TEST REPORT

Application No.:	FYCR2206000203ET(SGS SZ No.: T52210270277EM)
Applicant:	Foshan Baby Bear Technology Co.,Ltd
Address of Applicant:	No. 11-3, XingYeZhong Road, Changjiao Residential Committee, Lunjiao, Shunde, Foshan, Guangdong, China.
Manufacturer:	Foshan Baby Bear Technology Co.,Ltd
Address of Manufacturer:	No. 11-3, XingYeZhong Road, Changjiao Residential Committee, Lunjiao, Shunde, Foshan, Guangdong, China.
Supplier:	Foshan Baby Bear Technology Co.,Ltd
Equipment Under Test (EUT):	
EUT Name:	BABY SWING CHAIR
Item No.:	BB501/ BB501A / BB501B / BB501C / BB501D / BB501E / BB501F / BB501G / BB501H / BB501I / BB501J / BB501K / BB501L / BB501M / BB501N / BB501O / BB501P / BB501Q / BB501R / BB501S / BB501T / BB501U / BB501V / BB501W / BB501X / BB501Y / BB501Z ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
FCC ID:	2ATQH-BB501
Requested Age Grading:	0-9 month
Country of Origin:	China
Country of Destination:	North America
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2022-06-02
Date of Test:	2022-06-06 to 2022-06-22
Date of Issue:	2022-06-27
Test Result:	**Pass***

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

Winkey Wang
EMC Technical Manager

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Revision Record				
Version	***Chapter***	***Date***	***Modifier***	***Remark***
01		*2022-06-27*		*Original*

Authorized for issue by:				
		Tree Zhan **Tree Zhan/Project Engineer**		
		Winkey Wang **Winkey Wang/Reviewer**		

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2 Test Summary

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

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

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Declaration of EUT Family Grouping:

Item No.: BB501/ BB501A / BB501B / BB501C / BB501D / BB501E / BB501F / BB501G / BB501H / BB501I / BB501J / BB501K / BB501L / BB501M / BB501N / BB501O / BB501P / BB501Q / BB501R / BB501S / BB501T / BB501U / BB501V / BB501W / BB501X / BB501Y / BB501Z

Only the item BB501 was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above items, with only difference on item No., color and decorations.

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3 Contents

Page

1 COVER PAGE 1

2 TEST SUMMARY 3

3 CONTENTS 5

4 GENERAL INFORMATION 7

4.1 DETAILS OF E.U.T. 7
4.2 DESCRIPTION OF SUPPORT UNITS 7
4.3 MEASUREMENT UNCERTAINTY 8
4.4 TEST LOCATION 9
4.5 TEST FACILITY 9
4.6 DEVIATION FROM STANDARDS 9
4.7 ABNORMALITIES FROM STANDARD CONDITIONS 9

5 EQUIPMENT LIST 10

6 RADIO SPECTRUM TECHNICAL REQUIREMENT 15

6.1 ANTENNA REQUIREMENT 15
6.1.1 Test Requirement: 15
6.1.2 Conclusion 15
6.2 OTHER REQUIREMENTS FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM HOPPING SEQUENCE 16
6.2.1 Test Requirement: 16
6.2.2 Conclusion 16

7 RADIO SPECTRUM MATTER TEST RESULTS 18

7.1 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ) 18
7.1.1 E.U.T. Operation 18
7.1.2 Test Mode Description 18
7.1.3 Test Setup Diagram 19
7.1.4 Measurement Procedure and Data 19
7.2 CONDUCTED PEAK OUTPUT POWER 22
7.2.1 E.U.T. Operation 22
7.2.2 Test Mode Description 22
7.2.3 Test Setup Diagram 22
7.2.4 Measurement Procedure and Data 23
7.3 20DB BANDWIDTH 24
7.3.1 E.U.T. Operation 24
7.3.2 Test Mode Description 24
7.3.3 Test Setup Diagram 24
7.3.4 Measurement Procedure and Data 24
7.4 CARRIER FREQUENCIES SEPARATION 25
7.4.1 E.U.T. Operation 25
7.4.2 Test Mode Description 25
7.4.3 Test Setup Diagram 25
7.4.4 Measurement Procedure and Data 25

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7.5 HOPPING CHANNEL NUMBER....26
7.5.1 E.U.T. Operation....26
7.5.2 Test Mode Description....26
7.5.3 Test Setup Diagram....26
7.5.4 Measurement Procedure and Data....26
7.6 DWELL TIME....27
7.6.1 E.U.T. Operation....27
7.6.2 Test Mode Description....27
7.6.3 Test Setup Diagram....27
7.6.4 Measurement Procedure and Data....27
7.7 CONDUCTED BAND EDGES MEASUREMENT....28
7.7.1 E.U.T. Operation....28
7.7.2 Test Mode Description....28
7.7.3 Test Setup Diagram....29
7.7.4 Measurement Procedure and Data....29
7.8 CONDUCTED SPURIOUS EMISSIONS....30
7.8.1 E.U.T. Operation....30
7.8.2 Test Mode Description....30
7.8.3 Test Setup Diagram....31
7.8.4 Measurement Procedure and Data....31
7.9 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS....32
7.9.1 E.U.T. Operation....32
7.9.2 Test Mode Description....32
7.9.3 Test Setup Diagram....33
7.9.4 Measurement Procedure and Data....34
7.10 RADIATED SPURIOUS EMISSIONS BELOW 1GHZ....39
7.10.1 E.U.T. Operation....39
7.10.2 Test Mode Description....39
7.10.3 Test Setup Diagram....40
7.10.4 Measurement Procedure and Data....40
7.11 RADIATED SPURIOUS EMISSIONS ABOVE 1GHZ....43
7.11.1 E.U.T. Operation....43
7.11.2 Test Mode Description....43
7.11.3 Test Setup Diagram....43
7.11.4 Measurement Procedure and Data....44

8 TEST SETUP PHOTO....51

9 EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS)....51

10 APPENDIX....52

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4 General Information

4.1 Details of E.U.T.

Power supply:	Swing: Input 6Vdc via 'AAA' battery or Input 5V via AC/DC adapter AC/DC adapter: Input 100-240V~, 50/60Hz, 0.2A max; Output 5Vdc, 1000mA adapter Model No.: KA0601-0501000USU Infrared remote control: 3Vdc via 'CR2025' cell battery
Cable(s):	USB DC output cable: 200cm, unshielded
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V4.2 Dual mode
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PCB Antenna
Antenna Gain:	1.2dBi

4.2 Description of Support Units

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

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4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	± 2.1 dB (9kHz to 30MHz)
Conducted Peak Output Power	± 0.8dB
20dB Bandwidth	± 0.3%
Carrier Frequencies Separation	± 0.3%
Hopping Channel Number	± 0.3%
Dwell Time	± 0.3%
Conducted Band Edges Measurement	± 2.7dB
Conducted Spurious Emissions	± 2.7dB
Radiated Emissions which fall in the restricted bands	± 4.4dB (Above 1GHz)
Radiated Spurious Emissions Below 1GHz	± 3.1dB (Below 1GHz)
Radiated Spurious Emissions Above 1GHz	± 4.4dB (Above 1GHz)
Remark: The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.	

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4.4 Test Location

All tests were performed at:

Compliance Certification Services（Kunshan）Inc. Shenzhen branch.

Fuyong lab. Xinlong TechnoPark,Fengtang Road, Fuyong Subdistrict, Bao'an, Shenzhen, China

Tel: +86 755 8866 3988 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

• A2LA (Certificate No. 6606.01)

Compliance Certification Services（Kunshan）Inc. Shenzhen branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6606.01.

• FCC –Designation Number: CN1322

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

Designation Number: CN1322. Test Firm Registration Number: 718073

• Innovation, Science and Economic Development Canada

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

CAB identifier: CN0129.

IC#: 28189.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	CRT	N/A	SEM001-14	2021/7/13	2024/7/12
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-01	2021/7/13	2022/7/12
Two-Line V-Network	Rohde & Schwarz	ENV216	SEM007-16	2021/7/13	2022/7/12
Two-Line V-Network	Rohde & Schwarz	ESH3-Z5	SEM007-22	2022/1/10	2023/1/9

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12

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Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

Hopping Channel Number					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

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Dwell Time					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

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Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021/7/13	2022/7/12
MXA Signal Analyzer	Agilent	N9020A	SEM004-20	2021/7/13	2022/7/12
Signal Generator	Agilent	N5173B	SEM006-05	2021/7/13	2022/7/12
ESG Vector Signal Generator	Agilent	E4438C	SEM006-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-15	2021/7/13	2022/7/12
Power Sensor	Erika Fiedler	U2021XA	SEM009-16	2021/7/13	2022/7/12
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	SEM010-08	2021/7/13	2022/7/12
Programmable DC Source	Chroma	62024P-80-60	SEM011-09	2021/7/13	2022/7/12
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2021/7/13	2022/7/12

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-33	2021/9/25	2024/9/24
Biconical Antenna	Schwarzbeck	VUBA9117	SEM003-35	2021/12/26	2024/12/25
Loop Antenna	ETS-LINDGREN	6502	SEM003-36	2021/9/26	2024/9/25
MXE EMI receiver	Agilent	N9038A	SEM004-05	2021/7/13	2022/7/12
Pre-amplifier	HP	8447D	SEM005-02	2021/7/13	2022/7/12
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2021/7/11	2024/7/10
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	SEM003-32	2021/9/26	2024/9/25
Double-ridged waveguide horn	ETS-LINDGREN	3117	SEM003-34	2021/9/25	2024/9/24
Spectrum Analyzer	Rohde & Schwarz	101288	SEM004-08	2021/7/13	2022/7/12
Low Noise Amplifier	CLAVIIO	BDLNA-0118-352810	SEM005-05	2021/7/13	2022/7/12
Pre-amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2021/7/13	2022/7/12
Pre-amplifier	Rohde & Schwarz	CH14-H052	SEM005-17	2021/7/13	2022/7/12
Pre-amplifier	TST PASS	LNA04080G30	SEM005-27	2022/4/15	2023/4/14
Pre-amplifier	TST PASS	LNA10180G45	SEM005-28	2022/4/15	2023/4/14

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Radiated Spurious Emissions Below 1GHz					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2022/7/12
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-33	2021/9/25	2024/9/24
Biconical Antenna	Schwarzbeck	VUBA9117	SEM003-35	2021/12/26	2024/12/25
Loop Antenna	ETS-LINDGREN	6502	SEM003-36	2021/9/26	2024/9/25
MXE EMI receiver	Agilent	N9038A	SEM004-05	2021/7/13	2022/7/12
Pre-amplifier	HP	8447D	SEM005-02	2021/7/13	2022/7/12

Radiated Spurious Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2022/7/12
MXE EMI receiver	Agilent	N9038A	SEM004-05	2021/7/13	2022/7/12
Pre-amplifier	HP	8447D	SEM005-02	2021/7/13	2022/7/12
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2021/7/11	2024/7/10
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	SEM003-32	2021/9/26	2024/9/25
Double-ridged waveguide horn	ETS-LINDGREN	3117	SEM003-34	2021/9/25	2024/9/24
Spectrum Analyzer	Rohde & Schwarz	101288	SEM004-08	2021/7/13	2022/7/12
Low Noise Amplifier	CLAVIIO	BDLNA-0118-352810	SEM005-05	2021/7/13	2022/7/12
Pre-amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2021/7/13	2022/7/12
Pre-amplifier	Rohde & Schwarz	CH14-H052	SEM005-17	2021/7/13	2022/7/12
Pre-amplifier	TST PASS	LNA04080G30	SEM005-27	2022/4/15	2023/4/14
Pre-amplifier	TST PASS	LNA10180G45	SEM005-28	2022/4/15	2023/4/14

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Mingle	TH607	SEM002-22	2021-07-13	2022-07-12
Humidity/ Temperature Indicator	Mingle	TH607	SEM002-23	2021-07-13	2022-07-12
Barometer	DUMAI	DYM3	SEM002-24	2021-07-13	2022-07-12

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 1.2dBi.

Antenna location: Refer to internal photo.

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6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

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

6.2.2 Conclusion

Standard Requirement:

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

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

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

Compliance for section 15.247(a)(1):

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

> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

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

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

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

Compliance for section 15.247(g):

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

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Compliance for section 15.247(h):

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

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

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7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C Humidity: 52.9 % RH Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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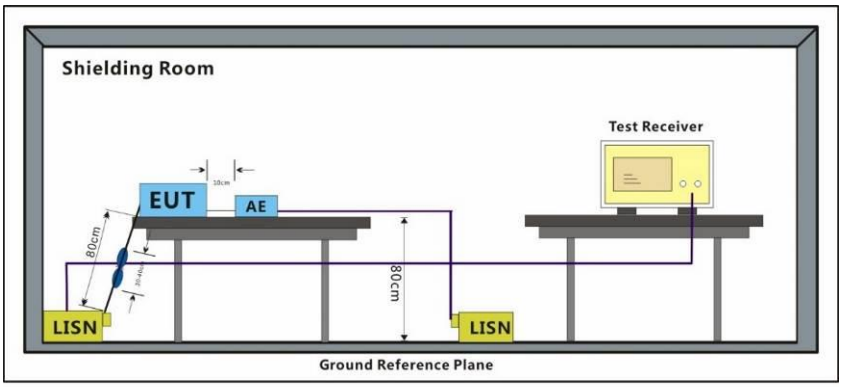
7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Level=Read Level+ Cable Loss+ LISN Factor

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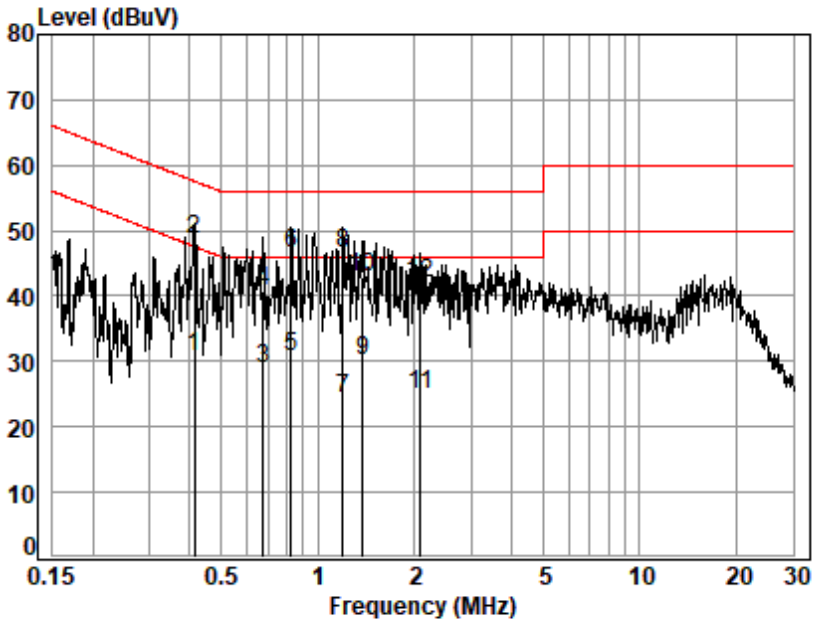
Test Mode: 01; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 00203ET
Test mode: 01

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.4148	0.03	0.27	30.52	30.82	47.55	-16.73	Average
2	0.4148	0.03	0.27	48.25	48.55	57.55	-9.00	QP
3	0.6754	0.02	0.23	28.63	28.88	46.00	-17.12	Average
4	0.6754	0.02	0.23	40.50	40.75	56.00	-15.25	QP
5	0.8261	0.05	0.21	30.60	30.86	46.00	-15.14	Average
6	0.8261	0.05	0.21	46.37	46.63	56.00	-9.37	QP
7	1.1970	0.02	0.18	24.02	24.22	46.00	-21.78	Average
8	1.1970	0.02	0.18	46.38	46.58	56.00	-9.42	QP
9	1.3811	0.02	0.18	29.79	29.99	46.00	-16.01	Average
10	1.3811	0.02	0.18	42.59	42.79	56.00	-13.21	QP
11	2.0768	0.01	0.17	24.79	24.97	46.00	-21.03	Average
12	2.0768	0.01	0.17	41.83	42.01	56.00	-13.99	QP

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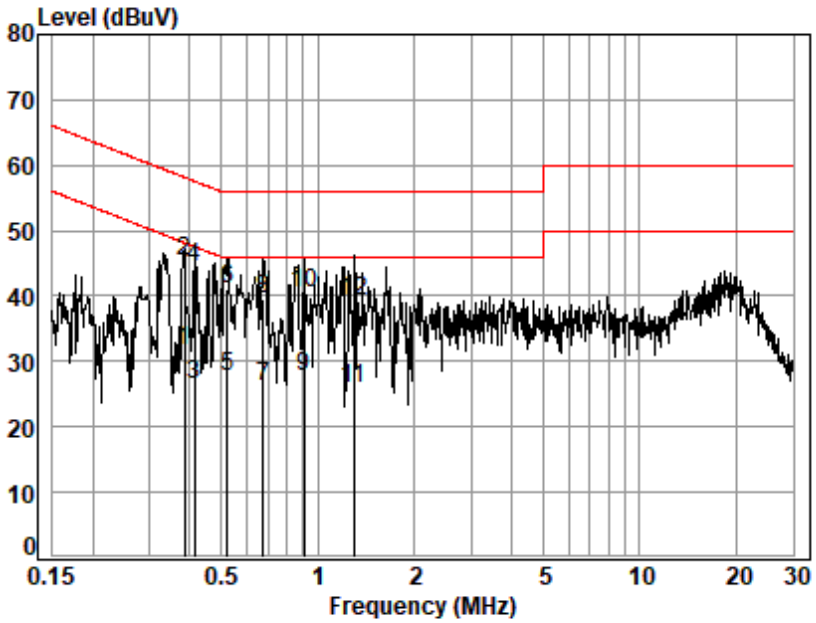
Test Mode: 01; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 00203ET
Test mode: 01

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.3852	0.03	0.28	31.24	31.55	48.17	-16.62	Average
2	0.3852	0.03	0.28	45.00	45.31	58.17	-12.86	QP
3	0.4127	0.03	0.27	26.22	26.52	47.59	-21.07	Average
4	0.4127	0.03	0.27	44.15	44.45	57.59	-13.14	QP
5	0.5238	0.02	0.25	27.30	27.57	46.00	-18.43	Average
6	0.5238	0.02	0.25	40.86	41.13	56.00	-14.87	QP
7	0.6790	0.02	0.17	26.07	26.26	46.00	-19.74	Average
8	0.6790	0.02	0.17	39.27	39.46	56.00	-16.54	QP
9	0.9039	0.01	0.09	27.54	27.64	46.00	-18.36	Average
10	0.9039	0.01	0.09	40.41	40.51	56.00	-15.49	QP
11	1.2960	0.02	0.09	25.61	25.72	46.00	-20.28	Average
12	1.2960	0.02	0.09	39.11	39.22	56.00	-16.78	QP

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7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

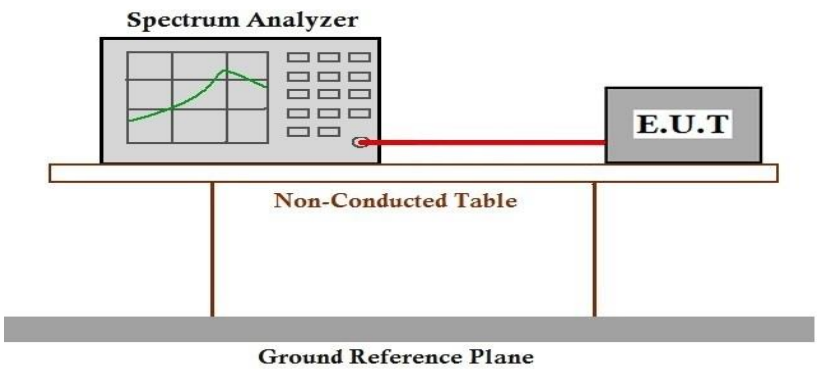
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram



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7.2.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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7.3 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.7

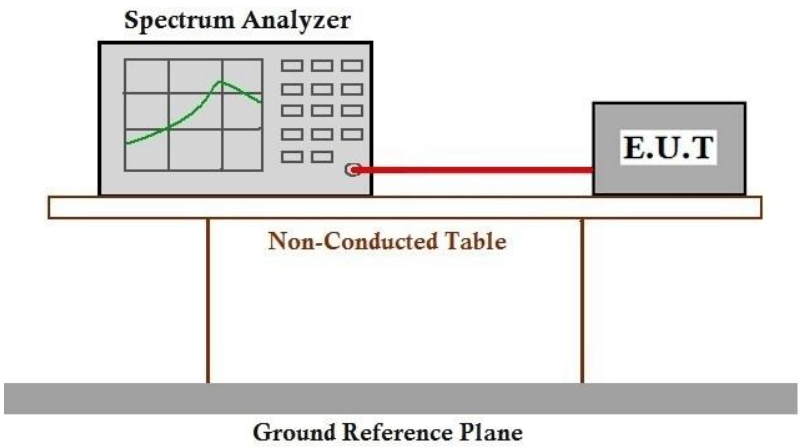
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

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7.4 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)
Test Method: ANSI C63.10 (2013) Section 7.8.2

Limit:

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

7.4.1 E.U.T. Operation

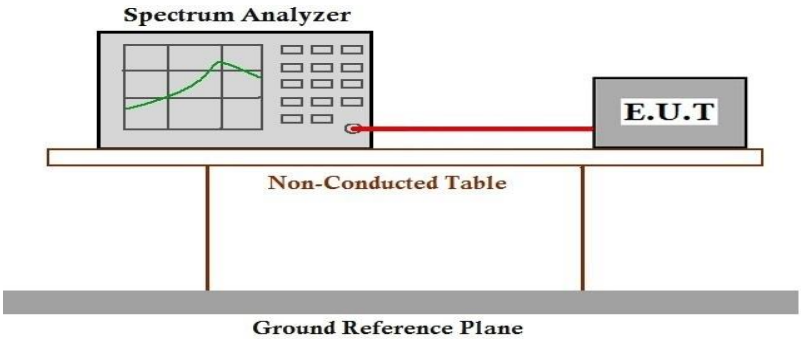
Operating Environment:

Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	02	TX_Hop mode via battery power supply _Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_Hop mode via adapter power supply_ Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

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7.5 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

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

7.5.1 E.U.T. Operation

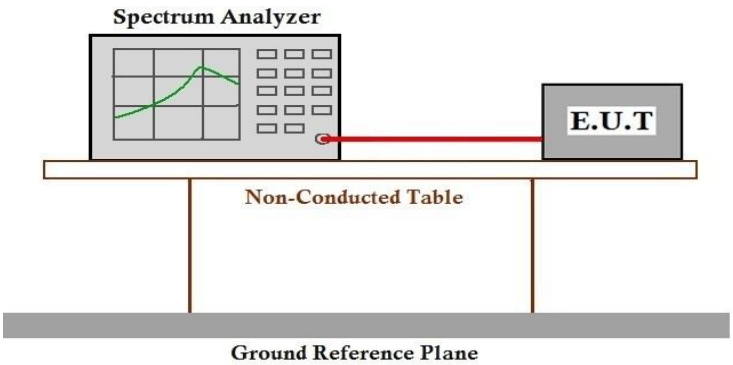
Operating Environment:

Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	02	TX_Hop mode via battery power supply _Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_Hop mode via adapter power supply_ Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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7.6 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)
Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

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

7.6.1 E.U.T. Operation

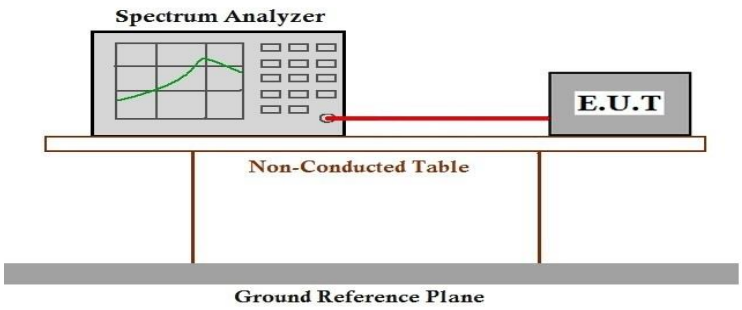
Operating Environment:

Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	02	TX_Hop mode via battery power supply _Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_Hop mode via adapter power supply_ Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

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7.7 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 7.8.6

Limit:

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

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply _Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	02	TX_Hop mode via battery power supply _Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_Hop mode via adapter power supply_ Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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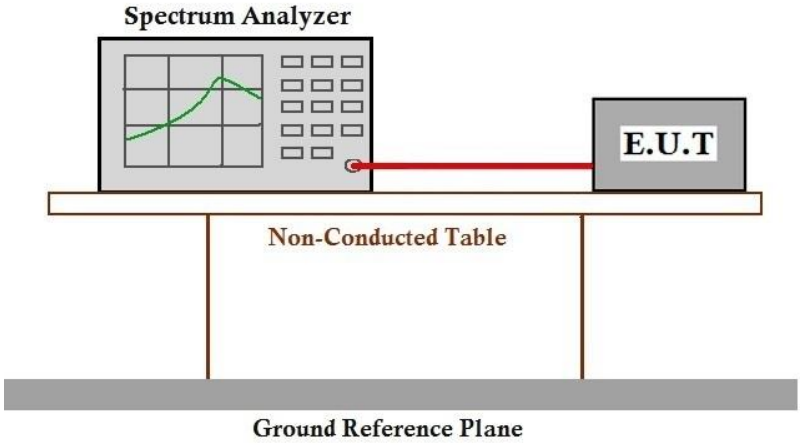
7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

