TEST REPORT

Report No.:	TW2302203-01E
Applicant:	Shenzhen Bilian Electronic Co.,Ltd.
Product:	802.11b/g/n 1T1R WLAN + Bluetooth 4.2 USB Module
Model No.:	BL-M8723DU4
Trademark:	N/A
Test Standards:	FCC Part 15.247
Test result:	It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility

Approved By:

Terry Tang

Manager

Dated: March 02, 2023

Results appearing herein relate only to the sample tested

The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com

Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

CAB identifier: CN0033

Test Report Conclusion

Content

1.0 **General Details**

1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.

Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Telephone: (755) 83448688

Fax: (755) 83442996

1.2 Applicant Details

Applicant: Shenzhen Bilian Electronic Co.,Ltd.

Address: Room 501, Building 3, No. 32, Dafu Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen City

Telephone: --

Fax: --

1.3 Description of EUT

Product: 802.11b/g/n 1T1R WLAN + Bluetooth 4.2 USB Module

Manufacturer: Shenzhen Bilian Electronic Co.,Ltd.

Address: Room 501, Building 3, No. 32, Dafu Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen City

Trademark: N/A

Model Number: BL-M8723DU4

Additional Model Number: N/A

Hardware Version: 1.0

Software Version: 1.15

Serial No.: LB202303130001

Type of Modulation	GFSK, π/4DQPSK, 8DPSK for Bluetooth
Frequency range	2402-2480MHz for Bluetooth
Channel Spacing	1MHz for Bluetooth
Frequency Selection	By software
Channel Number	79 channels for Bluetooth
Antenna:	PIFA Antenna. The gain of the antennas is 0.2dBi (Get from the antenna specification provided the manufacturer)
Input Voltage:	DC5.0V

1.4 Submitted Sample: 2 Samples

1.5 Test Duration

2023-02-20 to 2023-03-02

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Occupied Channel Bandwidth Uncertainty =5%

Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

The sample tested by _____

Print Name: Andy King

2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2022-07-15	2023-07-14
LISN	R&S	EZH3-Z5	100294	2022-07-18	2023-07-17
LISN	R&S	EZH3-Z5	100253	2022-07-18	2023-07-17
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2022-07-18	2023-07-17
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2022-07-15	2023-07-14
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2024-07-17
Power meter	Anritsu	ML2487A	6K00003613	2022-07-18	2023-07-17
Power sensor	Anritsu	MA2491A	32263	2022-07-18	2023-07-17
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2022-07-15	2023-07-14
EMI Test Receiver	RS	ESCS 30	834115/006	2022-07-15	2023-07-14
Spectrum	HP/Agilent	E4407B	MY50441392	2022-07-15	2023-07-14
Spectrum	RS	FSP	1164.4391.38	2022-07-15	2023-07-14
RF Cable	Zhengdi	ZT26-NJ-NJ-8M/FA	--	2022-07-15	2023-07-14
RF Cable	Zhengdi	7m	--	2022-07-15	2023-07-14
Pre-Amplifier	Schwarebeck	BBV9743	#218	2022-07-15	2023-07-14
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2022-07-15	2023-07-14
LISN	SCHAFFNER	NNB42	00012	2022-08-18	2023-07-17
ESPI Test Receiver	R&S	ESPI 3	100379	2022-07-15	2023-07-14
LISN	R&S	EZH3-Z5	100294	2022-07-18	2023-07-17

2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

Requirement	CFR 47 Section	Result	Notes
Antenna Requirement	15.203, 15.247(b)(4)	Pass	Complies
Maximum Peak Out Power	15.247 (b)(1), (4)	Pass	Complies
Carrier Frequency Separation	15.247(a)(1)	Pass	Complies
20dB Channel Bandwidth	15.247 (a)(1)	Pass	Complies
Number of Hopping Channels	15.247(a)(iii), 15.247(b)(1)	Pass	Complies
Time of Occupancy (Dwell Time)	15.247(a)(iii)	Pass	Complies
Spurious Emission, Band Edge, and Restricted bands	15.247(d),15.205(a), 15.209 (a),15.109	Pass	Complies
Conducted Emissions	15.207(a)，15.107	Pass	Complies
RF Exposure	15.247(i), 1.1307(b)(1)	Pass	Complies

3.2 Test Standards

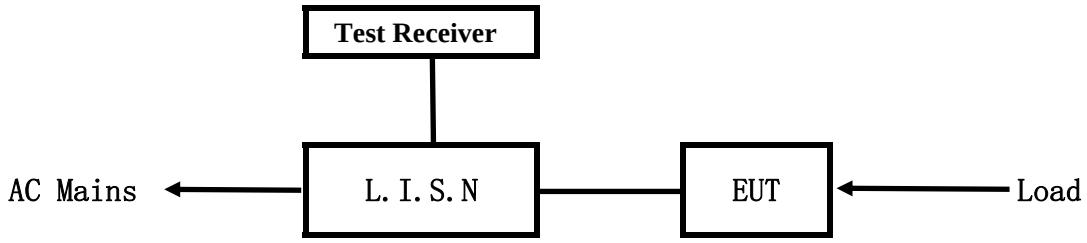
FCC Part 15 Subpart & Subpart C, Paragraph 15.247

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

5. Power Line Conducted Emission Test

5.1 Schematics of the test



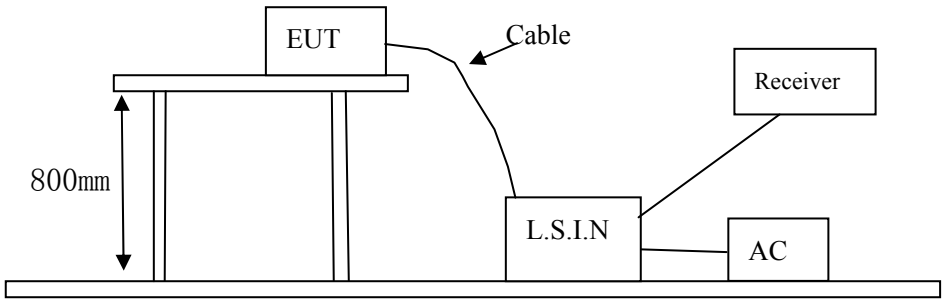
EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013.The Frequency spectrum from 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10–2013.

Test Voltage: 120V~ 60Hz

Block diagram of Test setup



5.3 Configuration of the EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
802.11b/g/n 1T1R WLAN + Bluetooth 4.2 USB Module	Shenzhen Bilian Electronic Co.,Ltd.	BL-M8723DU4	2AL6K-BL-M8723DU4

B. Internal Device

Device	Manufacturer	Model	Rating

C. Peripherals

Device	Manufacturer	Model	Rating
PC	Dell	P54G	DC19V, 3.3A

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ～ 0.50	66.0～56.0*	56.0～46.0*
0.50 ～ 5.00	56.0	46.0
5.00 ～ 30.00	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

A: Conducted Emission on Live Terminal (150kHz to 30MHz)

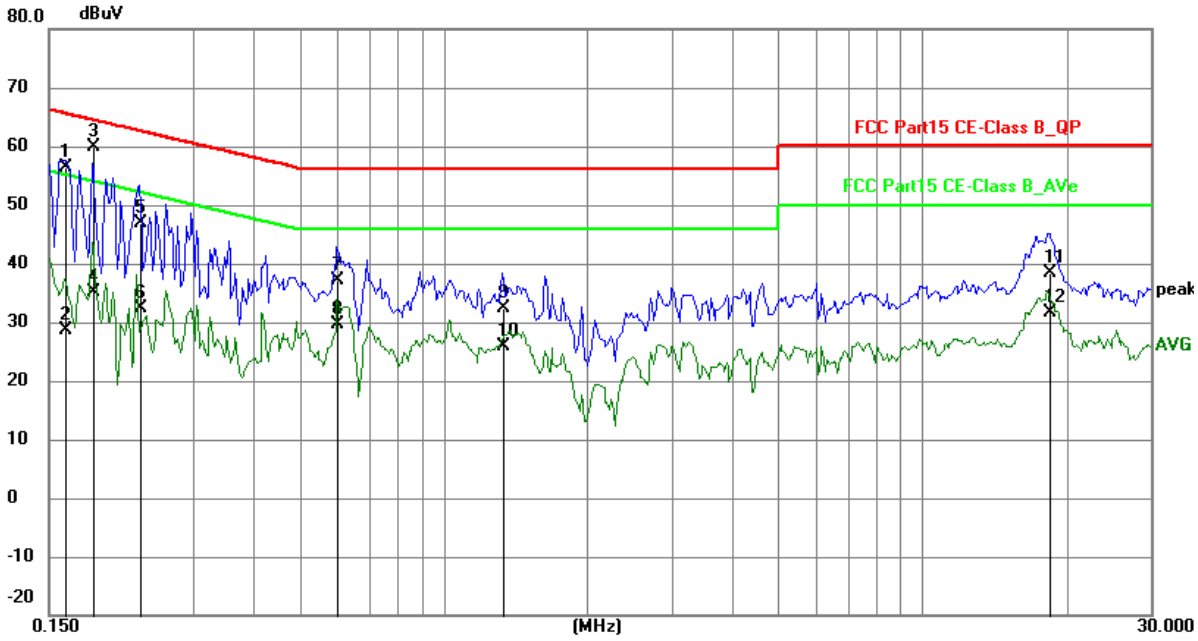
EUT Operating Environment

Temperature: 26℃ Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep Bluetooth Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1617	46.68	9.78	56.46	65.38	-8.92	QP	P
2	0.1617	18.88	9.78	28.66	55.38	-26.72	AVG	P
3	0.1850	50.08	9.76	59.84	64.26	-4.42	QP	P
4	0.1850	25.48	9.76	35.24	54.26	-19.02	AVG	P
5	0.2319	37.08	9.75	46.83	62.38	-15.55	QP	P
6	0.2319	22.69	9.75	32.44	52.38	-19.94	AVG	P
7	0.5985	27.37	9.77	37.14	56.00	-18.86	QP	P
8	0.5985	19.81	9.77	29.58	46.00	-16.42	AVG	P
9	1.3239	22.70	9.79	32.49	56.00	-23.51	QP	P
10	1.3239	16.14	9.79	25.93	46.00	-20.07	AVG	P
11	18.3933	27.81	10.58	38.39	60.00	-21.61	QP	P
12	18.3933	21.15	10.58	31.73	50.00	-18.27	AVG	P

B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)

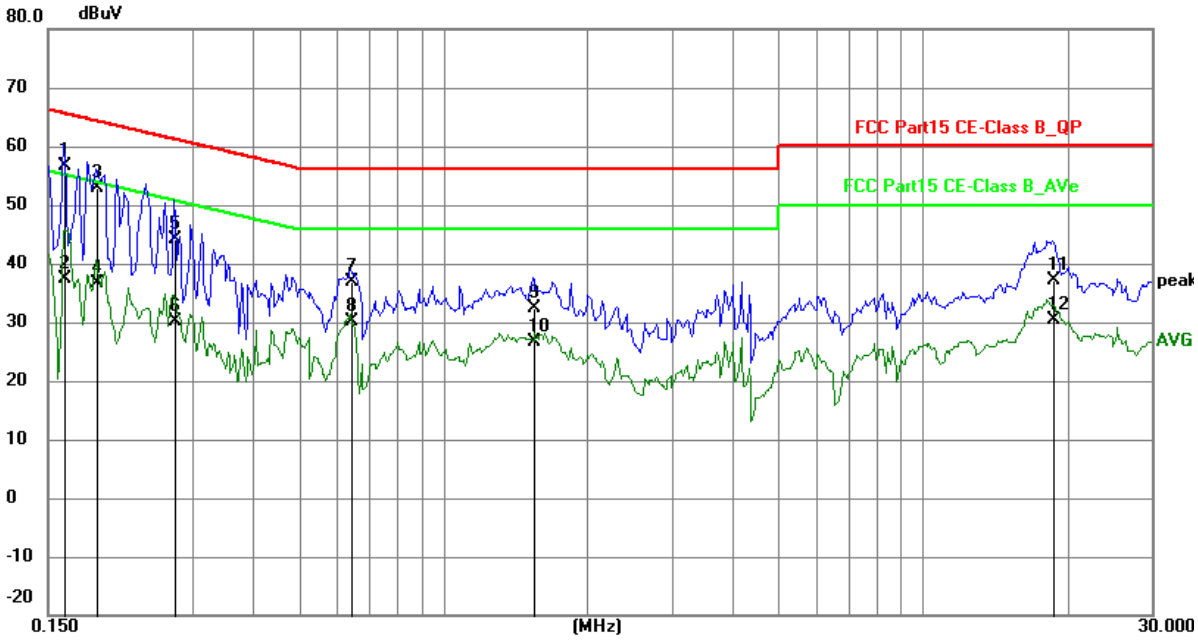
EUT Operating Environment

Temperature: 26℃ Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep Bluetooth Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1617	46.88	9.78	56.66	65.38	-8.72	QP	P
2	0.1617	27.62	9.78	37.40	55.38	-17.98	AVG	P
3	0.1890	43.16	9.76	52.92	64.08	-11.16	QP	P
4	0.1890	26.81	9.76	36.57	54.08	-17.51	AVG	P
5	0.2748	34.35	9.75	44.10	60.97	-16.87	QP	P
6	0.2748	20.36	9.75	30.11	50.97	-20.86	AVG	P
7	0.6414	27.13	9.78	36.91	56.00	-19.09	QP	P
8	0.6414	20.33	9.78	30.11	46.00	-15.89	AVG	P
9	1.5423	22.54	9.80	32.34	56.00	-23.66	QP	P
10	1.5423	16.77	9.80	26.57	46.00	-19.43	AVG	P
11	18.6623	26.45	10.60	37.05	60.00	-22.95	QP	P
12	18.6623	19.85	10.60	30.45	50.00	-19.55	AVG	P

6 Radiated Emission Test

6.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189

(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.

(3) The frequency spectrum from 30 MHz to 25GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements were made at 3 meters.

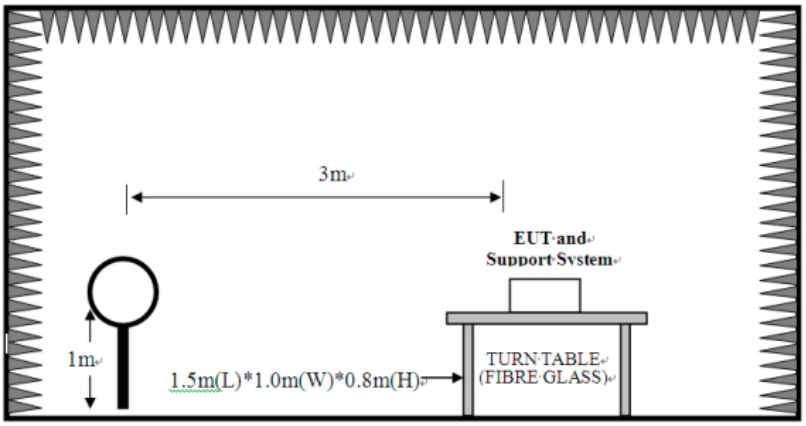
(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "**QP**" in the data table.

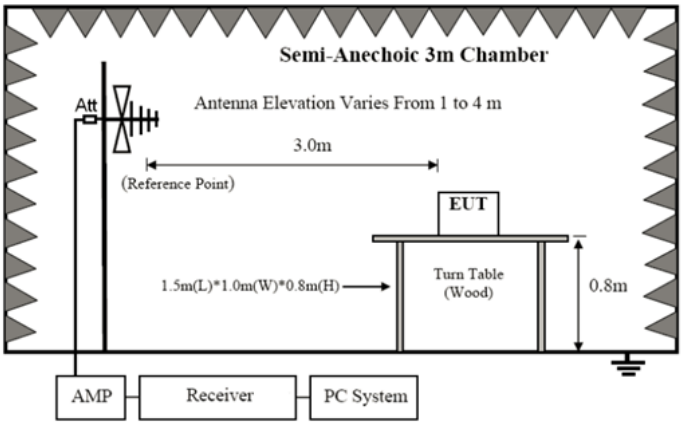
(6) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

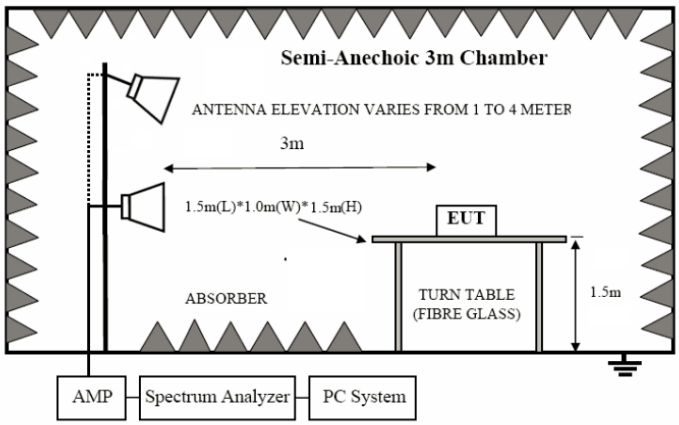
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



6.2 Configuration of the EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the higher limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

4. 8DPSK was the worst case because it has highest output power

Test result

General Radiated Emission Data and Harmonics Radiated Emission Data

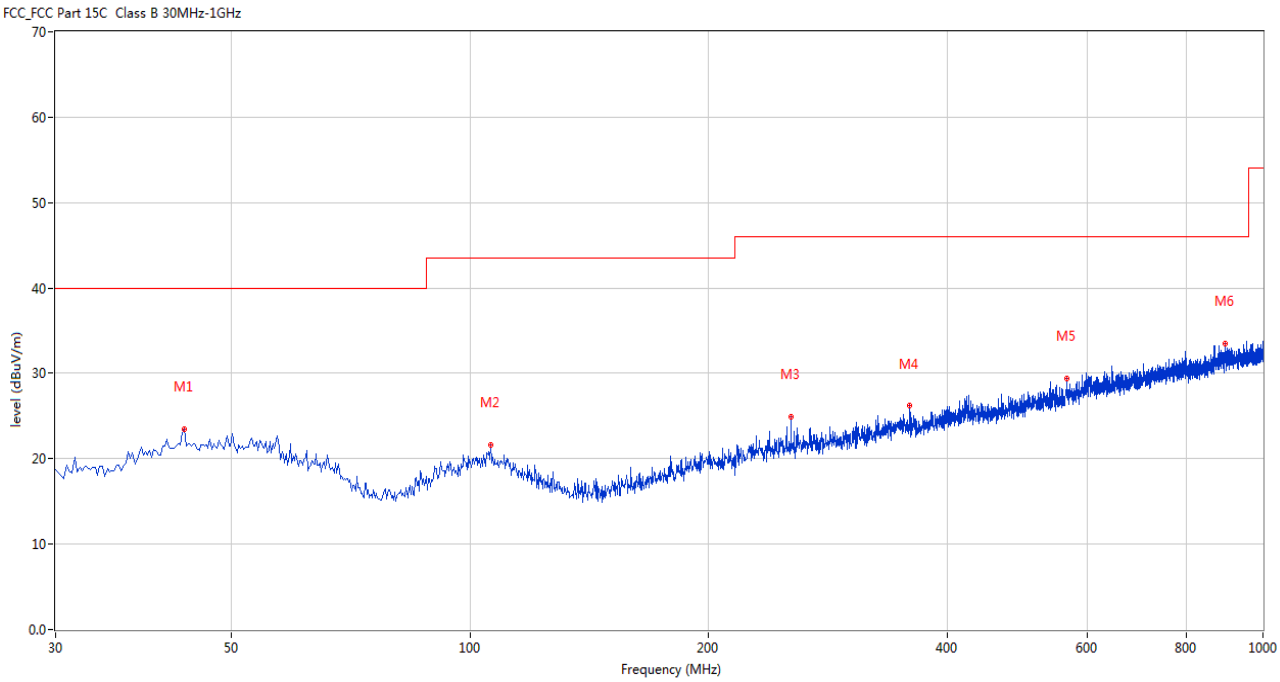
Radiated Emission In Horizontal/Vertical (30MHz----1000MHz)

EUT set Condition: Keep Bluetooth Transmitting

Results: **Pass**

Test Figure:

