

TEST REPORT

Application No.: KSCR2601000148AU
FCC ID: 2BS5K-5GY0
Applicant: Heilongjiang Tianyouwei Electronic Co., Ltd
Address of Applicant: No. 9 Kunshan Road, Economic And Technological Development Zone, Suihua City, Heilongjiang Province
Manufacturer: Heilongjiang Tianyouwei Electronic Co., Ltd
Address of Manufacturer: No. 9 Kunshan Road, Economic And Technological Development Zone, Suihua City, Heilongjiang Province
Factory: TYW MANUFACTURING MEXICO, S DE RL DE CV
Address of Factory: Zaraiche 652, Centro Industrial de Guanajuato, Cp 36835, Irapuato, Guanajuato, Mexico
Equipment Under Test (EUT):
EUT Name: Instrument Cluster
Model No.: 5GY0-MMS-01
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2026-01-16
Date of Test: 2026-01-27 to 2026-02-14
Date of Issue: 2026-02-25

Test Result:
Pass*

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

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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

Revision Record			
Version	Description	Date	Remark
00	Original	2026-02-25	/

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

2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence		N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2020) Section 6.10.5 & 7.8.8	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2020) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2020) Section 6.6 & 7.8.8	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Maximum Conducted Output Power		ANSI C63.10 (2020) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2020) Section 6.9.2	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2020) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2020) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2020) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2020) Section 7.8.7.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2020) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(d)	Pass

3 Contents

	Page
1 COVER PAGE	1
2 Test Summary.....	3
3 Contents	4
4 General Information.....	5
4.1 Details of E.U.T.	5
4.2 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.....	10
6.1 Antenna Requirement	10
6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	11
7 Radio Spectrum Matter Test Results	13
7.1 Radiated Emissions which fall in the restricted bands	13
7.2 Radiated Spurious Emissions Below 1GHz.....	23
7.3 Radiated Spurious Emissions Above 1GHz	29
7.4 Maximum Conducted Output Power	47
7.5 20dB Bandwidth	49
7.6 Carrier Frequencies Separation.....	50
7.7 Hopping Channel Number	51
7.8 Dwell Time	52
7.9 Conducted Band Edges Measurement	53
7.10 Conducted Spurious Emissions	55
8 Test Setup Photo	56
9 EUT Constructional Details (EUT Photos).....	56
10 Appendix.....	57

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 13.5V/0.6A 0.6*13.5W
---------------	-------------------------

TX105b Module:

Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 Dual mode
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	FPC Antenna
Antenna Gain:	6.5dBi (Provided by the manufacturer)

GOC-R18761-BT Module:

Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 Dual mode
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PCB Antenna
Antenna Gain:	-0.51dBi (Provided by the manufacturer)

4.2 Power level setting using in test

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

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
DC power supply	Agilent	E3632A	/
Notebook	LENOVO	K27	EB24537645

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%
Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

4.5 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

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

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

No tests were sub-contracted.

Note:

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

4.6 Test Facility

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

- **A2LA (Certificate No. 2541.01)**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA).

- **FCC (Designation Number: CN1172)**

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

- **ISED (CAB Identifier: CN0072)**

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 (Member No:1938)**

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

5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
RF Conducted Test						
1	Spectrum Analyzer	Keysight	N9020A	KUS1911E004-2	07/09/2025	07/08/2026
2	Spectrum Analyzer	Keysight	N9020A	KUS2001M001-2	07/09/2025	07/08/2026
3	Spectrum Analyzer	Keysight	N9030B	KSEM021-1	12/17/2025	12/16/2026
4	Signal Generator	R&S	SMBV100B	KSEM032	12/17/2025	12/16/2026
5	Signal Generator	R&S	SMW200A	KSEM020-1	07/09/2025	07/08/2026
6	Signal Generator	Agilent	N5182A	KUS2001M001-1	07/08/2025	07/07/2026
7	Signal Generator	Agilent	E8257C	KS301066	07/22/2025	07/21/2026
8	Radio Communication Test Station	Anritsu	MT8000A	KSEM001-1	07/09/2025	07/08/2026
9	Radio Communication Analyzer	Anritsu	MT8821C	KSEM002-1	12/17/2025	12/16/2026
10	Universal Radio Communication Tester	R&S	CMW500	KUS1911E004-1	07/08/2025	07/07/2026
11	Switcher	TST	FY562	KUS2001M001-4	12/17/2025	12/16/2026
12	Conducted Test Cable	Thermax	RF01-RF04	CZ301111-CZ301120	12/17/2025	12/16/2026
13	Temp. / Humidity Chamber	TERCHY	MHK-120AK	KS301190	07/15/2025	07/14/2026
14	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-5	12/30/2025	12/29/2026
15	Software	BST	TST-PASS	/	NCR	NCR
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	07/09/2025	07/08/2026
2	Universal Radio Communication Tester	R&S	CMW500	KSEM009-1	12/17/2025	12/16/2026
3	Signal Generator	Agilent	E8257C	KS301066	07/22/2025	07/21/2026
4	Loop Antenna (9KHz-30MHz)	COM-POWER	AL-130R	KUS1806E001	07/11/2025	07/10/2026
5	Bilog Antenna (30MHz-1GHz)	TESEQ	CBL 6112D	KUS1806E005	07/12/2025	07/11/2026
6	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	KS301079	01/11/2026	01/10/2028
7	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	CZ301058	01/11/2026	01/10/2028
8	Amplifier(30MHz~1GHz)	TST	LNA009100G30	KSEM061	12/18/2025	12/17/2026
9	Amplifier(400MHz~8GHz)	TST	LNA004080G30	KSEM062	12/18/2025	12/17/2026
10	Amplifier(1GHz~18GHz)	TST	LNA010180G45	KSEM039	07/09/2025	07/08/2026
11	Amplifier(18~40GHz)	TST	LNA180400G40	KSEM038	07/09/2025	07/08/2026
12	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	12/30/2025	12/29/2026
13	Software	ESE	E3_V 6.111221a	/	NCR	NCR
14	Measurement Software	Tonscend	JS32-RE V5.0.0.1	/	NCR	NCR



15	Measurement Software	Tonscend	JS32-RSE V5.0.0.0	/	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 TX105b Module: FPC Antenna; GOC-R18761-BT Module: PCB Antenna and no consideration of replacement. The best case gain of the antenna is TX105b Module: 6.5 dBi and GOC-R18761-BT Module: -0.51 dBi.

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.



Report No.: KSCR260100014804

Page: 12 of 168

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 Radiated Emissions which fall in the restricted bands

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

Test Method: ANSI C63.10 (2020) Section 6.10.5 & 7.8.8

Limit:

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

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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

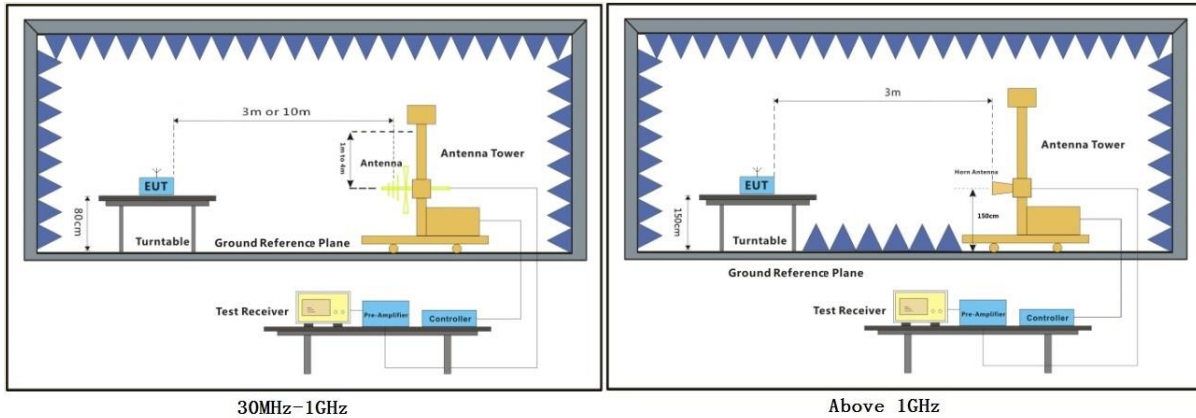
Humidity: 47.6 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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



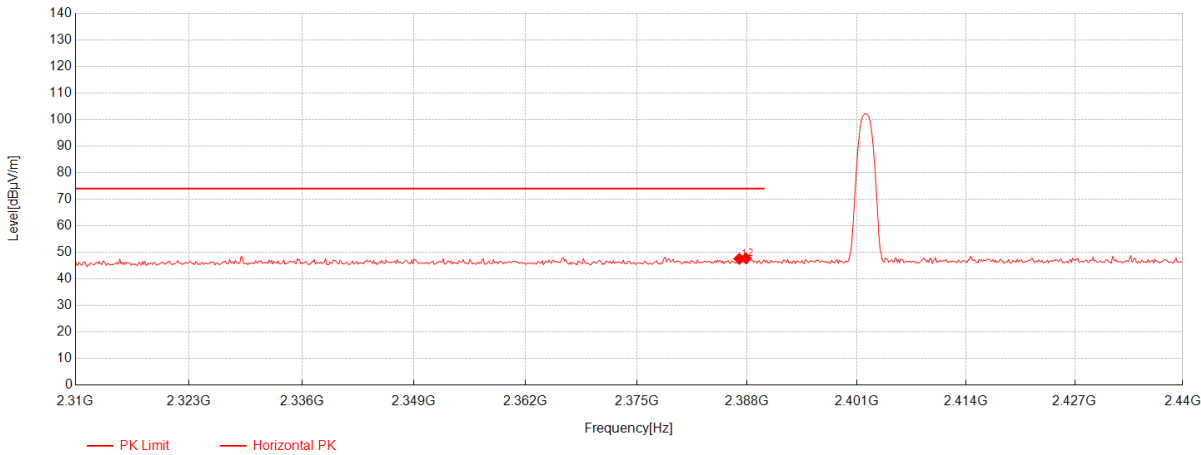
7.1.4 Measurement Procedure and Data

- 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

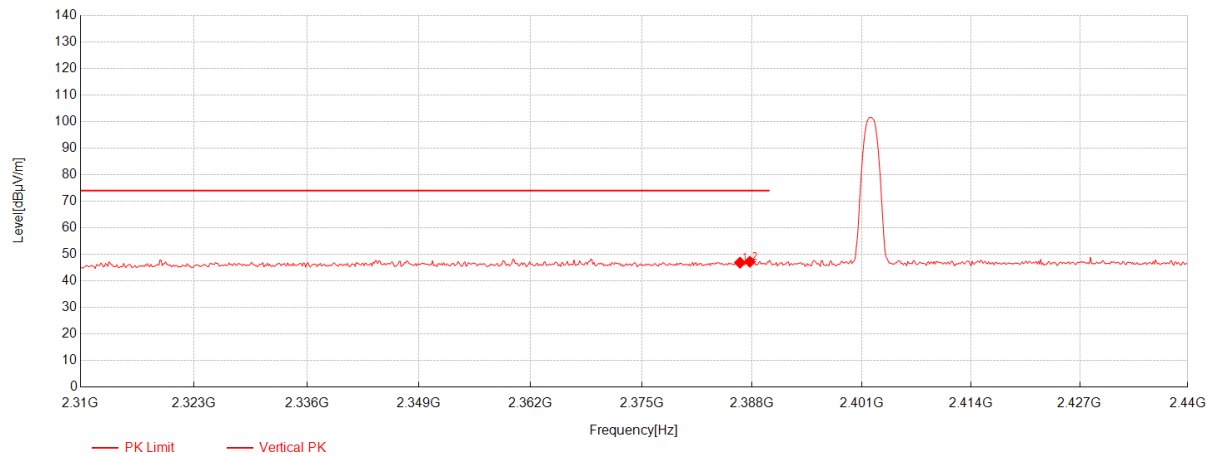
TX105b Module:

BT_DH5_TX_CH_00_Horizontal_Peak



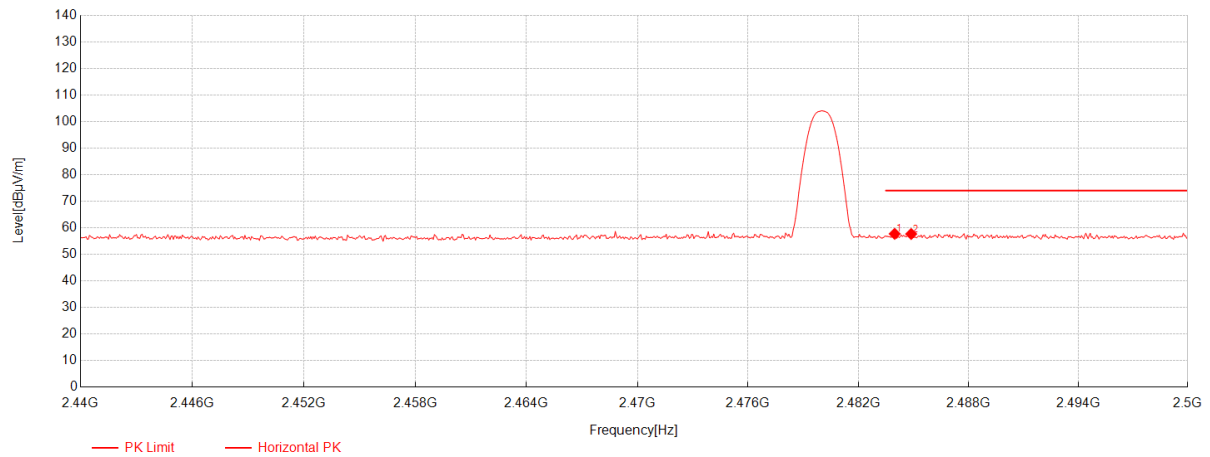
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	2387.09	47.02	26.67	-26.14	47.55	74.00	26.45	Horizontal
-	-	-	-	-	22.80	54.00	31.20	-
2	2387.87	47.19	26.68	-26.14	47.73	74.00	26.27	Horizontal
-	-	-	-	-	22.98	54.00	31.02	-

BT_DH5_TX_CH_00_Vertical_Peak



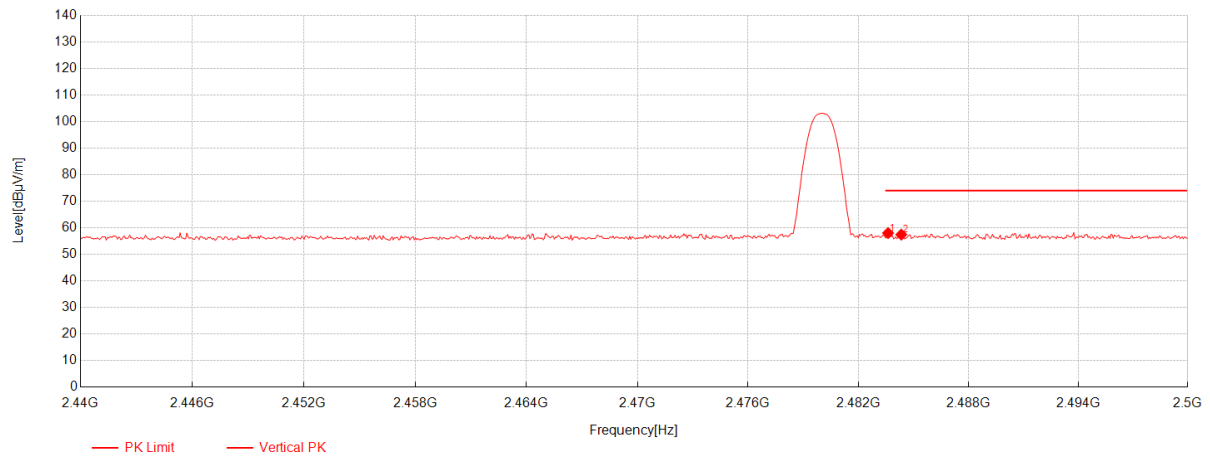
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2386.57	46.32	26.67	-26.14	46.85	74.00	27.15	Vertical
-	-	-	-	-	22.10	54.00	31.90	-
2	2387.74	46.65	26.68	-26.14	47.19	74.00	26.81	Vertical
-	-	-	-	-	22.44	54.00	31.56	-

BT_DH5_TX_CH_78_Horizontal_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.98	56.78	27.16	-26.24	57.70	74.00	16.30	Horizontal
-	-	-	-	-	32.95	54.00	21.05	-
2	2484.88	56.72	27.15	-26.24	57.63	74.00	16.37	Horizontal
-	-	-	-	-	32.88	54.00	21.12	-

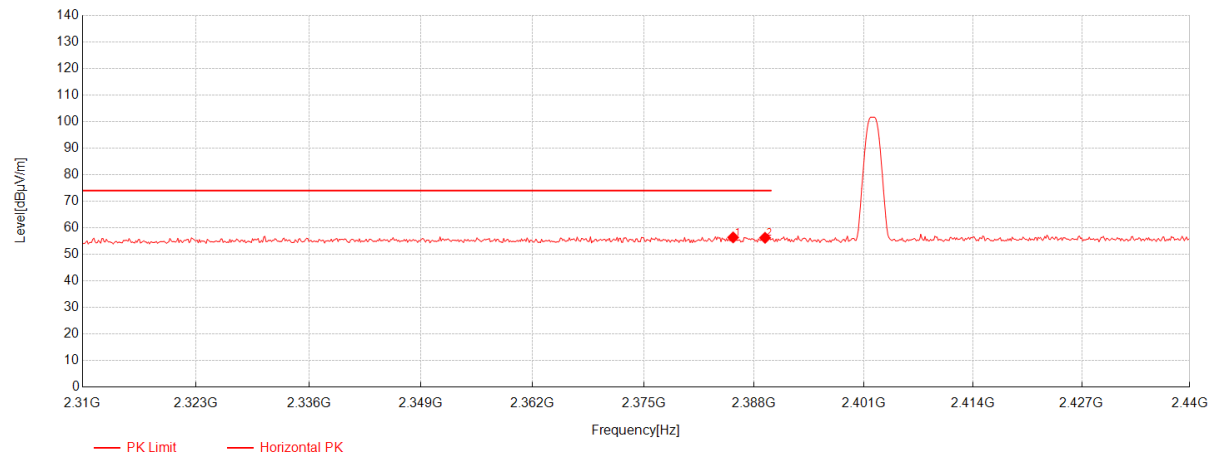
BT_DH5_TX_CH_78_Vertical_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.62	57.07	27.16	-26.24	57.99	74.00	16.01	Vertical
-	-	-	-	-	33.24	54.00	20.76	-
2	2484.34	56.49	27.16	-26.24	57.41	74.00	16.59	Vertical
-	-	-	-	-	32.66	54.00	21.34	-

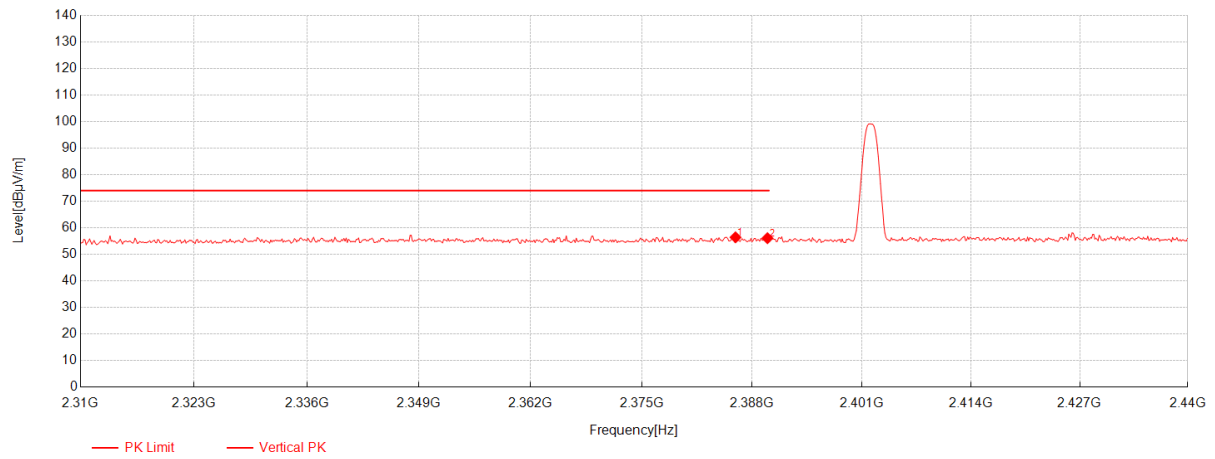


GOC-R18761-BT Module:
BT_3DH5_TX_CH_00_Horizontal_Peak



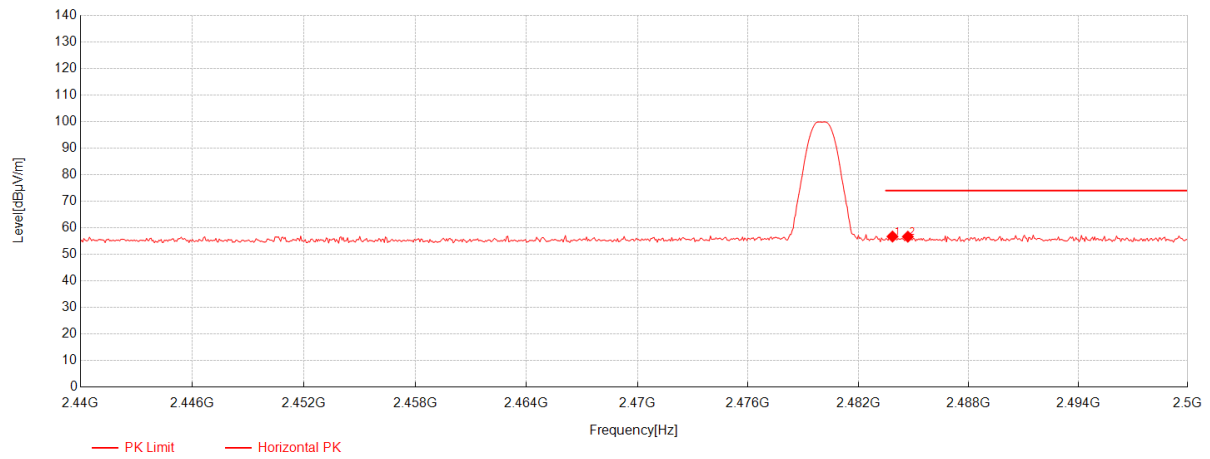
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2385.53	55.83	26.66	-26.15	56.34	74.00	17.66	Horizontal
-	-	-	-	-	37.67	54.00	16.33	-
2	2389.3	55.64	26.69	-26.13	56.20	74.00	17.80	Horizontal
-	-	-	-	-	37.53	54.00	16.47	-

BT_3DH5_TX_CH_00_Vertical_Peak



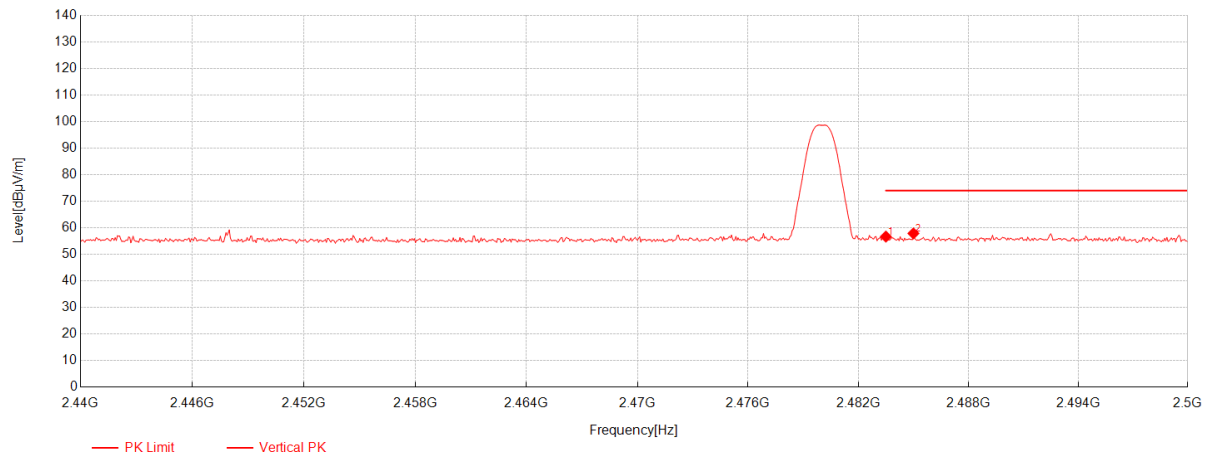
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2386.05	55.86	26.66	-26.15	56.37	74.00	17.63	Vertical
-	-	-	-	-	37.7	54.00	16.3	-
2	2389.82	55.48	26.70	-26.13	56.05	74.00	17.95	Vertical
-	-	-	-	-	37.38	54.00	16.62	-

BT_3DH5_TX_CH_78_Horizontal_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.86	55.76	27.16	-26.24	56.68	74.00	17.32	Horizontal
-	-	-	-	-	38.01	54.00	15.99	-
2	2484.7	55.71	27.15	-26.24	56.62	74.00	17.38	Horizontal
-	-	-	-	-	37.95	54.00	16.05	-

BT_3DH5_TX_CH_78_Vertical_Peak



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2483.5	55.73	27.17	-26.24	56.66	74.00	17.34	Vertical
-	-	-	-	-	37.99	54.00	16.01	-
2	2485	56.94	27.15	-26.24	57.85	74.00	16.15	Vertical
-	-	-	-	-	39.18	54.00	14.82	-

7.2 Radiated Spurious Emissions Below 1GHz

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

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

Limit:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBμV/m@3m)
0.009-0.490	2400/F(kHz)	300	128.5 to 93.8
0.490-1.705	24000/F(kHz)	30	73.8 to 62.9
1.705-30.0	30	30	69.60
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
960-1000	500	3	54.0

Note: The emission limits for the range 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

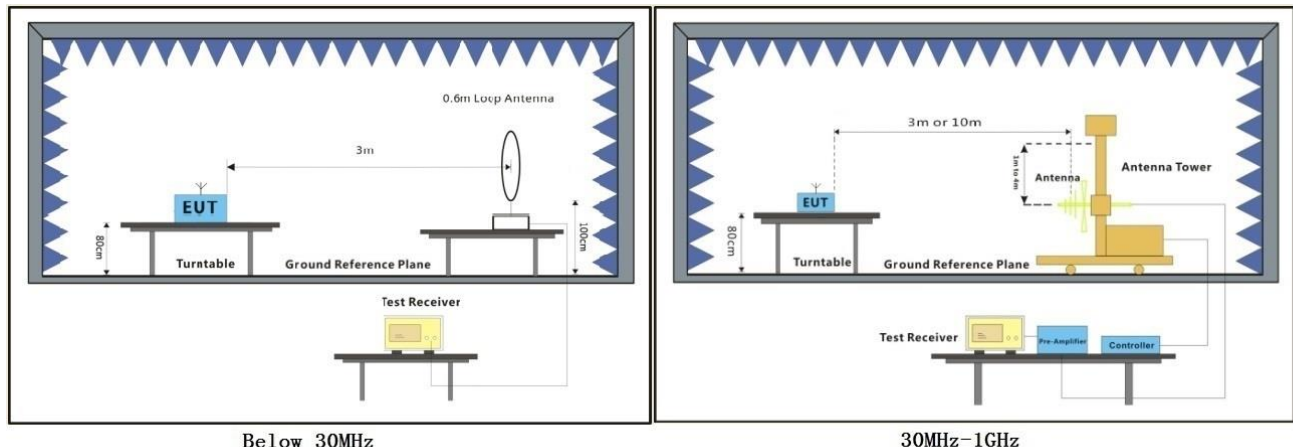
Humidity: 47.6 % RH

Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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



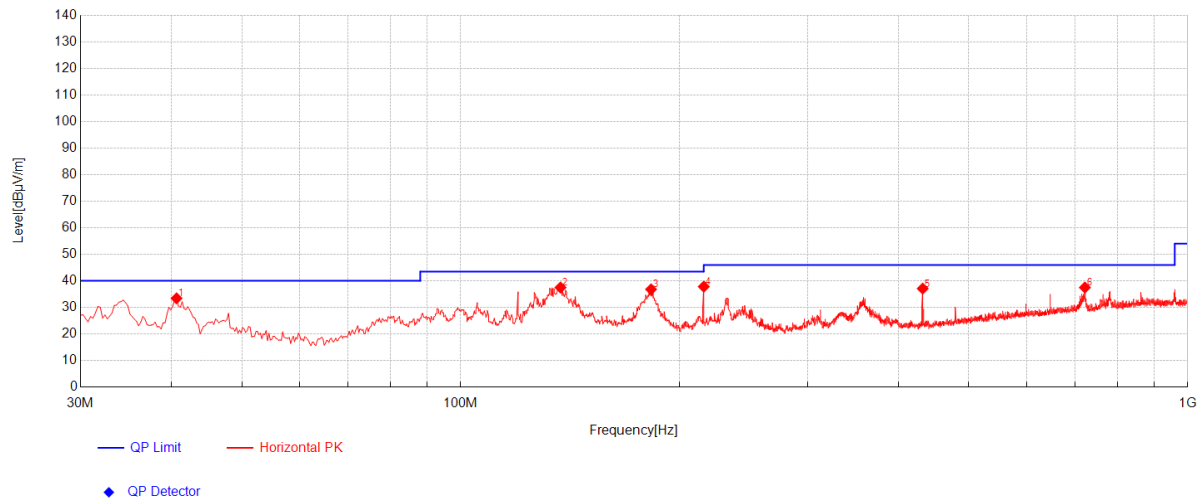
7.2.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8m above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3m or 10m away from the interference-receiving antenna, which was mounted on the variable-height antenna tower.
- c. The antenna height is varied from 1m to 4m 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 1m to 4m (for the test frequency of below 30MHz, the antenna was tuned to heights 1m) 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:

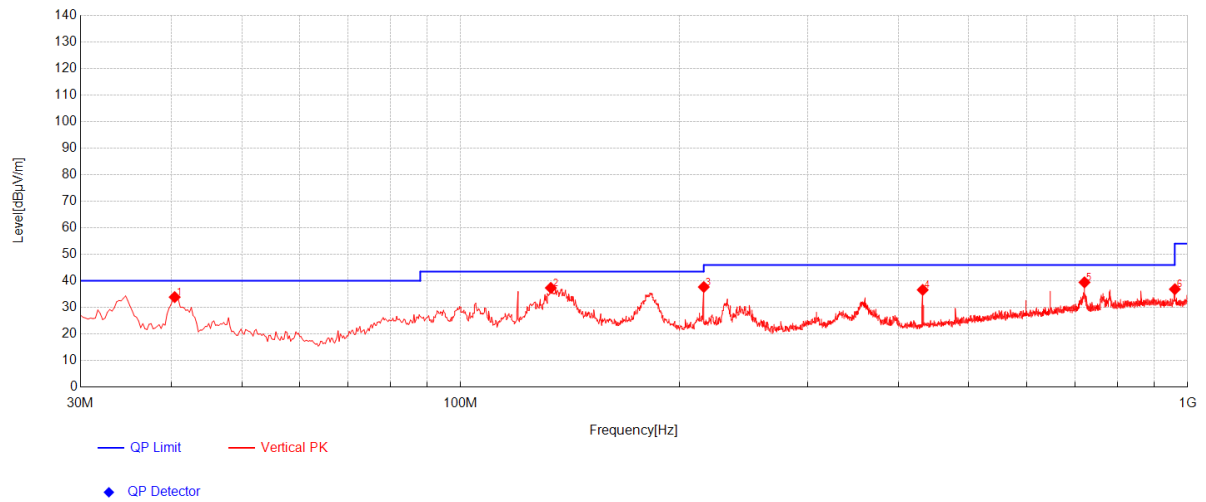
1. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only below points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
2. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the worst-case test curve is displayed.

