

FCC/ISED - TEST REPORT

Report Number : **68.950.23.0915.01** Date of Issue: **2023-12-06**

Model/HVIN : **EF-MT-H10-1**

Product Type : EcoFlow PowerInsight

Applicant : EcoFlow Inc.

Address : 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian
Community, Shiyan Street, Bao'an District, Shenzhen City,
Guangdong 518000, China

Manufacturer : EcoFlow Inc.

Address : 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian
Community, Shiyan Street, Bao'an District, Shenzhen City,
Guangdong 518000, China

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including Appendices : **66**

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1 Table of Contents

1	Table of Contents	2
2	Details about the Test Laboratory	3
3	Description of the Equipment Under Test	4
4	Summary of Test Standards	5
5	Summary of Test Results	6
6	General Remarks	7
7	Test Setups	8
8	Systems Test Configuration	10
9	Technical Requirement	11
9.1	Conducted Emission	11
9.2	Conducted Peak Output Power & EIRP	14
9.3	20 dB Bandwidth and 99% Occupied Bandwidth	19
9.4	Carrier Frequency Separation	27
9.5	Number of Hopping Frequencies	30
9.6	Dwell Time	33
9.7	Spurious RF Conducted Emissions	41
9.8	Band Edge	49
9.9	Spurious Radiated Emissions for Transmitter	55
10	Test Equipment List	65
11	System Measurement Uncertainty	66

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou,
Nanshan District
Shenzhen 518052
P.R. China

Telephone: 86 755 8828 6998

Fax: 86 755 828 5299

FCC Registration
No.: 514049

FCC Designation
Number: CN5009

ISED CAB
identifier CN0077

IC Registration
No.: 10320A

3 Description of the Equipment Under Test

Product:	EcoFlow PowerInsight
Model no.:	EF-MT-H10-1
Hardware Version Identification No. (HVIN)	EF-MT-H10-1
Product Marketing Name (PMN)	EcoFlow PowerInsight
Brand name:	
FCC ID:	2A2P9-MTH101
IC:	27618-MTH101
Options and accessories:	N/A
Rating:	3.8VDC, 3000mAh, 11.4Wh rechargeable Li-ion battery or 5VDC, 2A supplied by external adapter or 5VDC, 2A supplied by charging base
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna Type:	FPCB
Antenna B Gain:	1.34dBi (MT7663BSN Module Antenna, Antenna Model No.: X4-AUX)
Description of the EUT:	The EUT is an EcoFlow PowerInsight. It has two wireless modules. The module ESP32-S3-WROOM-1U supports Bluetooth Low Energy, 2.4G Wi-Fi functions. And the module MT7663BSN supports Bluetooth Low Energy/Bluetooth BDR+EDR, 2.4G Wi-Fi & 5G Wi-Fi functions. Only Bluetooth (BR+EDR) included in this report.

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2021 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5, April 2018 Amendment 1, March 2019 + Amendment 2, February 2021	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 3 August 2023	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2020.

5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C/ RSS-247 Issue 3/RSS-Gen Issue 5			
Test Condition		Test Site	Test Result
§15.207 & RSS-Gen 8.8	Conducted emission AC power port	Site 1	Pass
§15.247(b)(1)	Conducted peak output power	Site 1	Pass
RSS-247 5.4(b)	Conducted peak output power and Equivalent Isotropic Radiated Power	Site 1	Pass
§15.247(a)(1) & RSS-247 5.1(a) & RSS-Gen 6.7	20dB bandwidth and 99% occupied bandwidth	Site 1	Pass
§15.247(a)(1) & RSS-247 5.1(b)	Carrier channel frequency separation	Site 1	Pass
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Number of hopping frequencies	Site 1	Pass
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Dwell Time - Average Time of Occupancy	Site 1	Pass
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	Site 1	Pass
§15.247(d) & RSS-247 5.5	Band edge	Site 1	Pass
§15.247(d) & §15.209 & §15.205 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	Site 1	Pass
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 2	Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT use a FPCB antenna, which gain is 1.34dBi. In accordance to §15.203 & RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2A2P9-MTH101, IC: 27618-MTH101, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: 2023-11-17

Testing Start Date: 2023-11-17

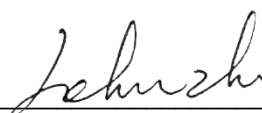
Testing End Date: 2023-11-24

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

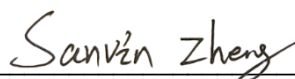
Reviewed by:

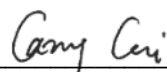
Prepared by:

Tested by:


John Zhi
Project Manager

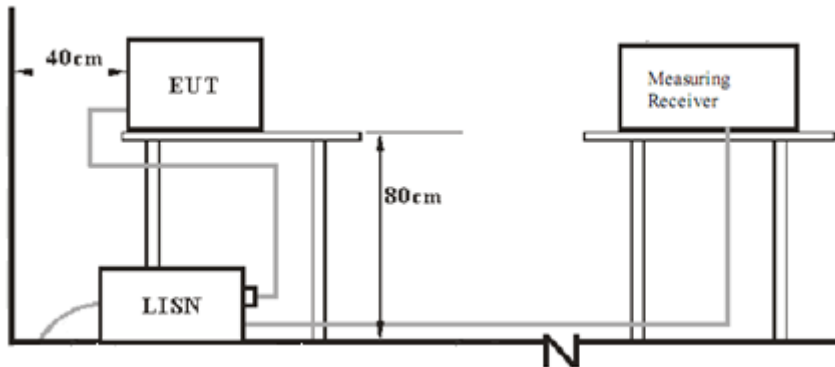



Sanvin Zheng
Project Engineer


Carry Cai
Test Engineer

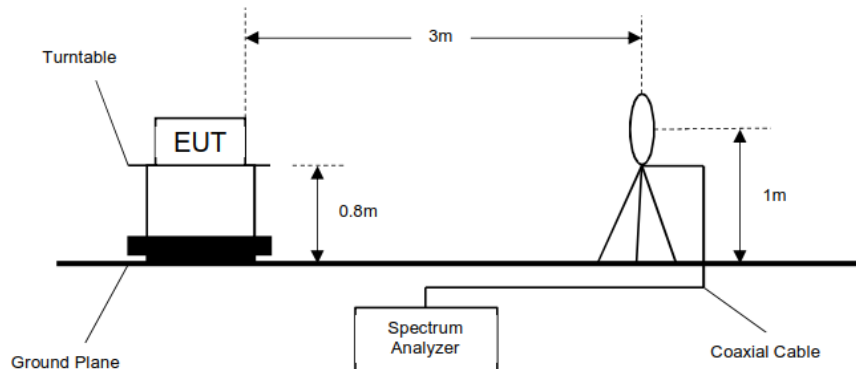
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

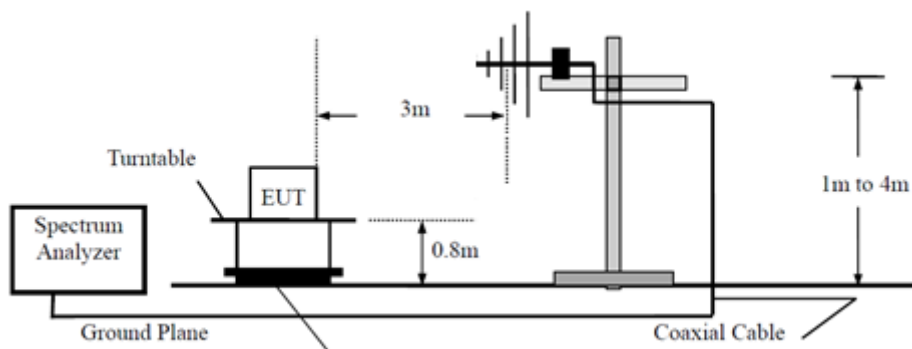


7.2 Radiated test setups

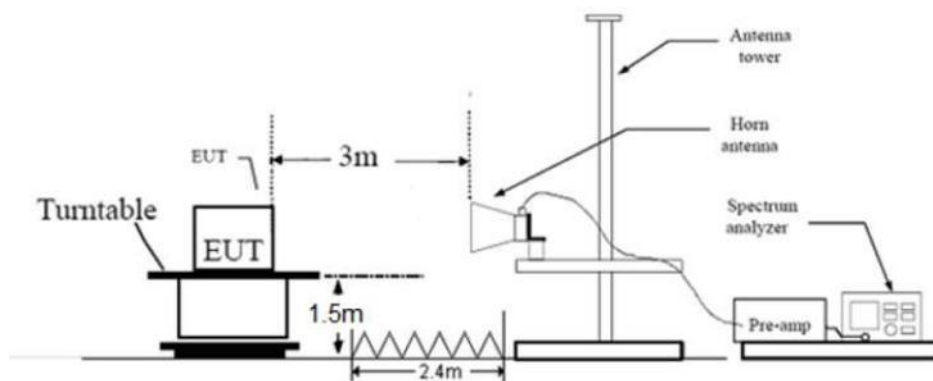
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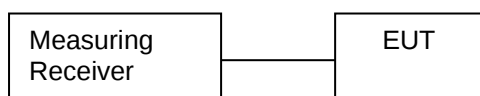
30MHz - 1GHz



Above 1GHz



7.3 Conducted RF test setups



8 Systems Test Configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
Notebook	LENOVO	X220	429044C

Cables Used During Test:

Cable	Length	Shielded/unshielded	With / without ferrite
USB Cable	100cm	Unshielded	without ferrite

Test software information:

Test Software	cmd.exe	
Modulation	Setting TX Power	Packet Type
GFSK	Default	PRBS9
$\pi/4$ -DQPSK	Default	PRBS9
8DPSK	Default	PRBS9