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7.8 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit:

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

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C Humidity: 63.7 % RH Atmospheric Pressure: 1020 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply _Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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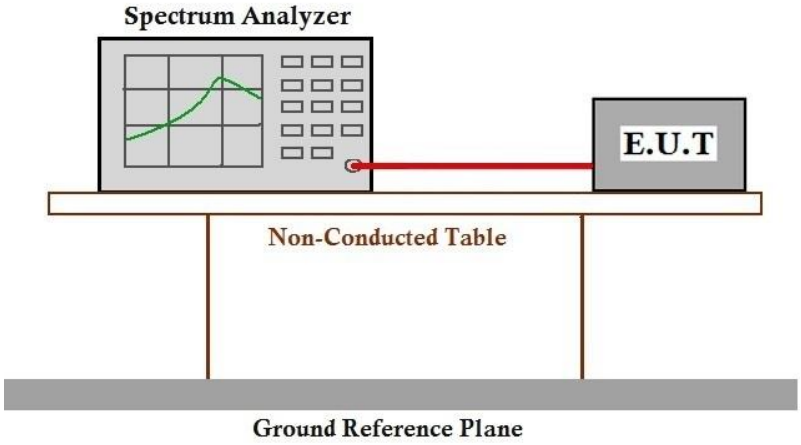
7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

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7.9 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

7.9.1 E.U.T. Operation

Operating Environment:
Temperature: 23.3 °C Humidity: 60.5 % RH Atmospheric Pressure: 1020 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply _Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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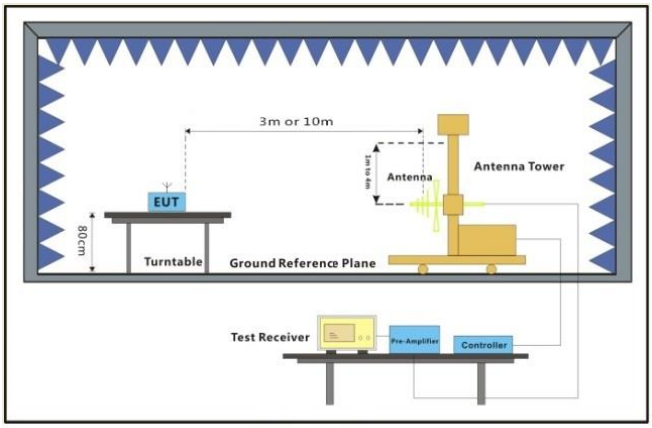
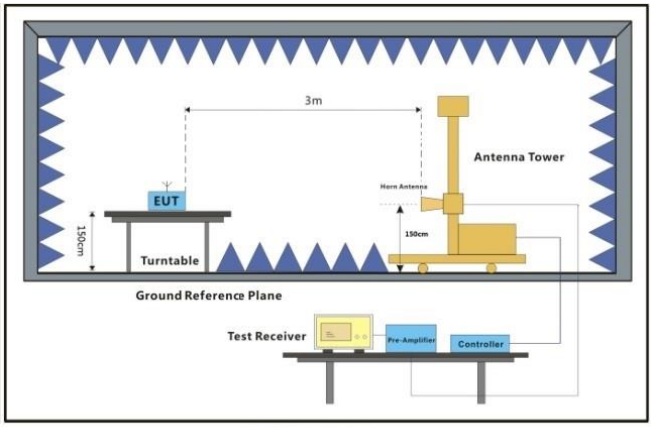
7.9.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.9.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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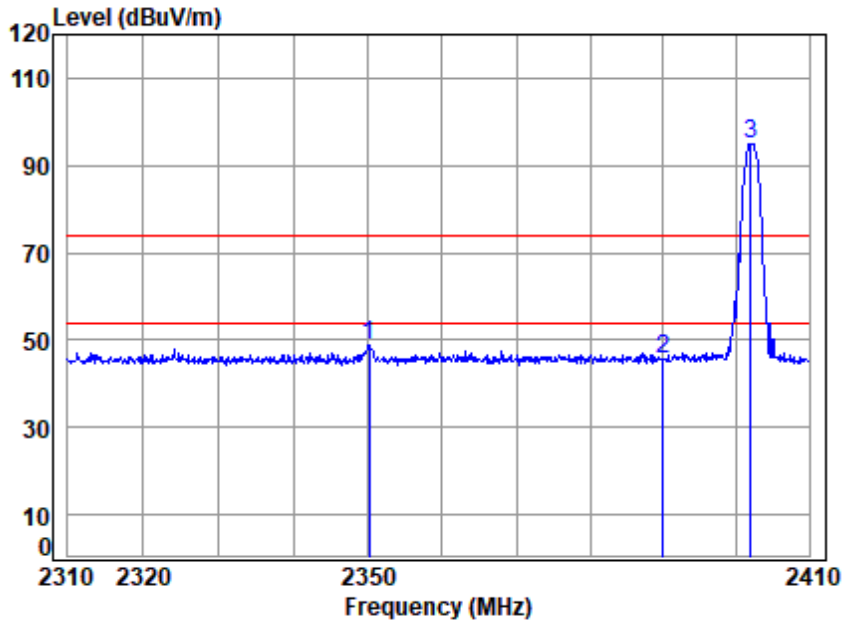
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00203ET
Mode : 2402 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2350.0900	5.02	27.07	32.50	49.26	48.85	74.00	-25.15	peak
2	2390.0000	5.05	27.16	32.50	45.74	45.45	74.00	-28.55	peak
3	2402.0000	5.06	27.18	32.50	95.25	94.99	74.00	20.99	peak

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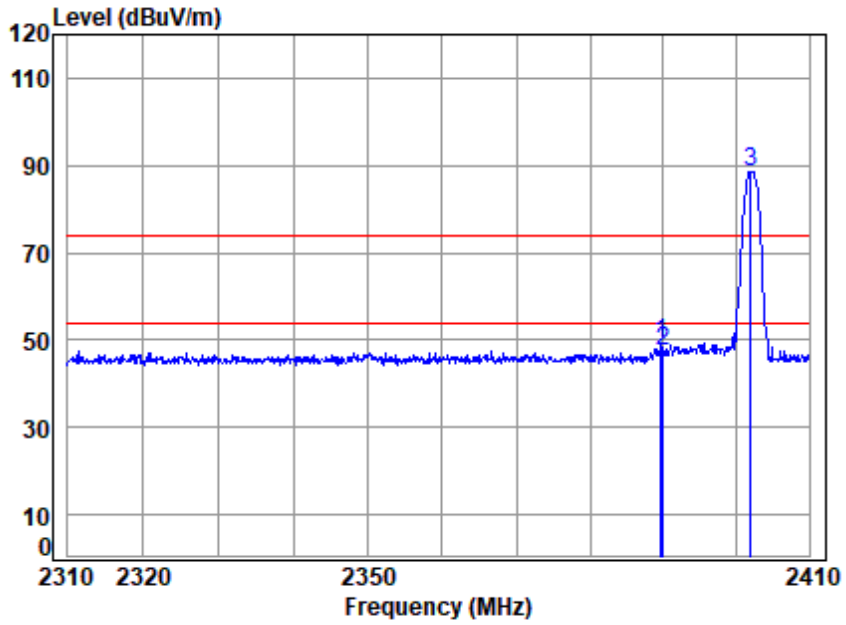
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 00203ET
Mode : 2402 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.6590	5.05	27.16	32.50	49.71	49.42	74.00	-24.58	peak
2	2390.0000	5.05	27.16	32.50	47.77	47.48	74.00	-26.52	peak
3	2402.0000	5.06	27.18	32.50	88.86	88.60	74.00	14.60	peak

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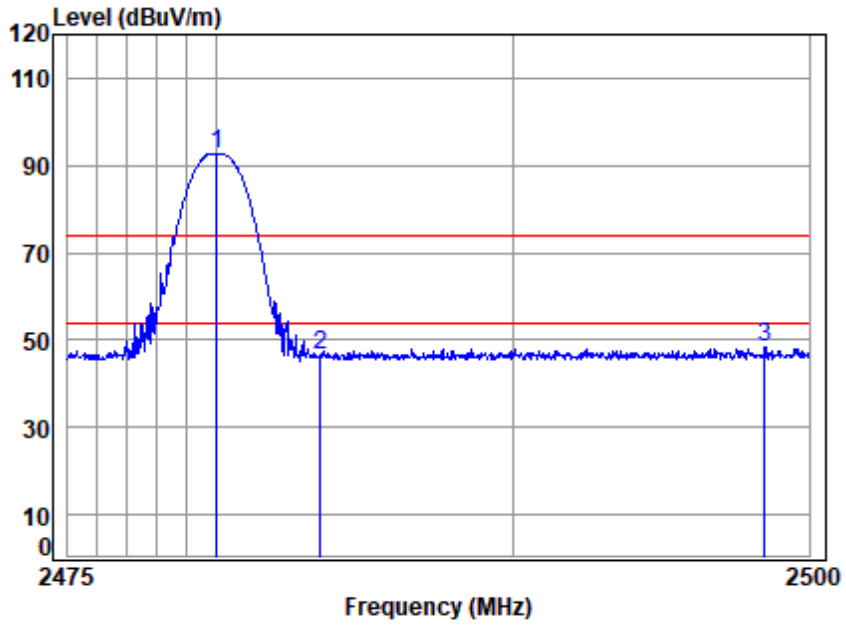
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00203ET
Mode : 2480 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2480.0000	5.12	27.36	32.50	92.79	92.77	74.00	18.77	peak
2	2483.5000	5.12	27.36	32.50	46.61	46.59	74.00	-27.41	peak
3	2498.4930	5.13	27.40	32.50	48.48	48.51	74.00	-25.49	peak

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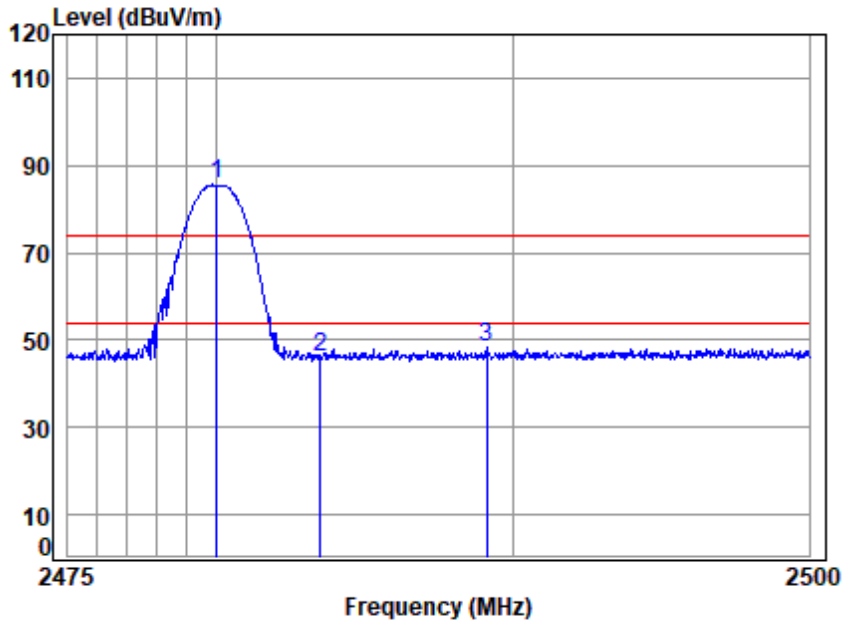
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 00203ET
Mode : 2480 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2480.0000	5.12	27.36	32.50	85.60	85.58	74.00	11.58	peak
2	2483.5000	5.12	27.36	32.50	46.01	45.99	74.00	-28.01	peak
3	2489.0940	5.12	27.38	32.50	48.45	48.45	74.00	-25.55	peak

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7.10 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5
Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

7.10.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 48.9 % RH Atmospheric Pressure: 1020 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply _Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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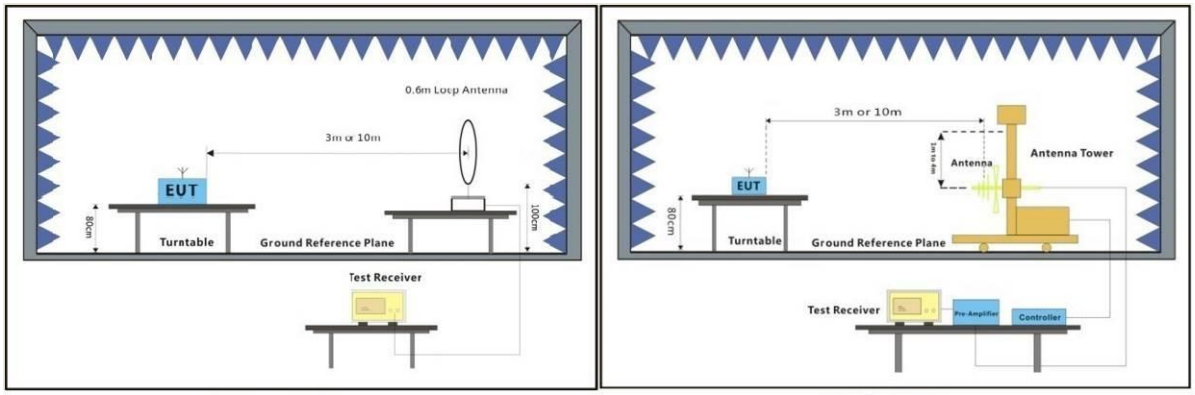
7.10.3 Test Setup Diagram



Below 30MHz 30MHz-1GHz

7.10.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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

3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

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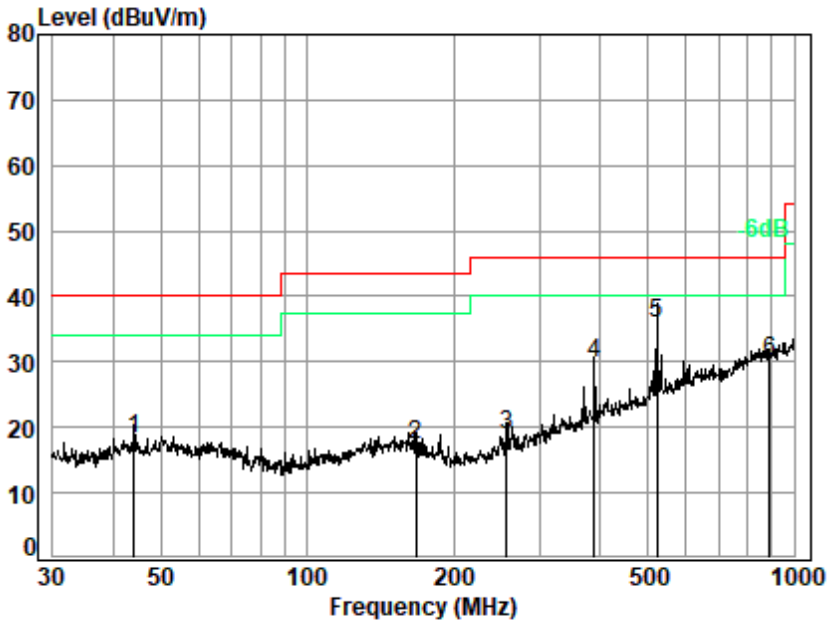
Test Mode: 01; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00203ET
Mode : 01

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	43.9658	0.21	17.30	24.92	25.78	18.37	40.00	-21.63	QP
2	167.2368	0.74	16.98	25.55	25.12	17.29	43.50	-26.21	QP
3	256.5211	0.85	16.78	25.59	26.80	18.84	46.00	-27.16	QP
4	389.3549	1.67	20.56	25.65	33.24	29.82	46.00	-16.18	QP
5	522.7180	1.59	23.34	25.70	36.76	35.99	46.00	-10.01	QP
6	890.7278	2.40	28.07	25.56	25.09	30.00	46.00	-16.00	QP

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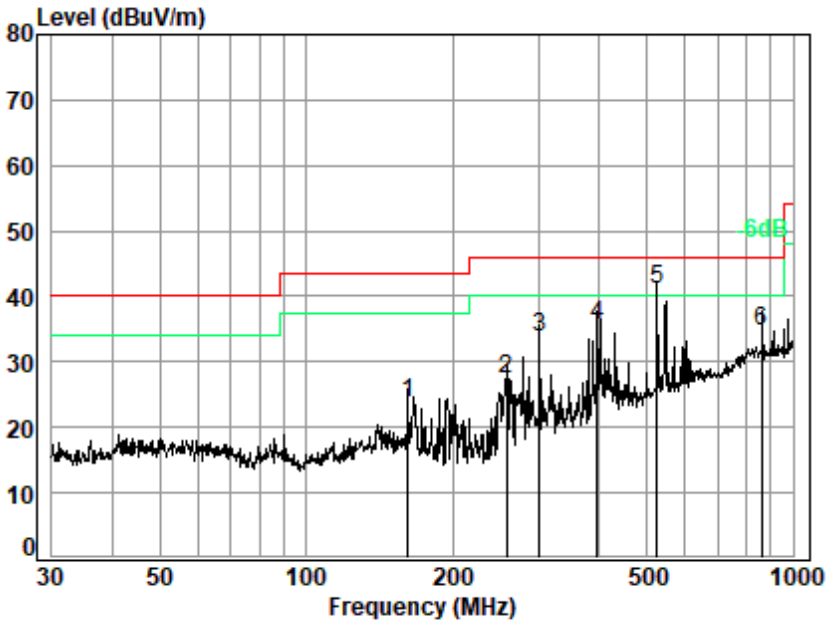
Test Mode: 01; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00203ET
Mode : 01

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	161.4742	0.78	17.16	25.54	31.45	23.85	43.50	-19.65	QP
2	258.3264	0.85	16.77	25.59	35.42	27.45	46.00	-18.55	QP
3	301.4224	1.03	18.38	25.60	39.85	33.66	46.00	-12.34	QP
4	396.2415	1.70	20.65	25.65	39.00	35.70	46.00	-10.30	QP
5	526.3967	1.62	23.45	25.70	41.85	41.22	46.00	-4.78	QP
6	863.0562	2.78	27.59	25.60	29.80	34.57	46.00	-11.43	QP

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7.11 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.6
Measurement Distance: 3m

Limit:

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

7.11.1 E.U.T. Operation

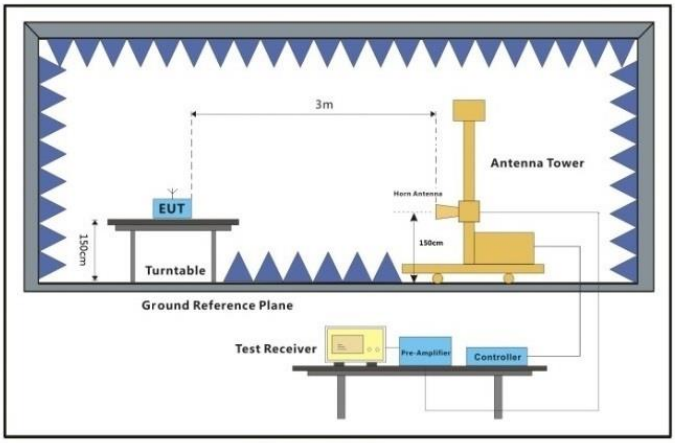
Operating Environment:

Temperature: 22.2 °C Humidity: 59.3 % RH Atmospheric Pressure: 1020 mbar

7.11.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode via battery power supply _Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_non-Hop mode via adapter power supply_Keep the EUT continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.11.3 Test Setup Diagram



Above 1GHz

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7.11.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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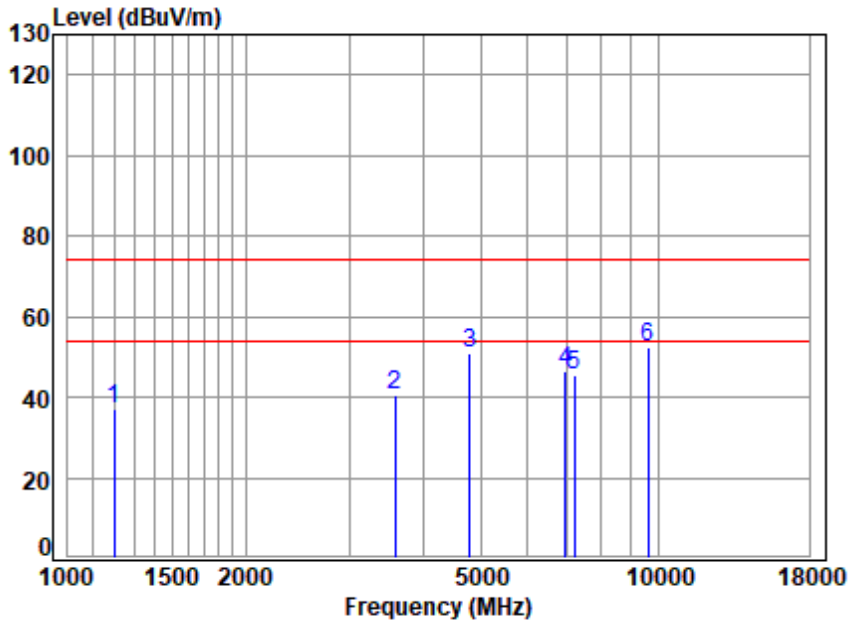
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00203ET
Mode : 2402 TX RSE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1199.7260	3.15	24.30	52.66	62.45	37.24	74.00	-36.76	peak
2	3577.4630	7.07	28.83	52.92	57.52	40.50	74.00	-33.50	peak
3	4804.0000	7.98	30.94	53.05	65.03	50.90	74.00	-23.10	peak
4	6954.8520	8.15	35.70	53.47	55.87	46.25	74.00	-27.75	peak
5	7206.0000	8.29	36.05	53.52	54.84	45.66	74.00	-28.34	peak
6	9608.0000	11.41	37.53	53.58	57.26	52.62	74.00	-21.38	peak

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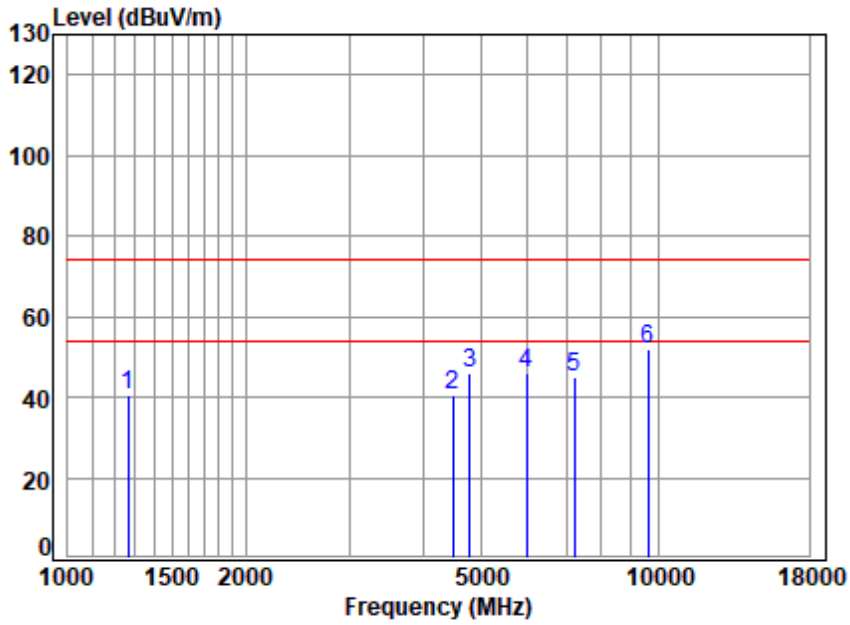
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 00203ET
Mode : 2402 TX RSE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1263.7960	3.29	24.27	52.70	65.82	40.68	74.00	-33.32	peak
2	4495.1250	7.47	30.19	52.96	55.66	40.36	74.00	-33.64	peak
3	4804.0000	7.98	30.94	53.05	60.29	46.16	74.00	-27.84	peak
4	5984.3050	7.66	32.41	52.80	58.56	45.83	74.00	-28.17	peak
5	7206.0000	8.29	36.05	53.52	54.09	44.91	74.00	-29.09	peak
6	9608.0000	11.41	37.53	53.58	56.61	51.97	74.00	-22.03	peak