TX105b Module:
 Test Mode: 00; Polarity: Horizontal



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	40.67	54.73	11.10	-32.40	33.43	40.00	6.57	Horizontal
2	137.185	55.27	13.78	-31.56	37.49	43.50	6.01	Horizontal
3	182.775	56.87	11.39	-31.45	36.81	43.50	6.69	Horizontal
4	215.9975	57.53	11.52	-31.23	37.82	43.50	5.68	Horizontal
5	432.065	49.99	17.54	-30.44	37.09	46.00	8.91	Horizontal
6	722.095	45.35	21.82	-29.68	37.49	46.00	8.51	Horizontal

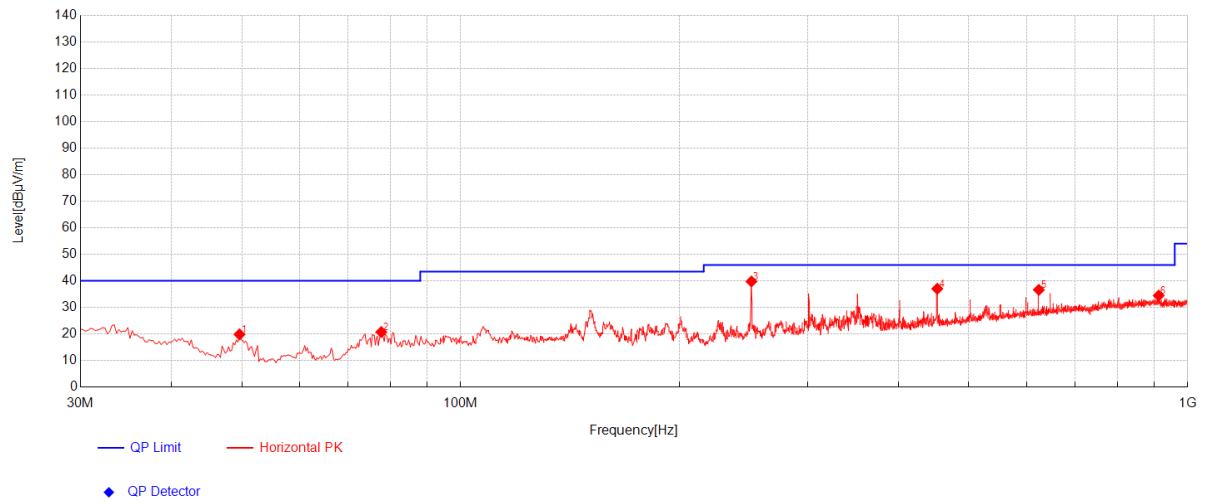
Test Mode: 00; Polarity: Vertical



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	40.4275	55.12	11.17	-32.41	33.88	40.00	6.12	Vertical
2	133.0625	55.24	13.71	-31.61	37.34	43.50	6.16	Vertical
3	215.9975	57.40	11.52	-31.23	37.69	43.50	5.81	Vertical
4	432.065	49.50	17.54	-30.44	36.60	46.00	9.40	Vertical
5	721.125	47.28	21.86	-29.70	39.44	46.00	6.56	Vertical
6	960.23	43.16	22.70	-29.01	36.85	54.00	17.15	Vertical

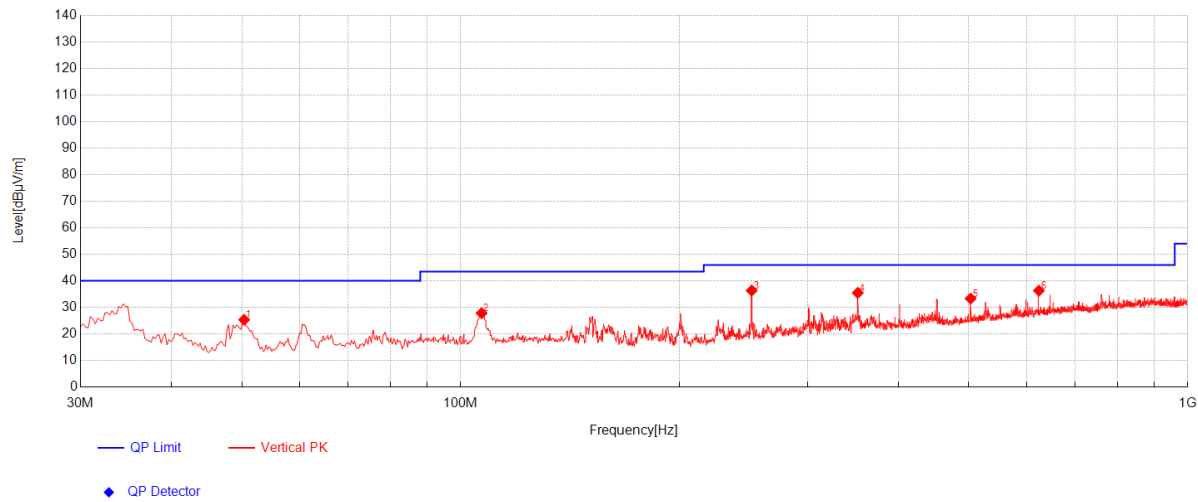
GOC-R18761-BT Module:

Test Mode: 00; Polarity: Horizontal



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	49.6425	45.57	6.61	-32.33	19.85	40.00	20.15	Horizontal
2	77.7725	43.73	9.03	-32.02	20.74	40.00	19.26	Horizontal
3	251.16	57.37	13.55	-31.15	39.77	46.00	6.23	Horizontal
4	452.435	49.46	18.05	-30.49	37.02	46.00	8.98	Horizontal
5	624.125	45.77	20.74	-29.89	36.62	46.00	9.38	Horizontal
6	912.215	40.06	23.46	-29.07	34.45	46.00	11.55	Horizontal

Test Mode: 00; Polarity: Vertical



Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	50.37	51.20	6.46	-32.32	25.34	40.00	14.66	Vertical
2	106.8725	47.20	12.44	-31.80	27.84	43.50	15.66	Vertical
3	251.4025	53.93	13.56	-31.15	36.34	46.00	9.66	Vertical
4	351.7975	50.57	15.61	-30.70	35.48	46.00	10.52	Vertical
5	502.875	44.80	18.76	-30.22	33.34	46.00	12.66	Vertical
6	624.125	45.46	20.74	-29.89	36.31	46.00	9.69	Vertical

7.3 Radiated Spurious Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2020) Section 6.6 & 7.8.8

Limit:

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

Note:

At Above 18GHz, measurements may be performed at a distance shorter than that specified in the regulations

Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor+ Aux Factor (if applicable)

The aux factor needs to be added when measurements are performed at a distance other than the limit distance provided.

EX. Above 18GHz, Aux Factor = 20 dB/decade of distance, the aux factor is $20\log(1/3) = -9.54\text{dB}$ (for 1m test distance).

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

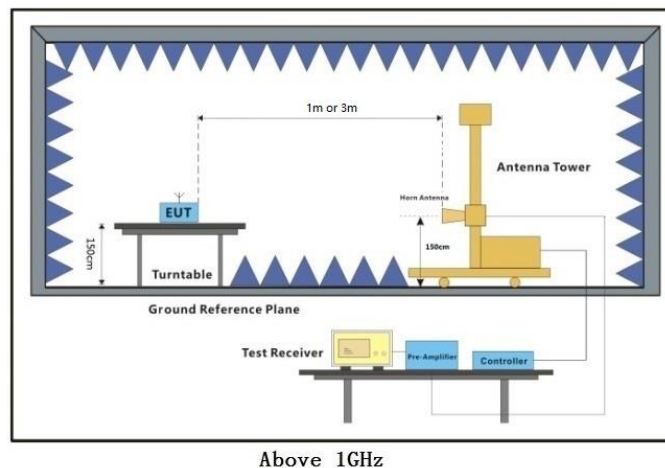
Humidity: 47.5 % RH

Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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

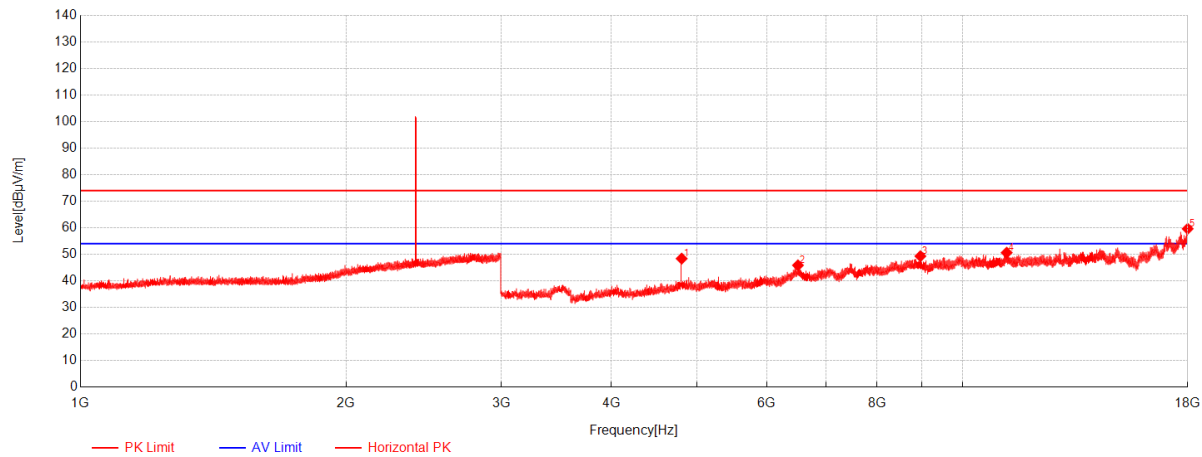
- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5m above the ground at a 3m fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3m away from the interference-receiving antenna from 1GHz to 18GHz, and 1m away from the interference-receiving antenna above 18GHz.
- b. The interference-receiving antenna was mounted on the variable-height antenna tower, with its boresight facing the EUT throughout the test.
- c. The antenna height is varied from 1m to 4m 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 1m to 4m 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. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- g. 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.
- h. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Scan from 18GHz to 10th harmonic of the highest frequency or 40 GHz, whichever is lower.
2. 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.
3. For the frequency above 18GHz, testing had been executed under all test modes, only the worst-case test curve is displayed in the report.
4. For devices with multiple operating modes, measurements on the middle channel is used to determine the worst-case mode(s). Only the worst-case mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum) is recorded in the test report.

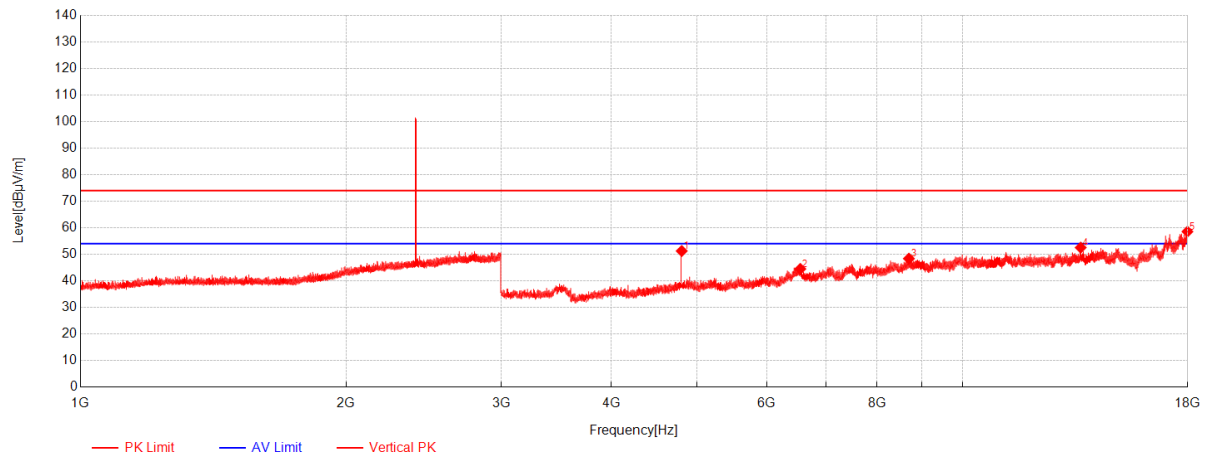
TX105b Module:

BT_DH5_TX_CH_00_Horizontal



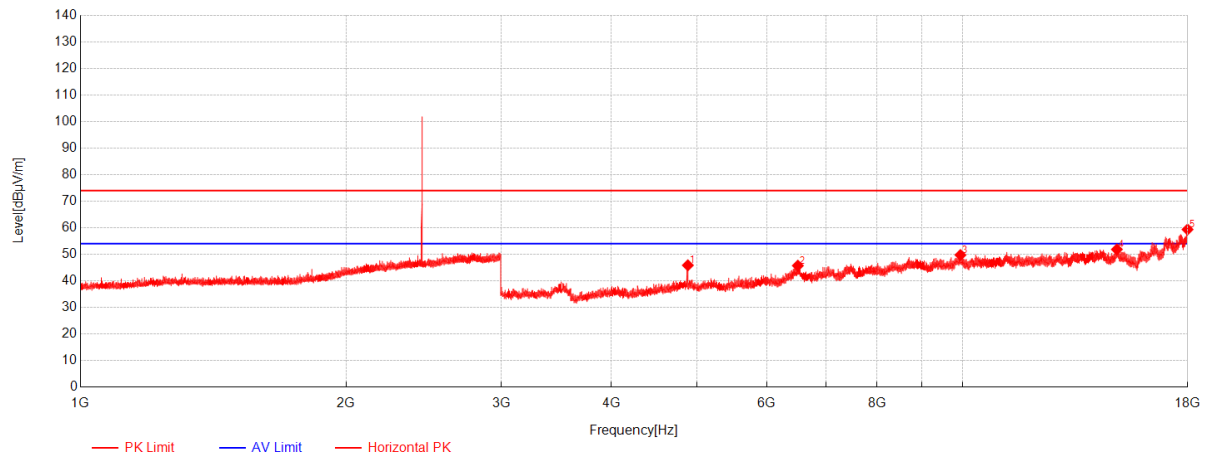
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4804	66.92	31.49	-50.04	48.37	74.00	25.63	Horizontal
-	-	-	-	-	23.62	54.00	30.38	-
2	6508	57.95	34.28	-46.38	45.85	74.00	28.15	Horizontal
-	-	-	-	-	21.10	54.00	32.90	-
3	8958.5	57.62	37.82	-46.16	49.28	74.00	24.72	Horizontal
-	-	-	-	-	24.53	54.00	29.47	-
4	11222	55.32	39.54	-44.25	50.61	74.00	23.39	Horizontal
-	-	-	-	-	25.86	54.00	28.14	-
5	18000	57.56	43.20	-41.16	59.60	74.00	14.40	Horizontal
-	-	-	-	-	34.85	54.00	19.15	-

BT_DH5_TX_CH_00_Vertical



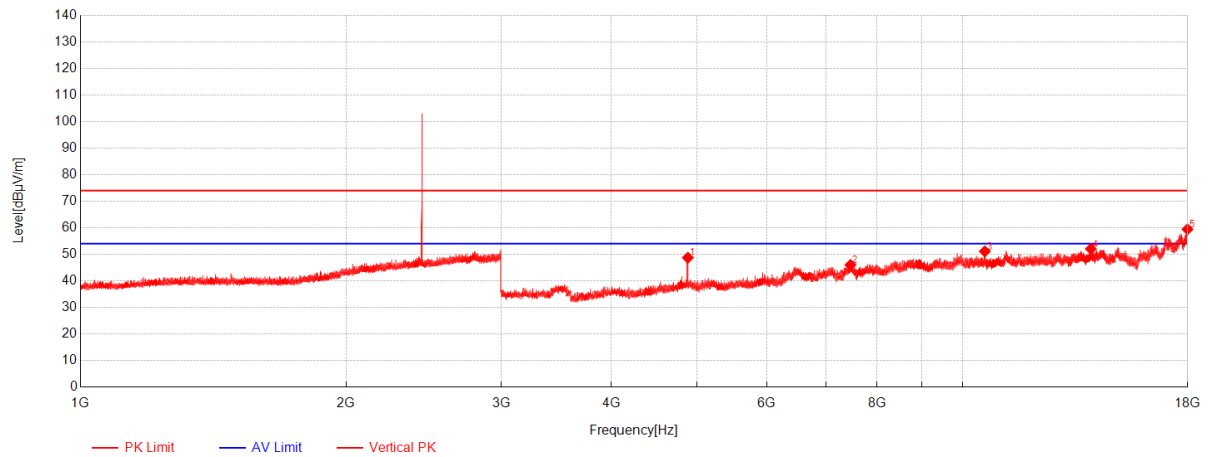
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4804.5	69.79	31.49	-50.04	51.24	74.00	22.76	Vertical
-	-	-	-	-	26.49	54.00	27.51	-
2	6548	57.24	34.68	-47.43	44.49	74.00	29.51	Vertical
-	-	-	-	-	19.74	54.00	34.26	-
3	8694.5	56.66	37.49	-45.79	48.36	74.00	25.64	Vertical
-	-	-	-	-	23.61	54.00	30.39	-
4	13613.5	54.98	40.43	-42.90	52.51	74.00	21.49	Vertical
-	-	-	-	-	27.76	54.00	26.24	-
5	17988.5	56.69	43.20	-41.36	58.53	74.00	15.47	Vertical
-	-	-	-	-	33.78	54.00	20.22	-

BT_DH5_TX_CH_39_Horizontal



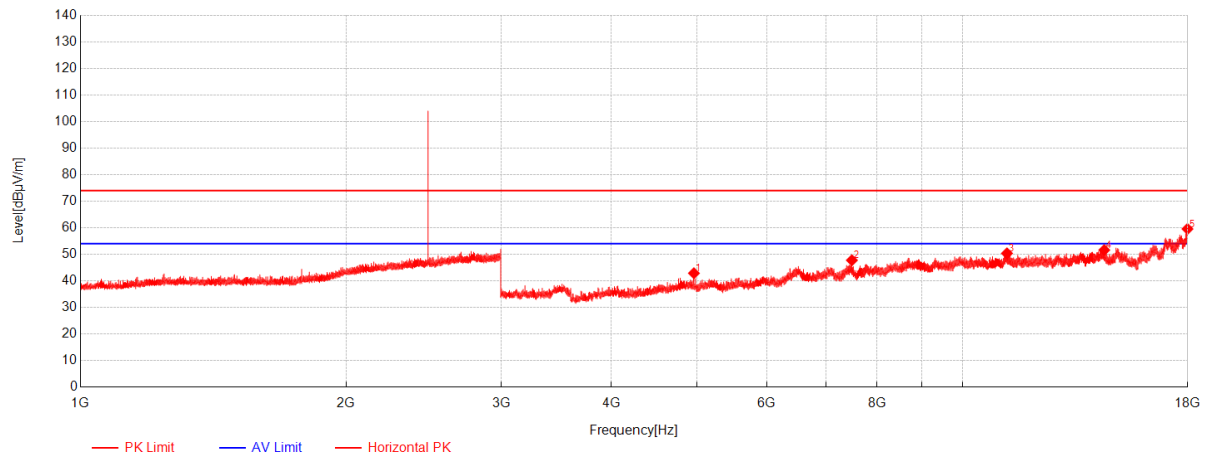
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4882	65.01	31.46	-50.62	45.85	74.00	28.15	Horizontal
-	-	-	-	-	21.10	54.00	32.90	-
2	6506	57.78	34.26	-46.33	45.71	74.00	28.29	Horizontal
-	-	-	-	-	20.96	54.00	33.04	-
3	9946	55.63	39.08	-44.99	49.72	74.00	24.28	Horizontal
-	-	-	-	-	24.97	54.00	29.03	-
4	14962.5	53.42	39.75	-41.34	51.83	74.00	22.17	Horizontal
-	-	-	-	-	27.08	54.00	26.92	-
5	17994	57.39	43.20	-41.26	59.33	74.00	14.67	Horizontal
-	-	-	-	-	34.58	54.00	19.42	-

BT_DH5_TX_CH_39_Vertical



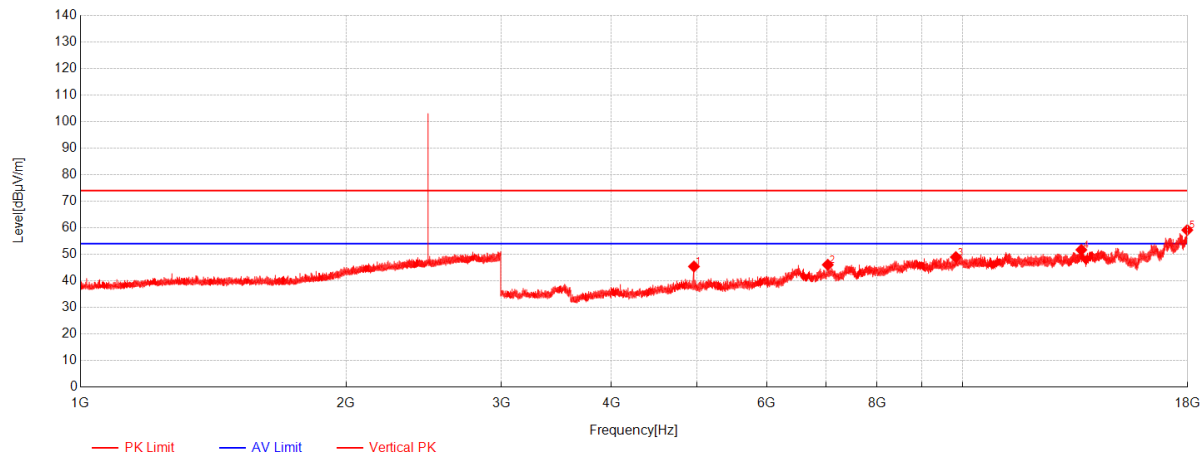
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4882	67.86	31.46	-50.62	48.70	74.00	25.30	Vertical
-	-	-	-	-	23.95	54.00	30.05	-
2	7463	56.92	36.30	-47.23	45.99	74.00	28.01	Vertical
-	-	-	-	-	21.24	54.00	32.76	-
3	10599.5	56.57	39.50	-44.98	51.09	74.00	22.91	Vertical
-	-	-	-	-	26.34	54.00	27.66	-
4	13979.5	53.76	40.42	-42.15	52.03	74.00	21.97	Vertical
-	-	-	-	-	27.28	54.00	26.72	-
5	17989	57.55	43.20	-41.35	59.40	74.00	14.60	Vertical
-	-	-	-	-	34.65	54.00	19.35	-

BT_DH5_TX_CH_78_Horizontal



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4960	62.01	31.56	-50.71	42.86	74.00	31.14	Horizontal
-	-	-	-	-	18.11	54.00	35.89	-
2	7491.5	58.15	36.53	-46.94	47.74	74.00	26.26	Horizontal
-	-	-	-	-	22.99	54.00	31.01	-
3	11230	55.04	39.56	-44.26	50.34	74.00	23.66	Horizontal
-	-	-	-	-	25.59	54.00	28.41	-
4	14477.5	54.10	40.36	-42.87	51.59	74.00	22.41	Horizontal
-	-	-	-	-	26.84	54.00	27.16	-
5	17989.5	57.68	43.20	-41.34	59.54	74.00	14.46	Horizontal
-	-	-	-	-	34.79	54.00	19.21	-