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

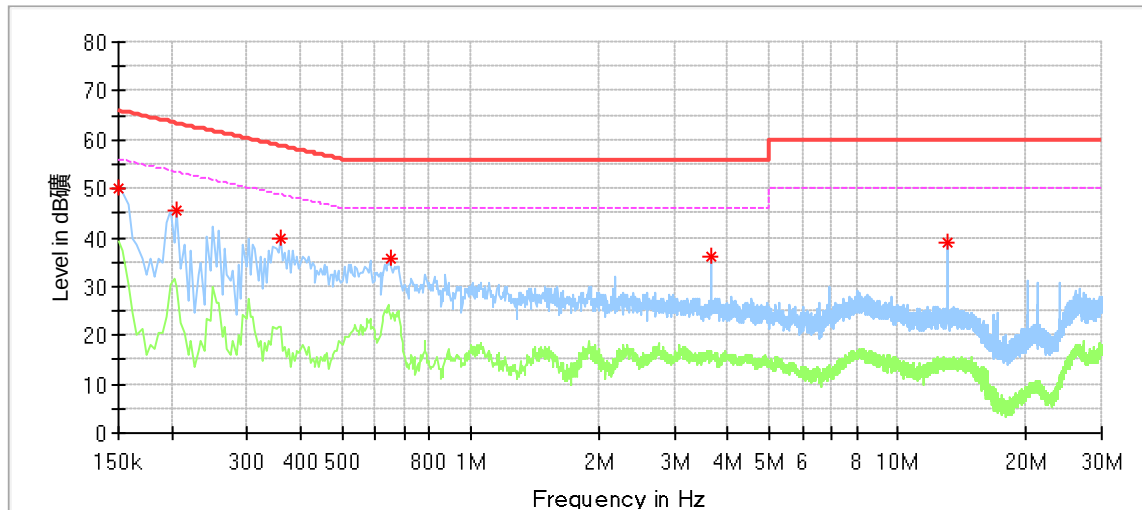
According to §15.207& RSS-Gen 8.8, Conducted Emission limit as below:

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Conducted Emission

Product Type : EcoFlow PowerInsight
 M/N : EF-MT-H10-1
 Operating Condition : Transmit mode
 Test Specification : Line
 Comment : AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.150000	49.89	---	66.00	16.11	L1	9.52
0.206000	45.46	---	63.37	17.90	L1	9.55
0.358000	39.71	---	58.78	19.07	L1	9.57
0.650000	35.49	---	56.00	20.51	L1	9.60
3.662000	35.98	---	56.00	20.02	L1	9.68
13.078000	38.83	---	60.00	21.17	L1	9.98

Remark:

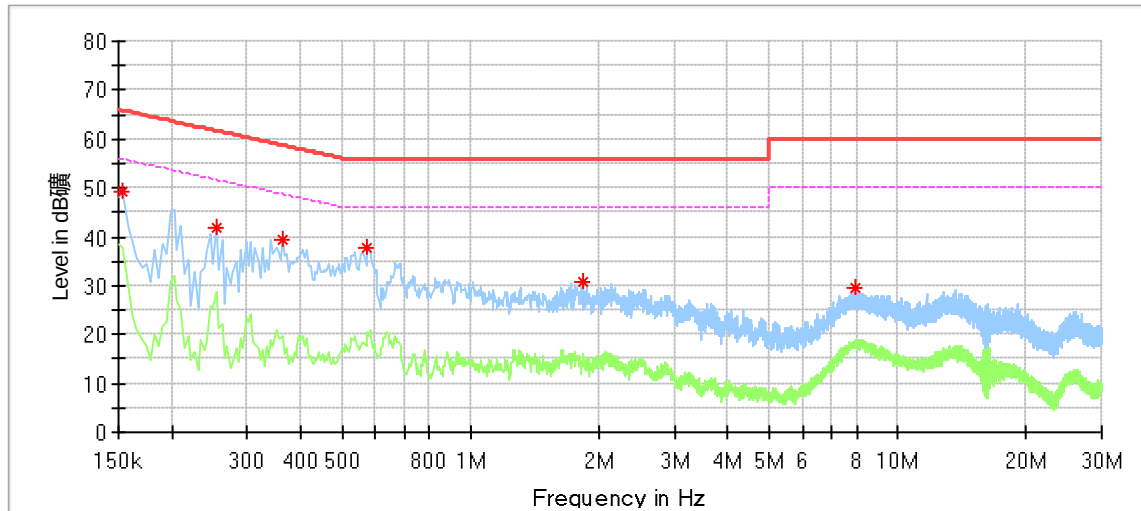
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : EcoFlow PowerInsight
 M/N : EF-MT-H10-1
 Operating Condition : Transmit mode
 Test Specification : Neutral
 Comment : AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.154000	49.05	---	65.78	16.73	N	9.55
0.254000	41.92	---	61.63	19.70	N	9.59
0.362000	39.20	---	58.68	19.48	N	9.61
0.574000	37.60	---	56.00	18.40	N	9.63
1.830000	30.66	---	56.00	25.34	N	9.65
7.942000	29.34	---	60.00	30.66	N	9.90

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

9.2 Conducted Peak Output Power & EIRP

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
RBW > the 20dB bandwidth of the emission being measured, VBW ≥ RBW,
Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

Limits

According to §15.247 (b) (1) & RSS-247 5.4(b), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

According to & RSS-247 5.4(b), EIRP limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤4	≤36

Remark: EIRP=Conducted output power + Antenna Gain

Conducted Peak Output Power & EIRP

Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Low channel 2402MHz	5.42	1.34	6.76	Pass
Middle channel 2441MHz	5.10	1.34	6.44	Pass
High channel 2480MHz	5.10	1.34	6.44	Pass

Bluetooth Mode $\pi/4$ -DQPSK modulation Test Result

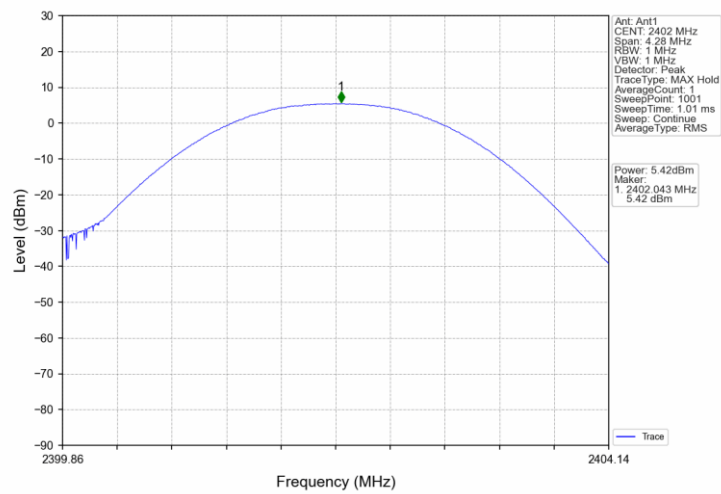
Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Low channel 2402MHz	7.70	1.34	9.04	Pass
Middle channel 2441MHz	7.72	1.34	9.06	Pass
High channel 2480MHz	7.61	1.34	8.95	Pass

Bluetooth Mode 8DPSK modulation Test Result

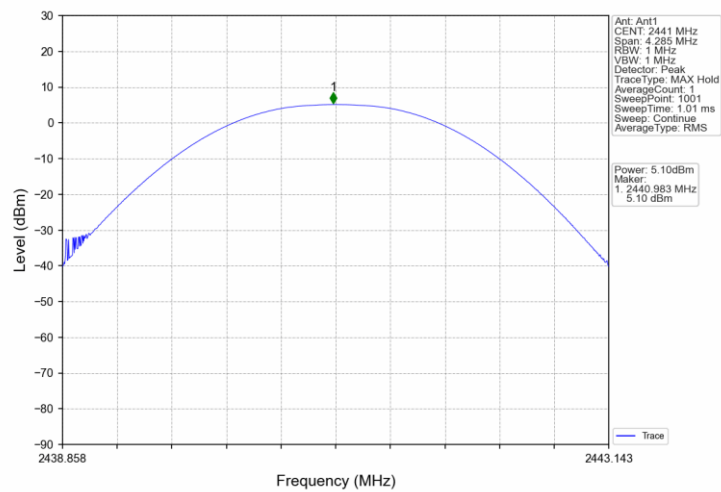
Frequency MHz	Conducted Peak Output Power dBm	Antenna Gain dBi	EIRP dBm	Result
Low channel 2402MHz	8.09	1.34	9.43	Pass
Middle channel 2441MHz	8.13	1.34	9.47	Pass
High channel 2480MHz	7.94	1.34	9.28	Pass