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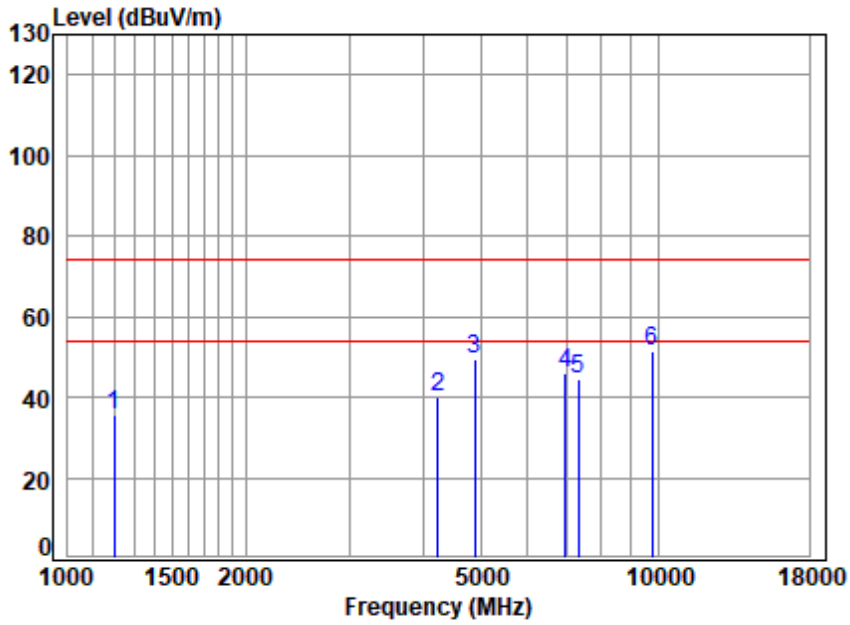
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00203ET
Mode : 2441 TX RSE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1196.2640	3.14	24.30	52.66	60.99	35.77	74.00	-38.23	peak
2	4230.3960	7.48	29.83	52.88	55.65	40.08	74.00	-33.92	peak
3	4882.0000	8.11	31.13	53.07	63.10	49.27	74.00	-24.73	peak
4	6954.8520	8.15	35.70	53.47	55.40	45.78	74.00	-28.22	peak
5	7323.0000	8.35	36.19	53.53	53.31	44.32	74.00	-29.68	peak
6	9764.0000	11.29	37.88	53.43	55.51	51.25	74.00	-22.75	peak

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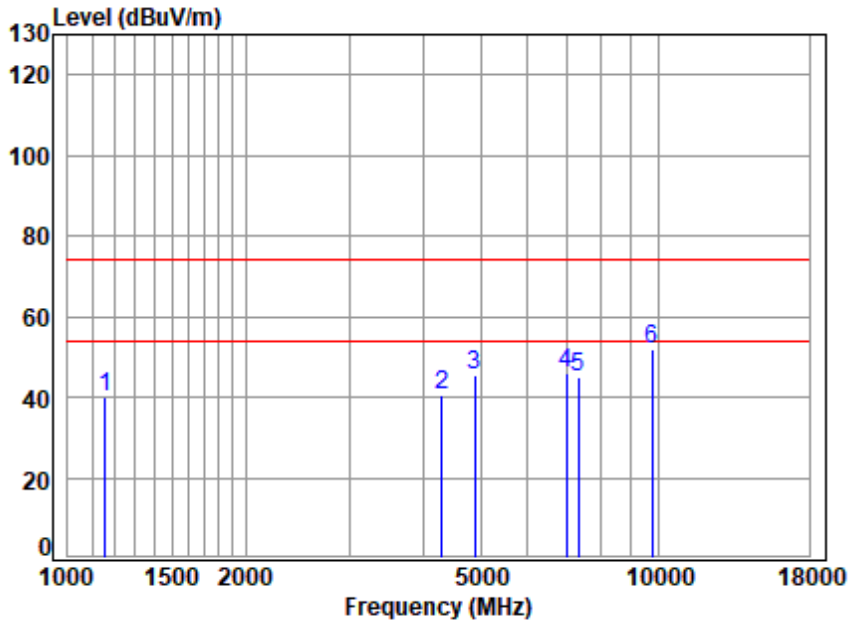
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle



Site : chamber
Condition: 3m VERTICAL
Job No : 00203ET
Mode : 2441 TX RSE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1155.4830	3.04	24.26	52.63	65.53	40.20	74.00	-33.80	peak
2	4304.4000	7.48	29.94	52.90	55.86	40.38	74.00	-33.62	peak
3	4882.0000	8.11	31.13	53.07	59.25	45.42	74.00	-28.58	peak
4	6974.9820	8.17	35.74	53.48	55.74	46.17	74.00	-27.83	peak
5	7323.0000	8.35	36.19	53.53	53.98	44.99	74.00	-29.01	peak
6	9764.0000	11.29	37.88	53.43	55.92	51.66	74.00	-22.34	peak

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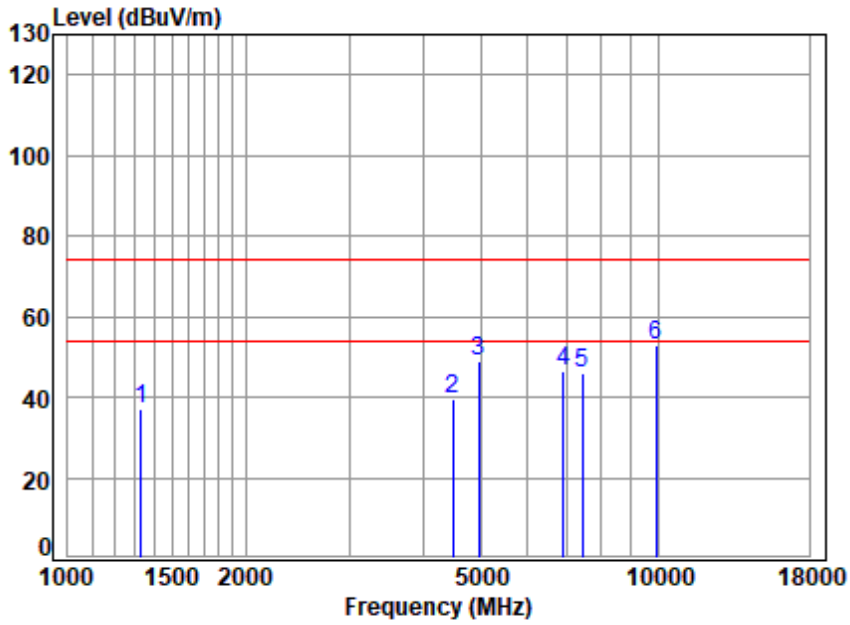
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00203ET
Mode : 2480 TX RSE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1331.2880	3.44	24.23	52.75	62.31	37.23	74.00	-36.77	peak
2	4495.1250	7.47	30.19	52.96	55.05	39.75	74.00	-34.25	peak
3	4960.0000	8.24	31.31	53.09	62.38	48.84	74.00	-25.16	peak
4	6914.7630	8.11	35.60	53.44	56.08	46.35	74.00	-27.65	peak
5	7440.0000	8.40	36.33	53.55	54.62	45.80	74.00	-28.20	peak
6	9920.0000	11.18	38.22	53.28	56.57	52.69	74.00	-21.31	peak

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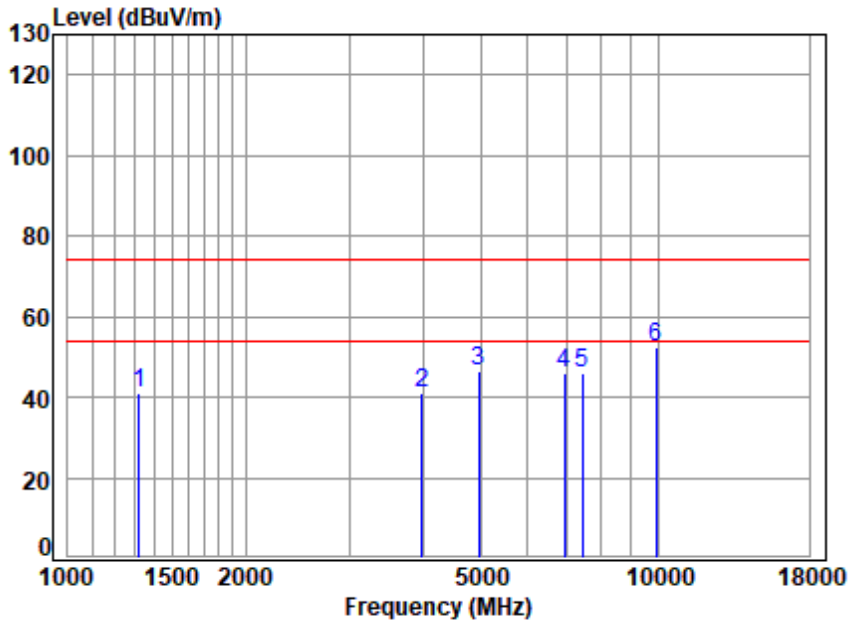
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 00203ET
Mode : 2480 TX RSE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1319.7940	3.41	24.24	52.74	66.18	41.09	74.00	-32.91	peak
2	3981.2570	7.47	29.47	52.80	56.93	41.07	74.00	-32.93	peak
3	4960.0000	8.24	31.31	53.09	59.91	46.37	74.00	-27.63	peak
4	6934.7780	8.13	35.65	53.46	55.53	45.85	74.00	-28.15	peak
5	7440.0000	8.40	36.33	53.55	54.95	46.13	74.00	-27.87	peak
6	9920.0000	11.18	38.22	53.28	56.08	52.20	74.00	-21.80	peak

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for FYCR2206000203ET

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for FYCR2206000203ET

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10 Appendix

1. Bandwidth

1.1 OBW

1.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz) Result	Verdict
GFSK	SISO	2402	DH5	1	0.822	Pass
		2441	DH5	1	0.822	Pass
		2480	DH5	1	0.824	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.170	Pass
		2441	2DH5	1	1.169	Pass
		2480	2DH5	1	1.171	Pass
8DPSK	SISO	2402	3DH5	1	1.167	Pass
		2441	3DH5	1	1.168	Pass
		2480	3DH5	1	1.170	Pass

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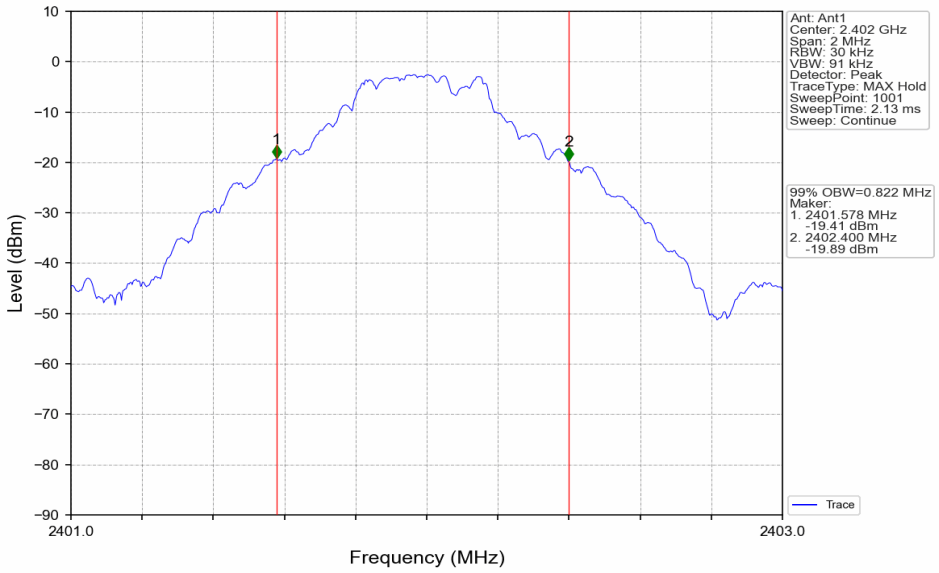
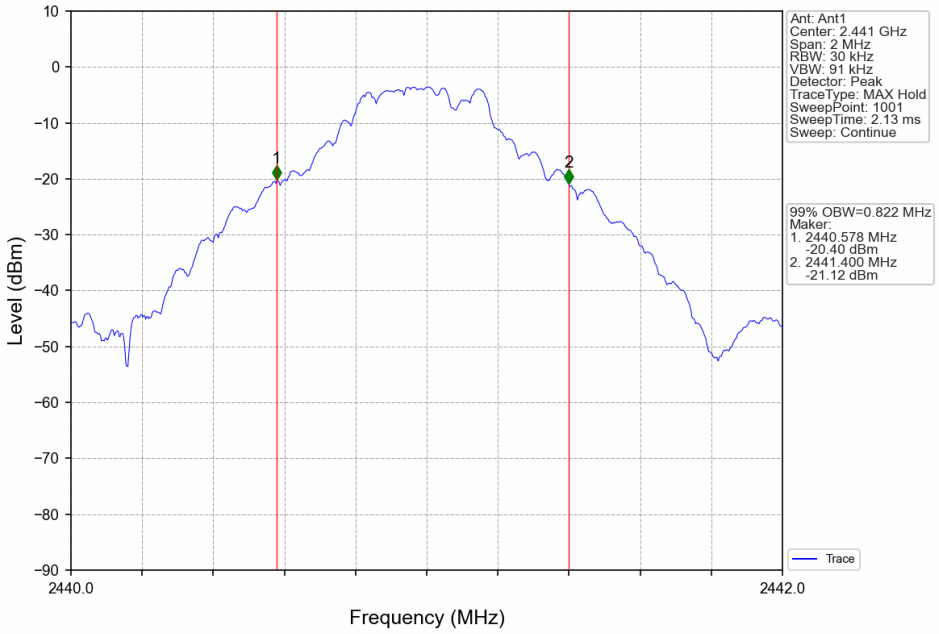
1.1.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



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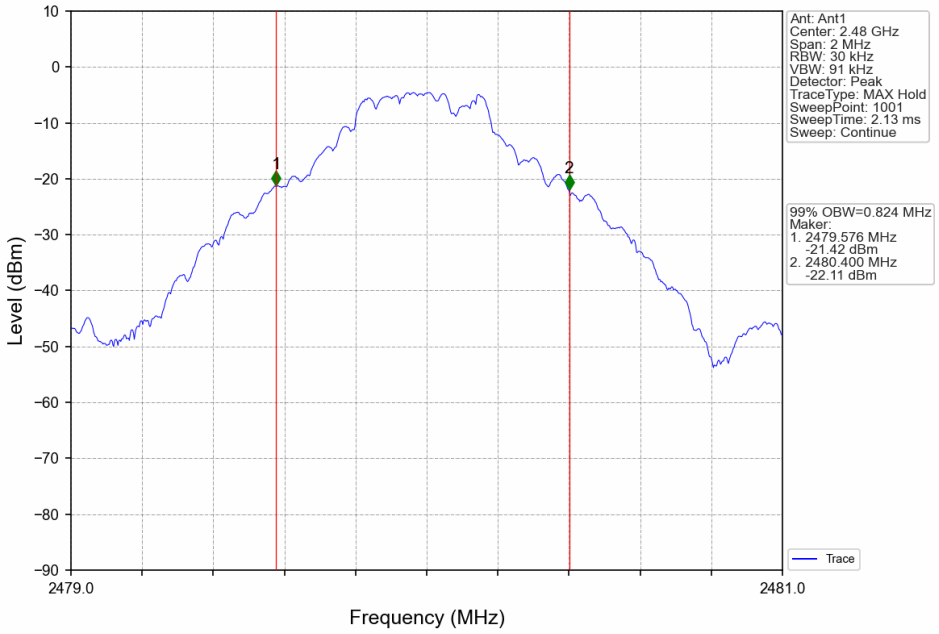
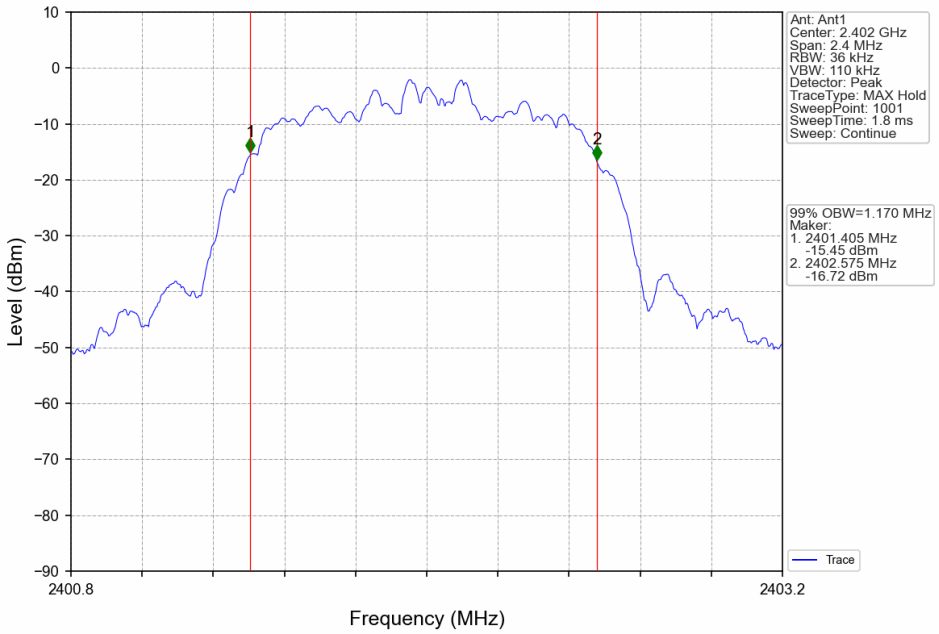
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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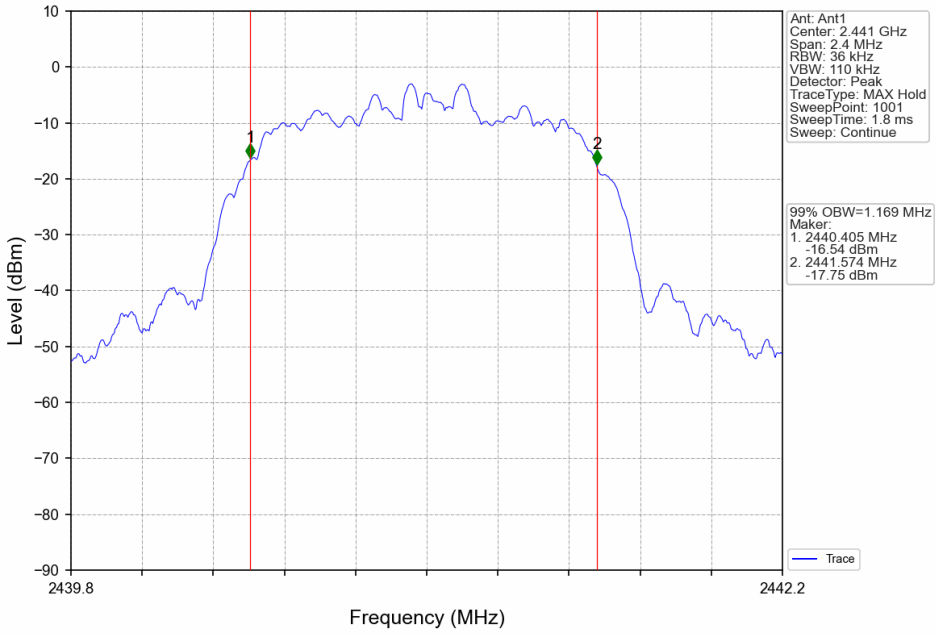
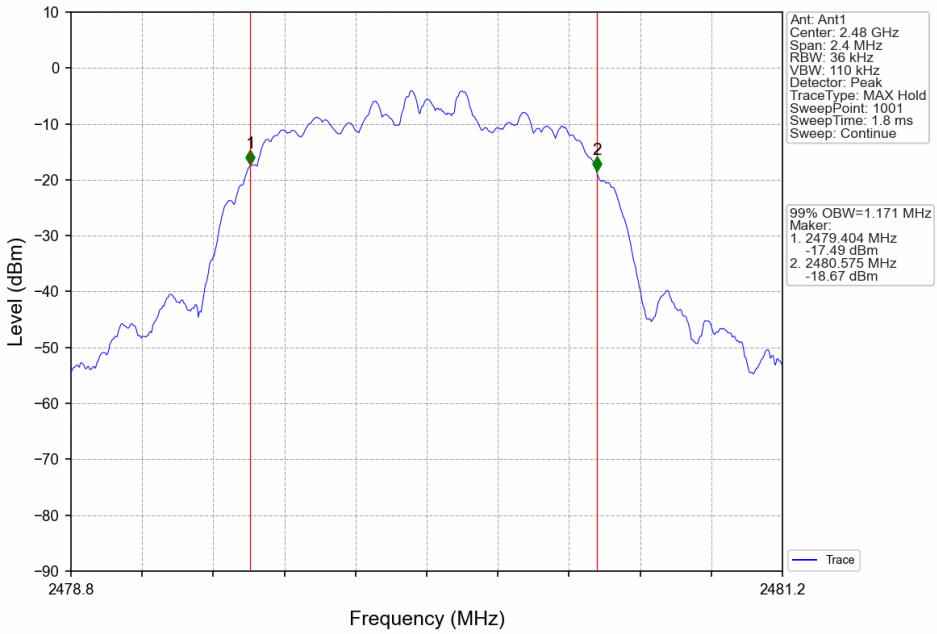
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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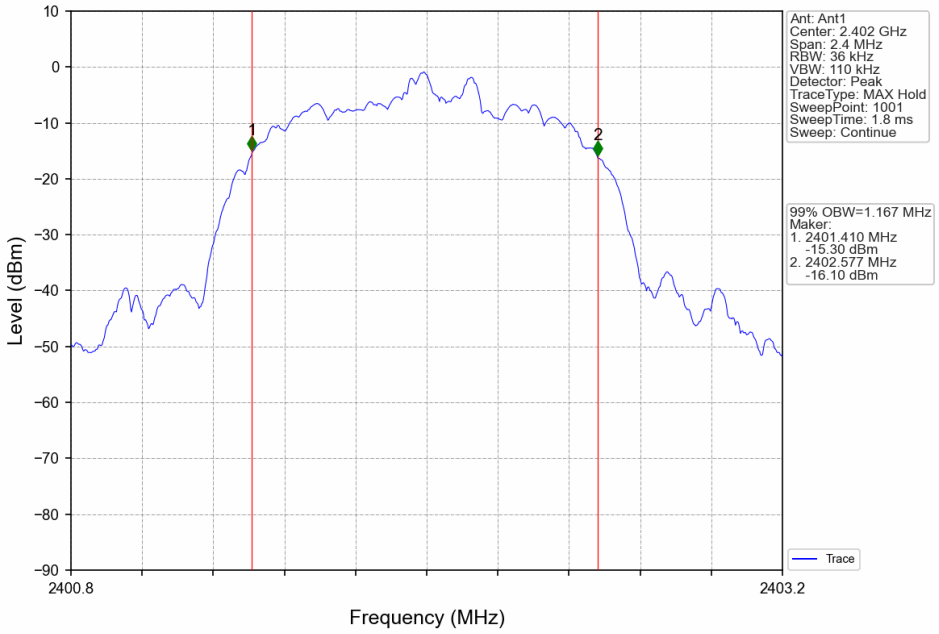
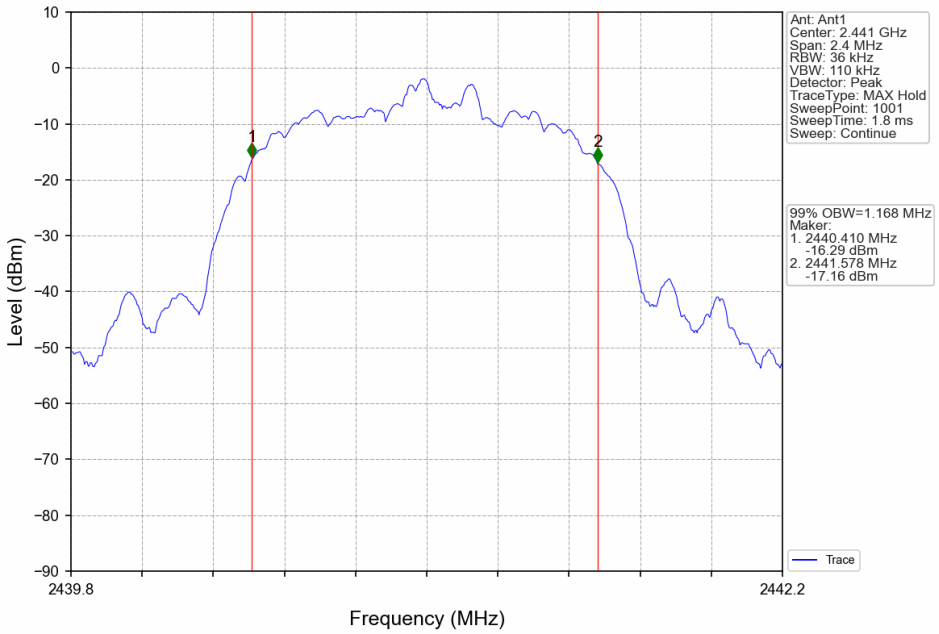
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