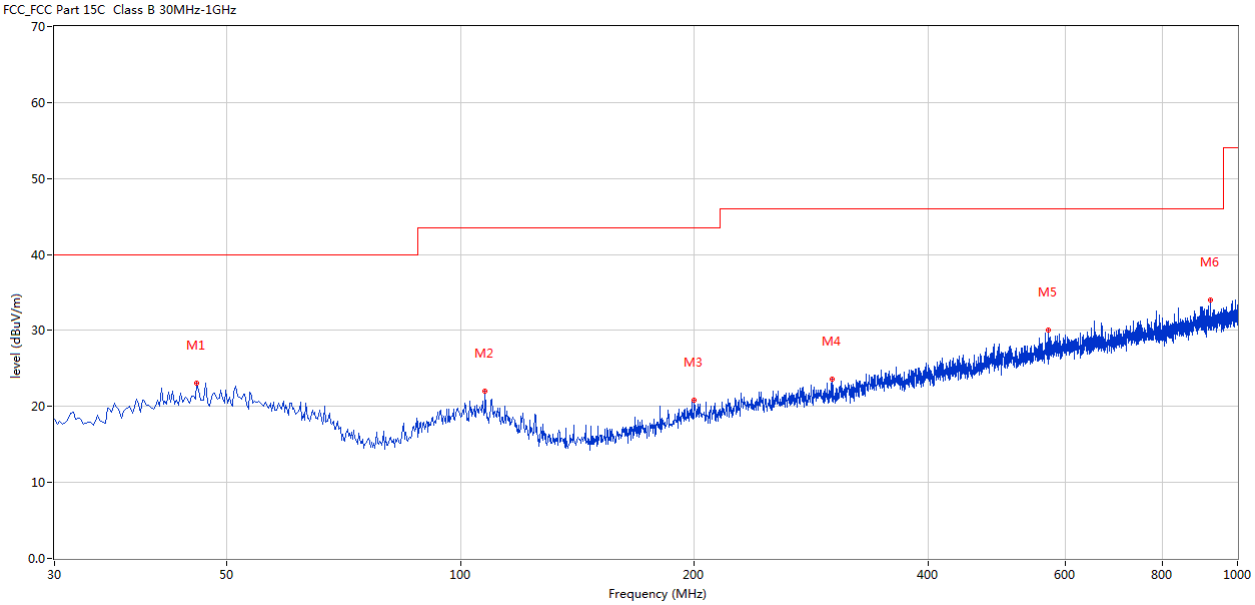
H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	43.577	23.45	-11.49	40.0	-16.55	Peak	282.00	200	Horizontal	Pass
2	106.126	21.66	-13.32	43.5	-21.84	Peak	360.00	200	Horizontal	Pass
3	254.014	24.96	-12.03	46.0	-21.04	Peak	228.00	100	Horizontal	Pass
4	358.263	26.17	-9.48	46.0	-19.83	Peak	7.00	100	Horizontal	Pass
5	565.549	29.41	-6.00	46.0	-16.59	Peak	230.00	200	Horizontal	Pass
6	895.024	33.53	-1.82	46.0	-12.47	Peak	176.00	200	Horizontal	Pass

Test Figure:

V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	45.759	23.07	-11.40	40.0	-16.93	Peak	360.00	100	Vertical	Pass
2	107.581	21.99	-13.40	43.5	-21.51	Peak	313.00	100	Vertical	Pass
3	199.950	20.87	-13.45	43.5	-22.63	Peak	201.00	100	Vertical	Pass
4	300.562	23.62	-11.02	46.0	-22.38	Peak	327.00	100	Vertical	Pass
5	570.640	30.10	-5.82	46.0	-15.90	Peak	182.00	100	Vertical	Pass
6	922.419	33.98	-1.76	46.0	-12.02	Peak	113.00	100	Vertical	Pass

Operation Mode: Transmitting under Low Channel (2402MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4804	--	H	74(Peak)/ 54(AV)
4804	--	V	74(Peak)/ 54(AV)
7206	--	H/V	74(Peak)/ 54(AV)
9608	--	H/V	74(Peak)/ 54(AV)
12010	--	H/V	74(Peak)/ 54(AV)
14412	--	H/V	74(Peak)/ 54(AV)
16814	--	H/V	74(Peak)/ 54(AV)
19216	--	H/V	74(Peak)/ 54(AV)
21618	--	H/V	74(Peak)/ 54(AV)
24020	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit
2. Remark "---" means that the emissions level is too low to be measured

Operation Mode: Transmitting g under Middle Channel (2441MHz)

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4882	--	H	74(Peak)/ 54(AV)
4882	--	V	74(Peak)/ 54(AV)
7323	--	H/V	74(Peak)/ 54(AV)
9764	--	H/V	74(Peak)/ 54(AV)
12205	--	H/V	74(Peak)/ 54(AV)
14646	--	H/V	74(Peak)/ 54(AV)
17087	--	H/V	74(Peak)/ 54(AV)
19528	--	H/V	74(Peak)/ 54(AV)
21969	--	H/V	74(Peak)/ 54(AV)
24410	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit
2. Remark "---" means that the emissions level is too low to be measured

Operation Mode: Transmitting under High Channel (2480MHz)

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4960	--	H	74(Peak)/ 54(AV)
4960	--	V	74(Peak)/ 54(AV)
7440	--	H/V	74(Peak)/ 54(AV)
9920	--	H/V	74(Peak)/ 54(AV)
12400	--	H/V	74(Peak)/ 54(AV)
14880	--	H/V	74(Peak)/ 54(AV)
17360	--	H/V	74(Peak)/ 54(AV)
19840	--	H/V	74(Peak)/ 54(AV)
22320	--	H/V	74(Peak)/ 54(AV)
24800	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark “---” means that the emissions level is too low to be measured

7.0 20dB Bandwidth Measurement

7.1 Regulation

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

7.2 Limits of 20dB Bandwidth Measurement

N/A

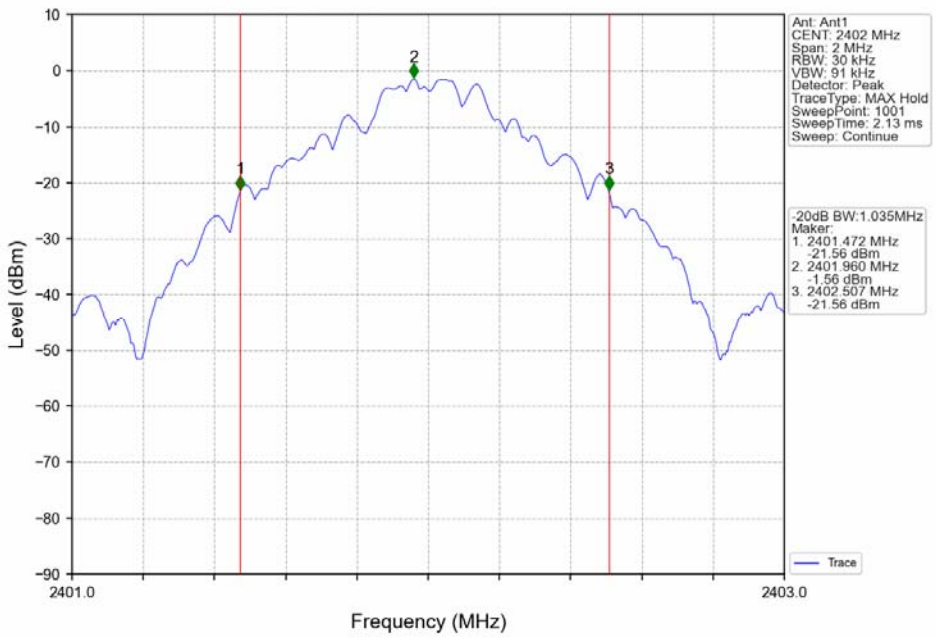
7.3 Test Procedure.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span =2MHz, RBW =30 kHz, VBW=91 kHz, Sweep = auto Detector function = peak, Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results. 6. Repeat above procedures until all frequencies measured were complete.

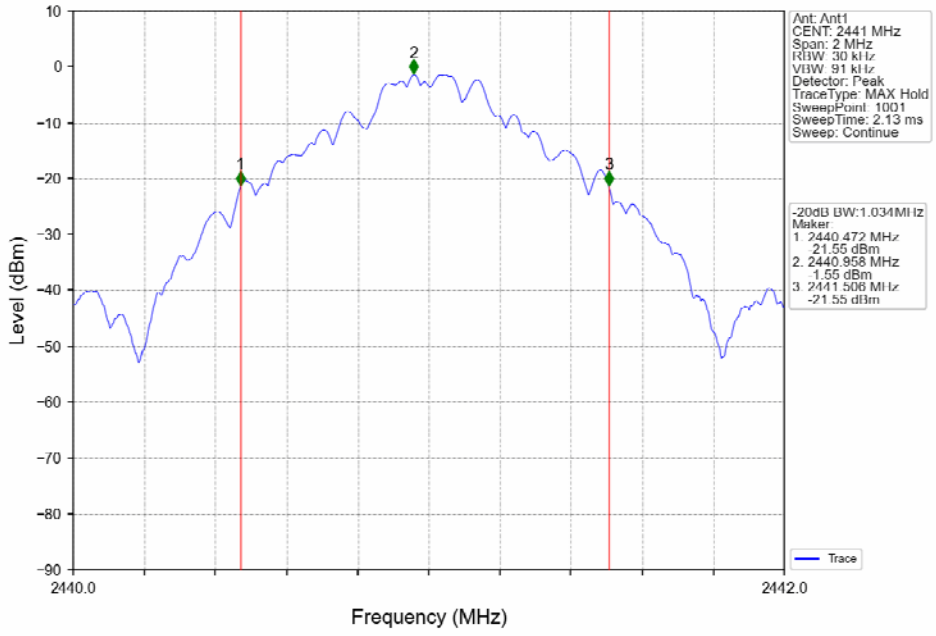
7.4 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz) Result	Verdict
GFSK	SISO	2402	DH5	1	1.035	Pass
		2441	DH5	1	1.034	Pass
		2480	DH5	1	1.046	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.364	Pass
		2441	2DH5	1	1.368	Pass
		2480	2DH5	1	1.360	Pass
8DPSK	SISO	2402	3DH5	1	1.357	Pass
		2441	3DH5	1	1.370	Pass
		2480	3DH5	1	1.376	Pass

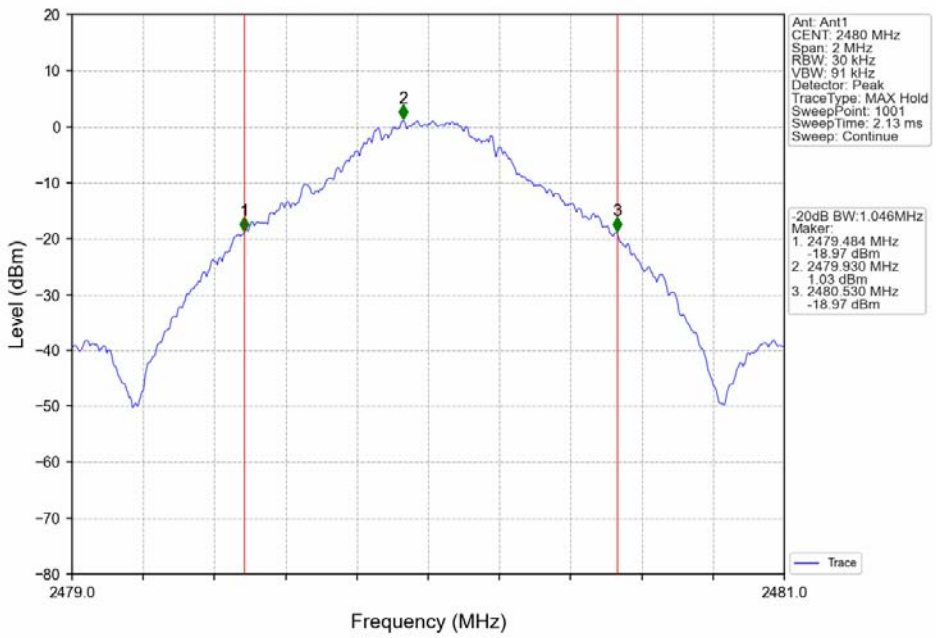
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



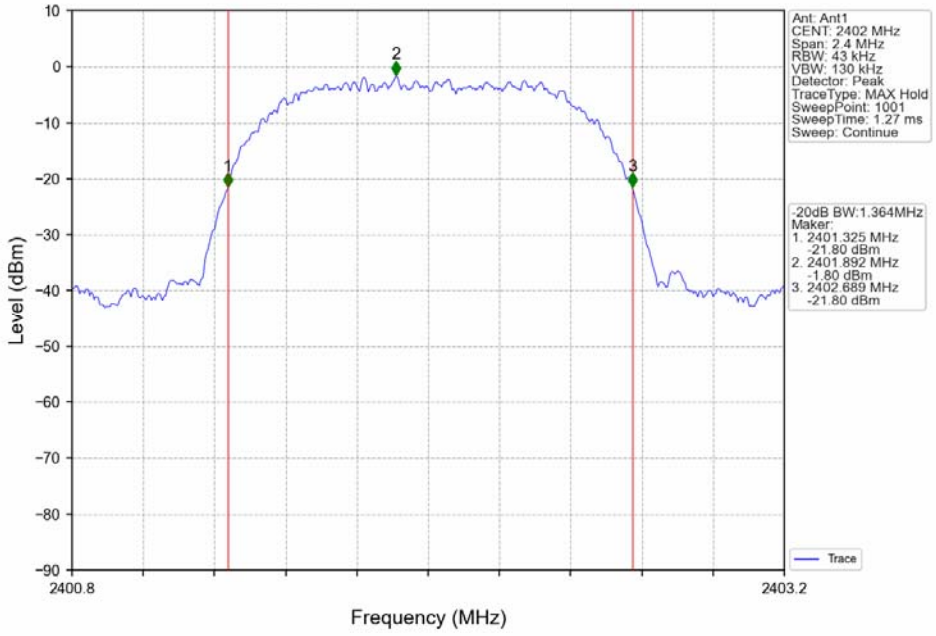
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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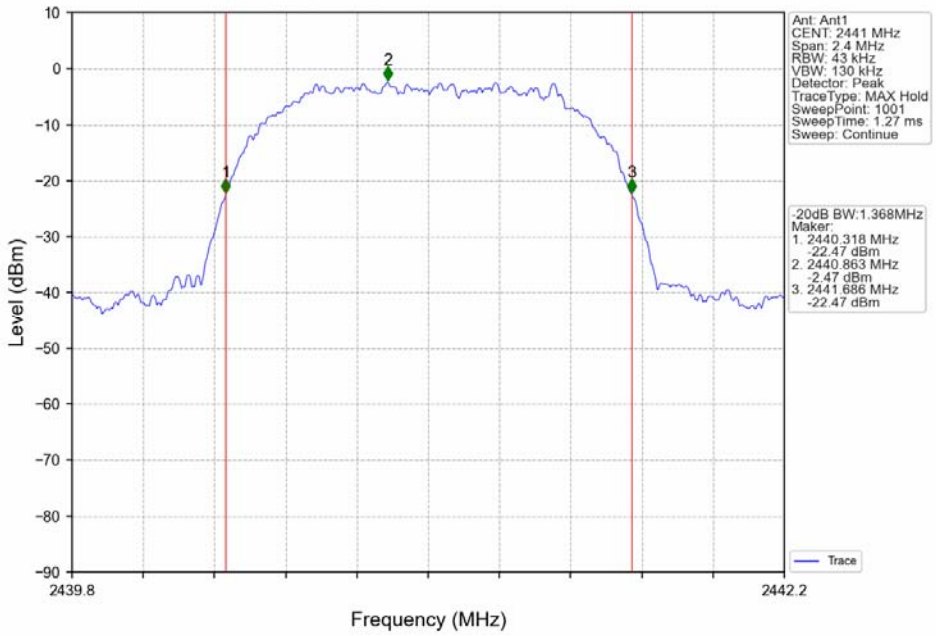
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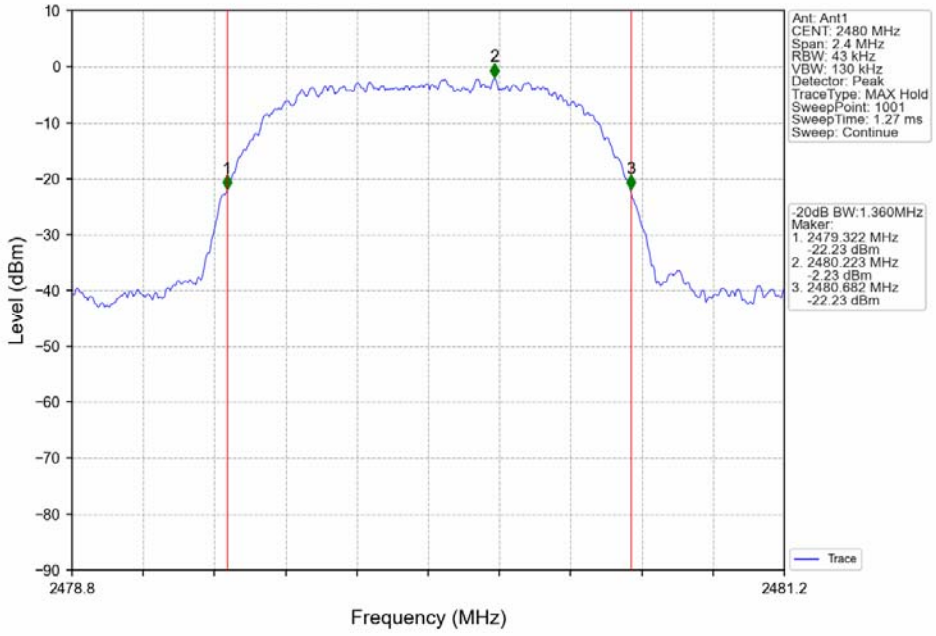
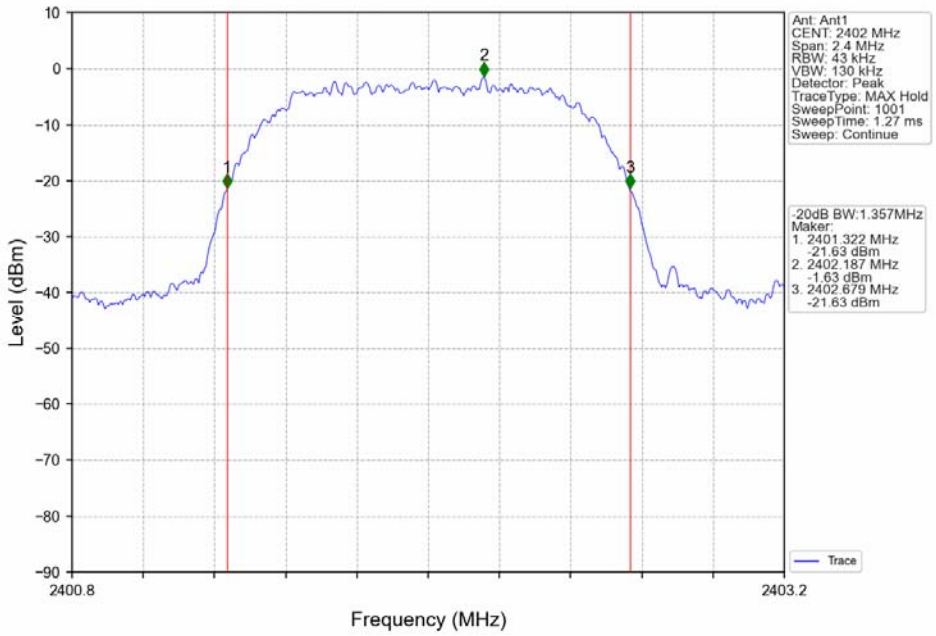


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV


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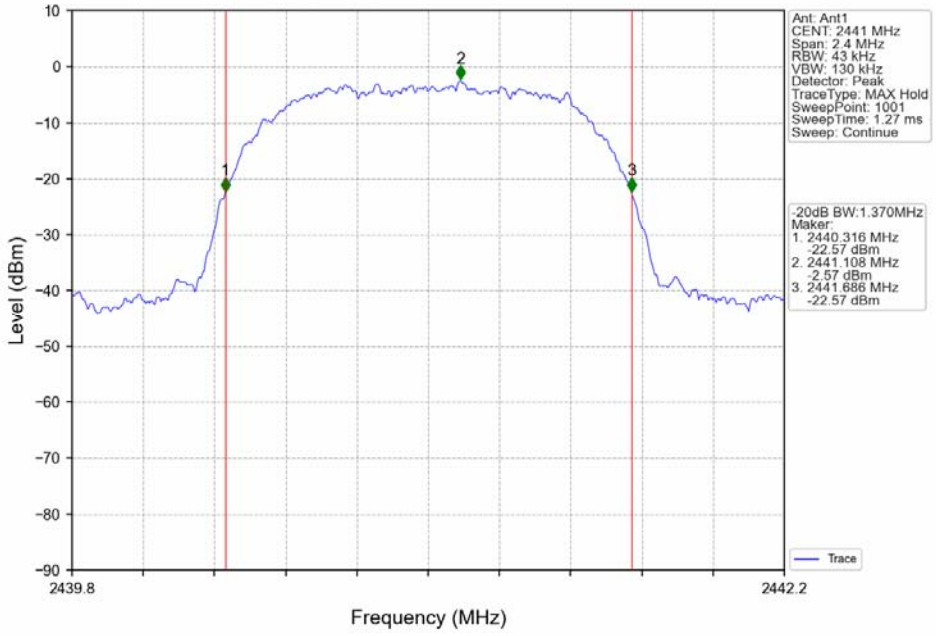
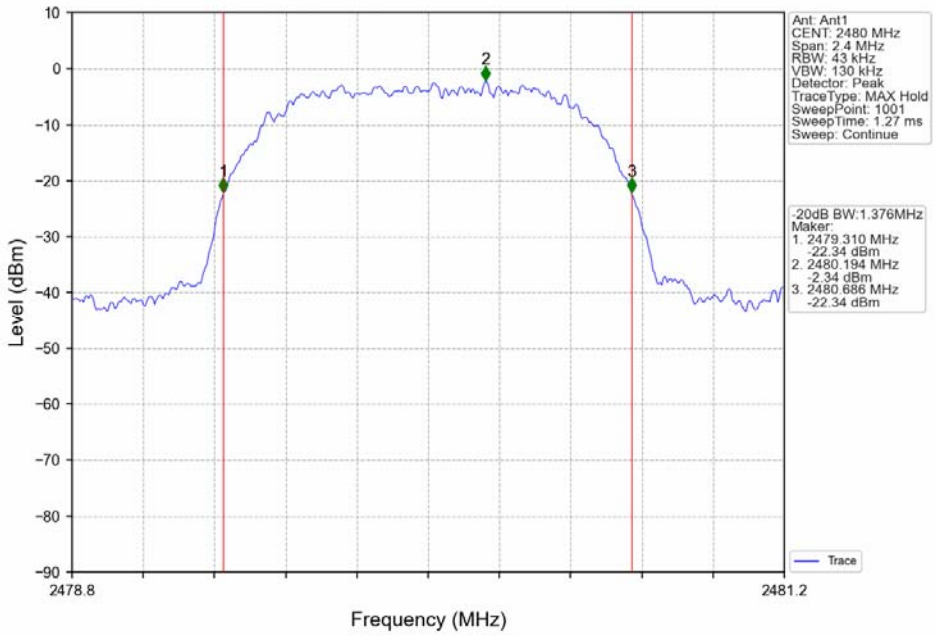


8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



8. Maximum Output Power

8.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band:0.125 watts. According to §15.247(b)(4), 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.