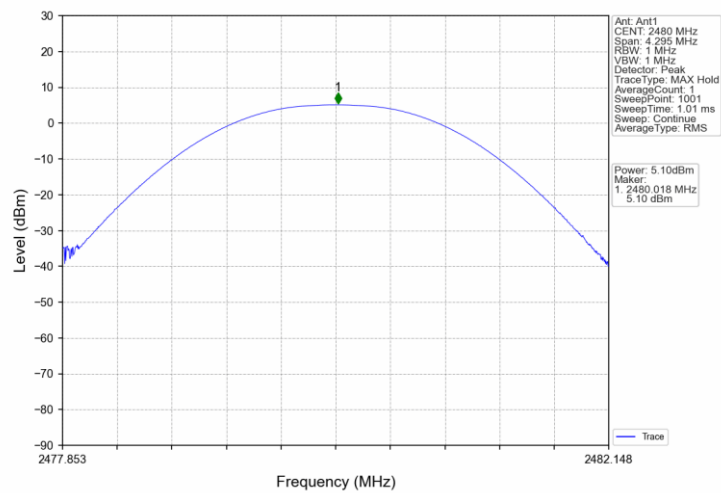
GFSK_DH5_LCH_2402MHz_Ant_B_NTNV



GFSK_DH5_MCH_2441MHz_Ant_B_NTNV

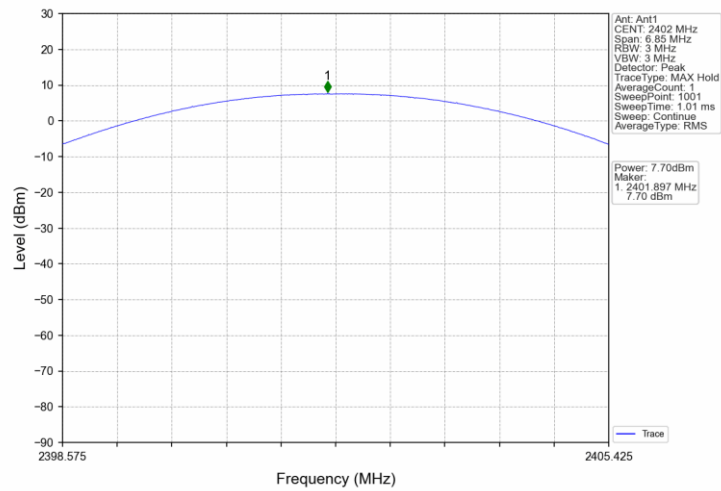


GFSK_DH5_HCH_2480MHz_Ant_B_NTNV

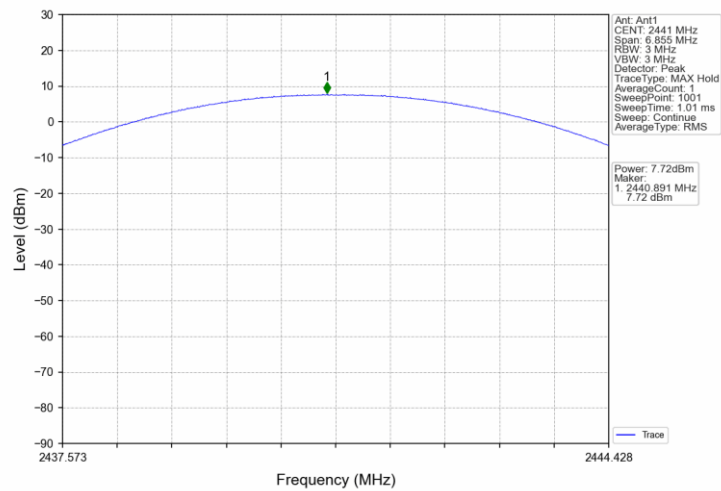




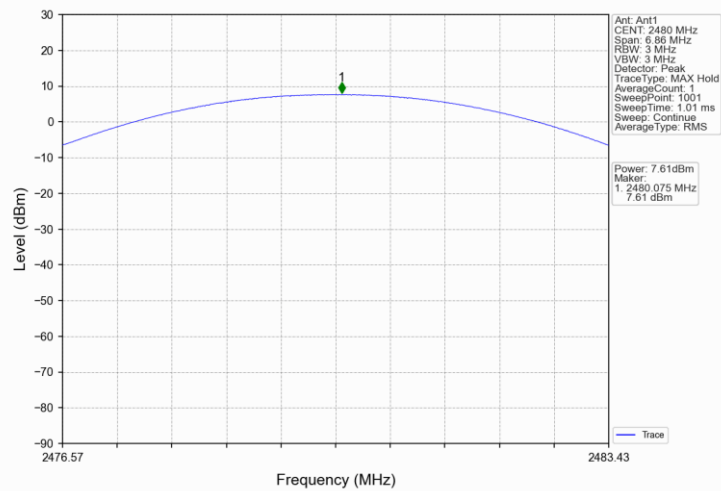
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant_B_NTNV



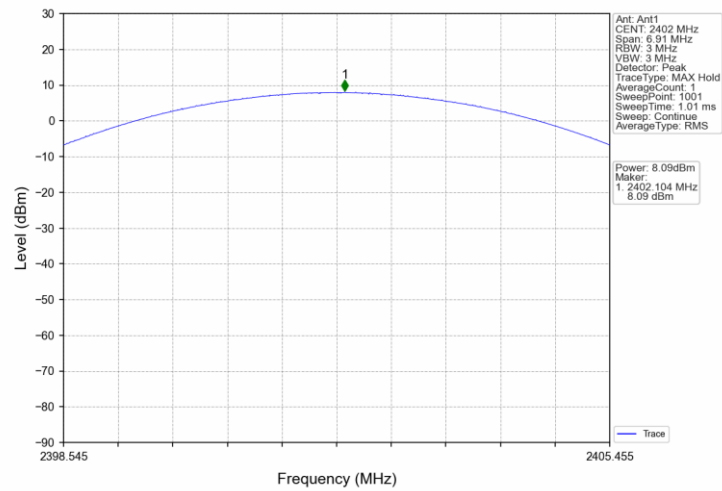
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant_B_NTNV



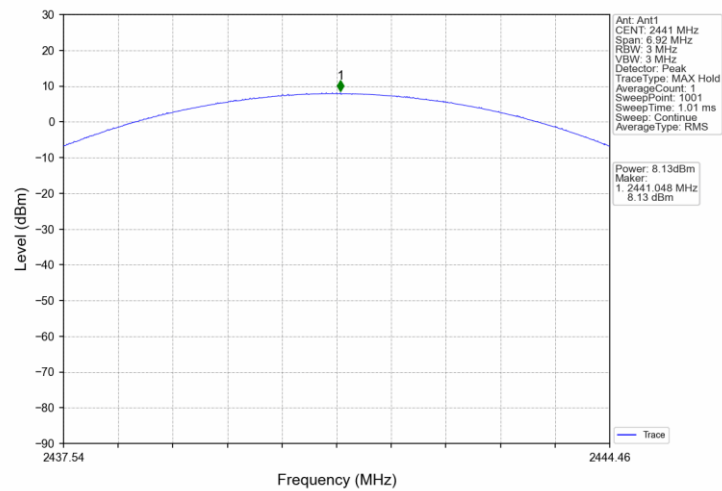
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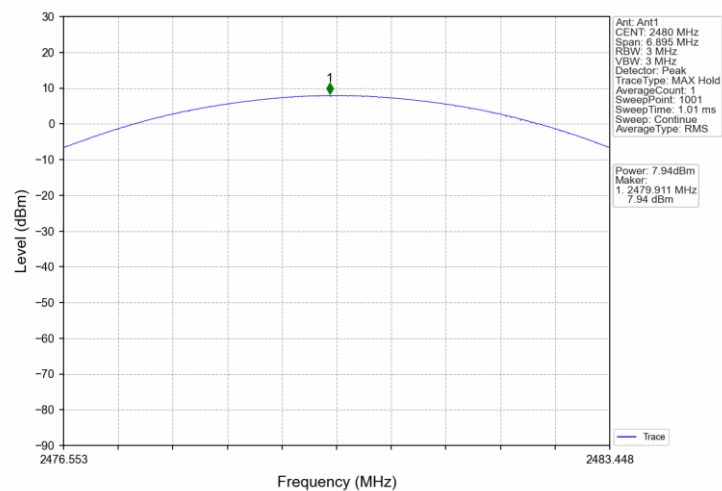
8DPSK_3DH5_LCH_2402MHz_Ant B_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant B_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant B_NTNV



9.3 20 dB Bandwidth and 99% Occupied Bandwidth

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW $\geq 1\%$ to 5% of the 20 dB bandwidth/99% OBW, VBW ≥ 3 RBW,
Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 20 dB/99% OBW from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
5. Repeat above procedures until all frequencies measured were complete.

Limit

According to §15.247(a)(1) & RSS-247 5.1(a) & RSS-Gen 6.7, 20 dB Bandwidth and 99% Occupied Bandwidth limit as below:

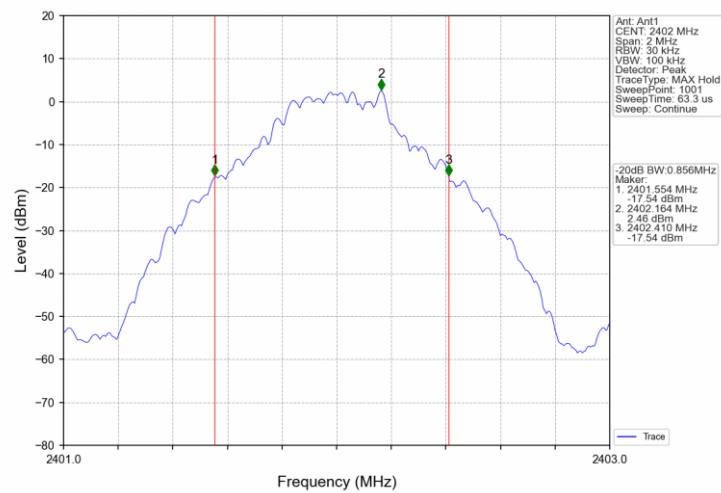
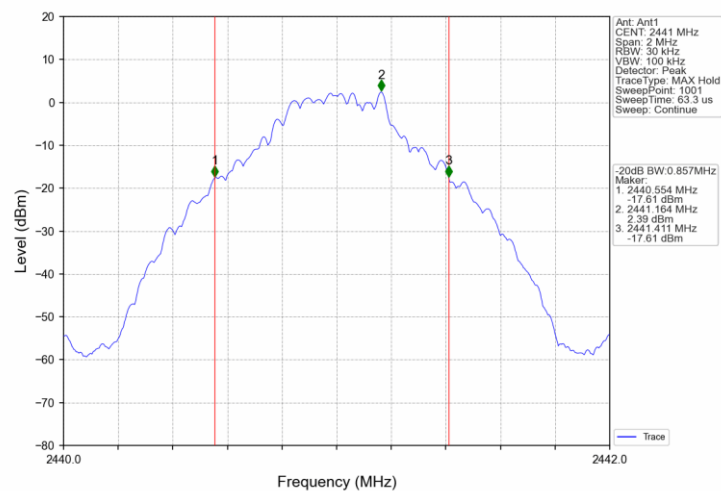
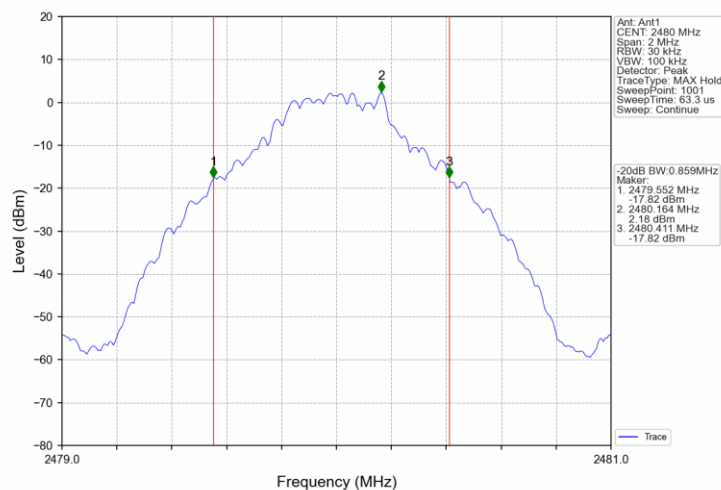
Limit [kHz]

N/A

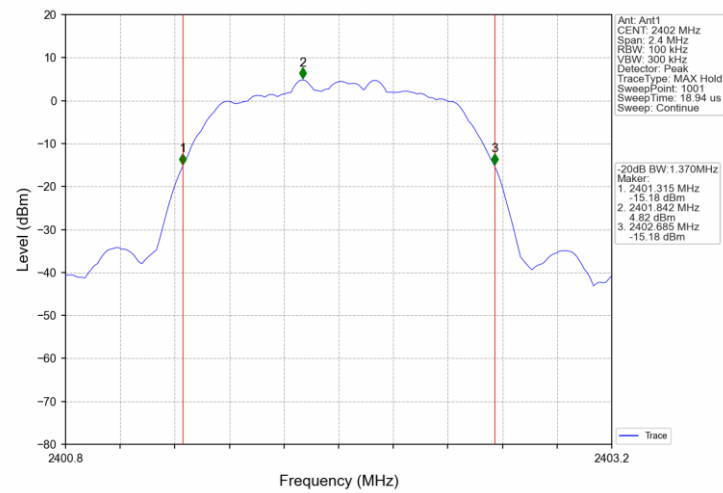
20 dB bandwidth and 99% Occupied Bandwidth