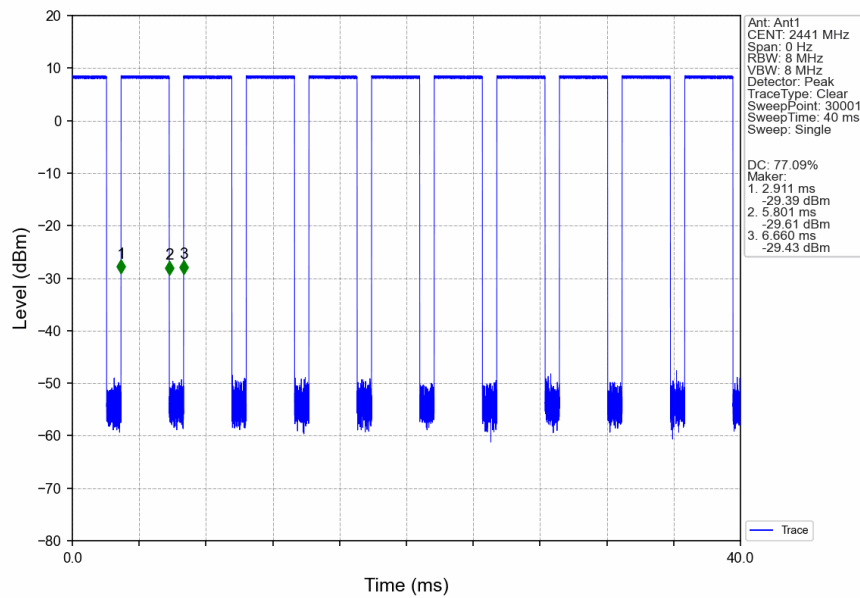
BT_DH5_TX_CH_78_Vertical



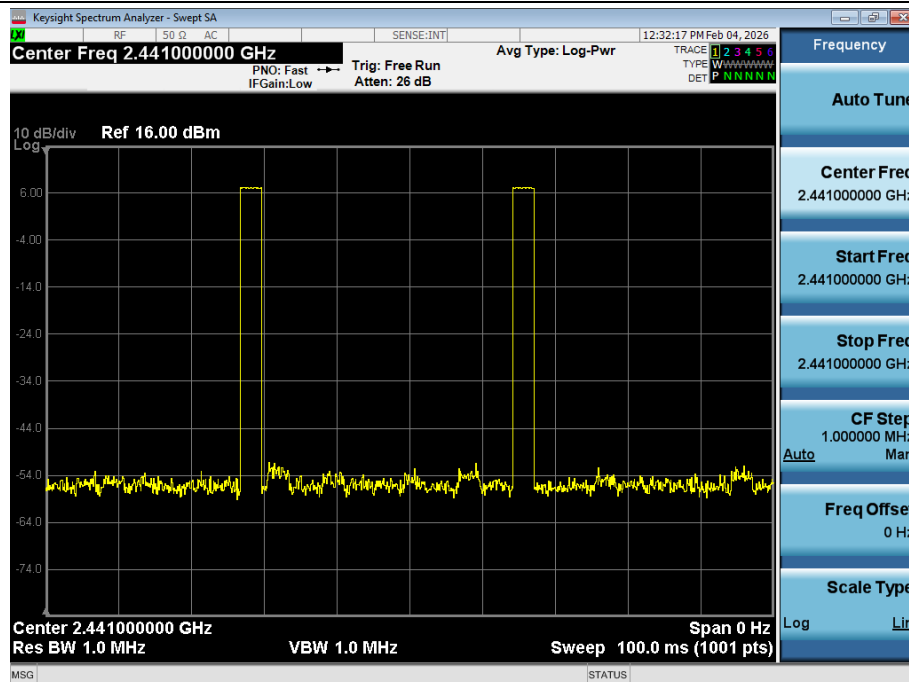
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4960.5	64.56	31.56	-50.71	45.41	74.00	28.59	Vertical
-	-	-	-	-	20.66	54.00	33.34	-
2	7034.5	58.18	35.43	-47.55	46.06	74.00	27.94	Vertical
-	-	-	-	-	21.31	54.00	32.69	-
3	9827	55.04	38.69	-44.79	48.94	74.00	25.06	Vertical
-	-	-	-	-	24.19	54.00	29.81	-
4	13637.5	54.24	40.48	-43.05	51.67	74.00	22.33	Vertical
-	-	-	-	-	26.92	54.00	27.08	-
5	17980.5	57.41	43.20	-41.50	59.11	74.00	14.89	Vertical
-	-	-	-	-	34.36	54.00	19.64	-

Duty Cycle Plots

DH5 on time(One Pules)Plot on channel 39



DH5 on time(Count Pulses)Plot on channel 39



The process and drawings of RSE-AVG

Ant1							
Test Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.016	0.848	≥ 0.848	Pass
PSK/4DQPSK	SISO	HOPP	2DH5	1.001	1.280	≥ 0.853	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.297	≥ 0.865	Pass

Note:

Channel separation correction

DH5: Channel Separation ≥ 1 MHz, Channel separation correction=1

2DH5: Channel Separation ≥ 1 MHz, Channel separation correction=1

3DH5: Channel Separation ≥ 1 MHz, Channel separation correction=1

Overlapping channel correction

DH5: Overlapping channel correction = 0

2DH5: Overlapping channel correction = 1

3DH5: Overlapping channel correction = 1

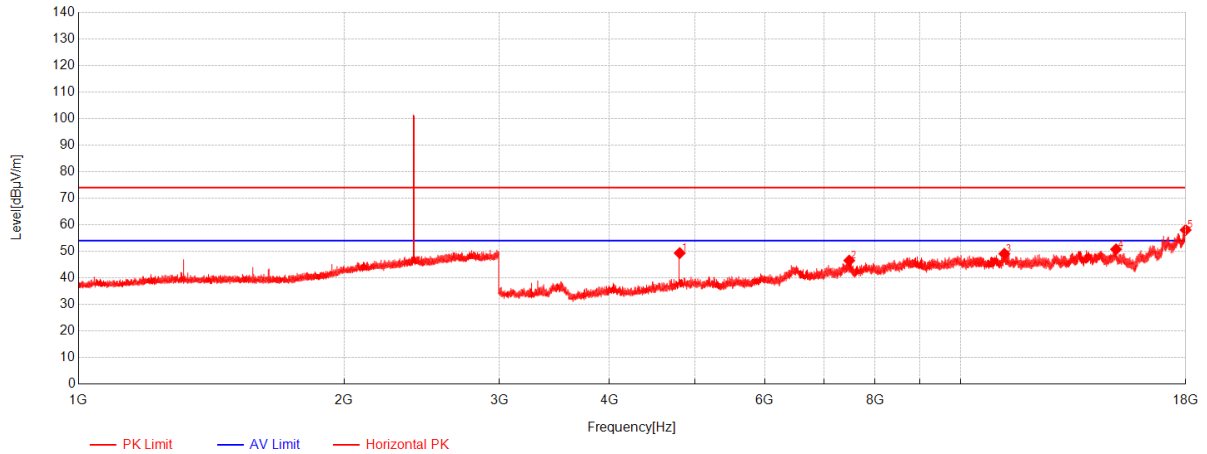
Test mode	Dwell time per 100 ms	Channel separation correction	Overlapping channel correction	Maximum dwell time
DH5	$2 \times 2.894 = 5.788$	1	0	5.788
2DH5	$2 \times 2.890 = 5.780$	1	1	11.560
3DH5	$2 \times 2.898 = 5.796$	1	1	11.592

Note: Maximum dwell time per 1MHz= Dwell time per 100 ms per Channel* (Channel separation correction+ Overlapping channel correction)

Test Mode	Factor
DH5	-24.75
2DH5	-18.74
3DH5	-18.72

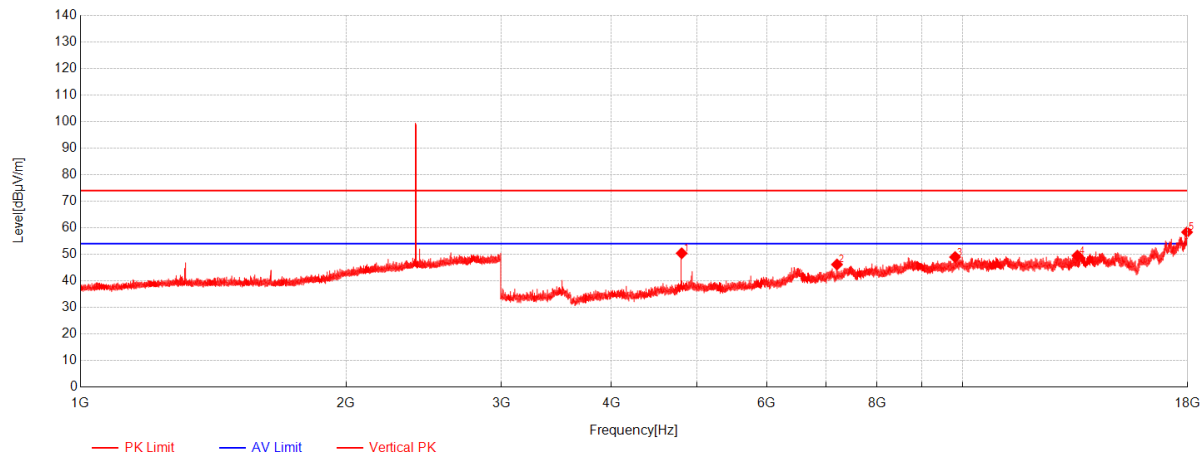
Factor= $20 \times \log(\text{Maximum dwell time in 100 ms}/100)$

GOC-R18761-BT Module:
BT_3DH5_TX_CH_00_Horizontal



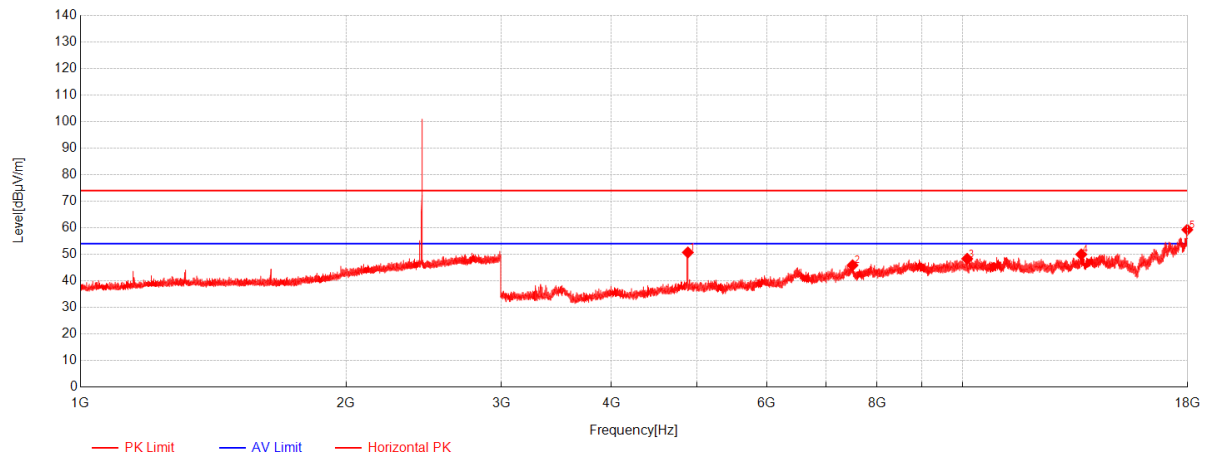
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4804.5	67.87	31.49	-50.04	49.32	74.00	24.68	Horizontal
-	-	-	-	-	30.65	54.00	23.35	-
2	7479.5	57.14	36.44	-47.06	46.52	74.00	27.48	Horizontal
-	-	-	-	-	27.85	54.00	26.15	-
3	11212	53.76	39.52	-44.23	49.05	74.00	24.95	Horizontal
-	-	-	-	-	30.38	54.00	23.62	-
4	15009	51.77	39.64	-40.67	50.74	74.00	23.26	Horizontal
-	-	-	-	-	32.07	54.00	21.93	-
5	17998.5	56.00	43.20	-41.19	58.01	74.00	15.99	Horizontal
-	-	-	-	-	39.34	54.00	14.66	-

BT_3DH5_TX_CH_00_Vertical



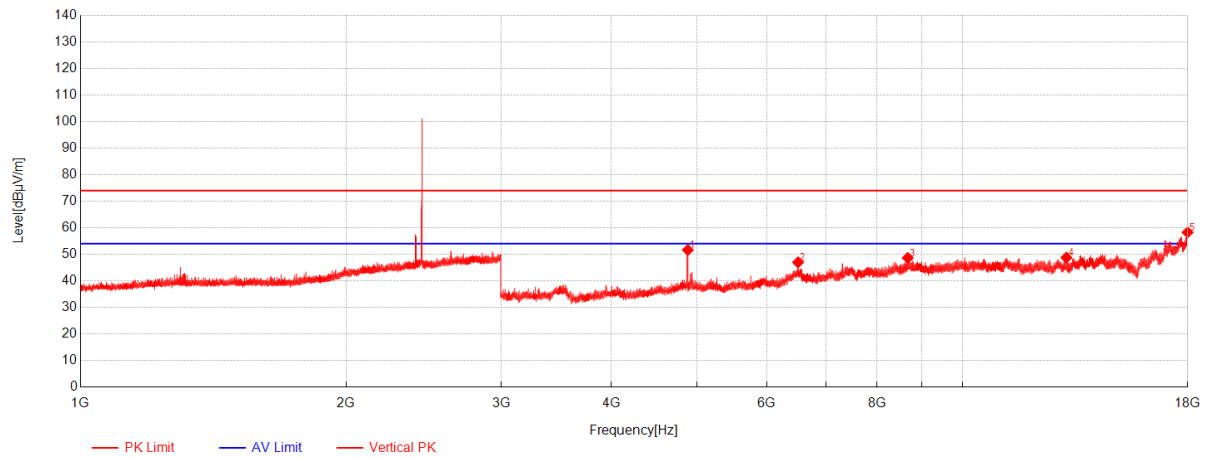
Data List								
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Polarity
1	4804	68.93	31.49	-50.04	50.38	74.00	23.62	Vertical
-	-	-	-	-	31.71	54.00	22.29	-
2	7205.5	58.54	36.22	-48.61	46.15	74.00	27.85	Vertical
-	-	-	-	-	27.48	54.00	26.52	-
3	9808	54.86	38.77	-44.68	48.95	74.00	25.05	Vertical
-	-	-	-	-	30.28	54.00	23.72	-
4	13497	52.25	40.39	-43.16	49.48	74.00	24.52	Vertical
-	-	-	-	-	30.81	54.00	23.19	-
5	17972	56.76	43.20	-41.64	58.32	74.00	15.68	Vertical
-	-	-	-	-	39.65	54.00	14.35	-

BT_3DH5_TX_CH_39_Horizontal



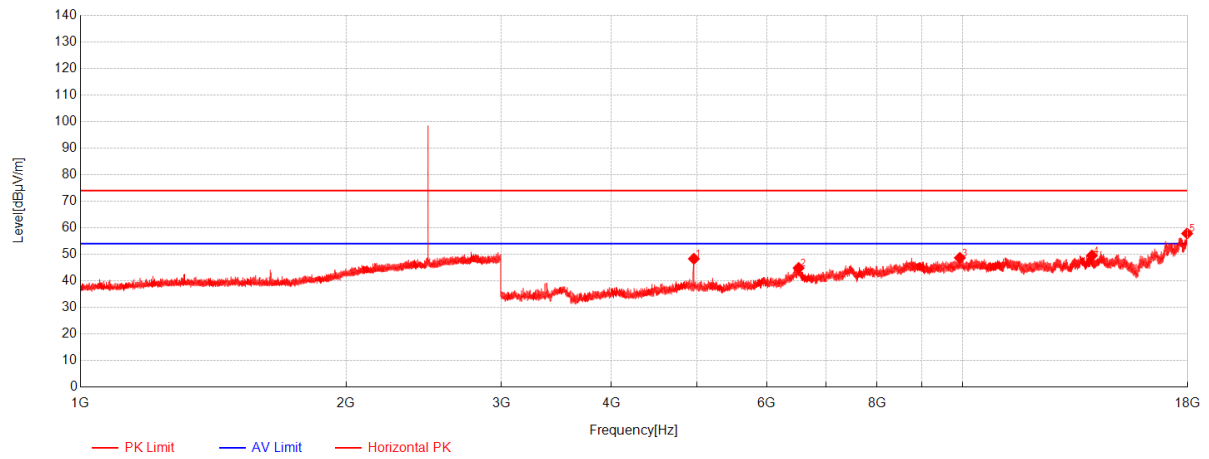
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4882.5	69.84	31.47	-50.62	50.69	74.00	23.31	Horizontal
-	-	-	-	-	32.02	54.00	21.98	-
2	7505	56.24	36.55	-46.91	45.88	74.00	28.12	Horizontal
-	-	-	-	-	27.21	54.00	26.79	-
3	10122.5	54.74	39.16	-45.59	48.31	74.00	25.69	Horizontal
-	-	-	-	-	29.64	54.00	24.36	-
4	13635.5	52.51	40.47	-43.03	49.95	74.00	24.05	Horizontal
-	-	-	-	-	31.28	54.00	22.72	-
5	17983	57.49	43.20	-41.45	59.24	74.00	14.76	Horizontal
-	-	-	-	-	40.57	54.00	13.43	-

BT_3DH5_TX_CH_39_Vertical



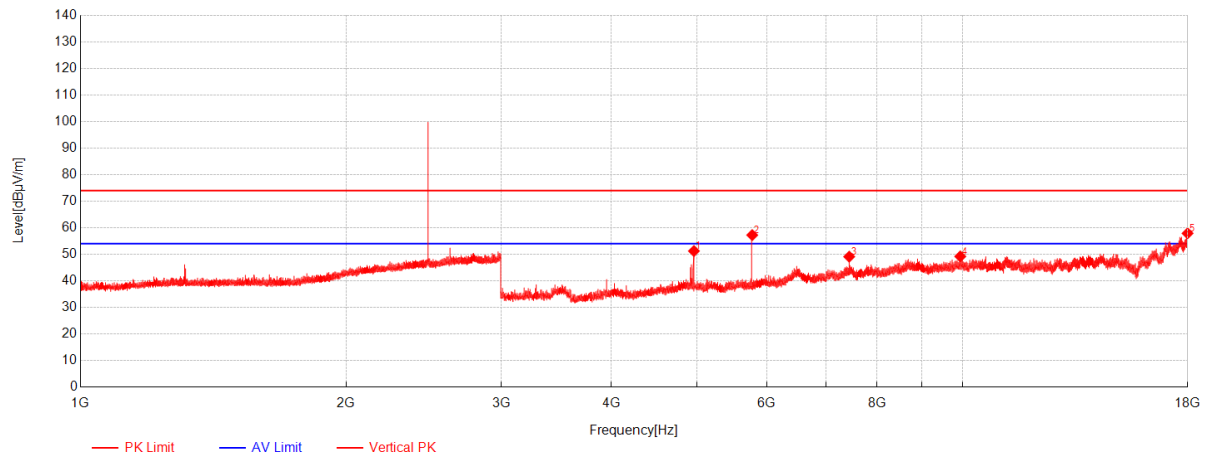
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4882	70.78	31.46	-50.62	51.62	74.00	22.38	Vertical
-	-	-	-	-	32.95	54.00	21.05	-
2	6509.5	59.09	34.30	-46.42	46.97	74.00	27.03	Vertical
-	-	-	-	-	28.3	54.00	25.7	-
3	8668	57.13	37.44	-45.94	48.63	74.00	25.37	Vertical
-	-	-	-	-	29.96	54.00	24.04	-
4	13116	52.21	39.76	-43.22	48.75	74.00	25.25	Vertical
-	-	-	-	-	30.08	54.00	23.92	-
5	17995	56.28	43.20	-41.25	58.23	74.00	15.77	Vertical
-	-	-	-	-	39.56	54.00	14.44	-

BT_3DH5_TX_CH_78_Horizontal



Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4959.5	67.46	31.56	-50.71	48.31	74.00	25.69	Horizontal
-	-	-	-	-	29.64	54.00	24.36	-
2	6519	57.12	34.39	-46.67	44.84	74.00	29.16	Horizontal
-	-	-	-	-	26.17	54.00	27.83	-
3	9930.5	54.69	39.02	-45.07	48.64	74.00	25.36	Horizontal
-	-	-	-	-	29.97	54.00	24.03	-
4	14019	51.36	40.41	-42.25	49.52	74.00	24.48	Horizontal
-	-	-	-	-	30.85	54.00	23.15	-
5	17975	56.20	43.20	-41.59	57.81	74.00	16.19	Horizontal
-	-	-	-	-	39.14	54.00	14.86	-

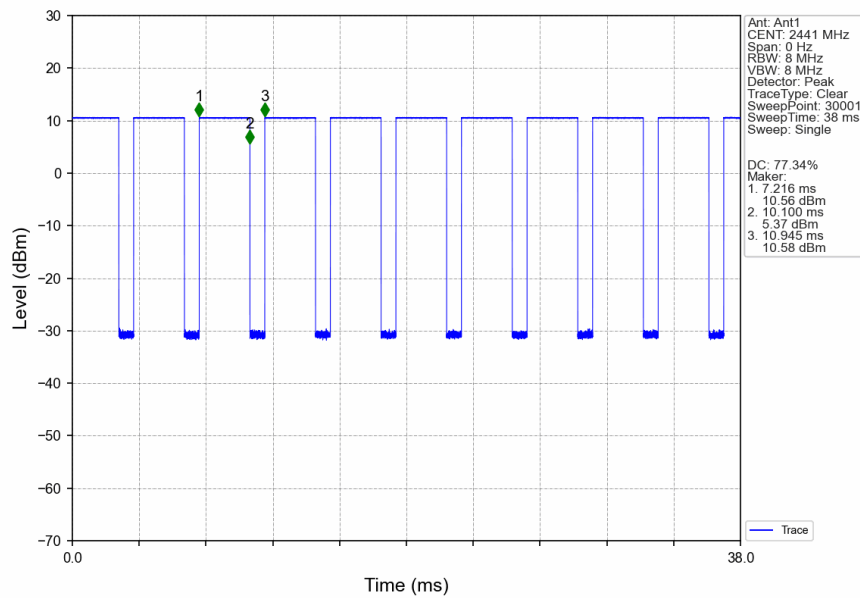
BT_3DH5_TX_CH_78_Vertical



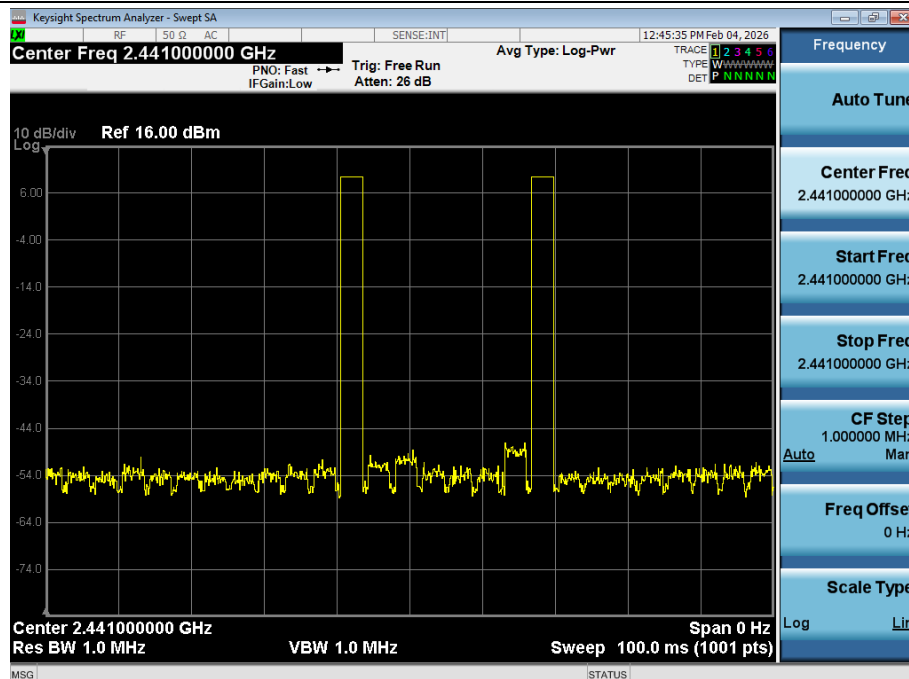
Data List								
NO.	Frequency [MHz]	Reading [dBμV]	AF [dB/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	4960	70.38	31.56	-50.71	51.23	74.00	22.77	Vertical
-	-	-	-	-	32.56	54.00	21.44	-
2	5775.5	74.78	32.65	-50.22	57.21	74.00	16.79	Vertical
-	-	-	-	-	38.54	54.00	15.46	-
3	7439.5	60.36	36.22	-47.47	49.11	74.00	24.89	Vertical
-	-	-	-	-	30.44	54.00	23.56	-
4	9942	55.13	39.07	-45.01	49.19	74.00	24.81	Vertical
-	-	-	-	-	30.52	54.00	23.48	-
5	17995.5	55.92	43.20	-41.24	57.88	74.00	16.12	Vertical
-	-	-	-	-	39.21	54.00	14.79	-

Duty Cycle Plots

DH5 on time(One Pules)Plot on channel 39



DH5 on time(Count Pulses)Plot on channel 39



The process and drawings of RSE-AVG

Ant1							
Test Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.004	0.962	≥ 0.962	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.284	≥ 0.856	Pass
8DPSK	SISO	HOPP	3DH5	0.996	1.308	≥ 0.872	Pass

Note:

Channel separation correction

DH5: Channel Separation ≥ 1 MHz, Channel separation correction=1

2DH5: Channel Separation ≥ 1 MHz, Channel separation correction=1

3DH5: Channel Separation < 1 MHz, Channel separation correction=1/0.996=1.004

Overlapping channel correction

DH5: Overlapping channel correction = 0

2DH5: Overlapping channel correction = 1

3DH5: Overlapping channel correction = 1

Test mode	Dwell time per 100 ms	Channel separation correction	Overlapping channel correction	Maximum dwell time
DH5	$2 \times 2.900 = 5.800$	1	0	5.800
2DH5	$2 \times 2.906 = 5.812$	1	1	11.624
3DH5	$2 \times 2.908 = 5.816$	1.004	1	11.655

Note: Maximum dwell time per 1MHz= Dwell time per 100 ms per Channel*(Channel separation correction+ Overlapping channel correction)

Test Mode	Factor
DH5	-24.73
2DH5	-18.69
3DH5	-18.67

Factor= $20 \times \log(\text{Maximum dwell time in 100 ms}/100)$

7.4 Maximum Conducted Output Power

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

Test Method: ANSI C63.10 (2020) 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

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

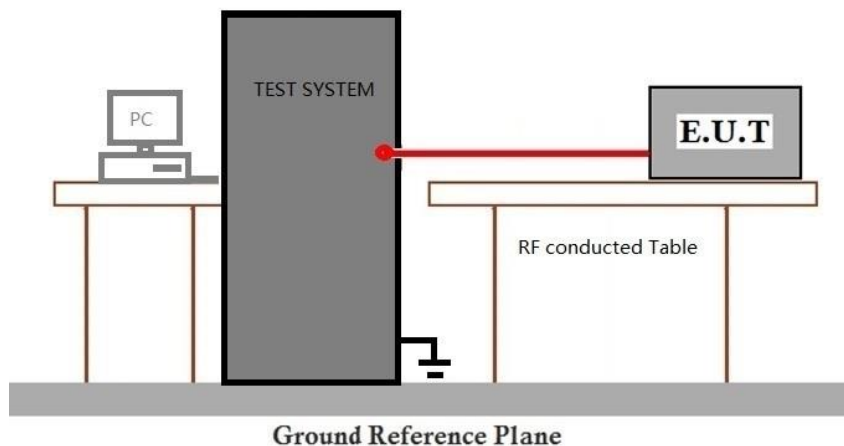
Humidity: 47.6 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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





Report No.: KSCR260100014804

Page: 48 of 168

7.4.4 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

7.5 20dB Bandwidth

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

Test Method: ANSI C63.10 (2020) Section 6.9.2

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

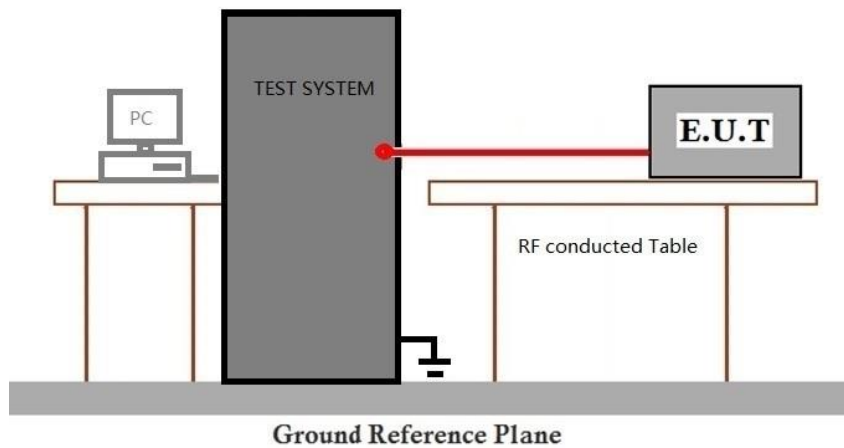
Humidity: 47.4 % RH

Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.6 Carrier Frequencies Separation

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

Test Method: ANSI C63.10 (2020) 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.