8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm or 20.97dBm.

8.3 Test Procedure

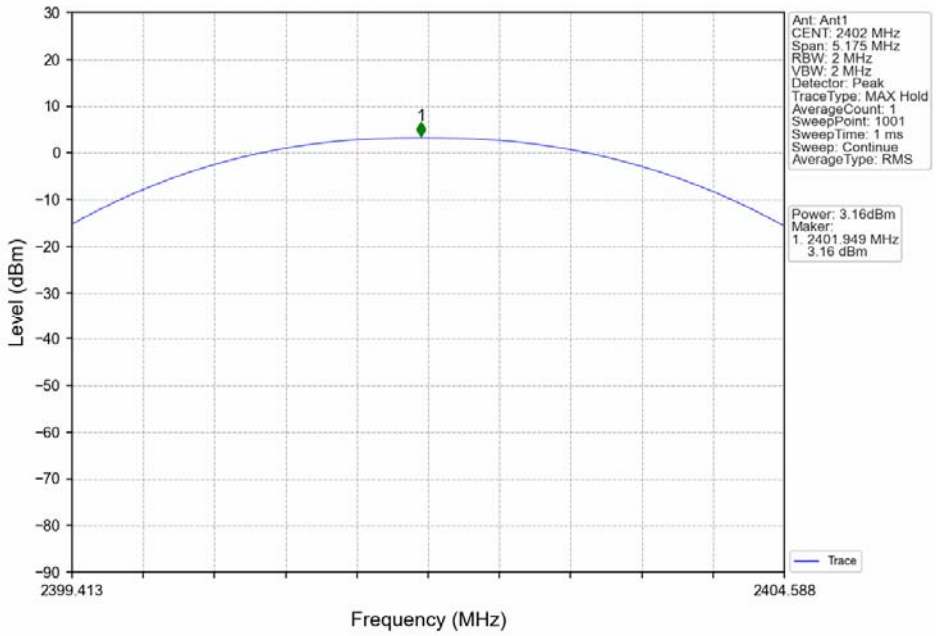
1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel; RBW > the 20 dB bandwidth of the emission being measured; VBW = RBW=2MHz;
Sweep = 1ms; Detector function = Peak; Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
4. Repeat above procedures until all frequencies measured were complete.

Note: The Peak power were measured

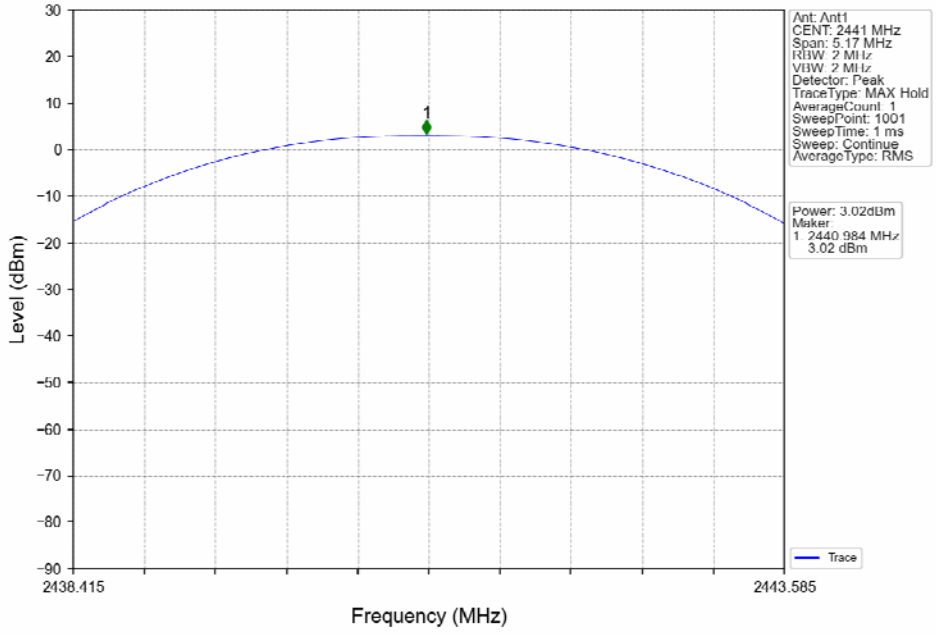
8.4Test Results

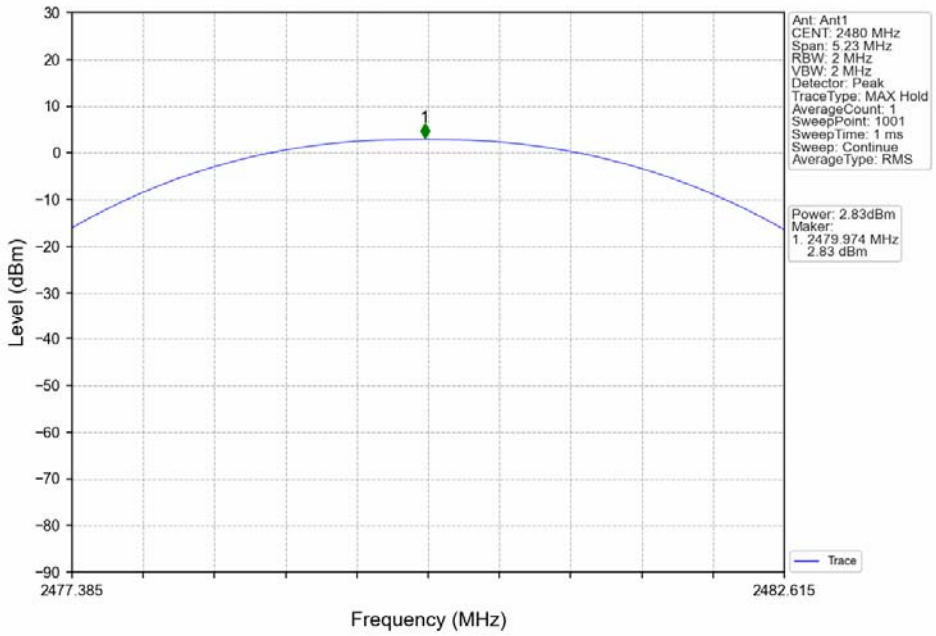
Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	3.16	<=30.00	Pass
		2441	DH5	3.02	<=30.00	Pass
		2480	DH5	2.83	<=30.00	Pass
Pi/4DQPSK	SISO	2402	2DH5	3.54	<=20.97	Pass
		2441	2DH5	3.14	<=20.97	Pass
		2480	2DH5	3.39	<=20.97	Pass
8DPSK	SISO	2402	3DH5	4.09	<=20.97	Pass
		2441	3DH5	3.52	<=20.97	Pass
		2480	3DH5	3.78	<=20.97	Pass
Note1: Antenna Gain: Ant1: 0.50dBi;						

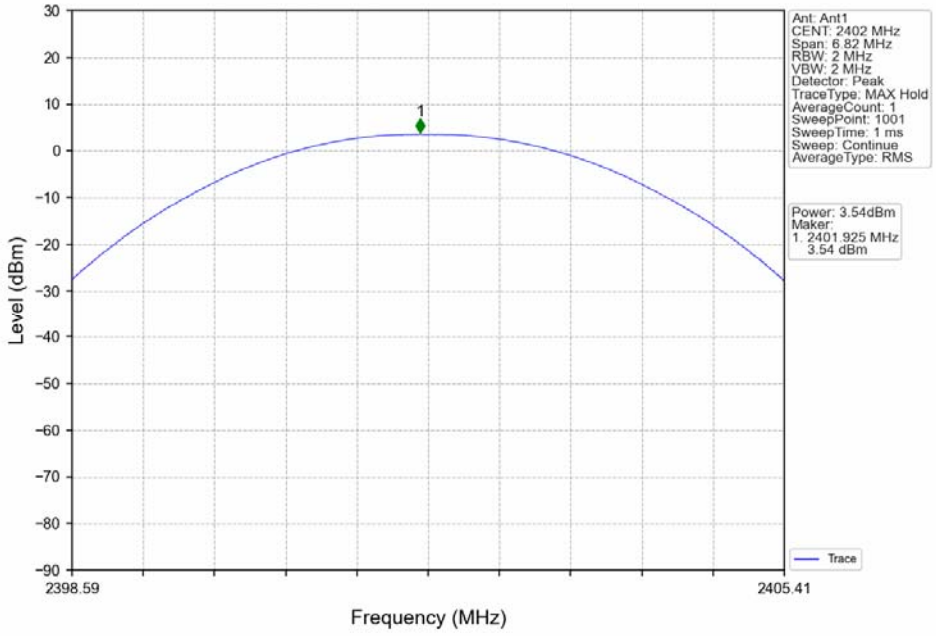
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_HCH_2480MHz_Ant1_NTNV


Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV


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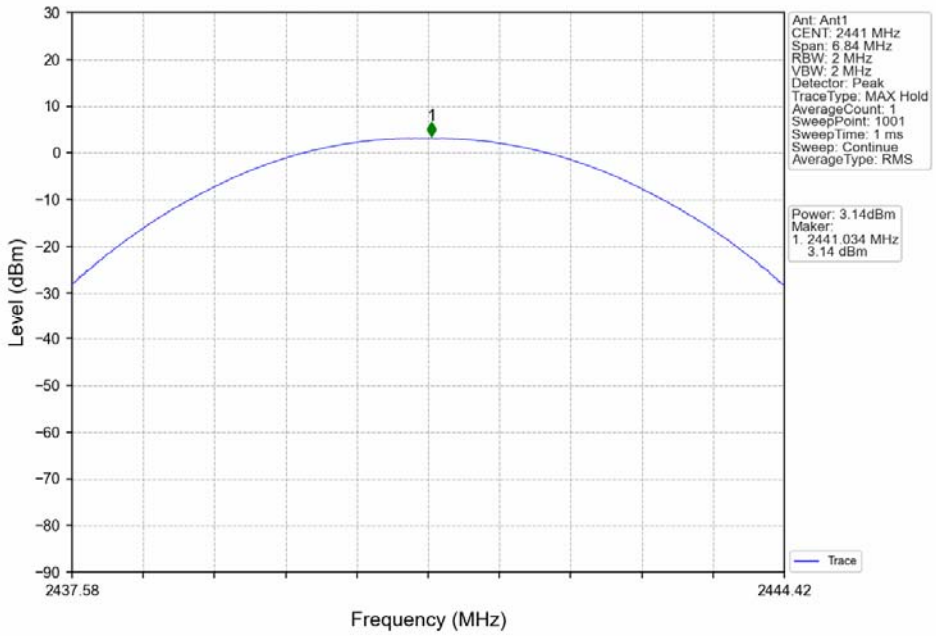

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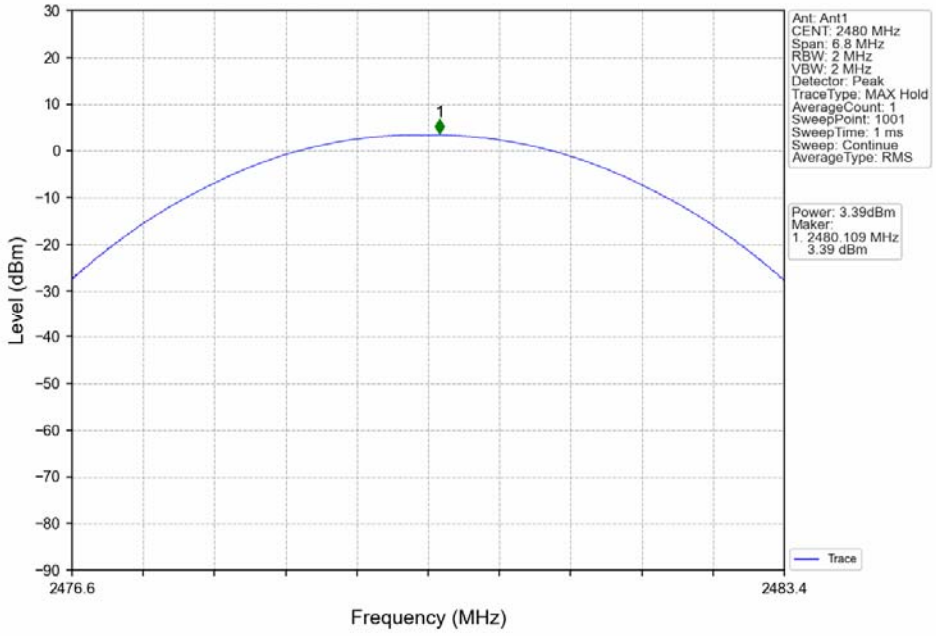
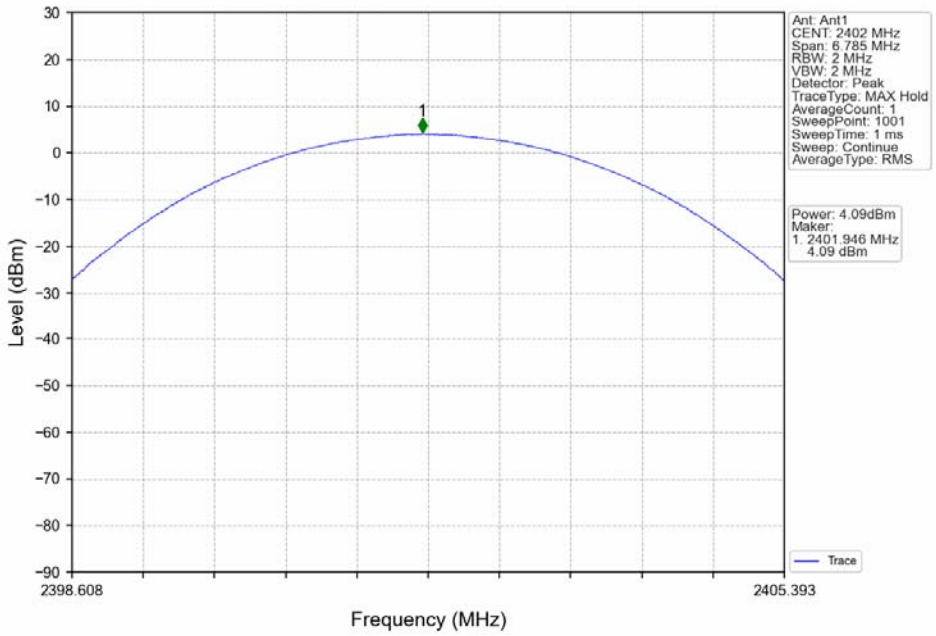


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV


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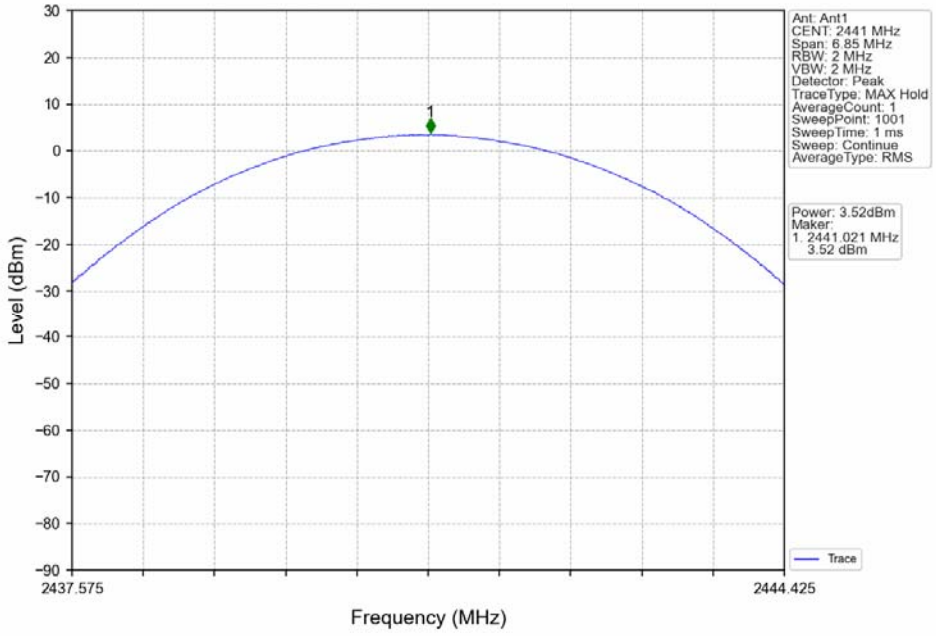
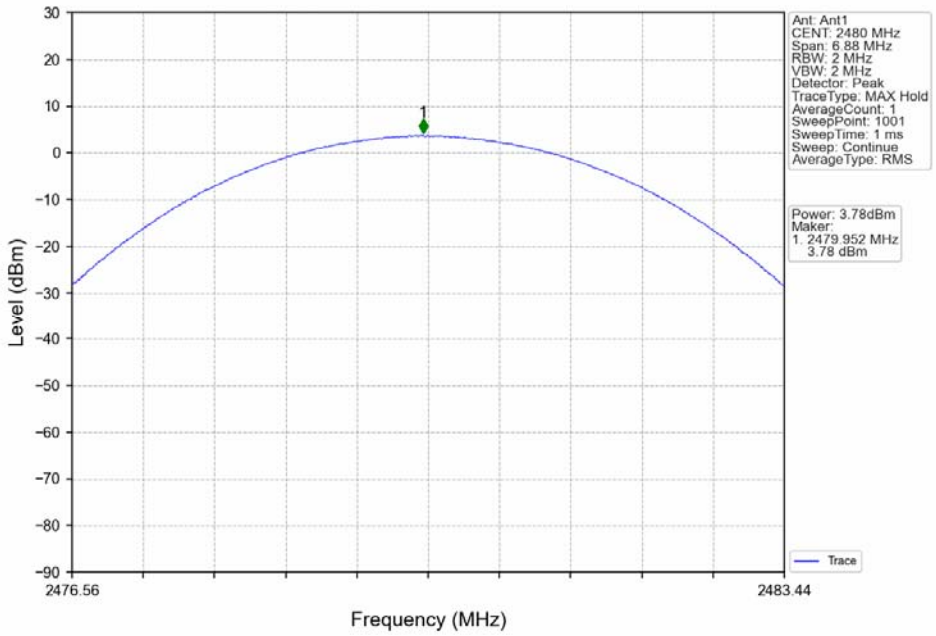


8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



9. Carrier Frequency Separation

9.1 Regulation

According to §15.247(a)(1), 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.