Test result

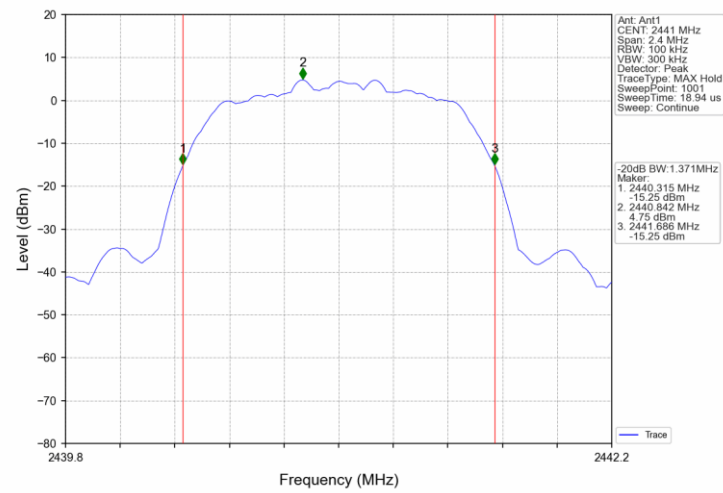
TestMode	Frequency MHz	20 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz	Result
GFSK	2402	0.856	0.752	--	Pass
GFSK	2441	0.857	0.752	--	Pass
GFSK	2480	0.859	0.752	--	Pass
$\pi/4$ -DQPSK	2402	1.370	1.200	--	Pass
$\pi/4$ -DQPSK	2441	1.371	1.200	--	Pass
$\pi/4$ -DQPSK	2480	1.372	1.200	--	Pass
8DPSK	2402	1.382	1.214	--	Pass
8DPSK	2441	1.384	1.214	--	Pass
8DPSK	2480	1.379	1.213	--	Pass

20 dB Bandwidth**GFSK_DH5_LCH_2402MHz_Ant_B_NTNV****GFSK_DH5_MCH_2441MHz_Ant_B_NTNV****GFSK_DH5_HCH_2480MHz_Ant_B_NTNV**

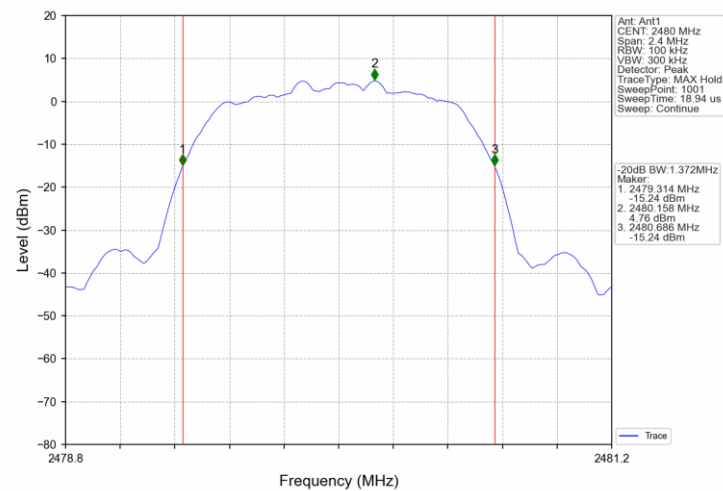
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant B_NTNV



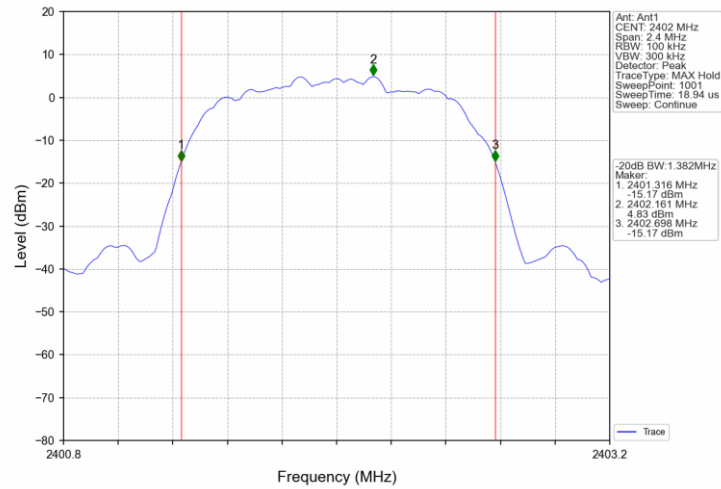
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant B_NTNV



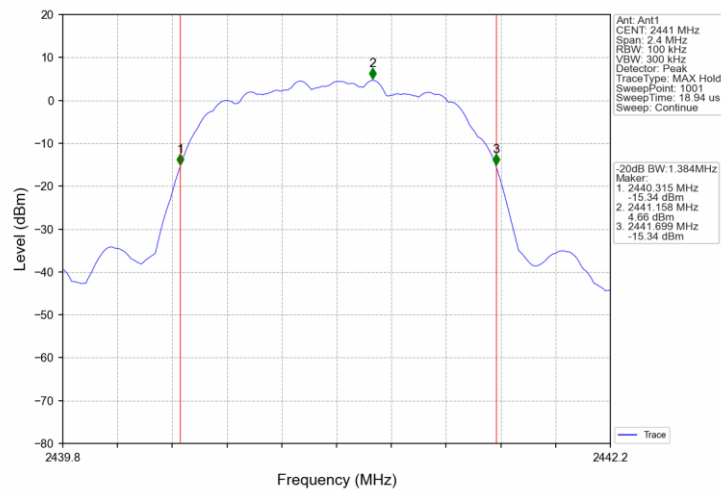
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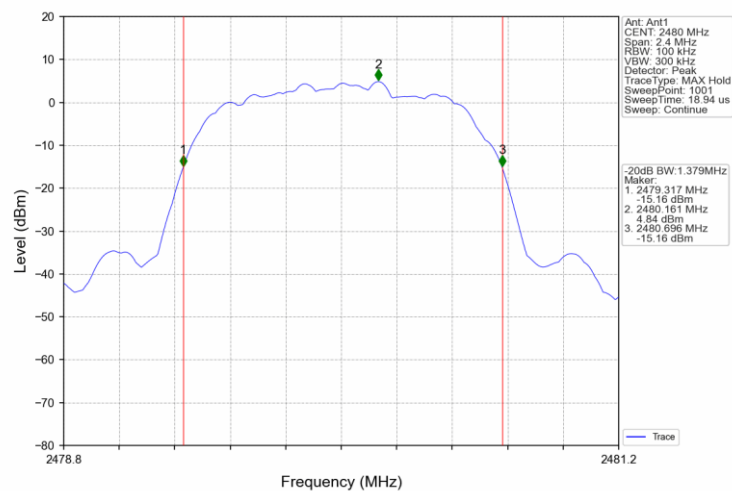
8DPSK_3DH5_LCH_2402MHz_Ant_B_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant_B_NTNV

