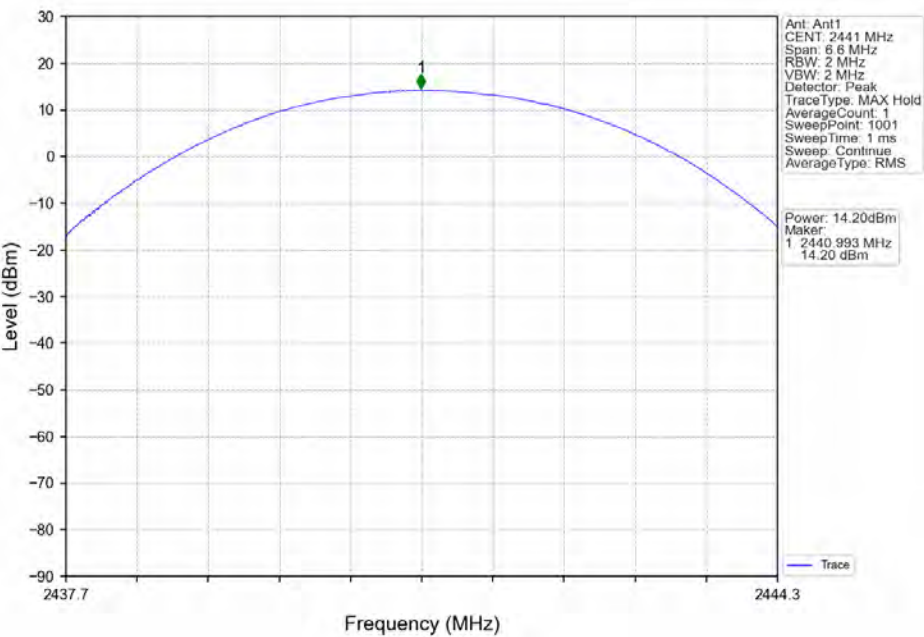
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant5_NTNV



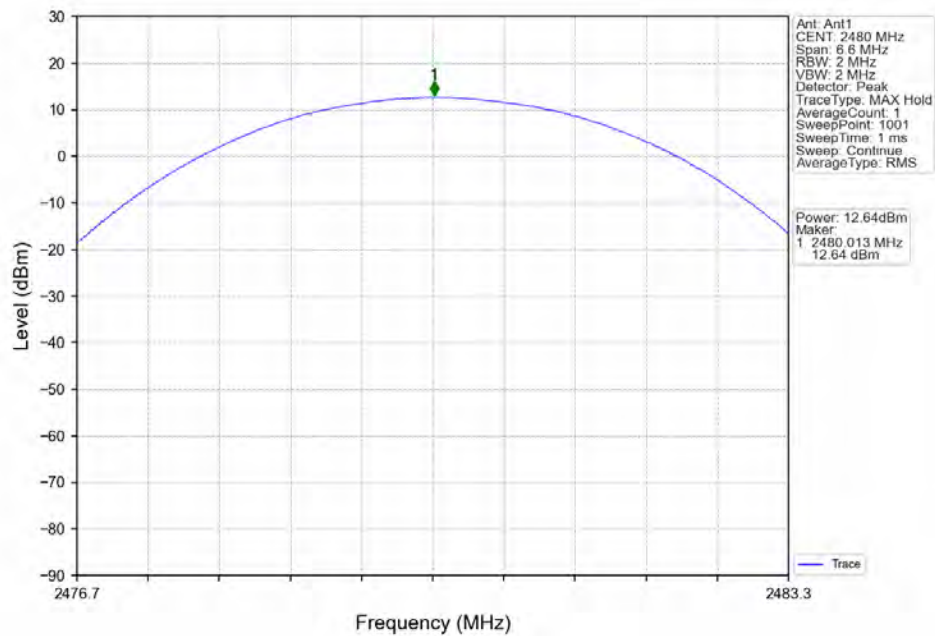
8DPSK_3DH5_LCH_2402MHz_Ant5_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant5_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant5_NTNV





Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 133 of 167

3. Carrier Frequency Separation

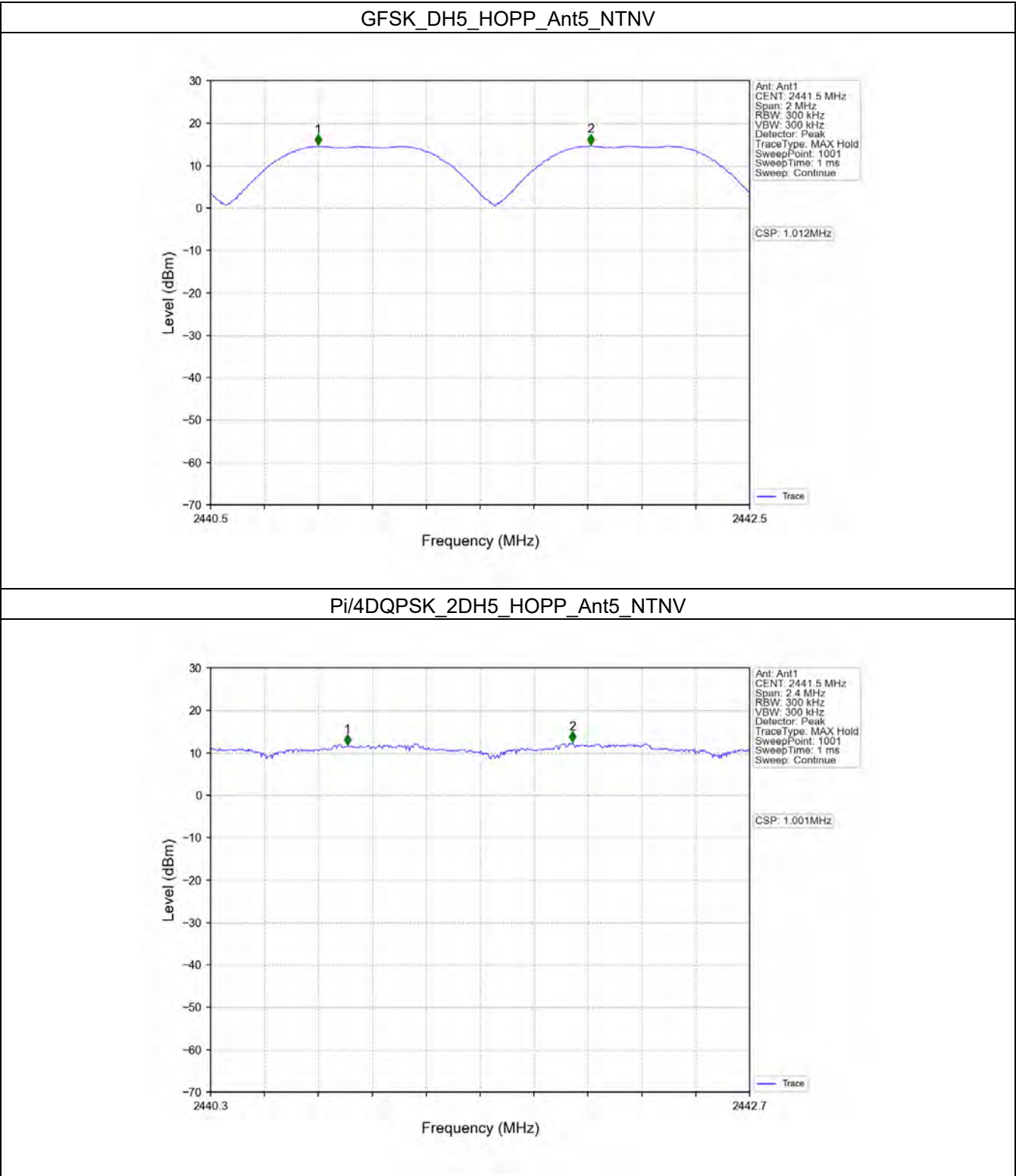
3.1 Test Result

3.1.1 Ant5

Ant5							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.012	0.939	≥ 0.939	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.332	≥ 0.888	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.320	≥ 0.88	Pass

3.2 Test Graph

3.2.1 Ant5



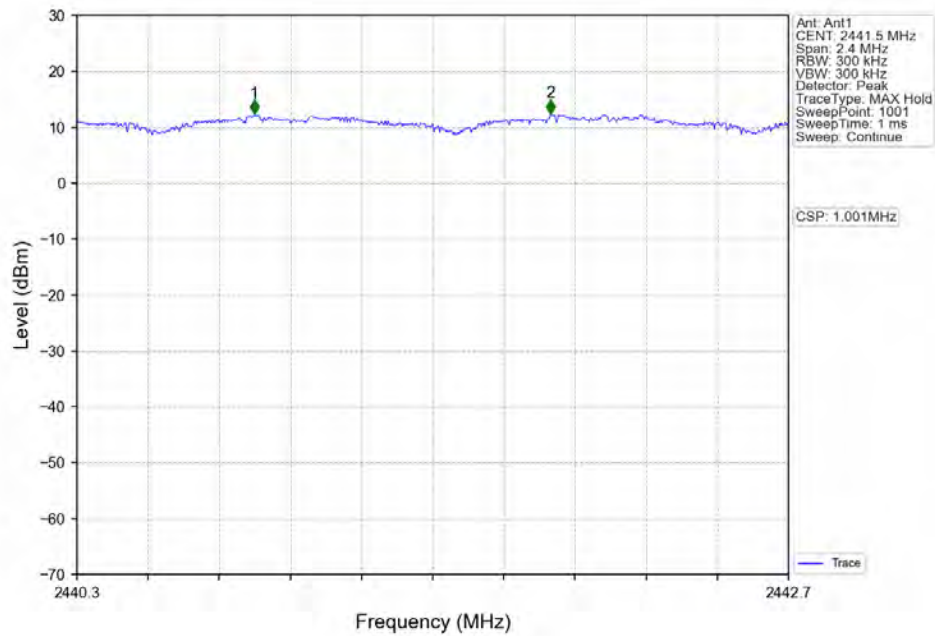
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 135 of 167

8DPSK_3DH5_HOPP_Ant5_NTNV





Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 136 of 167

4. Number of Hopping Frequencies

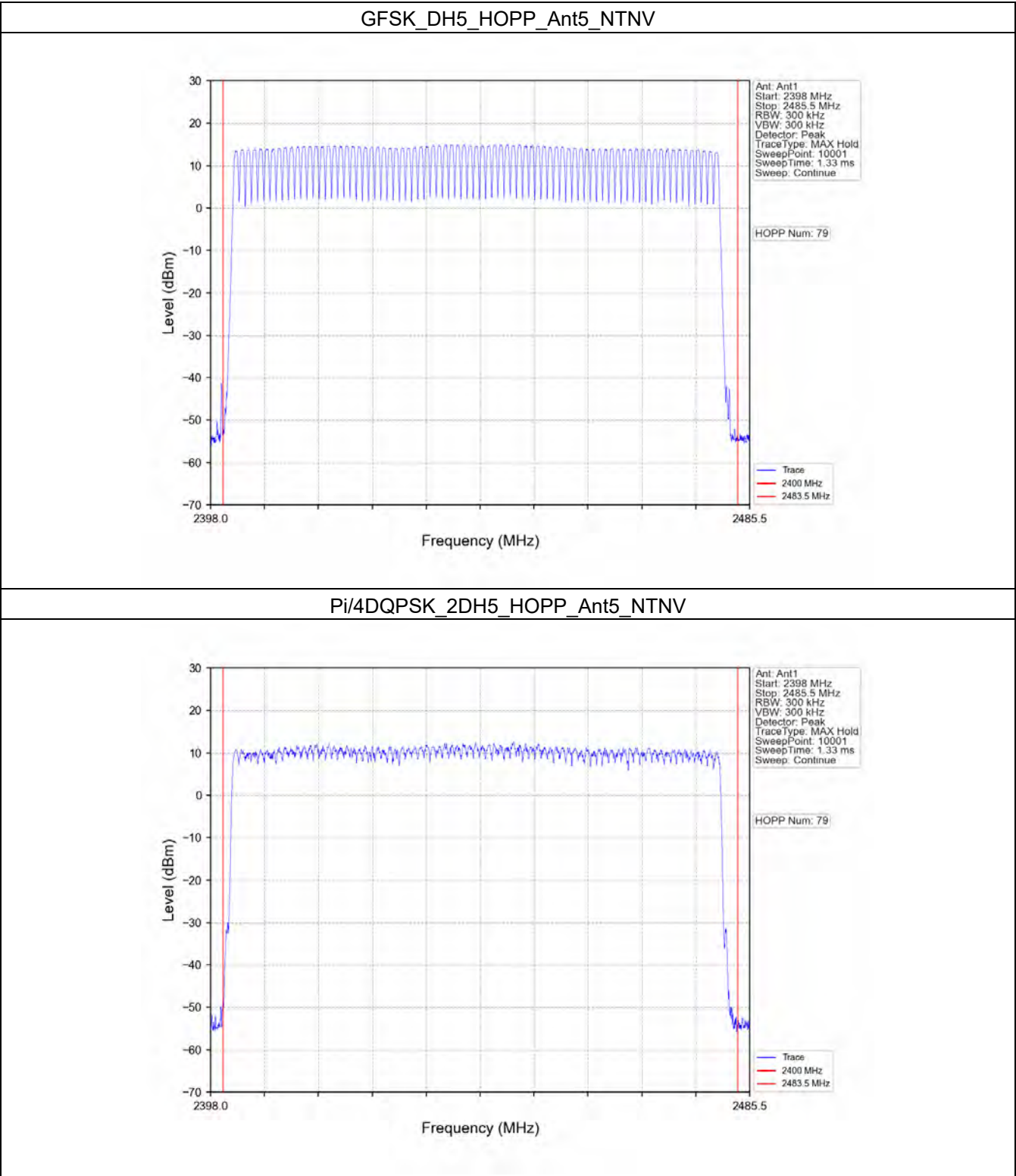
4.1 Test Result

4.1.1 HoppNum

Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT5	Limit	
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass
8DPSK	SISO	HOPP	3DH5	79	>=15	Pass