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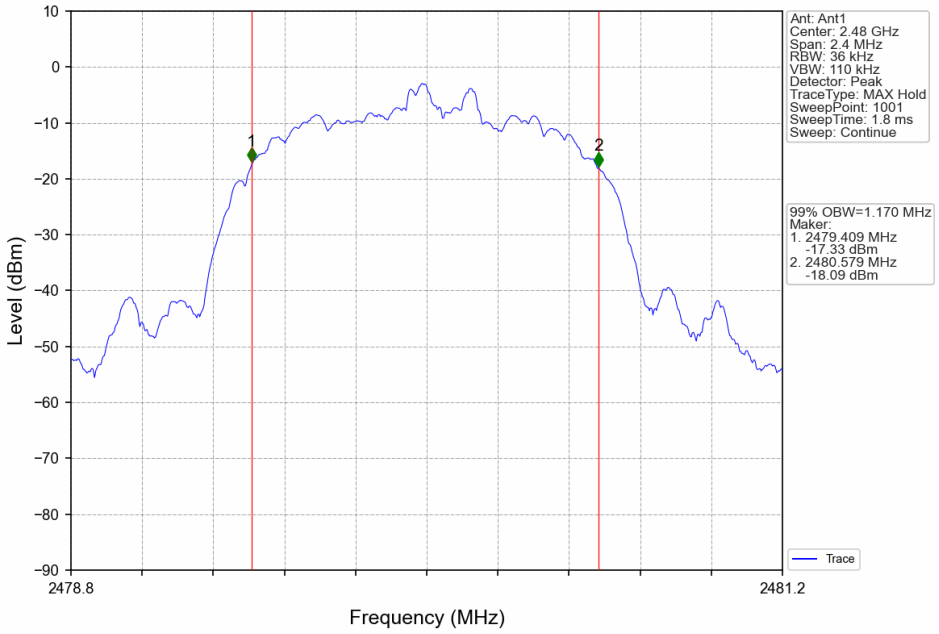
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



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1.2 20dB BW

1.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz) Result	Verdict
GFSK	SISO	2402	DH5	1	0.949	Pass
		2441	DH5	1	0.952	Pass
		2480	DH5	1	0.952	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.320	Pass
		2441	2DH5	1	1.327	Pass
		2480	2DH5	1	1.323	Pass
8DPSK	SISO	2402	3DH5	1	1.298	Pass
		2441	3DH5	1	1.302	Pass
		2480	3DH5	1	1.300	Pass

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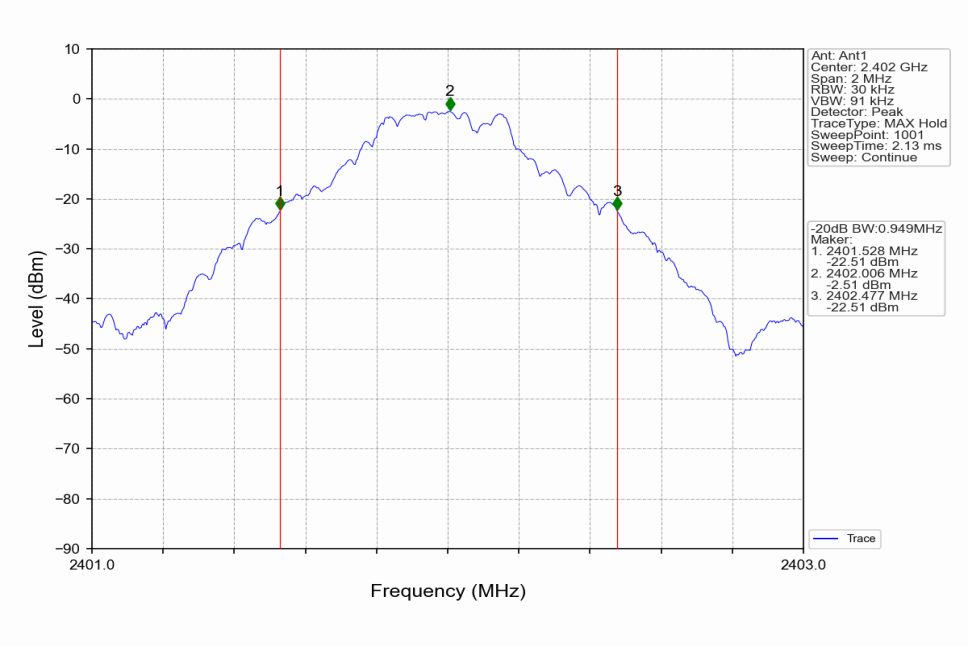
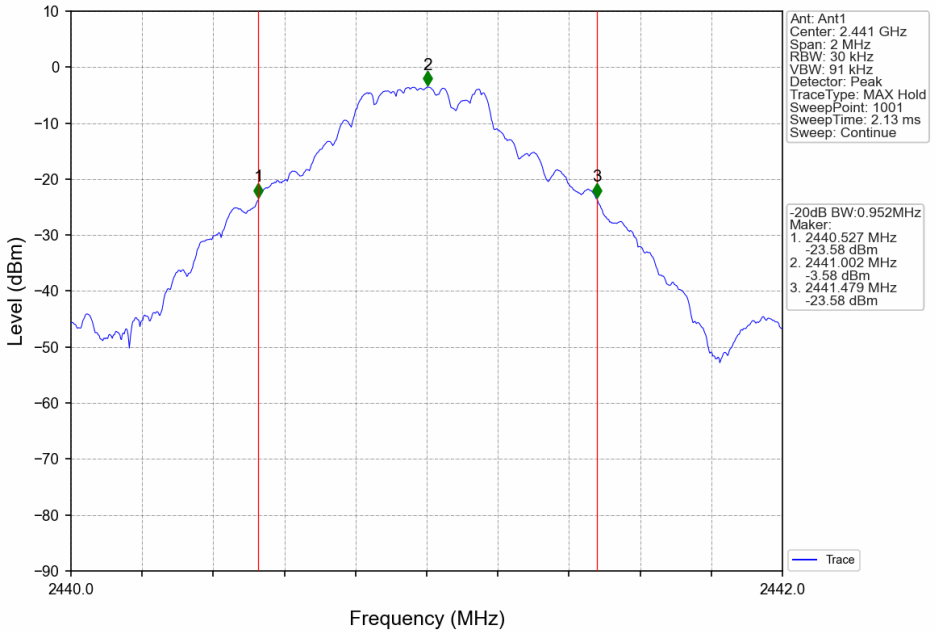
1.2.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



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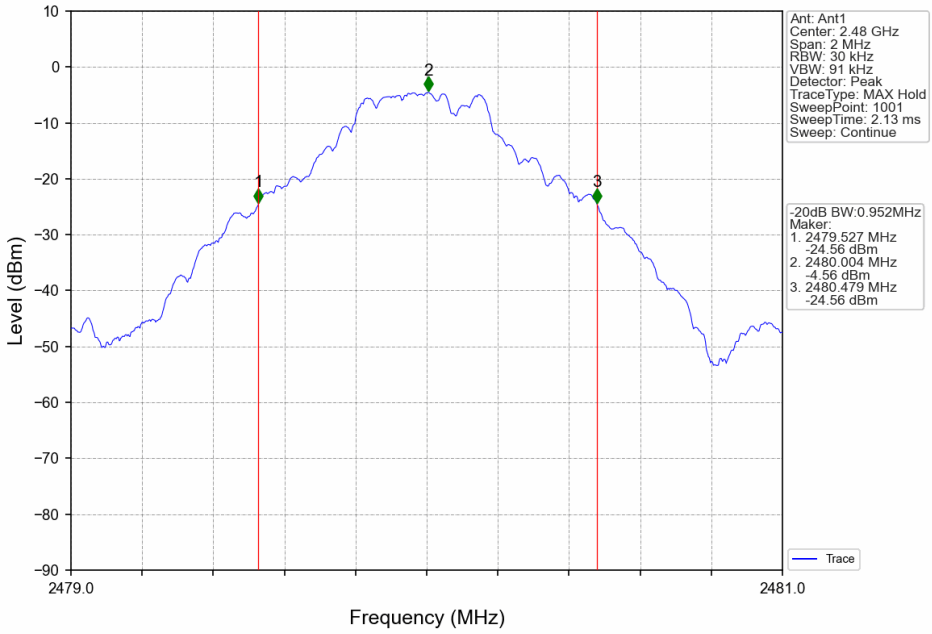
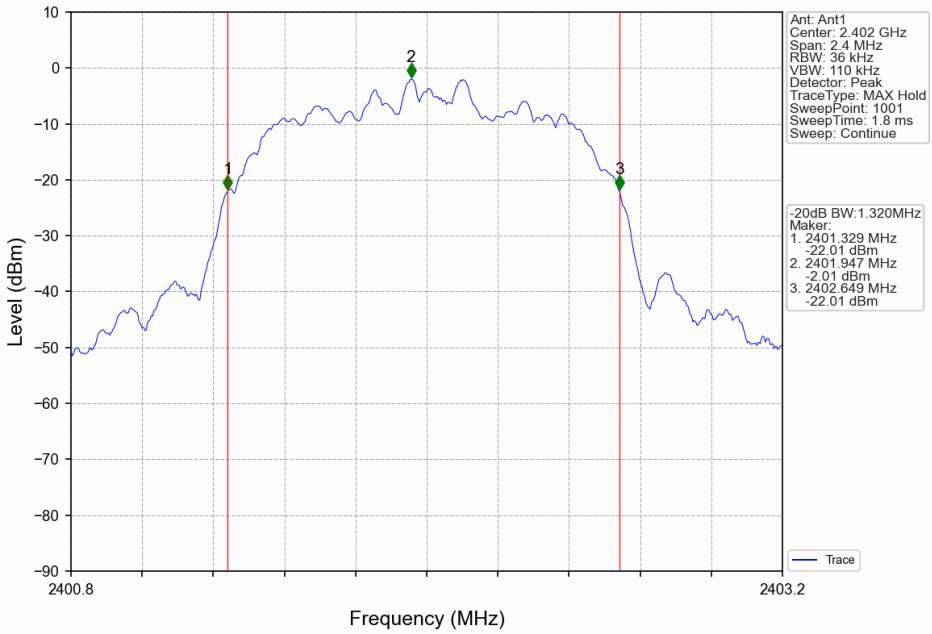
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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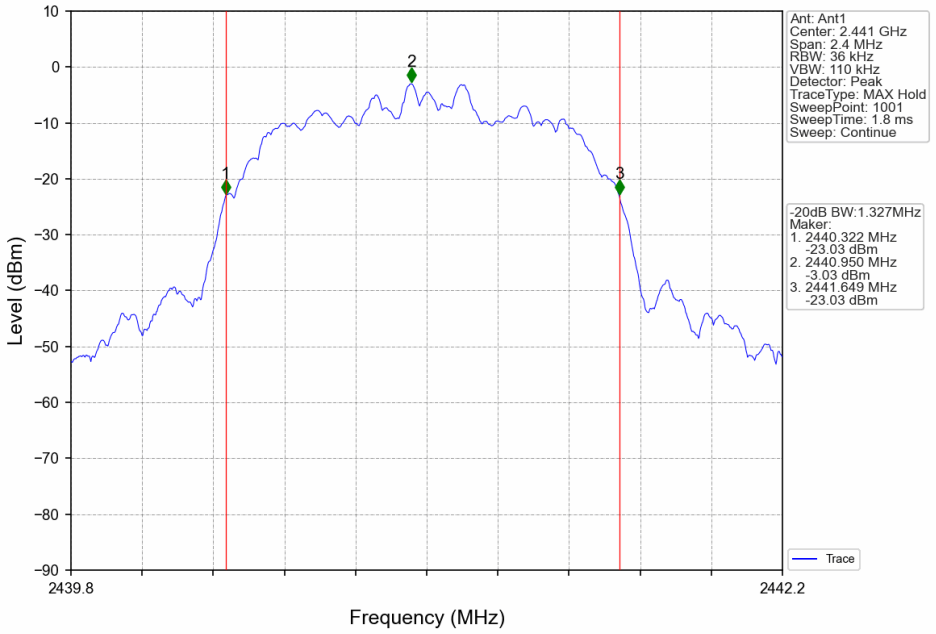
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



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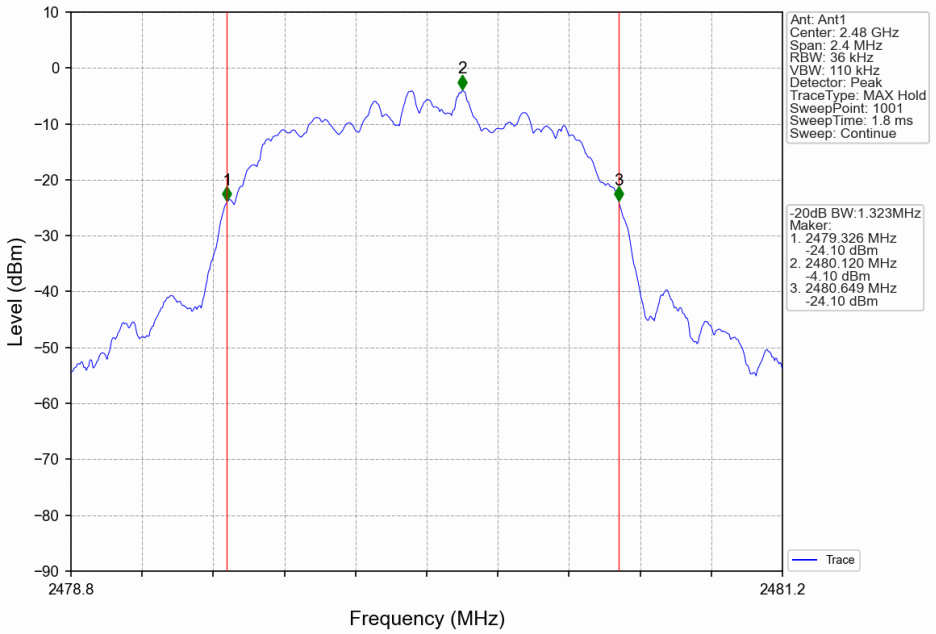

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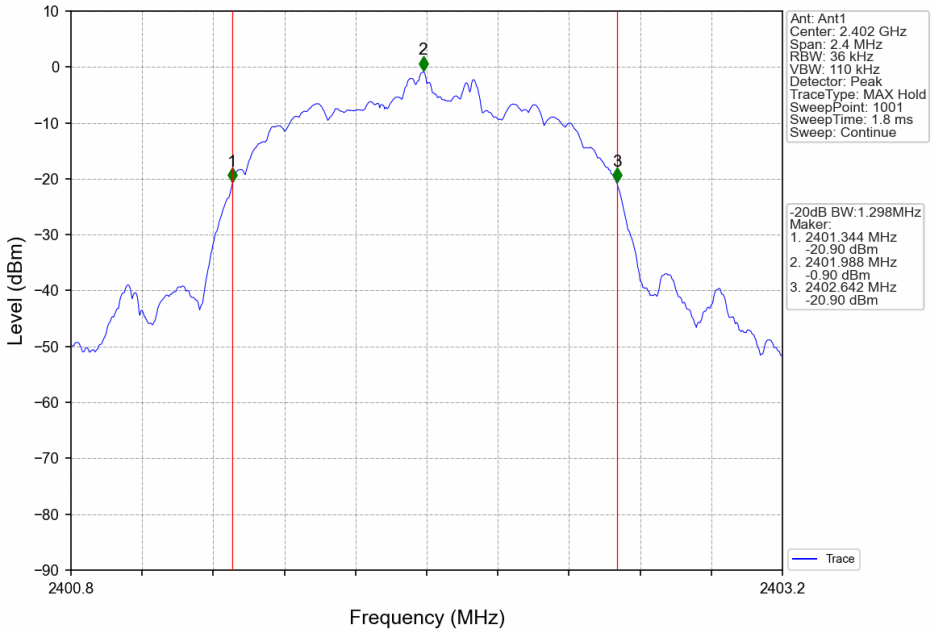
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



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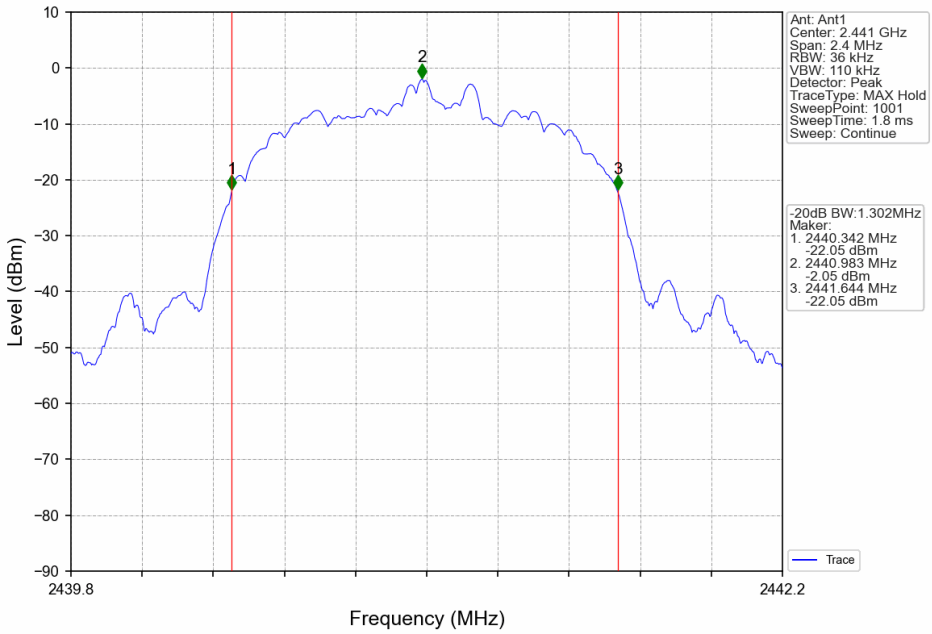

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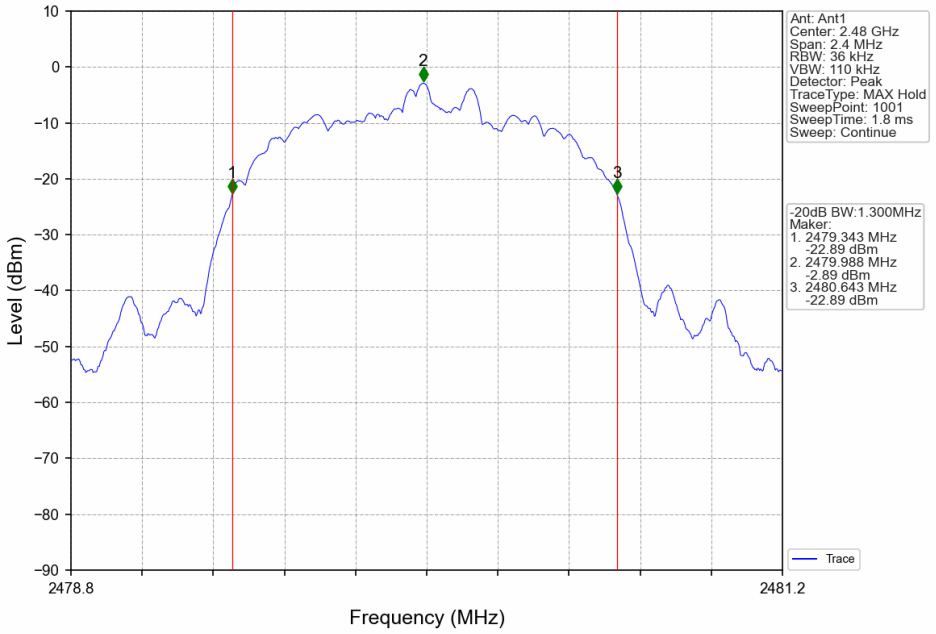
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



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2. Maximum Conducted Output Power

2.1 Power

2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	-0.04	<=30	Pass
		2441	DH5	-1.05	<=30	Pass
		2480	DH5	-2.07	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	2.48	<=20.97	Pass
		2441	2DH5	1.43	<=20.97	Pass
		2480	2DH5	0.36	<=20.97	Pass
8DPSK	SISO	2402	3DH5	3.04	<=20.97	Pass
		2441	3DH5	1.97	<=20.97	Pass
		2480	3DH5	0.95	<=20.97	Pass
Note1: Antenna Gain: Ant1: 1.2dBi;						

3. Carrier Frequency Separation

3.1 Ant1

3.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	0.996	0.952	>=0.952	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.020	1.327	>=0.885	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.302	>=0.868	Pass

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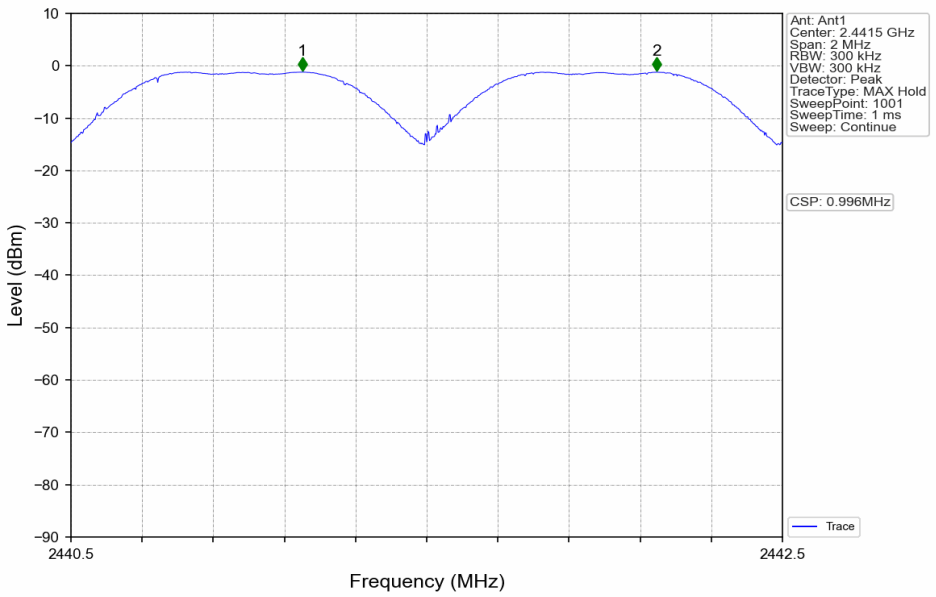
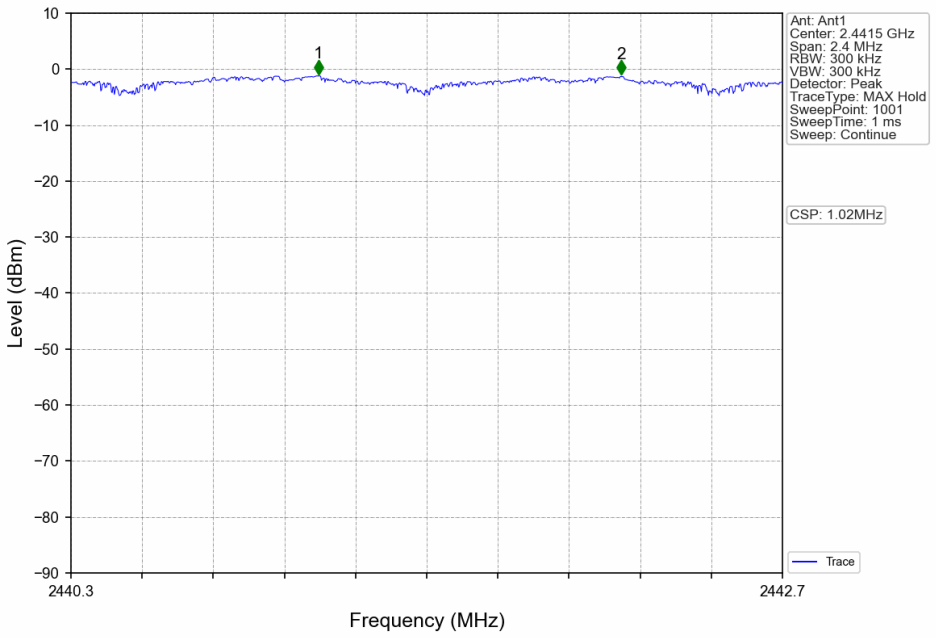
3.1.2 Test Graph

GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



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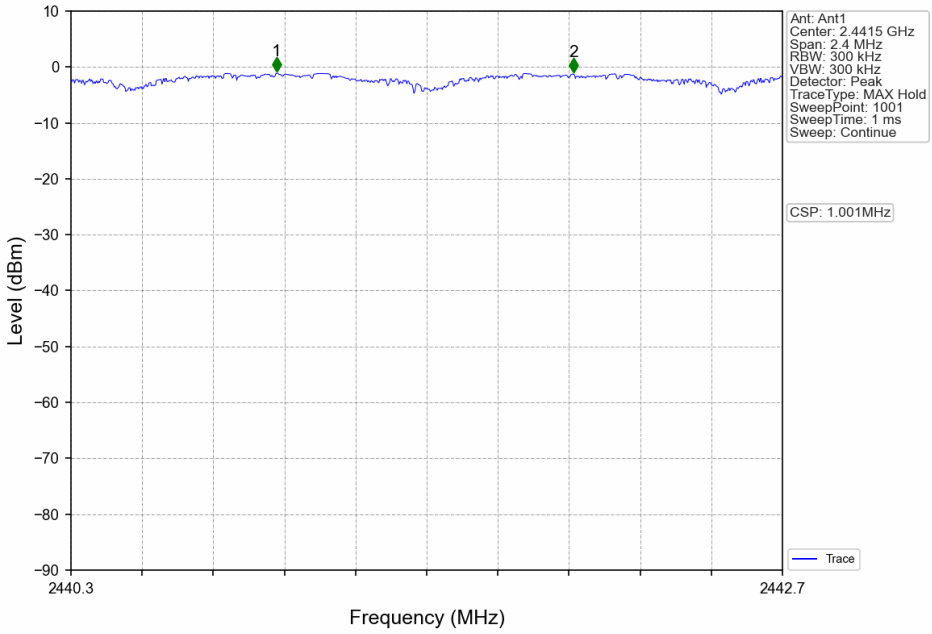
8DPSK_3DH5_HOPP_Ant1_NTNV



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4. Number of Hopping Frequencies

4.1 HoppNum

4.1.1 Test 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

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4.1.2 Test Graph

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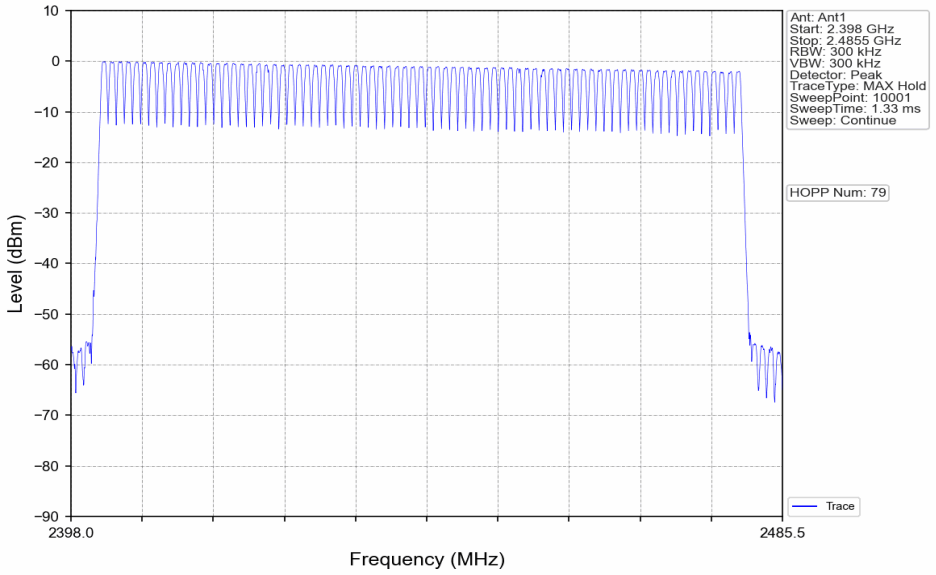
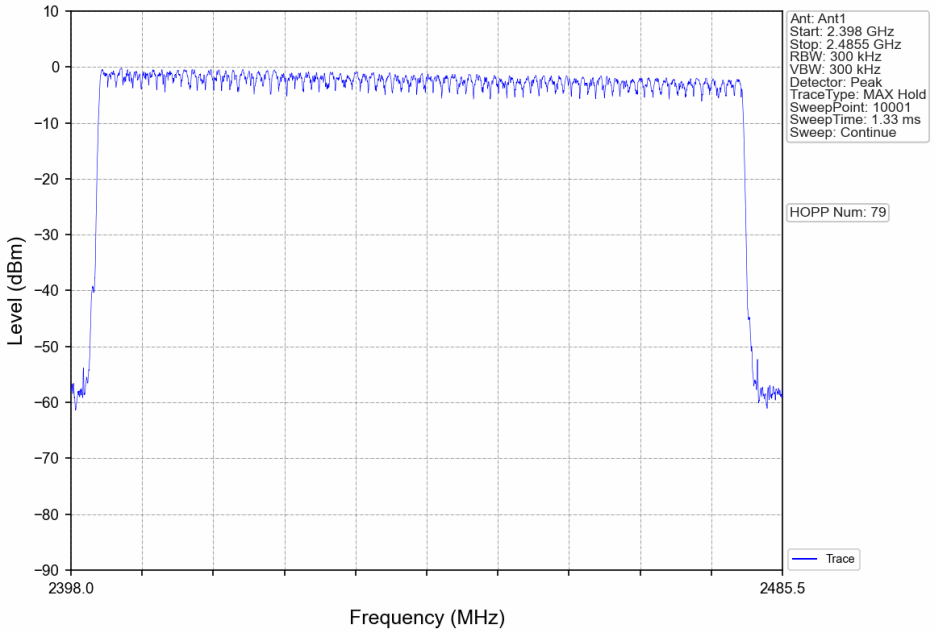


Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



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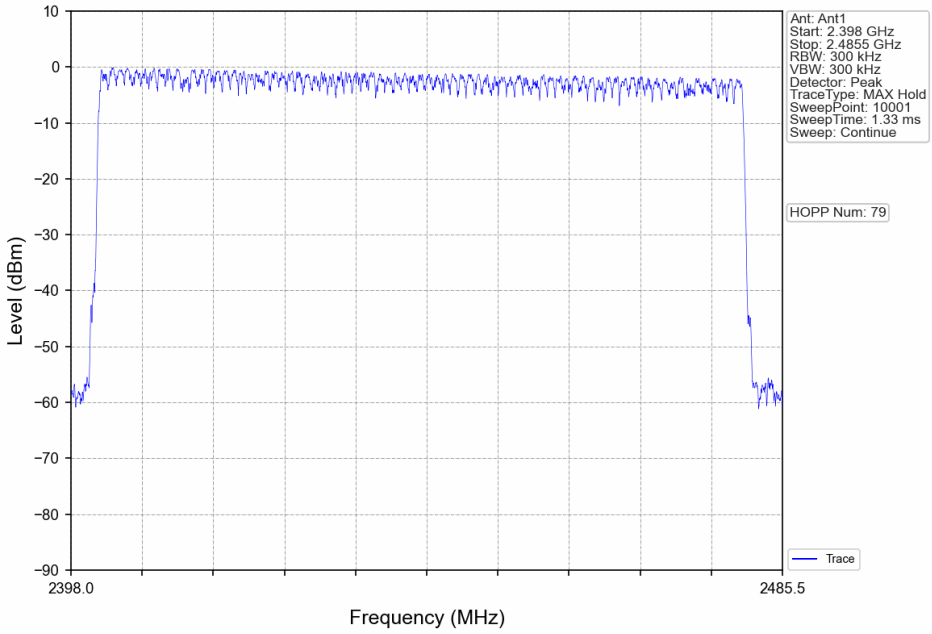

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5. Time of Occupancy (Dwell Time)

5.1 Ant1

5.1.1 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	0.400	31.600	320	128.000	<=400	Pass
			DH3	1.656	31.600	155	256.680	<=400	Pass
			DH5	2.910	31.600	110	320.100	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.410	31.600	319	130.790	<=400	Pass
			2DH3	1.662	31.600	158	262.596	<=400	Pass
			2DH5	2.916	31.600	117	341.172	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.412	31.600	320	131.840	<=400	Pass
			3DH3	1.664	31.600	157	261.248	<=400	Pass
			3DH5	2.914	31.600	115	335.110	<=400	Pass

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5.1.2 Test Graph

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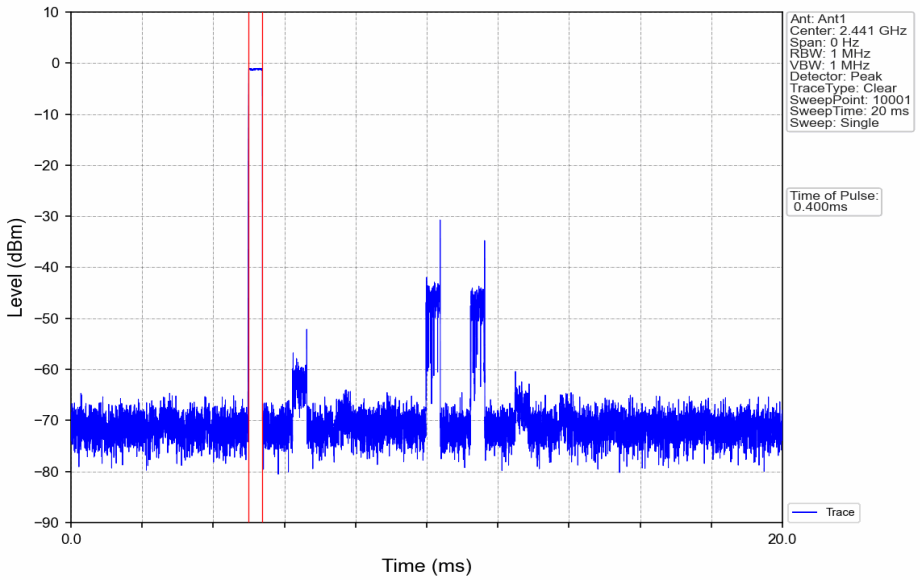

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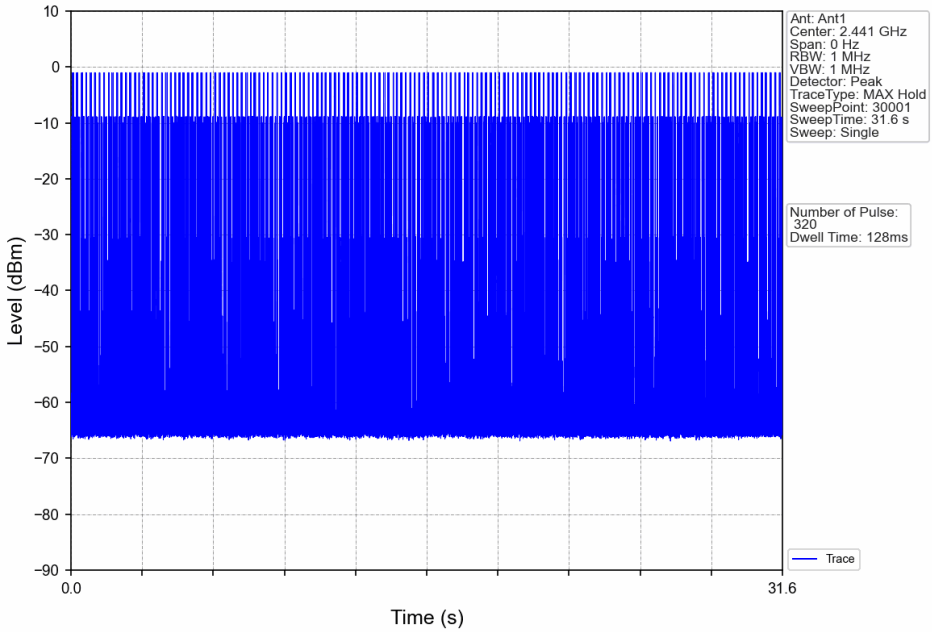

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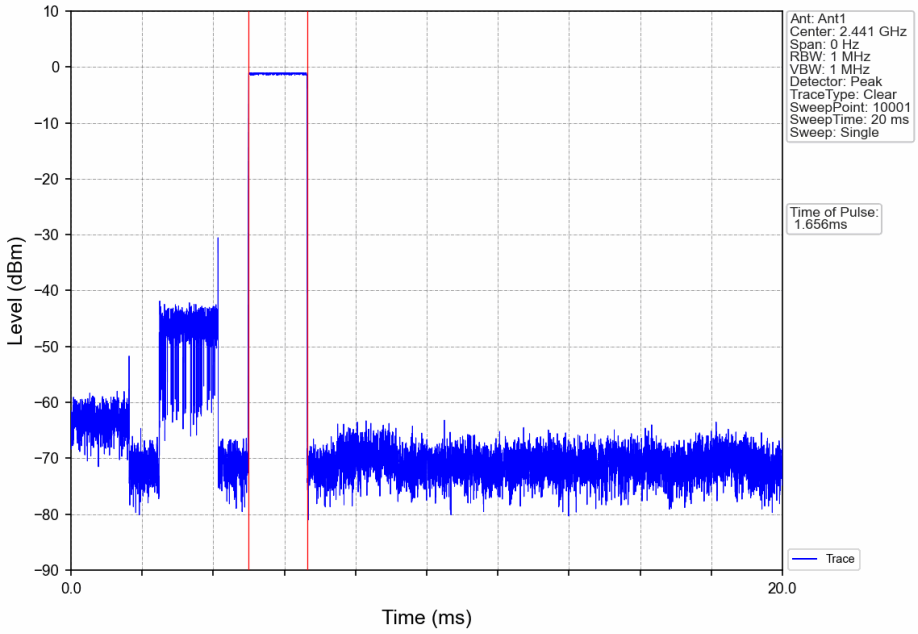

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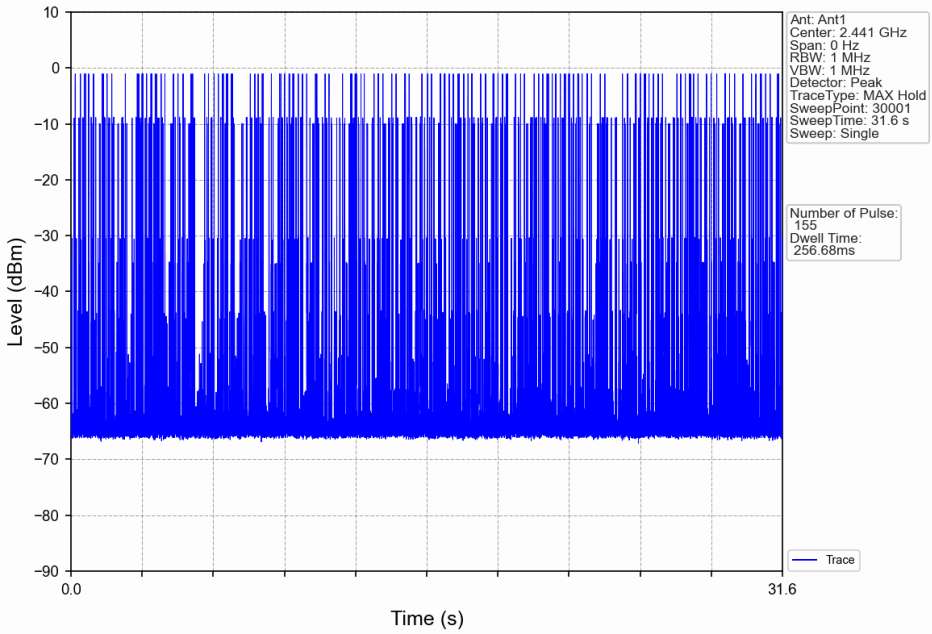

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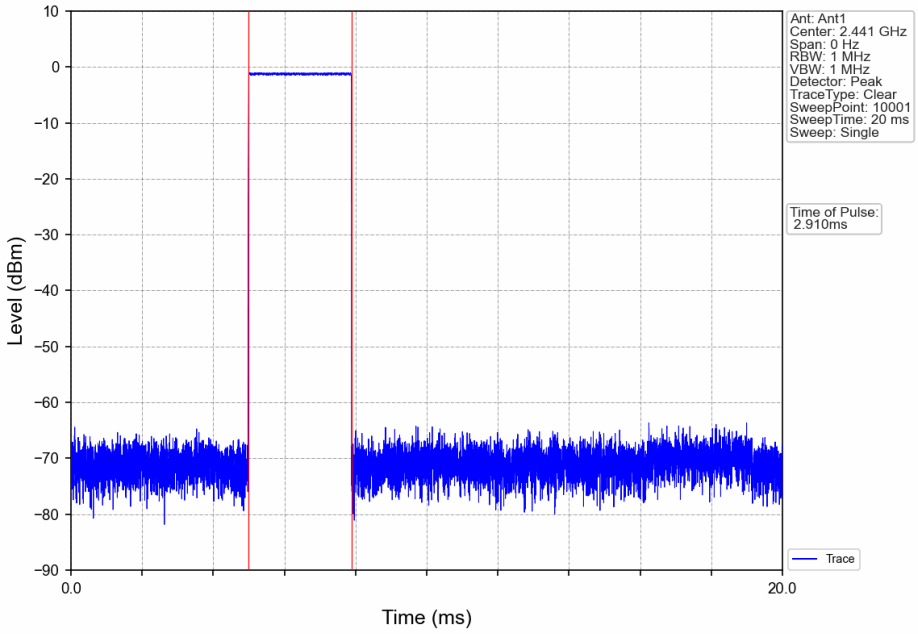

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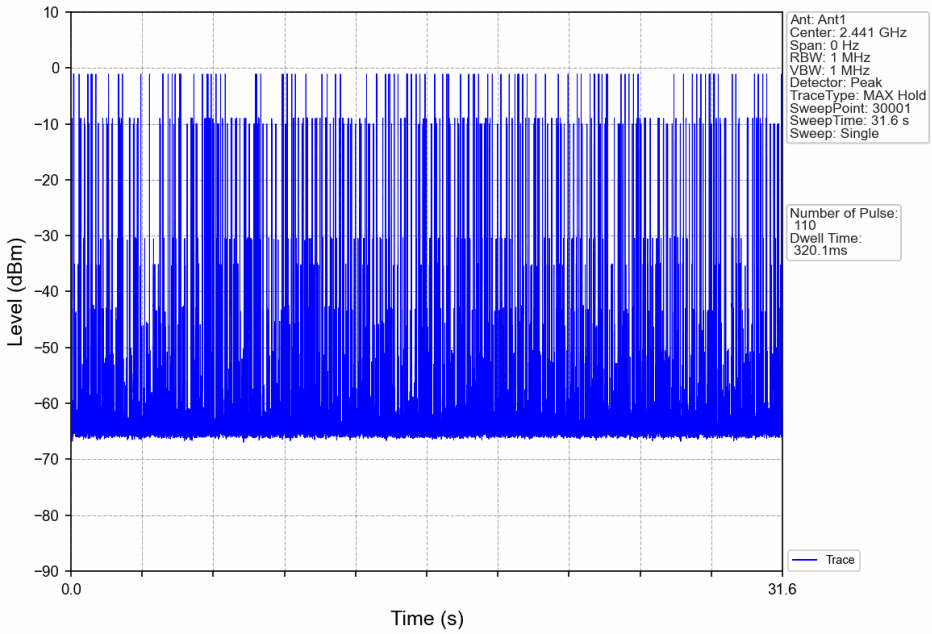

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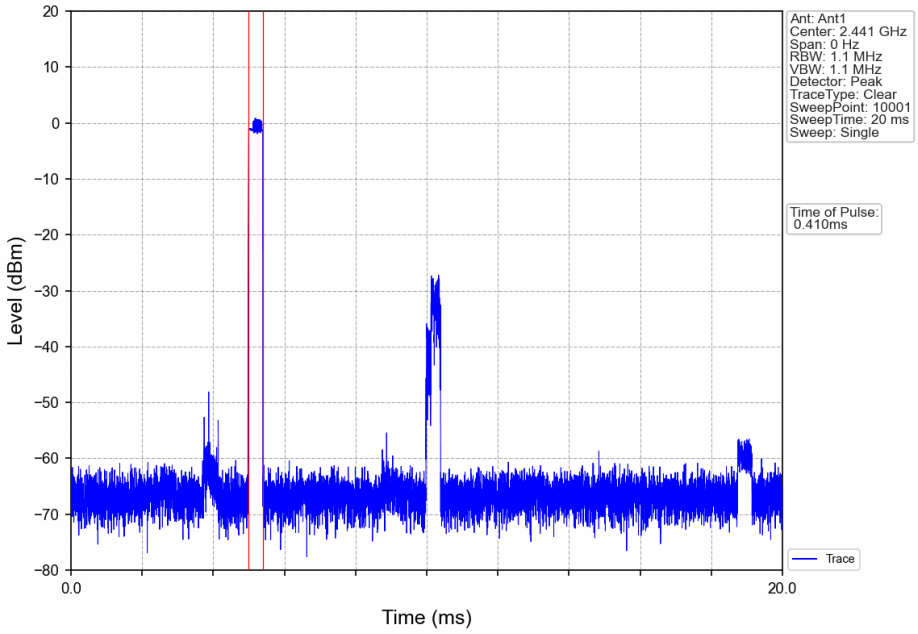
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



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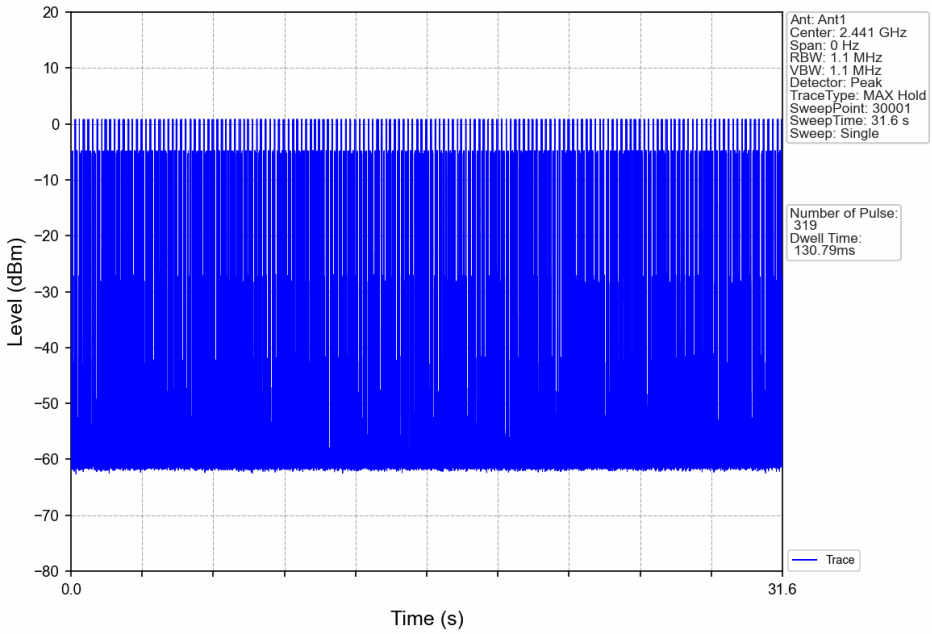

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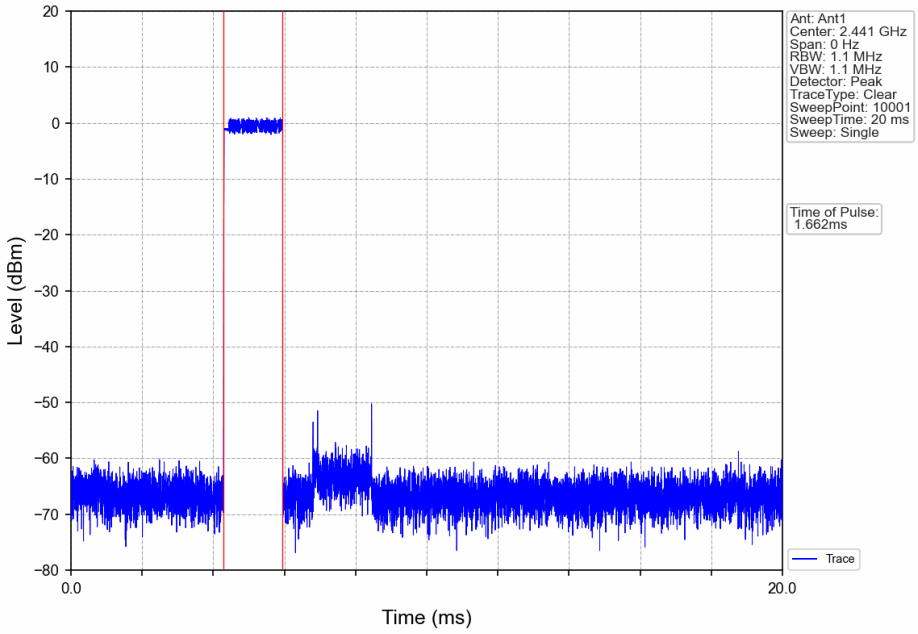