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

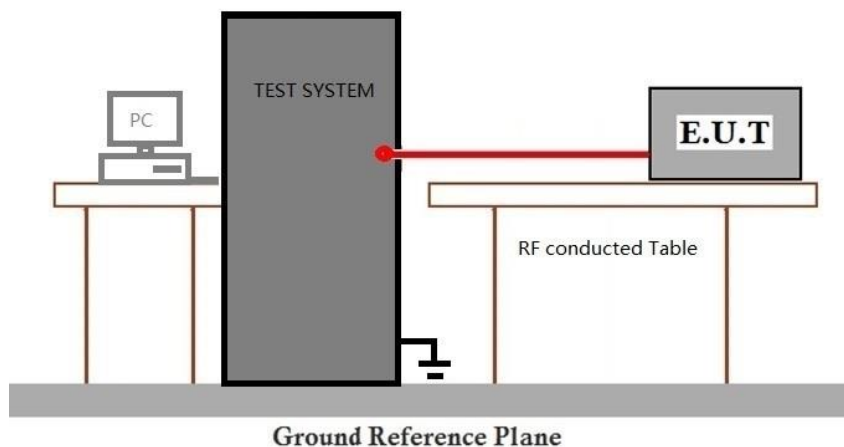
Humidity: 47.5 % RH

Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	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.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7 Hopping Channel Number

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

Test Method: ANSI C63.10 (2020) 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

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

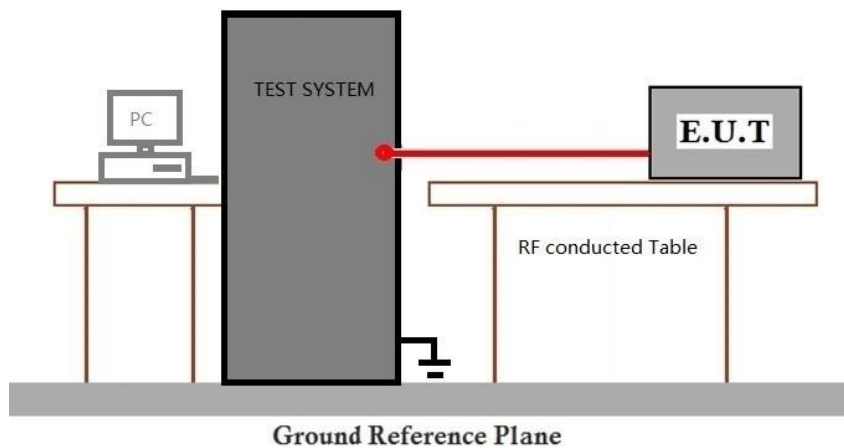
Humidity: 47.5 % RH

Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	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 Dwell Time

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

Test Method: ANSI C63.10 (2020) 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

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

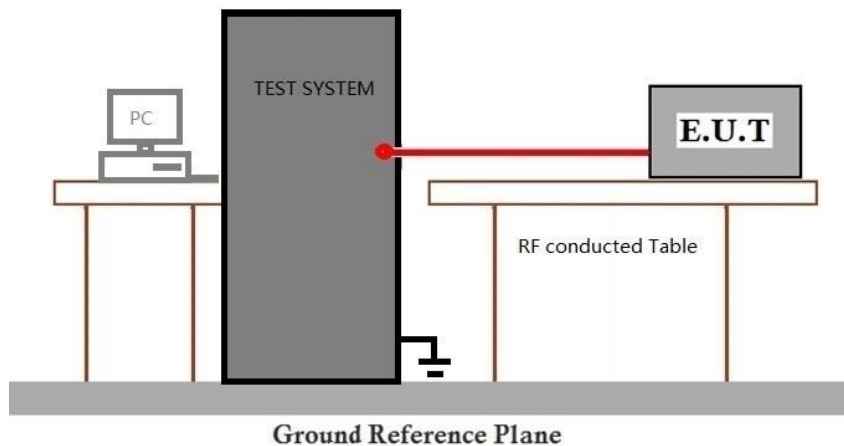
Humidity: 47.5 % RH

Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	06	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

7.9 Conducted Band Edges Measurement

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

Test Method: ANSI C63.10 (2020) Section 7.8.7.2

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C

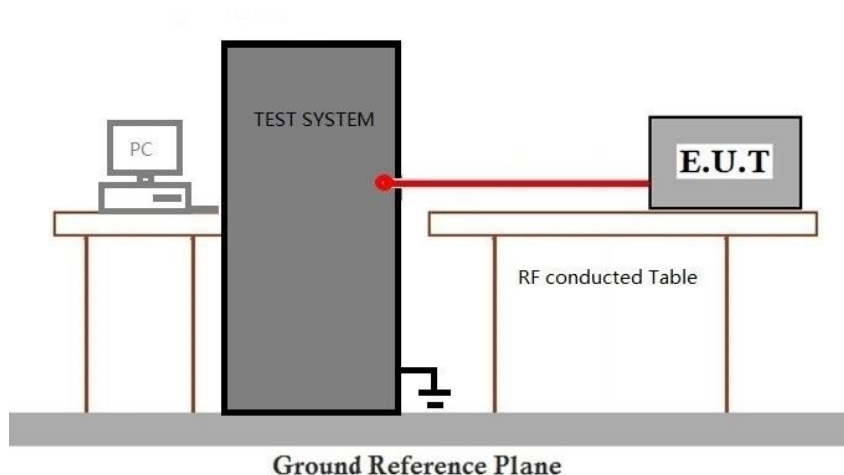
Humidity: 47.6 % RH

Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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	06	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





Report No.: KSCR260100014804

Page: 54 of 168

7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.10 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2020) Section 7.8.7

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: 22.6 °C

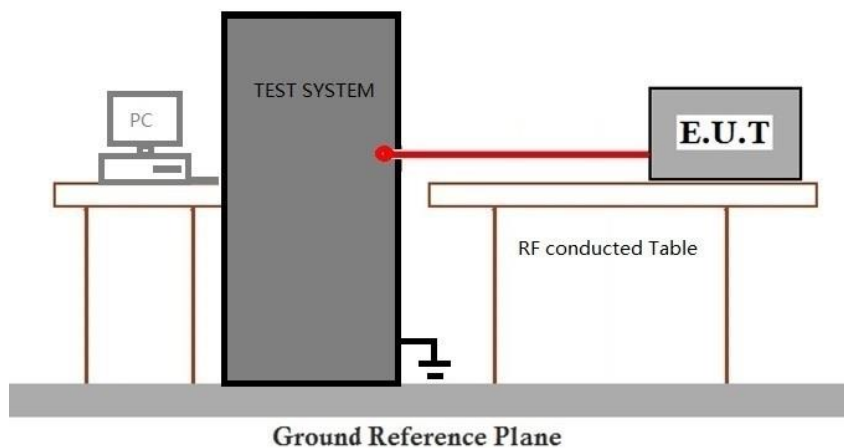
Humidity: 47.6 % RH

Atmospheric Pressure: 1010 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	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.

7.10.3 Test Setup Diagram



7.10.4 Measurement Procedure and Data

Please Refer to Appendix for Details

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2601000148AU

9 EUT Constructional Details (EUT Photos)

Refer to Appendix_Photographs of EUT Constructional Details for KSCR2601000148AU



10 Appendix

TX105b Module:

1. Duty Cycle

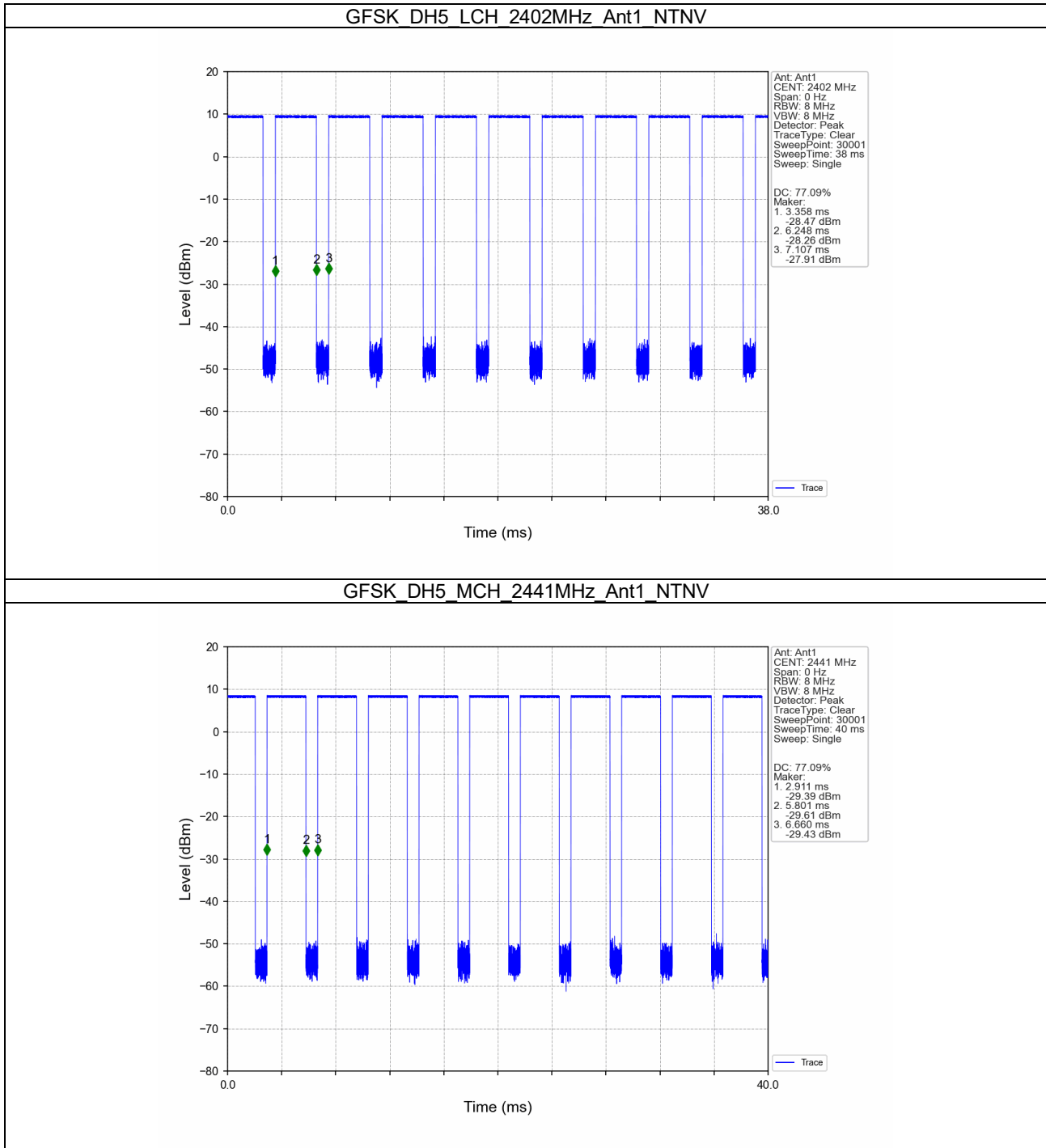
1.1 Test Result

1.1.1 Ant1

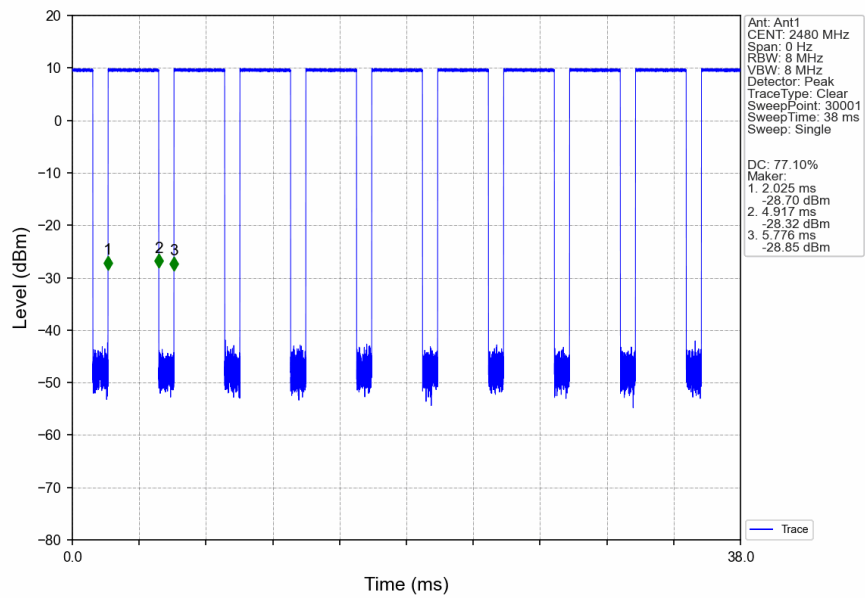
Ant1								
Mode	TX Type	Frequency (MHz)	Packet Type	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
GFSK	SISO	2402	DH5	2.890	3.749	77.09	1.13	0.03
		2441	DH5	2.890	3.749	77.09	1.13	0.01
		2480	DH5	2.892	3.751	77.10	1.13	0.03
Pi/4DQPSK	SISO	2402	2DH5	2.893	3.749	77.17	1.13	0.03
		2441	2DH5	2.894	3.750	77.17	1.13	0.01
		2480	2DH5	2.893	3.749	77.17	1.13	0.01
8DPSK	SISO	2402	3DH5	2.896	3.750	77.23	1.12	8.67
		2441	3DH5	2.896	3.751	77.21	1.12	0.03
		2480	3DH5	2.896	3.751	77.21	1.12	0.03

1.2 Test Graph

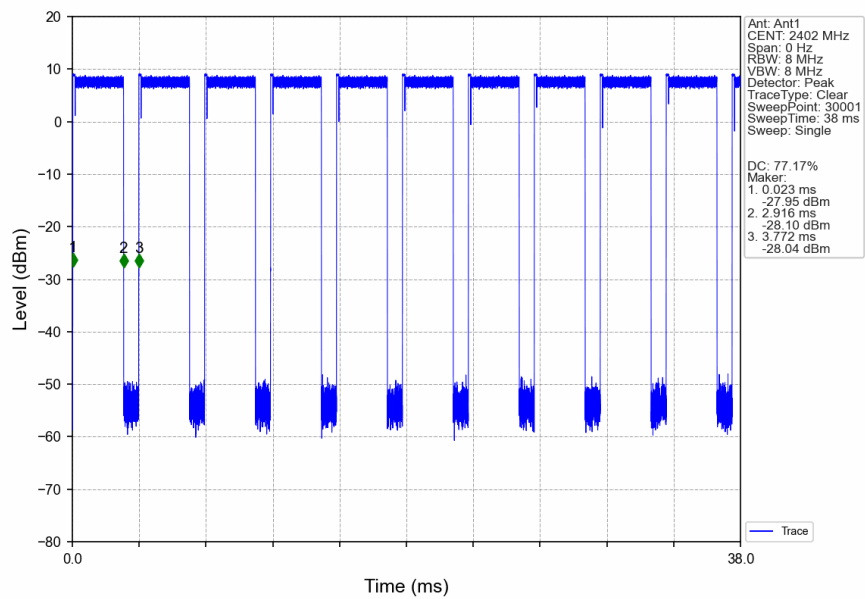
1.2.1 Ant1



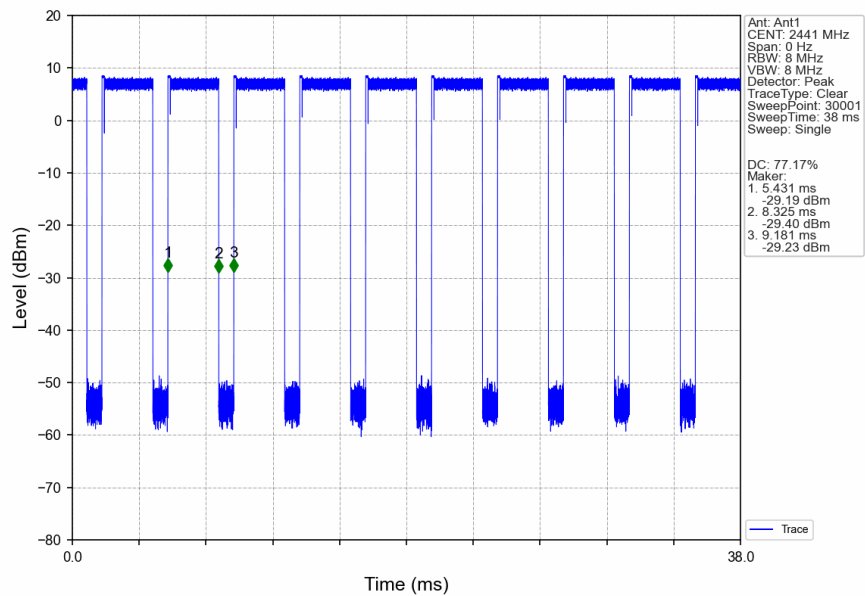
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



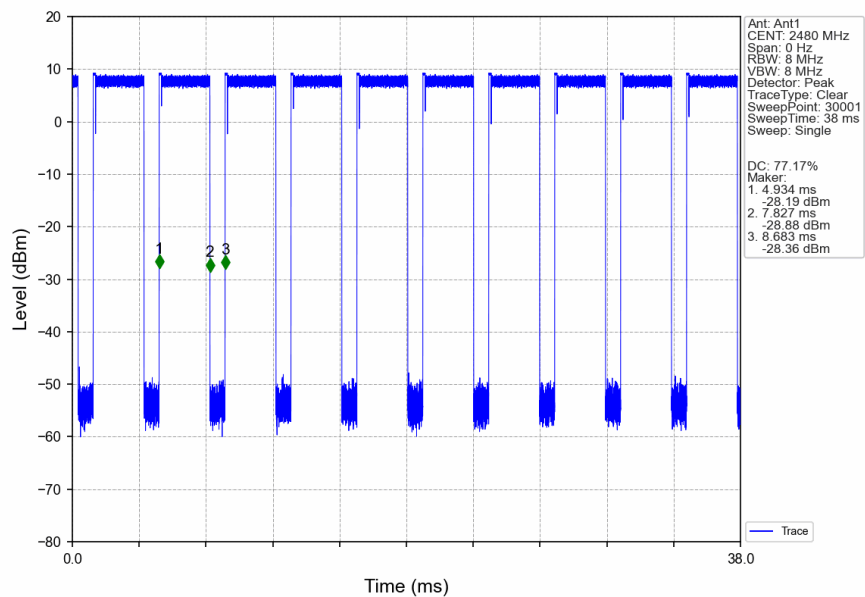
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



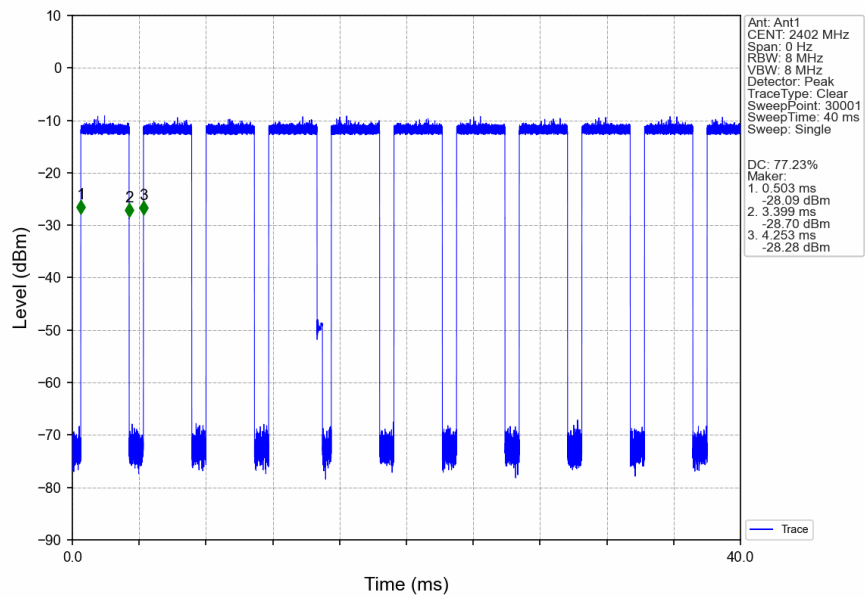
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



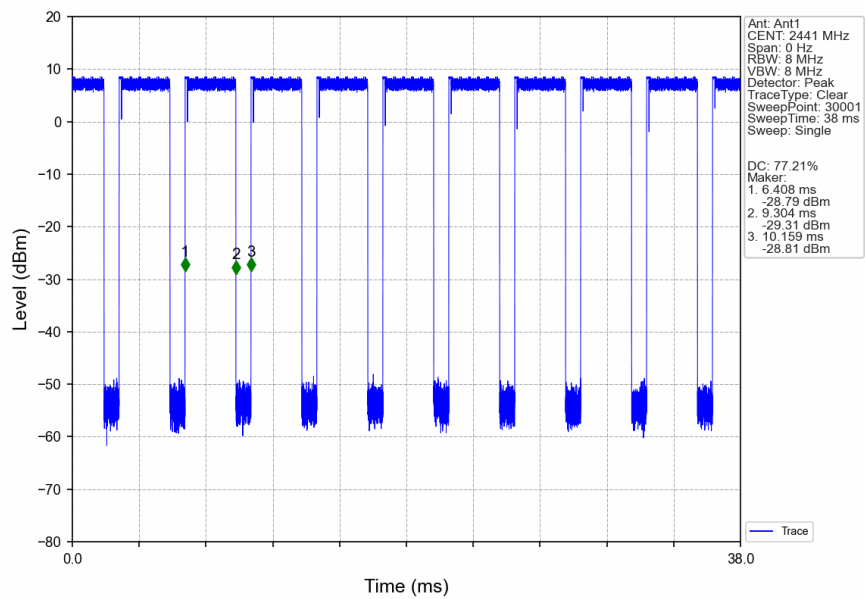
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



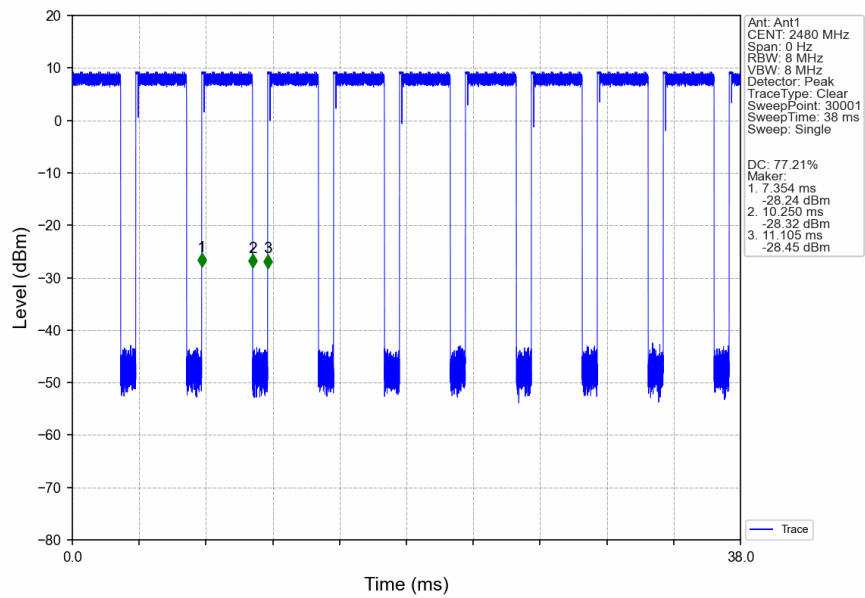
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

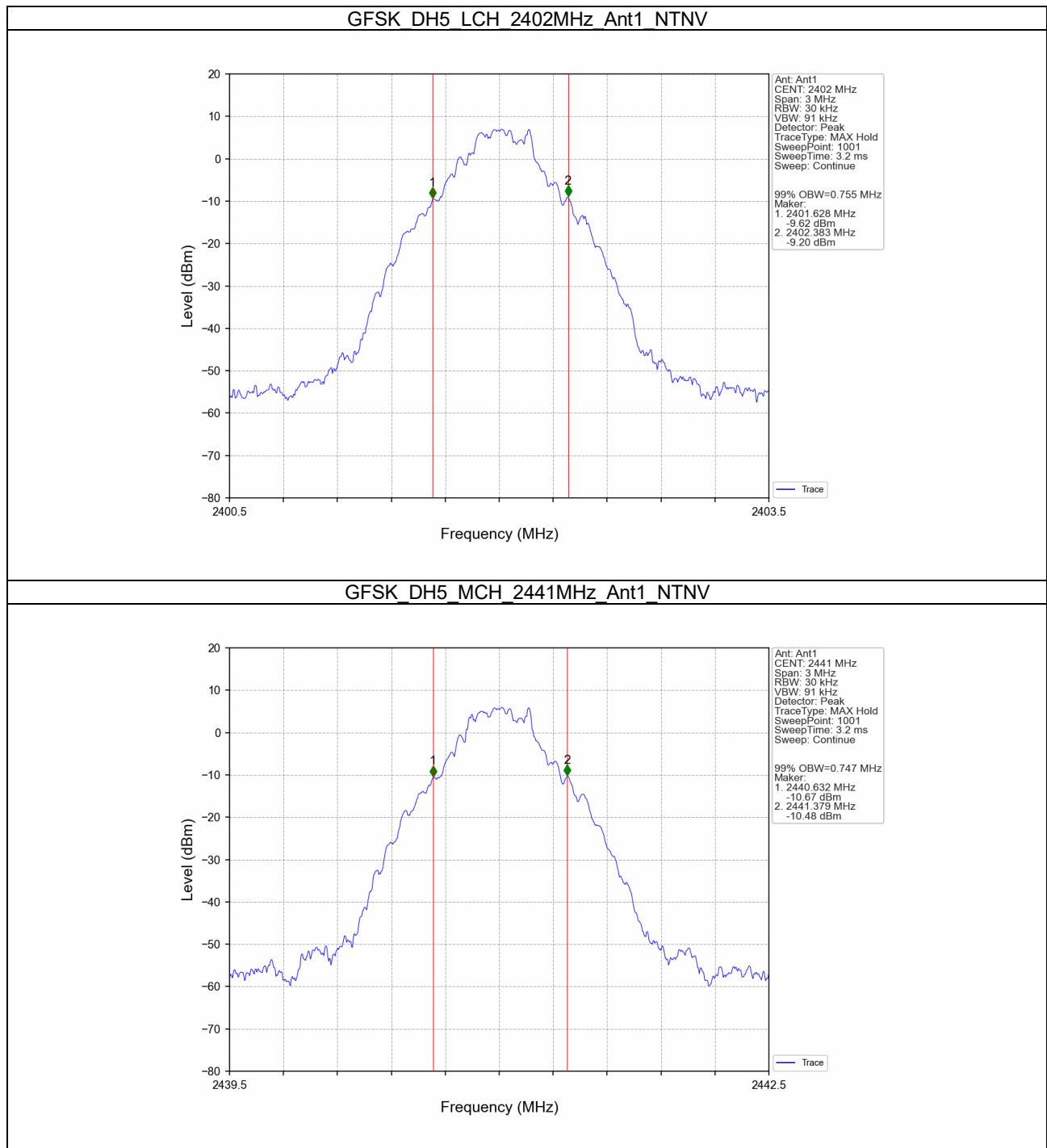
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.755	/	Pass
		2441	DH5	1	0.747	/	Pass
		2480	DH5	1	0.754	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.146	/	Pass
		2441	2DH5	1	1.146	/	Pass
		2480	2DH5	1	1.148	/	Pass
8DPSK	SISO	2402	3DH5	1	1.158	/	Pass
		2441	3DH5	1	1.157	/	Pass
		2480	3DH5	1	1.152	/	Pass