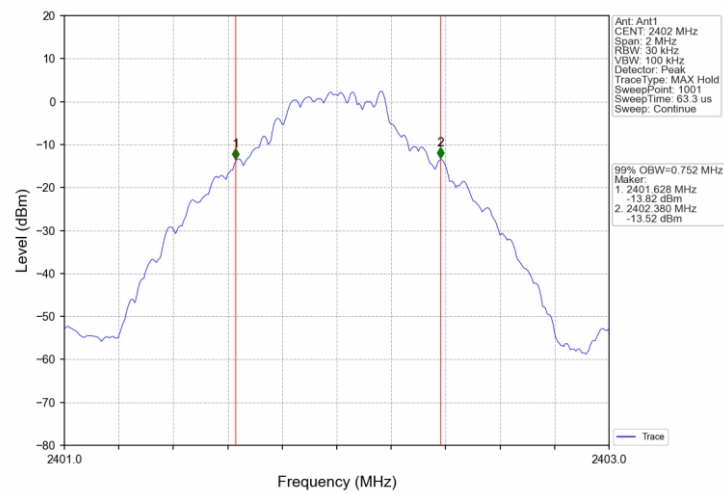


8DPSK_3DH5_HCH_2480MHz_Ant_B_NTNV

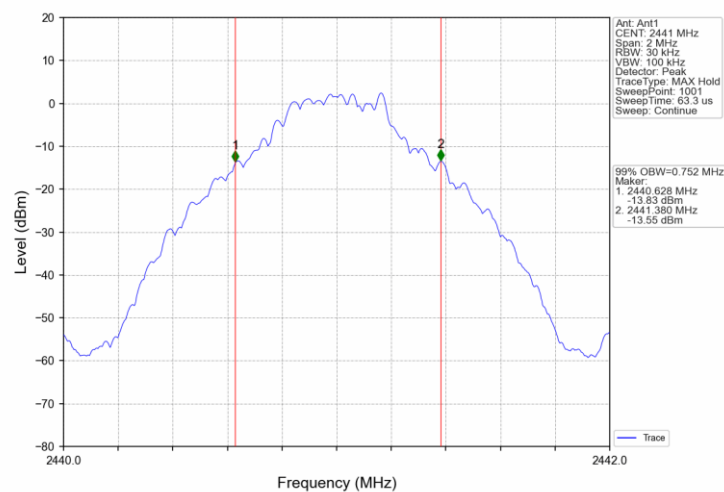


99% Occupied Bandwidth

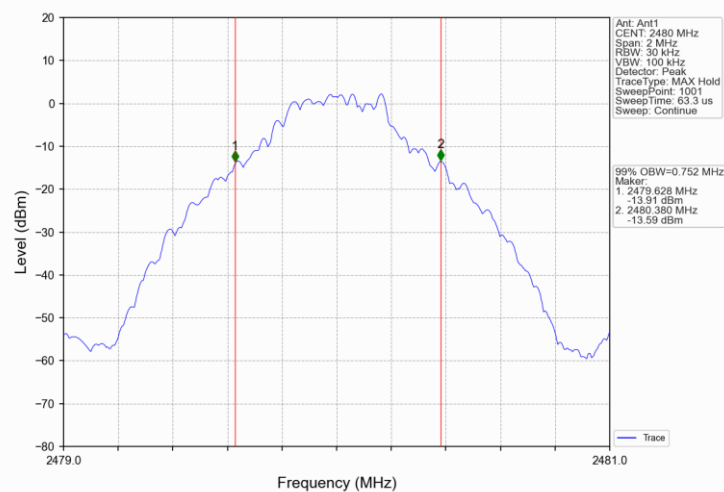
GFSK DH5 LCH 2402MHz Ant B NTN



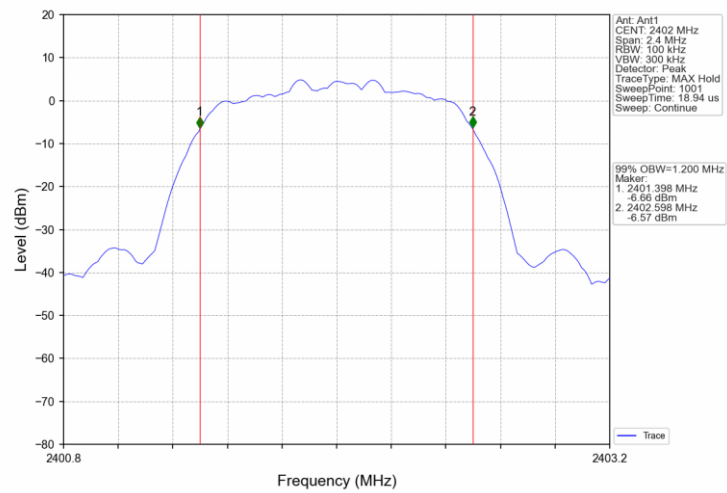
GFSK DH5 MCH 2441MHz Ant B NTN



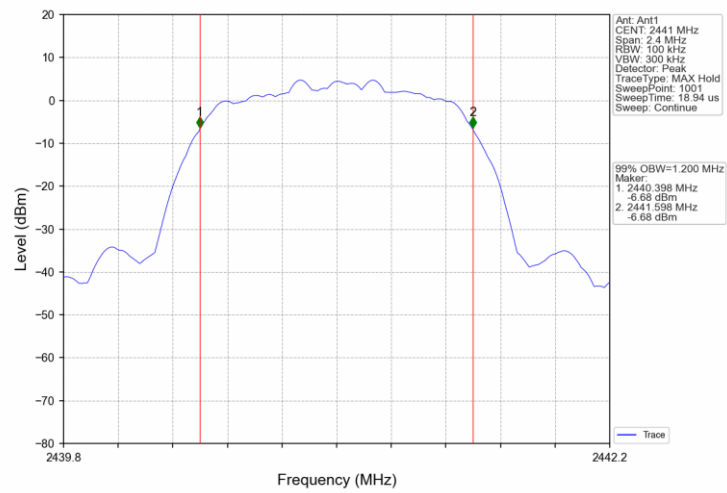
GFSK DH5 HCH 2480MHz Ant B NTN



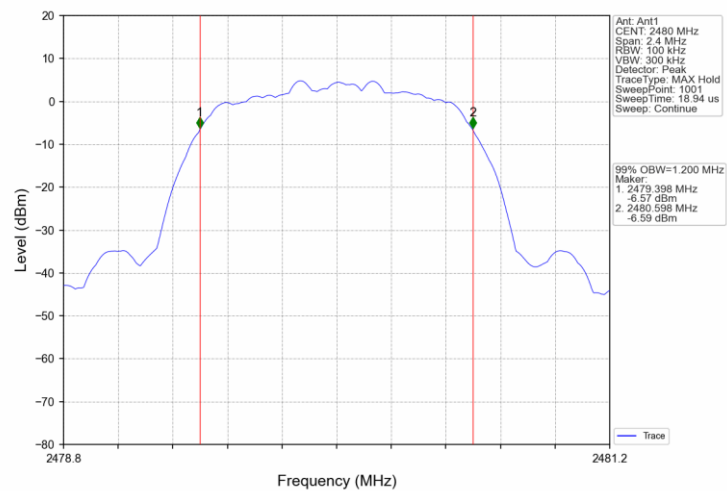
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant B_NTNV



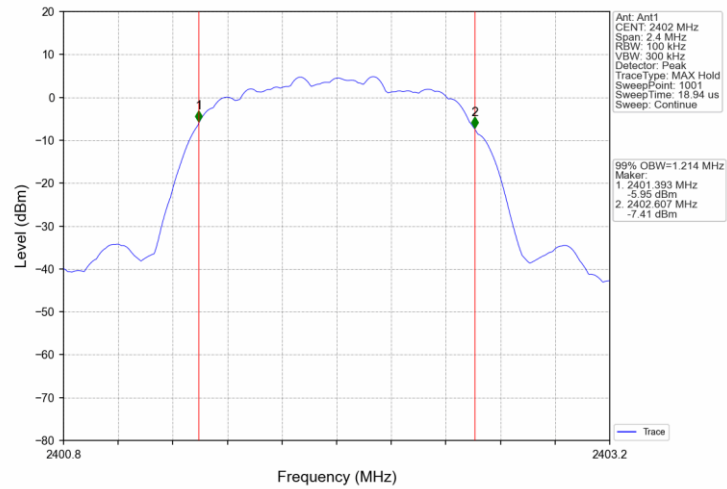
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant B_NTNV



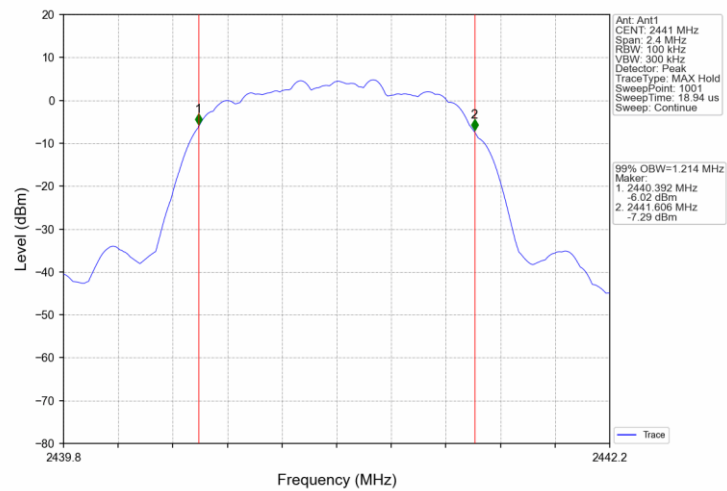
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant B_NTNV



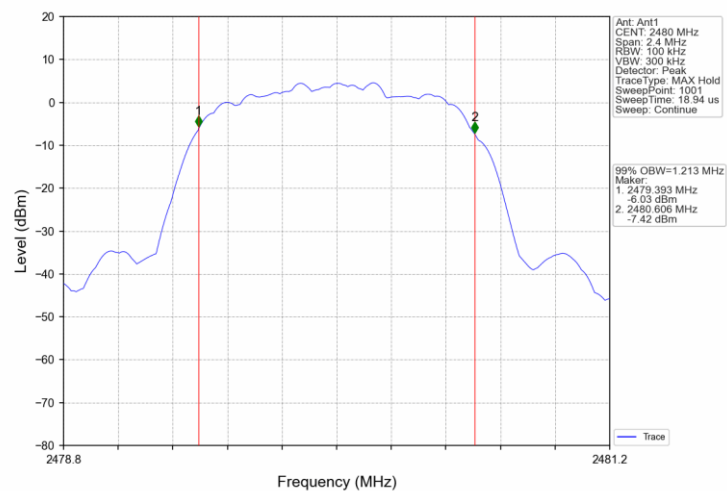
8DPSK_3DH5_LCH_2402MHz_Ant_B_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant_B_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant_B_NTNV



9.4 Carrier Frequency Separation

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels, RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. VBW $\geq$ RBW, Sweep = auto, Detector function = peak.
4. By using the Max-Hold function record the separation of two adjacent channels.
5. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function. Record the results.
6. Repeat above procedures until all frequencies measured were complete.

Limit

According to §15.247(a)(1) & RSS-247 5.1(b), Carrier Frequency Separation limit as below:

Limit kHz
$\geq 25\text{kHz}$ or $2/3$ of the 20 dB bandwidth which is greater

Limit

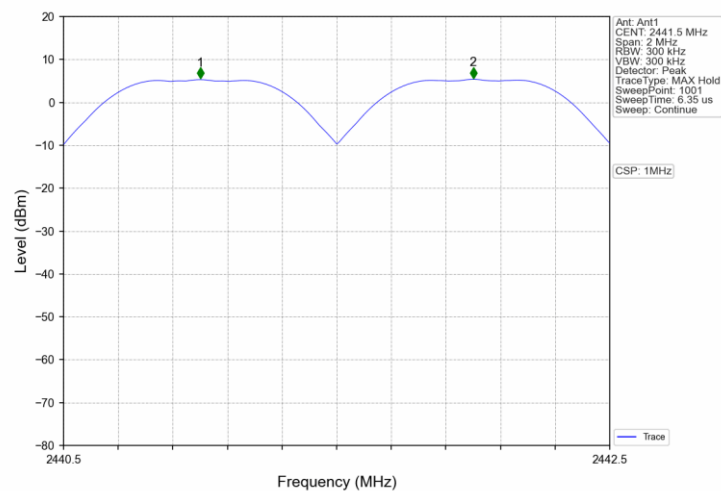
Modulation	Frequency MHz	2/3 of 20 dB Bandwidth kHz
GFSK	2441	573
$\pi/4$ -DQPSK	2441	915
8DPSK	2441	923

Carrier Frequency Separation

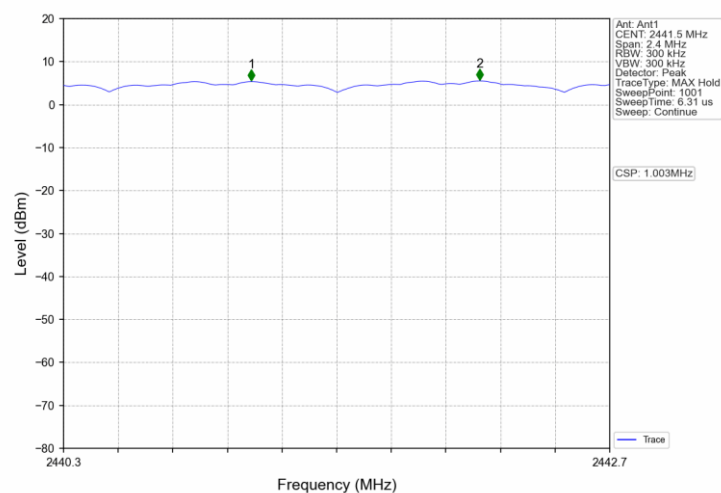
Test result: The measurement was performed with the typical configuration (normal hopping status).

