

FCC/ISED - TEST REPORT

Report Number : **68.950.24.0617.01** Date of Issue: **2025-01-16**

Model/HVIN : **FS2345**

Product Type : AURIA module

Applicant : Frontier Smart Technologies Ltd

Address : Harston, Harston Mill, Cambridge, CB22 7GG, UNITED KINGDOM

Manufacturer : Frontier Smart Technologies Ltd

Address : Harston, Harston Mill, Cambridge, CB22 7GG, UNITED KINGDOM

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

Total pages including Appendices : **109**

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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 City, 518052, P. R. China

Telephone: 86 755 8828 6998

Fax: 86 755 828 5299

FCC Registration No.: 514049

FCC Designation No.: CN5009

IC Registration No.: 10320A

ISED CAB identifier: CN0077

3 Description of the Equipment Under Test

Product Type:	AURIA module
Model no.:	FS2345
FCC ID:	YYX-FS2345
IC:	11458A-FS2345
PMN:	AURIA
HVIN:	FS2345
Rating:	5VDC
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna Type:	Ant 1: Internal PIFA Antenna Ant 2: External PIFA Antenna
Antenna Gain:	Ant 1: 1.86dBi Ant 2: 2.21dBi
	FS2345 does not support MIMO, only one of Ant 1 or Ant 2 can transmit through a switch selection
S/N	Conducted Method Module: 241500278RYA02 Conducted Method Platform: FS2345032403053 Radiated Method Module: 241500246RYA02 Radiated Method Platform: FS2345032403028 Normal Module: 240100004RYA02 Normal Platform: FS2345032403037
Description of the EUT:	The Equipment Under Test (EUT) is a AURIA supports Bluetooth Low Energy / Bluetooth BR+EDR/ Wi-Fi function
Remark:	This report is only for Bluetooth BR+EDR.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2023 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 output power	Site 1	Pass
RSS-247 5.4(b)	Conducted 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 uses an Internal Integrated PIFA Antenna, which gain is 1.86dBi and an External Integrated PIFA Antenna, which gain is 2.21dBi. 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: YYX-FS2345, complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C.

This submittal(s) (test report) is intended for IC:11458A-FS2345, complies with RSS-247, RSS-GEN.

The Model: FS2345 supports Bluetooth Low Energy/Bluetooth BR+EDR/Wi-Fi functions, power by 5VDC.

The TX and RX range is 2402MHz-2480MHz for Bluetooth, 2412MHz – 2462MHz for 2.4GHz Wi-Fi, 5180MHz – 5320MHz, 5500MHz – 5700MHz, 5745MHz – 5825MHz for 5GHz Wi-Fi. (This device shall not be capable of transmitting in the band 5600-5650MHz for Canada. This restriction is for the protection of Terminal Doppler Weather Radar (TDWR) operating in this band.)

Note: The report is for BR+EDR only.

SUMMARY:

All tests according to the regulations cited on page 6 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

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

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

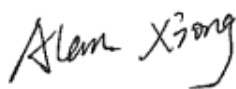
Sample Received Date: 2024-07-02

Testing Start Date: 2024-07-02

Testing End Date: 2024-08-05

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

Reviewed by:



Alan Xiong
Project Manager

Prepared by:



Henry Chen
Project Engineer

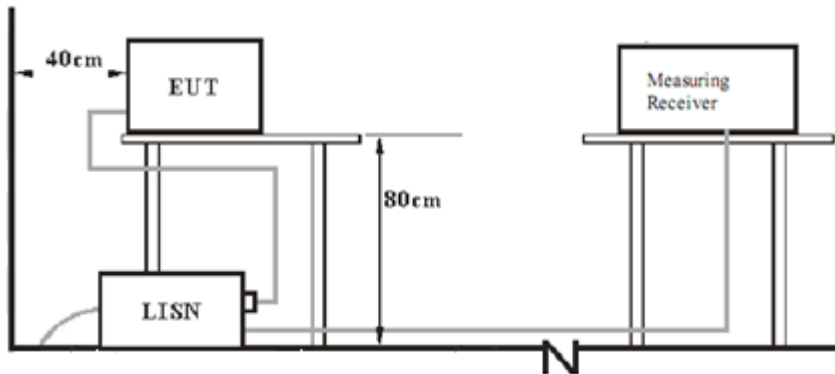
Tested by:



Carry Cai
Test Engineer

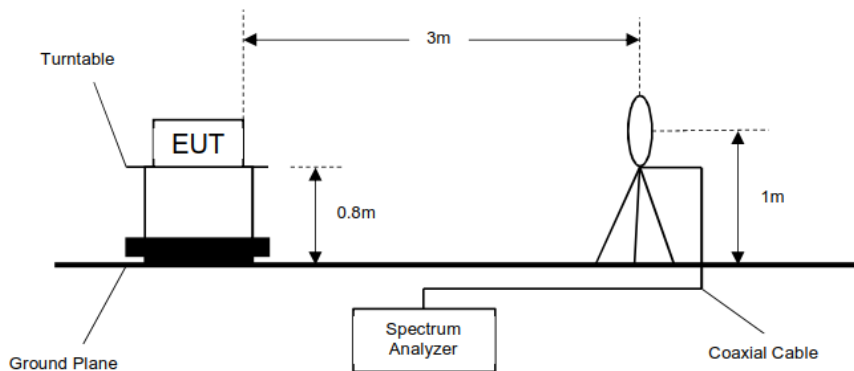
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

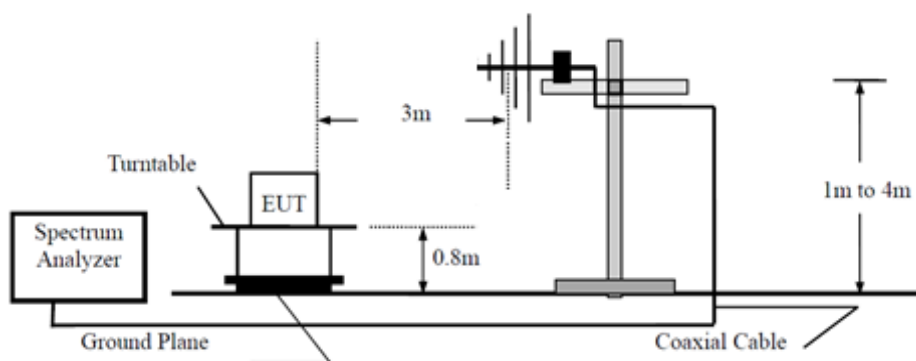


7.2 Radiated test setups

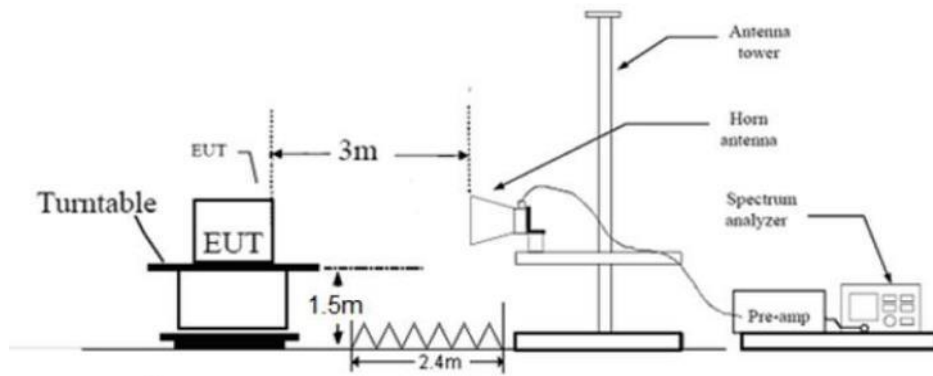
9KHz - 30MHz



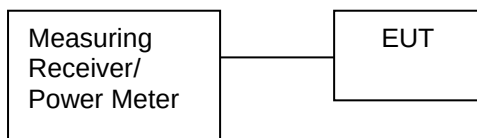
30MHz - 1GHz



Above 1GHz



7.3 Conducted RF test setups



8 Systems Test Configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
Laptop	Thinkpad	X230	0A72162

Test software information:

Test Software Version	RTLBTAPP
Modulation	Setting TX Power
GFSK	Default
$\pi/4$ -DQPSK	Default
8-DPSK	Default

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.

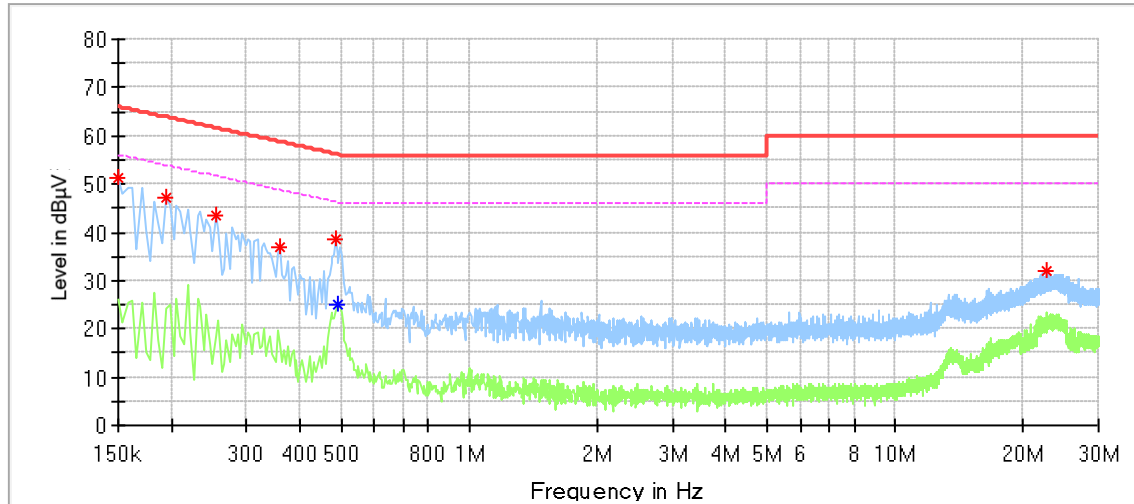
Limit

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 : AURIA
 M/N : FS2345
 Operating Condition : Transmit
 Test Specification : Line
 Comment : 5VDC Power by Laptop (AC 120V/60Hz)