4.2 Test Graph

4.2.1 HoppNum



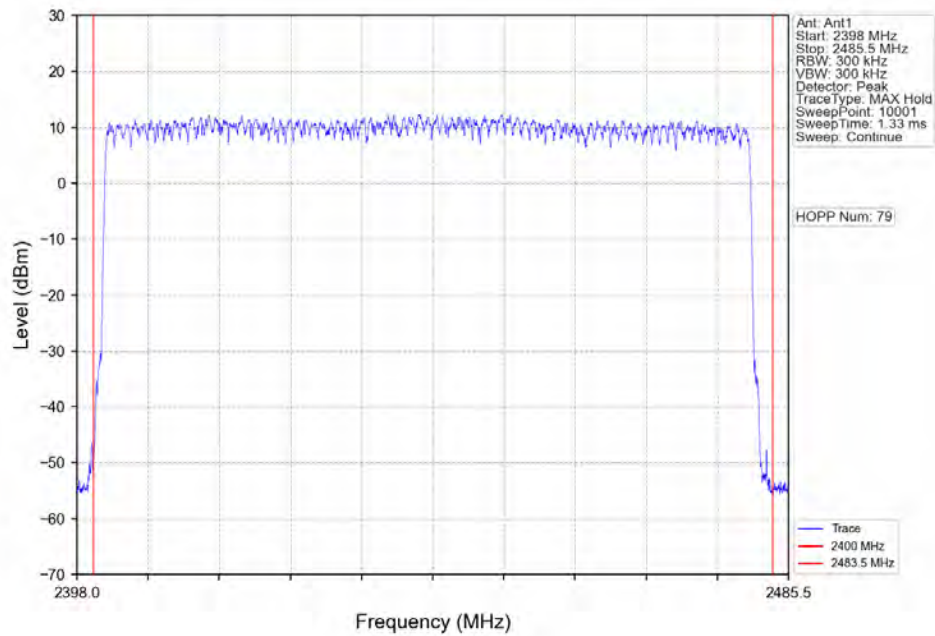
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 138 of 167

8DPSK_3DH5_HOPP_Ant5_NTNV



Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 139 of 167

5. Time of Occupancy (Dwell Time)

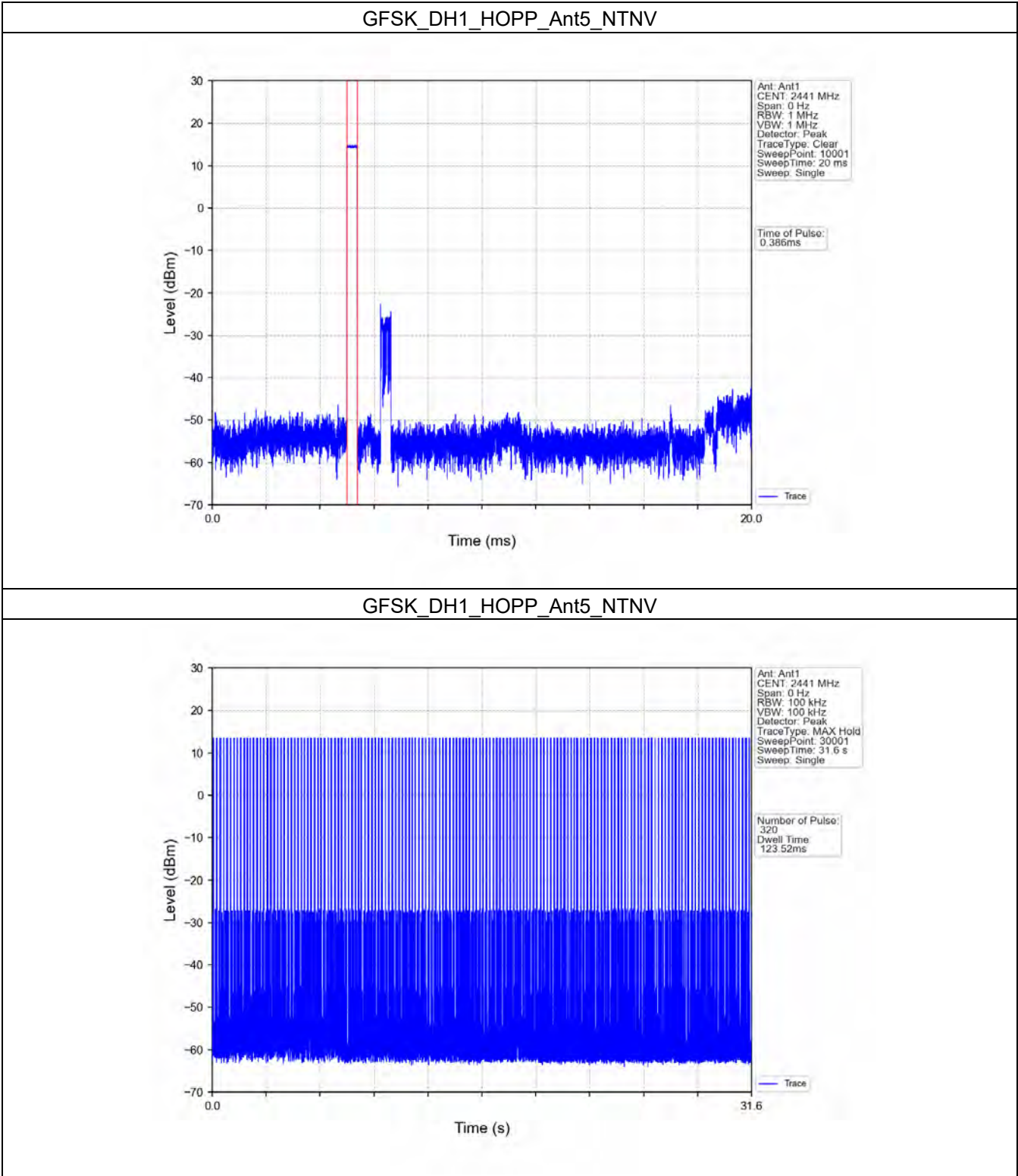
5.1 Test Result

5.1.1 Ant5

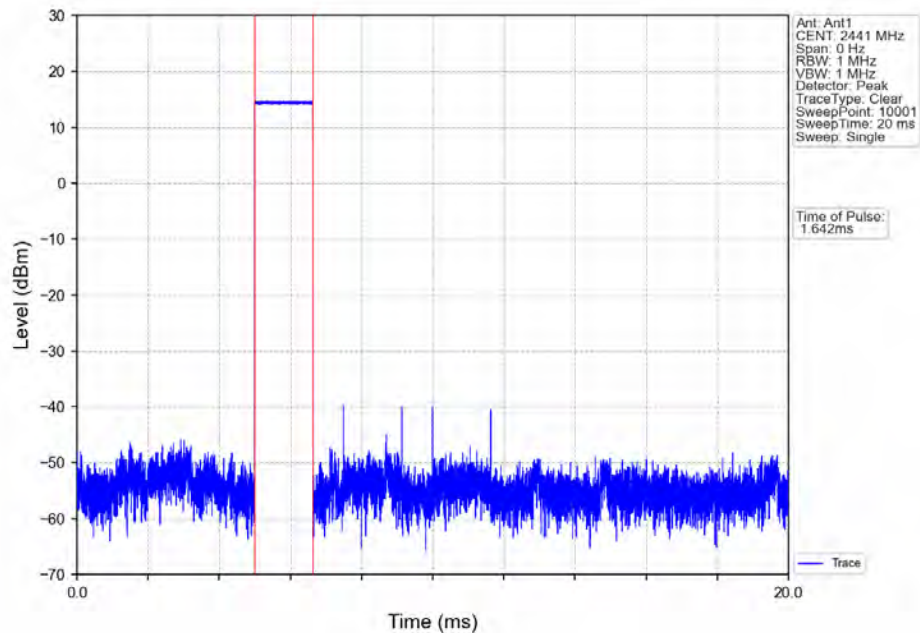
Ant5									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.386	31.600	320	123.520	<=400	Pass
			DH3	1.642	31.600	155	254.510	<=400	Pass
			DH5	2.892	31.600	106	306.552	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.392	31.600	319	125.048	<=400	Pass
			2DH3	1.644	31.600	164	269.616	<=400	Pass
			2DH5	2.892	31.600	102	294.984	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.388	31.600	320	124.160	<=400	Pass
			3DH3	1.644	31.600	162	266.328	<=400	Pass
			3DH5	2.896	31.600	103	298.288	<=400	Pass