2.1.2 20dB BW

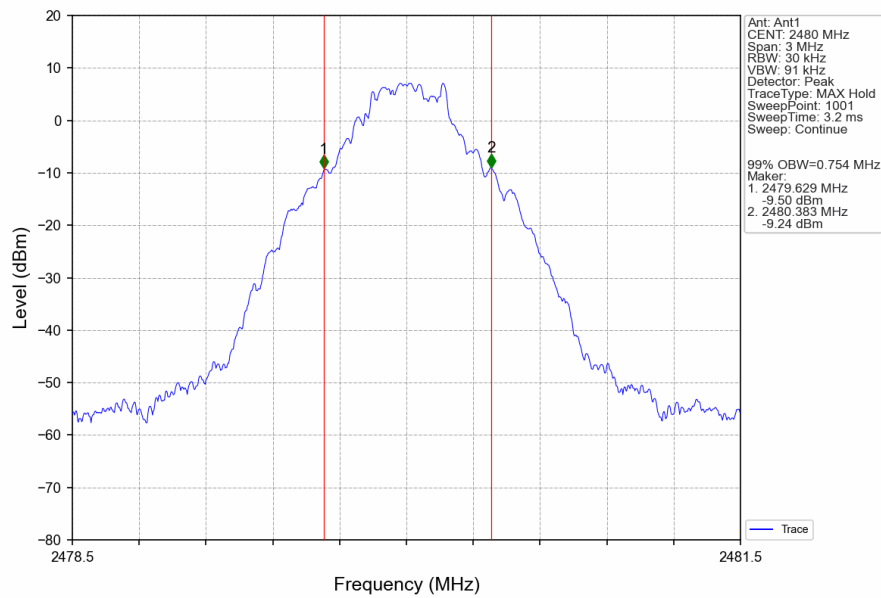
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.848	/	Pass
		2441	DH5	1	0.845	/	Pass
		2480	DH5	1	0.845	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.280	/	Pass
		2441	2DH5	1	1.276	/	Pass
		2480	2DH5	1	1.279	/	Pass
8DPSK	SISO	2402	3DH5	1	1.288	/	Pass
		2441	3DH5	1	1.297	/	Pass
		2480	3DH5	1	1.291	/	Pass

2.2 Test Graph

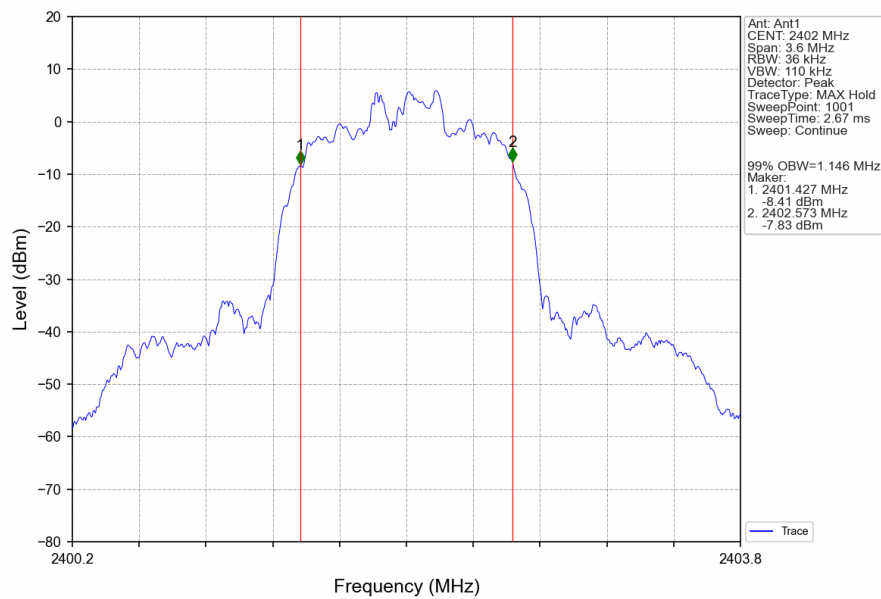
2.2.1 OBW



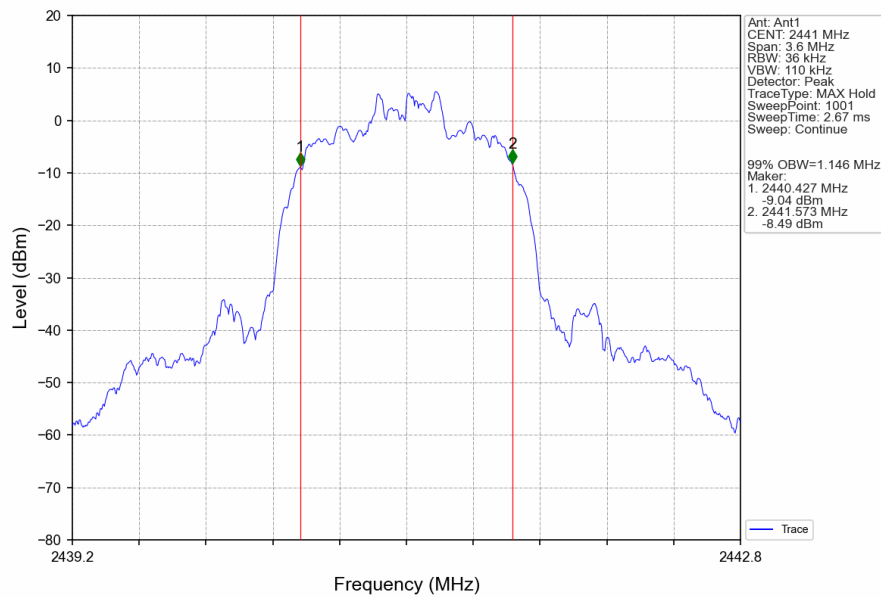
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



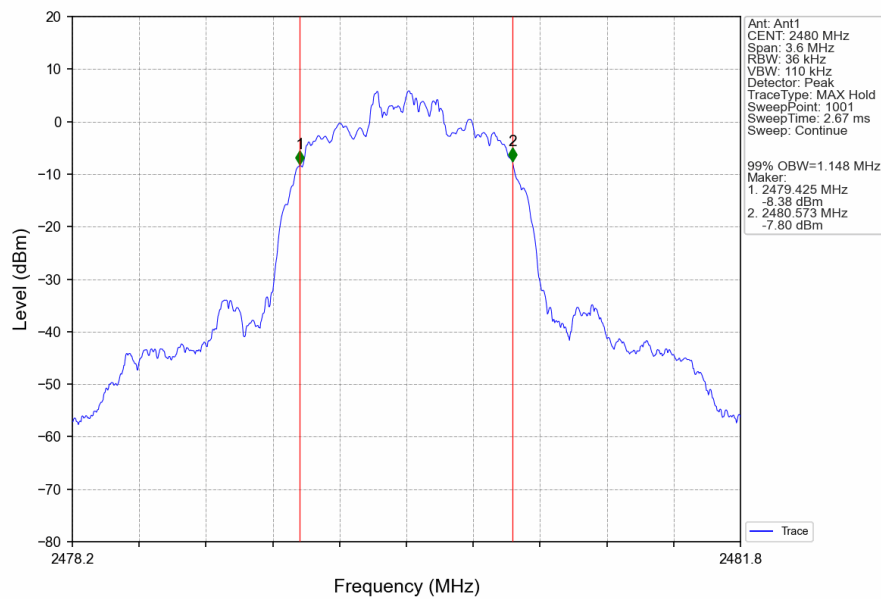
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



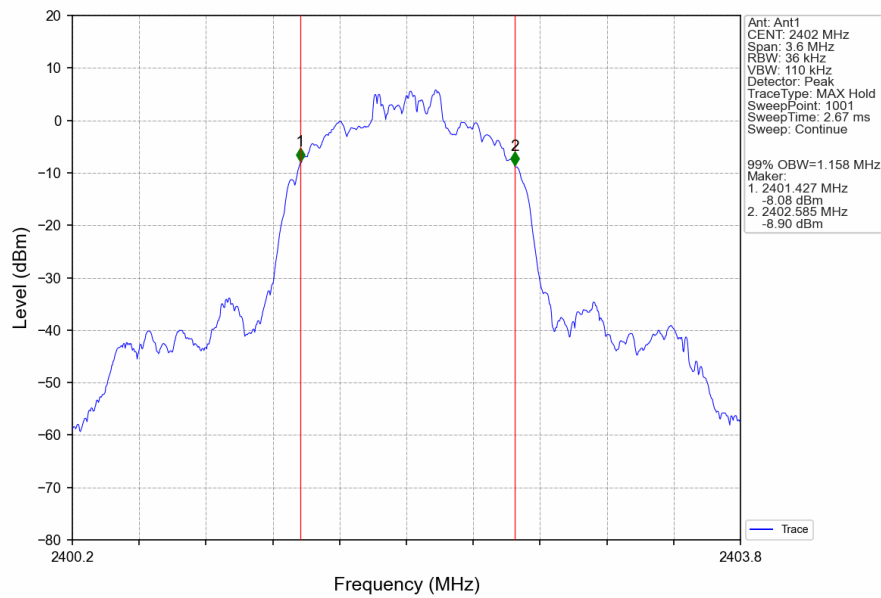
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



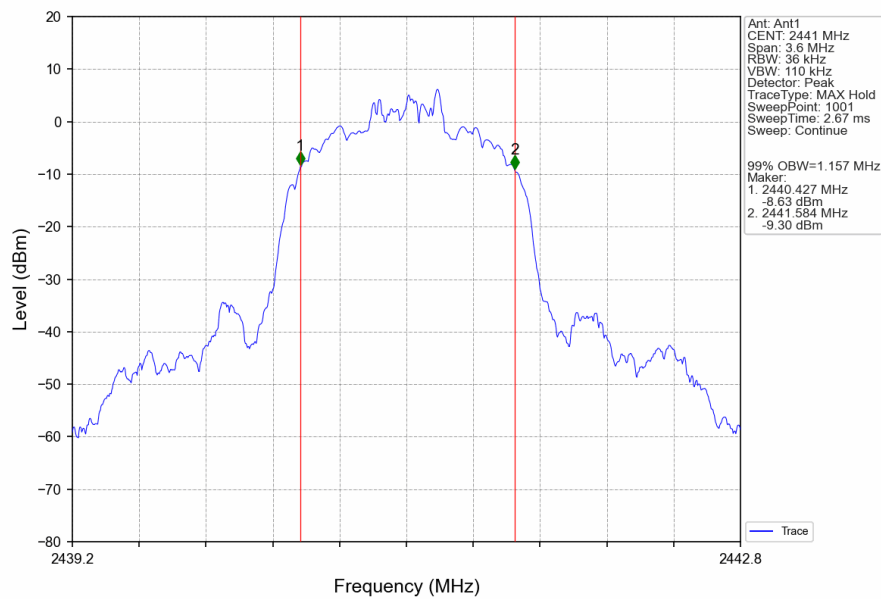
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



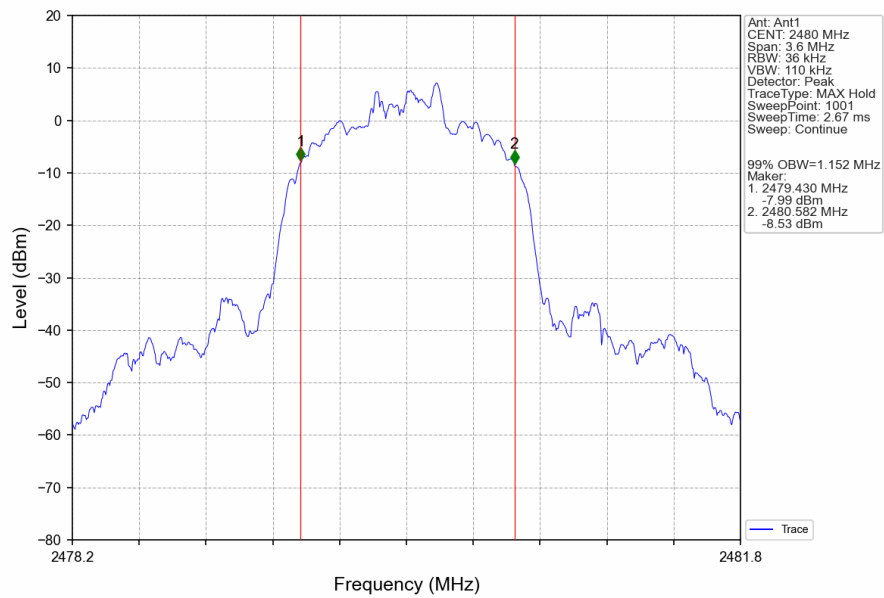
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



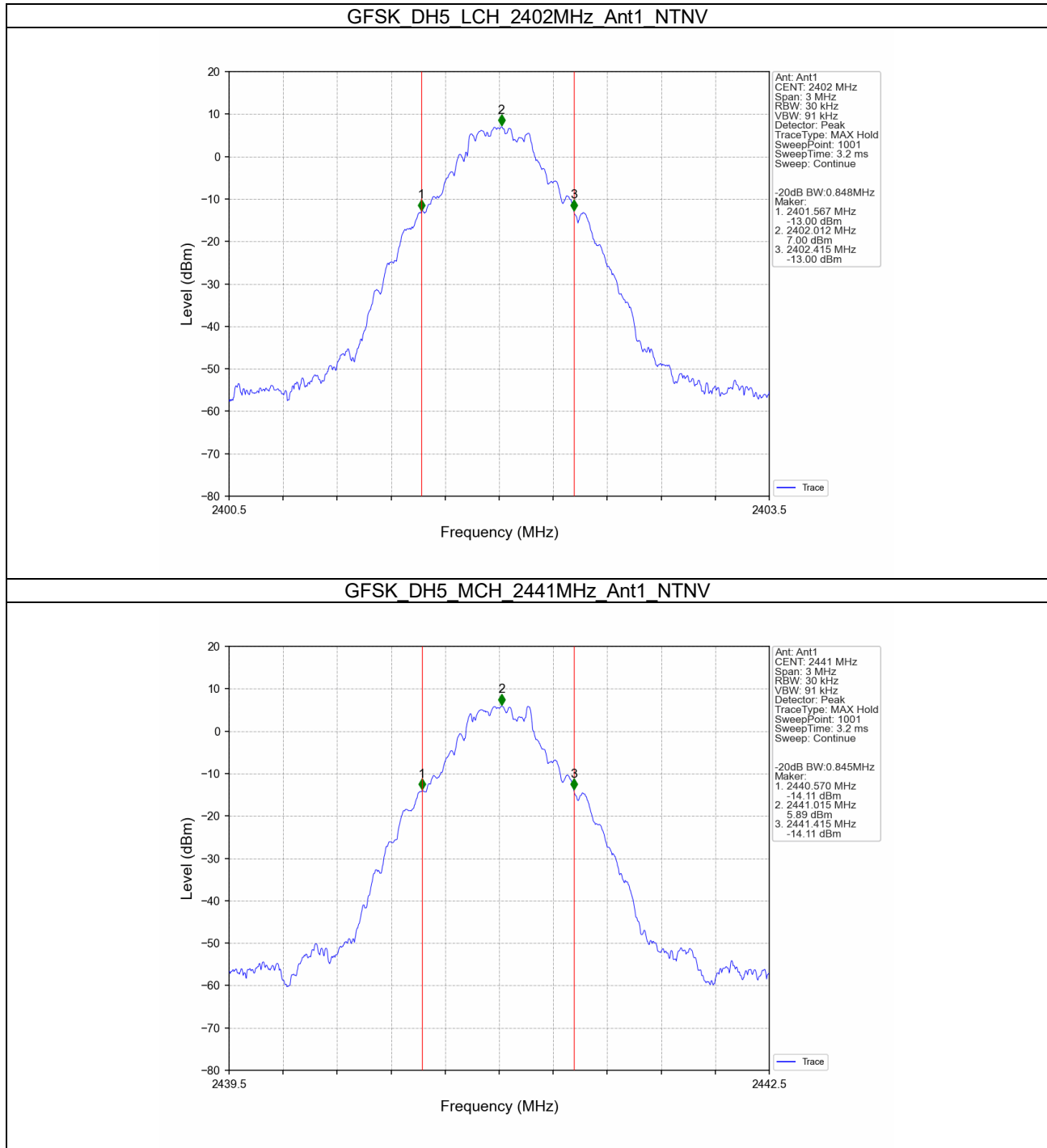
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



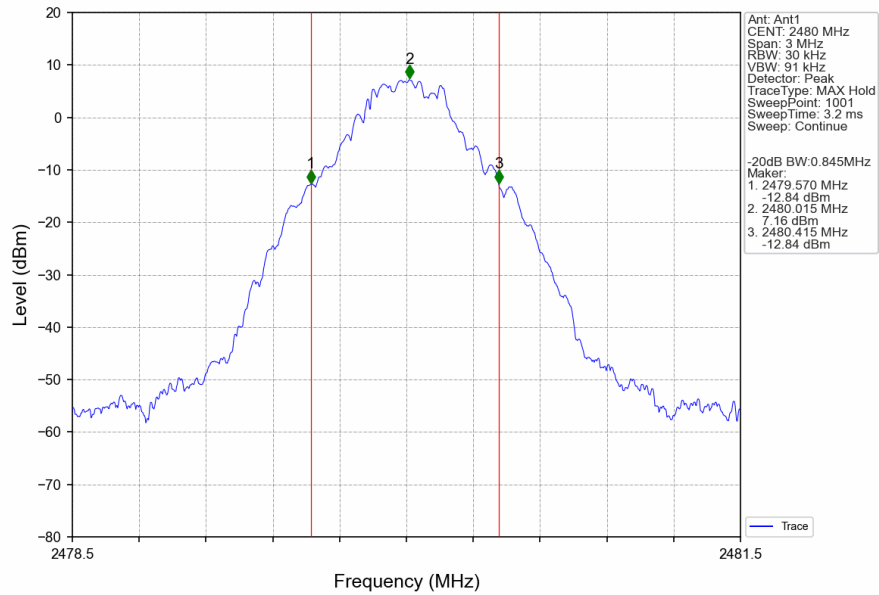
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



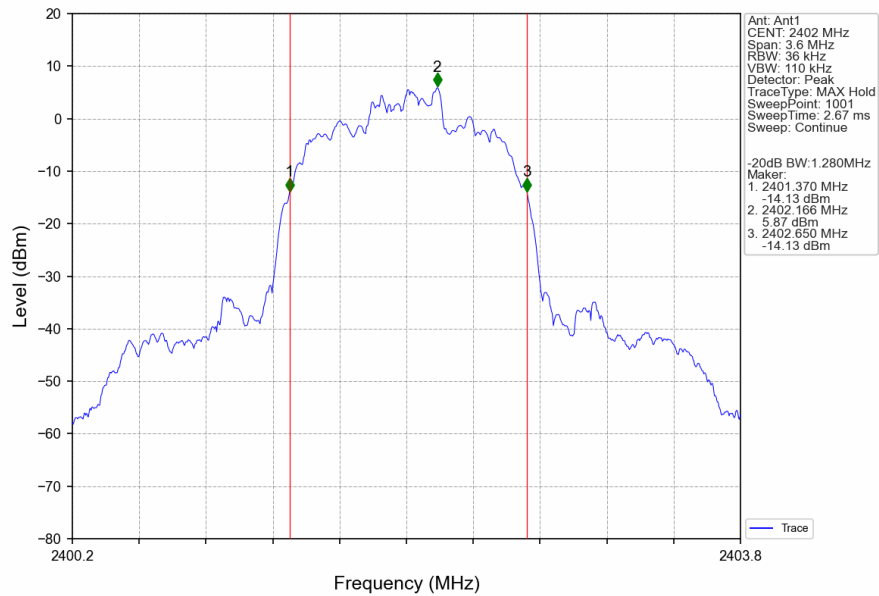
2.2.2 20dB BW



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



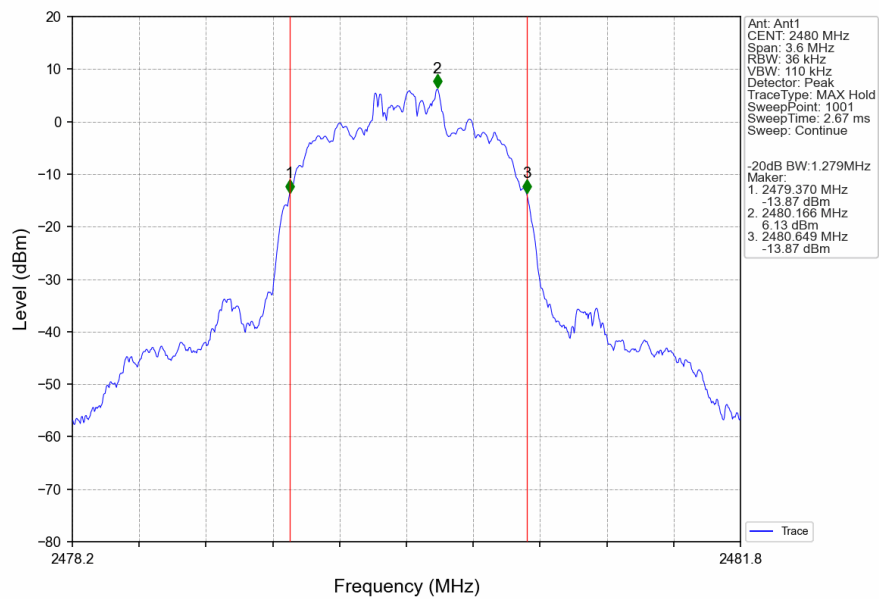
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



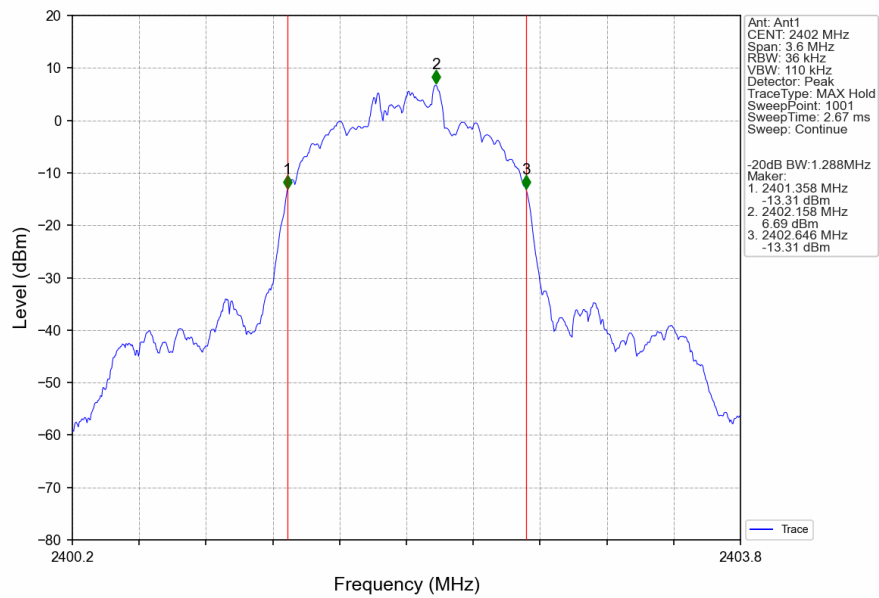
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



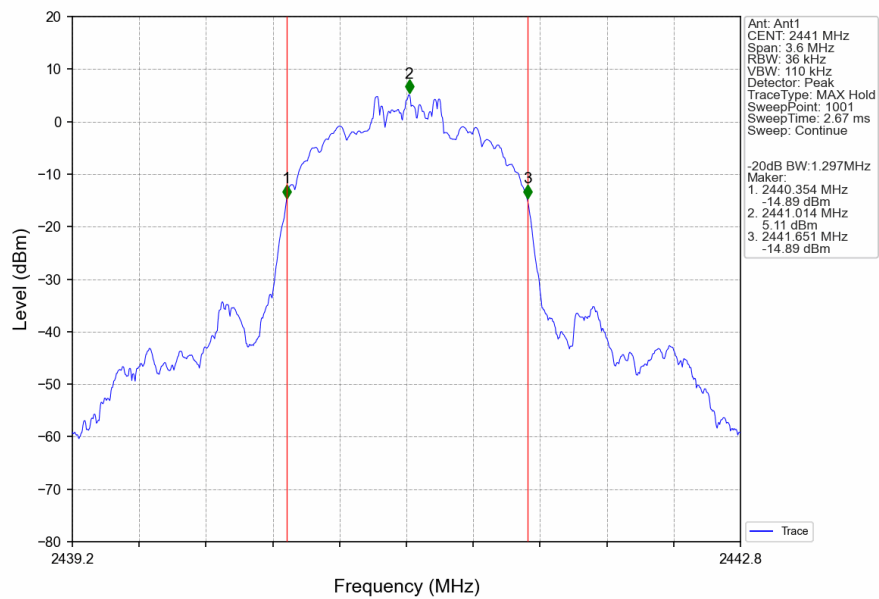
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



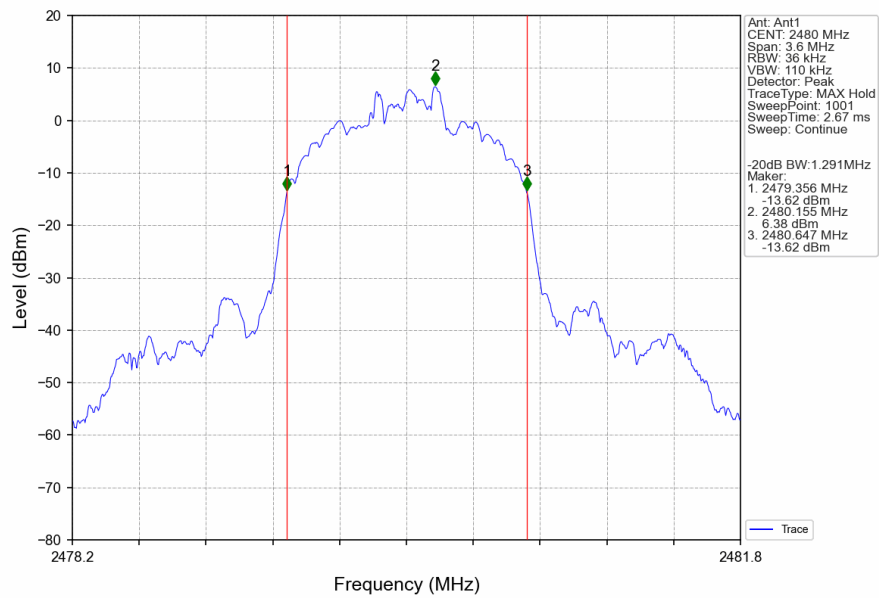
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