Critical Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.150000	51.14	---	66.00	14.86	L1	9.52
0.194000	47.09	---	63.86	16.77	L1	9.54
0.254000	43.55	---	61.63	18.08	L1	9.56
0.358000	36.85	---	58.78	21.93	L1	9.57
0.486000	38.65	---	56.24	17.58	L1	9.59
0.494000	---	24.97	46.10	21.13	L1	9.59
22.726000	31.80	---	60.00	28.20	L1	10.05

Remark:

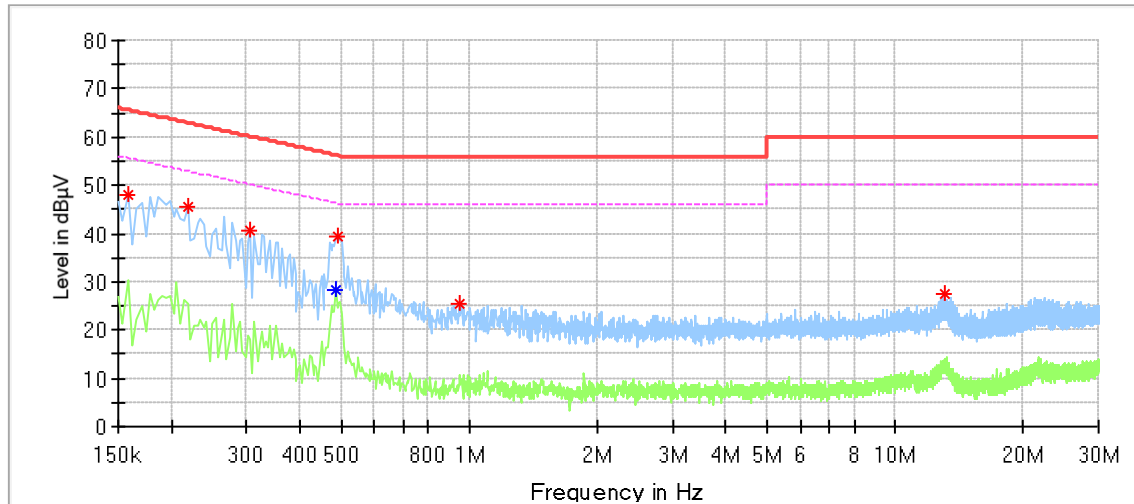
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

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

Conducted Emission

Product Type : AURIA
 M/N : FS2345
 Operating Condition : Transmit
 Test Specification : Neutral
 Comment : 5VDC Power by Laptop (AC 120V/60Hz)



Critical Freqs

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.158000	47.93	---	65.57	17.64	N	9.56
0.218000	45.35	---	62.90	17.55	N	9.58
0.306000	40.82	---	60.08	19.26	N	9.60
0.486000	---	28.35	46.24	17.89	N	9.62
0.490000	39.57	---	56.17	16.60	N	9.62
0.950000	25.38	---	56.00	30.62	N	9.63
13.042000	27.39	---	60.00	32.61	N	9.99

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 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 output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤0.125	≤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 Output Power & EIRP

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	5.28	<=30	Pass
		2441	DH5	5.11	<=30	Pass
		2480	DH5	4.64	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	6.49	<=30	Pass
		2441	2DH5	6.40	<=30	Pass
		2480	2DH5	5.97	<=30	Pass
8DPSK	SISO	2402	3DH5	7.09	<=30	Pass
		2441	3DH5	6.98	<=30	Pass
		2480	3DH5	6.50	<=30	Pass

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT2	Limit	
GFSK	SISO	2402	DH5	5.20	<=30	Pass
		2441	DH5	5.06	<=30	Pass
		2480	DH5	4.68	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	6.48	<=30	Pass
		2441	2DH5	6.33	<=30	Pass
		2480	2DH5	5.98	<=30	Pass
8DPSK	SISO	2402	3DH5	7.04	<=30	Pass
		2441	3DH5	6.94	<=30	Pass
		2480	3DH5	6.56	<=30	Pass

Mode	TX Type	Frequency (MHz)	Packet Type	EIRP (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	7.14	<=36	Pass
		2441	DH5	6.97	<=36	Pass
		2480	DH5	6.5	<=36	Pass
Pi/4DQPSK	SISO	2402	2DH5	8.35	<=36	Pass
		2441	2DH5	8.26	<=36	Pass
		2480	2DH5	7.83	<=36	Pass
8DPSK	SISO	2402	3DH5	8.95	<=36	Pass
		2441	3DH5	8.84	<=36	Pass
		2480	3DH5	8.36	<=36	Pass

Note: ANT1 gain is 1.86 dBi

Mode	TX Type	Frequency (MHz)	Packet Type	EIRP (dBm)		Verdict
				ANT2	Limit	
GFSK	SISO	2402	DH5	7.41	<=36	Pass
		2441	DH5	7.27	<=36	Pass
		2480	DH5	6.89	<=36	Pass
Pi/4DQPSK	SISO	2402	2DH5	8.69	<=36	Pass
		2441	2DH5	8.54	<=36	Pass
		2480	2DH5	8.19	<=36	Pass
8DPSK	SISO	2402	3DH5	9.25	<=36	Pass
		2441	3DH5	9.15	<=36	Pass
		2480	3DH5	8.77	<=36	Pass

Note: ANT2 gain is 2.21 dBi

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 = 1% to 5% of the OBW, VBW $\geq$ 3RBW,
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

Limit [kHz]

N/A

20 dB bandwidth and 99% Occupied Bandwidth

Test result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.969	/	Pass
		2441	DH5	1	0.974	/	Pass
		2480	DH5	1	0.969	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.304	/	Pass
		2441	2DH5	1	1.312	/	Pass
		2480	2DH5	1	1.319	/	Pass
8DPSK	SISO	2402	3DH5	1	1.289	/	Pass
		2441	3DH5	1	1.306	/	Pass
		2480	3DH5	1	1.300	/	Pass

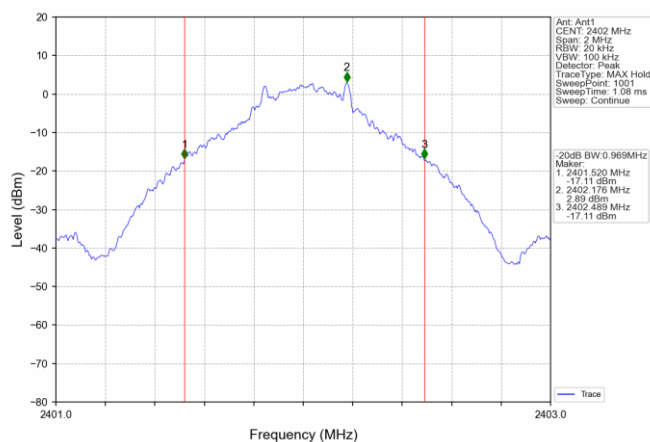
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	2	0.960	/	Pass
		2441	DH5	2	0.991	/	Pass
		2480	DH5	2	0.971	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	2	1.309	/	Pass
		2441	2DH5	2	1.304	/	Pass
		2480	2DH5	2	1.307	/	Pass
8DPSK	SISO	2402	3DH5	2	1.294	/	Pass
		2441	3DH5	2	1.299	/	Pass
		2480	3DH5	2	1.318	/	Pass

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.884	/	Pass
		2441	DH5	1	0.880	/	Pass
		2480	DH5	1	0.879	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.180	/	Pass
		2441	2DH5	1	1.177	/	Pass
		2480	2DH5	1	1.171	/	Pass
8DPSK	SISO	2402	3DH5	1	1.179	/	Pass
		2441	3DH5	1	1.185	/	Pass
		2480	3DH5	1	1.184	/	Pass

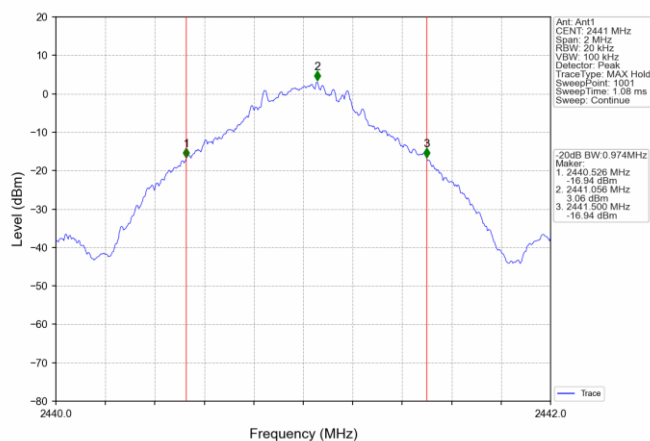
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	2	0.876	/	Pass
		2441	DH5	2	0.873	/	Pass
		2480	DH5	2	0.879	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	2	1.168	/	Pass
		2441	2DH5	2	1.181	/	Pass
		2480	2DH5	2	1.173	/	Pass
8DPSK	SISO	2402	3DH5	2	1.178	/	Pass
		2441	3DH5	2	1.178	/	Pass
		2480	3DH5	2	1.177	/	Pass