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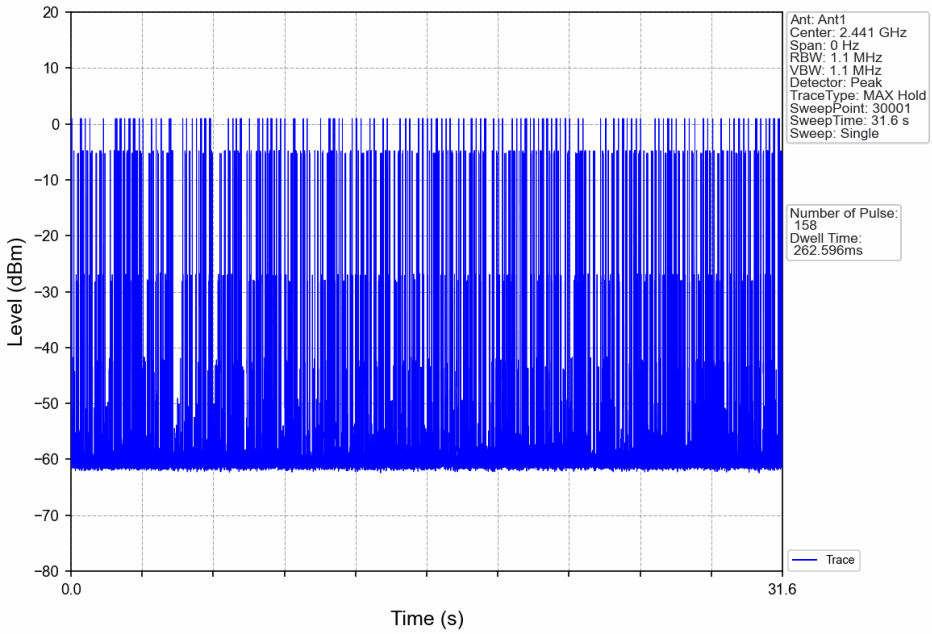

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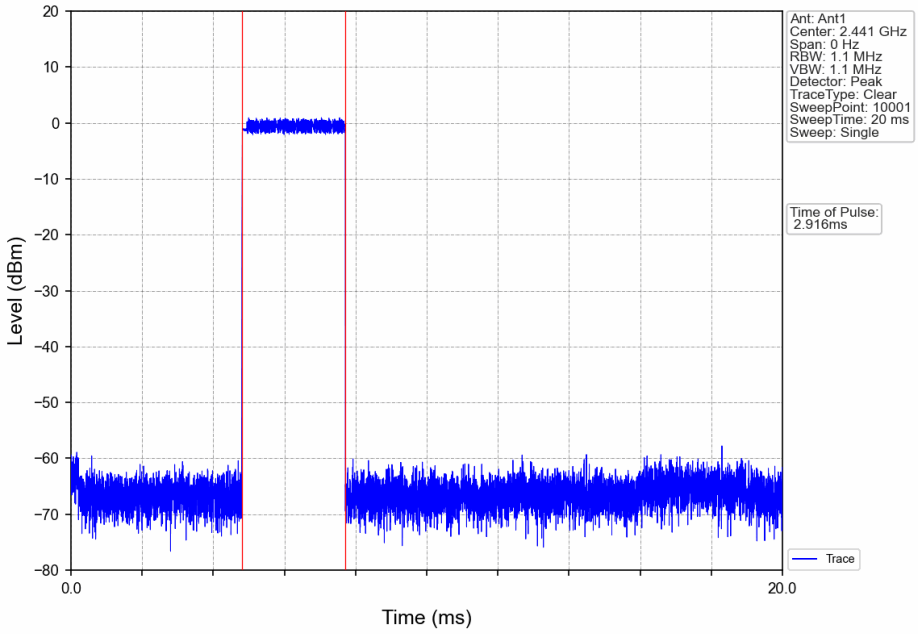

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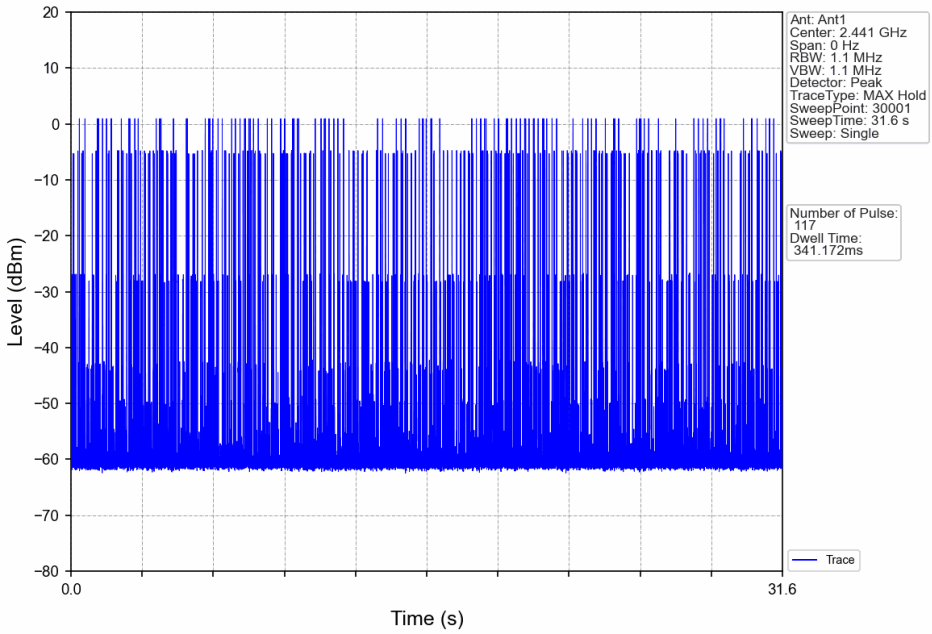

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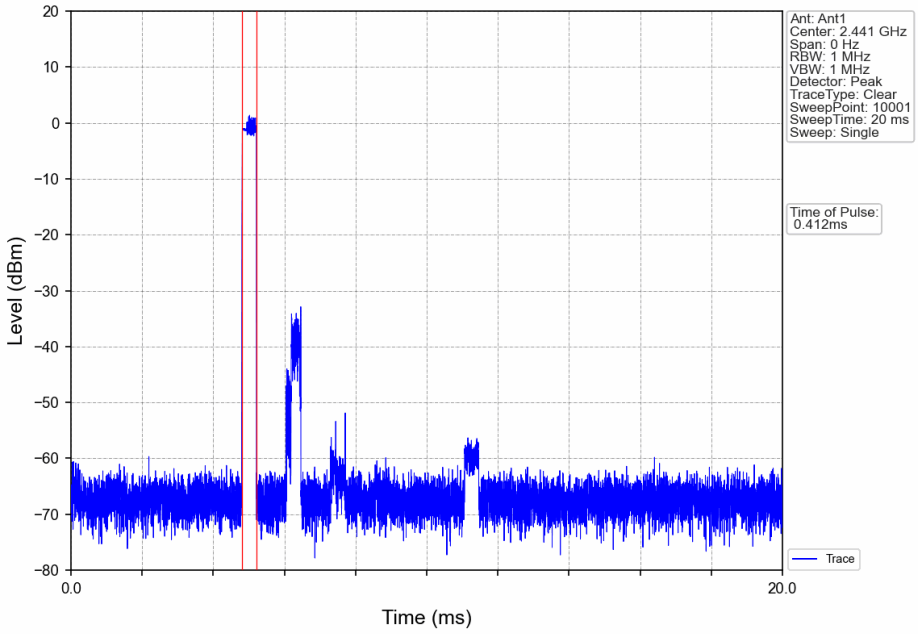

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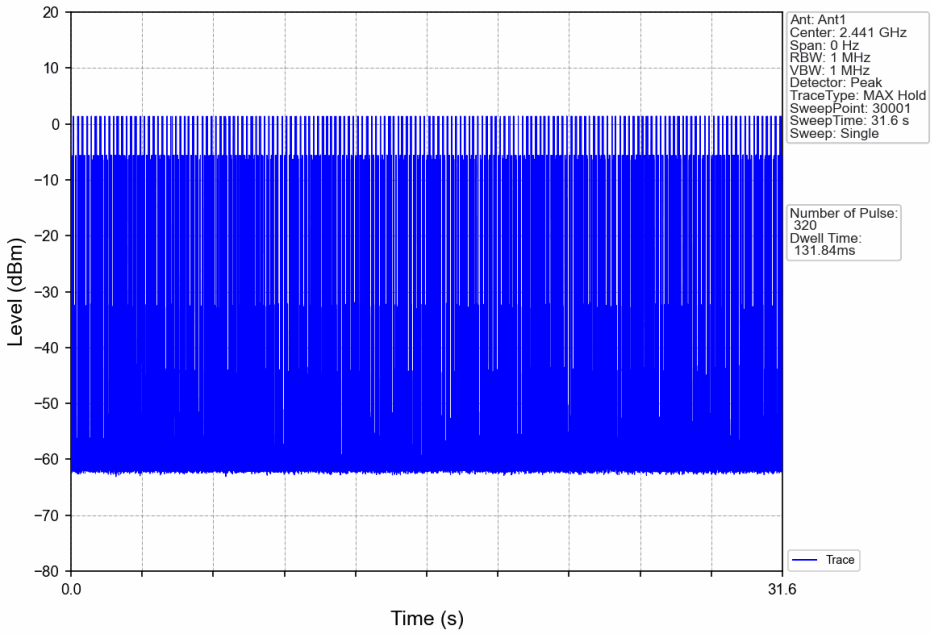

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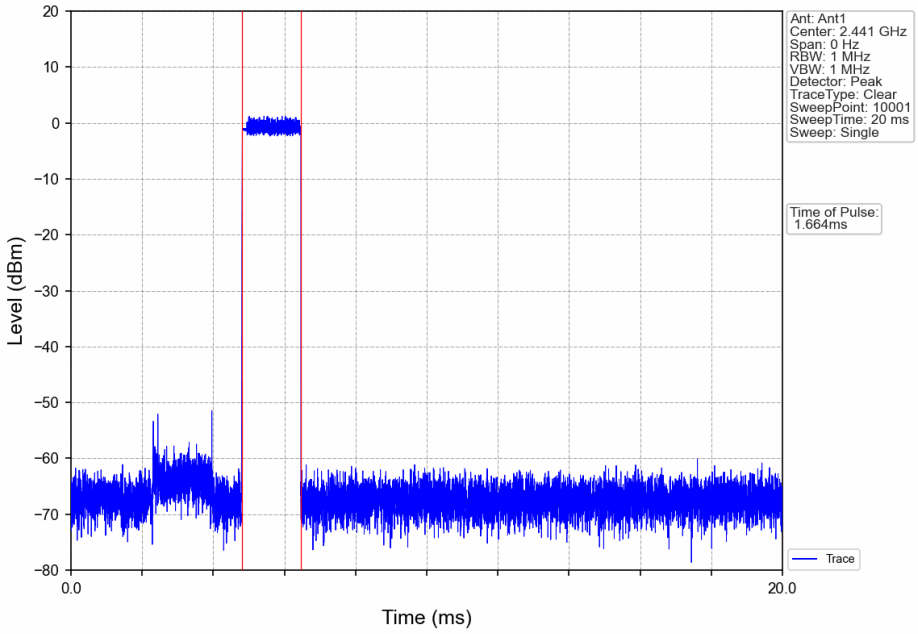
8DPSK_3DH3_HOPP_Ant1_NTNV



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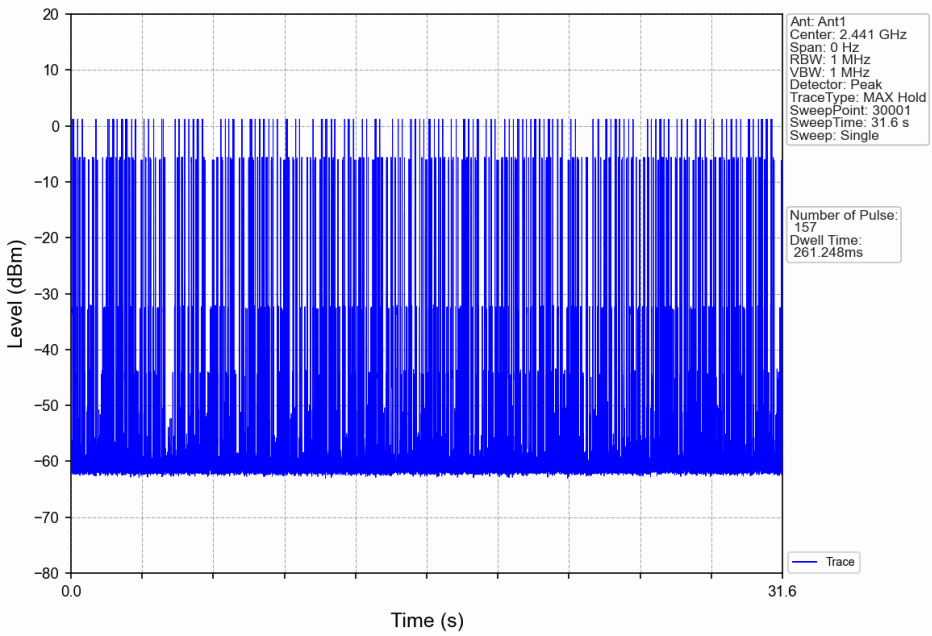

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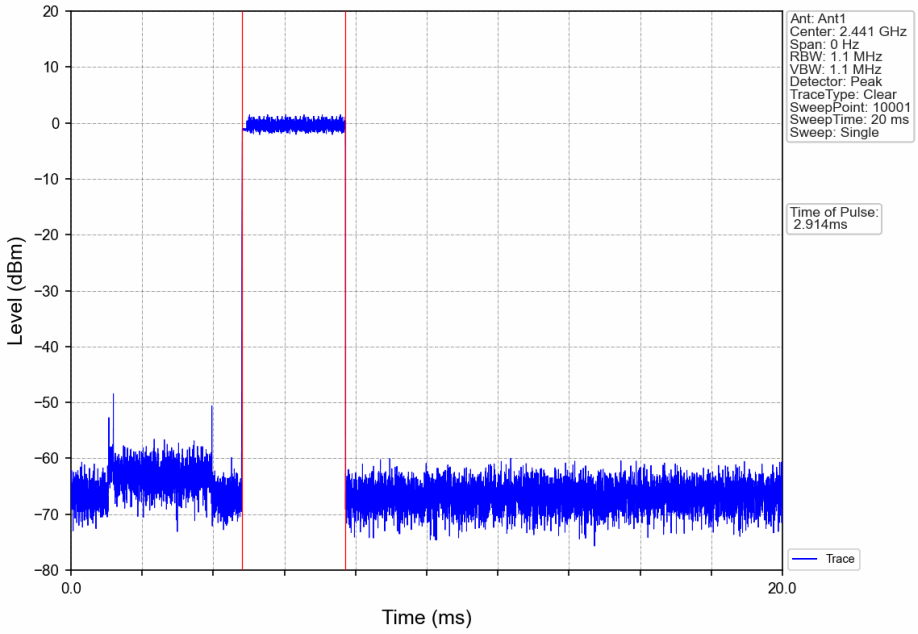

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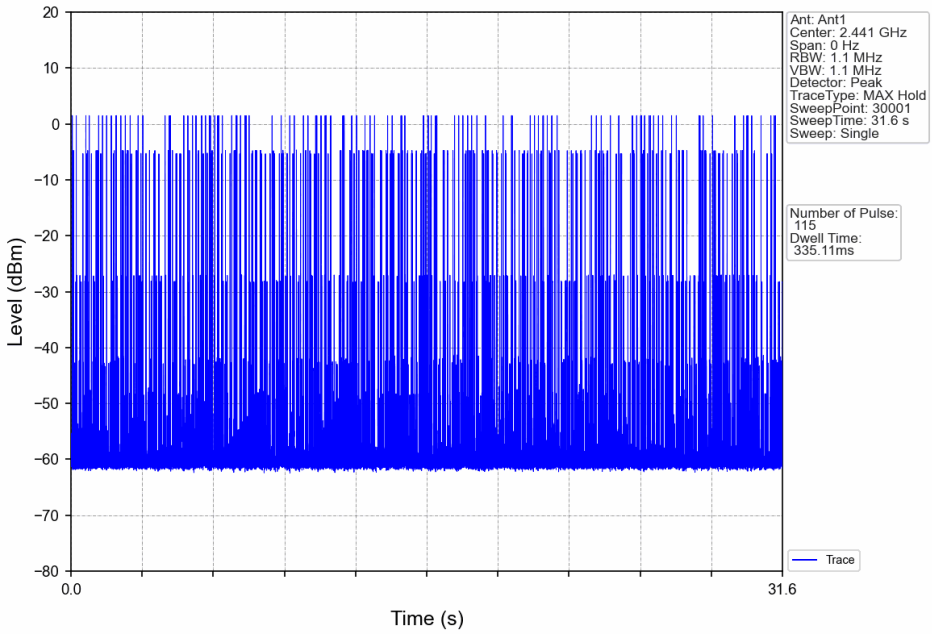

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6. Unwanted Emissions In Non-restricted Frequency Bands

6.1 Ref

6.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	-0.21
		2441	DH5	1	-1.20
		2480	DH5	1	-2.21
Pi/4DQPSK	SISO	2402	2DH5	1	-0.35
		2441	2DH5	1	-1.35
		2480	2DH5	1	-2.38
8DPSK	SISO	2402	3DH5	1	-0.11
		2441	3DH5	1	-1.12
		2480	3DH5	1	-2.11
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. Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.					

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6.1.2 Test Graph

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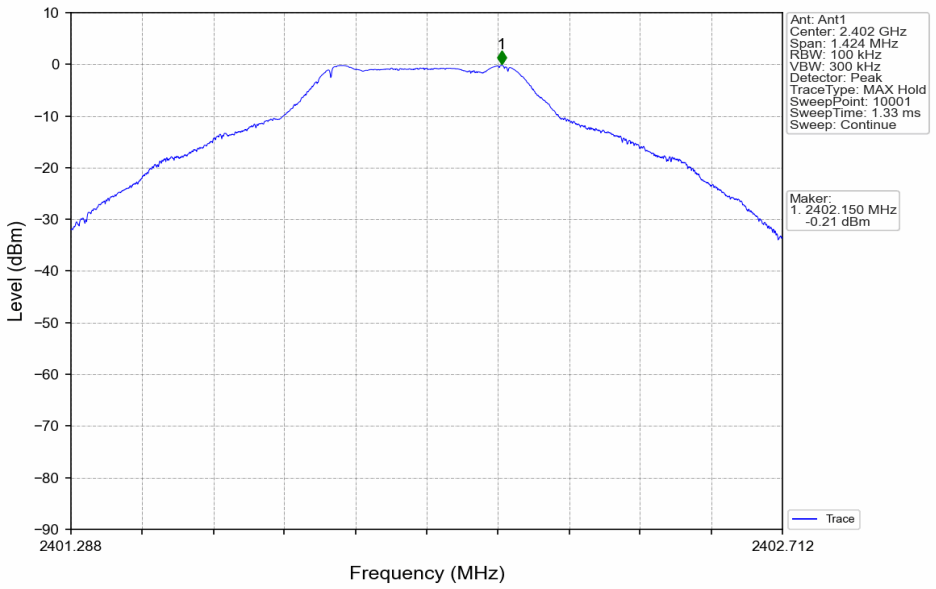

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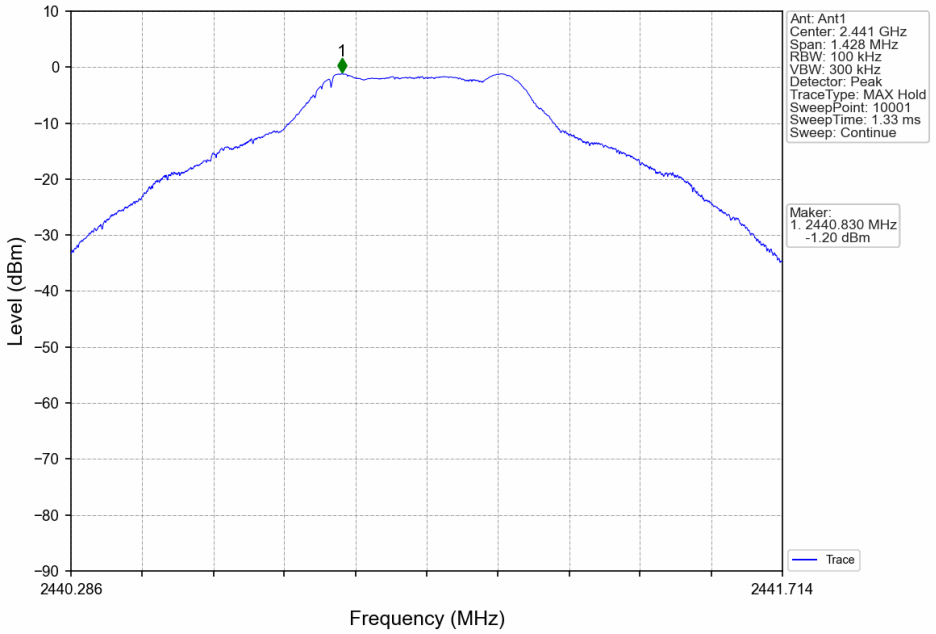

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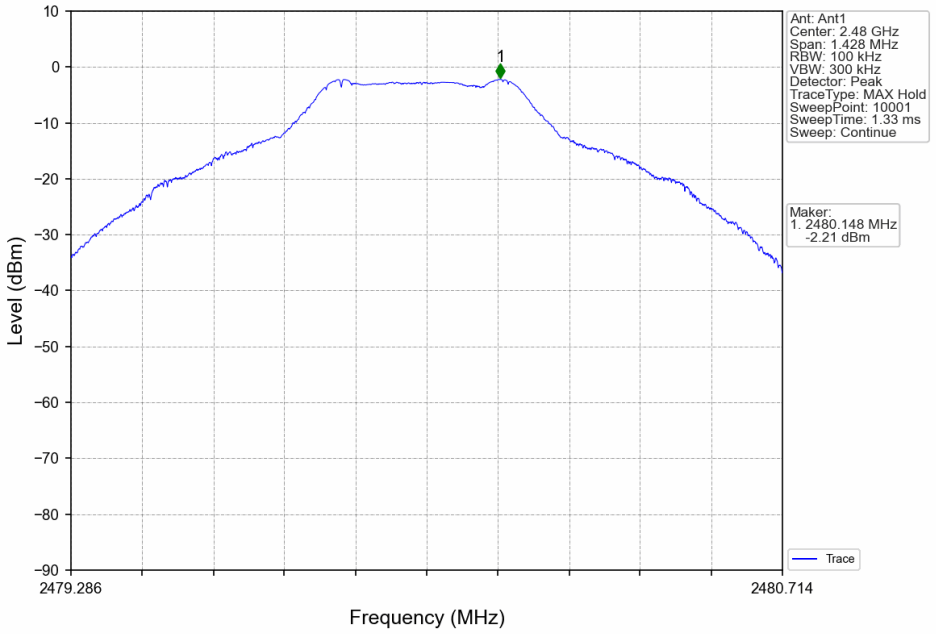

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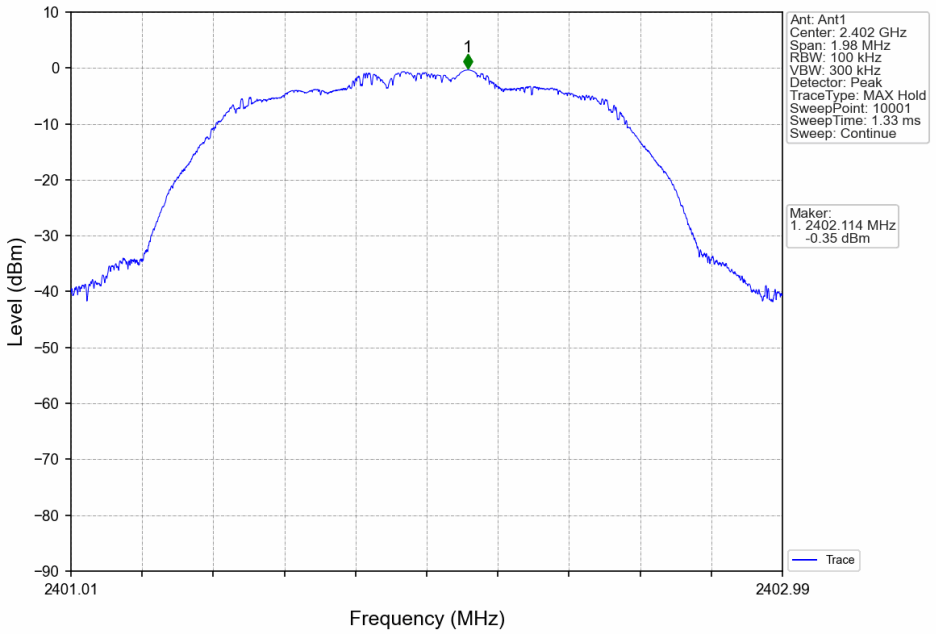