5.2 Test Graph

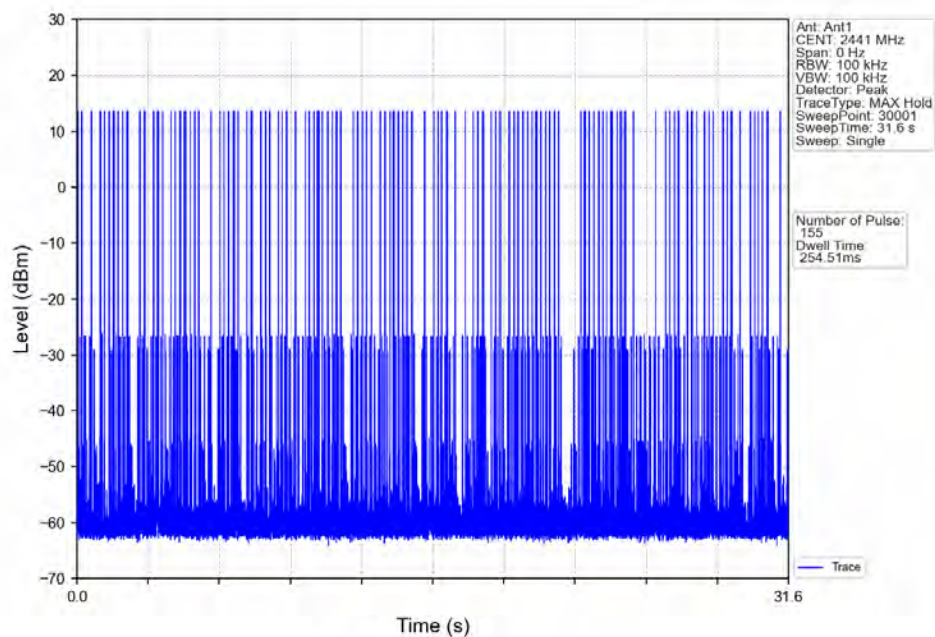
5.2.1 Ant5



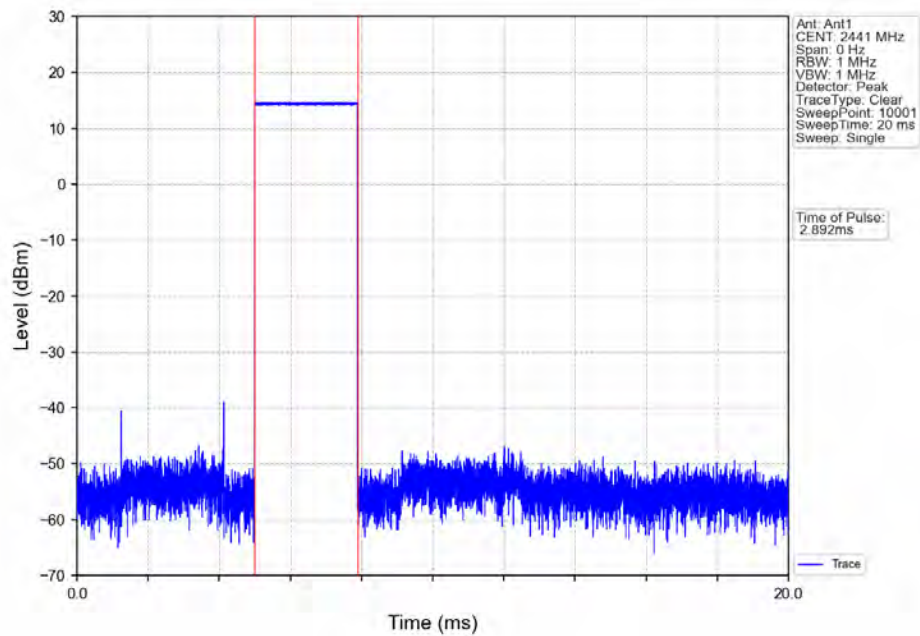
GFSK_DH3_HOPP_Ant5_NTNV



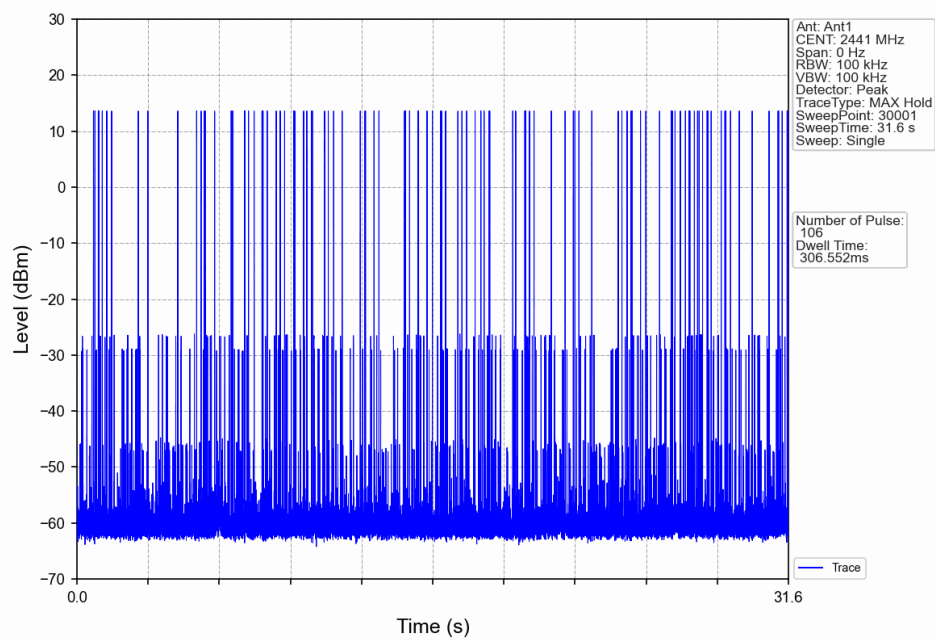
GFSK_DH3_HOPP_Ant5_NTNV



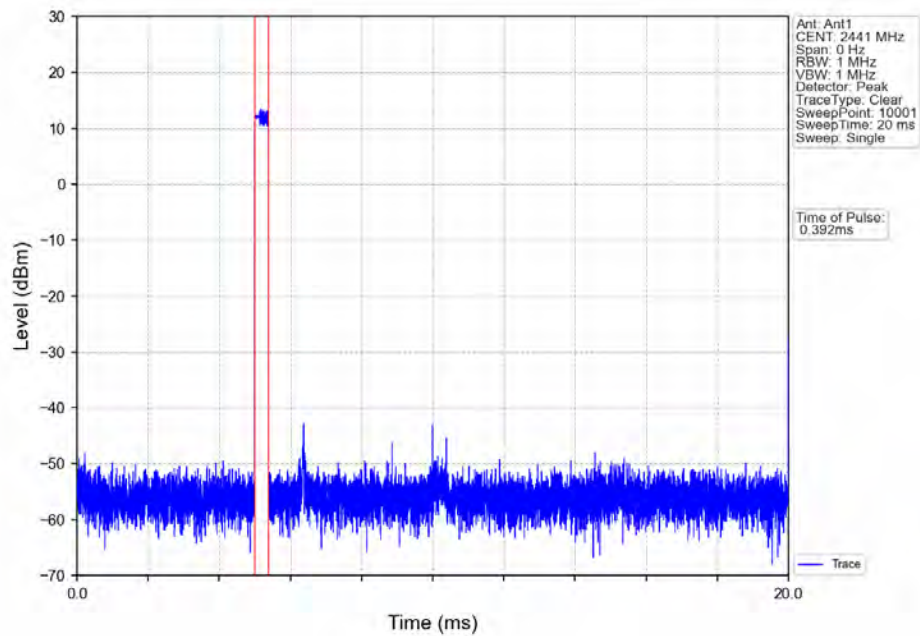
GFSK_DH5_HOPP_Ant5_NTNV



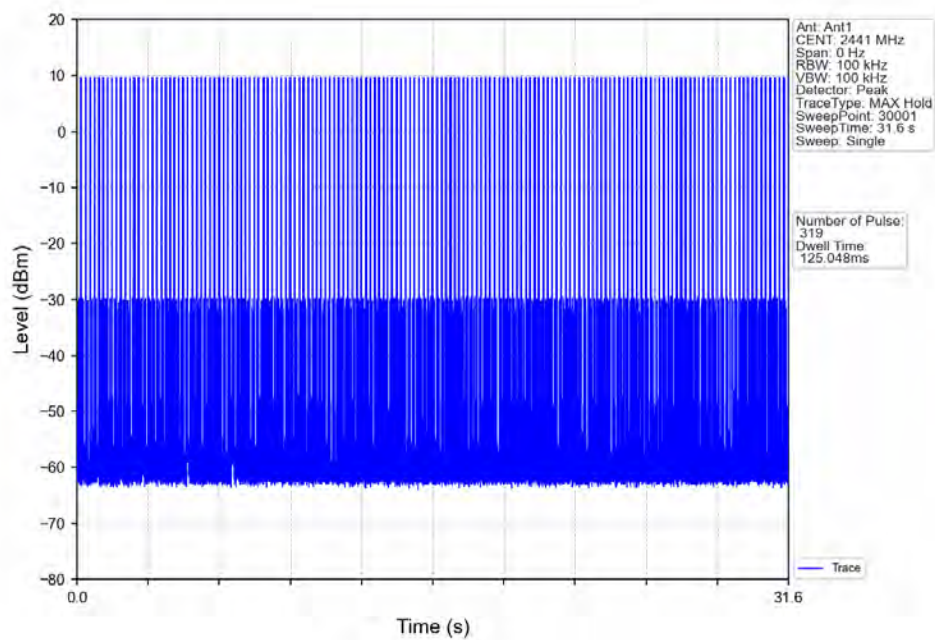
GFSK_DH5_HOPP_Ant5_NTNV



Pi/4DQPSK_2DH1_HOPP_Ant5_NTNV



Pi/4DQPSK_2DH1_HOPP_Ant5_NTNV



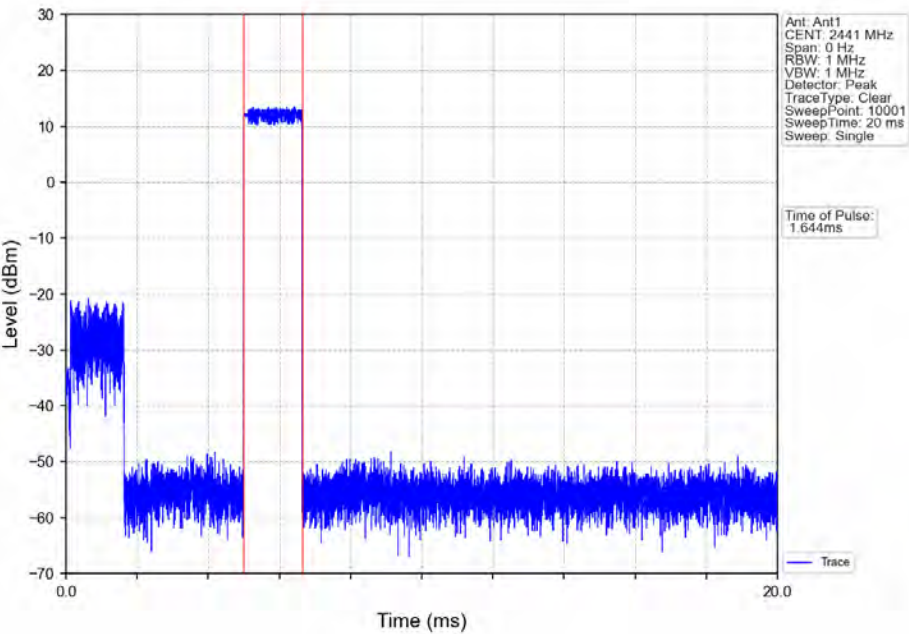
Compliance Certification Services (Kunshan) Inc.

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

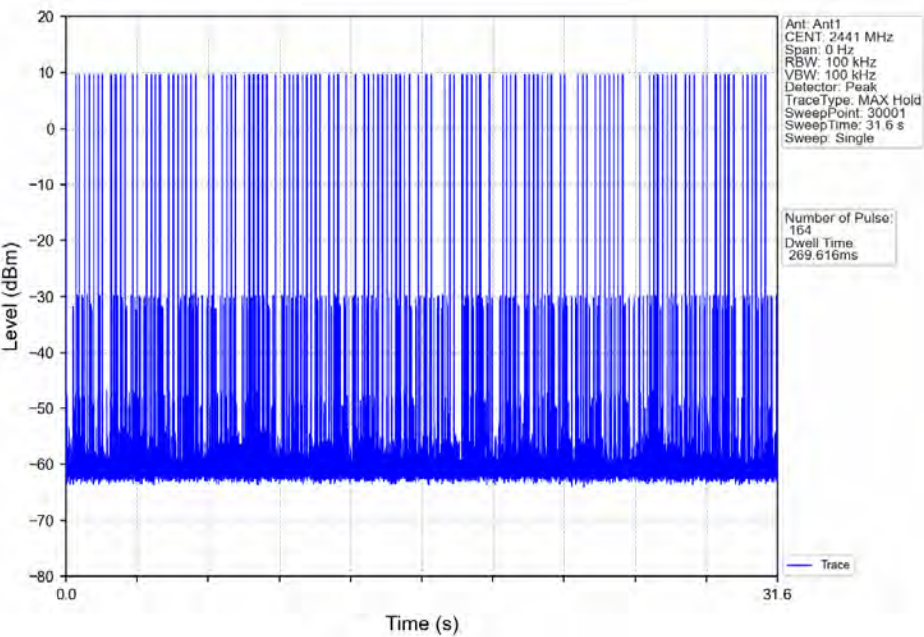
Report No.: KSCR240700121703

Page: 144 of 167

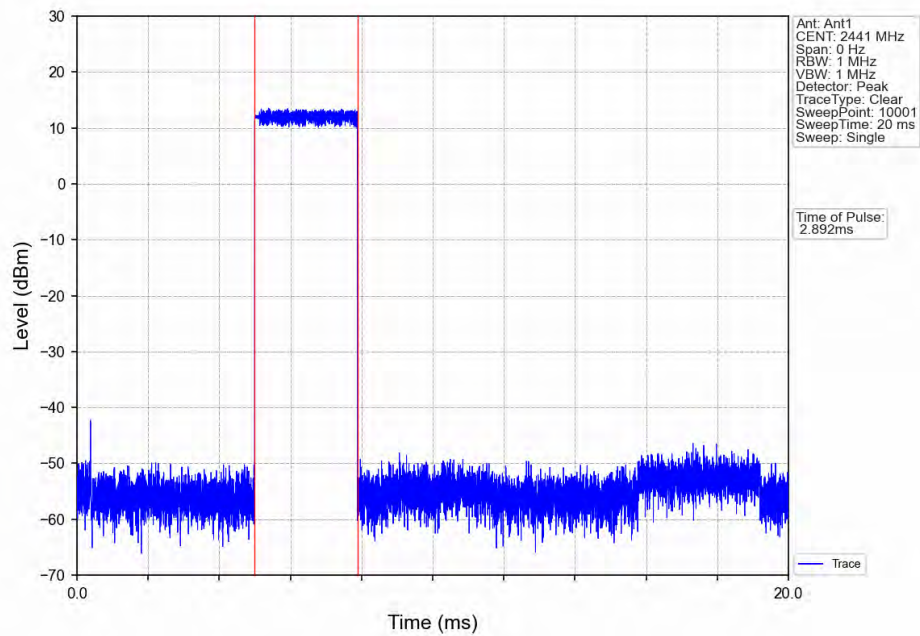
Pi/4DQPSK_2DH3_HOPP_Ant5_NTNV



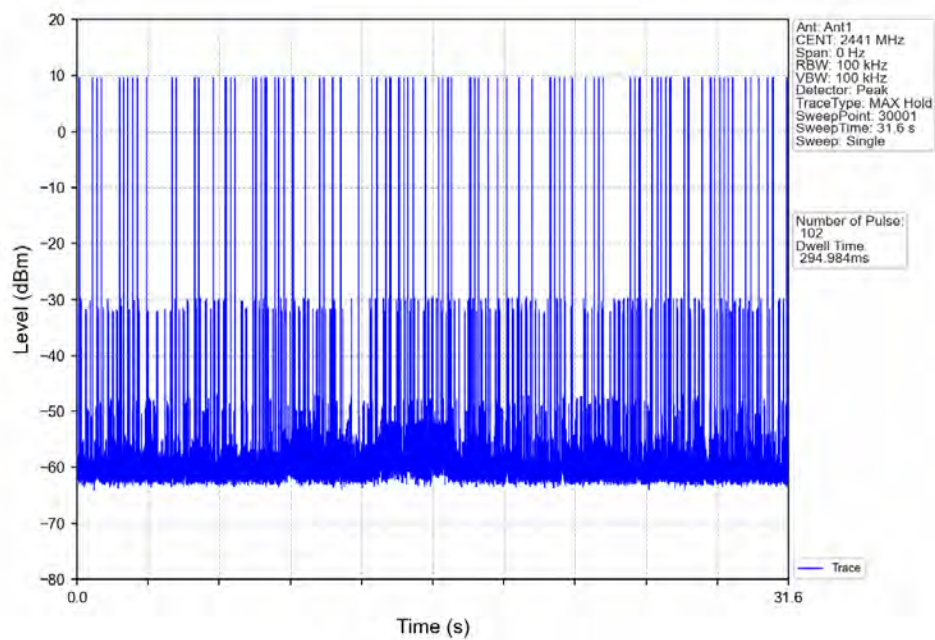
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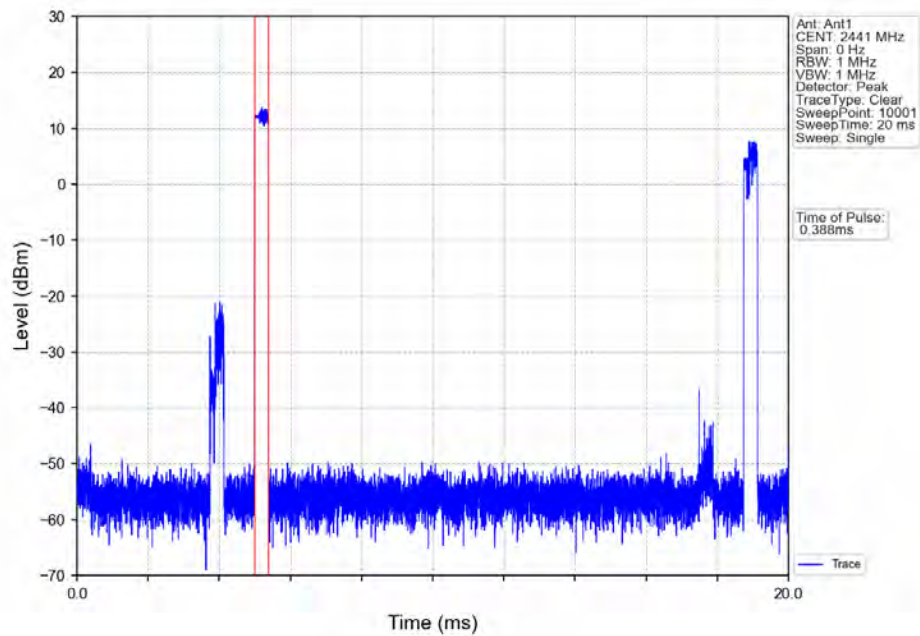
Pi/4DQPSK_2DH5_HOPP_Ant5_NTNV