9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

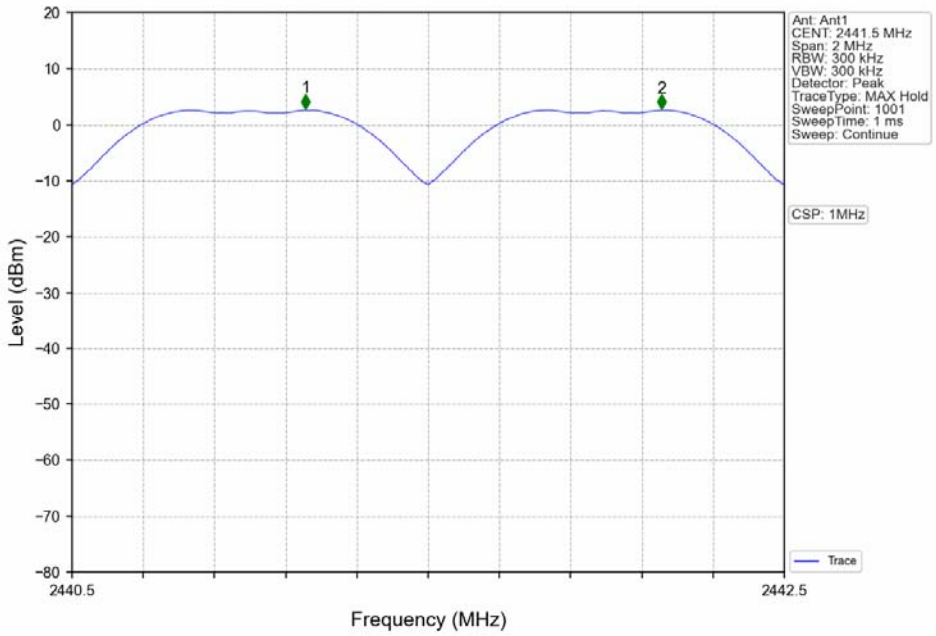
9.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span; Video (or Average) Bandwidth (VBW) ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.

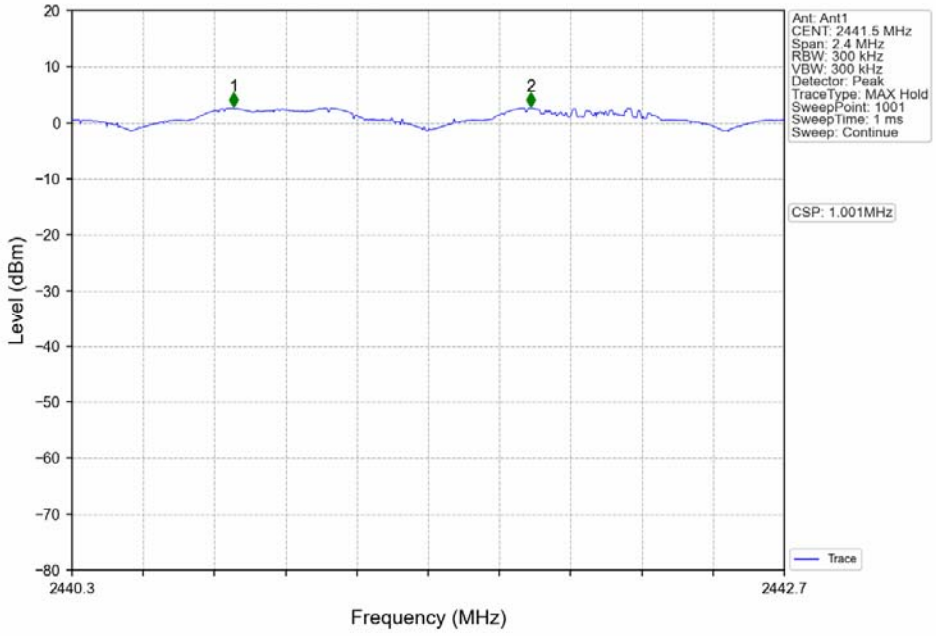
9.4Test Result

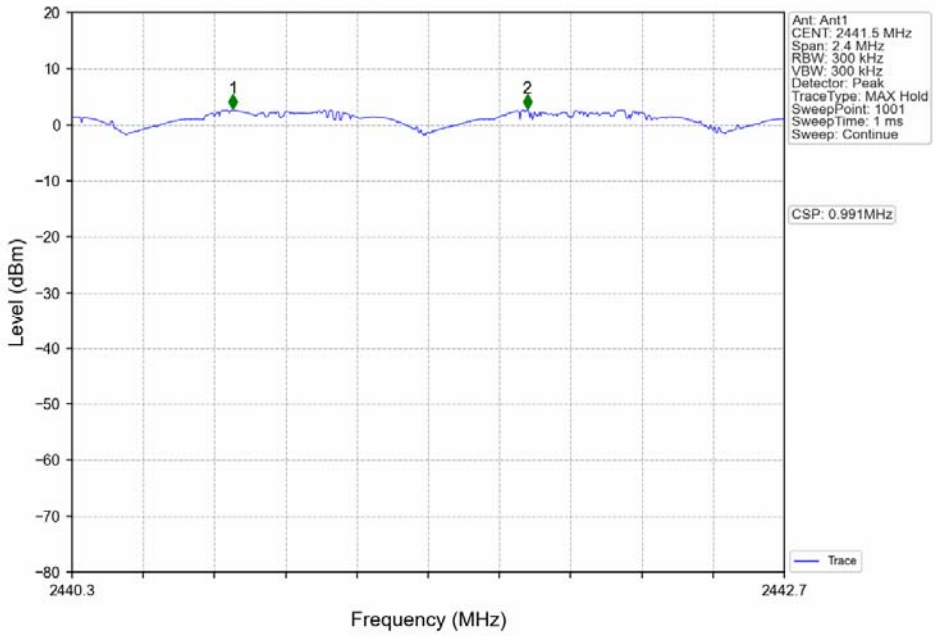
Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.000	1.046	>=0.697	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.368	>=0.912	Pass
8DPSK	SISO	HOPP	3DH5	0.991	1.376	>=0.917	Pass

GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV


10. Number of Hopping Channels

10.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

10.2 Limits of Number of Hopping Channels

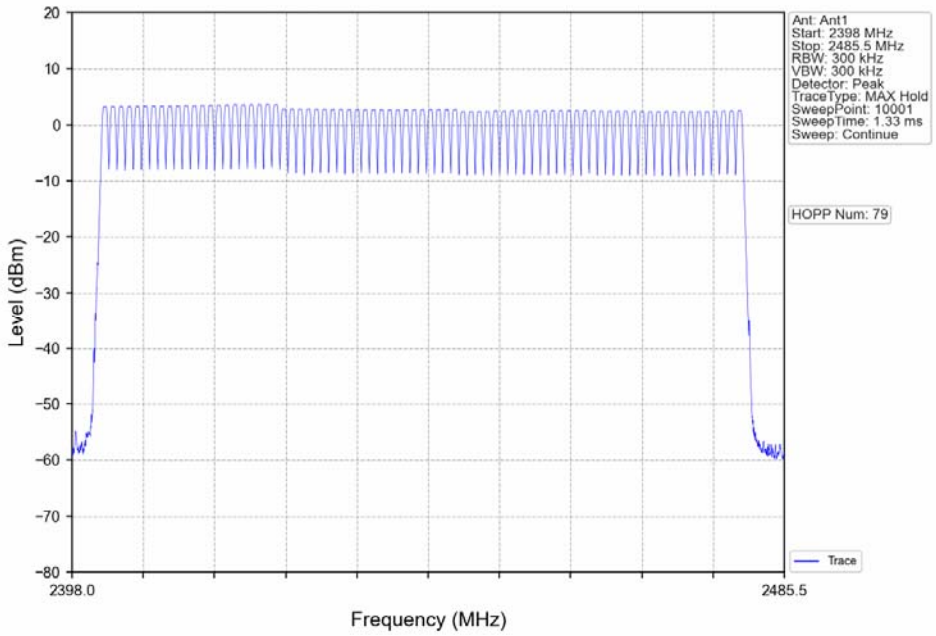
The frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

10.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW=300 kHz, VBW=300 kHz; Sweep = auto; Detector function = peak; Trace = max hold
3. Record the number of hopping channels.

10.4Test Result

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


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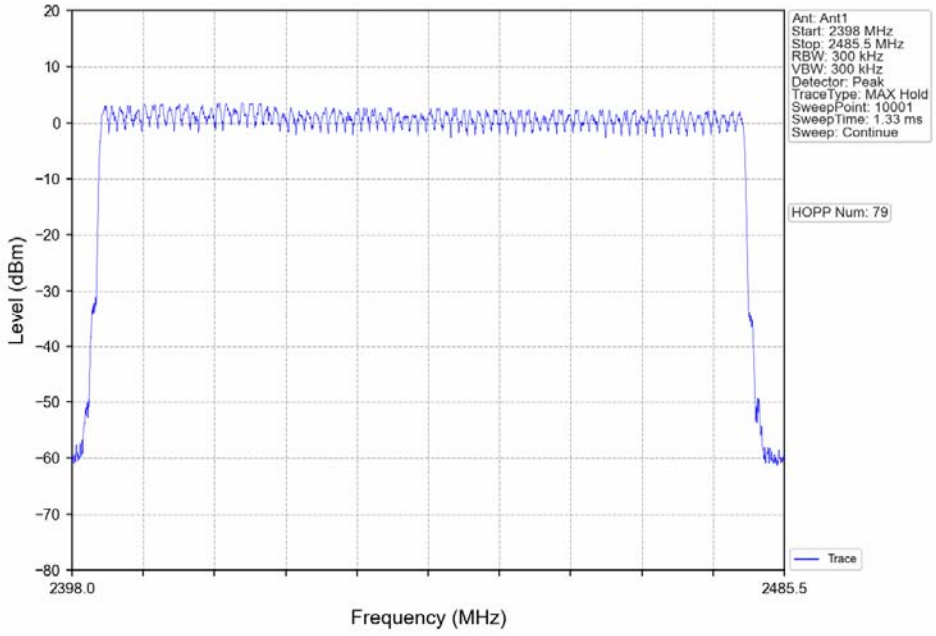

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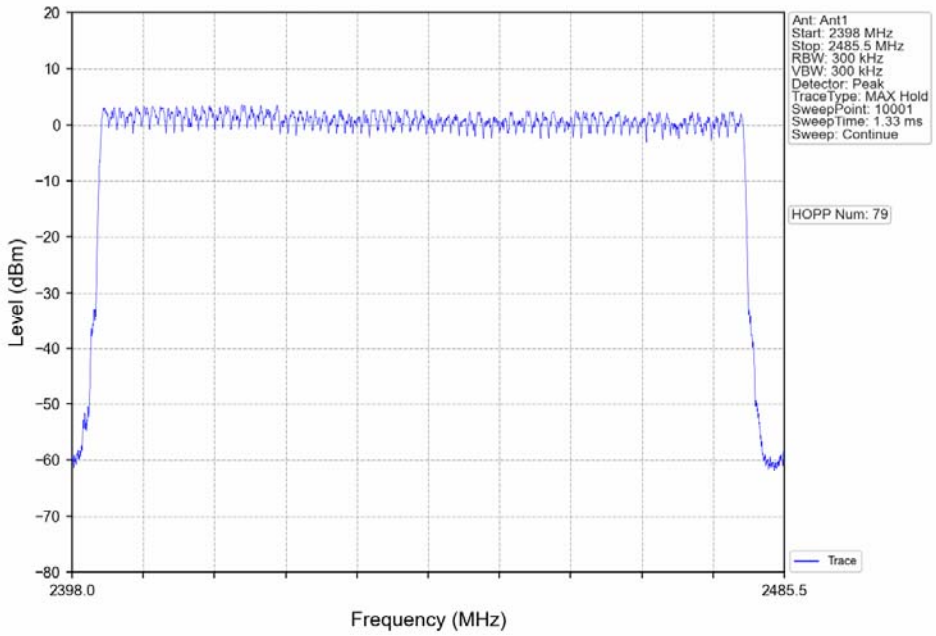


11. Time of Occupancy (Dwell Time)

11.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

11.2 Limits of Carrier Frequency Separation

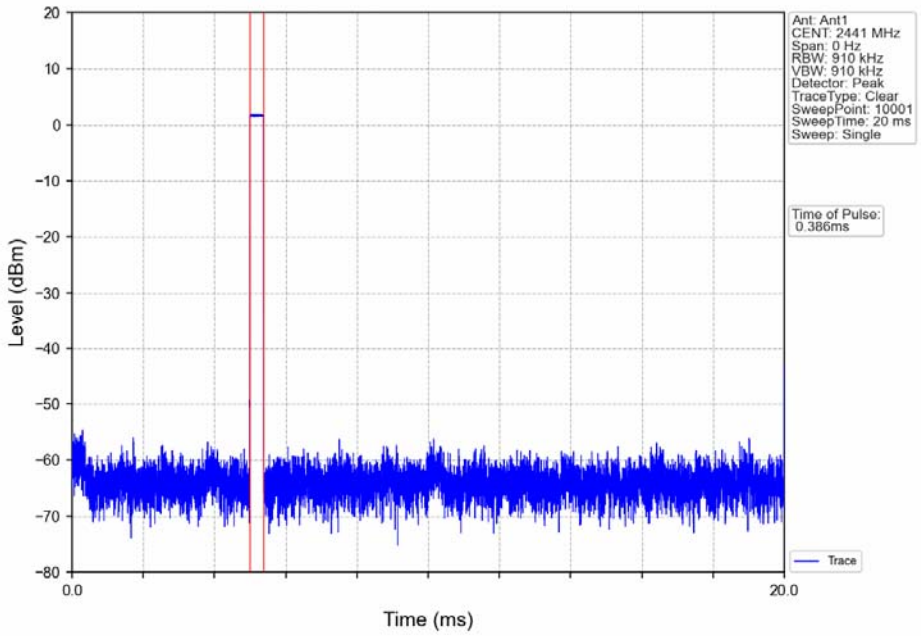
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

11.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 910 kHz or 1MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold
3. Measure the dwell time using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.
5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

11.4 Test Result

Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.386	31.600	320	123.520	<=400	Pass
			DH3	1.642	31.600	169	277.498	<=400	Pass
			DH5	2.892	31.600	104	300.768	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.404	31.600	320	129.280	<=400	Pass
			2DH3	1.656	31.600	174	288.144	<=400	Pass
			2DH5	2.898	31.600	110	318.780	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.396	31.600	320	126.720	<=400	Pass
			3DH3	1.654	31.600	162	267.948	<=400	Pass
			3DH5	2.900	31.600	110	319.000	<=400	Pass

GFSK_DH1_HOPP_Ant1_NTNV


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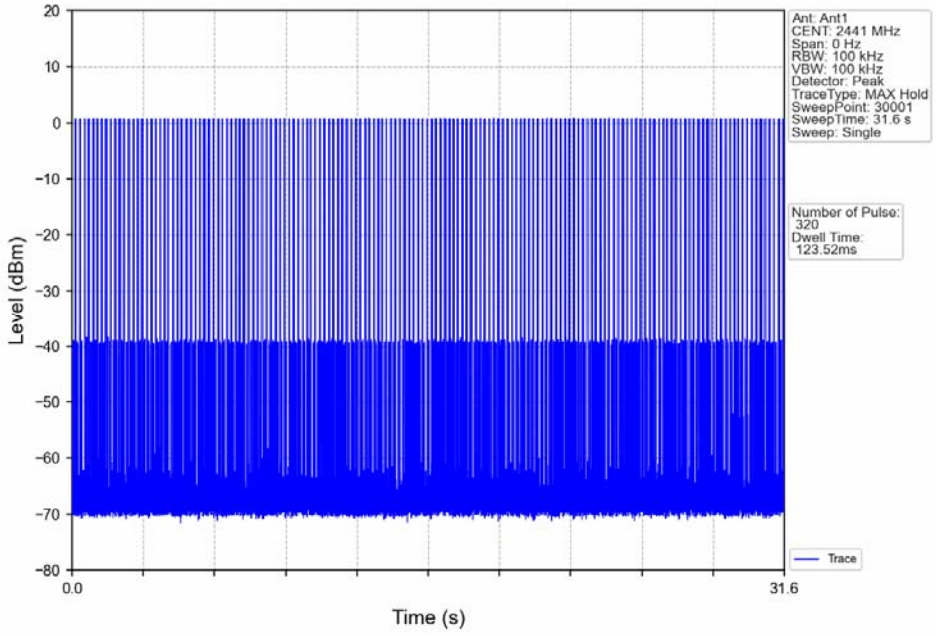
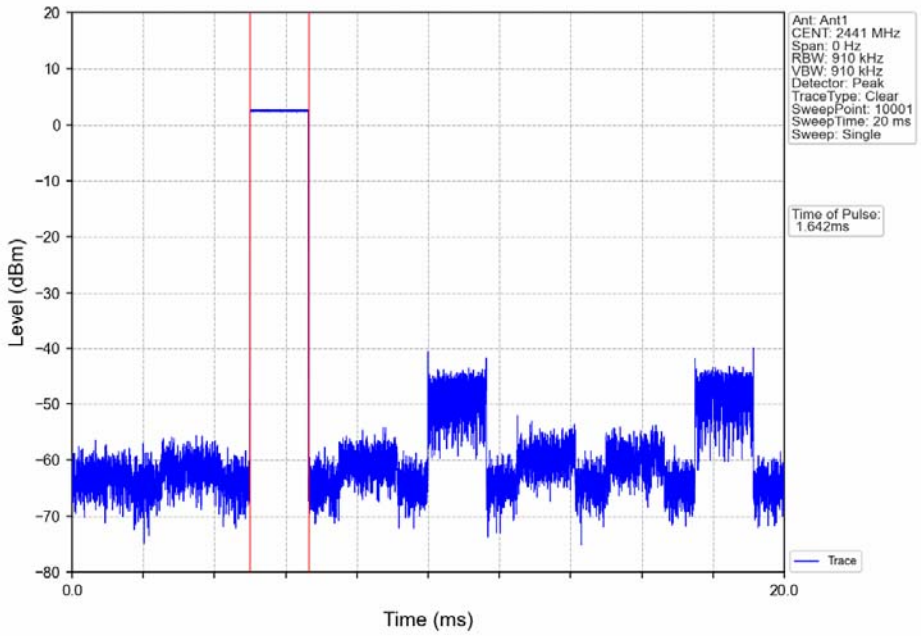


GFSK_DH3_HOPP_Ant1_NTNV


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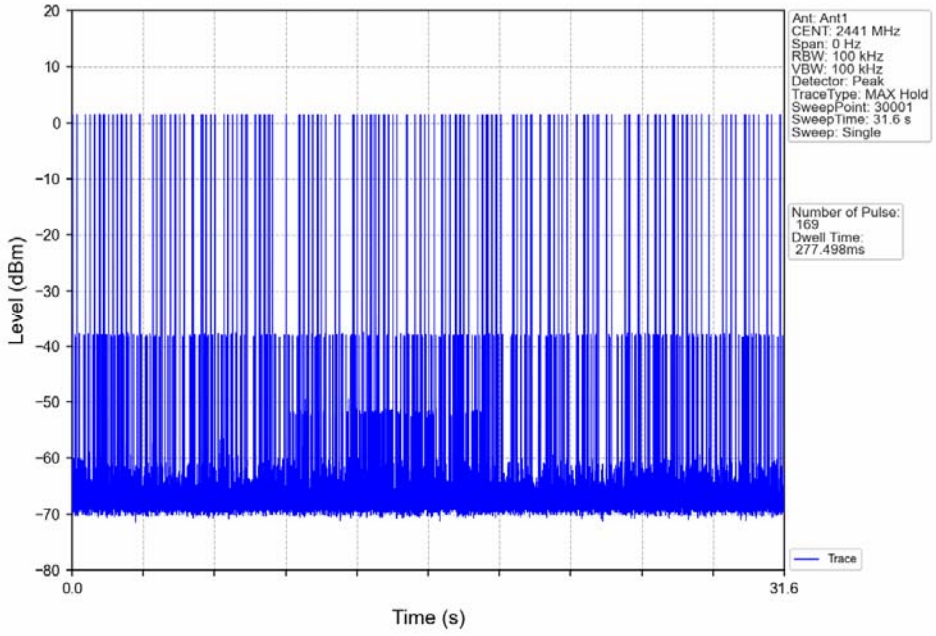
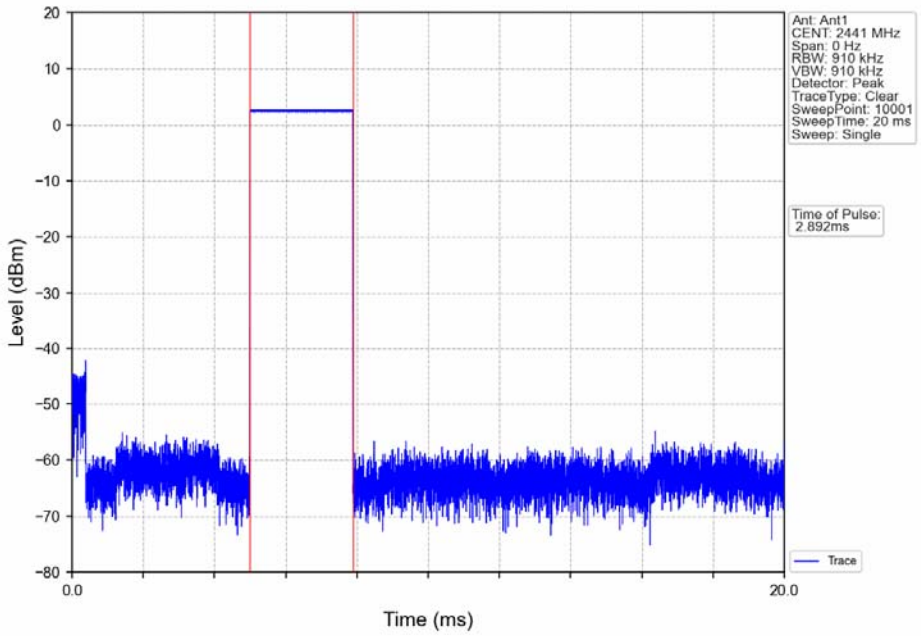