20 dB Bandwidth

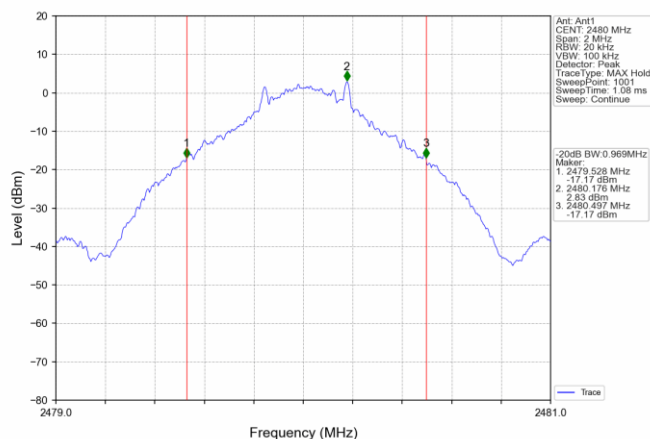
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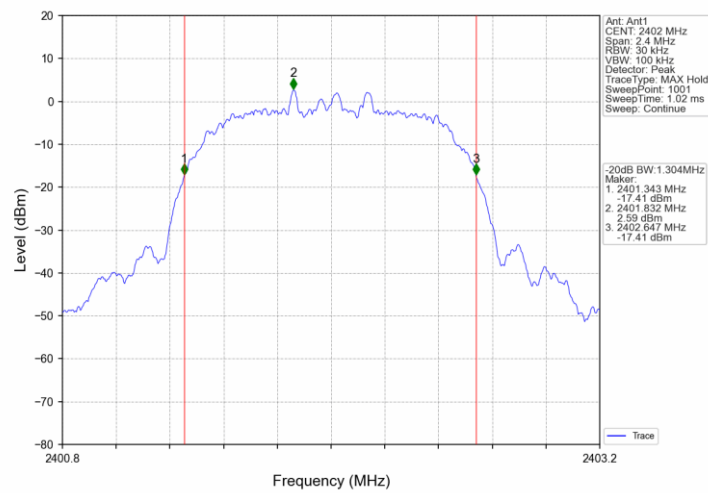
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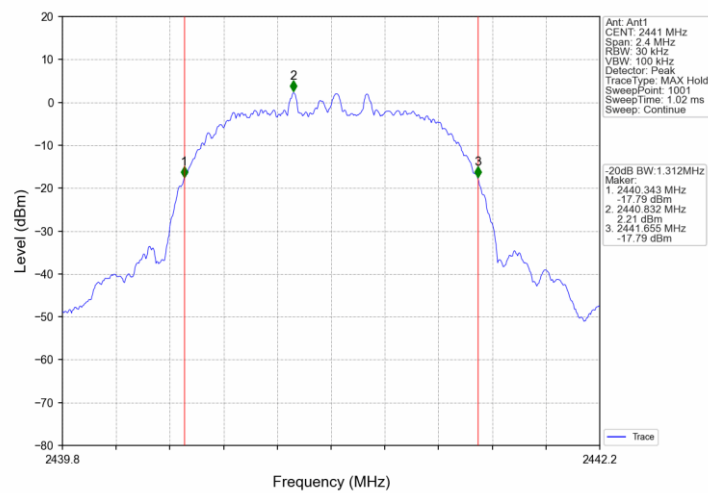
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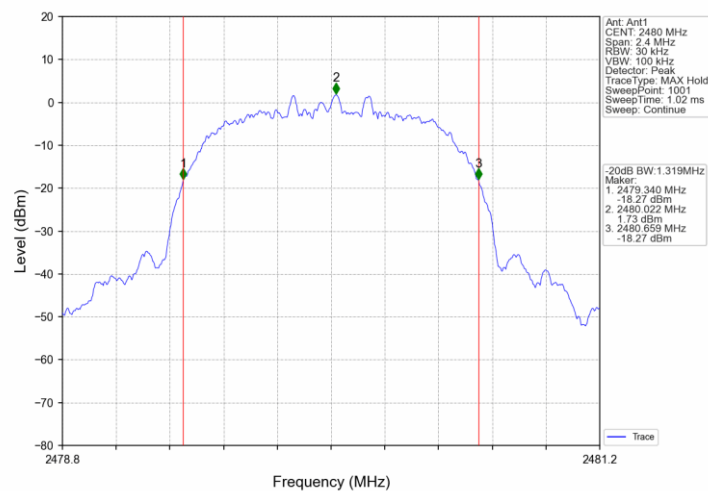
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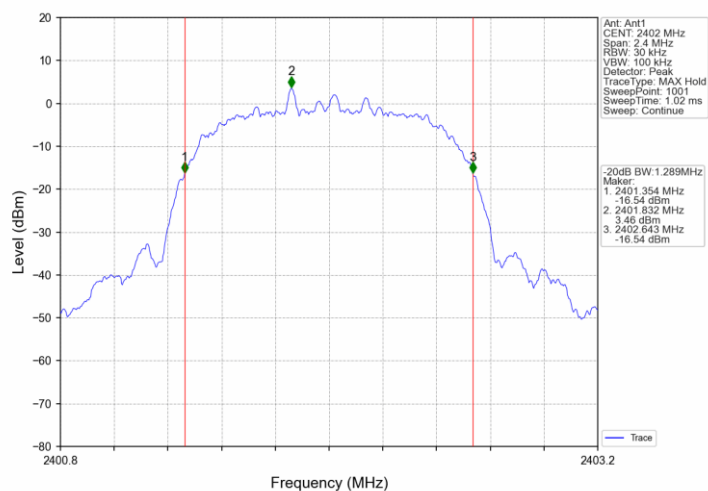
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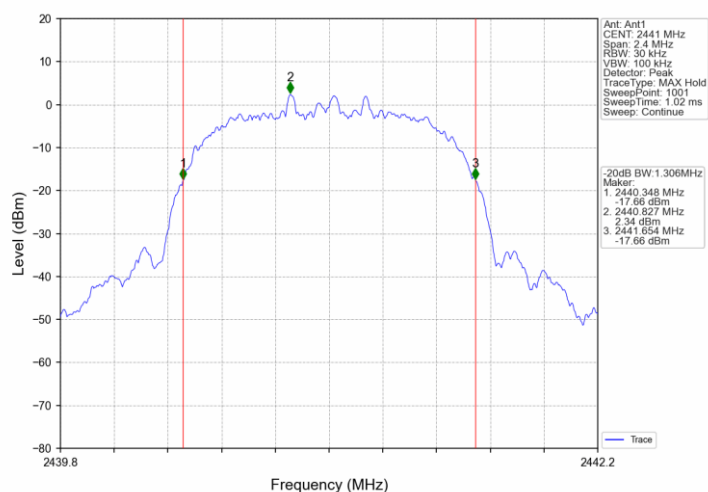
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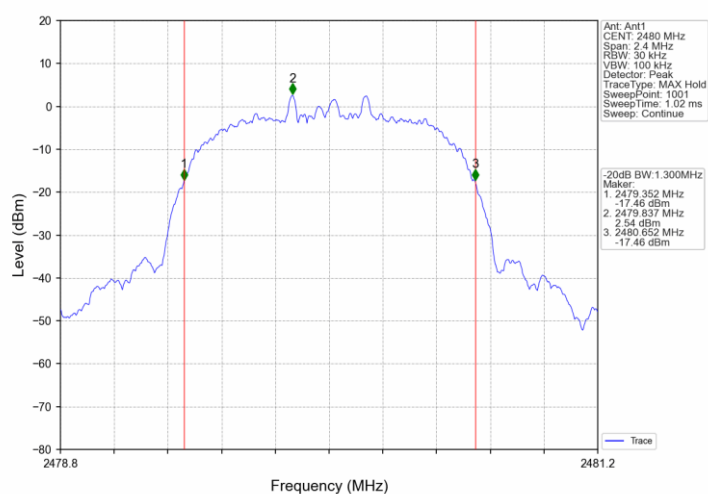
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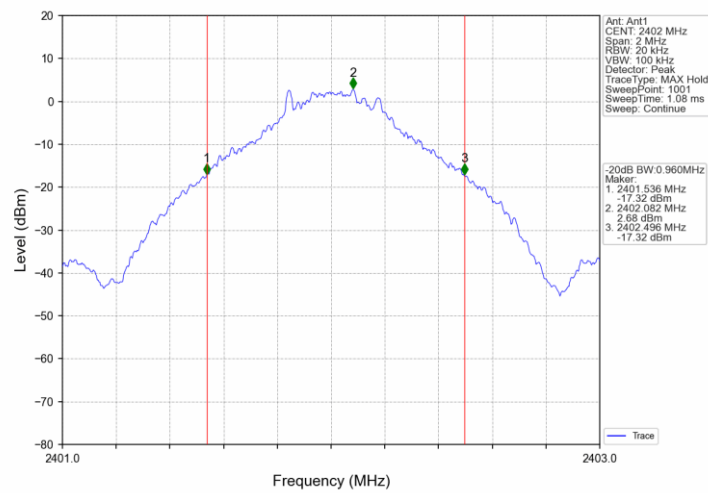
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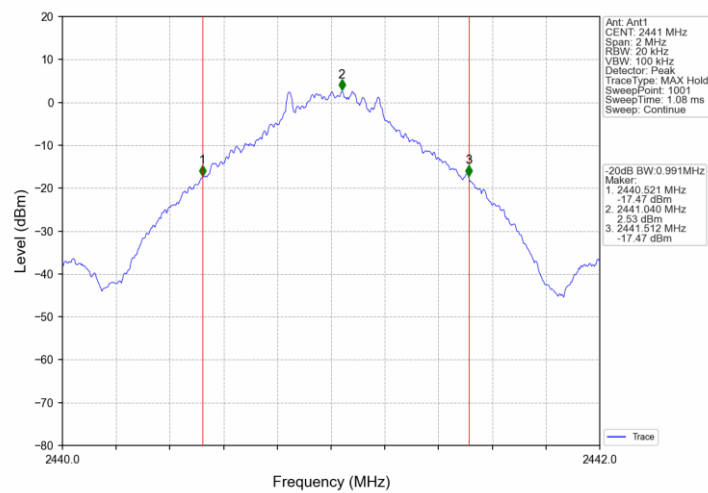
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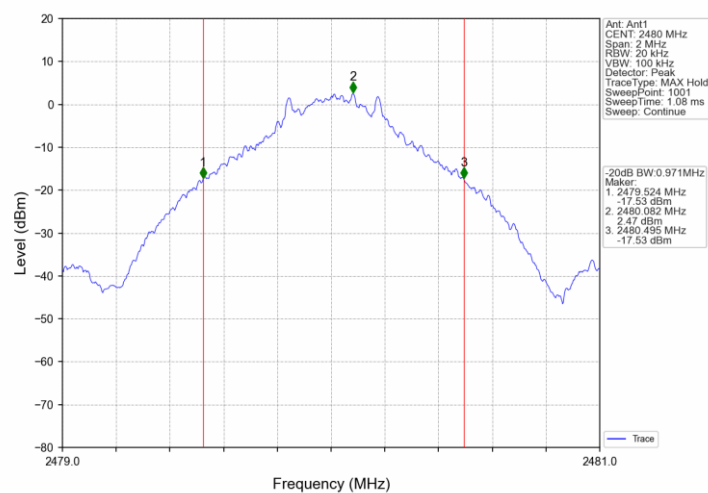
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GFSK_DH5_MCH_2441MHz_Ant2_NTNV