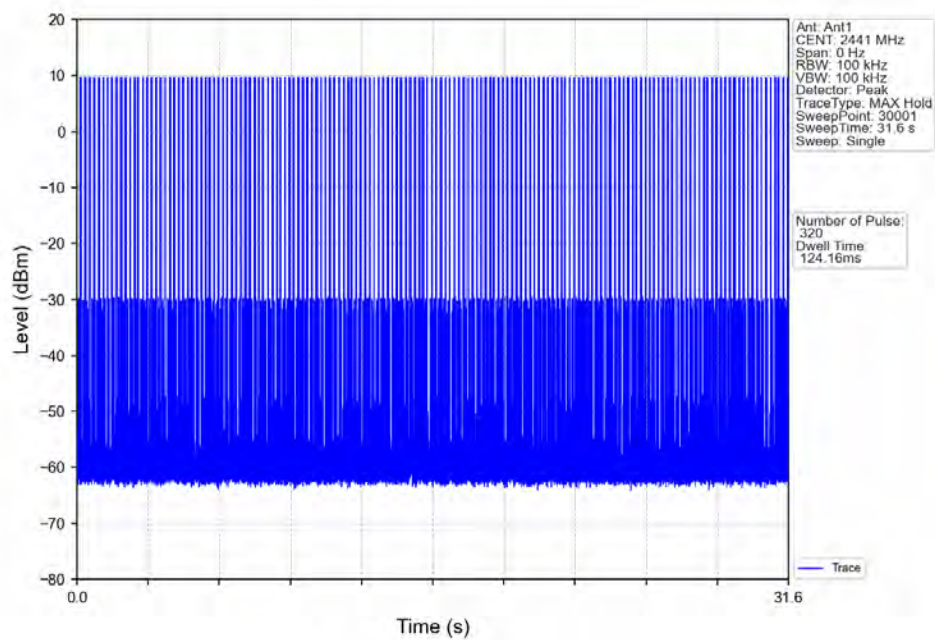
Pi/4DQPSK_2DH5_HOPP_Ant5_NTNV



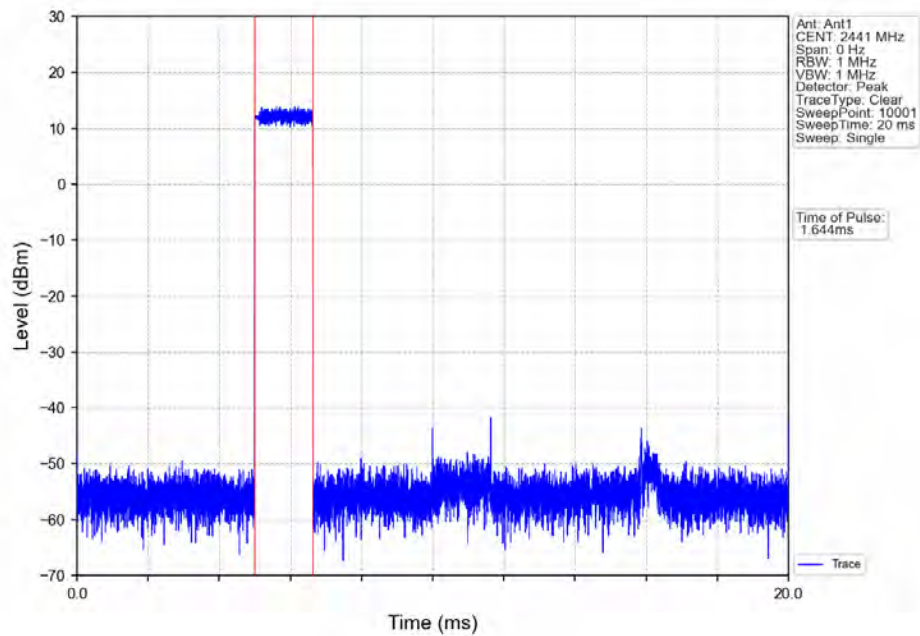
8DPSK_3DH1_HOPP_Ant5_NTNV



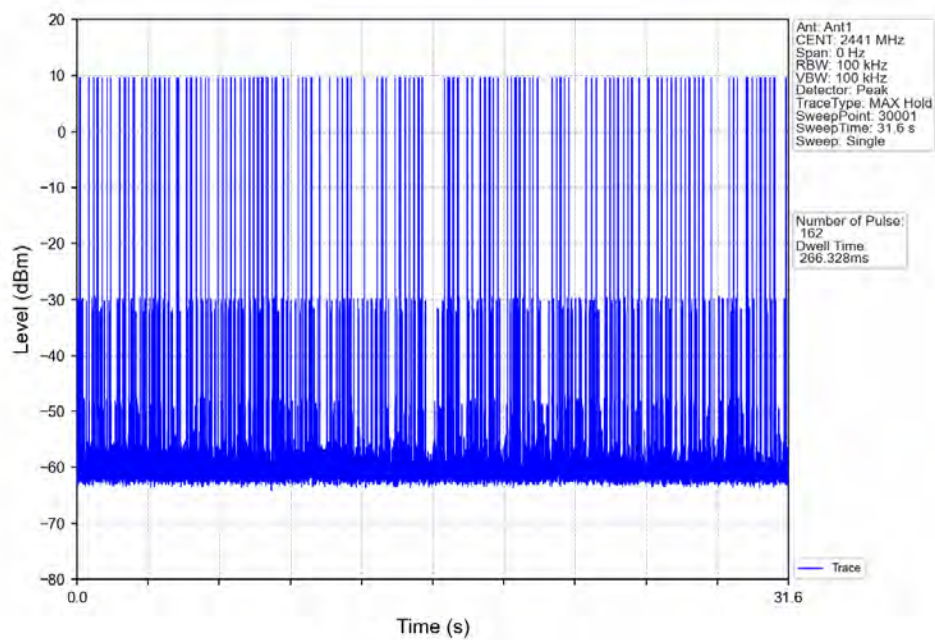
8DPSK_3DH1_HOPP_Ant5_NTNV



8DPSK_3DH3_HOPP_Ant5_NTNV



8DPSK_3DH3_HOPP_Ant5_NTNV



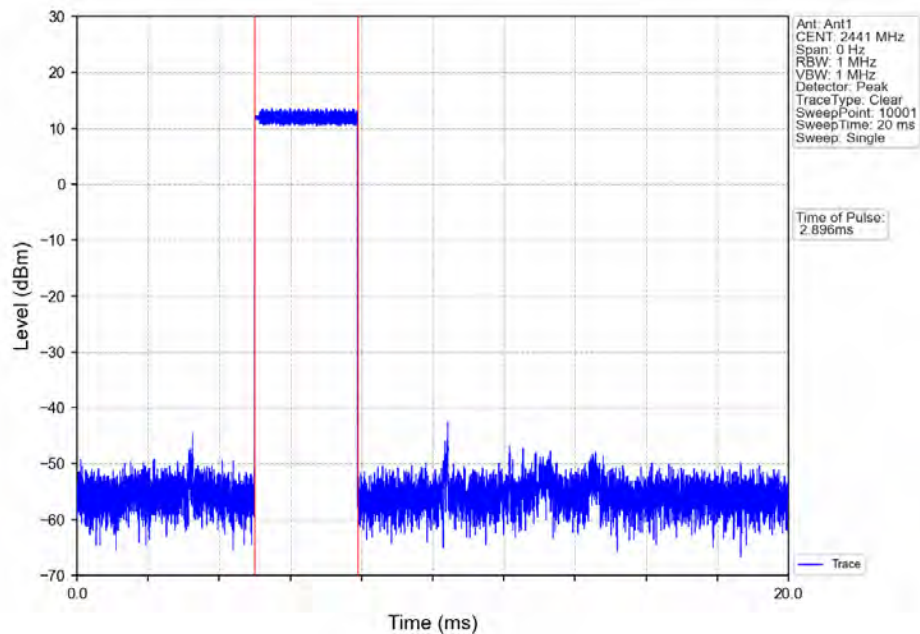
Compliance Certification Services (Kunshan) Inc.

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

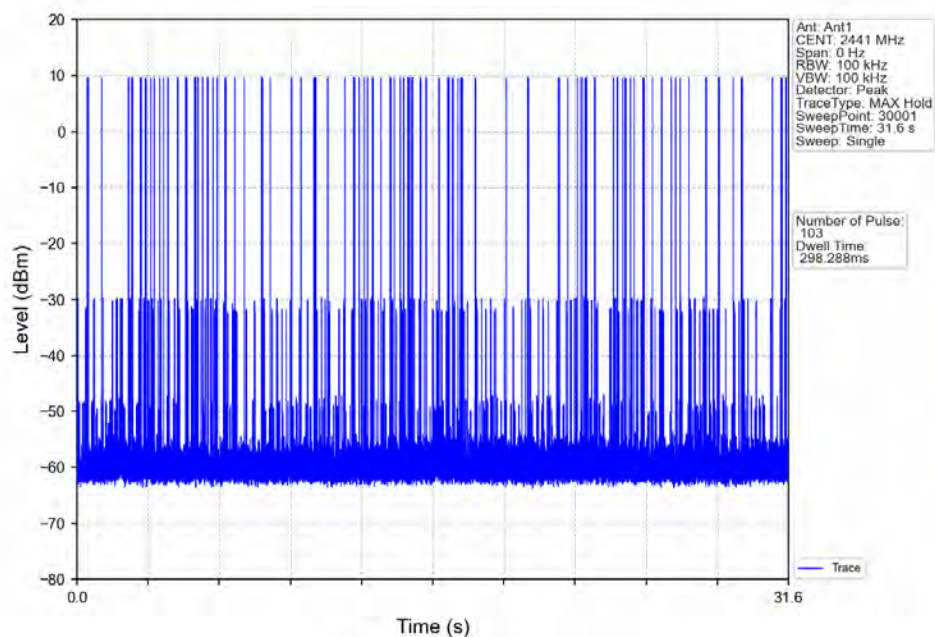
Report No.: KSCR240700121703

Page: 148 of 167

8DPSK_3DH5_HOPP_Ant5_NTNV



8DPSK_3DH5_HOPP_Ant5_NTNV



6. Unwanted Emissions In Non-restricted Frequency Bands

6.1 Test Result

6.1.1 Ref

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	5	13.35
		2441	DH5	5	14.38
		2480	DH5	5	12.94
Pi/4DQPSK	SISO	2402	2DH5	5	10.66
		2441	2DH5	5	11.95
		2480	2DH5	5	10.31
8DPSK	SISO	2402	3DH5	5	10.53
		2441	3DH5	5	11.96
		2480	3DH5	5	10.25

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.

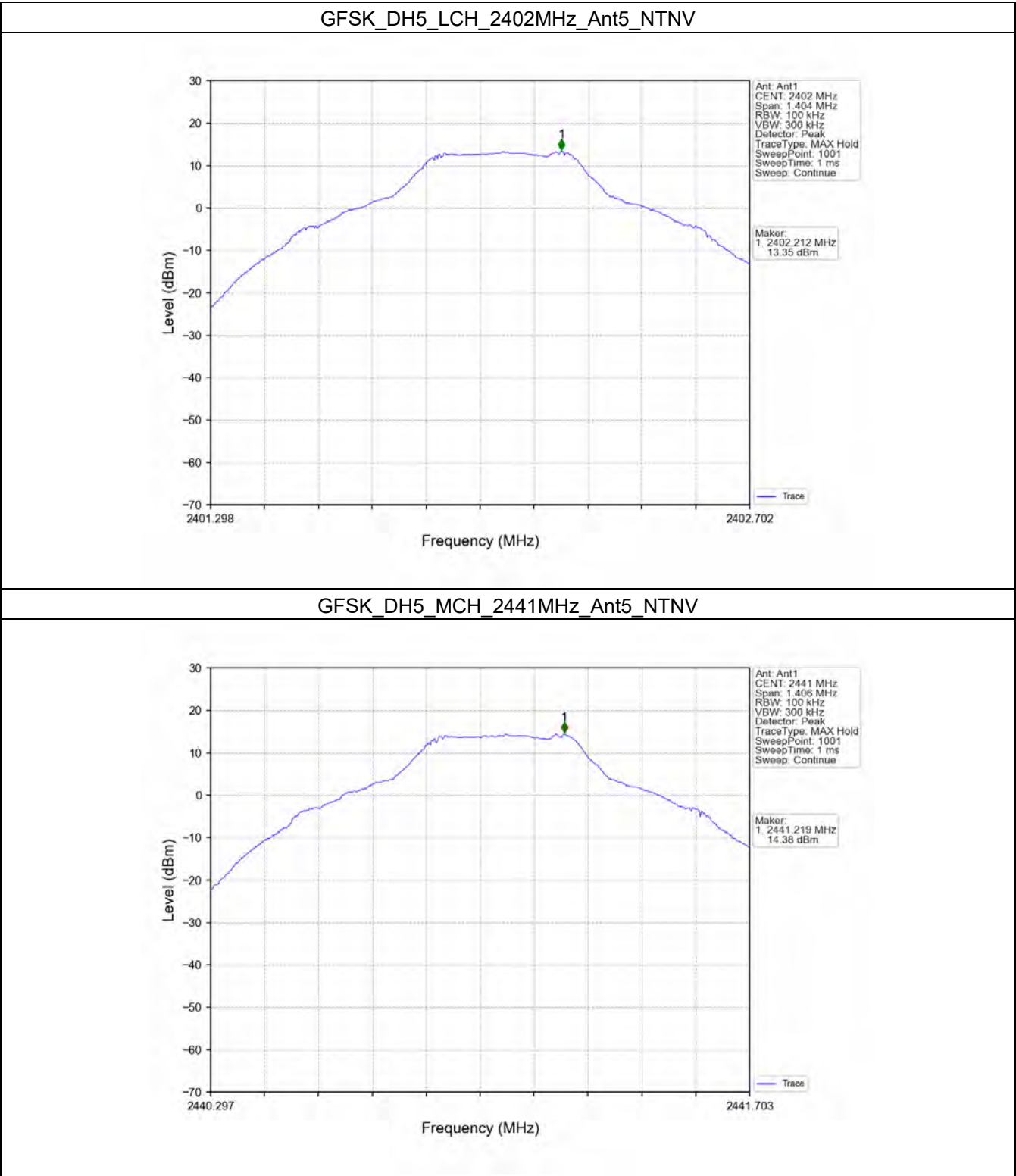
6.1.2 CSE

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	5	14.38	-5.62	Pass
		2441	DH5	5	14.38	-5.62	Pass
		2480	DH5	5	14.38	-5.62	Pass
		HOPP	DH5	5	14.38	-5.62	Pass
					14.38	-5.62	Pass
Pi/4DQPSK	SISO	2402	2DH5	5	11.95	-8.05	Pass
		2441	2DH5	5	11.95	-8.05	Pass
		2480	2DH5	5	11.95	-8.05	Pass
		HOPP	2DH5	5	11.95	-8.05	Pass
					11.95	-8.05	Pass
8DPSK	SISO	2402	3DH5	5	11.96	-8.04	Pass
		2441	3DH5	5	11.96	-8.04	Pass
		2480	3DH5	5	11.96	-8.04	Pass
		HOPP	3DH5	5	11.96	-8.04	Pass
					11.96	-8.04	Pass