GFSK_DH5_HOPP_Ant1_NTNV


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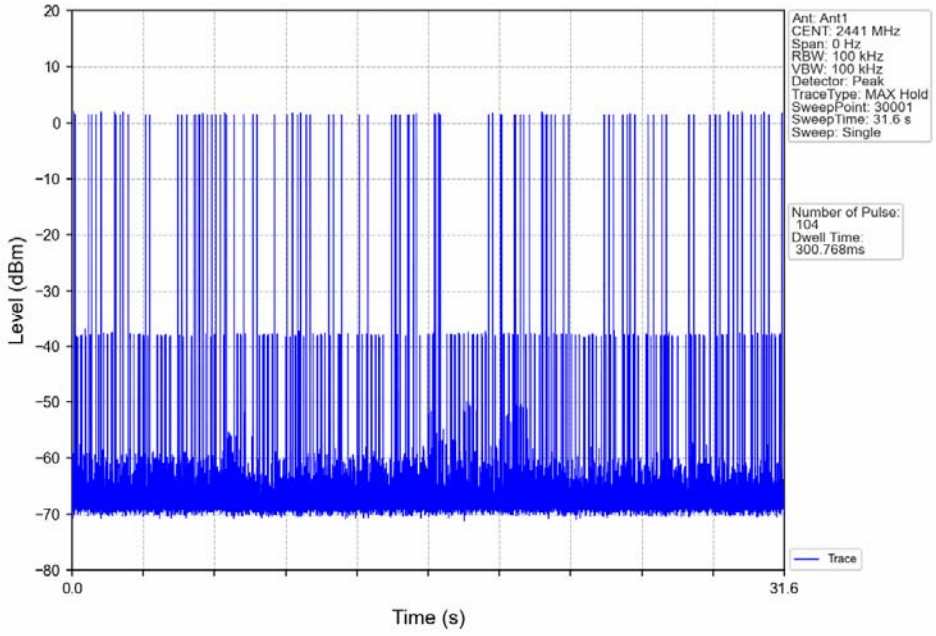
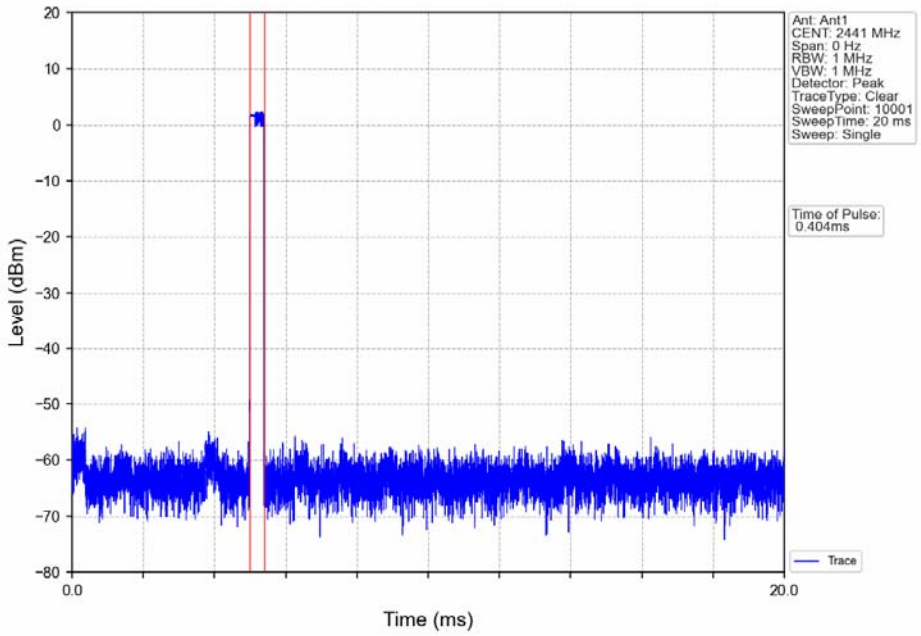


Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV


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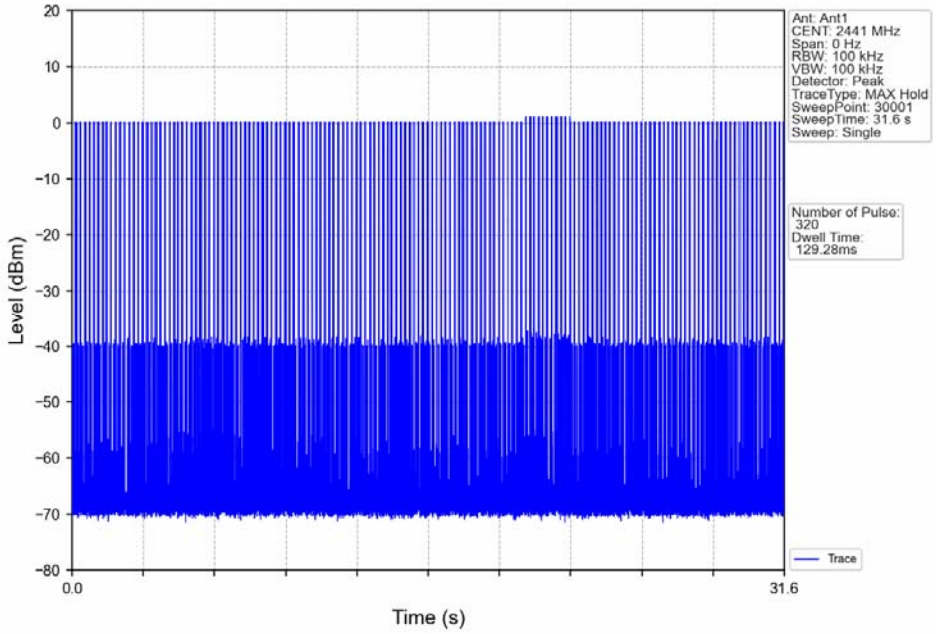

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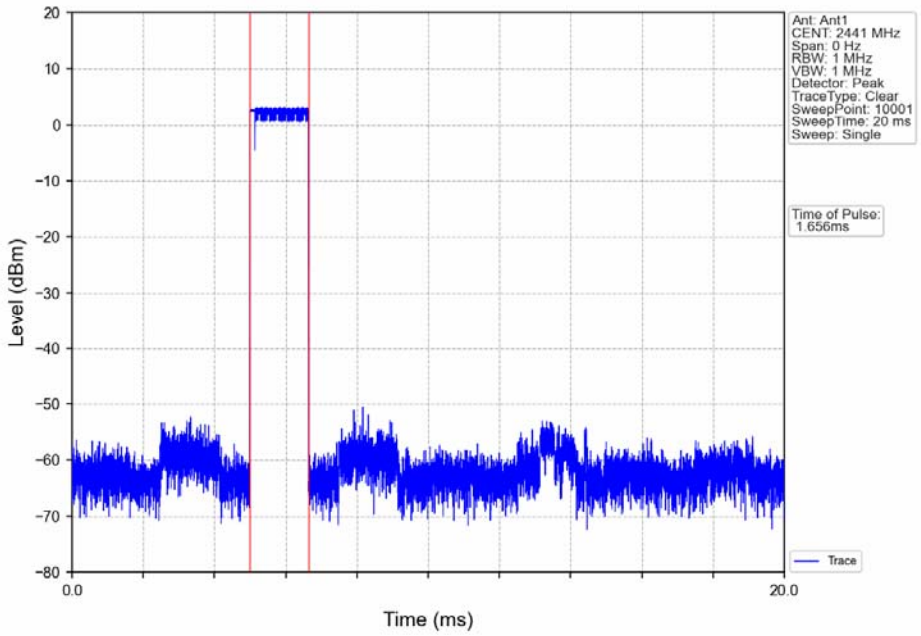

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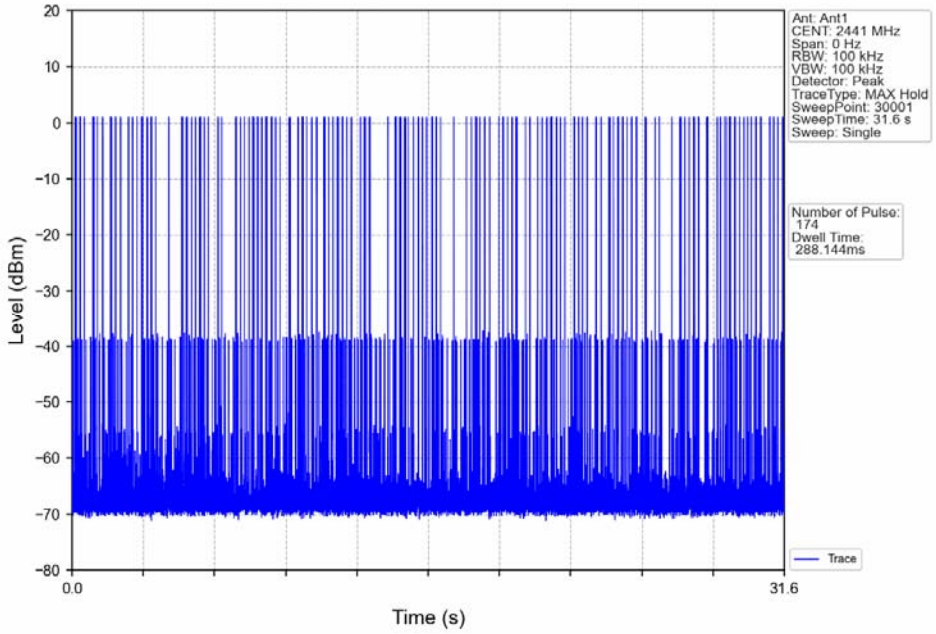

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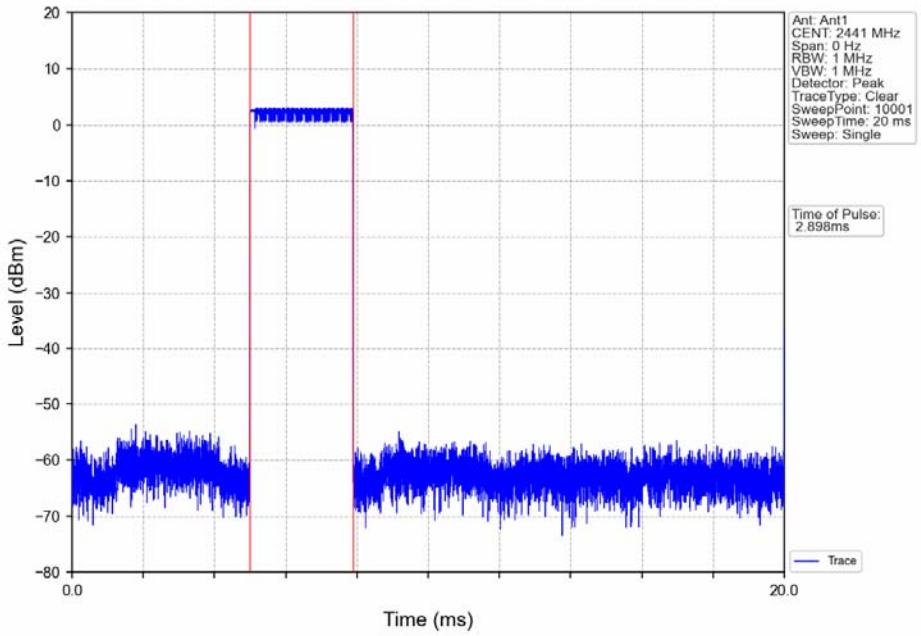

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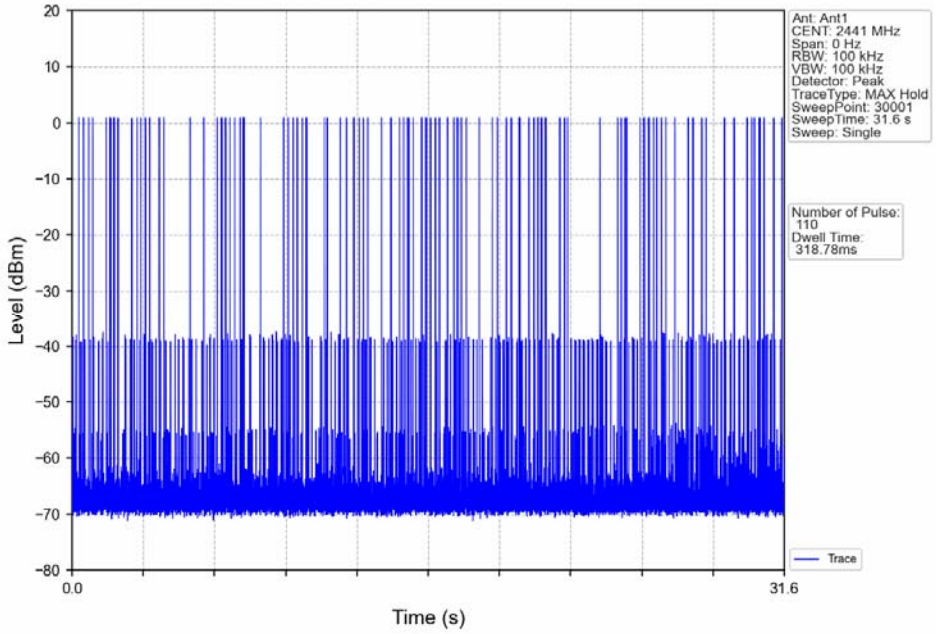

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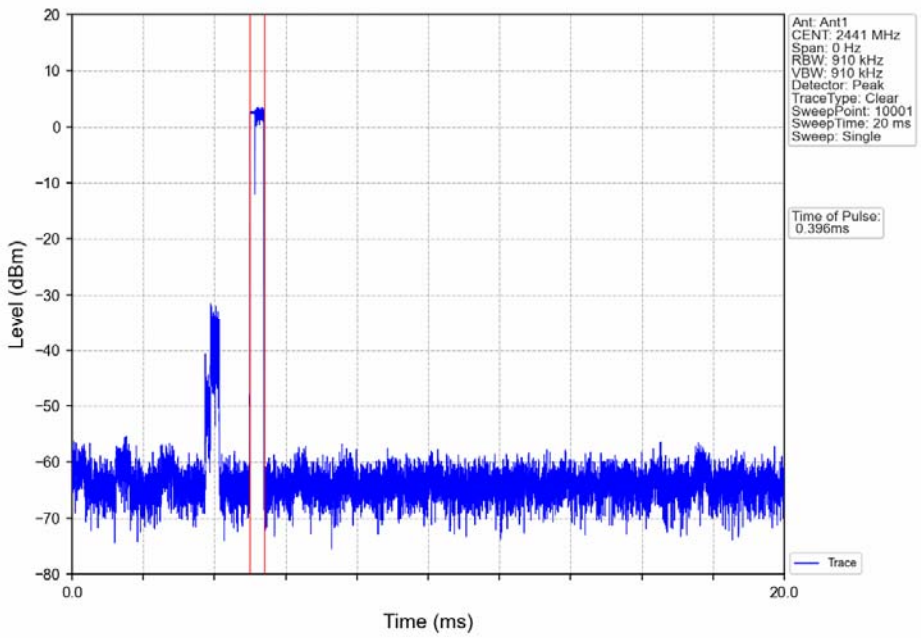

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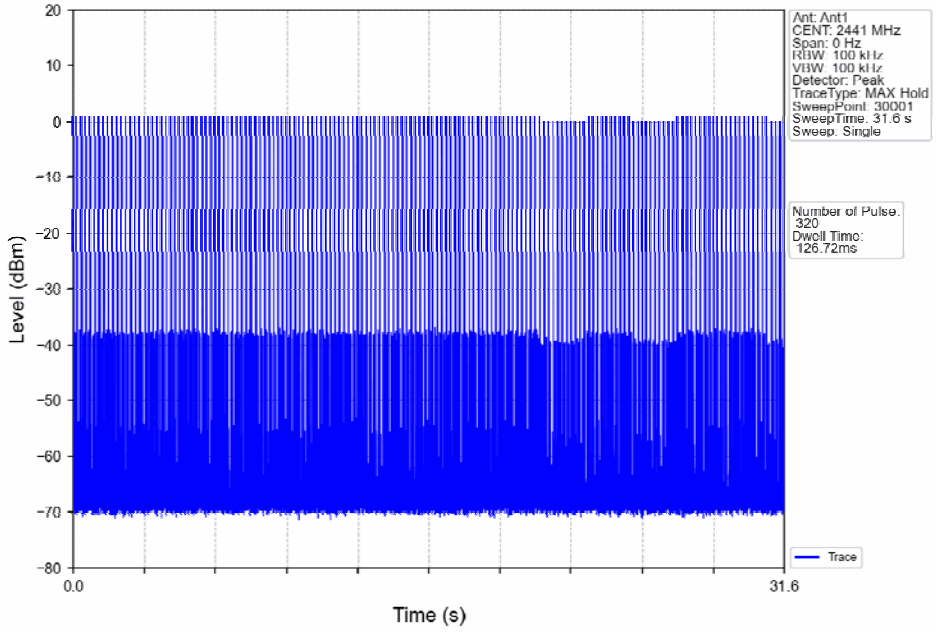

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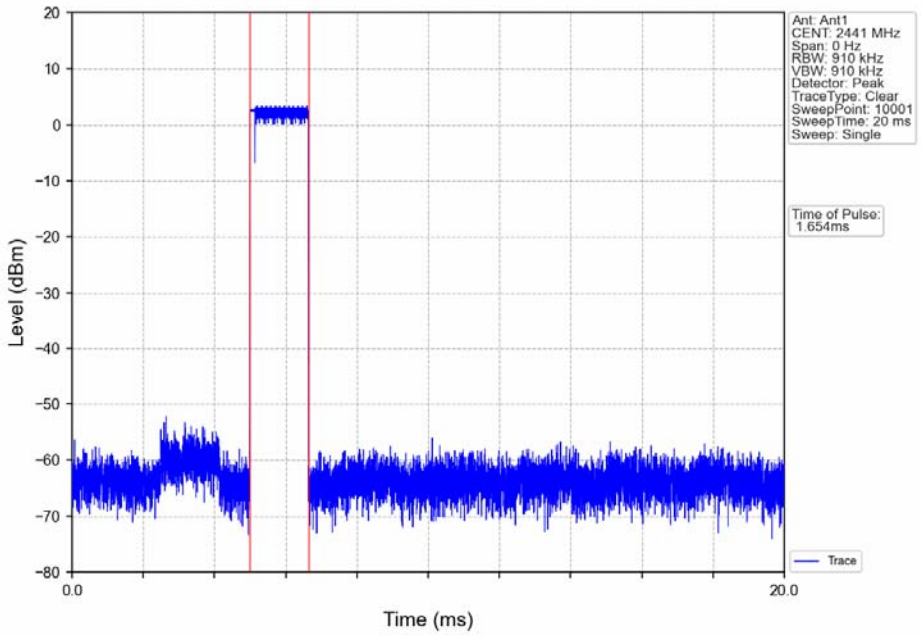