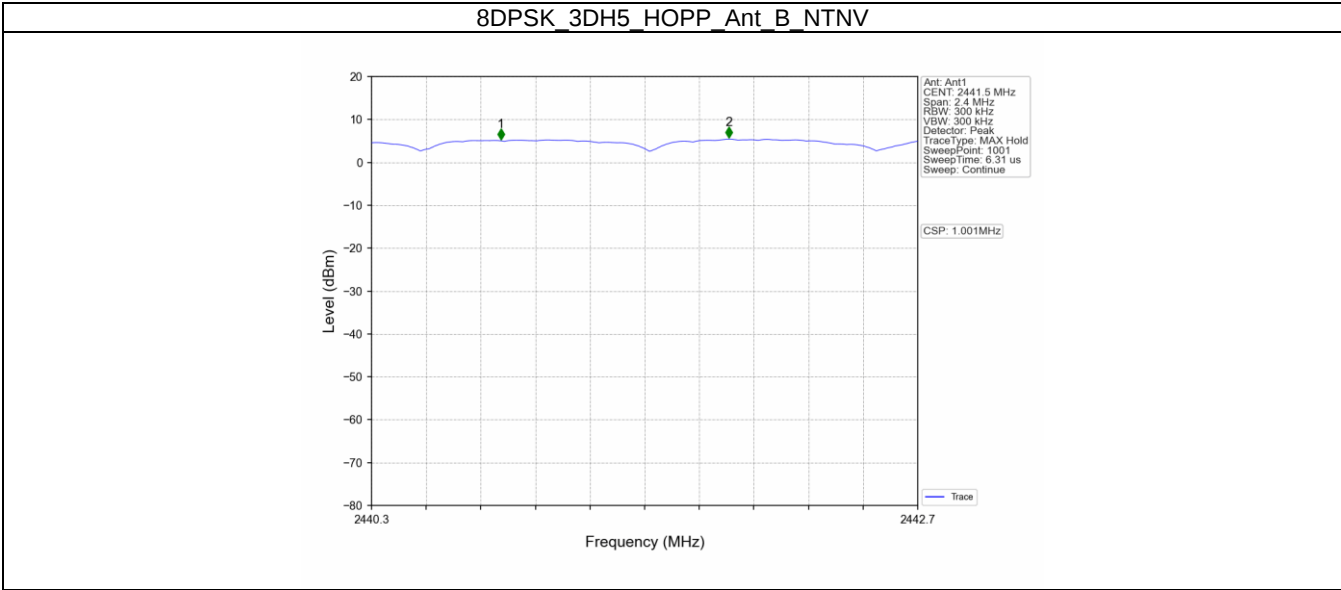
Modulation	Frequency MHz	Carrier Frequency Separation MHz	Result
GFSK	2441	1.000	Pass
$\pi/4$ -DQPSK	2441	1.003	Pass
8DPSK	2441	1.001	Pass

GFSK_DH5_HOPP_Ant_B_NTNV



$\pi/4$ DQPSK_2DH5_HOPP_Ant_B_NTNV





9.5 Number of Hopping Frequencies

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
Span = the frequency band of operation, RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller, VBW $\geq$ RBW, Sweep = auto, Detector function = peak, Trace=Max hold.
4. Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

Limit

According to §15.247(a)(1)(iii) & RSS-247 5.1(d), Number of Hopping Frequencies limit as below:

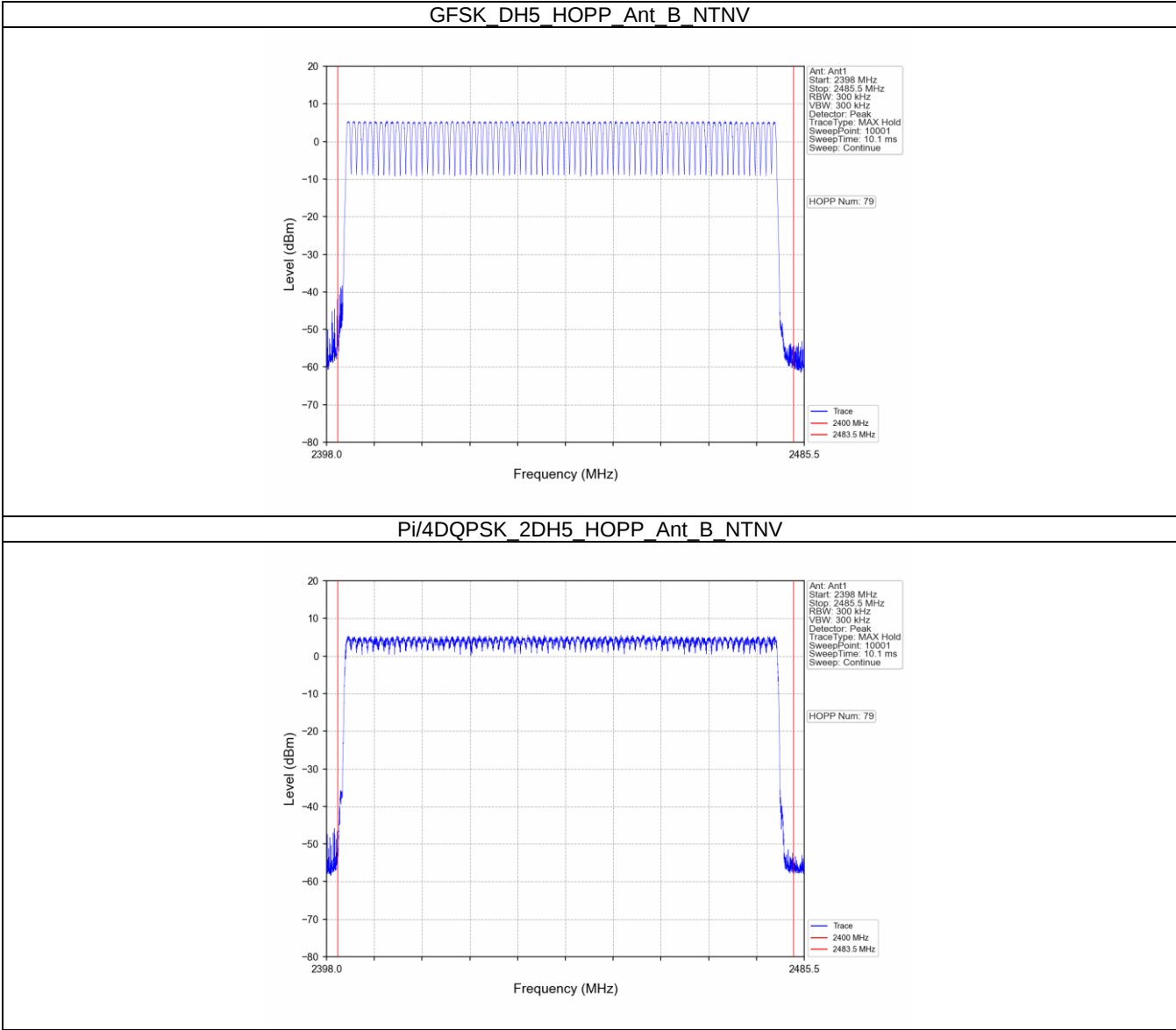
**Limit
number**

≥ 15

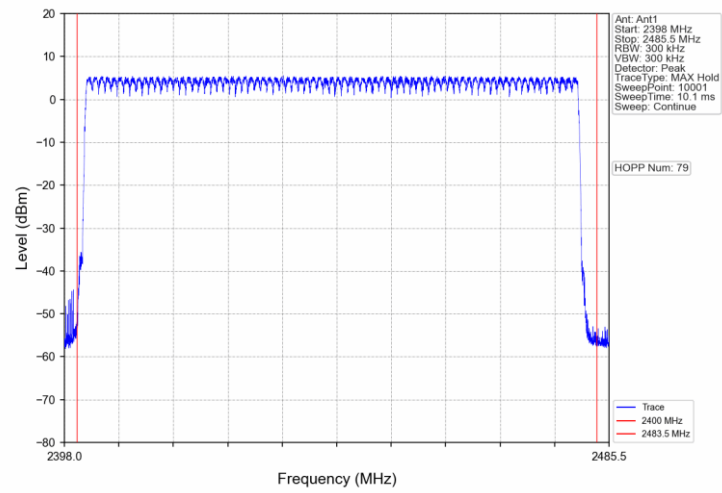


Number of Hopping Frequencies

Number of hopping frequencies	Result
79	Pass



8DPSK_3DH5_HOPP_Ant B_NTNV



9.6 Dwell Time

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Span: Zero span, centered on a hopping channel.
4. RBW shall be $\leq$ channel spacing and where possible RBW should be set $\gg 1 / T$, where T is the expected dwell time per channel.
5. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
6. Detector function: Peak.
7. Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Limit

According to §15.247(a)(1)(iii) & RSS-247 5.1(d), Dwell Time limit as below:

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Dwell Time

Dwell time

The maximum dwell time shall be 0.4 s.