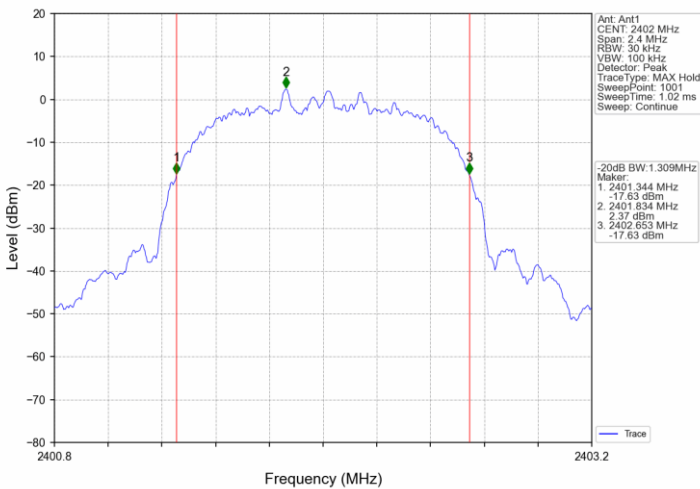


GFSK_DH5_HCH_2480MHz_Ant2_NTNV

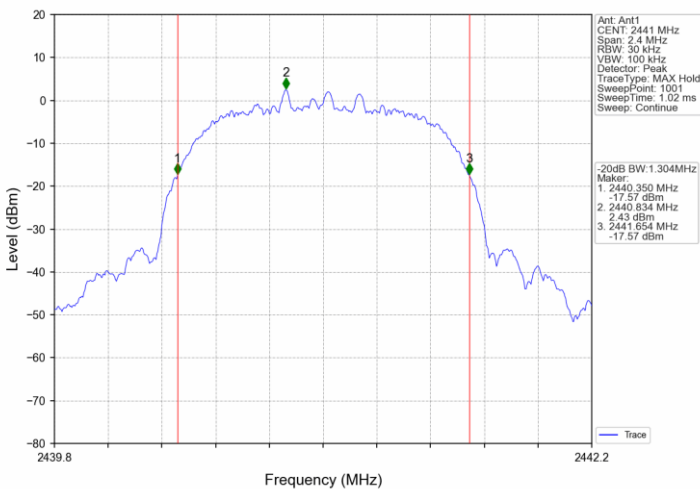




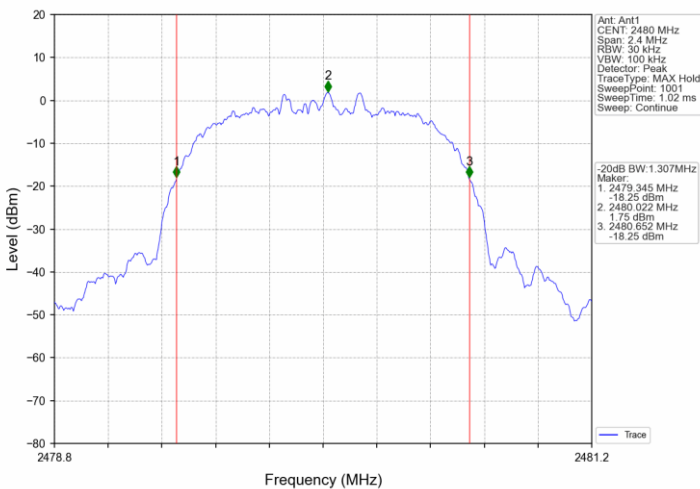
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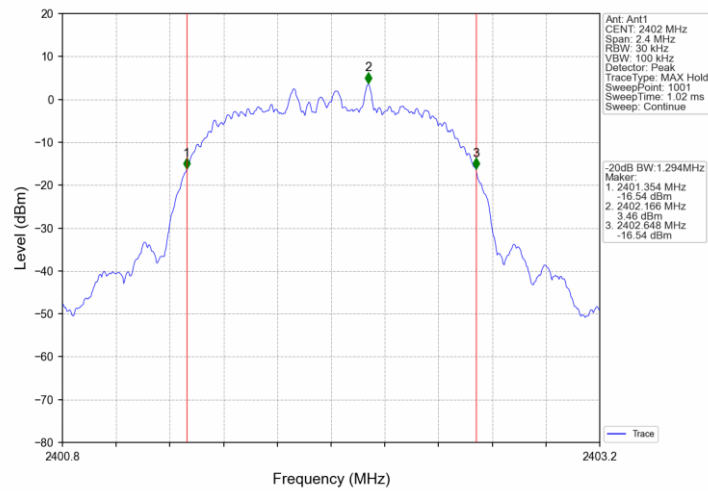
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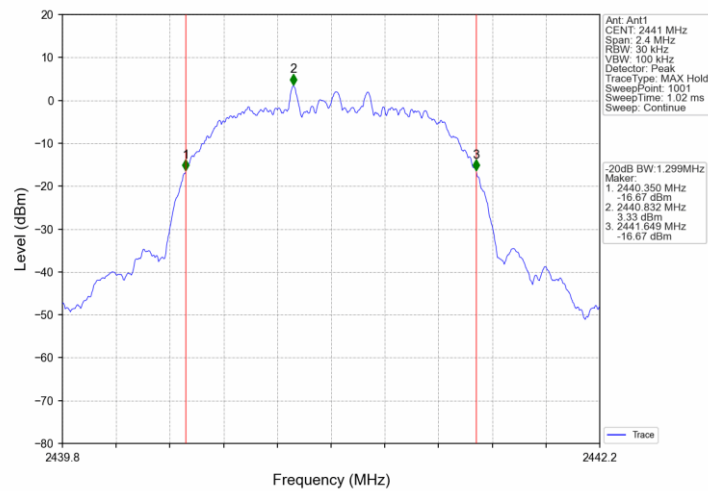
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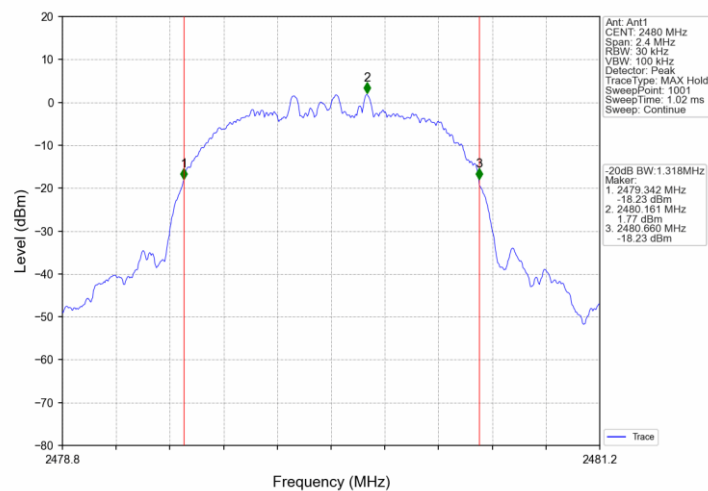
8DPSK_3DH5_LCH_2402MHz_Ant2_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant2_NTNV

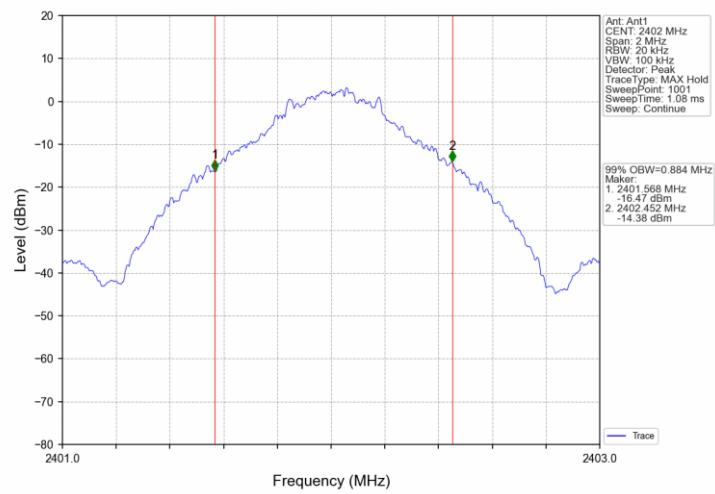


8DPSK_3DH5_HCH_2480MHz_Ant2_NTNV

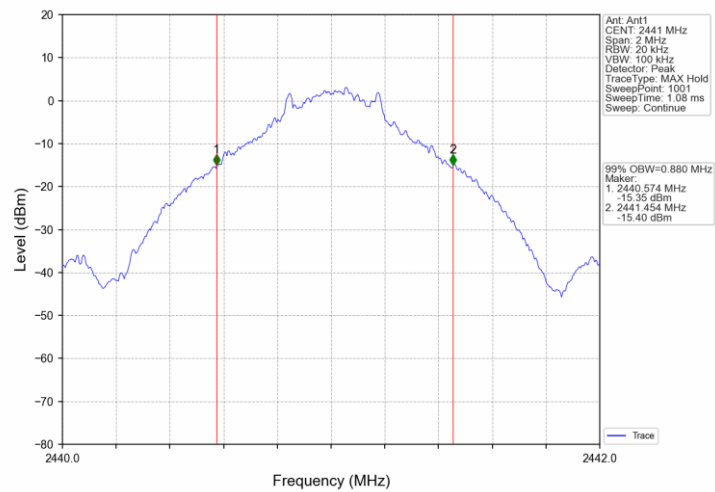


99% Occupied Bandwidth

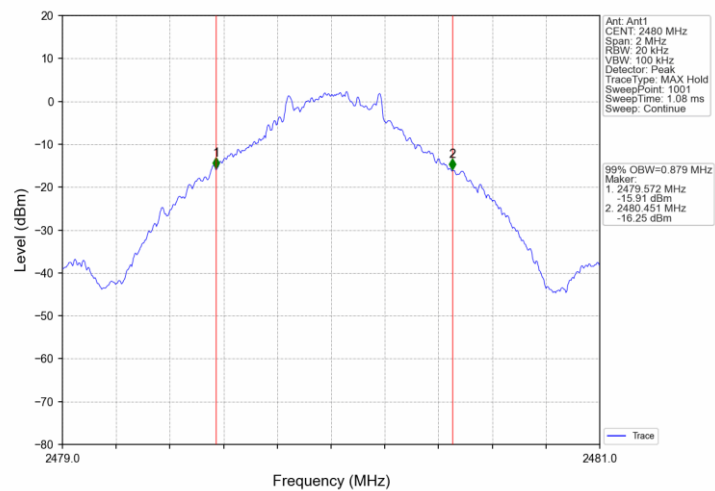
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