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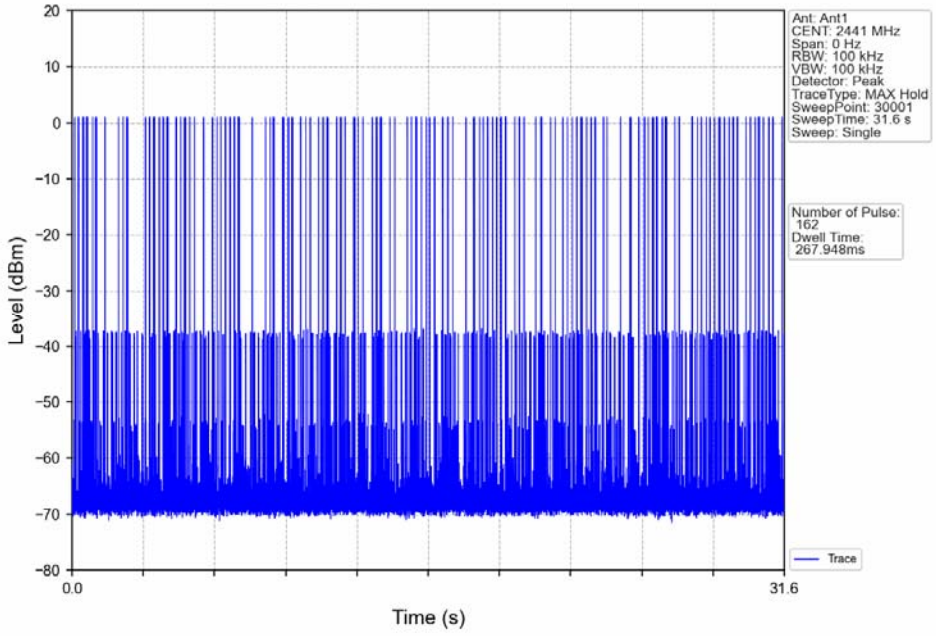
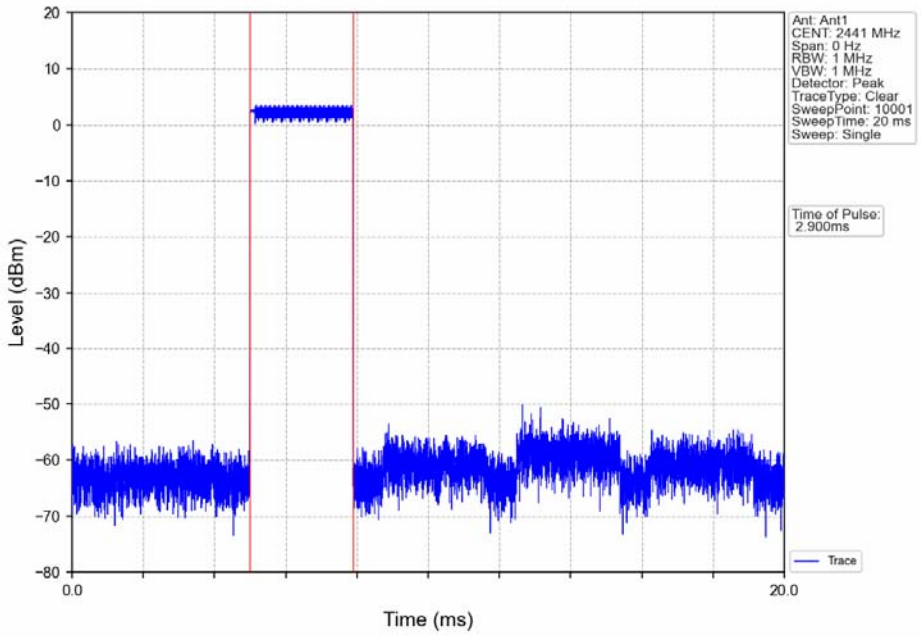


8DPSK_3DH5_HOPP_Ant1_NTNV


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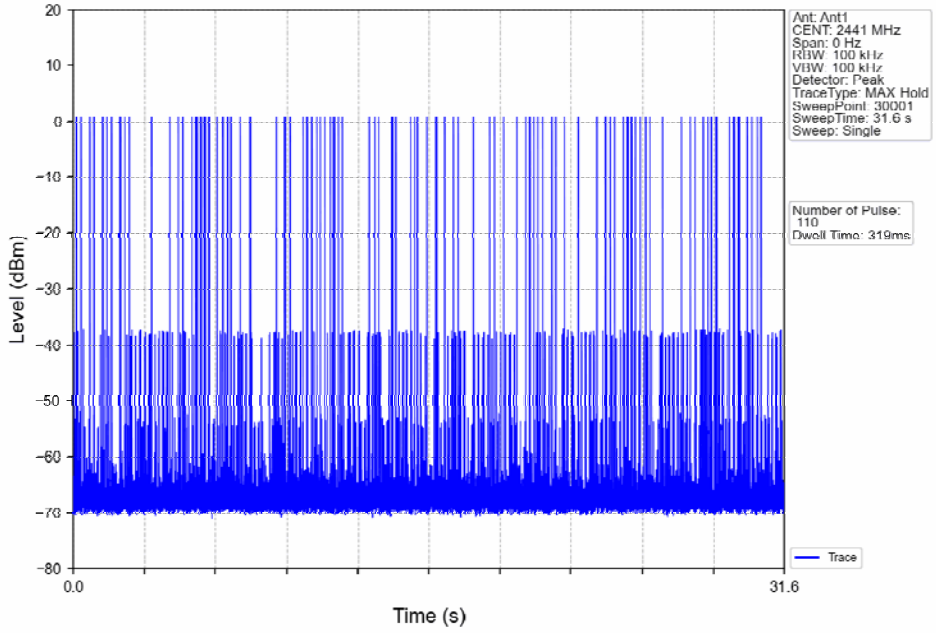
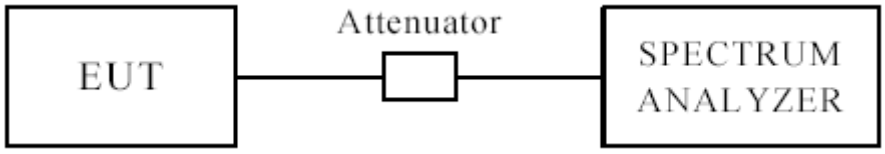


12 Out of Band Measurement

12.1 Test Setup



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

12.2 Limits of Out of Band Emissions Measurement

1. Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

12.3 Test Procedure

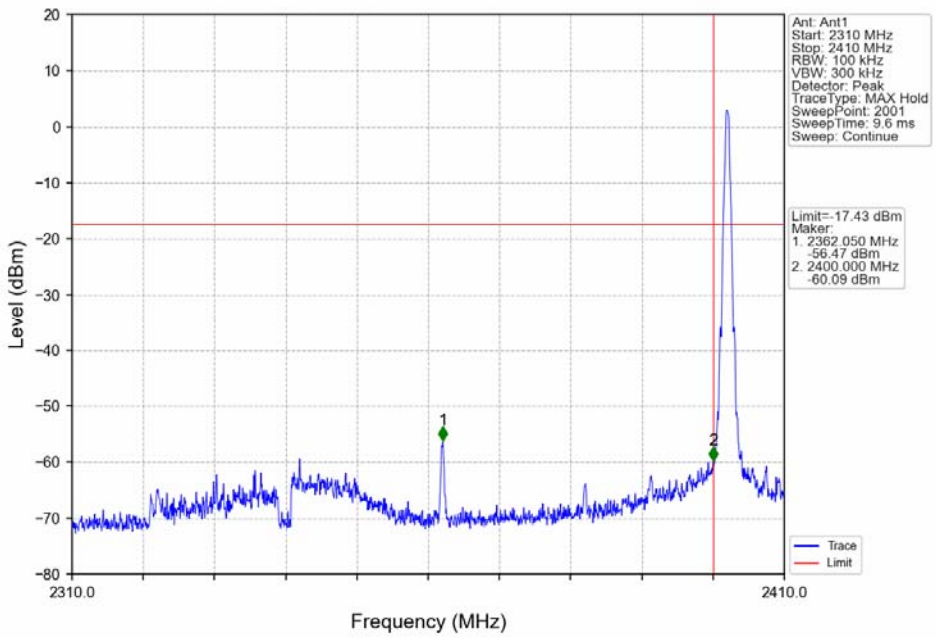
For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. Peak values with RBW=VBW=1MHz and PK detector.

For bandage test, the spectrum set as follows: RBW=100kHz, VBW=300 kHz. A conducted measurement used

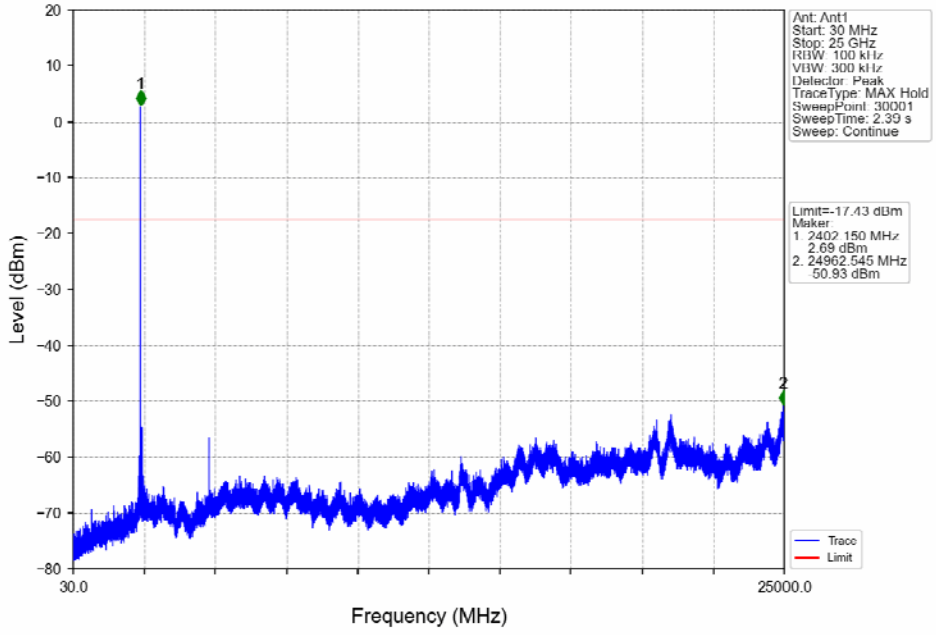
Note: 1. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	2.57	-17.43	Pass
		2441	DH5	1	2.57	-17.43	Pass
		2480	DH5	1	2.57	-17.43	Pass
		HOPP	DH5	1	2.57	-17.43	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	0.41	-19.59	Pass
		2441	2DH5	1	0.41	-19.59	Pass
		2480	2DH5	1	0.41	-19.59	Pass
		HOPP	2DH5	1	0.41	-19.59	Pass
8DPSK	SISO	2402	3DH5	1	0.12	-19.88	Pass
		2441	3DH5	1	0.12	-19.88	Pass
		2480	3DH5	1	0.12	-19.88	Pass
		HOPP	3DH5	1	0.12	-19.88	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.							

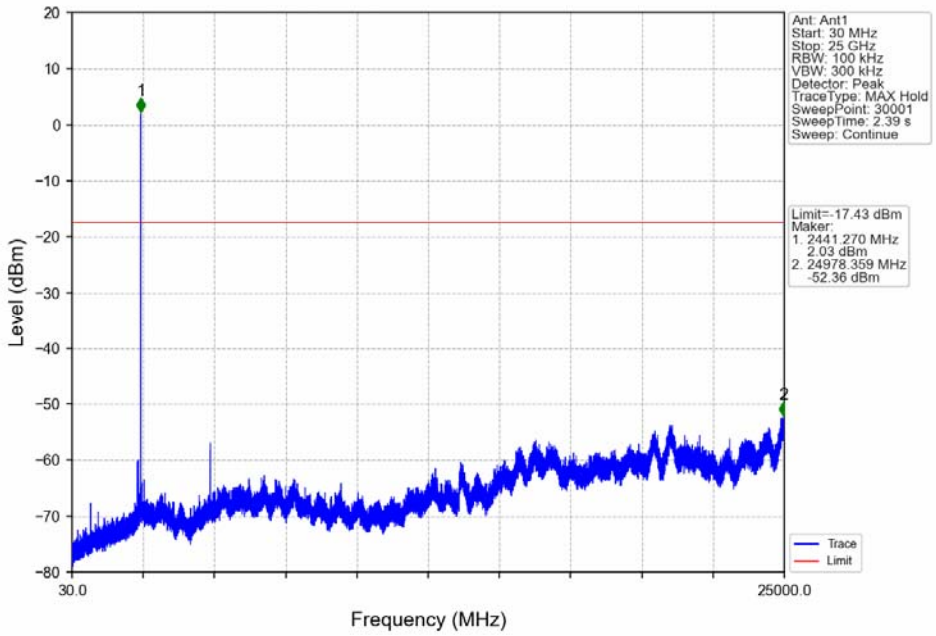
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



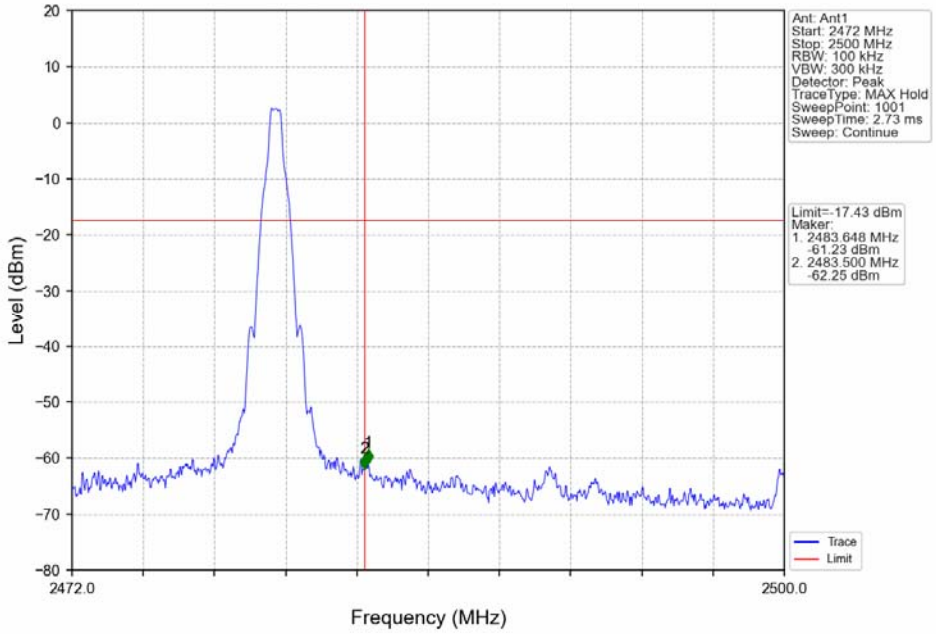
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



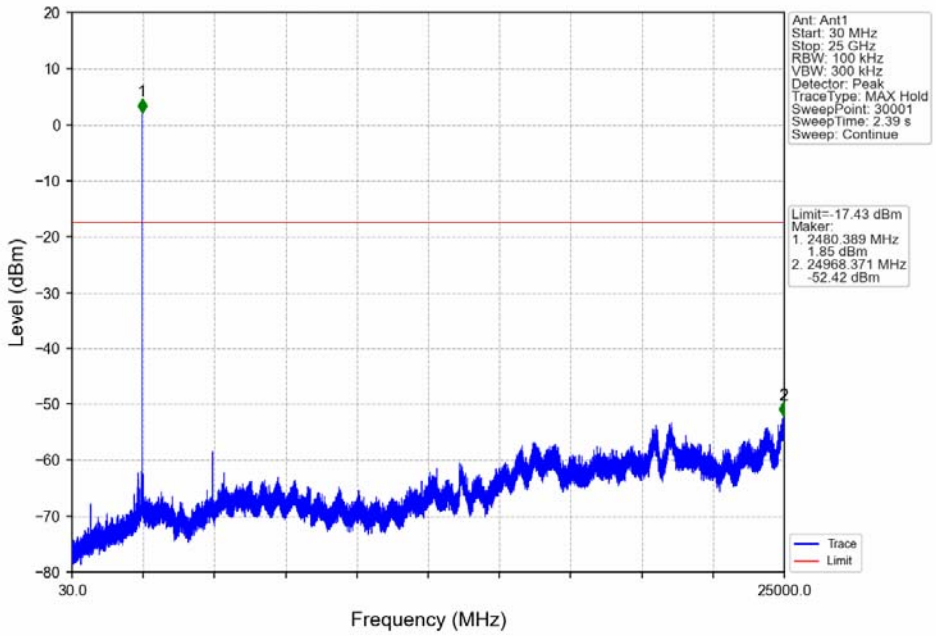
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



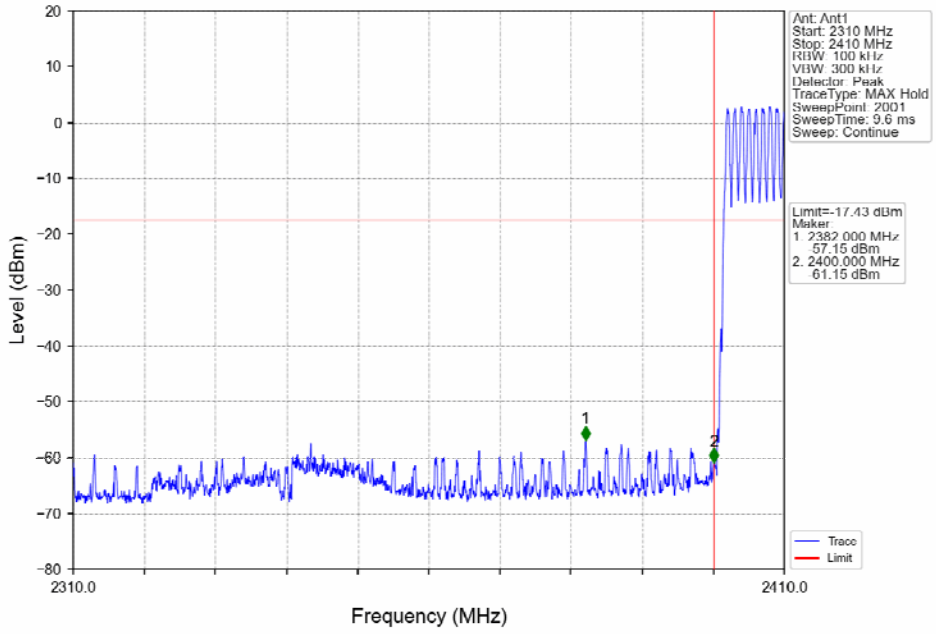
GFSK_DH5_HCH_2480MHz_Ant1_NTNV

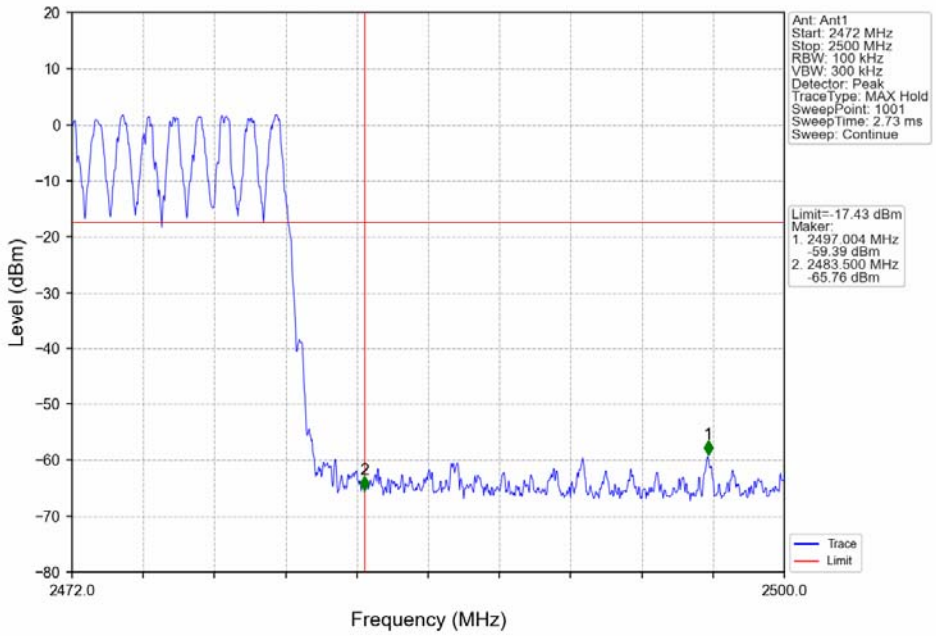


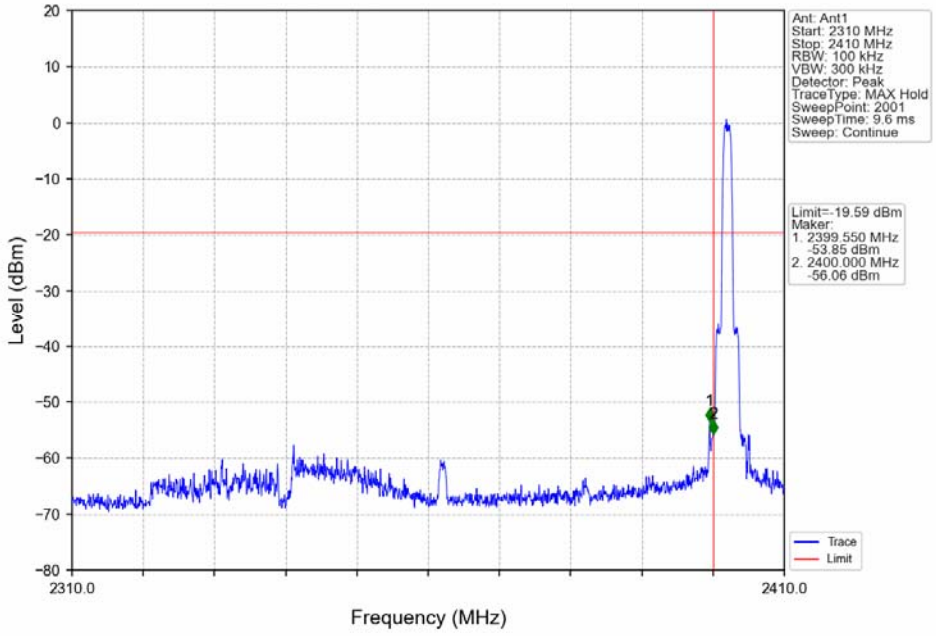
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