3. Maximum Conducted Output Power

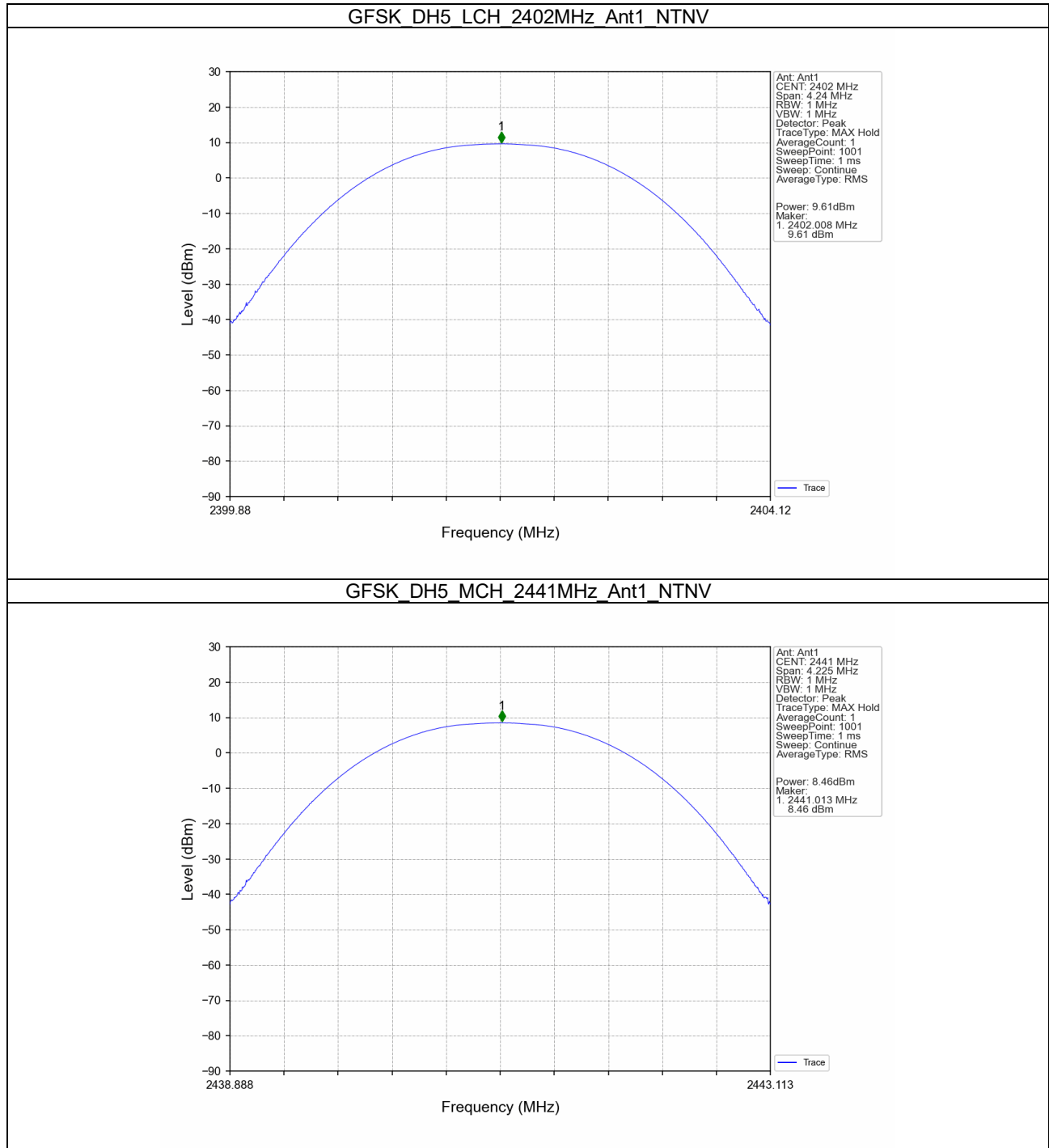
3.1 Test Result

3.1.1 Power

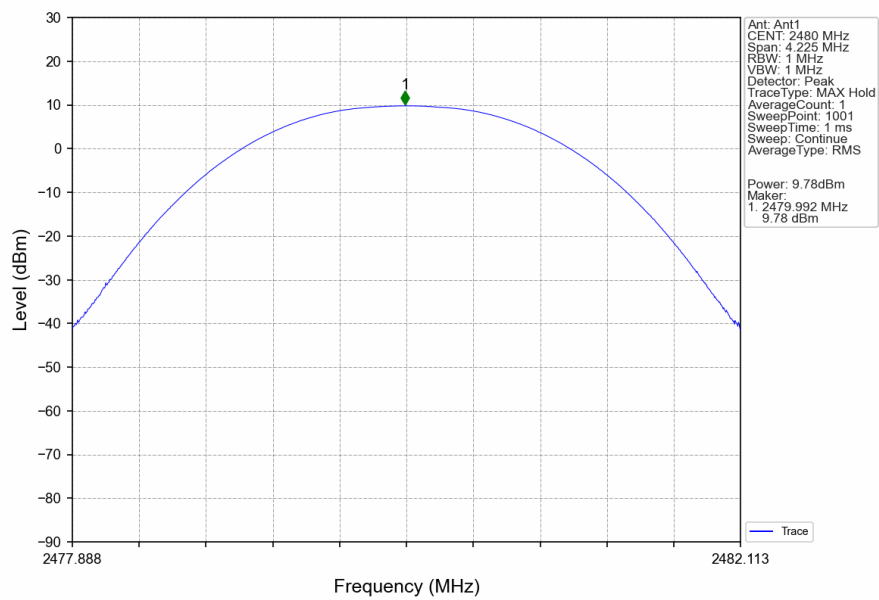
Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	9.61	<=29.5	Pass
		2441	DH5	8.46	<=29.5	Pass
		2480	DH5	9.78	<=29.5	Pass
Pi/4DQPSK	SISO	2402	2DH5	9.01	<=20.47	Pass
		2441	2DH5	8.46	<=20.47	Pass
		2480	2DH5	9.20	<=20.47	Pass
8DPSK	SISO	2402	3DH5	9.07	<=20.47	Pass
		2441	3DH5	8.49	<=20.47	Pass
		2480	3DH5	9.24	<=20.47	Pass
Note1: Antenna Gain: Ant1: 6.50dBi;						

3.2 Test Graph

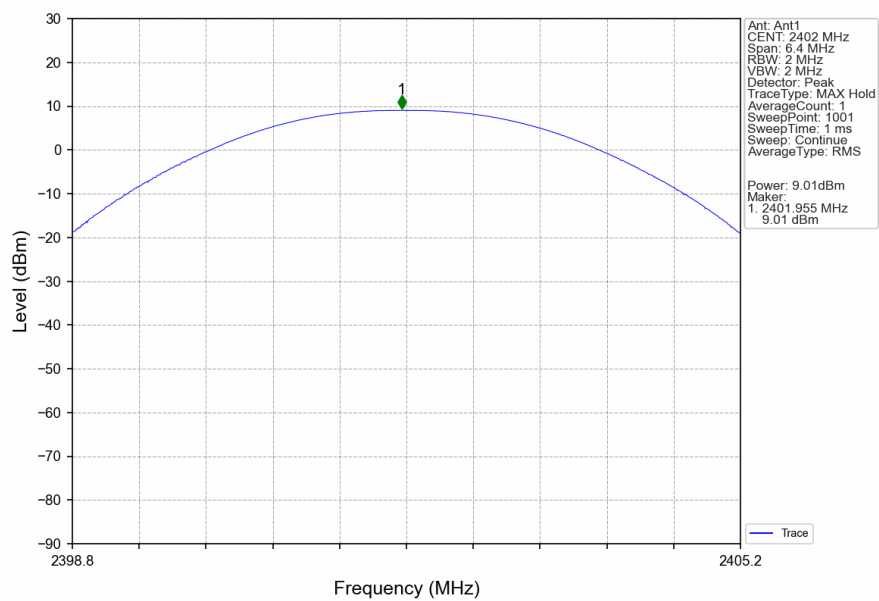
3.2.1 Power



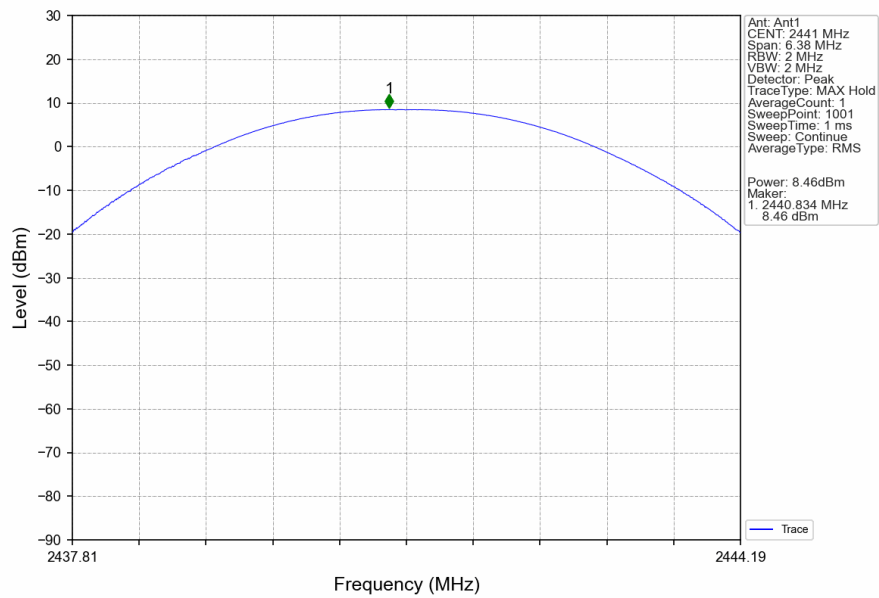
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



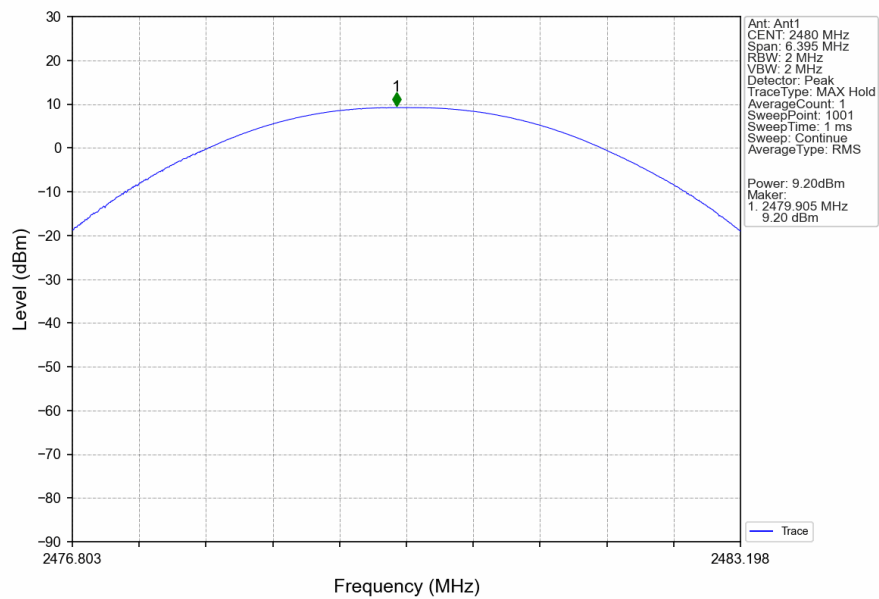
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



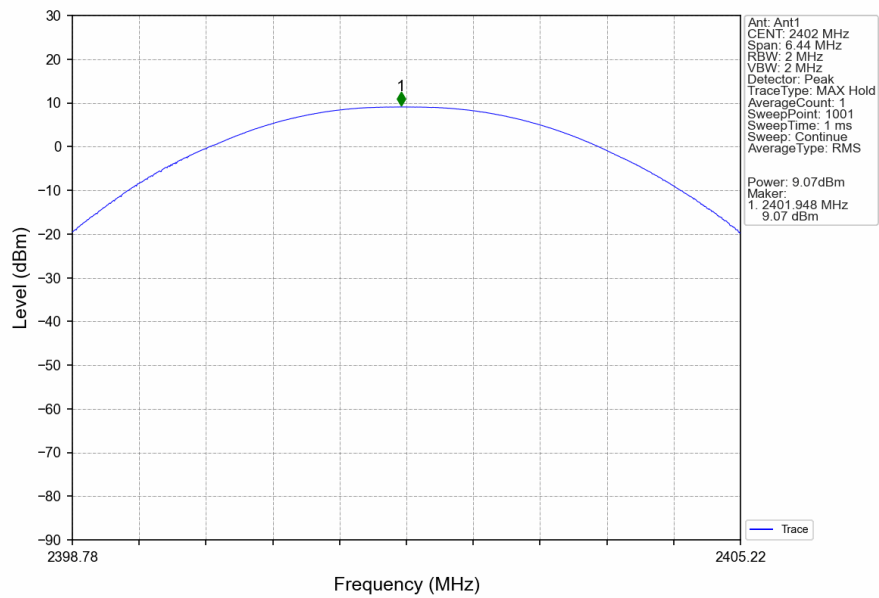
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



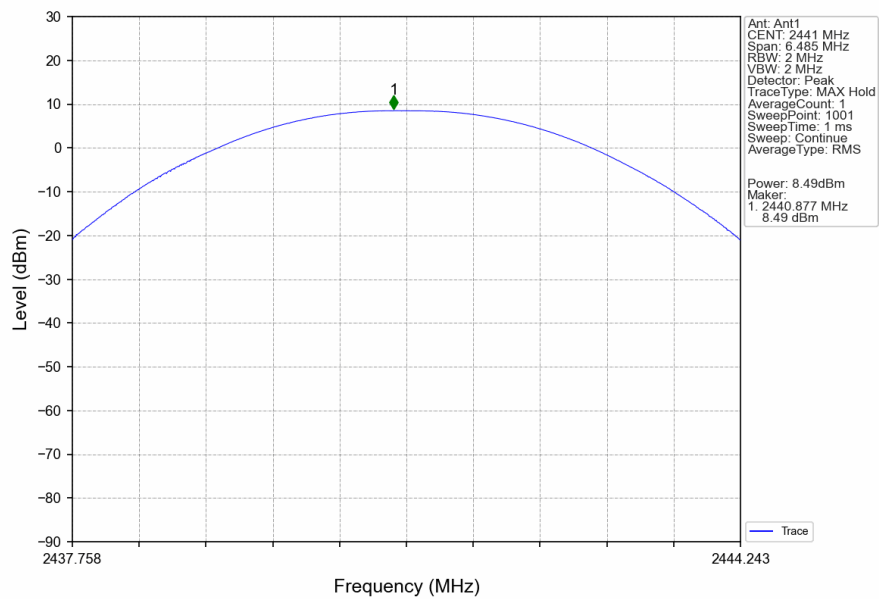
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV

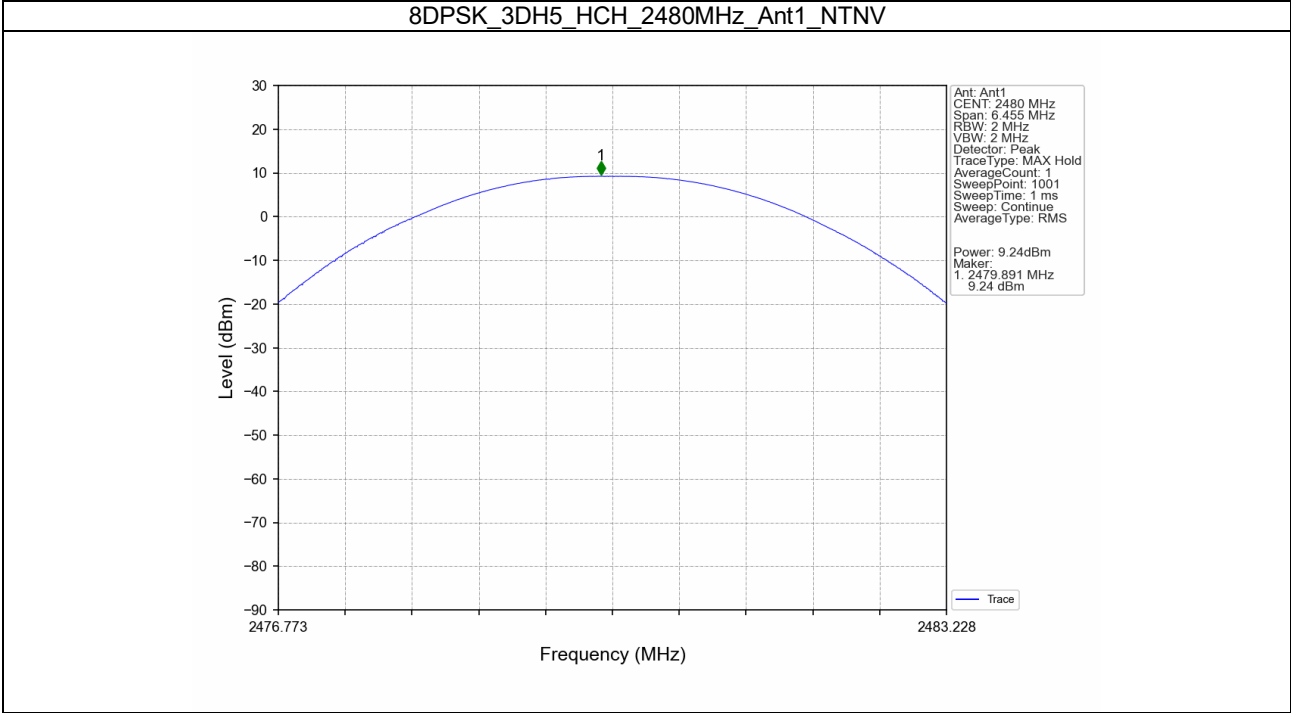


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV





4. Carrier Frequency Separation

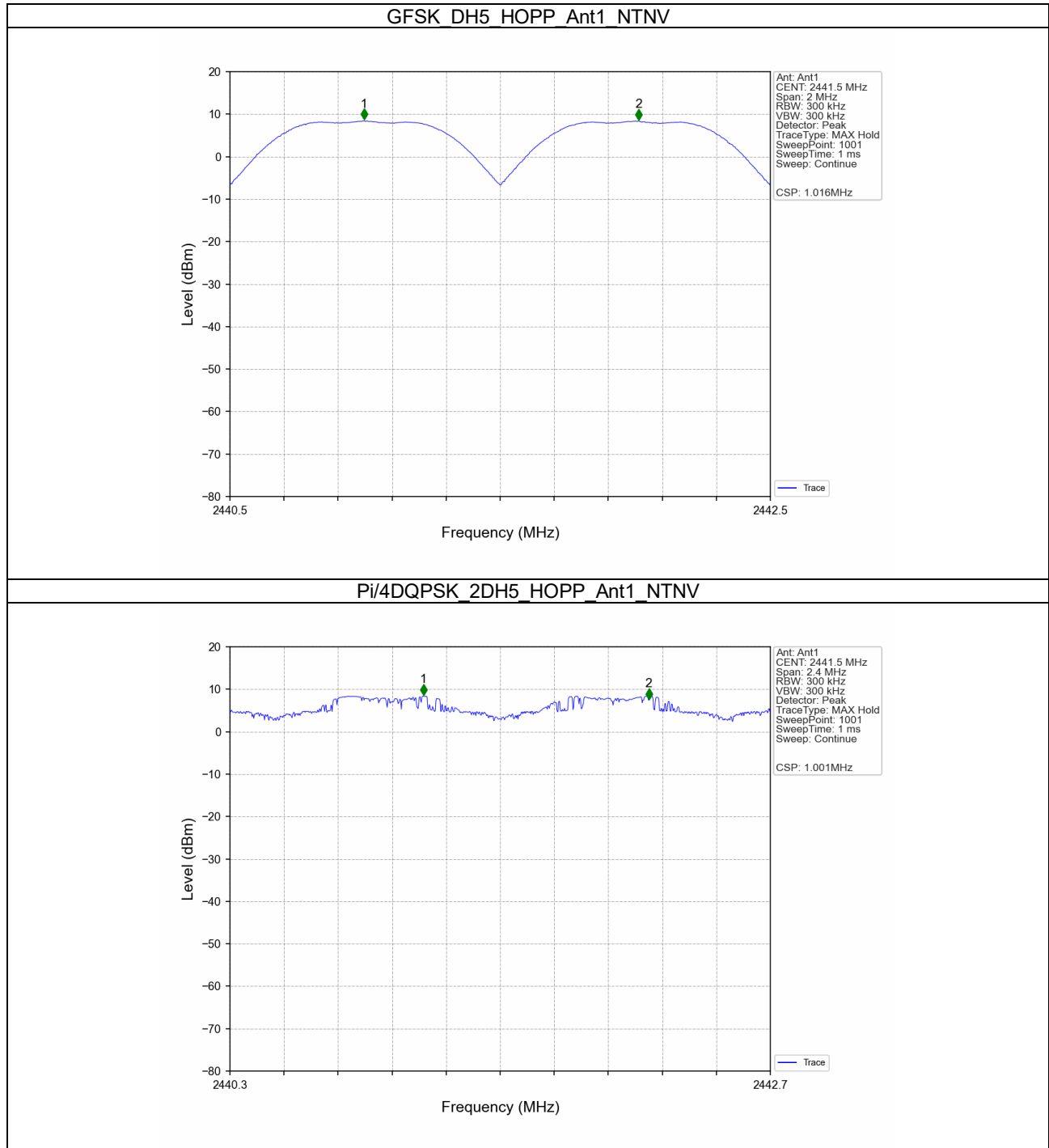
4.1 Test Result

4.1.1 Ant1

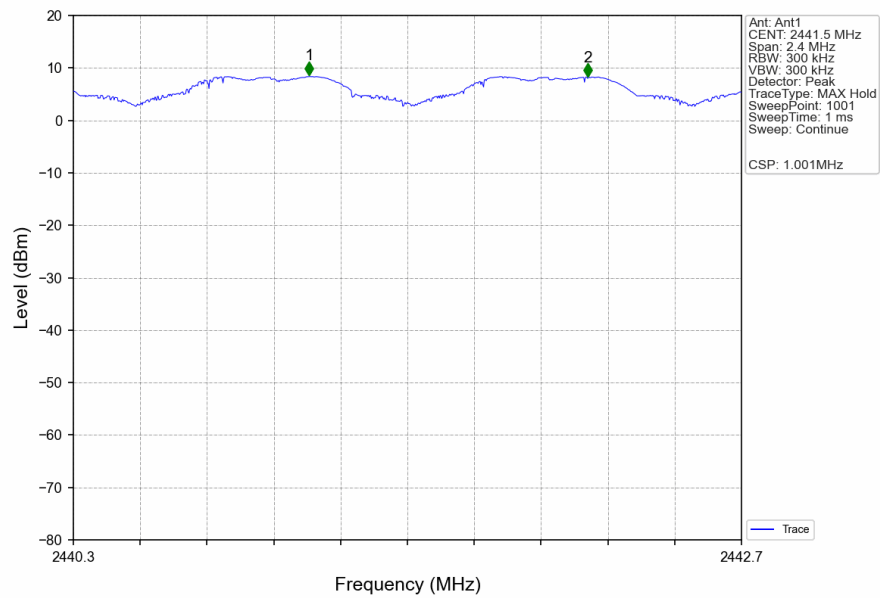
Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.016	0.848	≥ 0.848	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.280	≥ 0.853	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.297	≥ 0.865	Pass

4.2 Test Graph

4.2.1 Ant1



8DPSK_3DH5_HOPP_Ant1_NTNV



5. Number of Hopping Frequencies

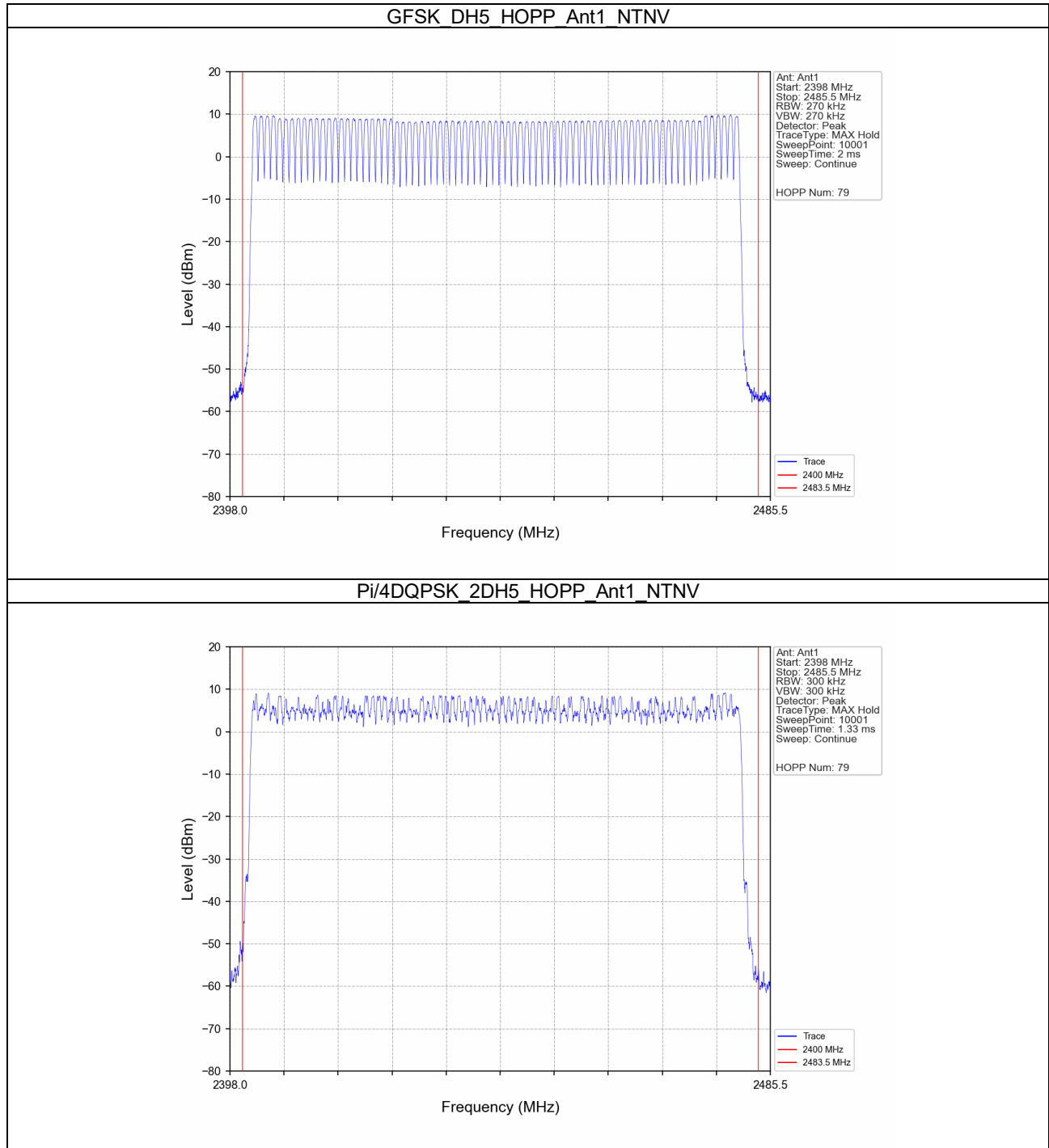
5.1 Test Result

5.1.1 HoppNum

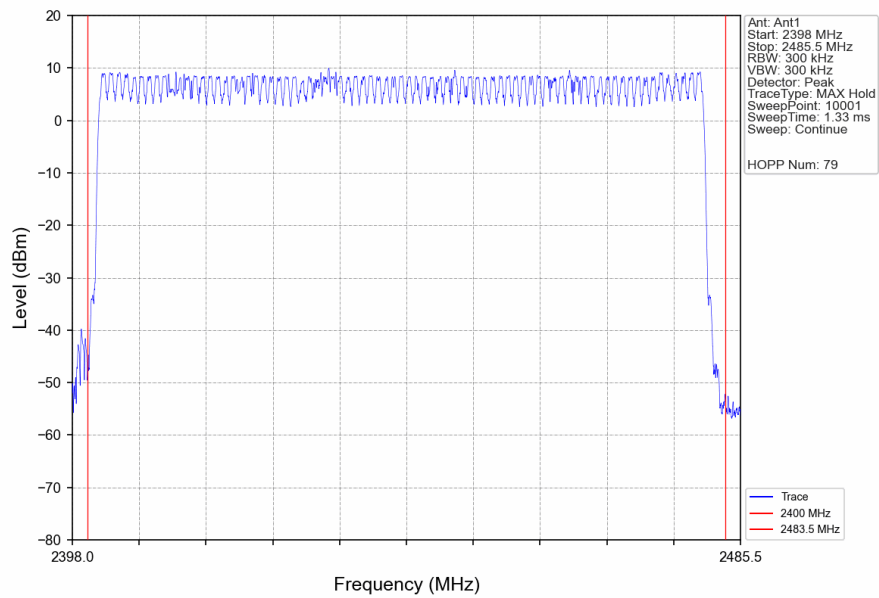
Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT1	Limit	
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass
8DPSK	SISO	HOPP	3DH5	79	>=15	Pass