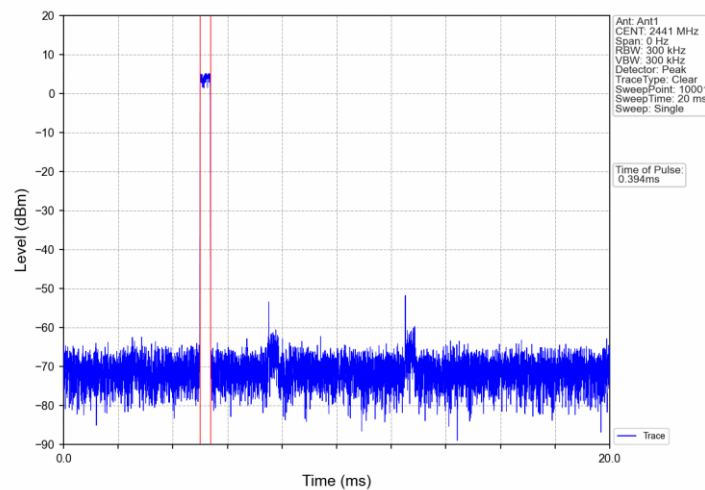
According to the Bluetooth Core Specification,

The duration for dwell time calculation: $0.4 \text{ [s]} * \text{hopping number} = 0.4 \text{ [s]} * 79 \text{ [ch]} = 31.6 \text{ [s]}$

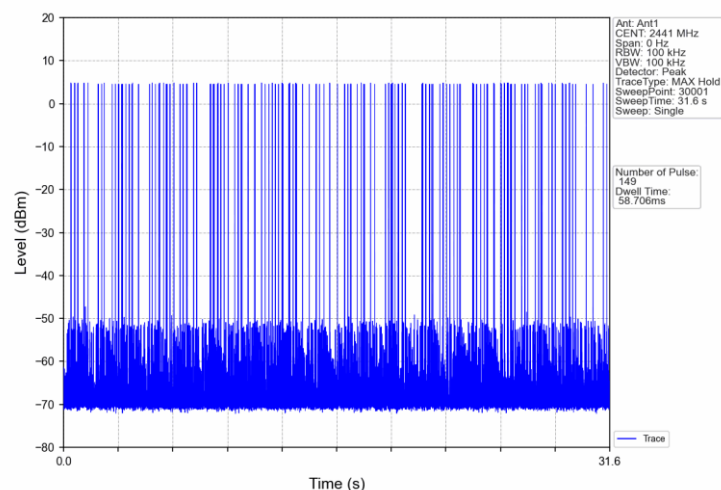
The Dwell Time = Burst Width * Total Hops.

Test Mode	Channel	Burst Width (ms)	Total Hops	Result (ms)	Limit (ms)	Verdict
DH1	Hop	0.394	149	58.706	≤ 400	PASS
DH3	Hop	1.648	160	263.680	≤ 400	PASS
DH5	Hop	2.898	89	257.922	≤ 400	PASS
2DH1	Hop	0.390	166	64.740	≤ 400	PASS
2DH3	Hop	1.650	162	267.300	≤ 400	PASS
2DH5	Hop	2.900	77	223.300	≤ 400	PASS
3DH1	Hop	0.388	156	60.528	≤ 400	PASS
3DH3	Hop	1.640	160	262.400	≤ 400	PASS
3DH5	Hop	2.892	72	208.224	≤ 400	PASS