GFSK_DH5_HOPP_Ant1_NTNV



GFSK_DH5_HOPP_Ant1_NTNV


Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV


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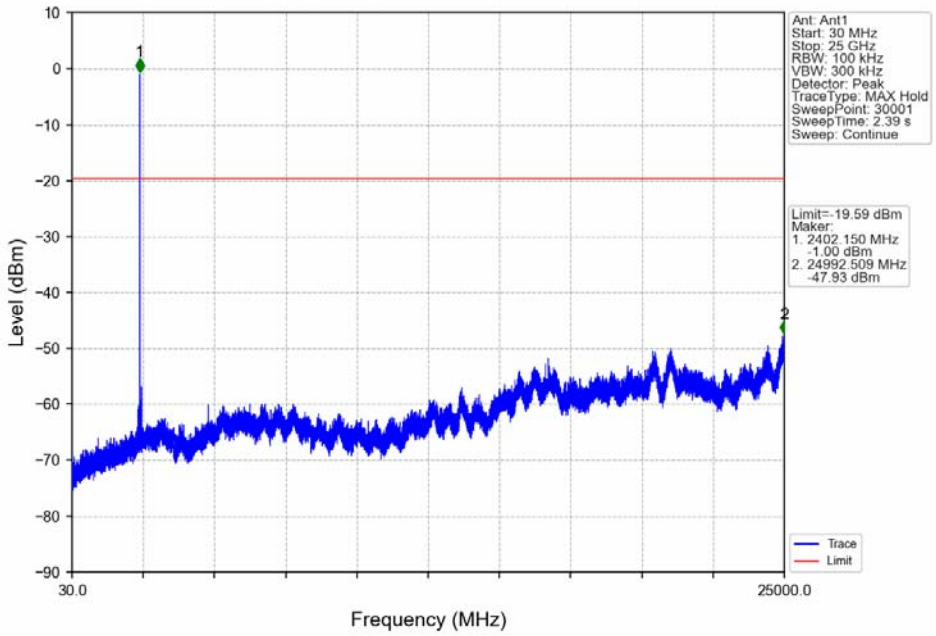

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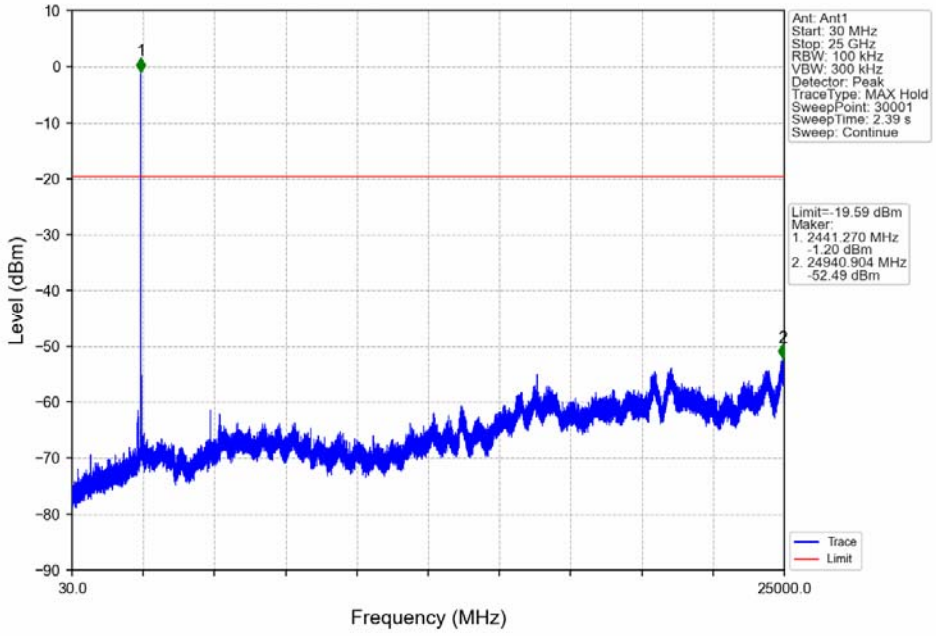

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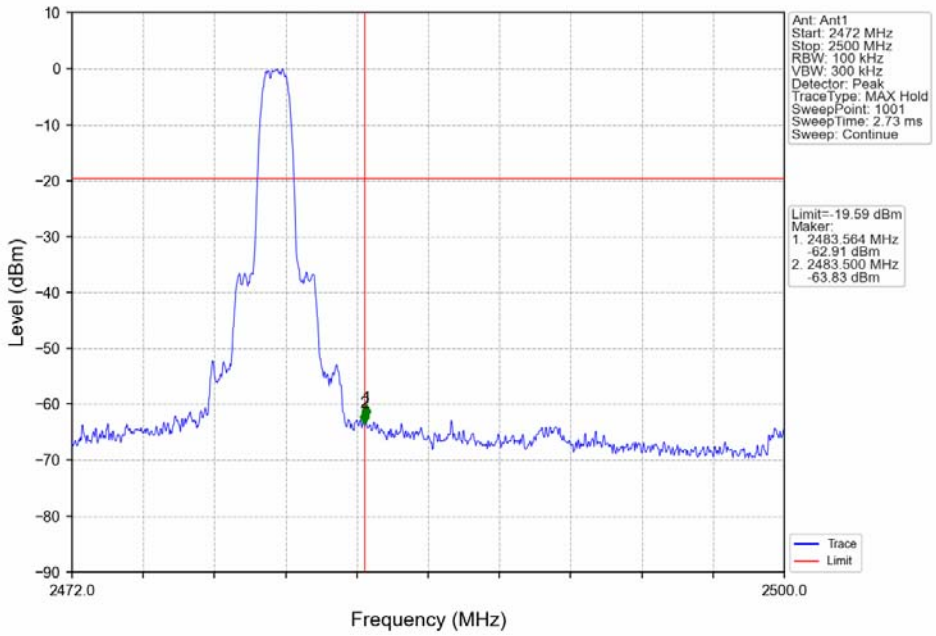

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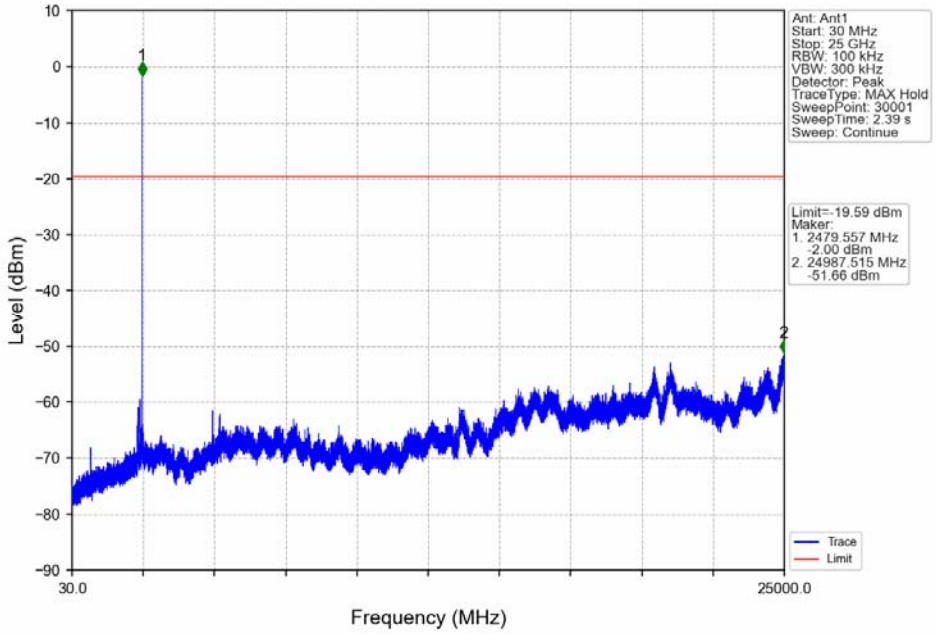

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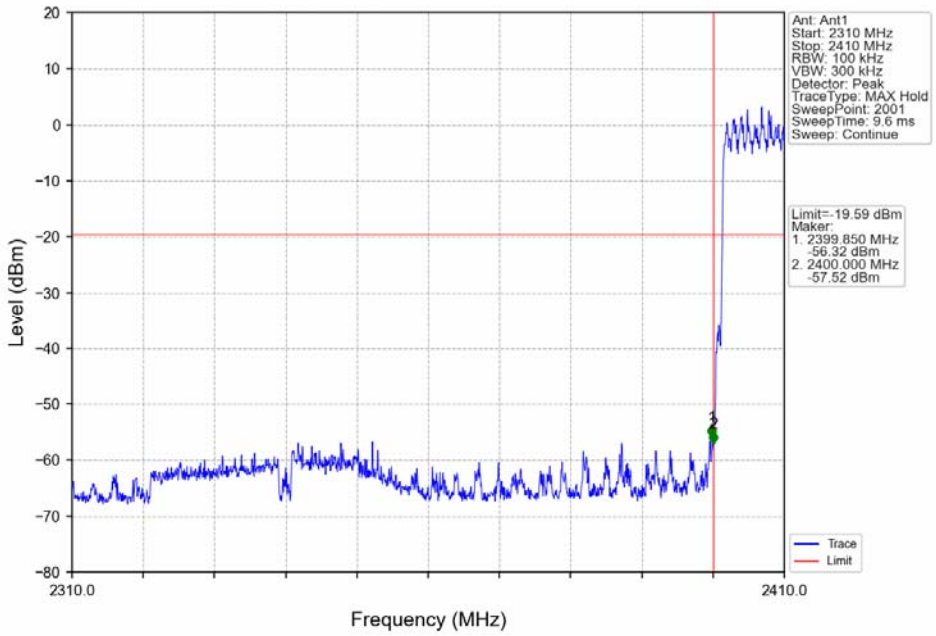

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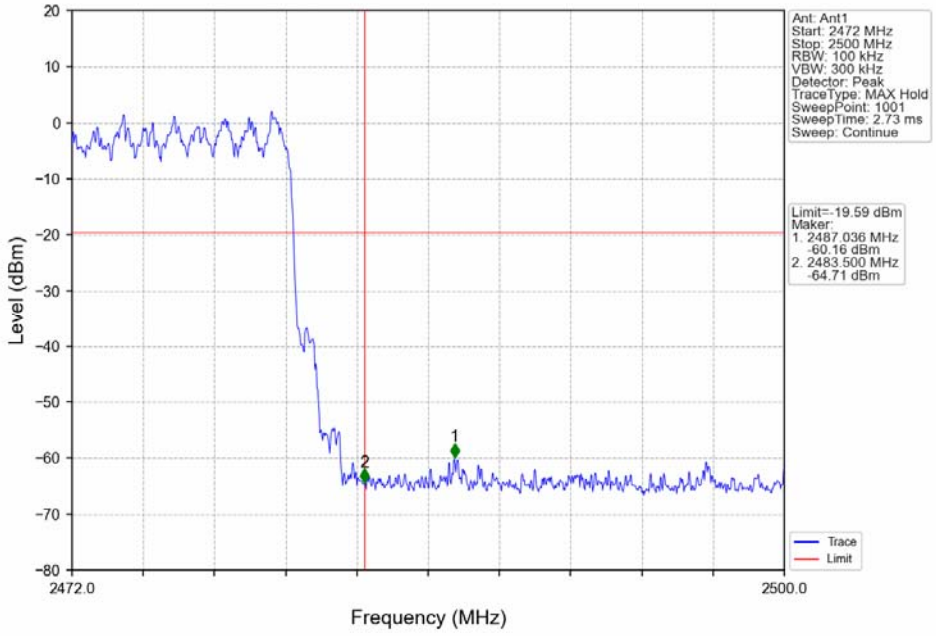
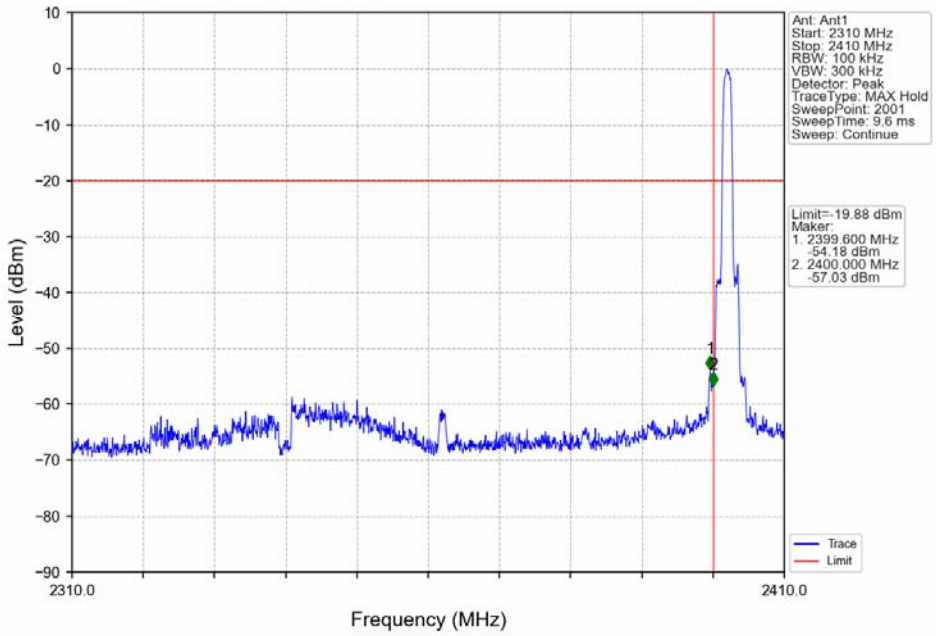


8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV


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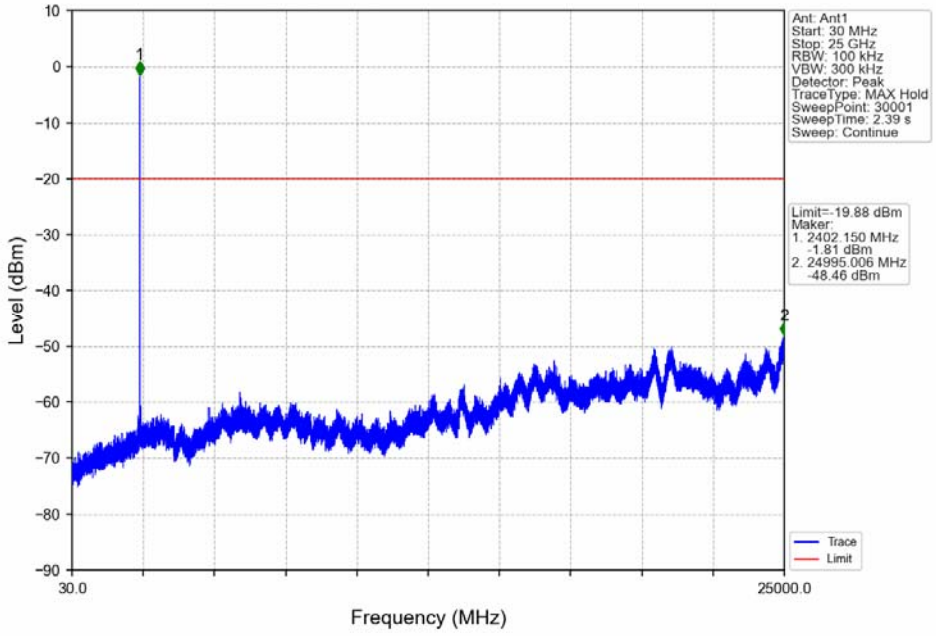
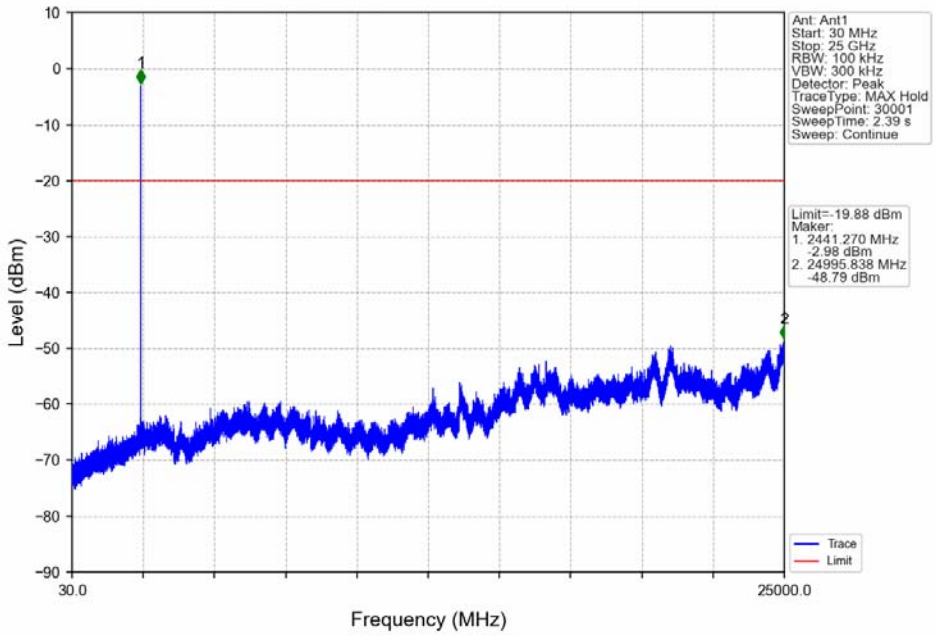


8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV


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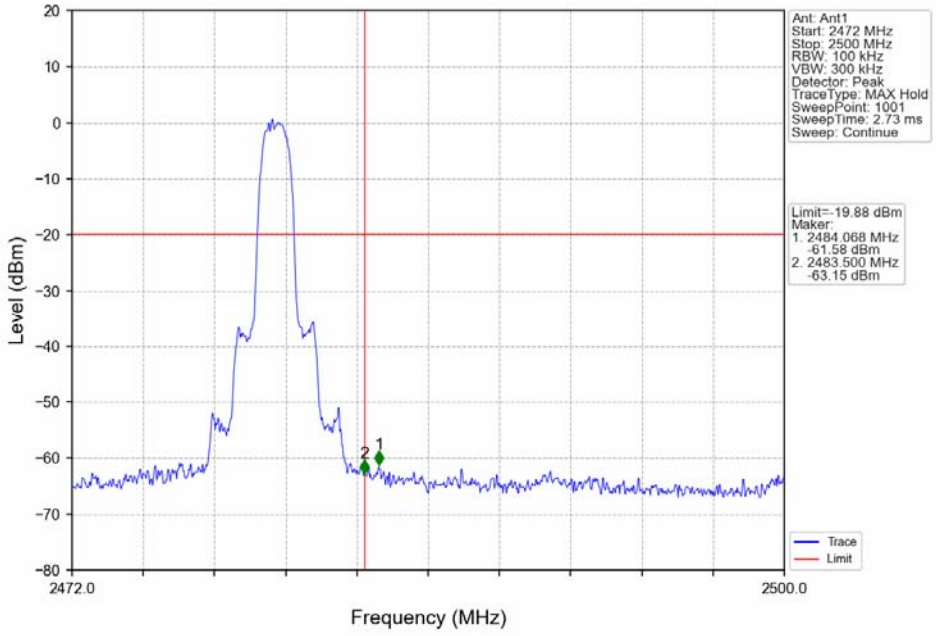