5.2 Test Graph

5.2.1 HoppNum



8DPSK_3DH5_HOPP_Ant1_NTNV



6. Time of Occupancy (Dwell Time)

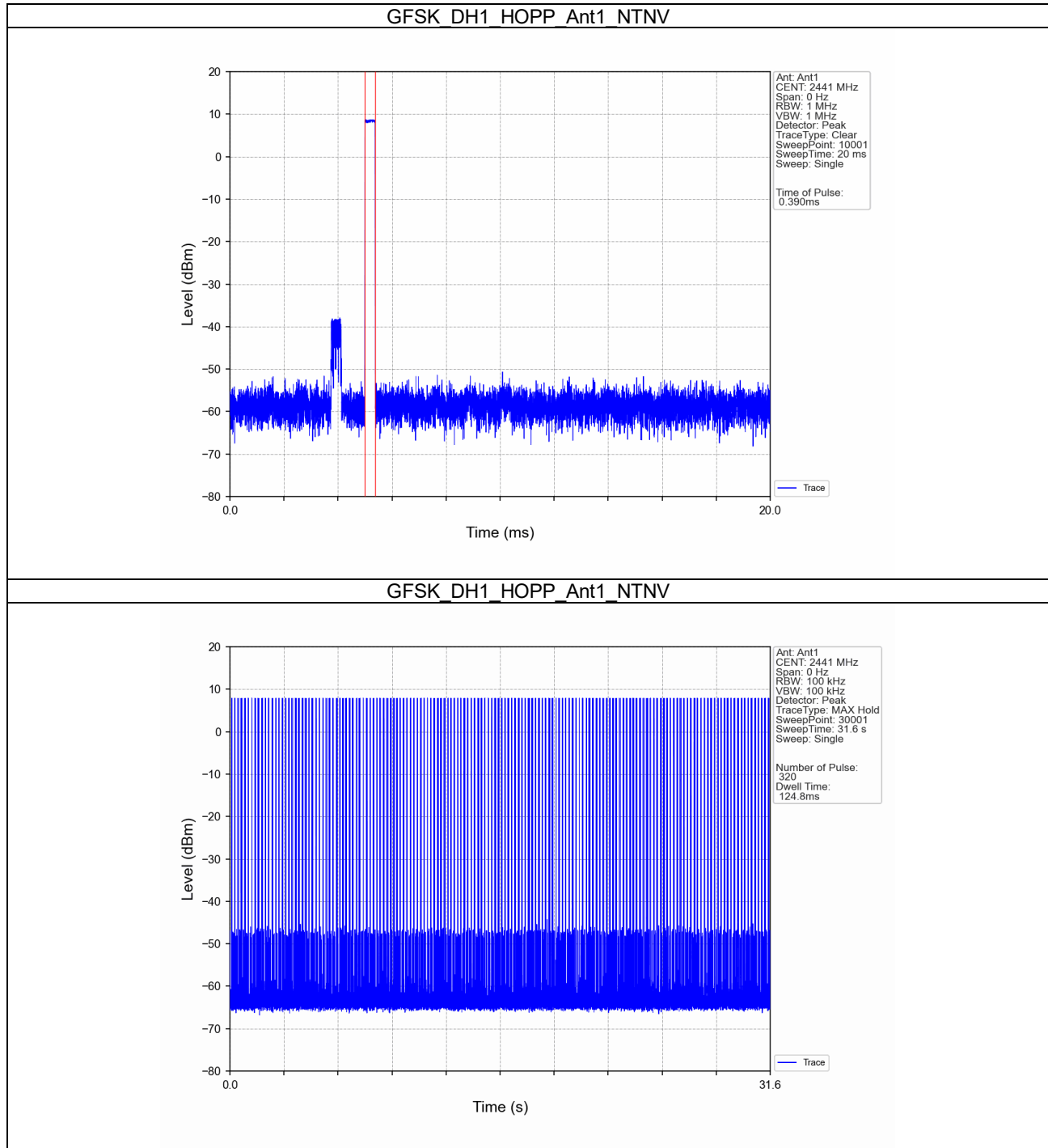
6.1 Test Result

6.1.1 Ant1

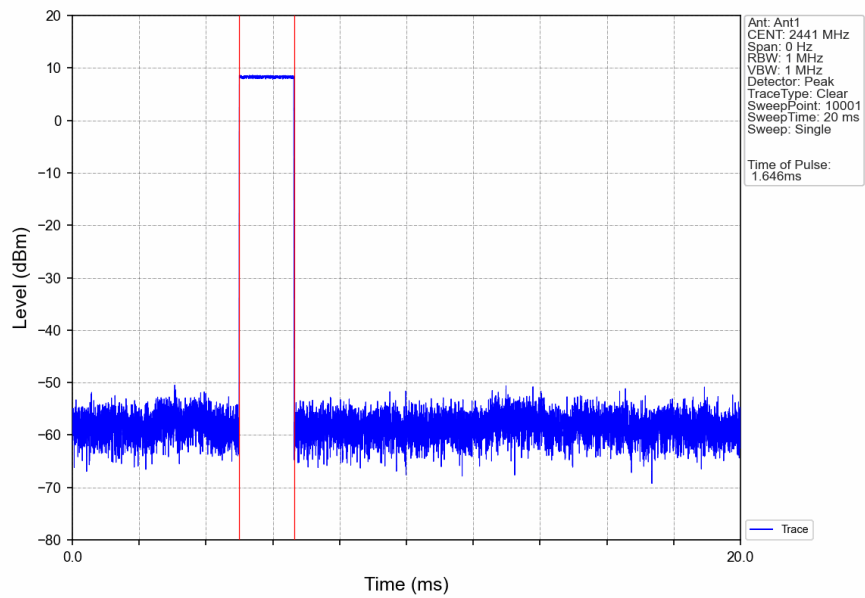
Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.390	31.600	320	124.800	<=400	Pass
			DH3	1.646	31.600	161	265.006	<=400	Pass
			DH5	2.894	31.600	108	312.552	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.388	31.600	320	124.160	<=400	Pass
			2DH3	1.642	31.600	161	264.362	<=400	Pass
			2DH5	2.890	31.600	114	329.460	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.398	31.600	320	127.360	<=400	Pass
			3DH3	1.640	31.600	160	262.400	<=400	Pass
			3DH5	2.898	31.600	104	301.392	<=400	Pass

6.2 Test Graph

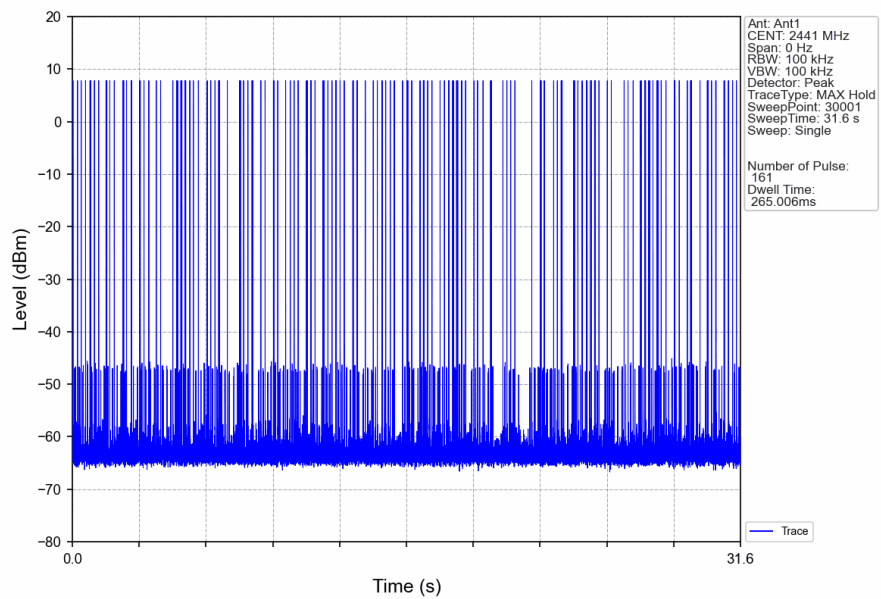
6.2.1 Ant1



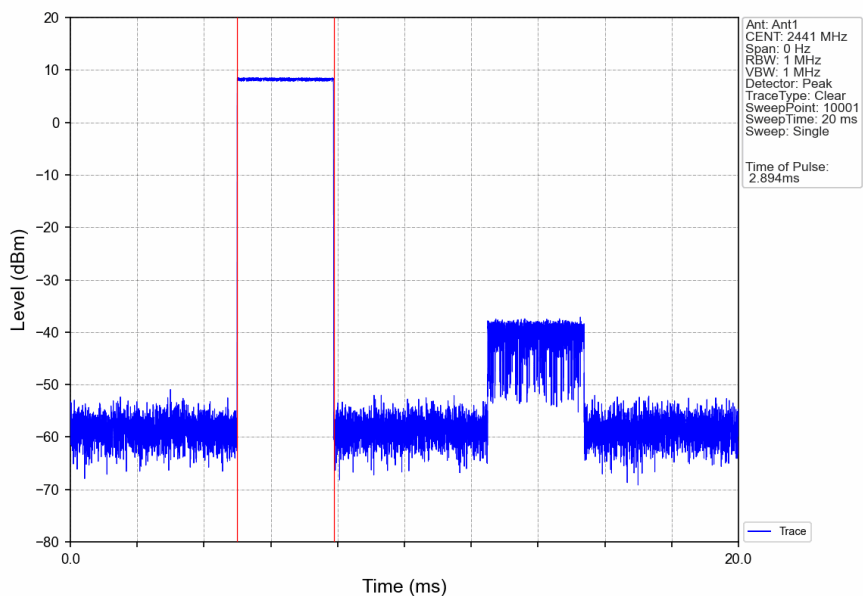
GFSK_DH3_HOPP_Ant1_NTNV



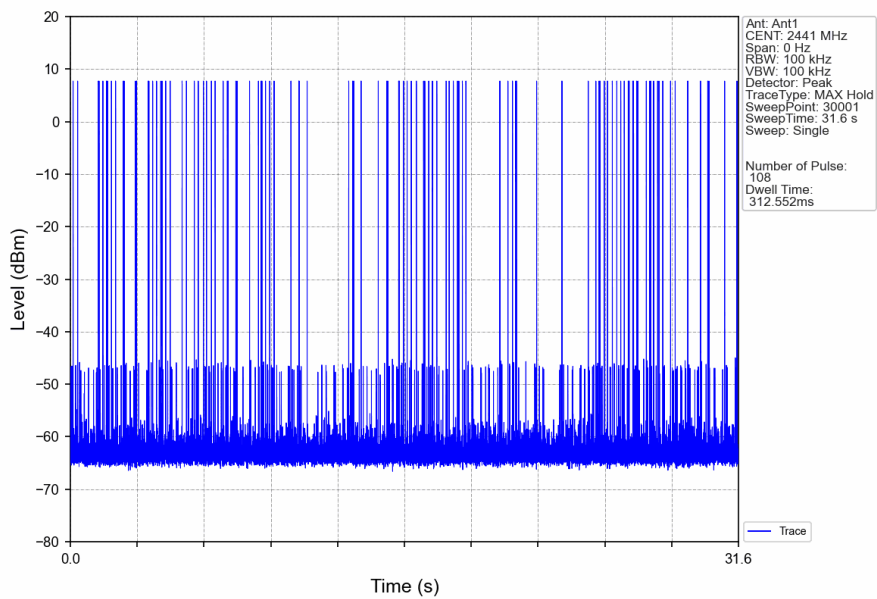
GFSK_DH3_HOPP_Ant1_NTNV



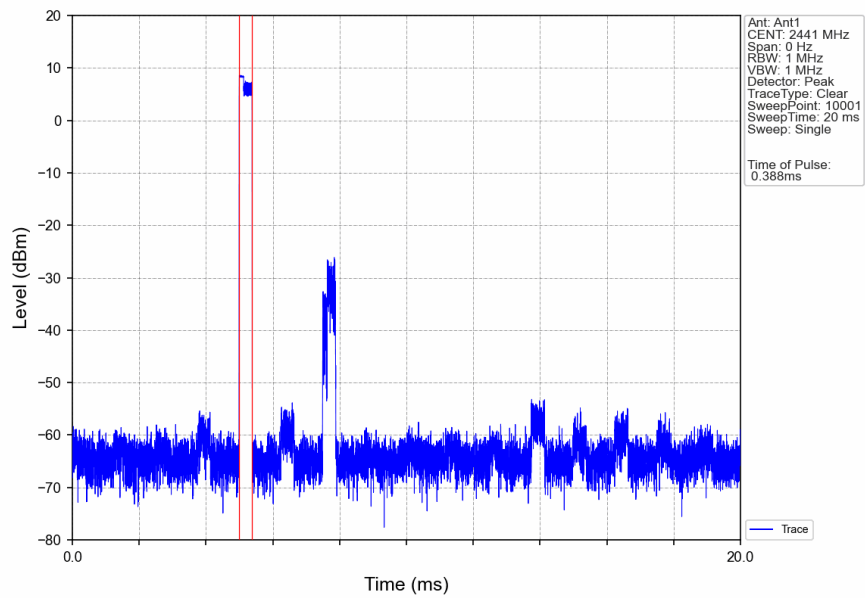
GFSK_DH5_HOPP_Ant1_NTNV



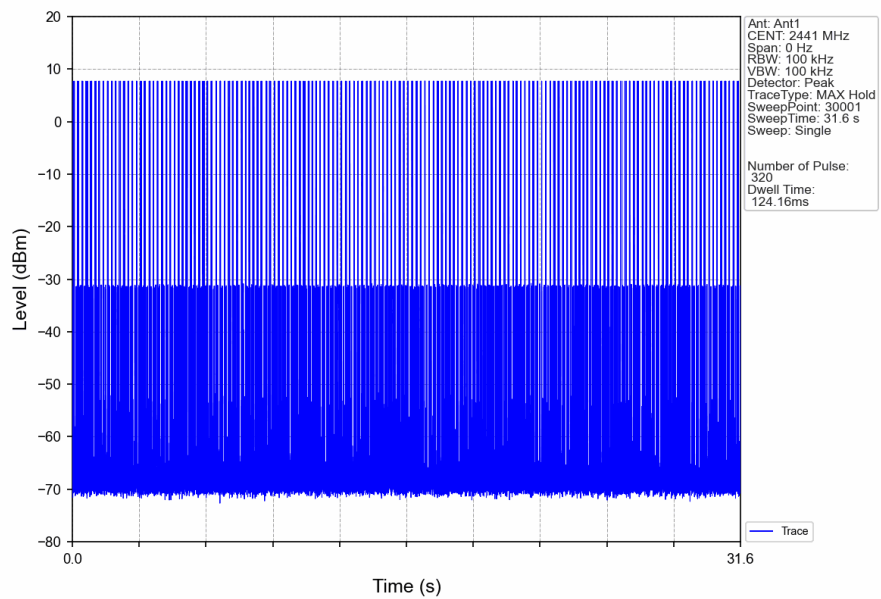
GFSK_DH5_HOPP_Ant1_NTNV



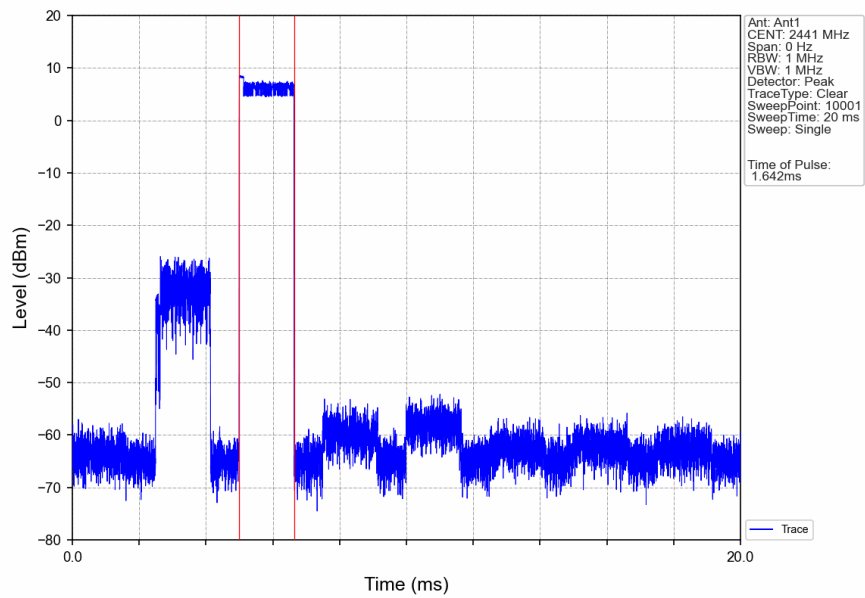
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



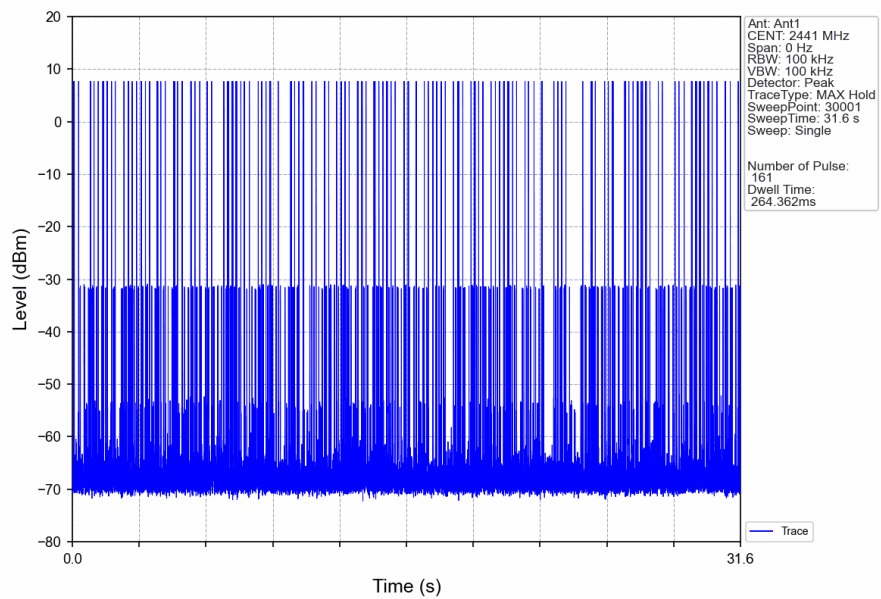
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



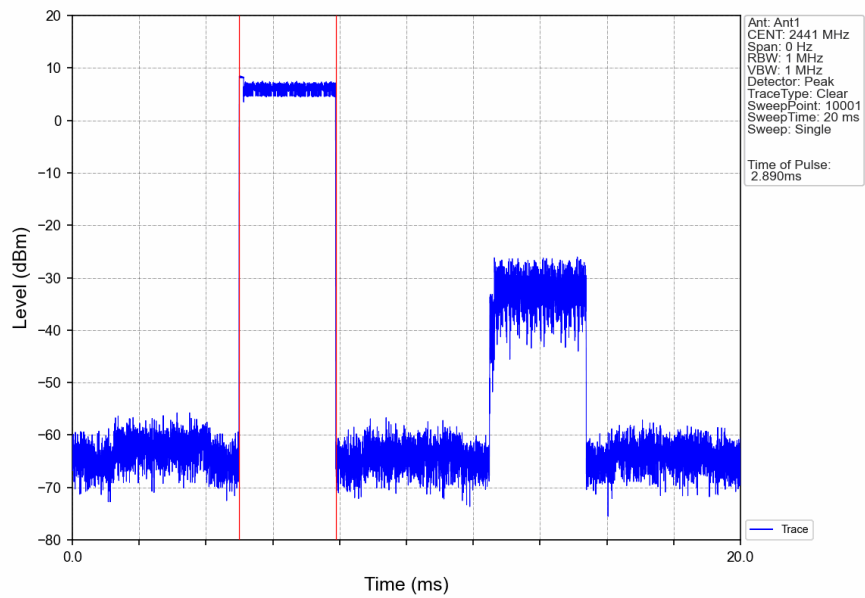
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



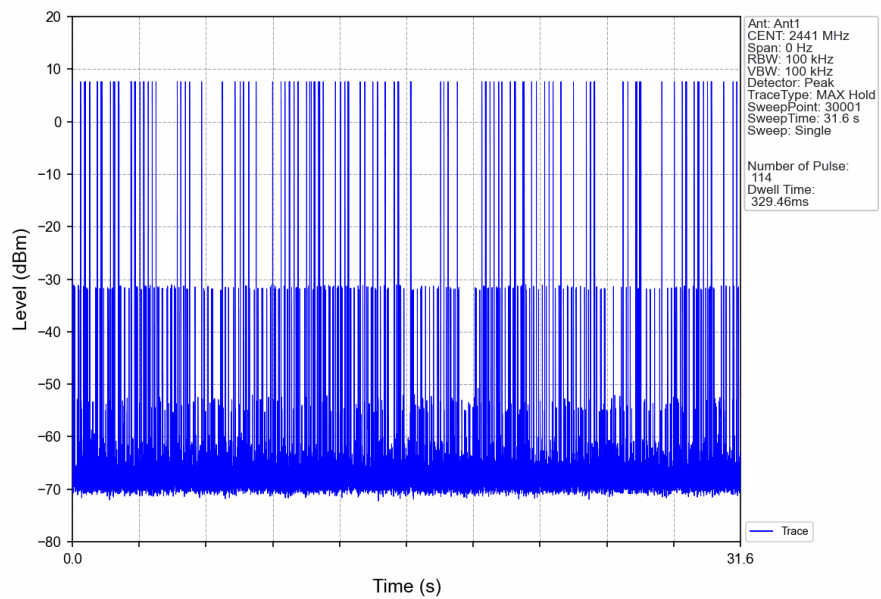
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



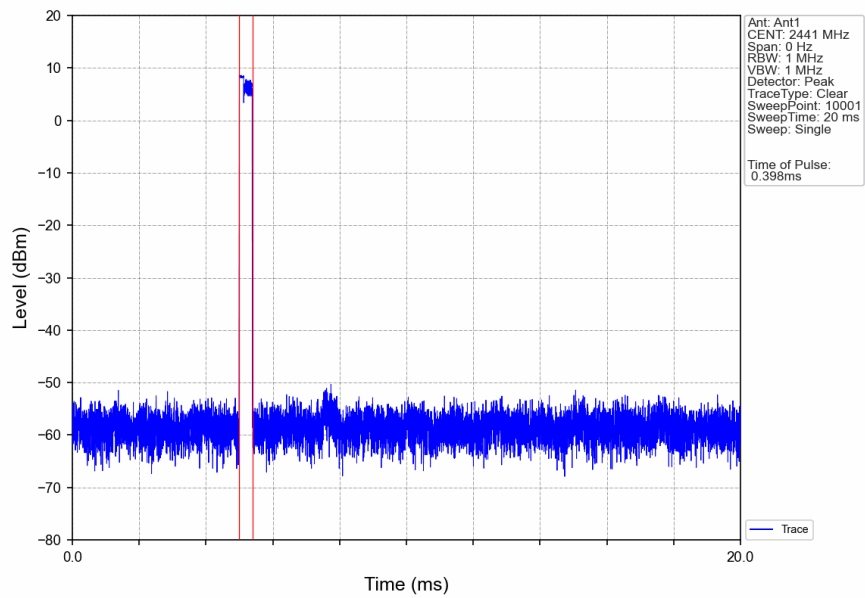
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



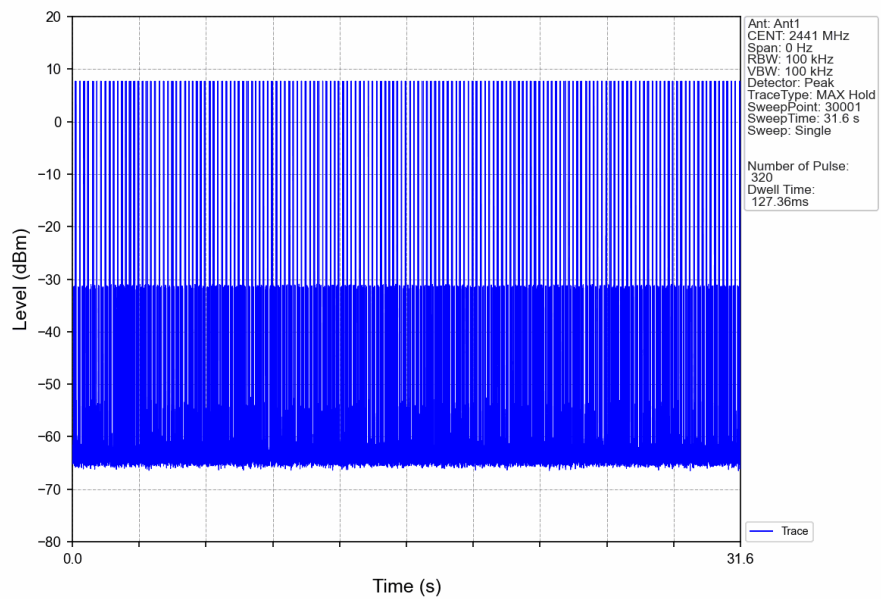
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