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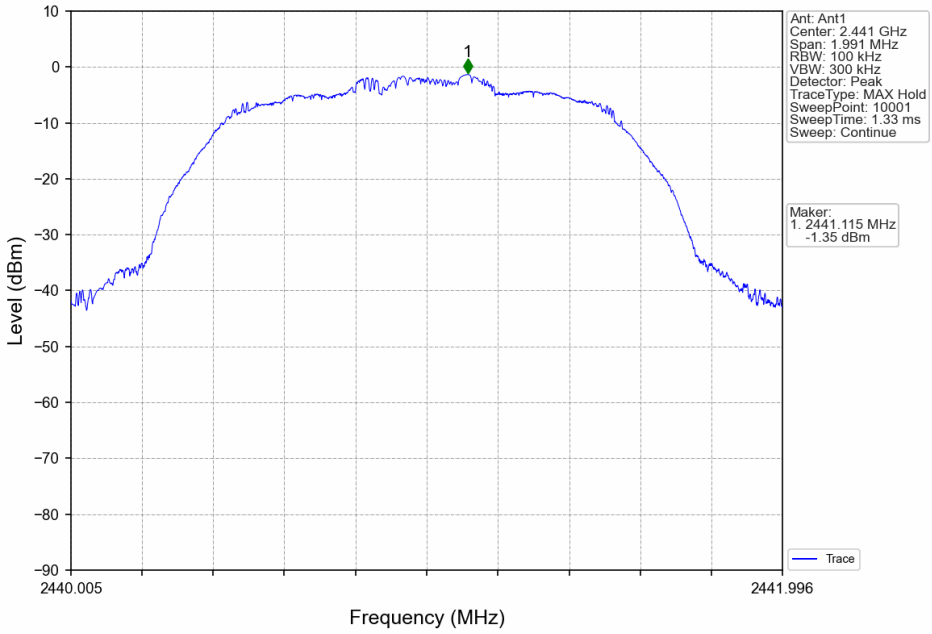

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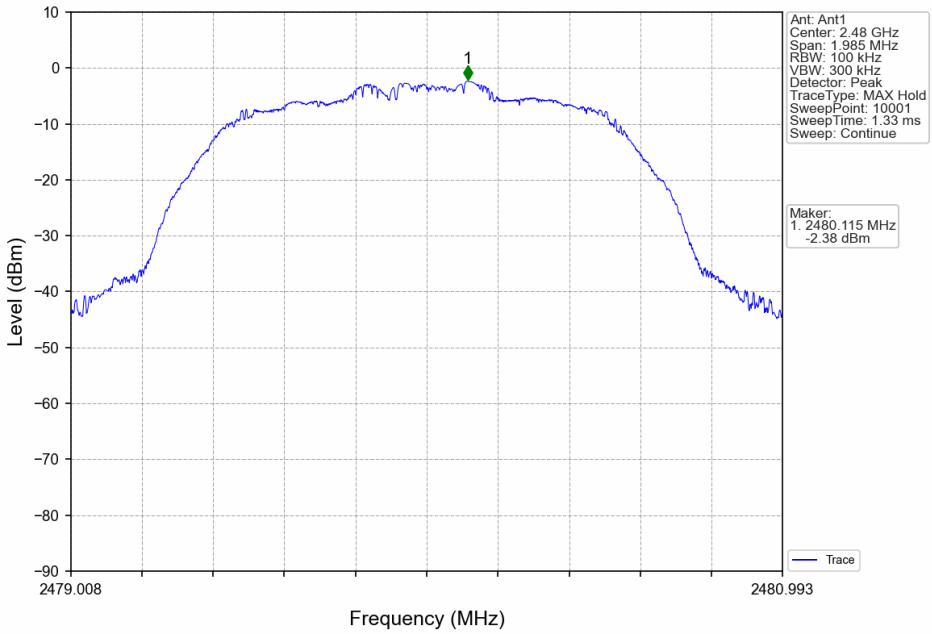

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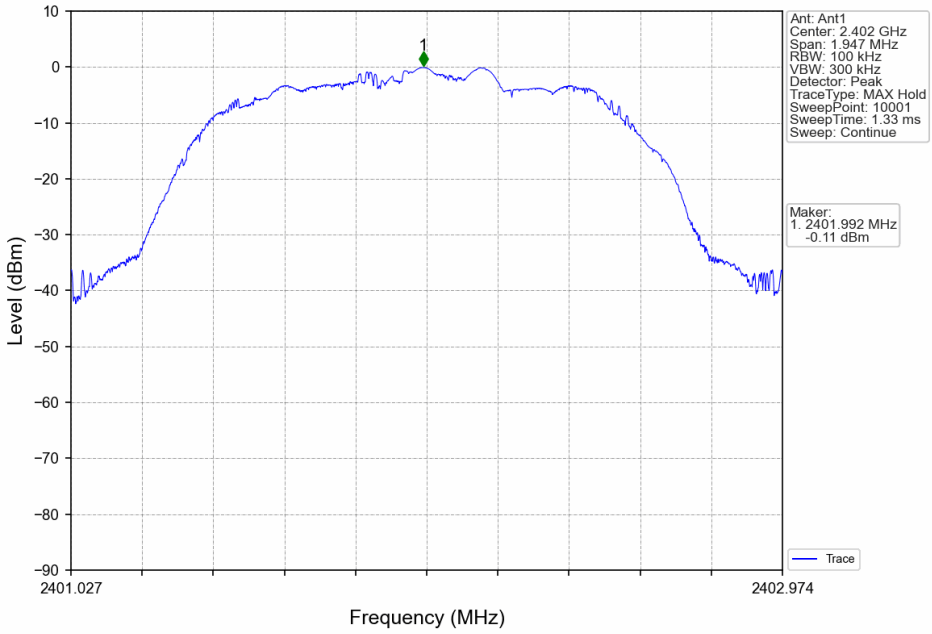
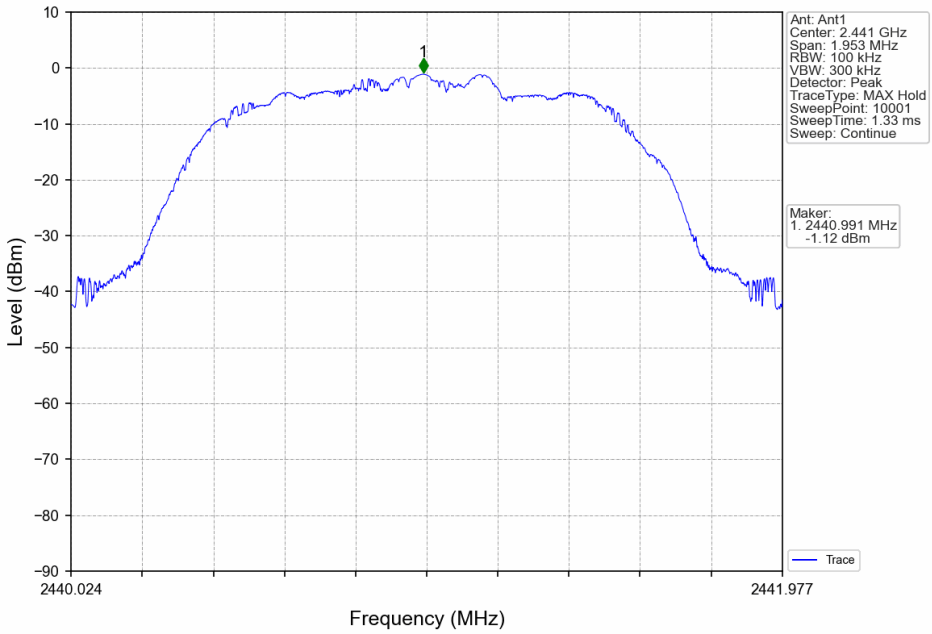
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



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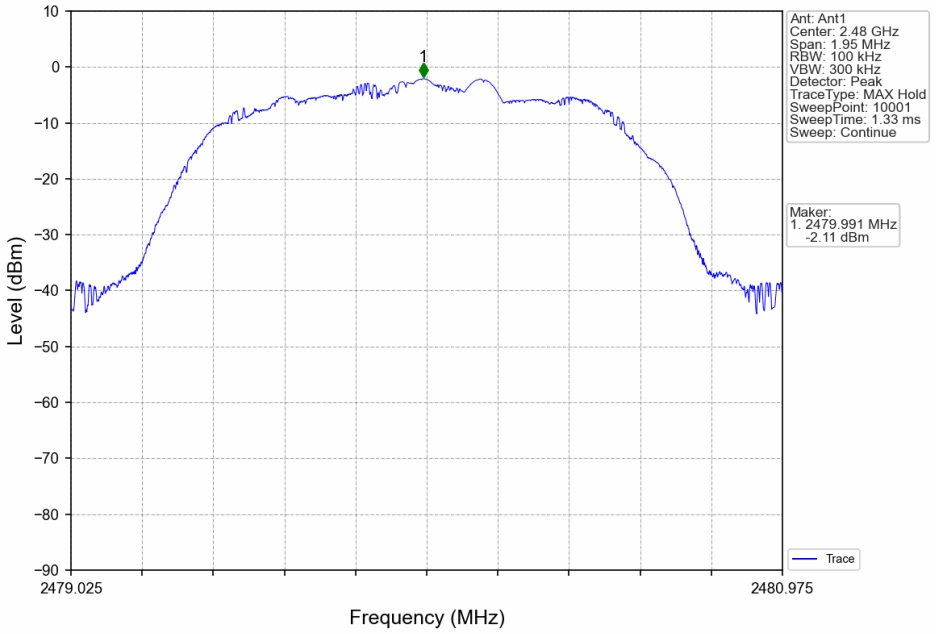
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



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6.2 CSE

6.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	-0.21	-20.21	Pass
		2441	DH5	1	-0.21	-20.21	Pass
		2480	DH5	1	-0.21	-20.21	Pass
		HOPP	DH5	1	-0.21	-20.21	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	-0.35	-20.35	Pass
		2441	2DH5	1	-0.35	-20.35	Pass
		2480	2DH5	1	-0.35	-20.35	Pass
		HOPP	2DH5	1	-0.35	-20.35	Pass
8DPSK	SISO	2402	3DH5	1	-0.11	-20.11	Pass
		2441	3DH5	1	-0.11	-20.11	Pass
		2480	3DH5	1	-0.11	-20.11	Pass
		HOPP	3DH5	1	-0.11	-20.11	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.
Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.

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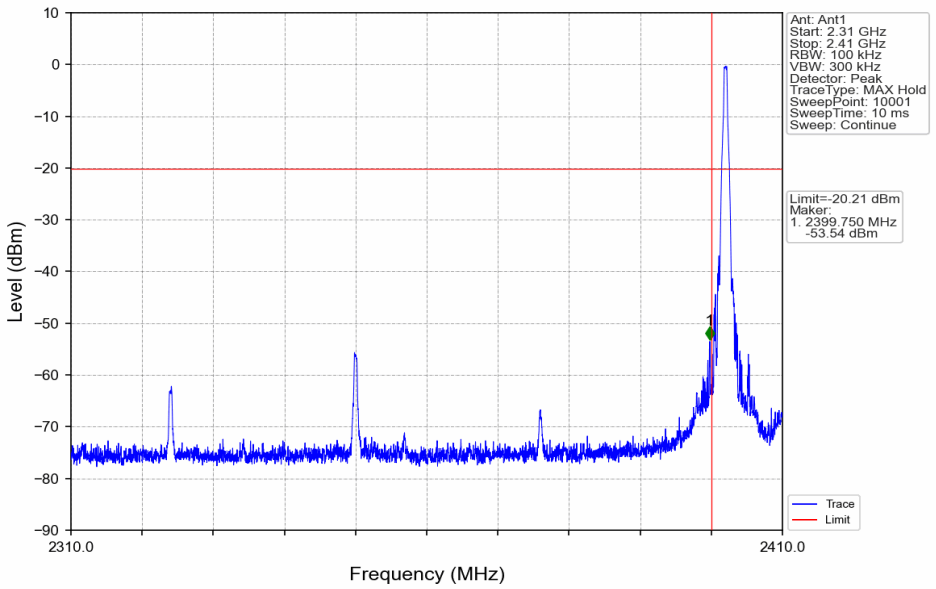
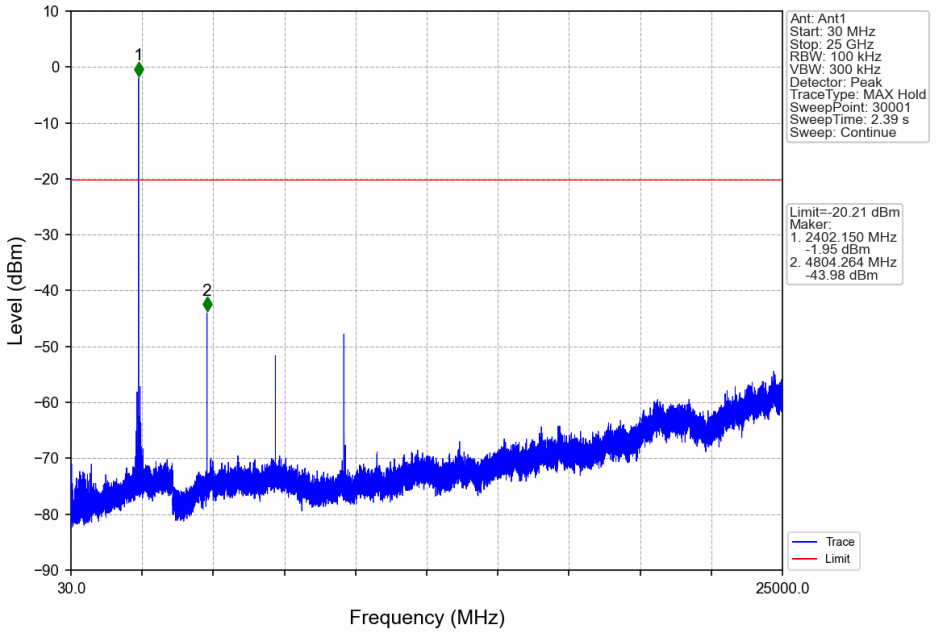
6.2.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_LCH_2402MHz_Ant1_NTNV



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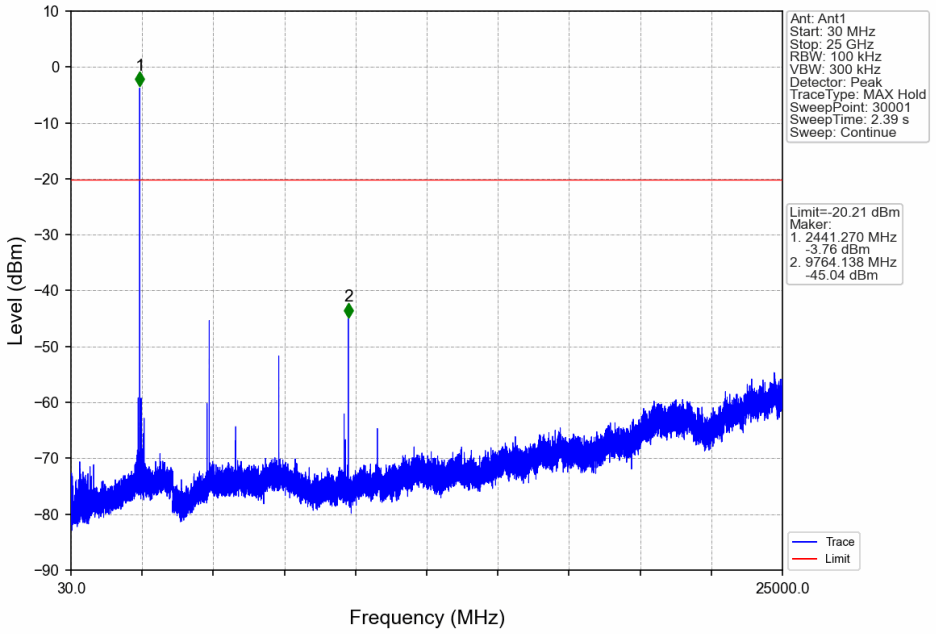
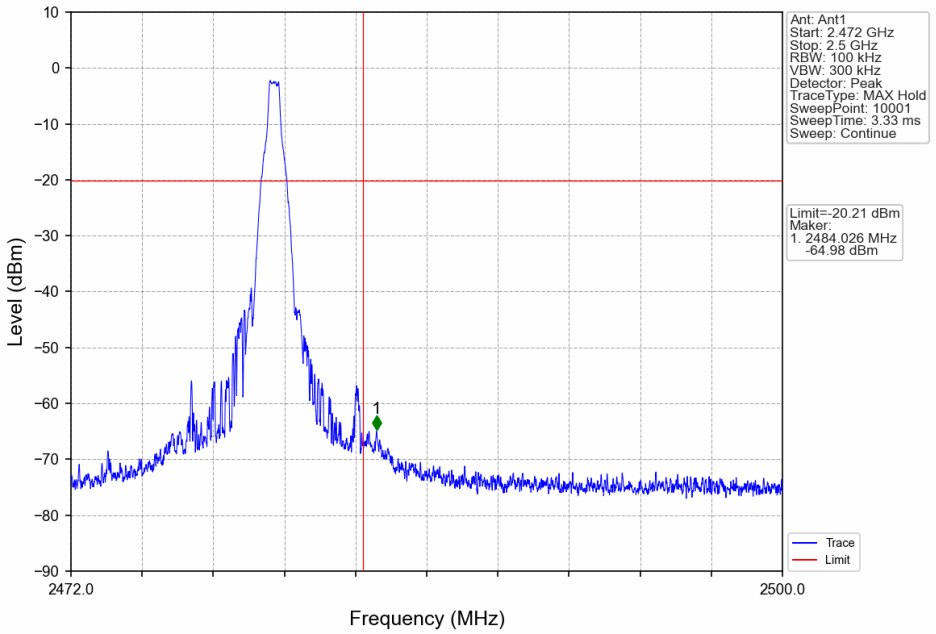
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



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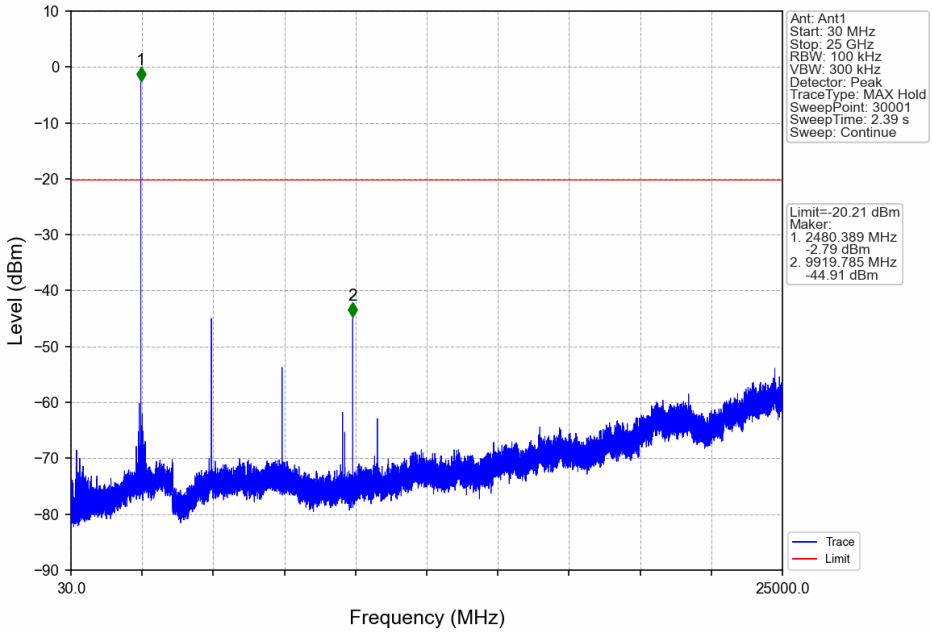
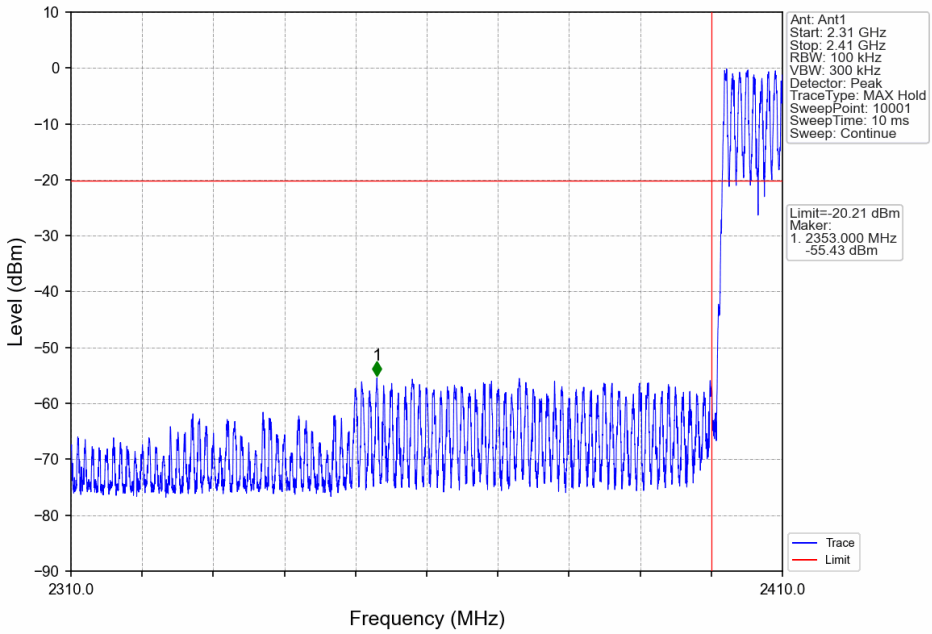
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



GFSK_DH5_HOPP_Ant1_NTNV



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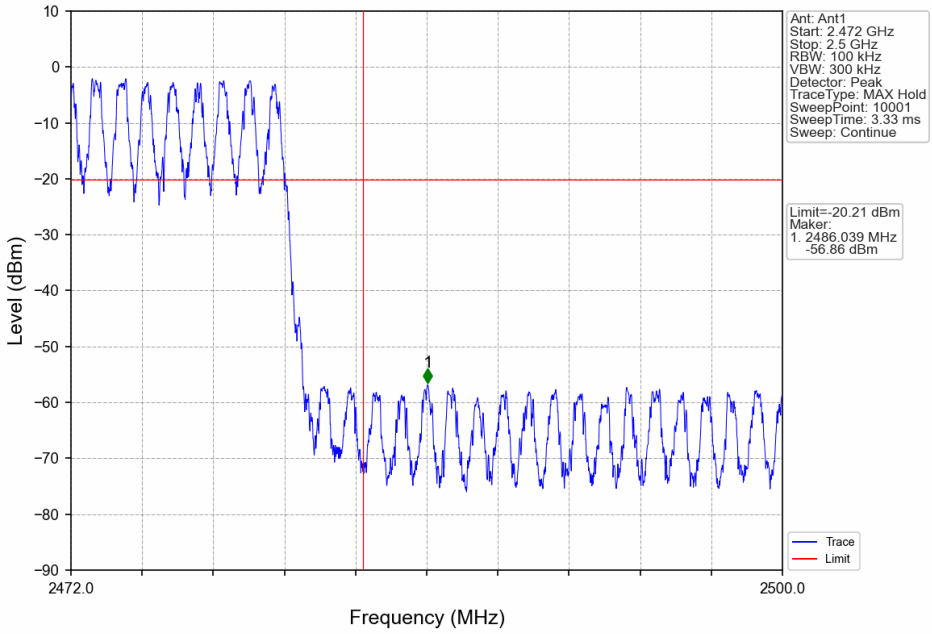
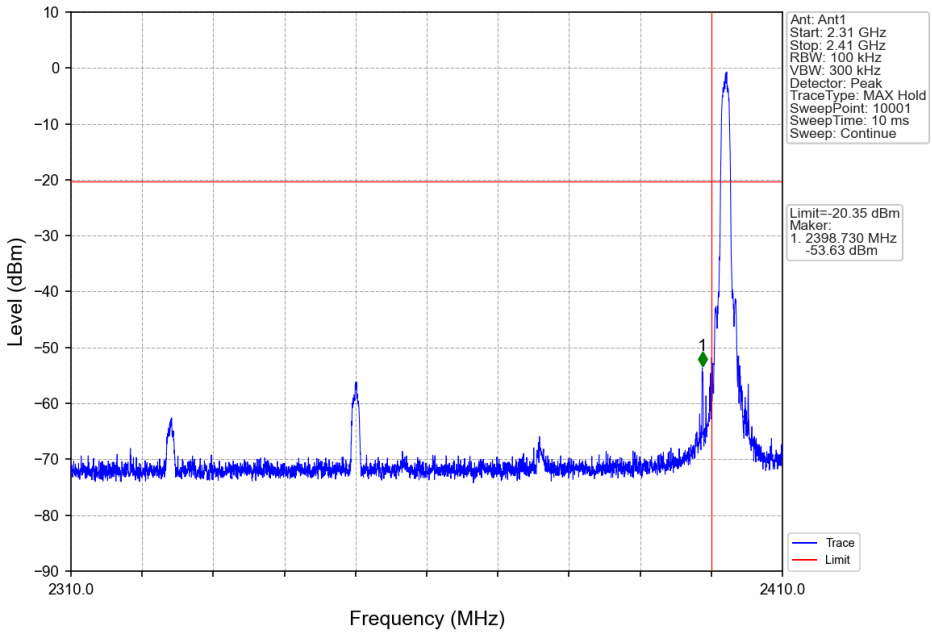
GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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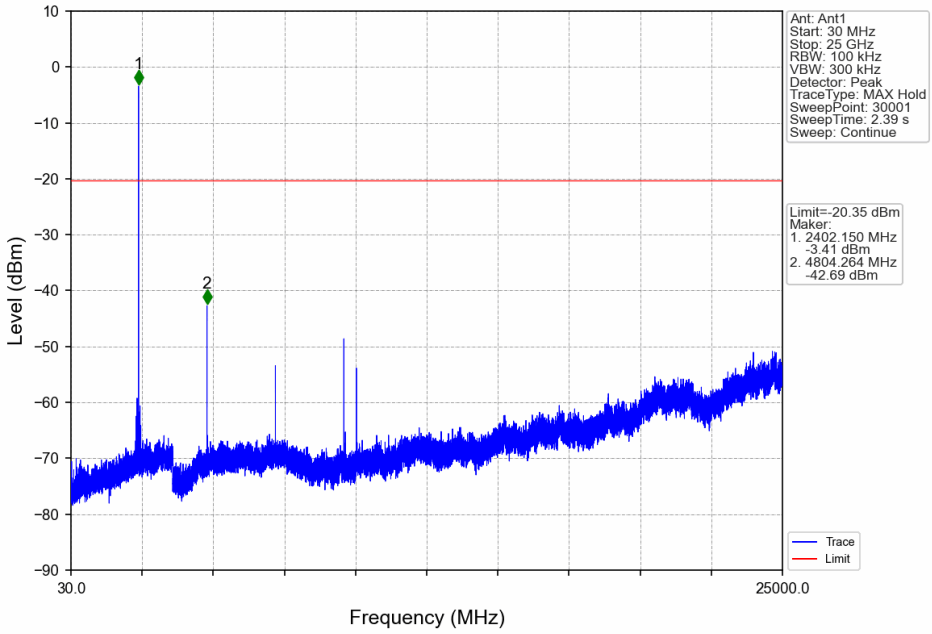