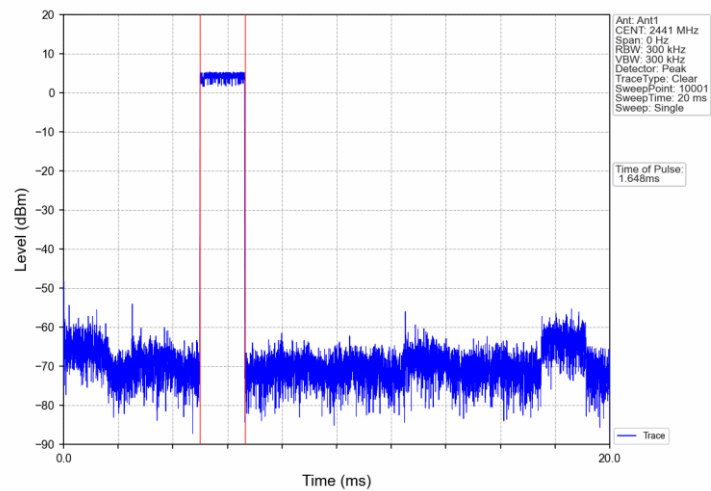
GFSK_DH1_HOPP_Ant_B_NTNV



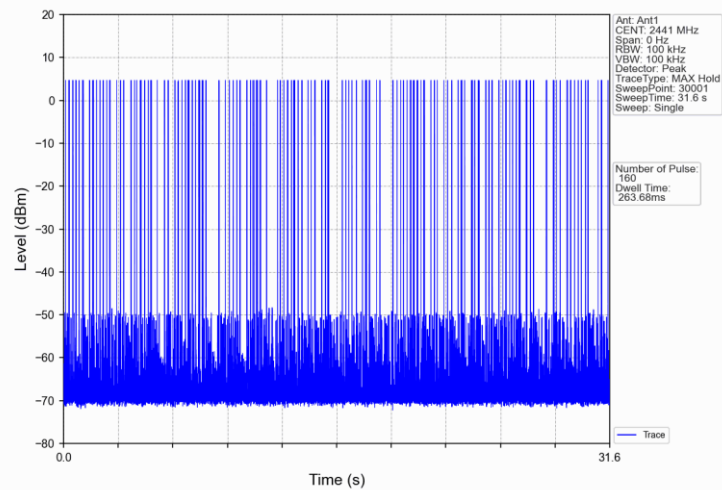
GFSK_DH1_HOPP_Ant_B_NTNV



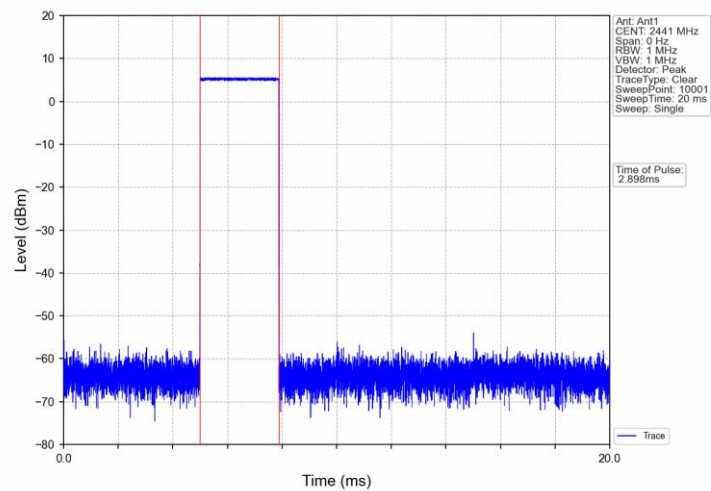
GFSK_DH3_HOPP_Ant_B_NTNV



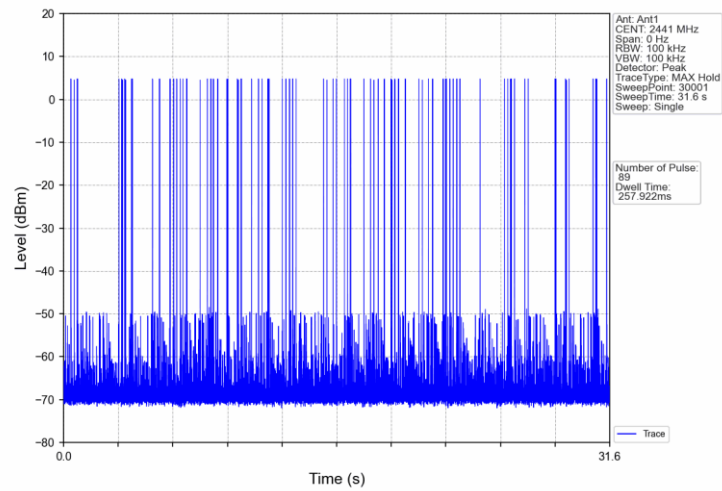
GFSK_DH3_HOPP_Ant_B_NTNV



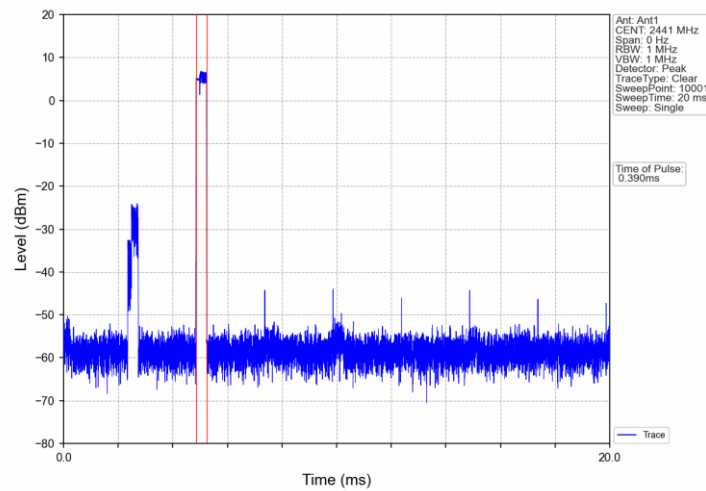
GFSK_DH5_HOPP_Ant_B_NTNV



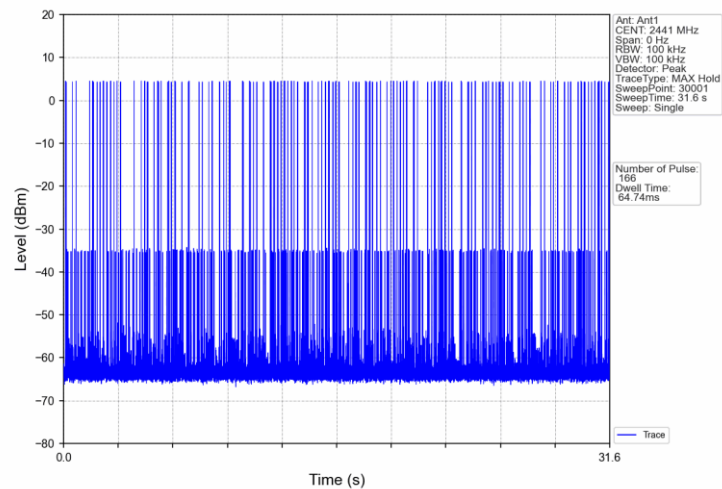
GFSK_DH5_HOPP_Ant_B_NTNV



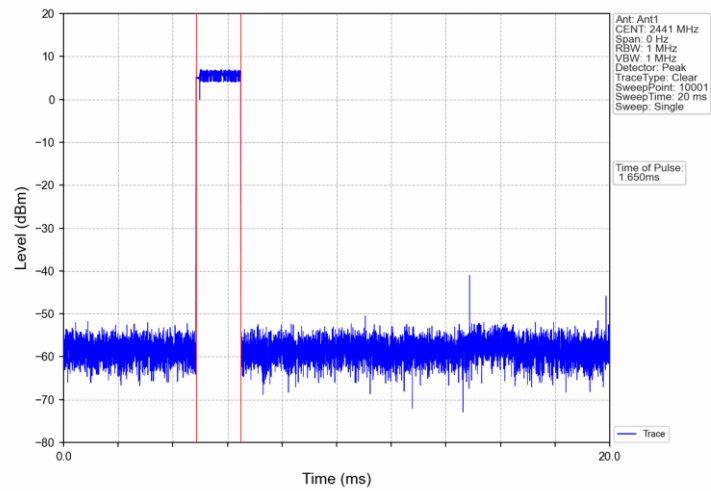
Pi/4DQPSK_2DH1_HOPP_Ant_B_NTNV



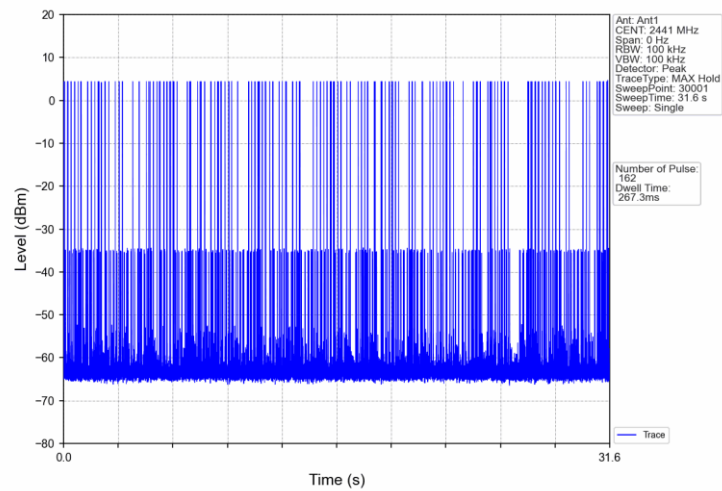
Pi/4DQPSK_2DH1_HOPP_Ant_B_NTNV



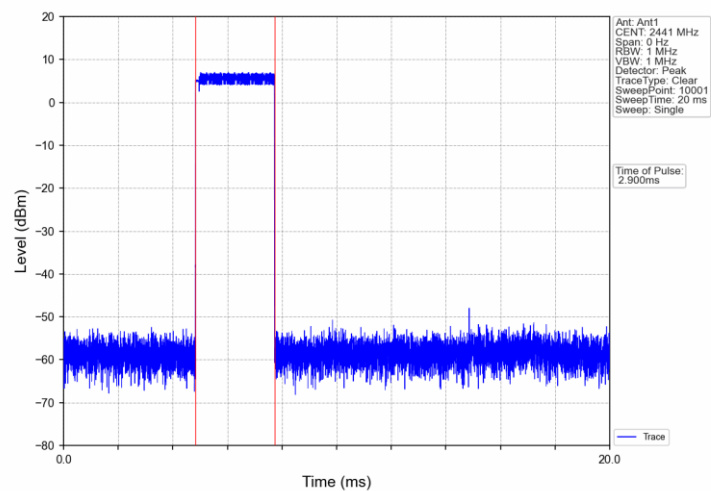
Pi/4DQPSK_2DH3_HOPP_Ant_B_NTNV



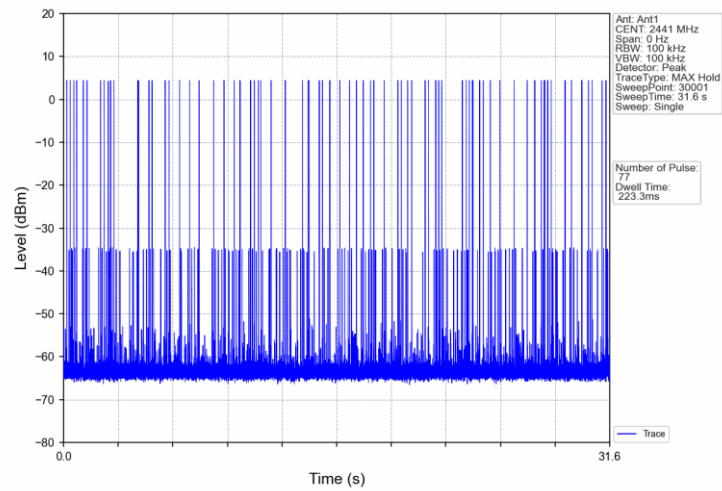
Pi/4DQPSK_2DH3_HOPP_Ant_B_NTNV



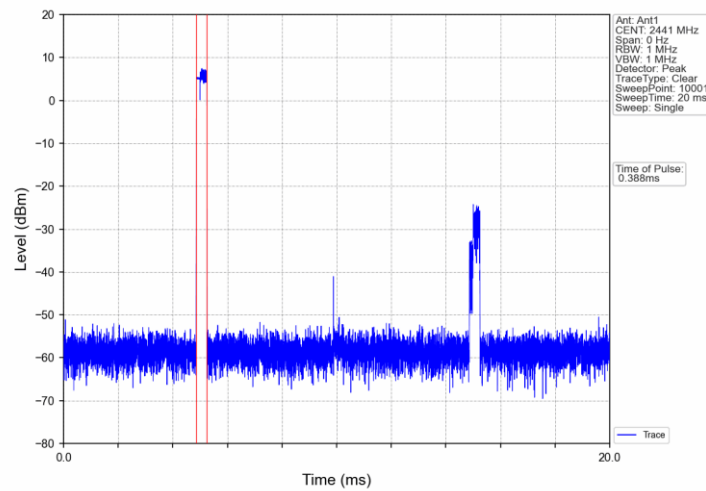
Pi/4DQPSK_2DH5_HOPP_Ant_B_NTNV



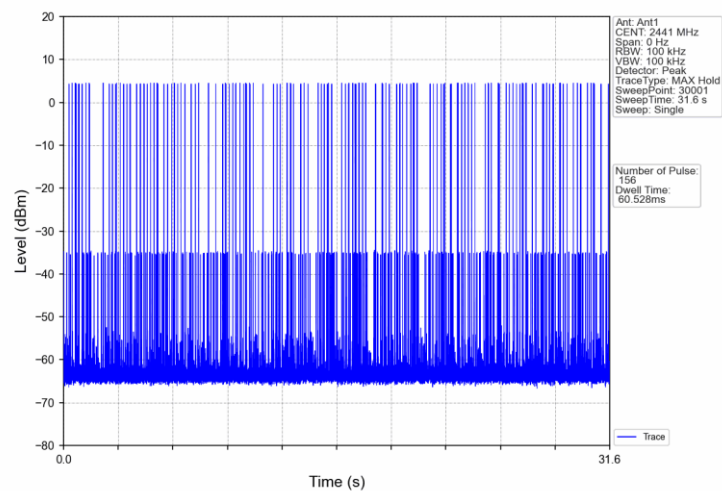
Pi/4DQPSK_2DH5_HOPP_Ant B_NTNV



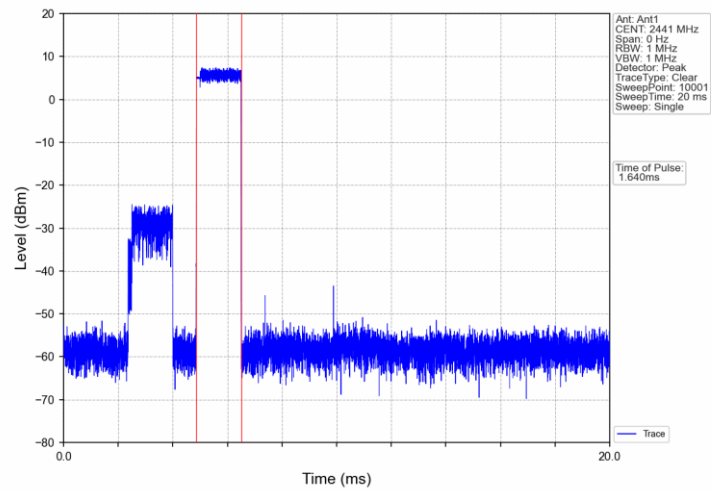
8DPSK_3DH1_HOPP_Ant B_NTNV



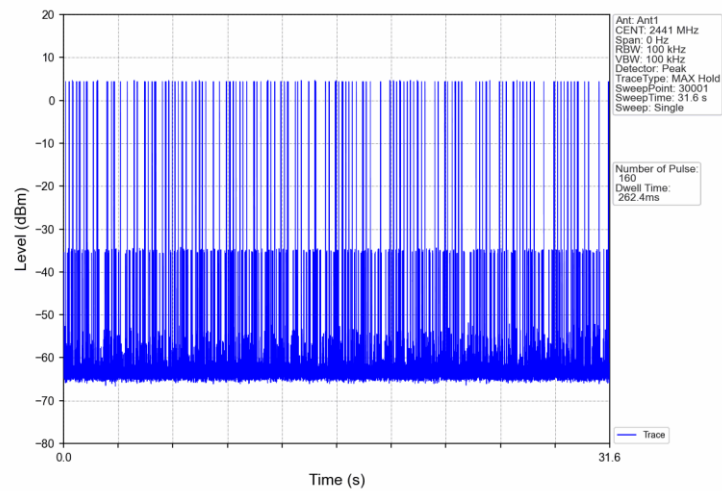
8DPSK_3DH1_HOPP_Ant B_NTNV



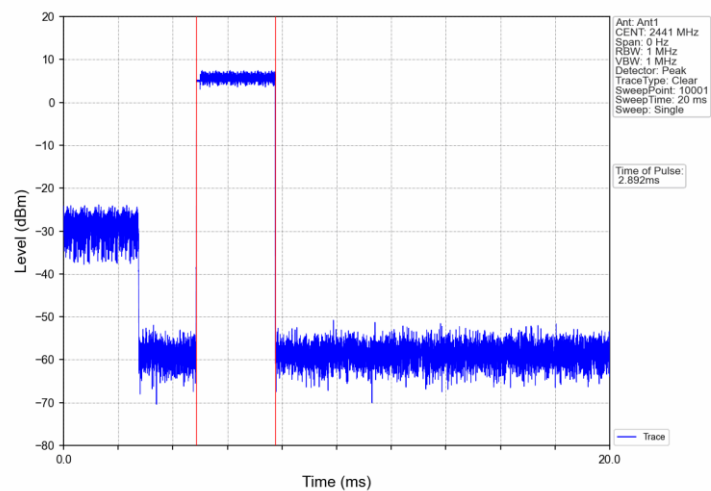
8DPSK_3DH3_HOPP_Ant B NTN



8DPSK_3DH3_HOPP_Ant B NTN



8DPSK_3DH5_HOPP_Ant B NTN



8DPSK_3DH5_HOPP_Ant B_NTNV