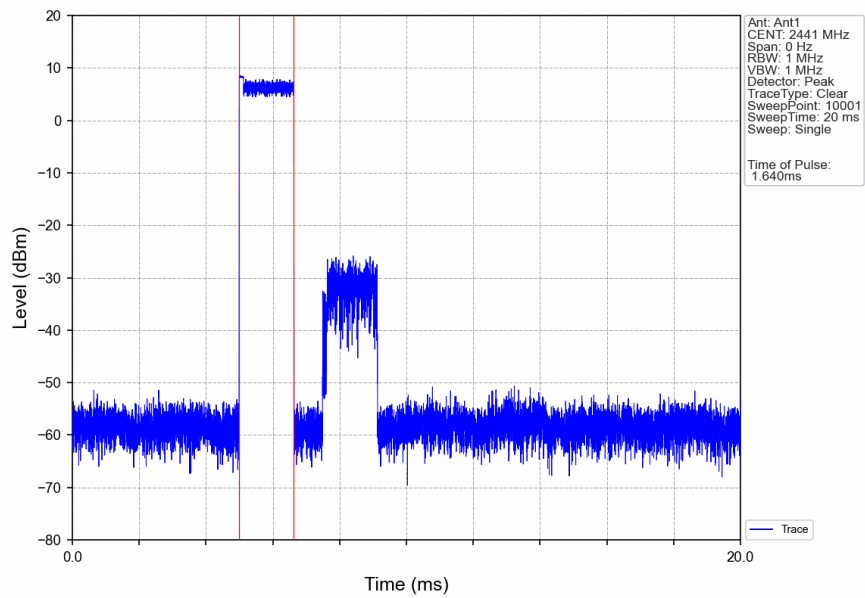
8DPSK_3DH1_HOPP_Ant1_NTNV



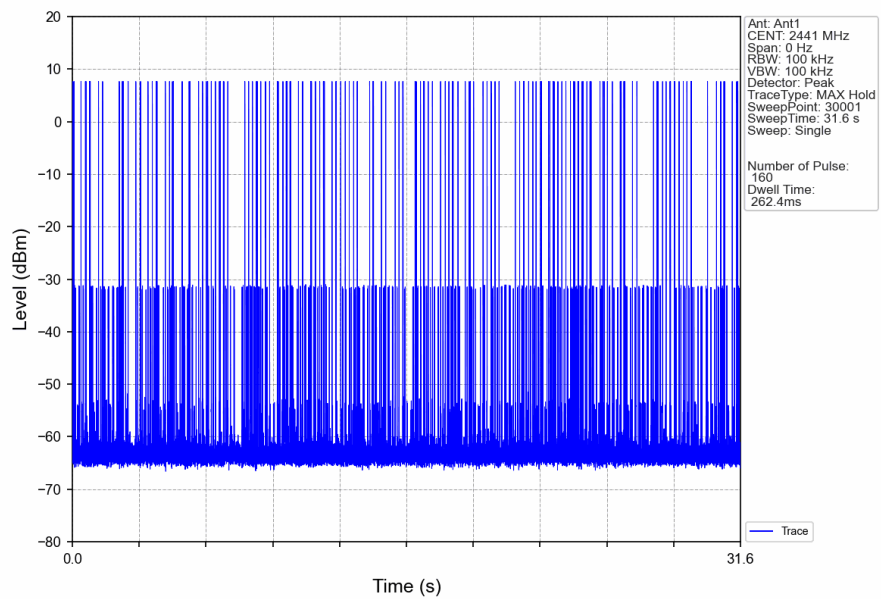
8DPSK_3DH1_HOPP_Ant1_NTNV



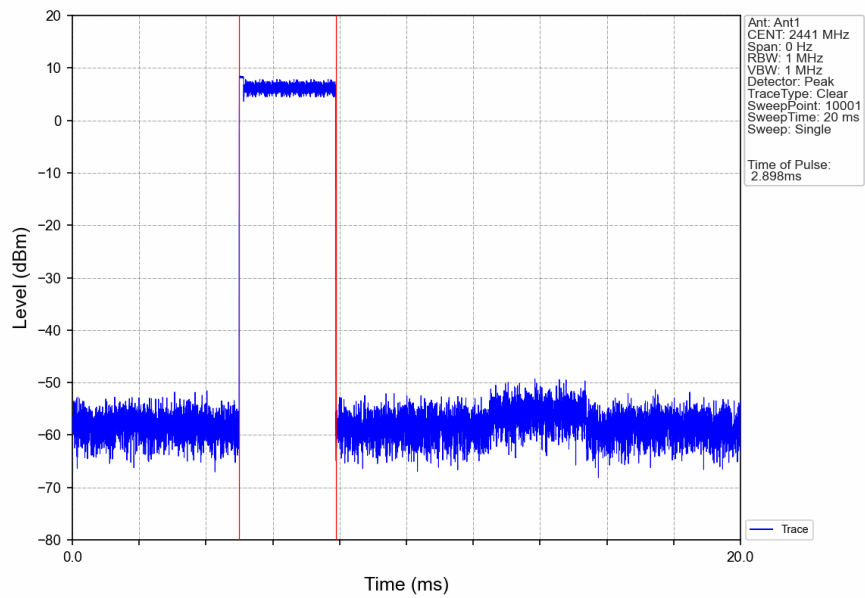
8DPSK_3DH3_HOPP_Ant1_NTNV



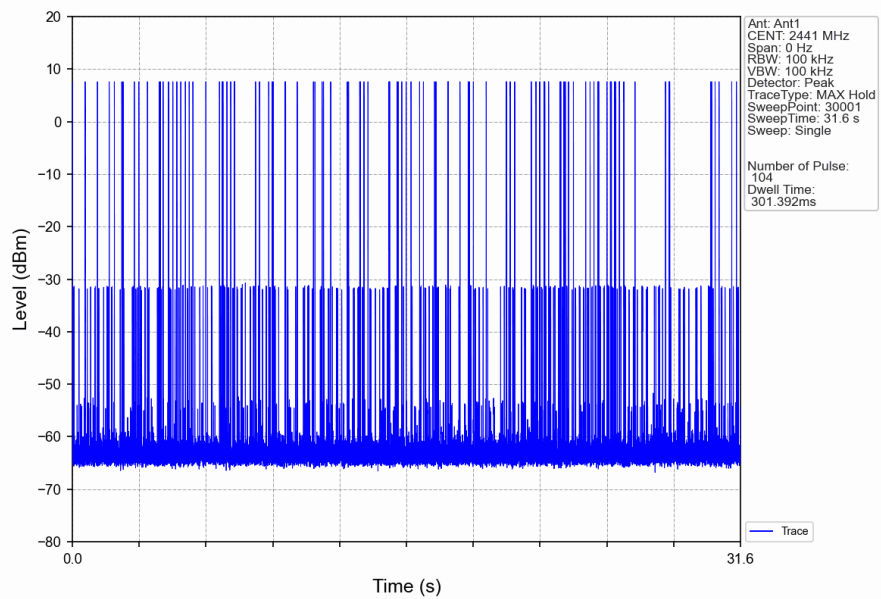
8DPSK_3DH3_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



7. Unwanted Emissions In Non-restricted Frequency Bands

7.1 Test Result

7.1.1 Ref

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	9.08
		2441	DH5	1	7.97
		2480	DH5	1	9.24
Pi/4DQPSK	SISO	2402	2DH5	1	8.48
		2441	2DH5	1	8.14
		2480	2DH5	1	8.83
8DPSK	SISO	2402	3DH5	1	8.67
		2441	3DH5	1	8.16
		2480	3DH5	1	8.86

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.

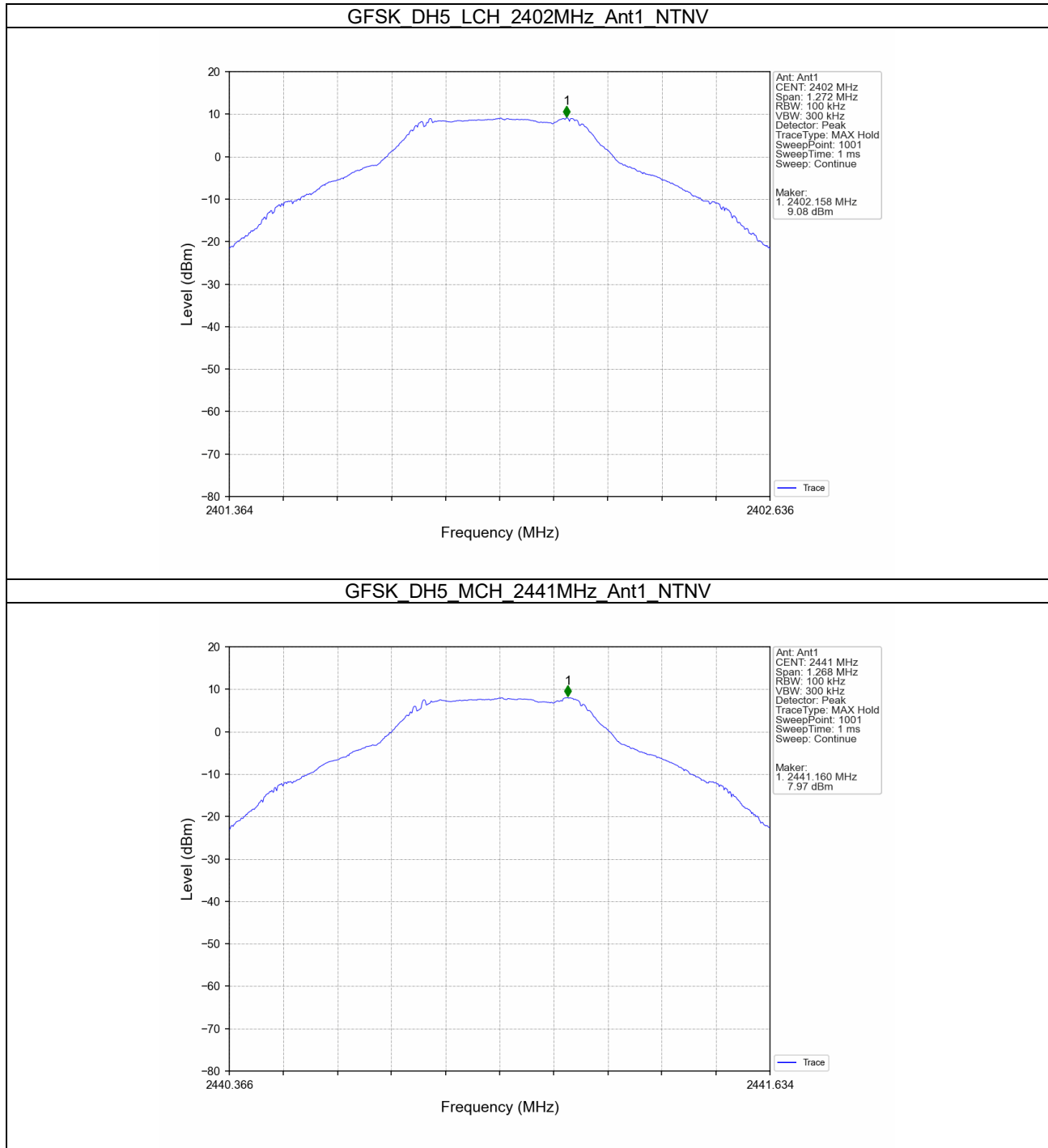
7.1.2 CSE

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	9.24	-10.76	Pass
		2441	DH5	1	9.24	-10.76	Pass
		2480	DH5	1	9.24	-10.76	Pass
		HOPP	DH5	1	9.24	-10.76	Pass
					9.24	-10.76	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	8.83	-11.17	Pass
		2441	2DH5	1	8.83	-11.17	Pass
		2480	2DH5	1	8.83	-11.17	Pass
		HOPP	2DH5	1	8.83	-11.17	Pass
					8.83	-11.17	Pass
8DPSK	SISO	2402	3DH5	1	8.86	-11.14	Pass
		2441	3DH5	1	8.86	-11.14	Pass
		2480	3DH5	1	8.86	-11.14	Pass
		HOPP	3DH5	1	8.86	-11.14	Pass
					8.86	-11.14	Pass

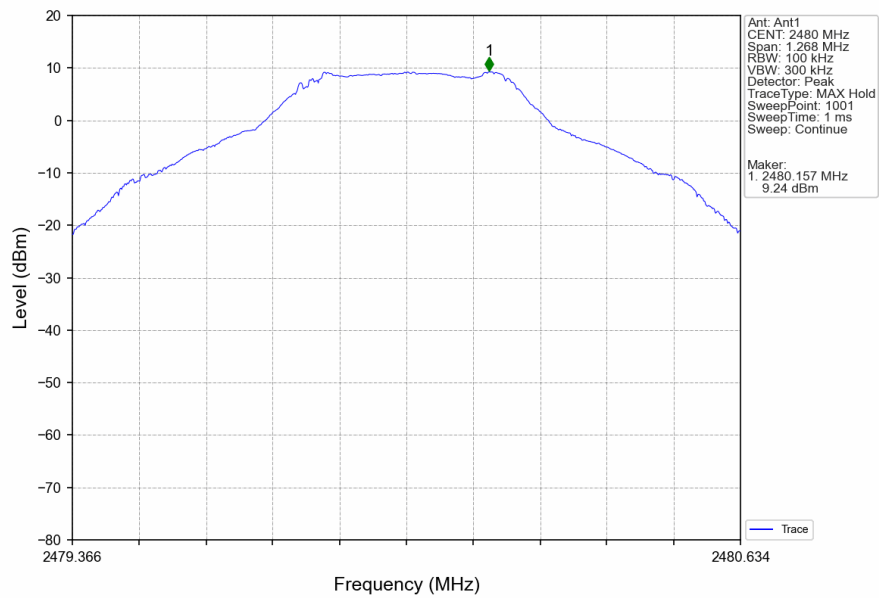
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.

7.2 Test Graph

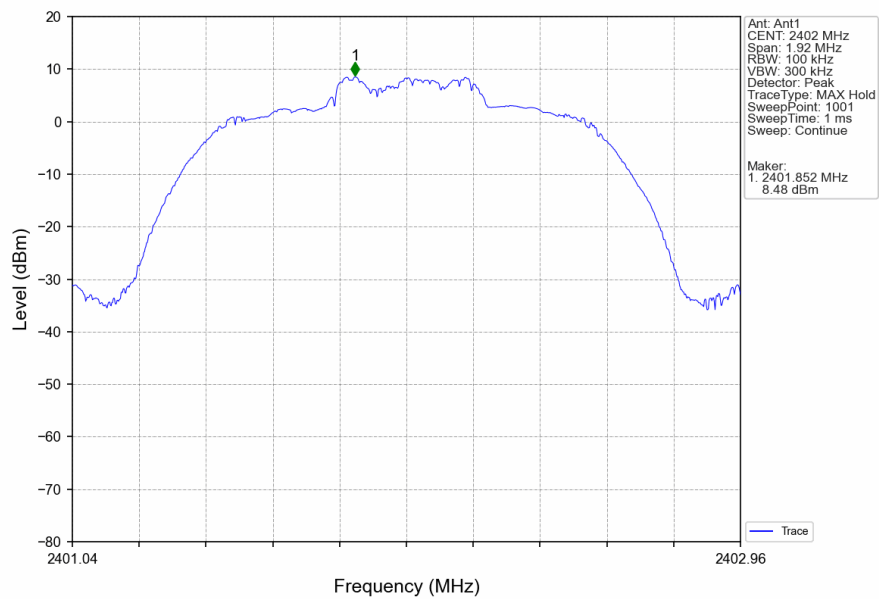
7.2.1 Ref



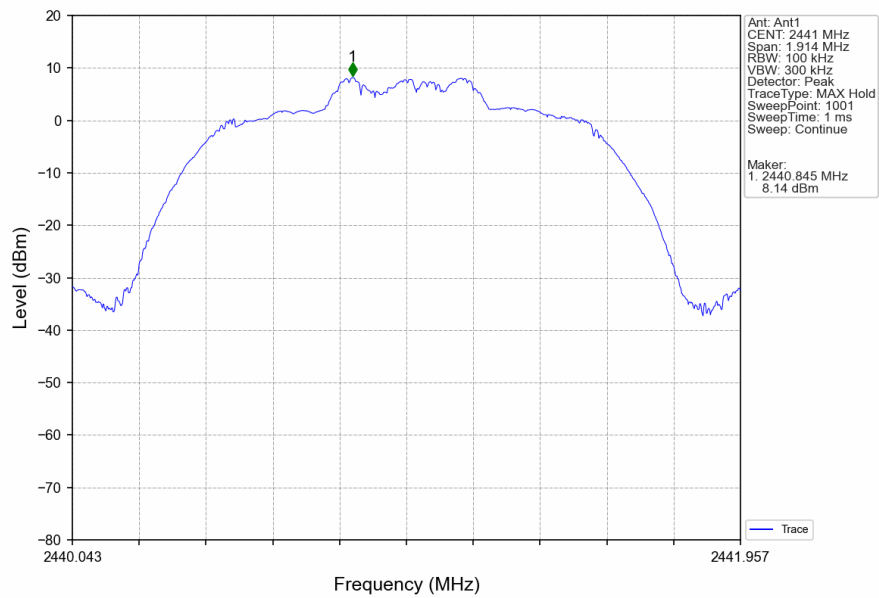
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



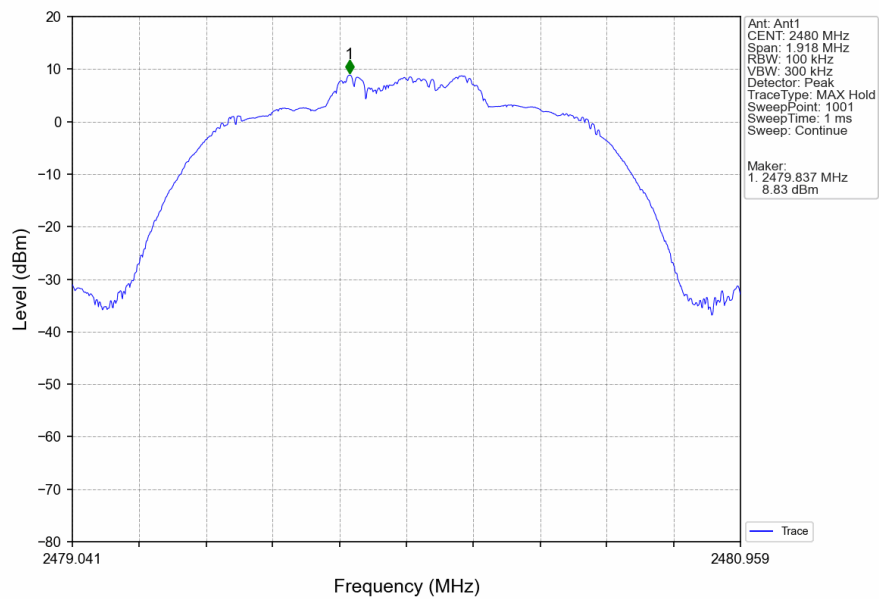
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



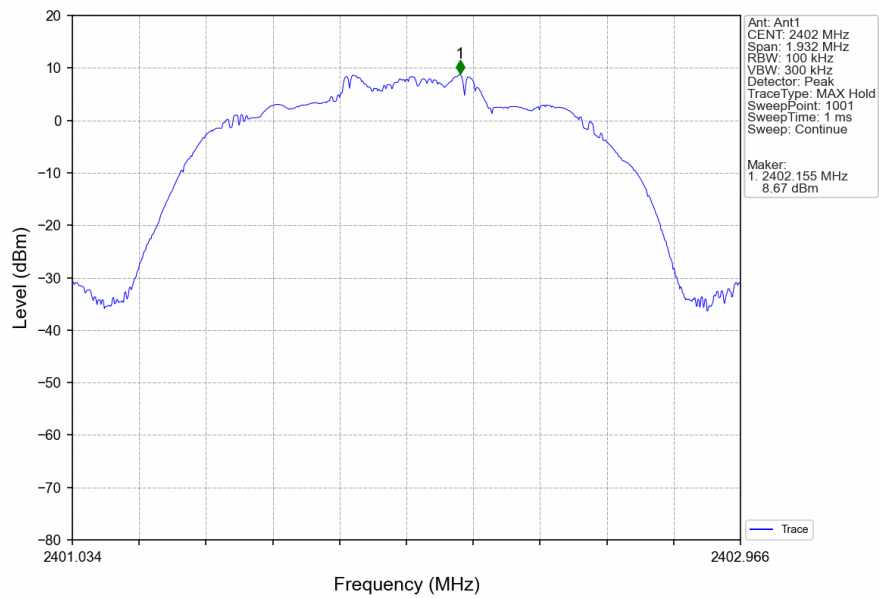
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



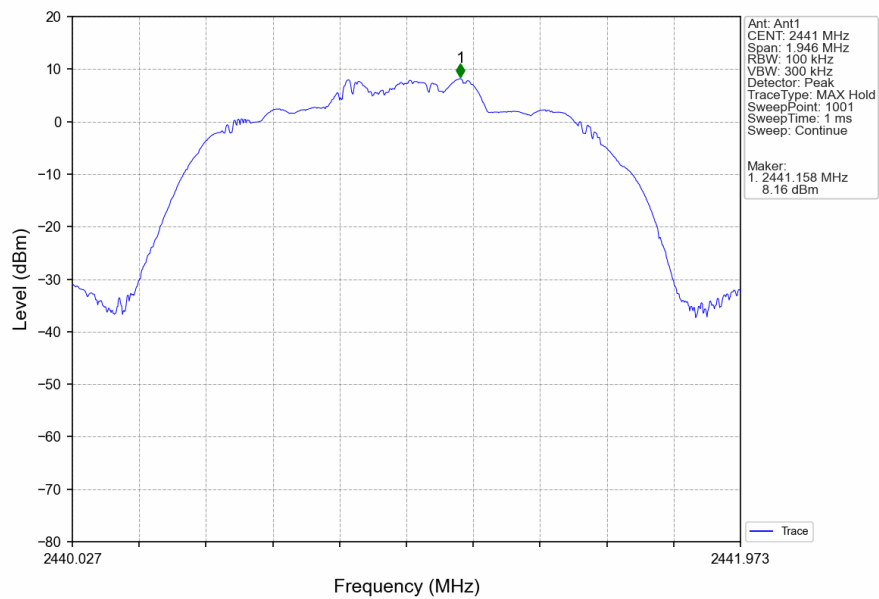
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



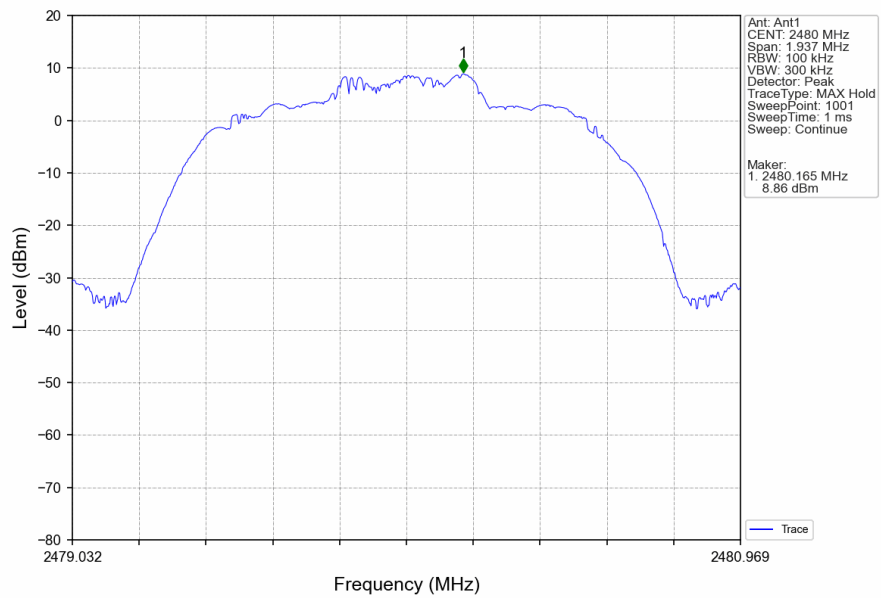
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



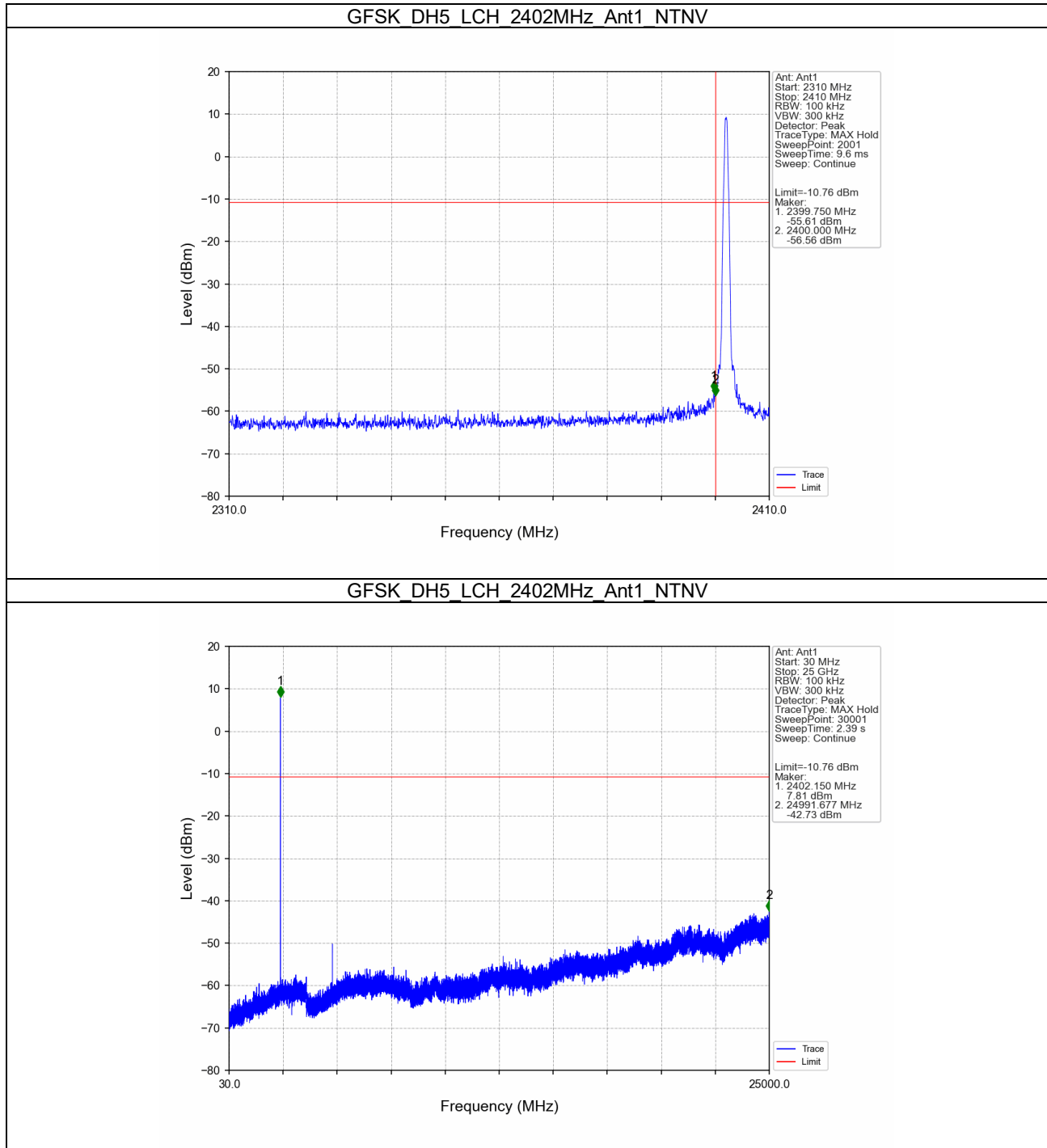
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



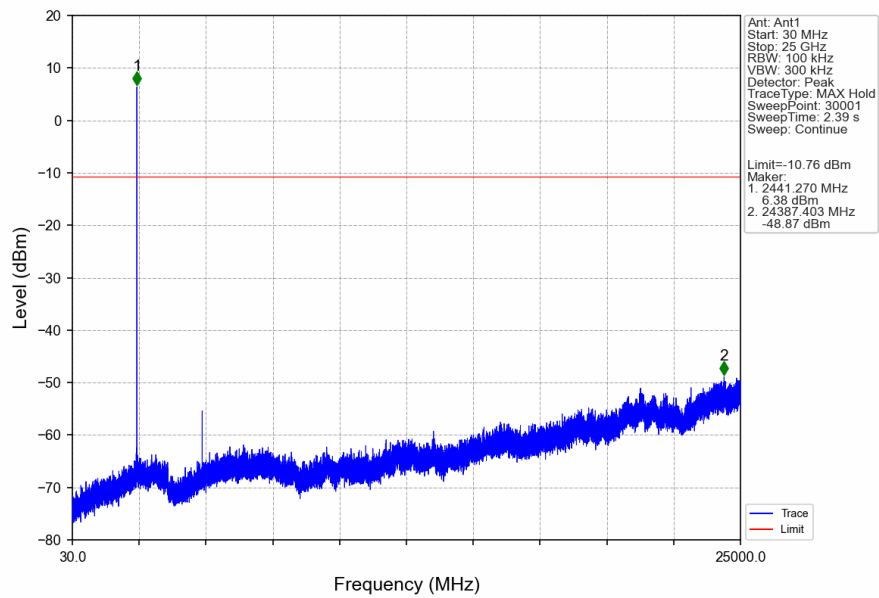
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



7.2.2 CSE



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_HCH_2480MHz_Ant1_NTNV