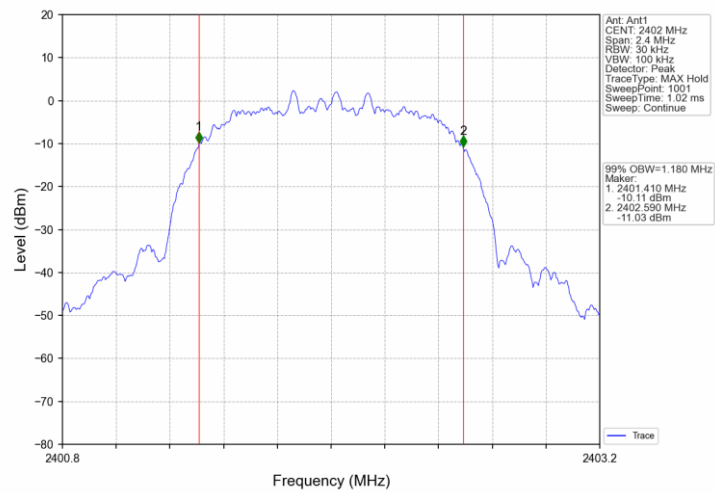
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



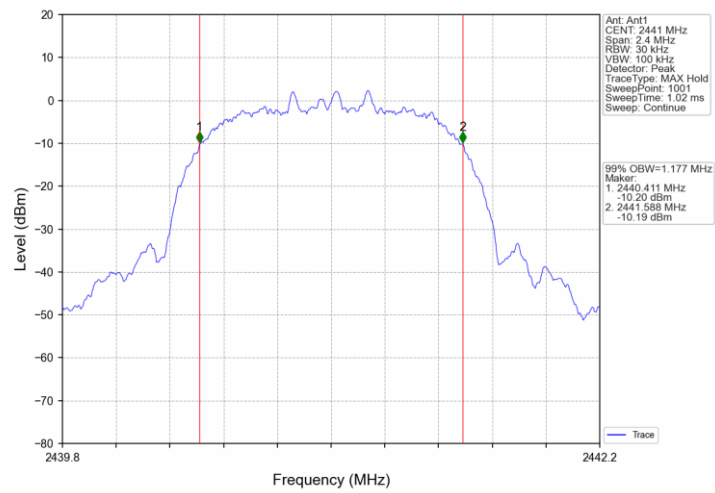
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



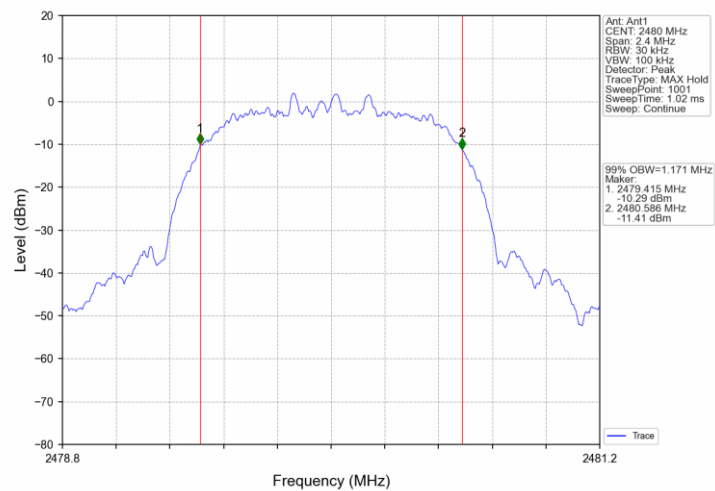
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



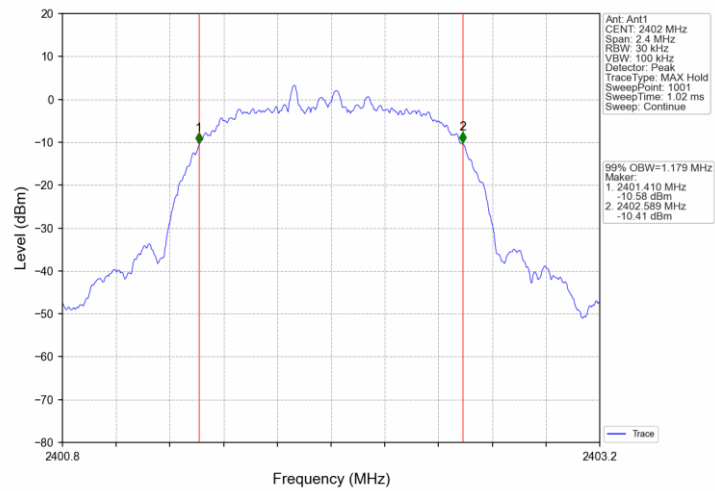
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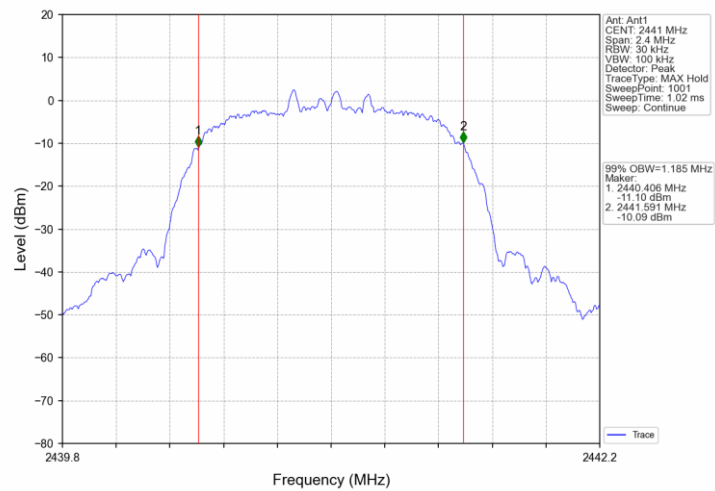
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



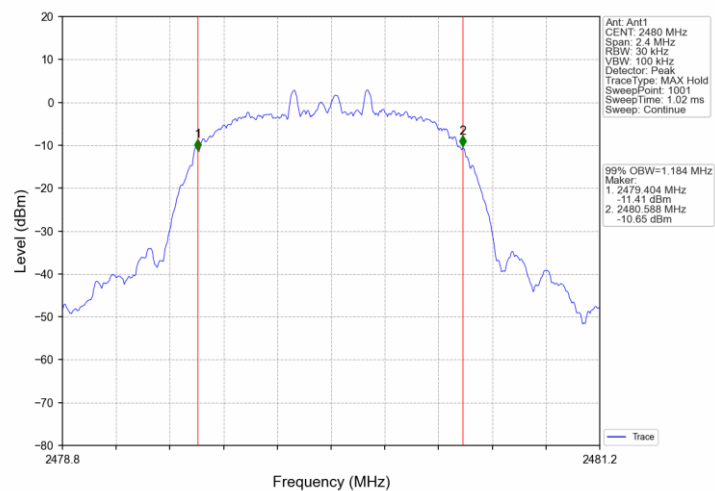
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