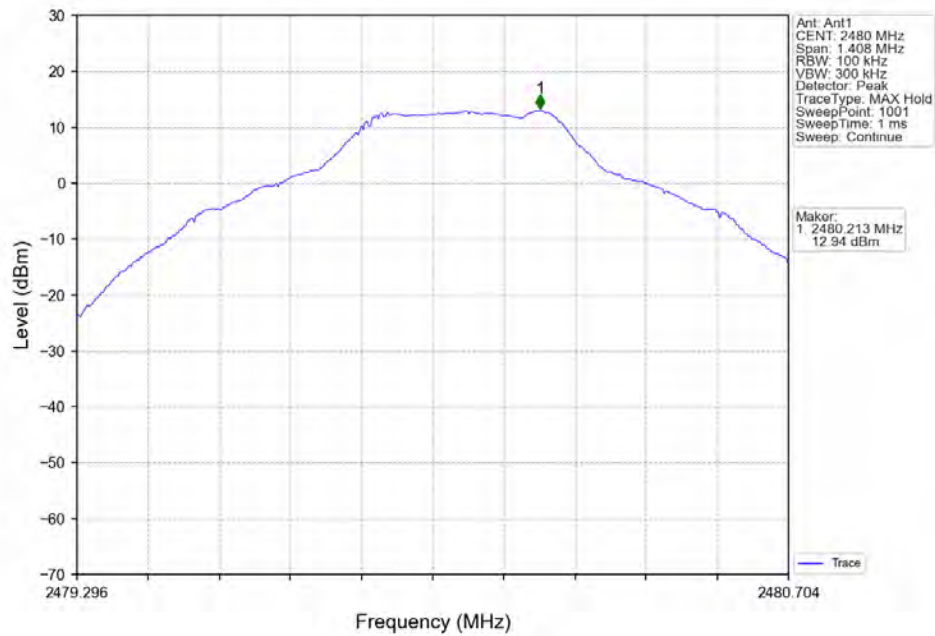
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

6.2 Test Graph

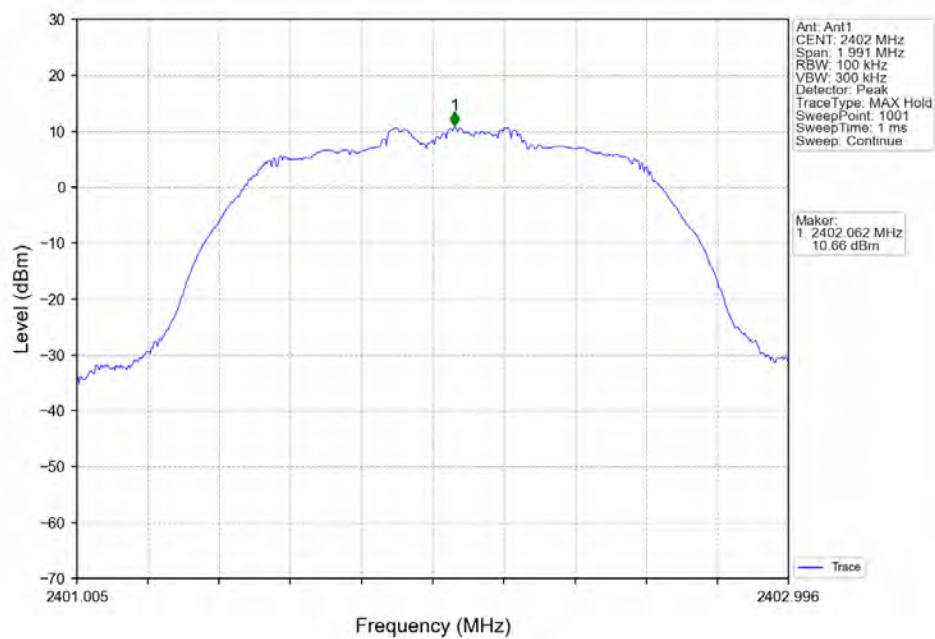
6.2.1 Ref



GFSK_DH5_HCH_2480MHz_Ant5_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant5_NTNV



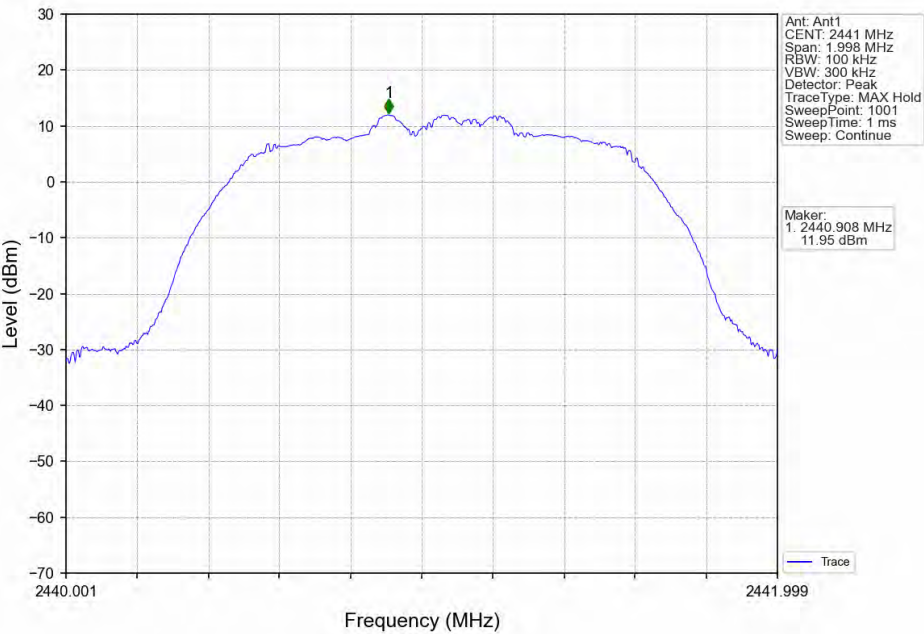
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CCSEM-TRF-001 Rev. 02 Sep 01, 2023

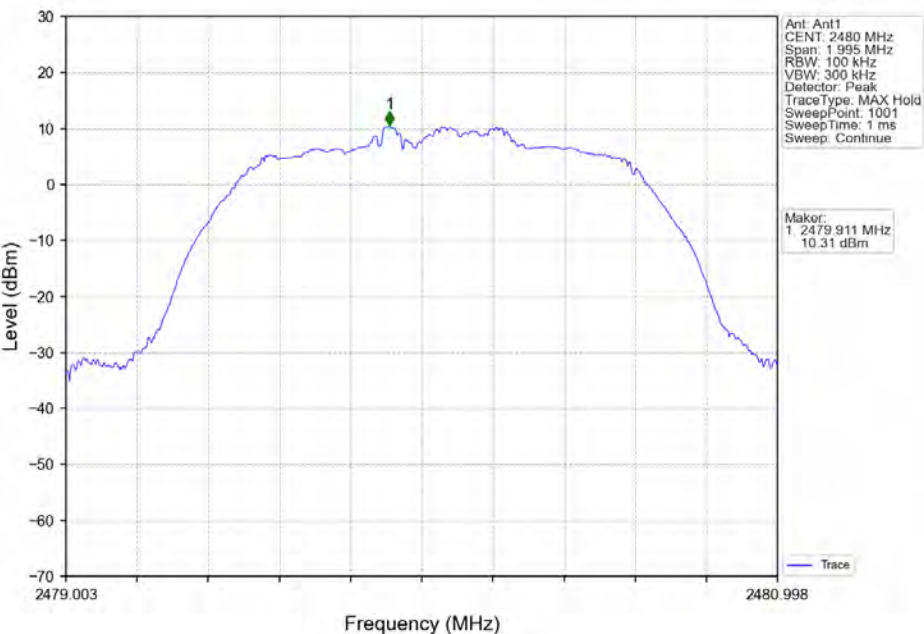
Report No.: KSCR240700121703

Page: 152 of 167

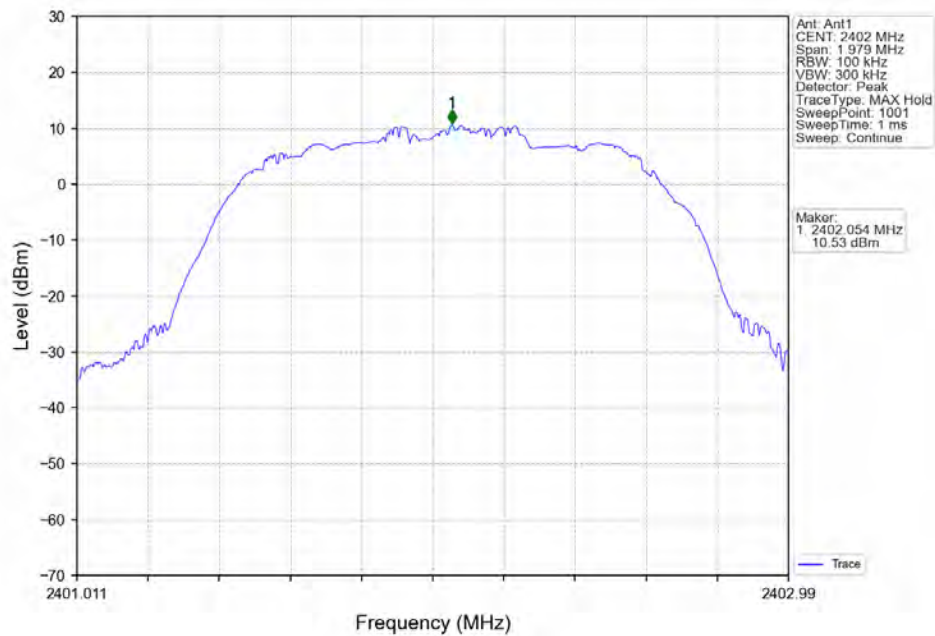
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant5_NTNV



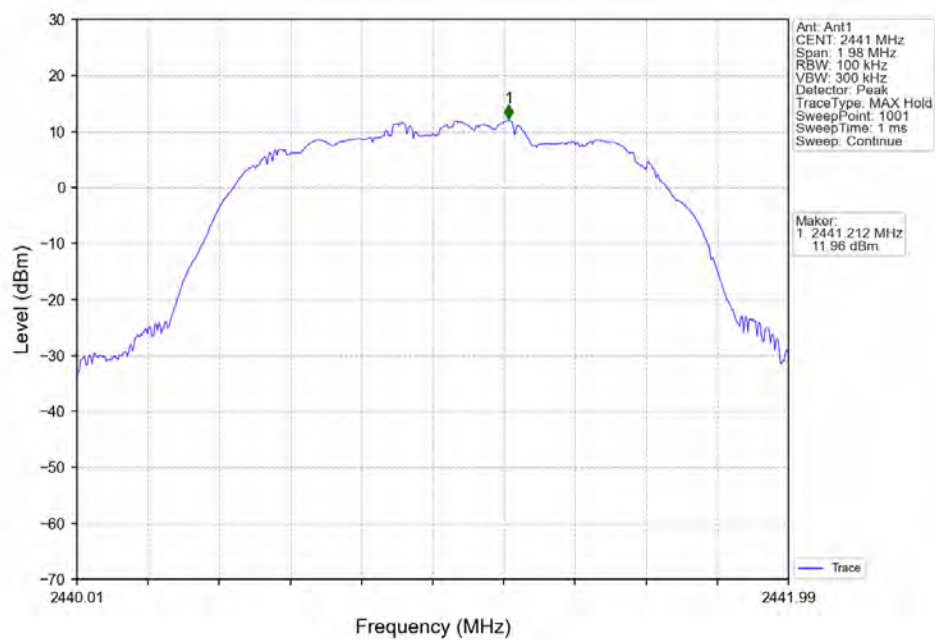
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant5_NTNV



8DPSK_3DH5_LCH_2402MHz_Ant5_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant5_NTNV



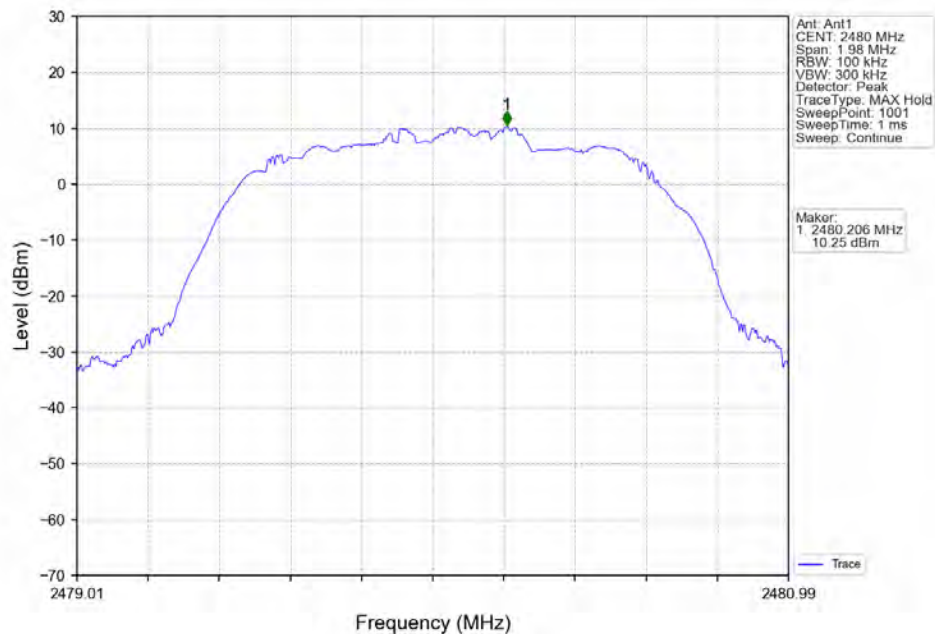
Compliance Certification Services (Kunshan) Inc.