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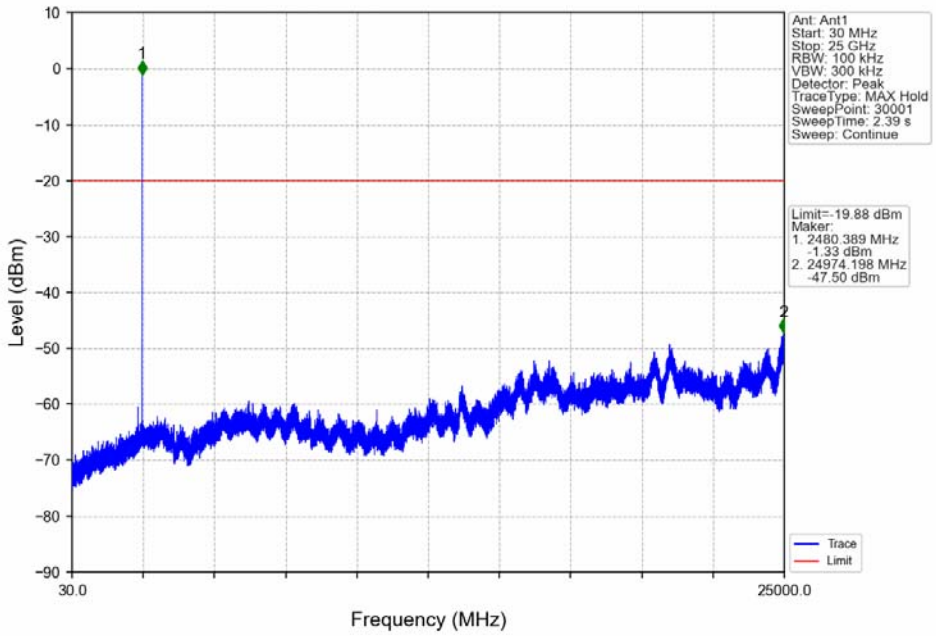

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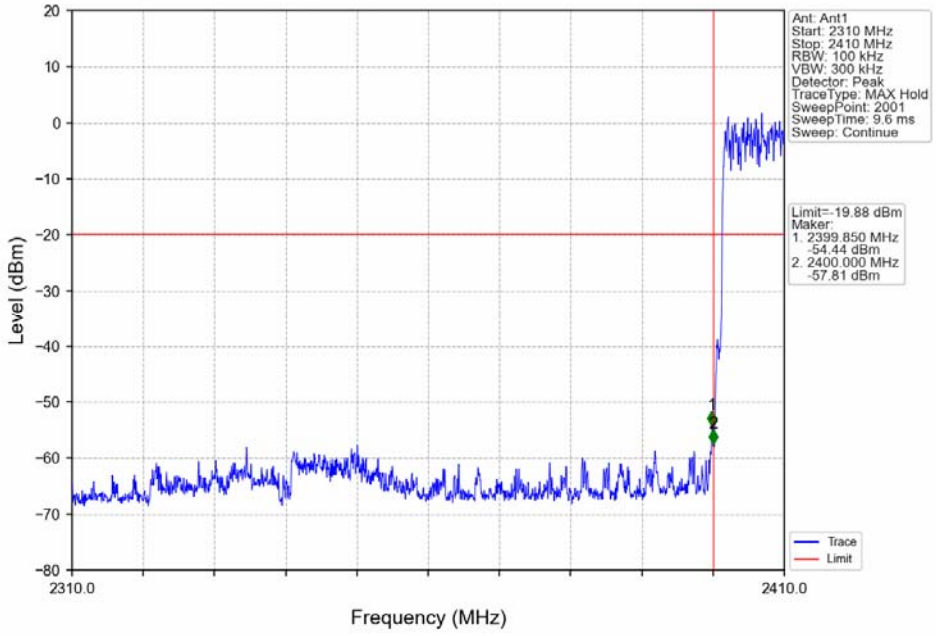
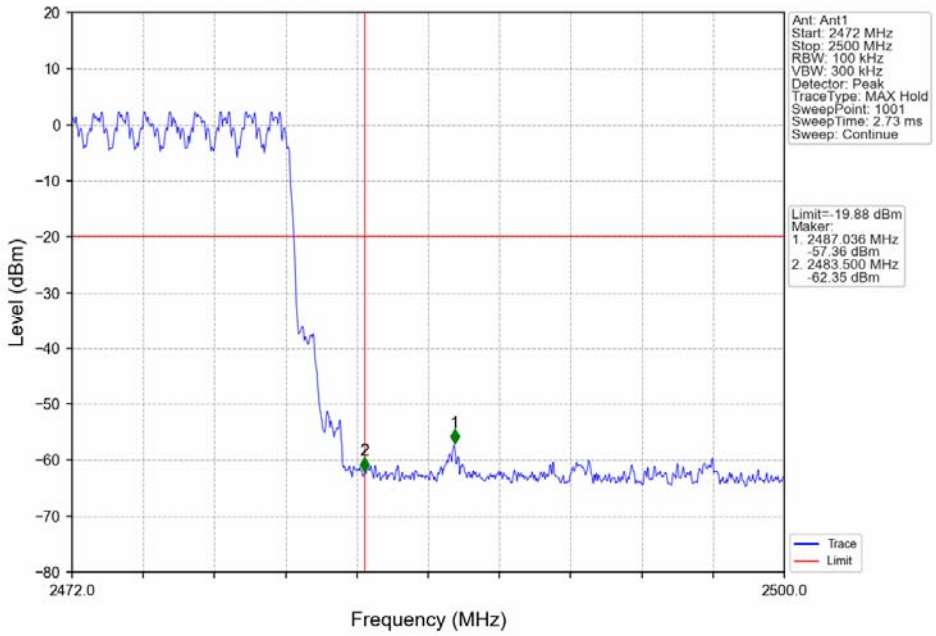


8DPSK_3DH5_HOPP_Ant1_NTNV



Restricted band Measurement

EUT	802.11b/g/n 1T1R WLAN + Bluetooth 4.2 USB Module		Model	BL-M8723DU4
Mode	Keeping Transmitting		Test Voltage	DC5.0V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
Horizontal				
2390	PK (dBμV/m)	42.3	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)
Vertical				
2390	PK (dBμV/m)	41.6	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

Restricted band Measurement

EUT	802.11b/g/n 1T1R WLAN + Bluetooth 4.2 USB Module		Model	BL-M8723DU4
Mode	Keeping Transmitting		Test Voltage	DC5.0V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
Horizontal				
2483.5	PK (dBμV/m)	55.8	Limit	74(dBμV/m)
	AV (dBμV/m)	46.3		54(dBμV/m)
Vertical				
2483.5	PK (dBμV/m)	49.11	Limit	74(dBμV/m)
	AV (dBμV/m)	--		54(dBμV/m)

Note: 1. For Restricted band test, only the worst case was reported and 8DPSK was the worst case

13.0 **Antenna Requirement**

13.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the mount in dB that the directional gain of the antenna exceeds 6 dBi.

13.2 Antenna Connected constructions

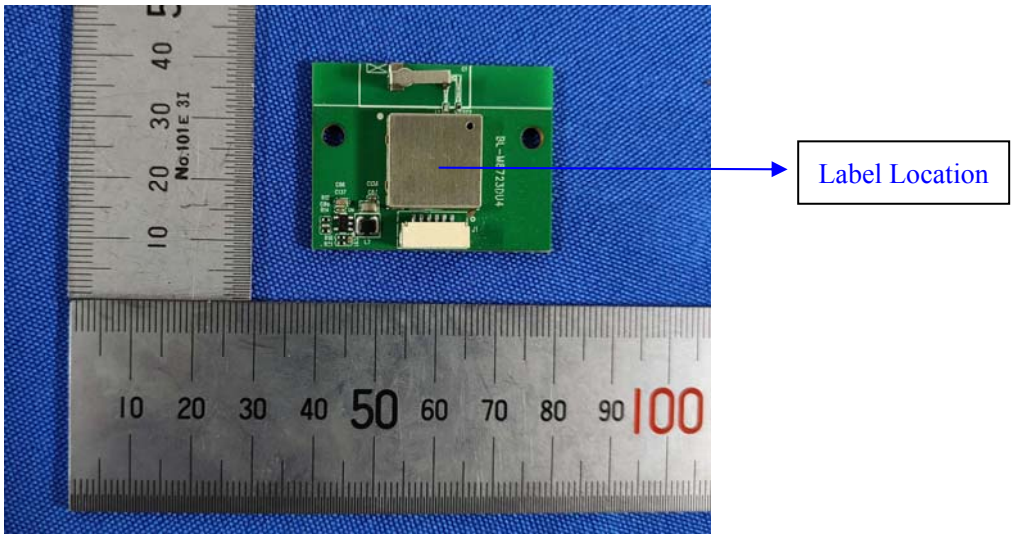
PIFA antenna used. The gain of the antennas is 0.2dBi (Get from the antenna specification provided the manufacturer)

14.0 FCC ID Label

FCC ID: 2AL6K-BL-M8723DU4

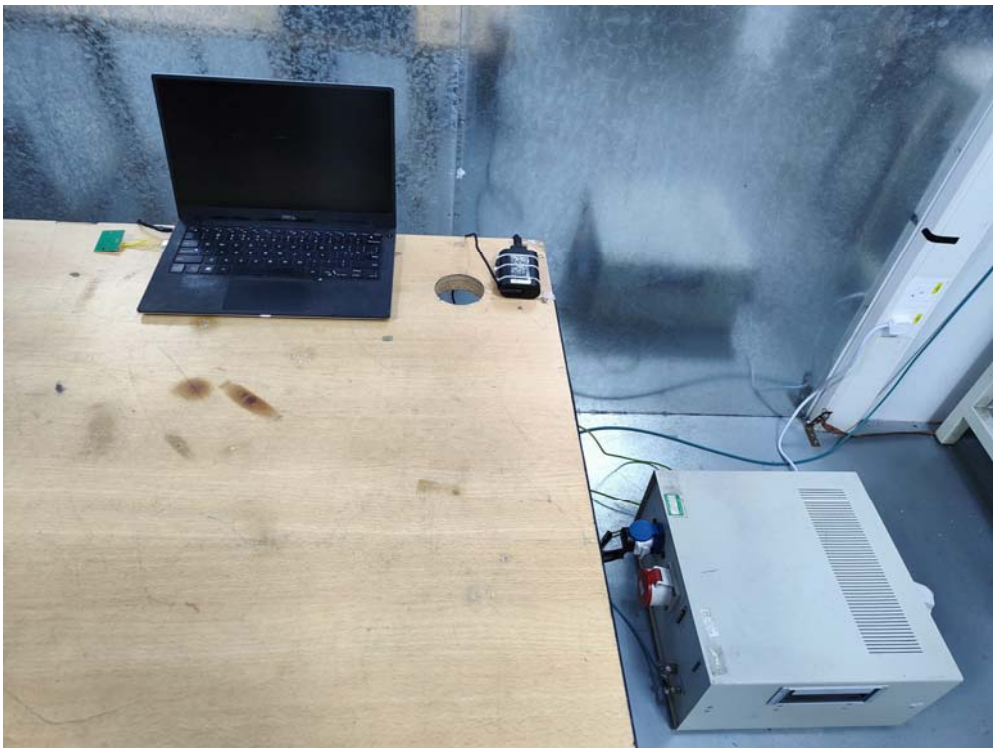
The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:

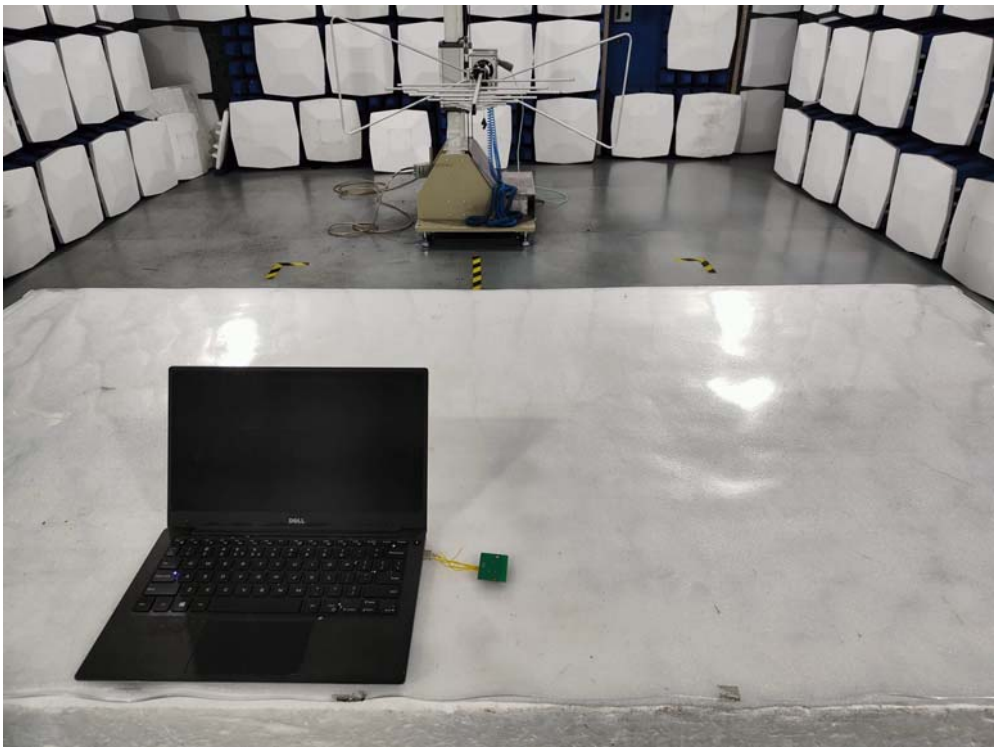


15.0 Photo of testing

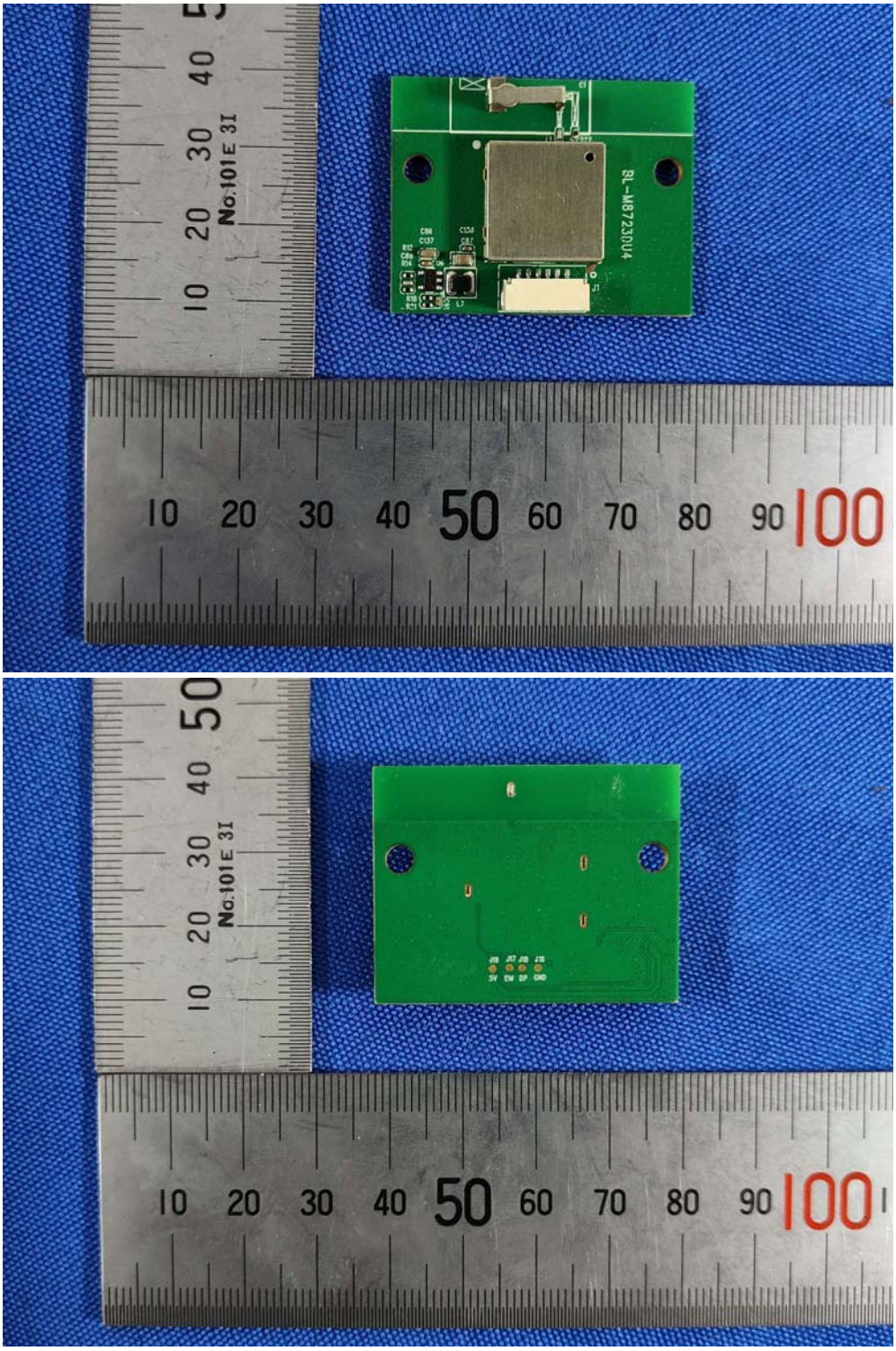
Conducted Emission Test Setup:



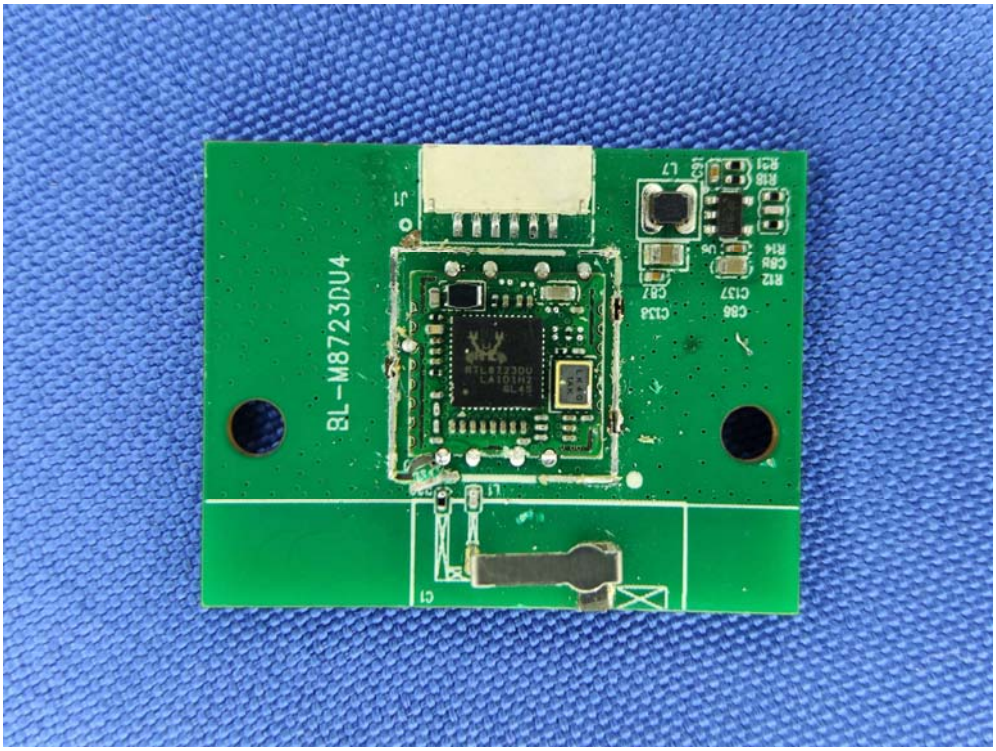
Radiated Emission Test Setup:



Photographs – EUT



Photographs – EUT



End of Report