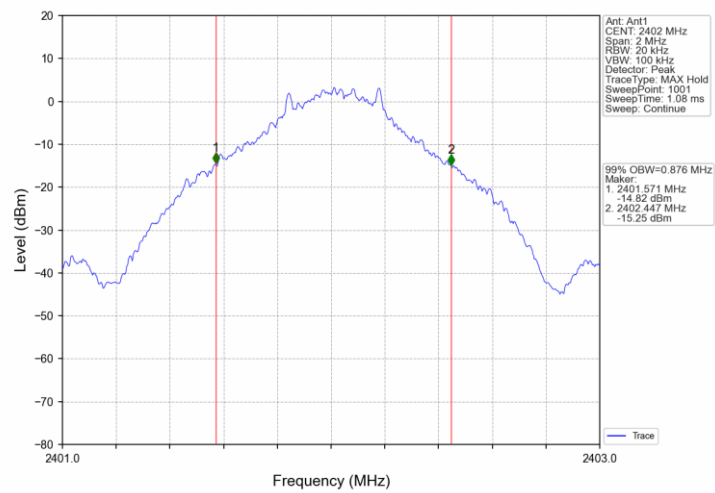
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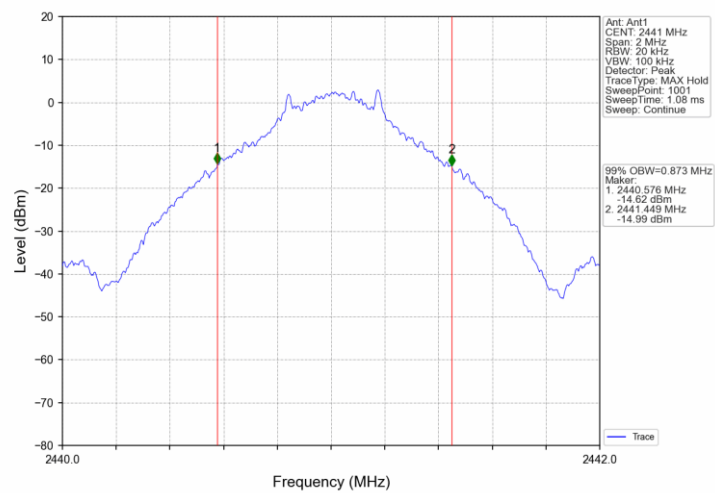
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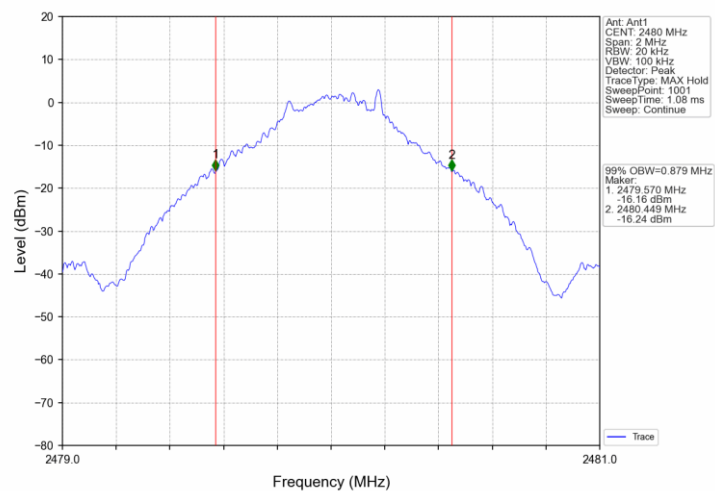
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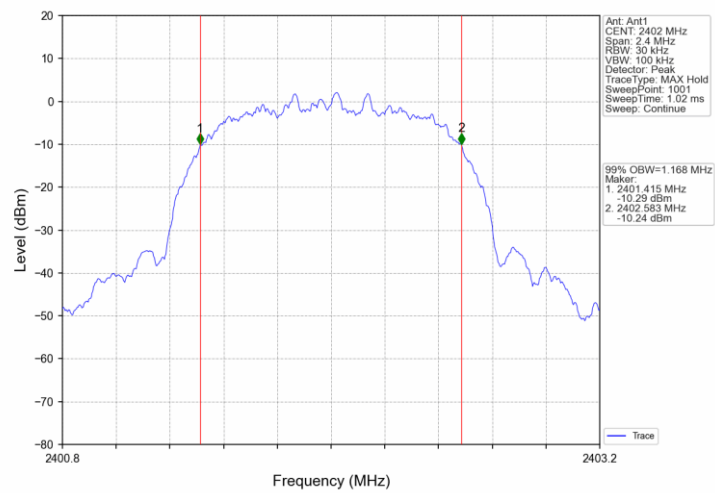
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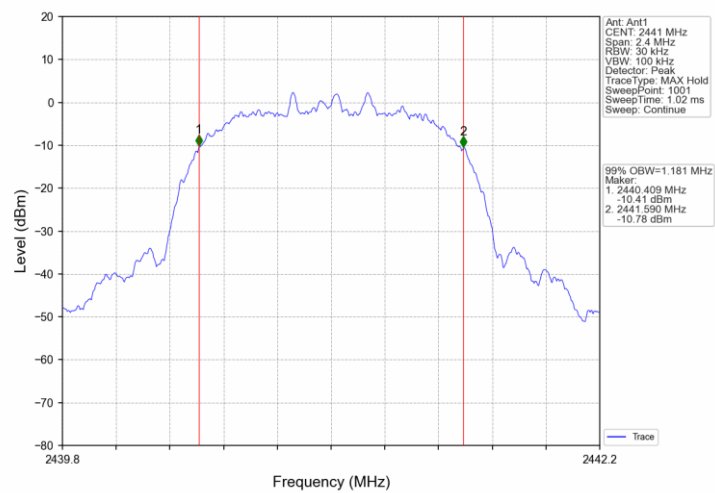
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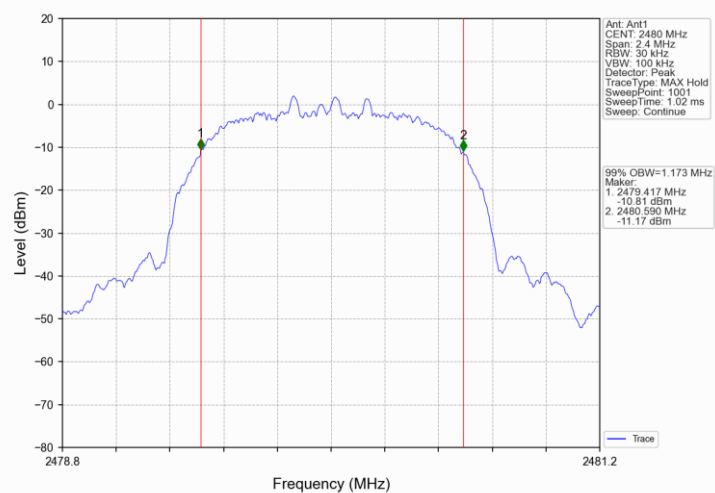
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant2_NTNV



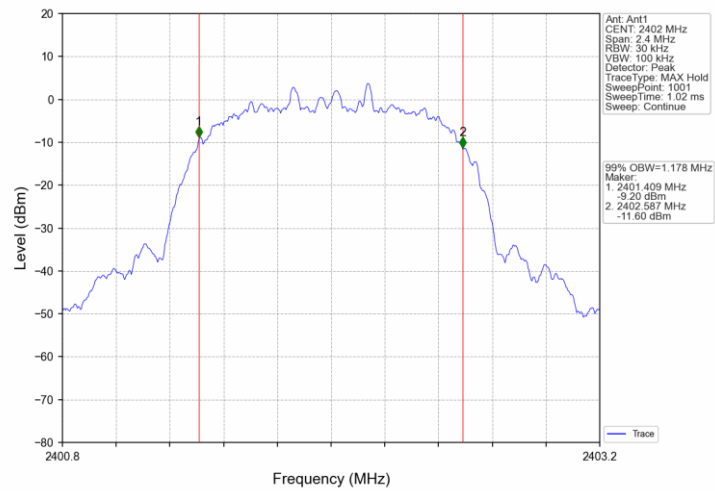
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant2_NTNV



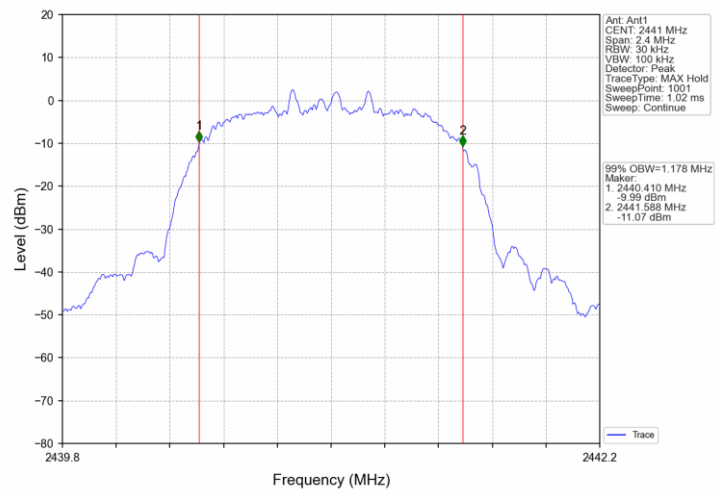
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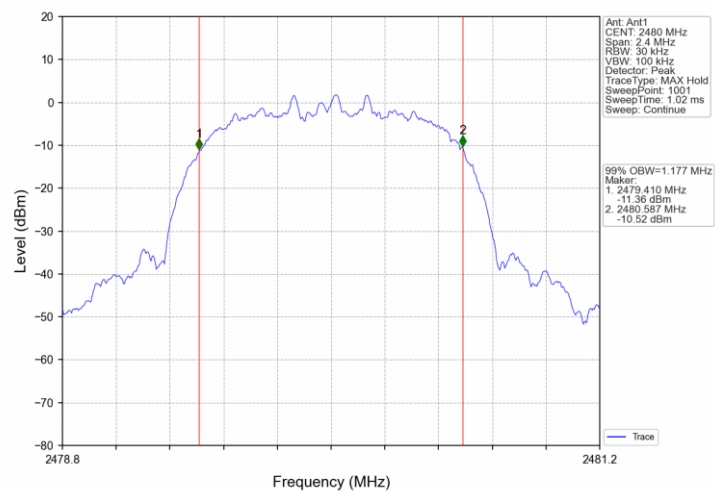
8DPSK_3DH5_LCH_2402MHz_Ant2_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant2_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant2_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

Limit
kHz

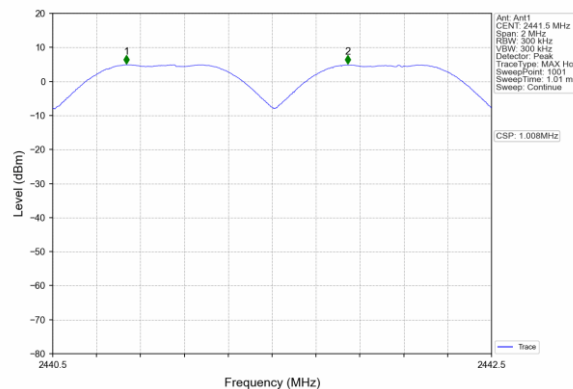
$\geq 25\text{kHz}$ or $2/3$ of the 20 dB bandwidth which is greater

Carrier Frequency Separation

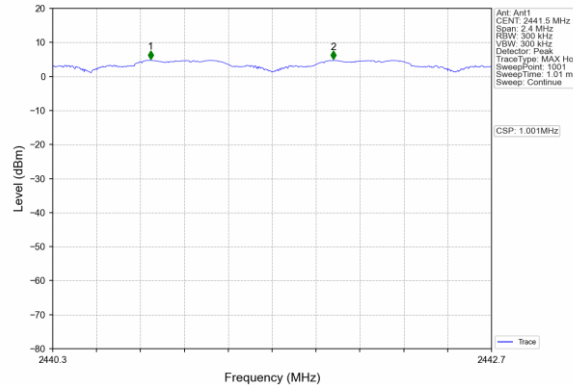
Test result: The measurement was performed with the typical configuration (normal hopping status).