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

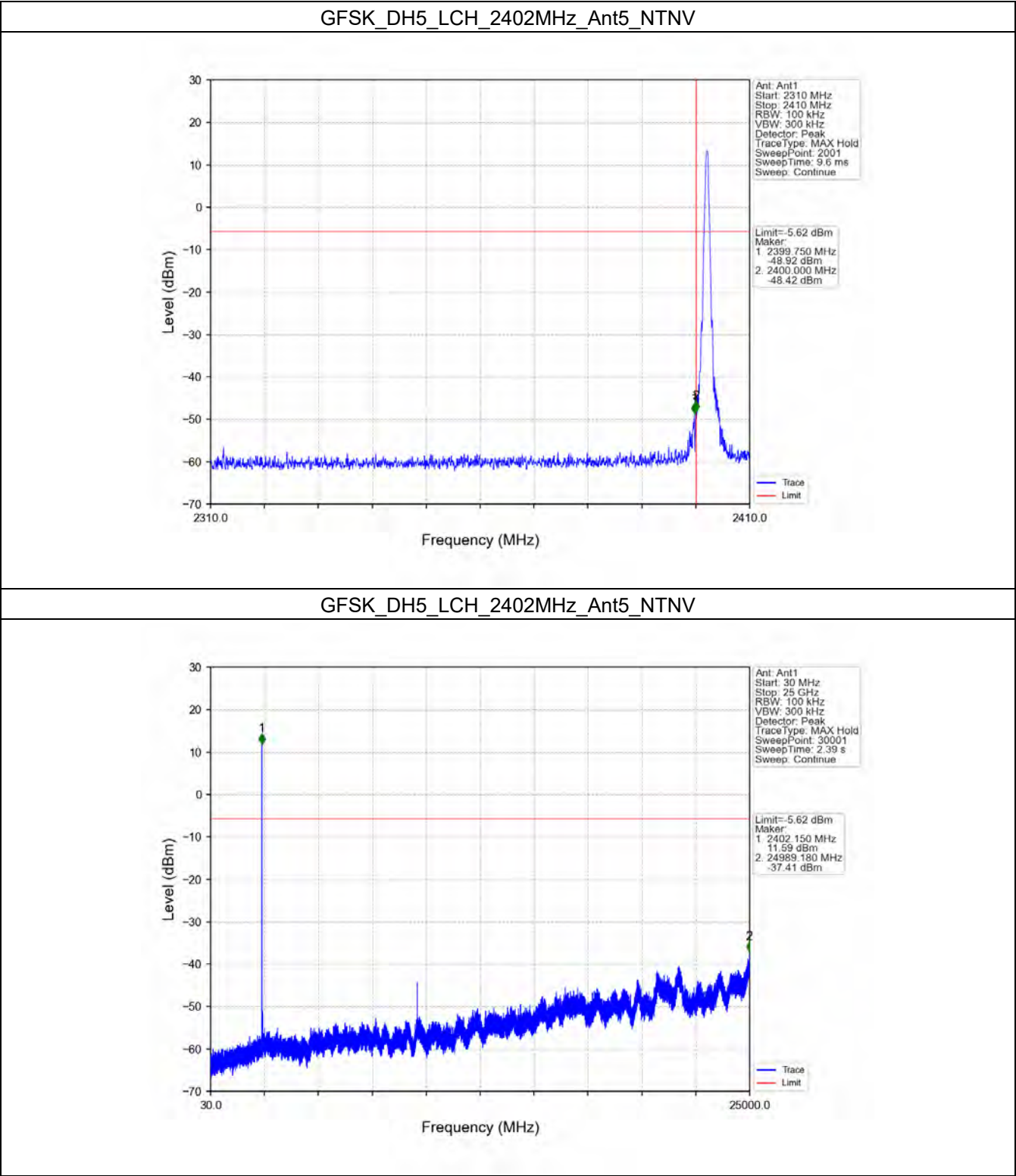
Report No.: KSCSR240700121703

Page: 154 of 167

8DPSK_3DH5_HCH_2480MHz_Ant5_NTNV



6.2.2 CSE



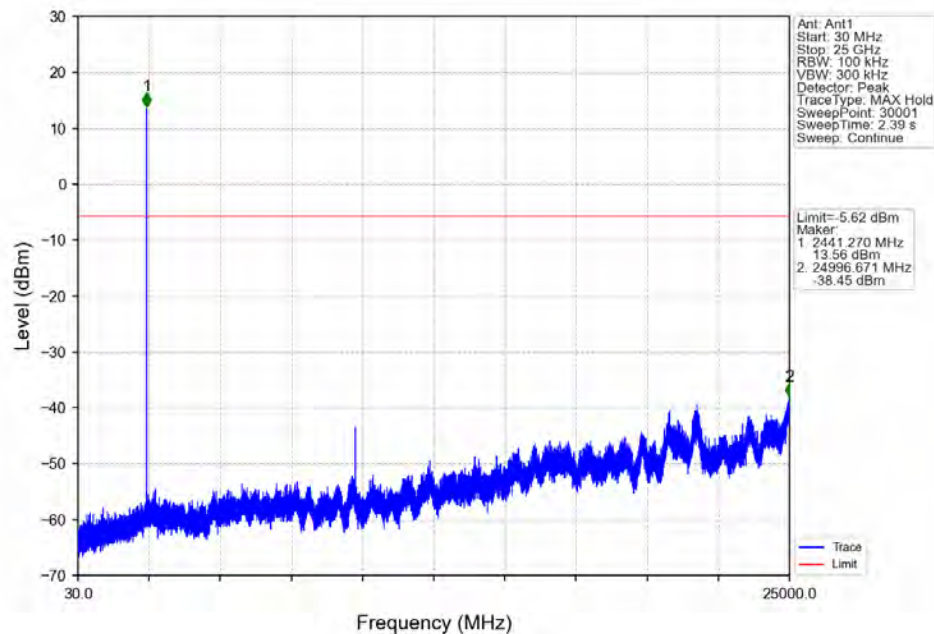
Compliance Certification Services (Kunshan) Inc.

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

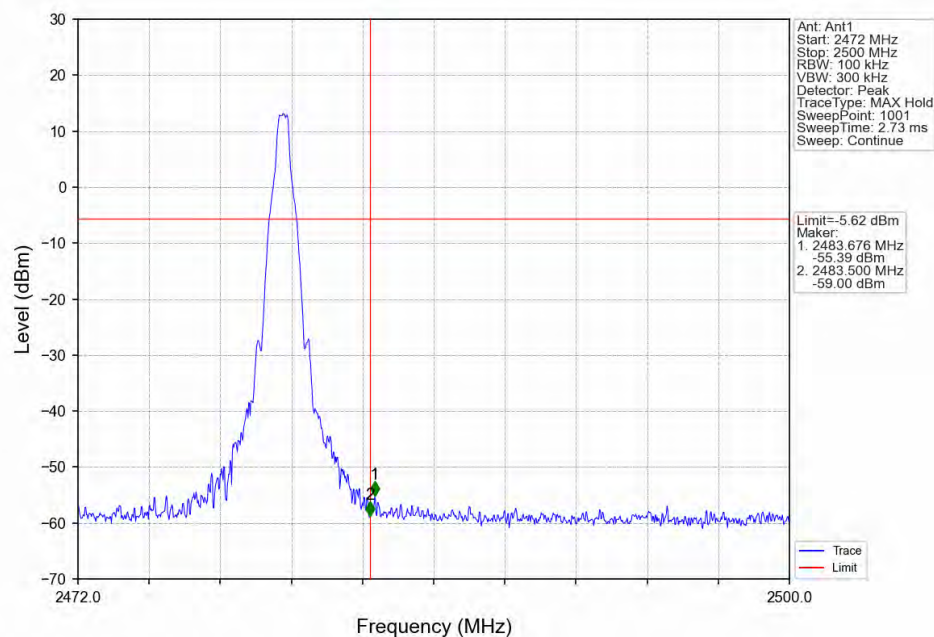
Report No.: KSCR240700121703

Page: 156 of 167

GFSK_DH5_MCH_2441MHz_Ant5_NTNV



GFSK_DH5_HCH_2480MHz_Ant5_NTNV



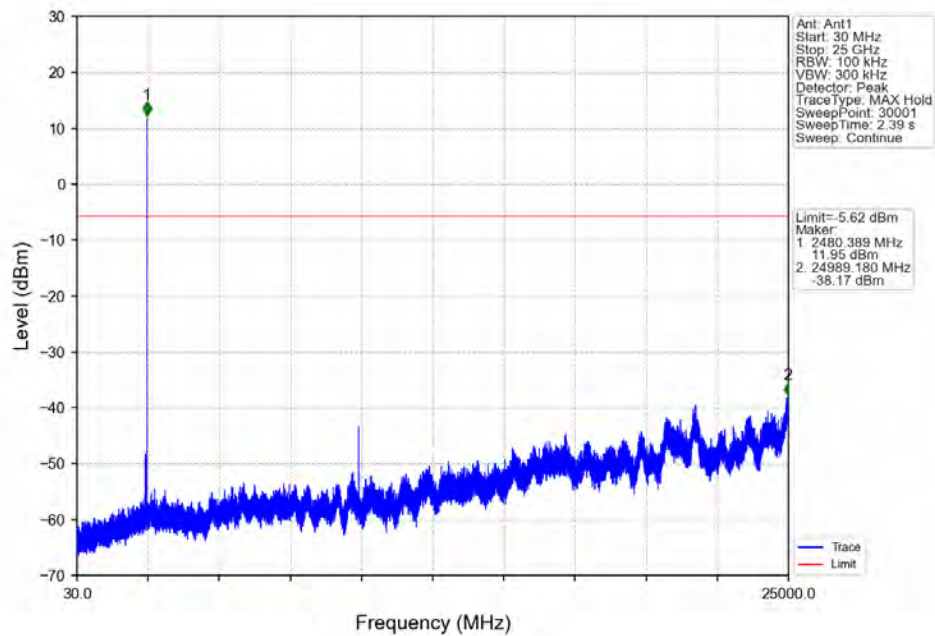
Compliance Certification Services (Kunshan) Inc.

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

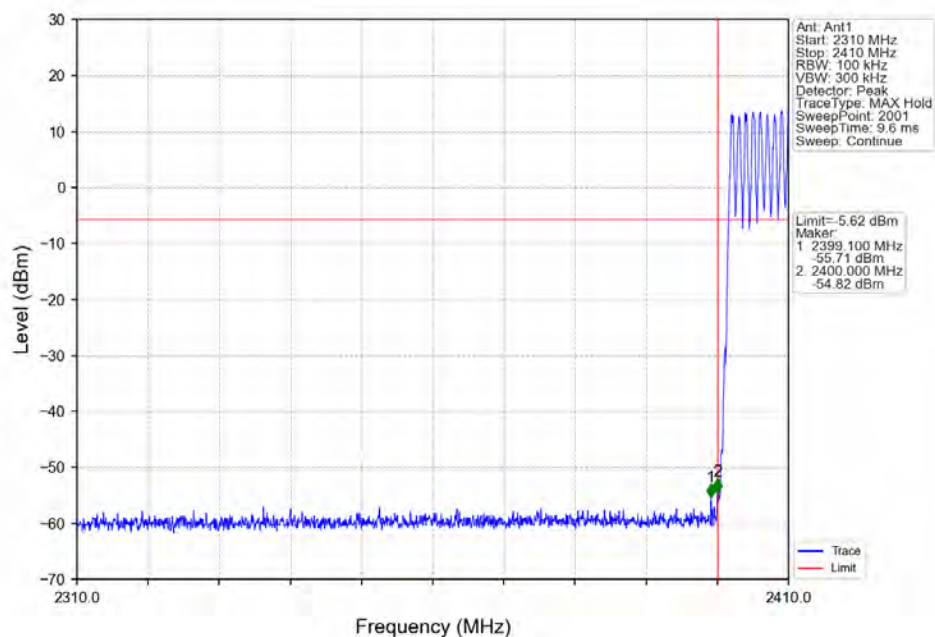
Report No.: KSCR240700121703

Page: 157 of 167

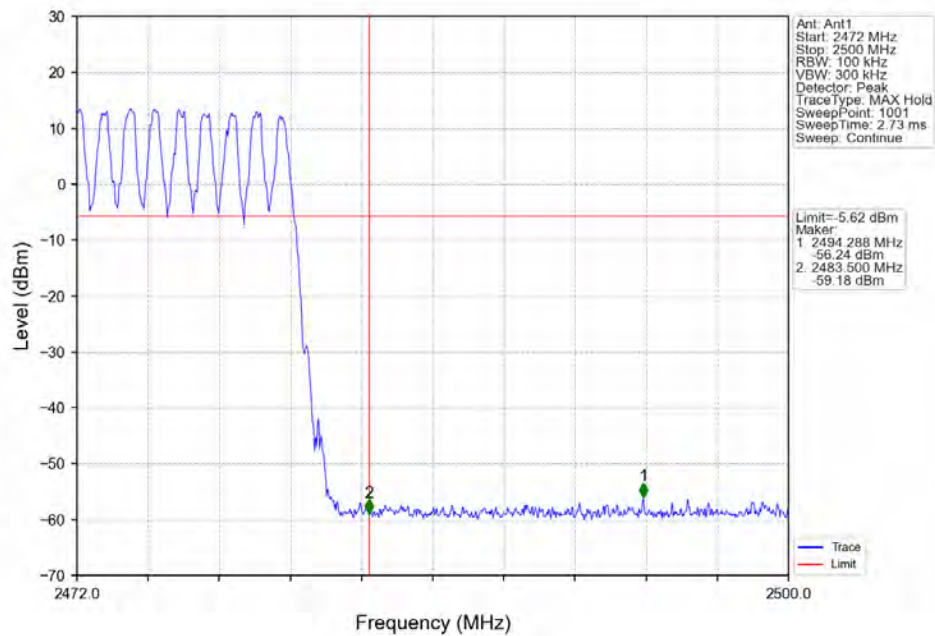
GFSK_DH5_HCH_2480MHz_Ant5_NTNV



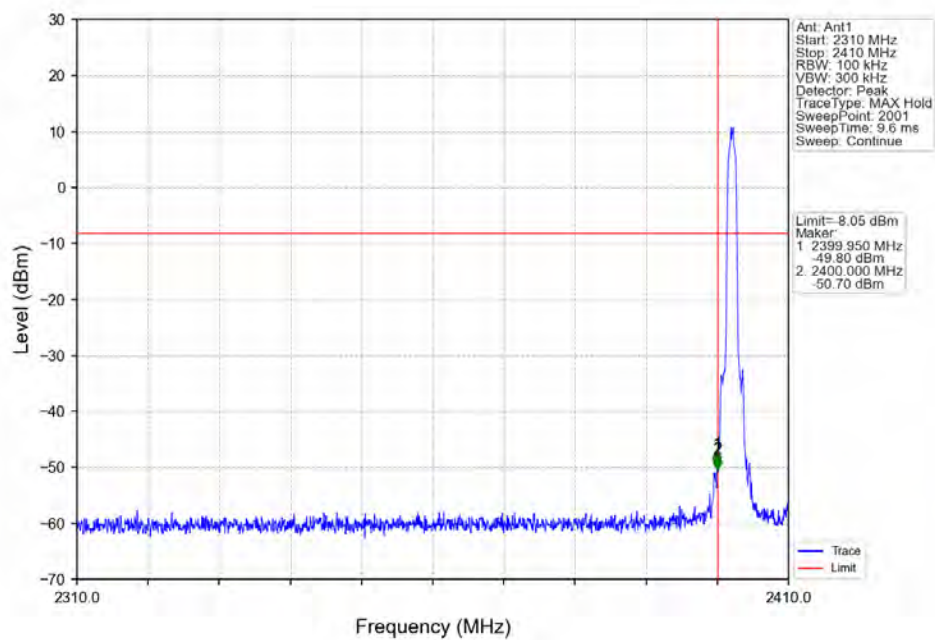
GFSK_DH5_HOPP_2410MHz_Ant5_NTNV



GFSK_DH5_HOPP_Ant5_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant5_NTNV



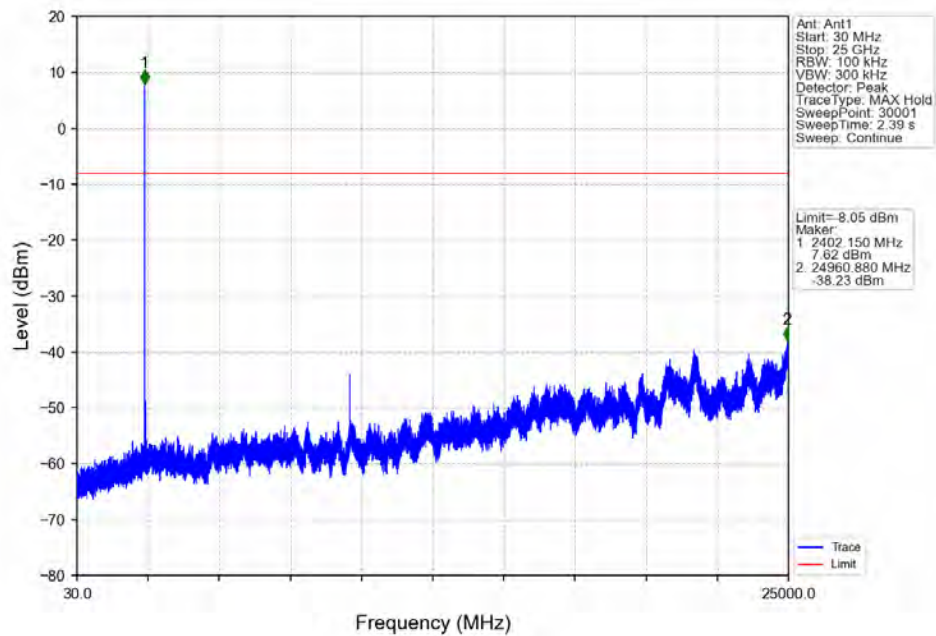
Compliance Certification Services (Kunshan) Inc.