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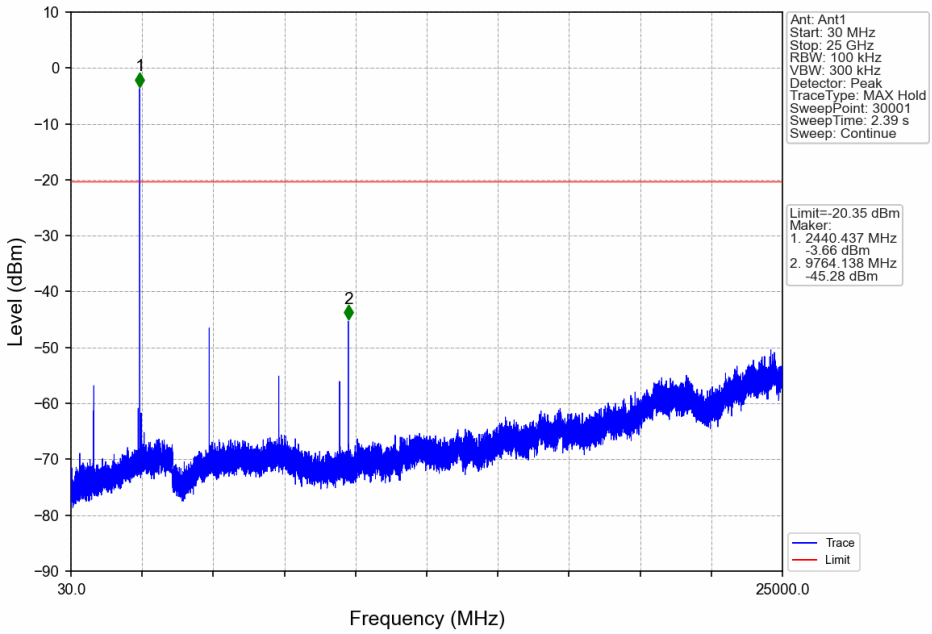

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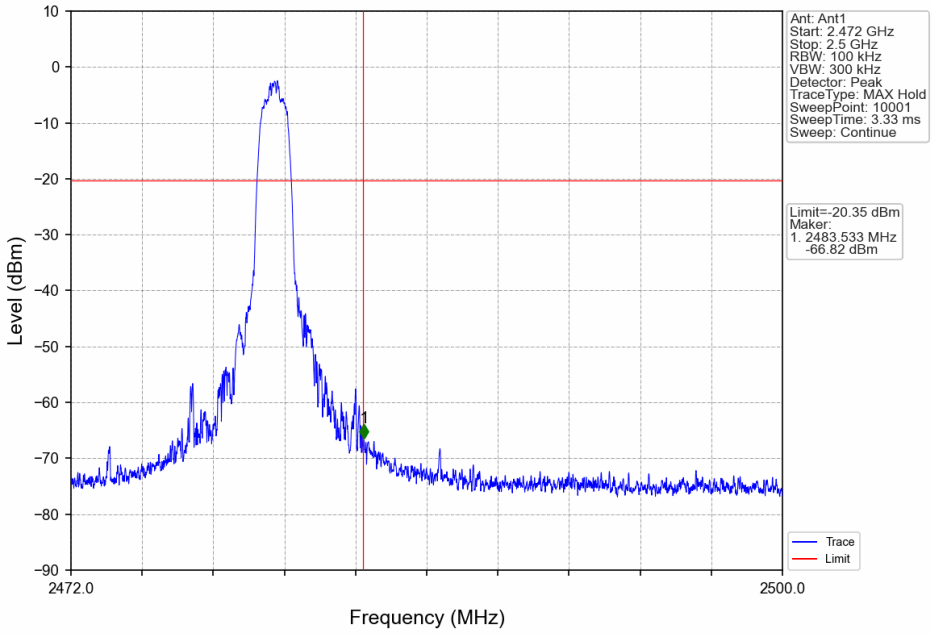

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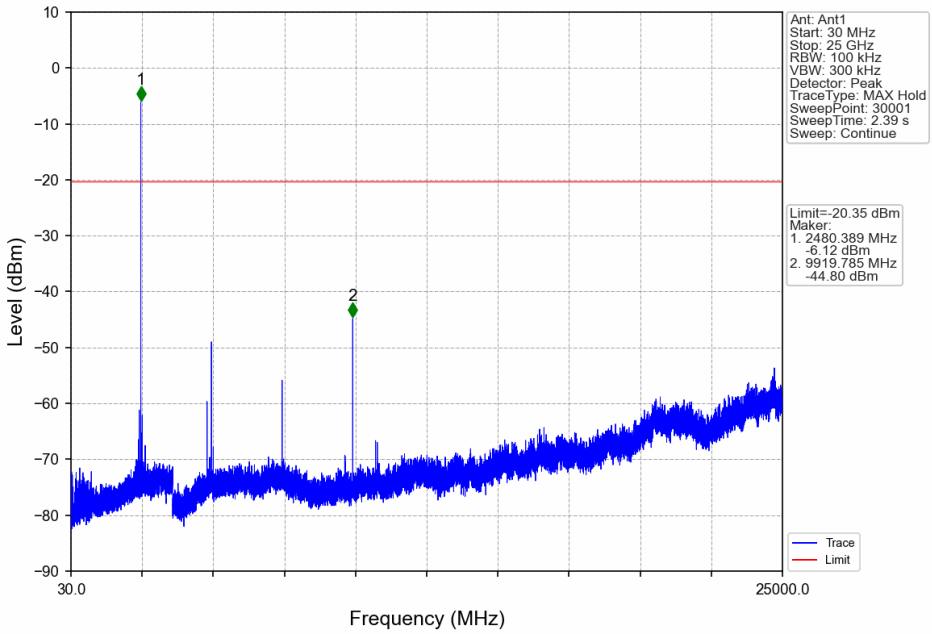

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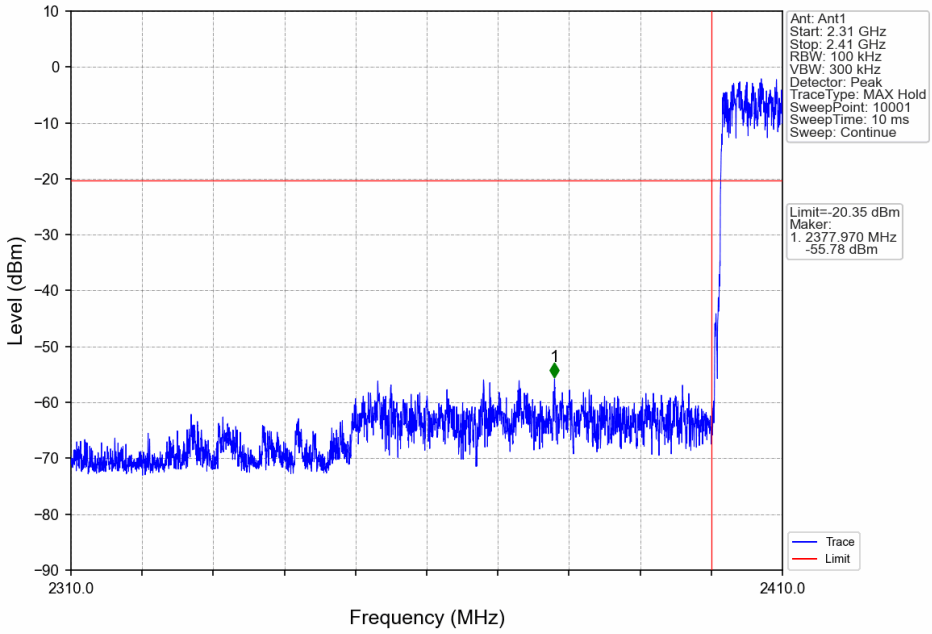
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



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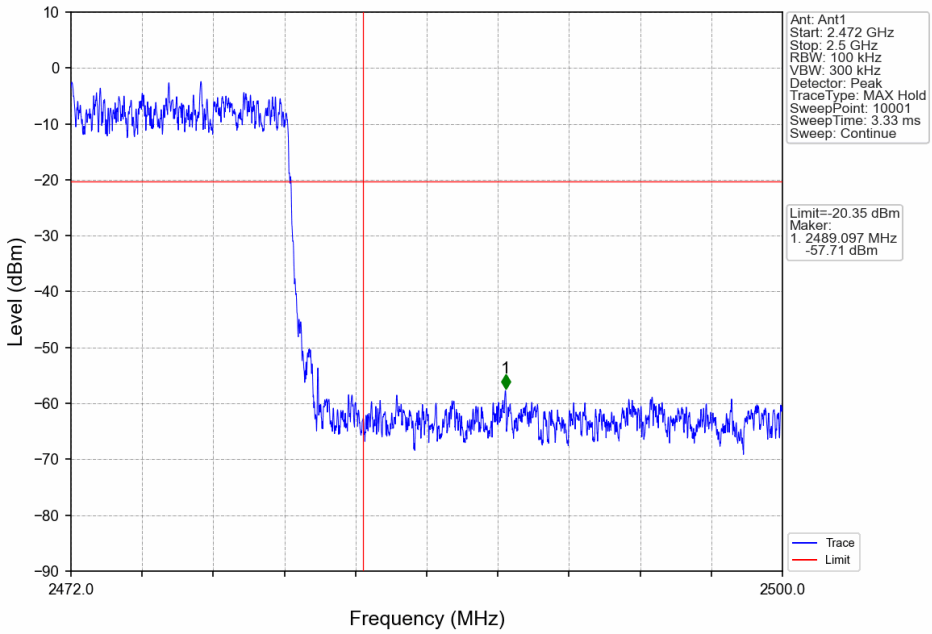

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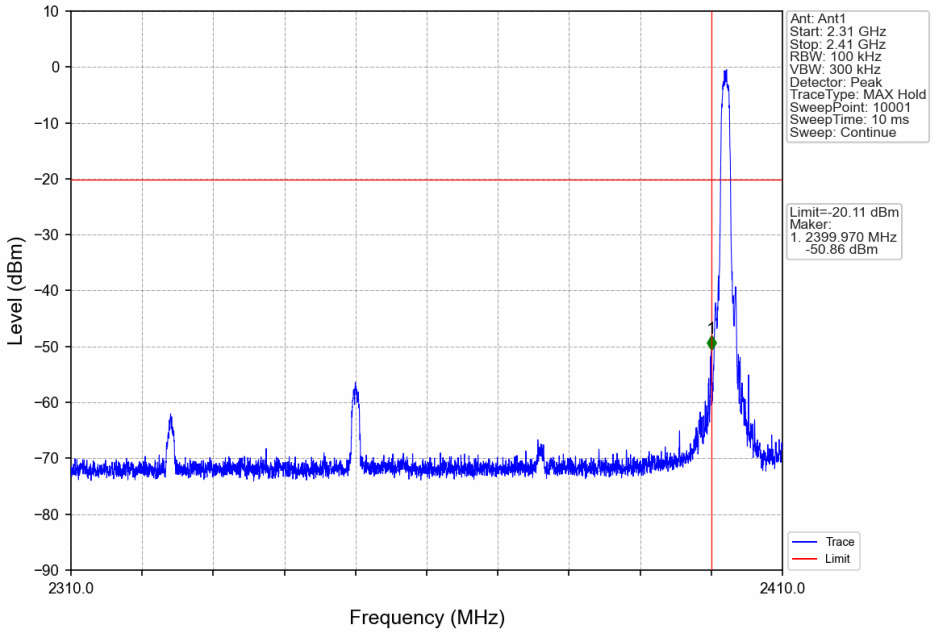

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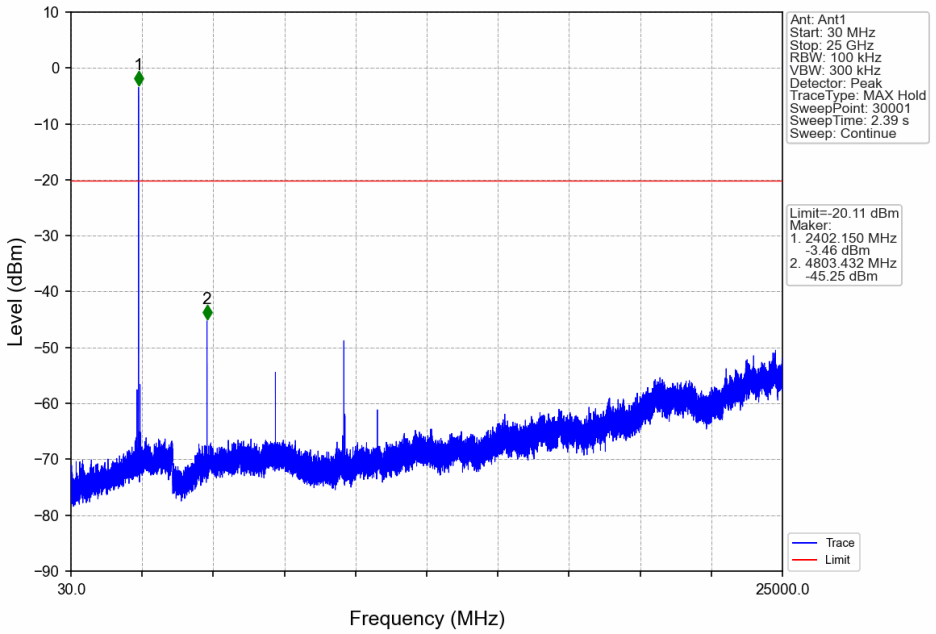

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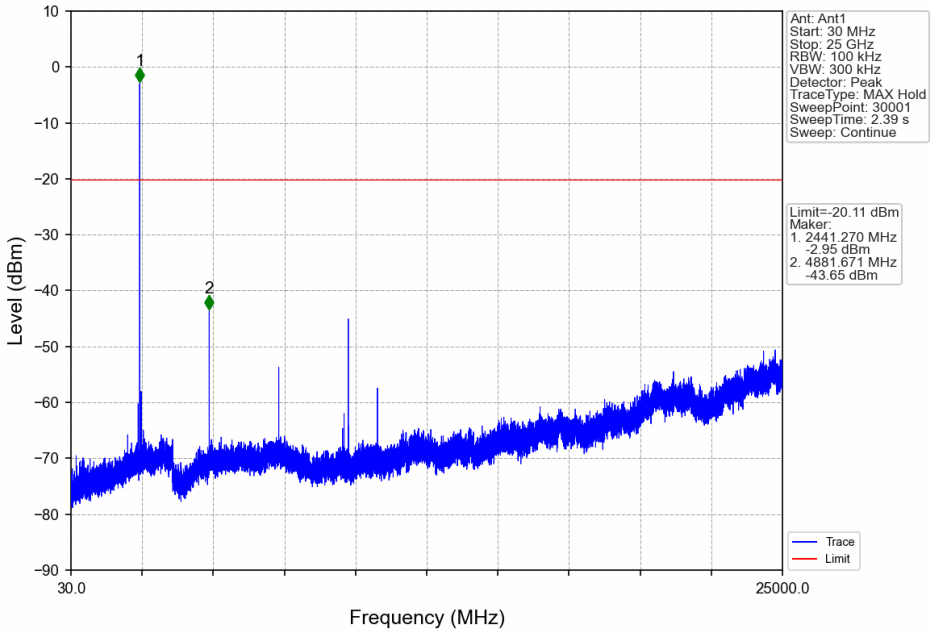
8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



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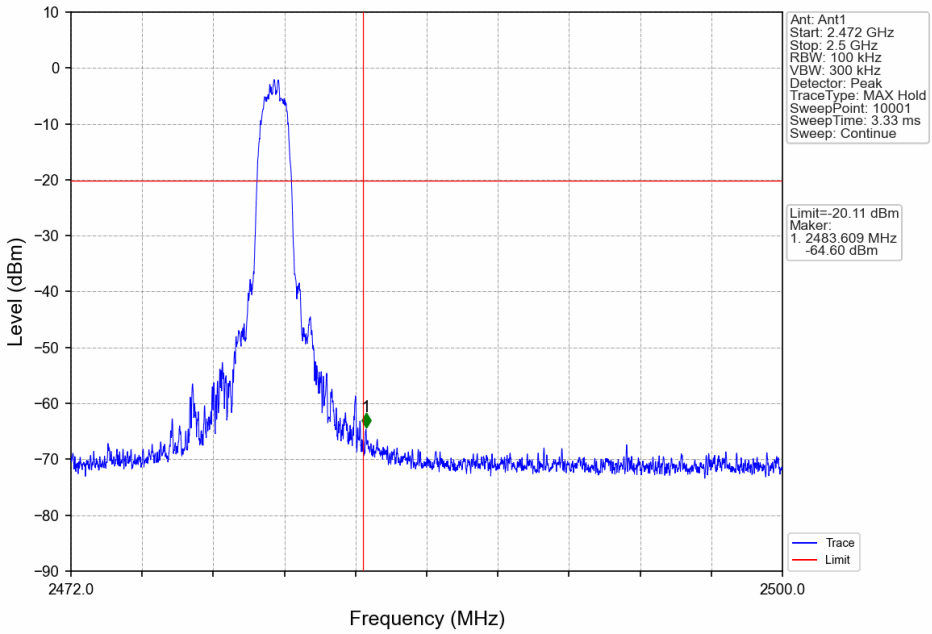

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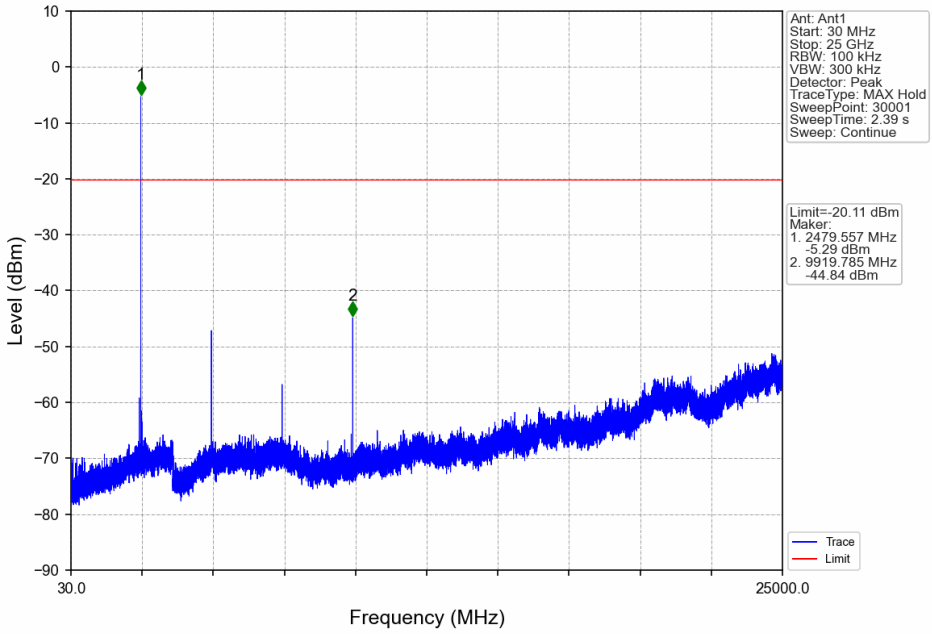
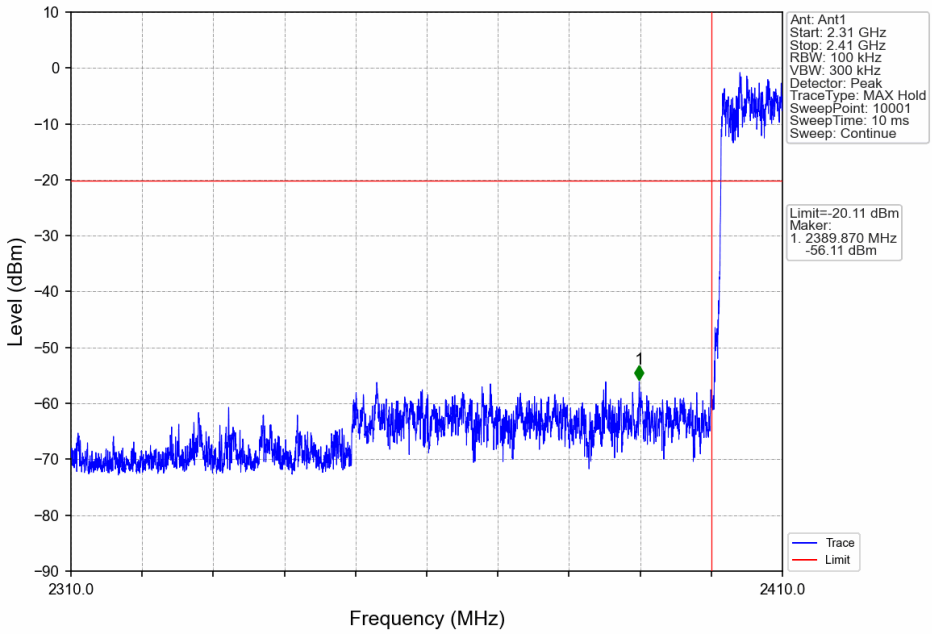
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



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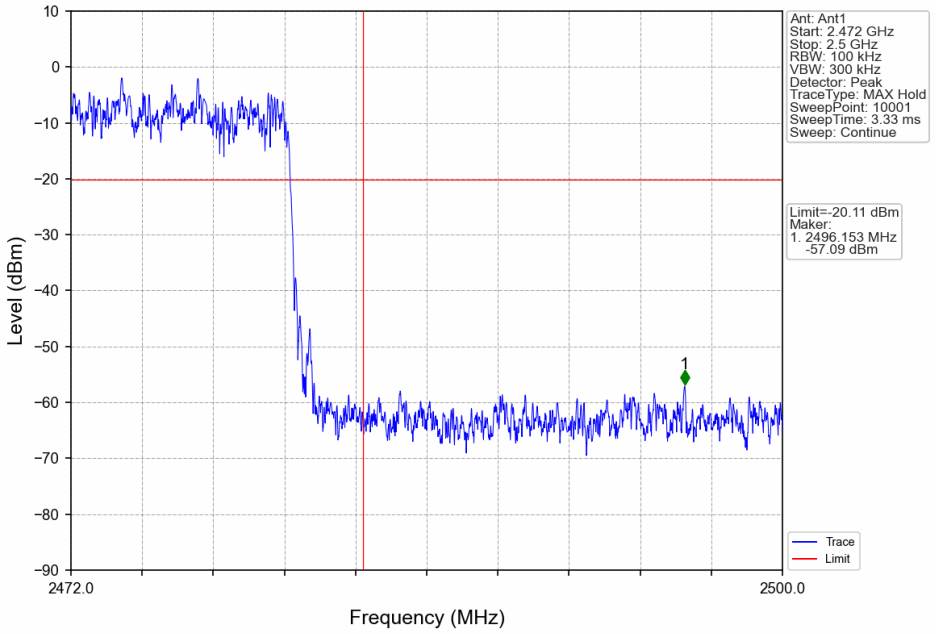

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7. Form731

7.1 Form731

7.1.1 Test Result

Lower Freq (MHz)	High Freq (MHz)	MAX Power (W)	MAX Power (dBm)
2402	2480	0.0020	3.04

- End of the Report -

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