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.008	0.974	≥ 0.649	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.319	≥ 0.879	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.306	≥ 0.871	Pass

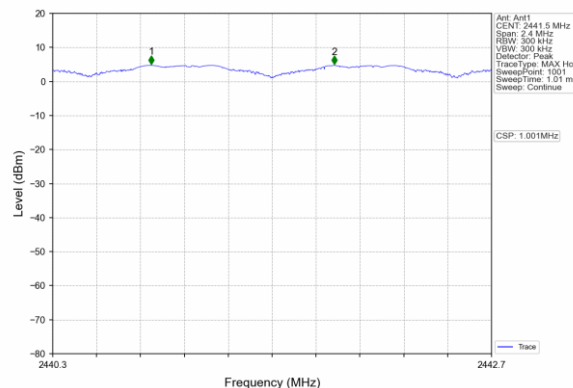
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV

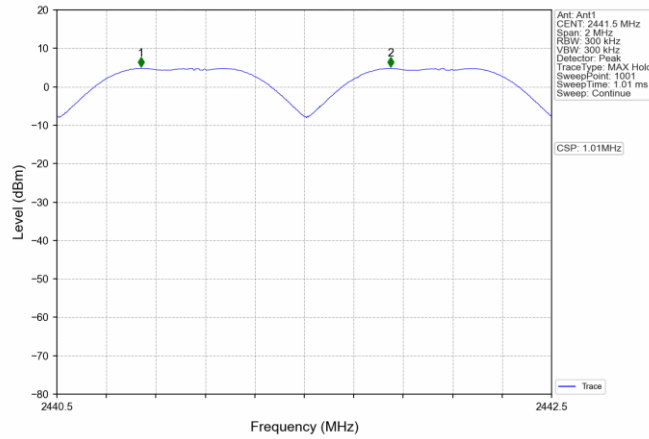


8DPSK_3DH5_HOPP_Ant1_NTNV

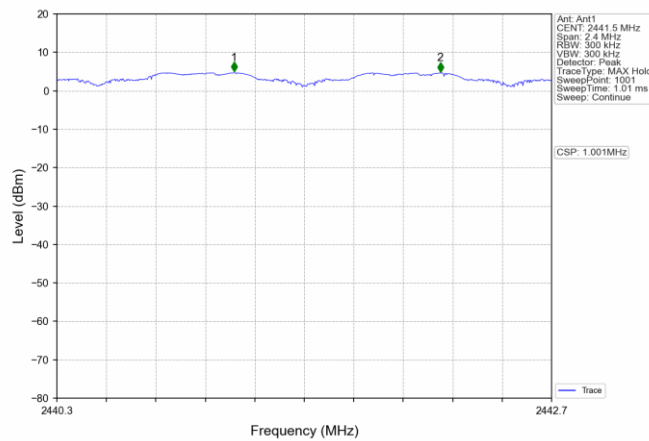


Ant2							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.010	0.991	≥ 0.660	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.309	≥ 0.873	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.318	≥ 0.879	Pass

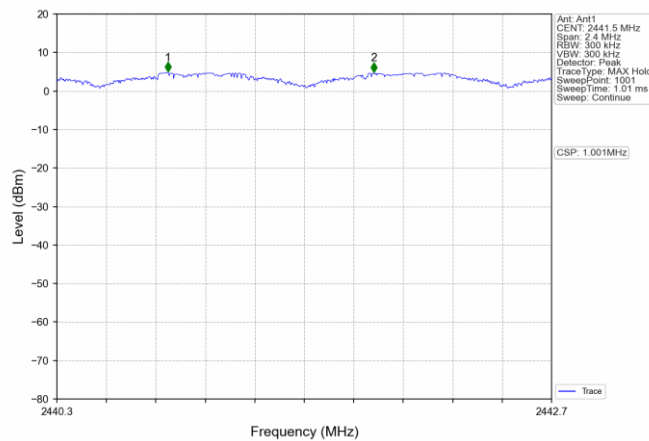
GFSK_DH5_HOPP_Ant2_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant2_NTNV



8DPSK_3DH5_HOPP_Ant2_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

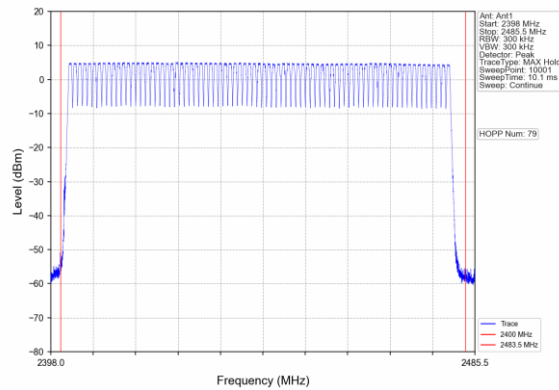
Limit
number

 ≥ 15

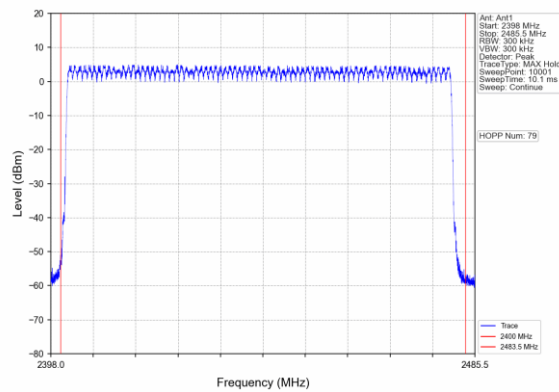
Number of Hopping Frequencies

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

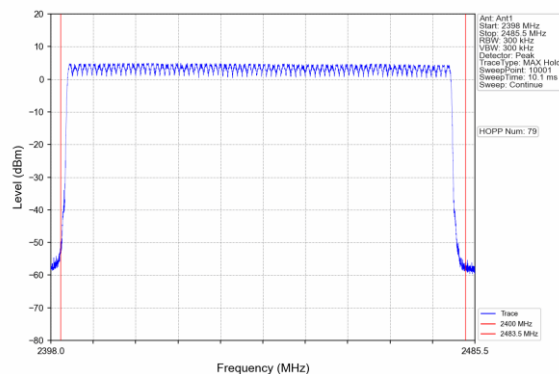
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV

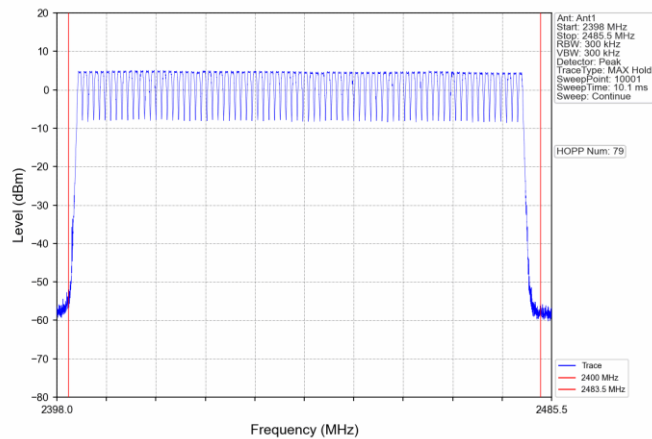


8DPSK_3DH5_HOPP_Ant1_NTNV

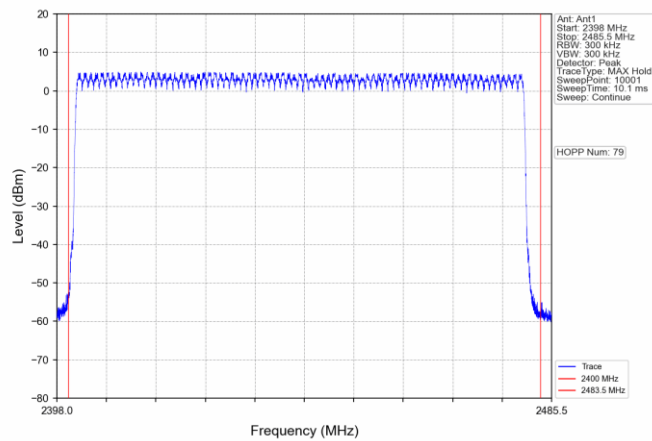


Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT2	Limit	
GFSK	SISO	HOPP	DH5	79	≥ 15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	≥ 15	Pass
8DPSK	SISO	HOPP	3DH5	79	≥ 15	Pass

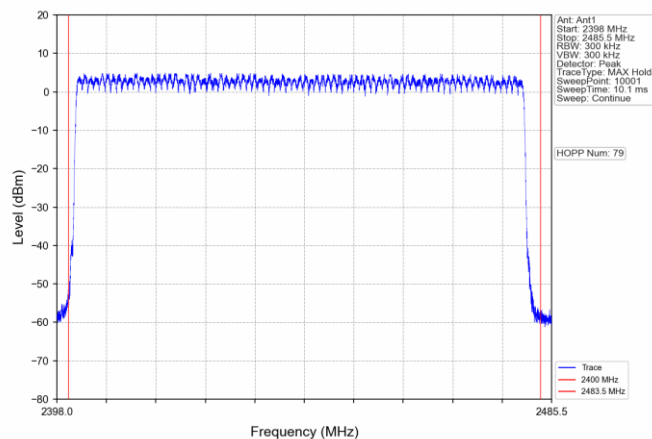
GFSK DH5 HOPP Ant2 NTN



Pi/4DQPSK 2DH5 HOPP Ant2 NTN



8DPSK 3DH5 HOPP Ant2 NTN



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

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.