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

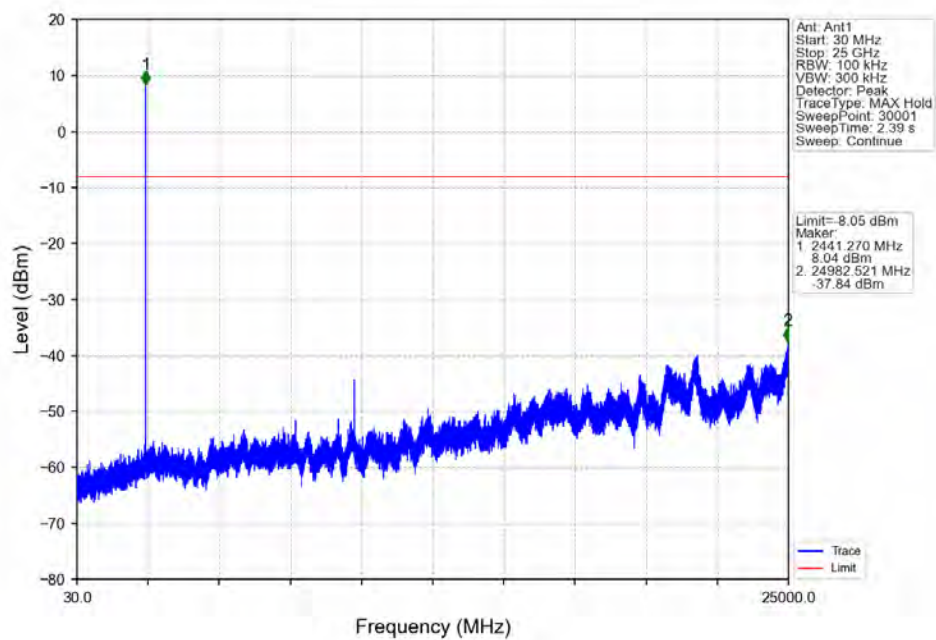
Report No.: KSCR240700121703

Page: 159 of 167

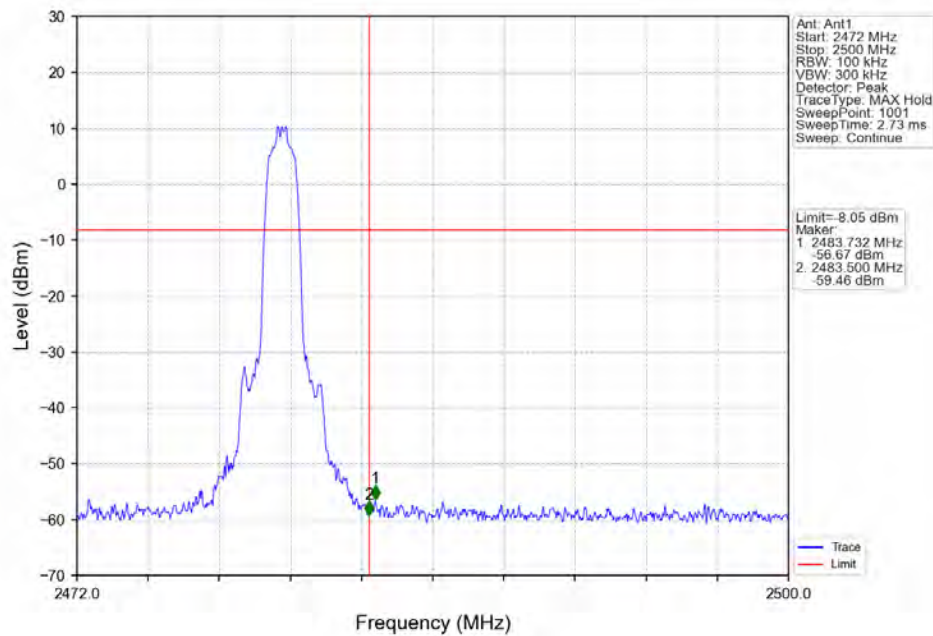
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant5_NTNV



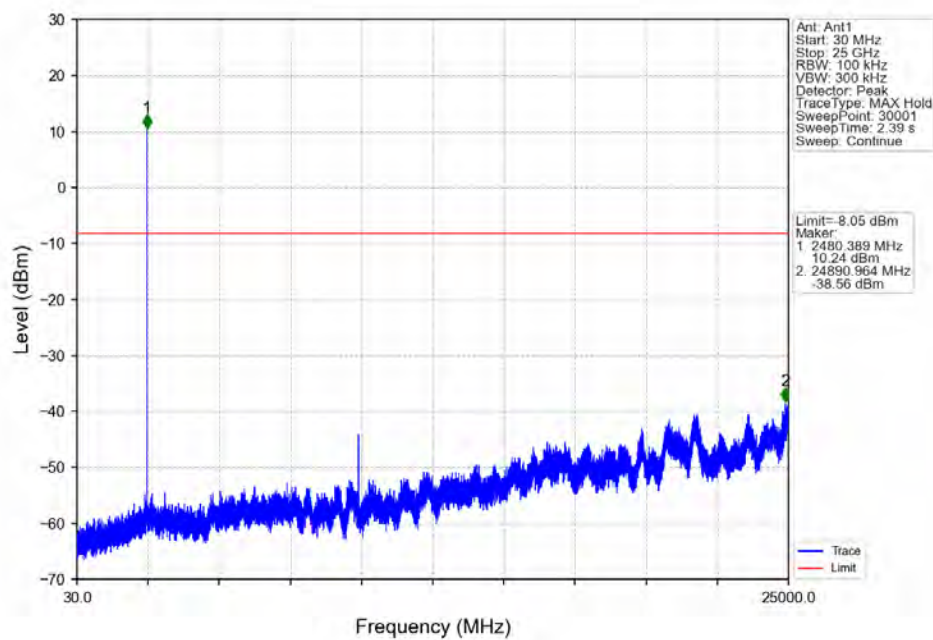
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant5_NTNV



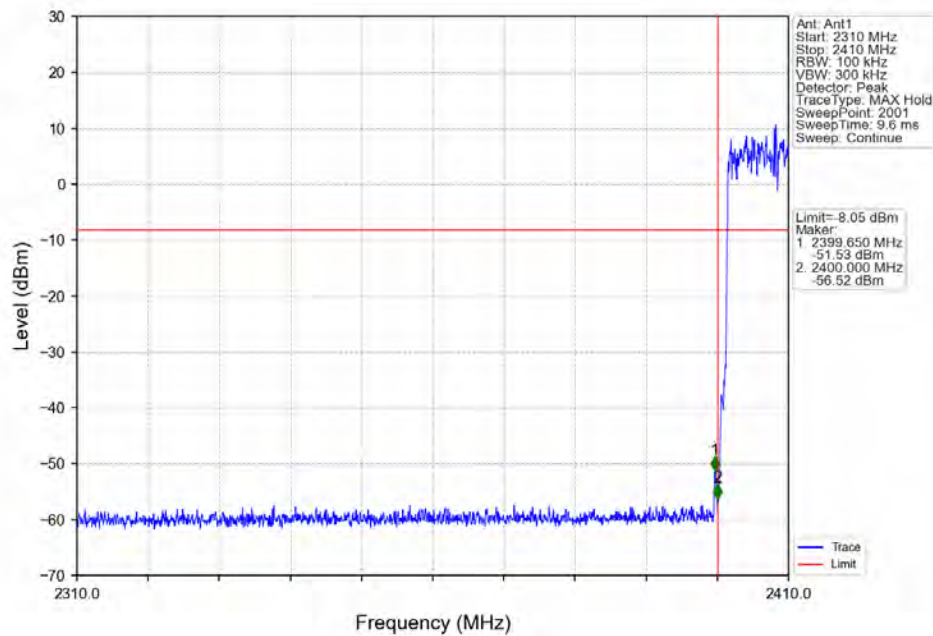
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant5_NTNV



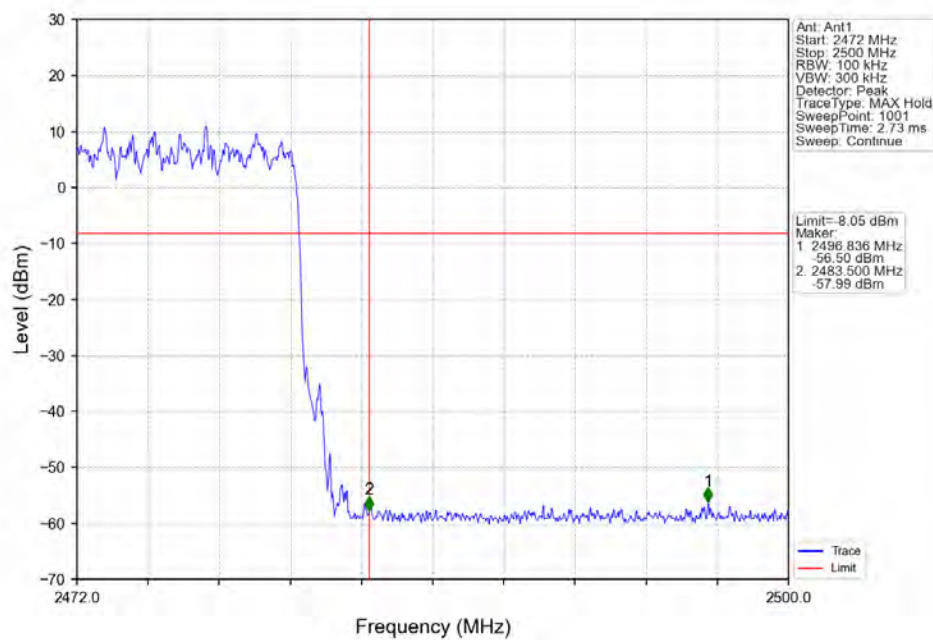
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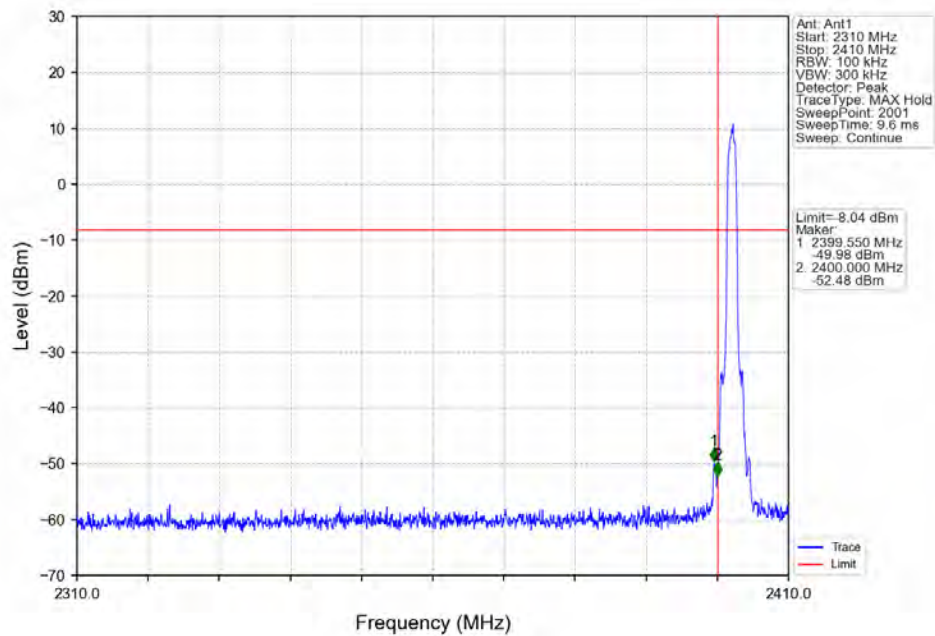
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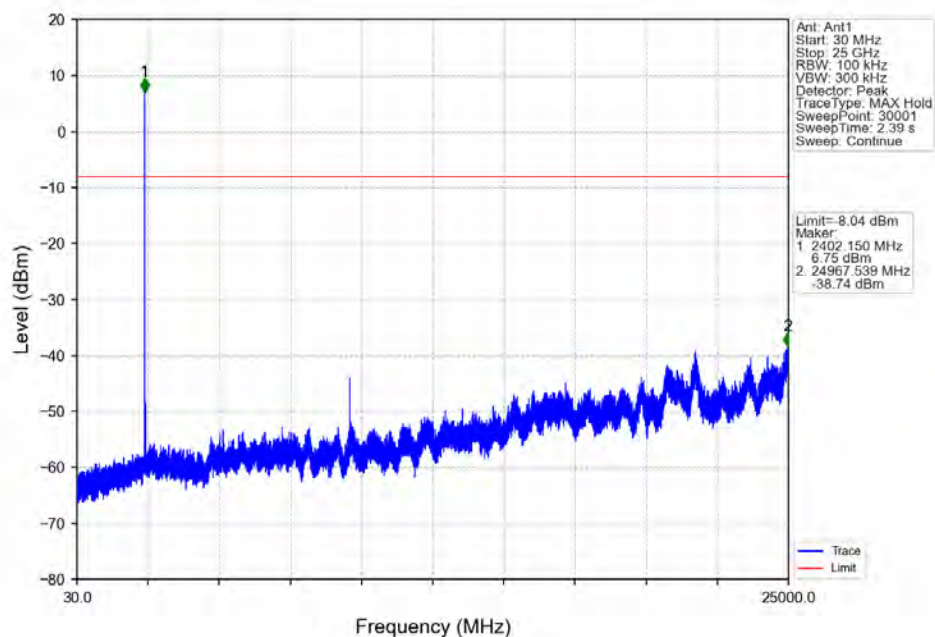
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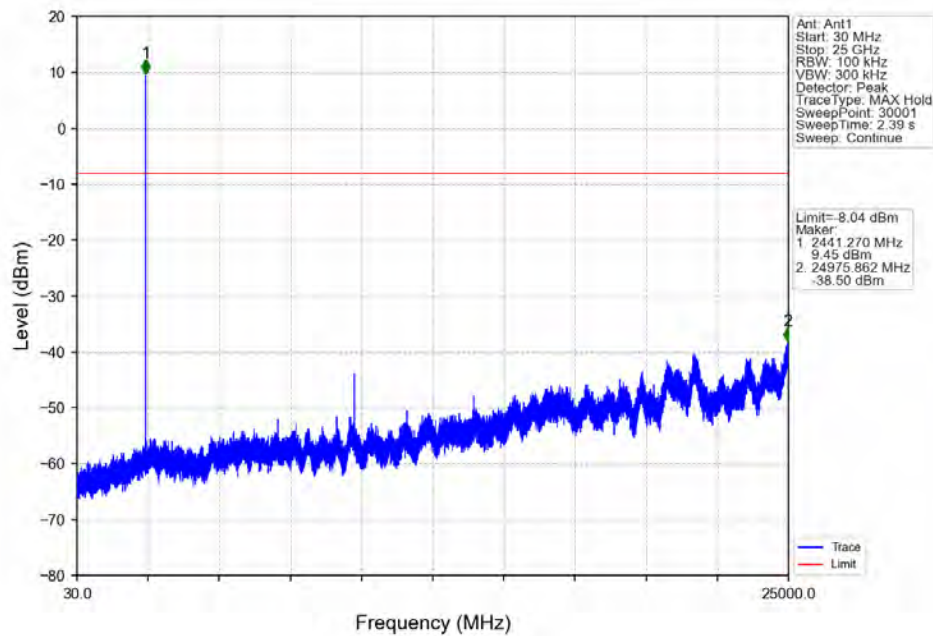
8DPSK_3DH5_LCH_2402MHz_Ant5_NTNV



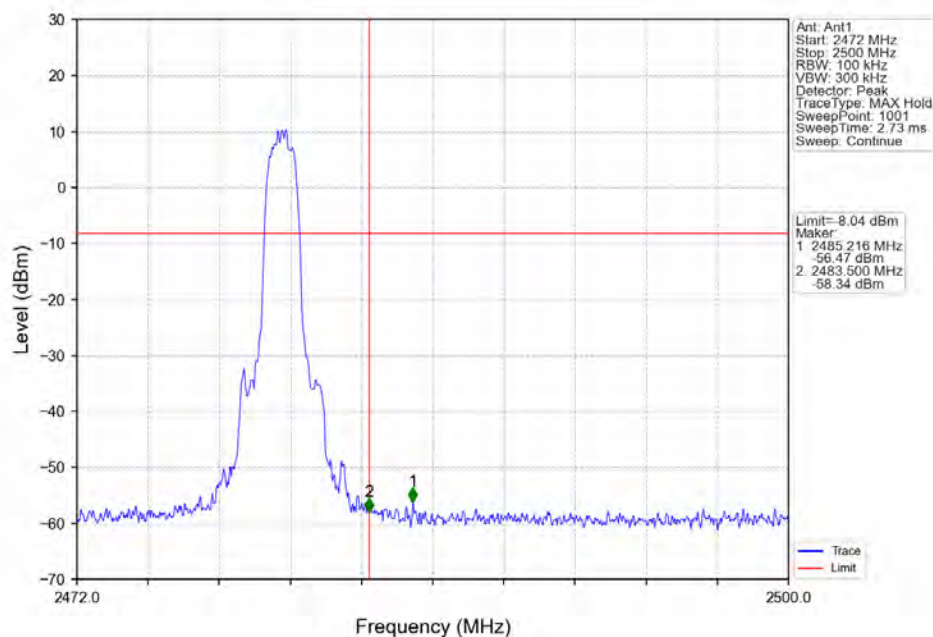
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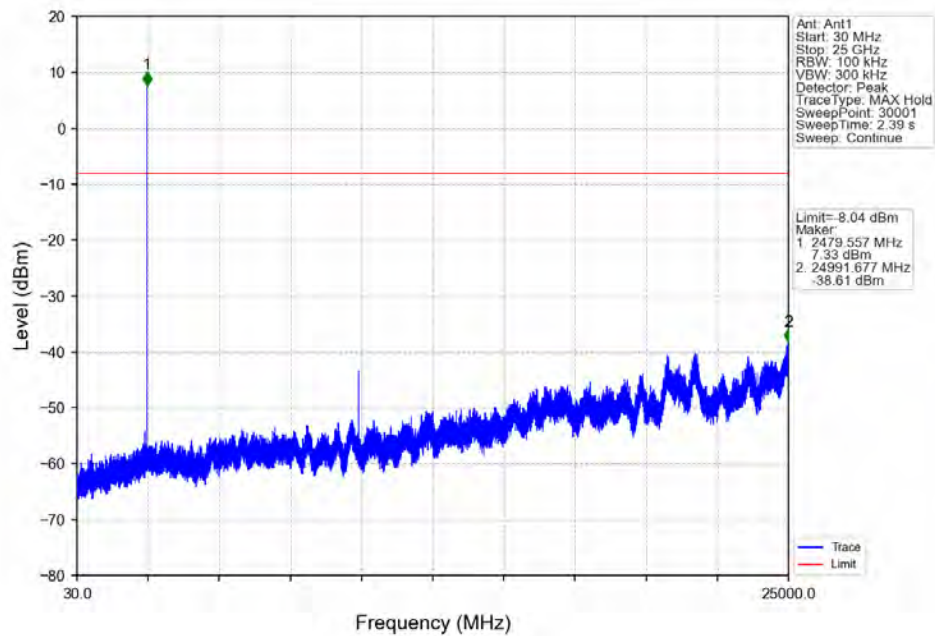
8DPSK_3DH5_MCH_2441MHz_Ant5_NTNV



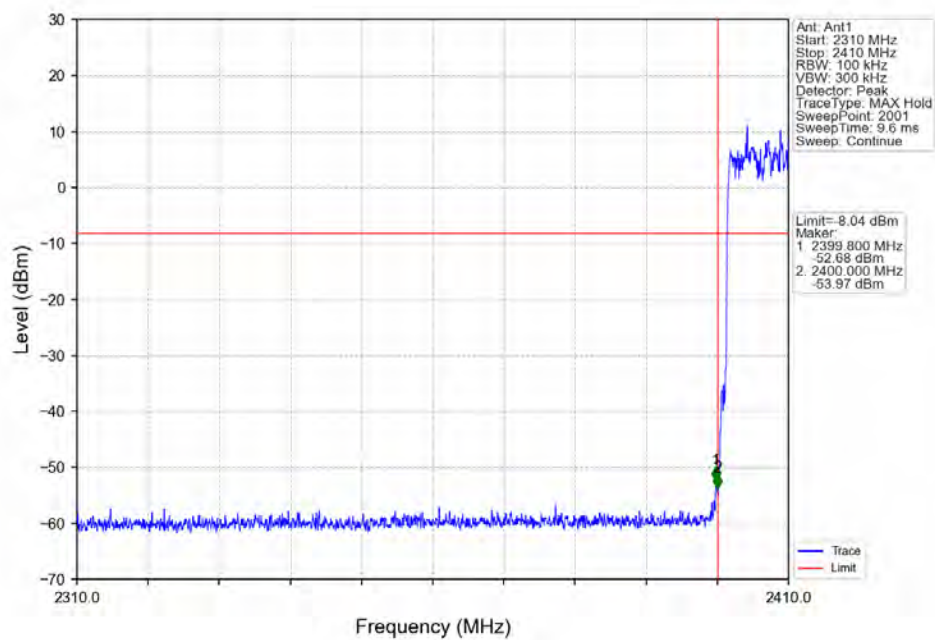
8DPSK_3DH5_HCH_2480MHz_Ant5_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant5_NTNV



8DPSK_3DH5_HOPP_Ant5_NTNV



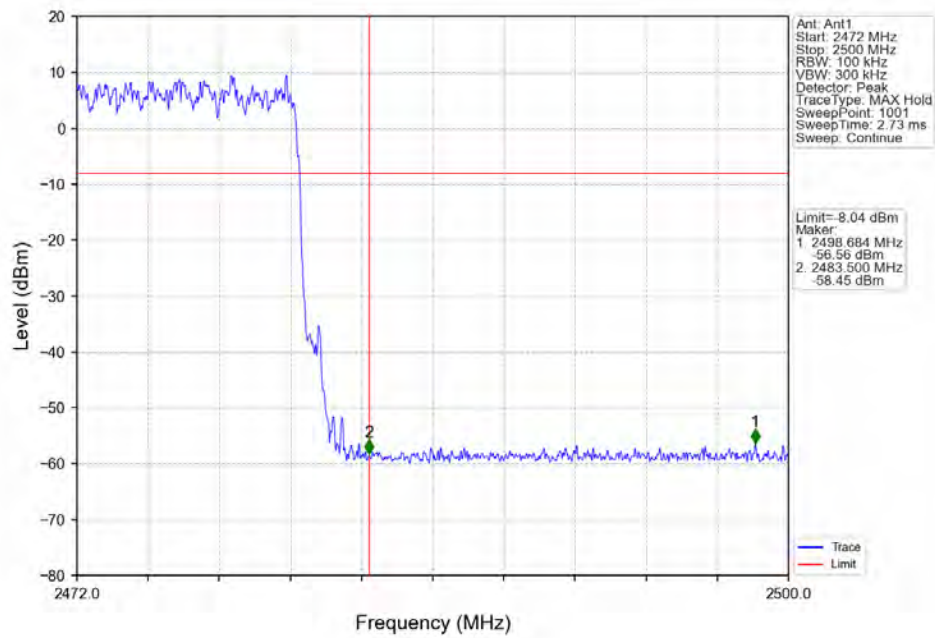
Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 165 of 167

8DPSK_3DH5_HOPP_Ant5_NTNV



Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 166 of 167

7. Frequency Error

7.1 Test Result

7.1.1 Ant5

Ant5								
Mode	TX Type	Frequency (MHz)	Packet Type	Temperature (°C)	Voltage (VAC)	Measured Frequency (MHz)	Limit (MHz)	Verdict
GFSK	SISO	2402	DH5	20	102	2402.056	2401.667 to 2402.333	Pass
					120	2402.056	2401.667 to 2402.333	Pass
					138	2402.056	2401.667 to 2402.333	Pass
				-20	120	2402.055	2401.667 to 2402.333	Pass
				50	120	2402.056	2401.667 to 2402.333	Pass
		2441	DH5	20	102	2441.056	2440.667 to 2441.333	Pass
					120	2441.056	2440.667 to 2441.333	Pass
					138	2441.055	2440.667 to 2441.333	Pass
				-20	120	2441.055	2440.667 to 2441.333	Pass
				50	120	2441.055	2440.667 to 2441.333	Pass
		2480	DH5	20	102	2480.057	2479.667 to 2480.333	Pass
					120	2480.058	2479.667 to 2480.333	Pass
					138	2480.054	2479.667 to 2480.333	Pass
				-20	120	2480.058	2479.667 to 2480.333	Pass
				50	120	2480.056	2479.667 to 2480.333	Pass
Pi/4DQPSK	SISO	2402	2DH5	20	102	2402.055	2401.531 to 2402.469	Pass
					120	2402.058	2401.531 to 2402.469	Pass
					138	2402.056	2401.531 to 2402.469	Pass
				-20	120	2402.058	2401.531 to 2402.469	Pass
				50	120	2402.059	2401.531 to 2402.469	Pass
		2441	2DH5	20	102	2441.053	2440.53 to 2441.47	Pass
					120	2441.055	2440.53 to 2441.47	Pass
					138	2441.052	2440.53 to 2441.47	Pass
				-20	120	2441.056	2440.53 to 2441.47	Pass
				50	120	2441.054	2440.53 to 2441.47	Pass
		2480	2DH5	20	102	2480.054	2479.531 to 2480.469	Pass
					120	2480.054	2479.531 to 2480.469	Pass
					138	2480.059	2479.531 to 2480.469	Pass
				-20	120	2480.056	2479.531 to 2480.469	Pass
				50	120	2480.055	2479.531 to 2480.469	Pass
8DPSK	SISO	2402	3DH5	20	102	2402.055	2401.527 to 2402.473	Pass
					120	2402.054	2401.527 to 2402.473	Pass
					138	2402.053	2401.527 to 2402.473	Pass
				-20	120	2402.054	2401.527 to 2402.473	Pass



Compliance Certification Services (Kunshan) Inc.

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

Report No.: KSCR240700121703

Page: 167 of 167

				50	120	2402.055	2401.527 to 2402.473	Pass
		2441	3DH5	20	102	2441.050	2440.528 to 2441.472	Pass
					120	2441.055	2440.528 to 2441.472	Pass
					138	2441.054	2440.528 to 2441.472	Pass
					-20	2441.050	2440.528 to 2441.472	Pass
				50	120	2441.056	2440.528 to 2441.472	Pass
		2480	3DH5	20	102	2480.056	2479.528 to 2480.472	Pass
					120	2480.052	2479.528 to 2480.472	Pass
					138	2480.054	2479.528 to 2480.472	Pass
					-20	2480.056	2479.528 to 2480.472	Pass
				50	120	2480.054	2479.528 to 2480.472	Pass

- End of the Report -