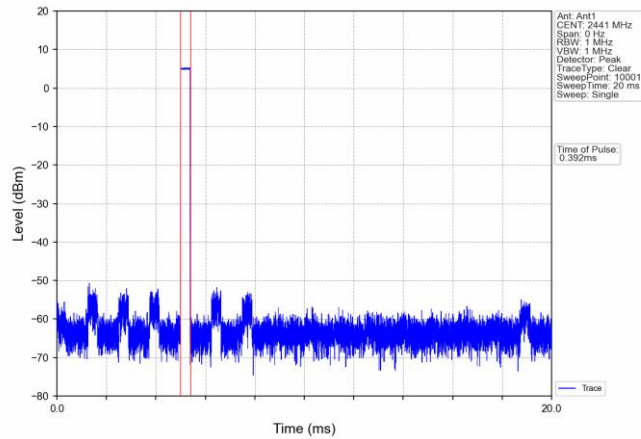
According to the Bluetooth Core Specification, the worse result (DH5, 2DH5, 3DH5 mode) was reported to show compliance.

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

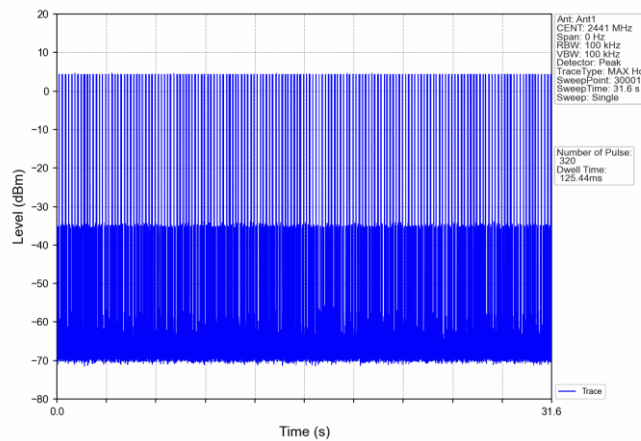
The Dwell Time = Burst Width * Total Hops.

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	0.392	31.600	320	125.440	<=400	Pass
			DH3	1.640	31.600	164	268.960	<=400	Pass
			DH5	2.896	31.600	101	292.496	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.400	31.600	320	128.000	<=400	Pass
			2DH3	1.648	31.600	168	276.864	<=400	Pass
			2DH5	2.902	31.600	120	348.240	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.396	31.600	320	126.720	<=400	Pass
			3DH3	1.646	31.600	149	245.254	<=400	Pass
			3DH5	2.904	31.600	100	290.400	<=400	Pass

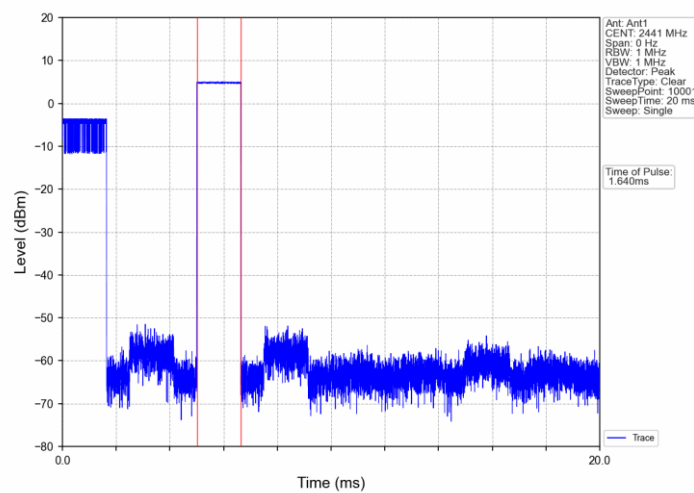
GFSK_DH1_HOPP_Ant1_NTNV



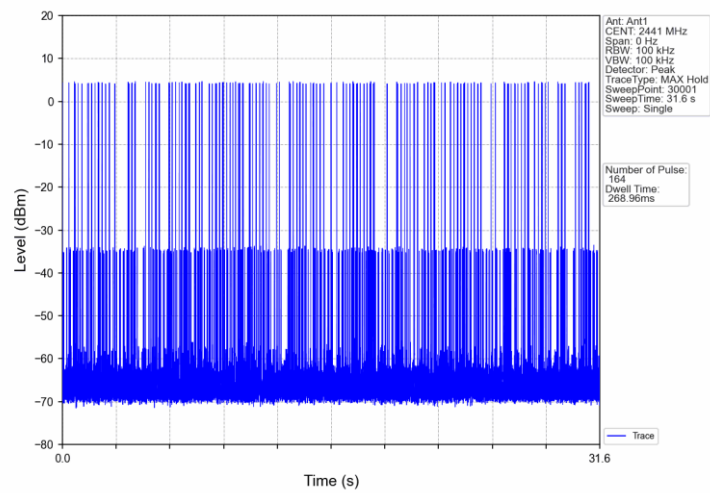
GFSK_DH1_HOPP_Ant1_NTNV



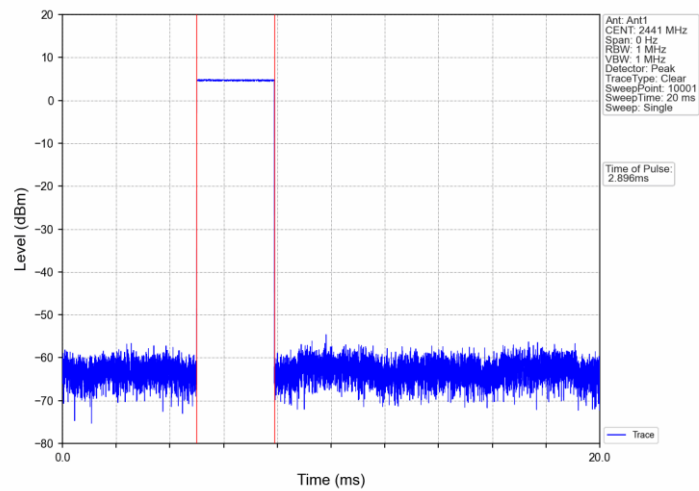
GFSK_DH3_HOPP_Ant1_NTNV



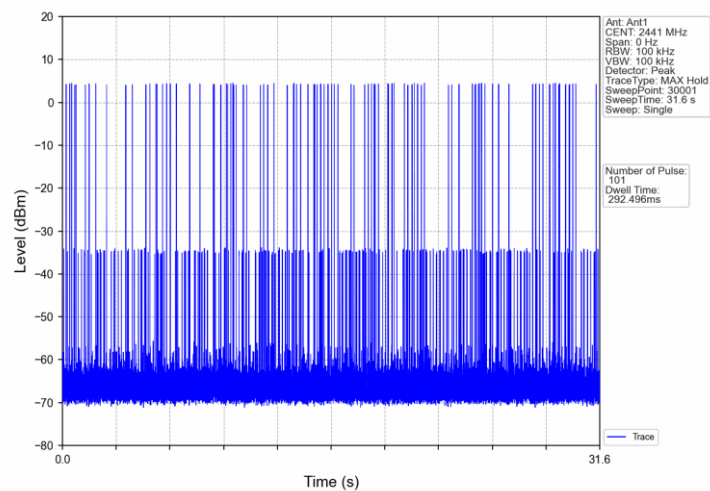
GFSK_DH3_HOPP_Ant1_NTNV



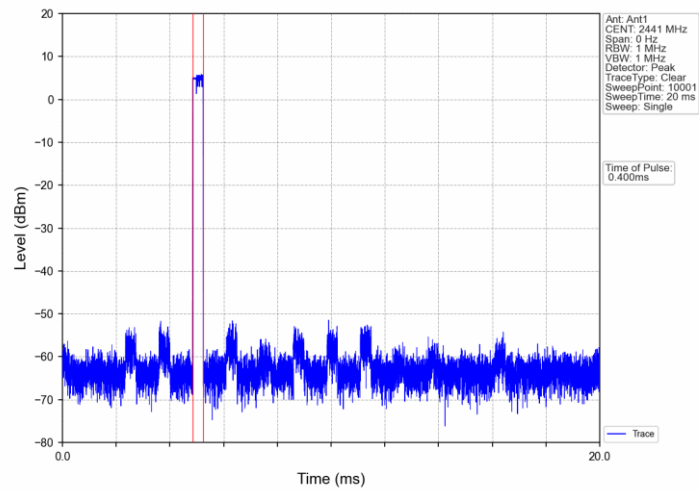
GFSK_DH5_HOPP_Ant1_NTNV



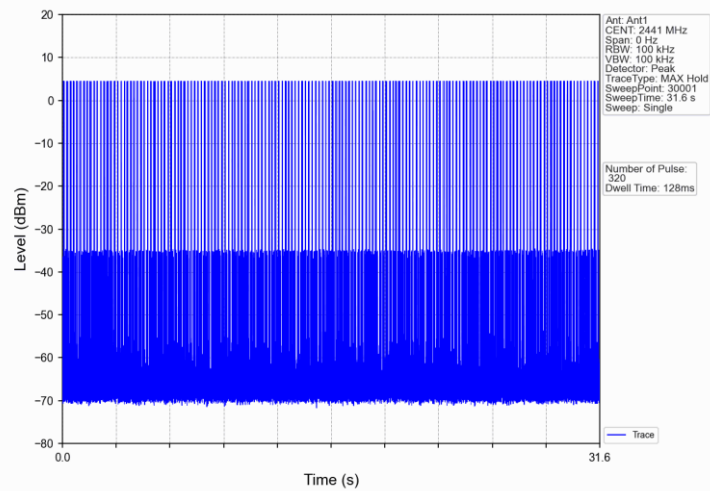
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV

