RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247

Test Standard	**FCC Part 15.247** **IC RSS-247 issue 3 and IC RSS-GEN issue 5**
Product name	**Chrion Pro**
Brand Name	**Mio, MiTAC, Magellan, Teletrac Navman**
Model No.	**N635**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.
The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:

Dally Hong

Dally Hong
Sr. Engineer

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		January 4, 2024		Initial Issue	ALL	Allison Chen

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

FCC Applicant	Mitac Digital Technology Corporation 4F., No. 1, R&D Road 2, Hsinchu Science Park, Hsinchu 30076 Taiwan
IC Applicant	MiTAC Digital Technology Corporation 4F., No. 1, R&D Road 2, Hsinchu Science Park, Hsinchu 30076 Taiwan
Manufacturer	MITAC COMPUTER (KUNSHAN) CO., LTD. No. 269, 2nd Avenue, District A, Comprehensive Free Trade Zone, Kunshan, Jiangsu, P.R. China
Equipment	Chrion Pro
Trade Name	Mio, MiTAC, Magellan, Teletrac Navman
Model No.	N635
Model Discrepancy	Difference of the those trade names (list on this report) are just for marketing purpose only.
Received Date	May 25, 2023
Date of Test	October 12 ~ 26, 2023
Power Supply	1. Powered from AC Adapter. I/P: 100-240Vac, 50-60Hz, 0.3A; O/P: Vdc,5V 2.0A 2. Powered from car charge. I/P: 12-24Vdc; O/P: 5Vdc, 2A (Max) 3. Powered from Rechargeable Li-ion Polymer Battery. Rating: 3.7VDC, 4000mAh, 14.8Wh
HW Version	R02
SW Version	R15
Serial number	HGM37E0001

Remark:
1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. Disclaimer: The variant model numbers / trademarks are assessed as identical in hardware and software to each other, hence all variants are fully covered by the test results in this test report without further verification test.

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1.2 INFORMATION ABOUT THE FHSS CHARACTERISTICS

1.2.1 Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1 600 hops/s.

1.2.2 Equal Hopping Frequency Use

The channels of this system will be used equally over the long-term distribution of the hopsets.

1.2.3 Example of a 79 hopping sequence in data mode:

02, 05, 31, 24, 20, 10, 43, 36, 30, 23, 40, 06, 21, 50, 44, 09, 71, 78, 01, 13, 73, 07, 70, 72, 35, 62, 42, 11, 41, 08, 16, 29, 60, 15, 34, 61, 58, 04, 67, 12, 22, 53, 57, 18, 27, 76, 39, 32, 17, 77, 52, 33, 56, 46, 37, 47, 64, 49, 45, 38, 69, 14, 51, 26, 79, 19, 28, 65, 75, 54, 48, 03, 25, 66, 05, 16, 68, 74, 59, 63, 55

1.2.4 System Receiver Input Bandwidth

Each channel bandwidth is 1MHz.
The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.2.5 Equipment Description

RSS-247, 5.1 (a): The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. 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.

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1.3 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	1. GFSK for BDR-1Mbps 2. π/4-DQPSK for EDR-2Mbps 3. 8DPSK for EDR-3Mbps
Number of channel	79 Channels

Remark:
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 and RSS-GEN Table 1 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.4 ANTENNA INFORMATION

Antenna Type	☐ PIFA ☐ PCB ☐ Dipole ☐ Coils ☒ Chip
Antenna Gain	Antenna Gain: 1.31 dBi
Brand / Model	INPAQ / ACM3-5036-A1-CC-S
Antenna connector	i-pex

Notes:
1. The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203 and RSS-Gen §6.8.

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1.5 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.213 dB
Channel Bandwidth	± 2.7 %
RF output power (Power Meter + Power sensor)	± 0.243 dB
Power Spectral density	± 2.739 dB
Conducted Bandedge	± 2.739 dB
Conducted Spurious Emission	± 2.742 dB
Radiated Emission_9kHz-30MHz	± 3.115 dB
Radiated Emission_30MHz-200MHz	± 4.071 dB
Radiated Emission_200MHz-1GHz	± 4.419 dB
Radiated Emission_1GHz-6GHz	± 5.023 dB
Radiated Emission_6GHz-18GHz	± 5.068 dB
Radiated Emission_18GHz-26GHz	± 3.349 dB
Radiated Emission_26GHz-40GHz	± 3.229 dB

Remark:

1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

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1.6 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

AC Powerline Conducted Emission and Conducted:

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

Radiated emission 9kHz to 40GHz:

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Tony Chao	-
Radiation	Tony Chao	-
RF Conducted	David Li	-

Remark: The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

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1.7 INSTRUMENT CALIBRATION

Conducted_FCC/IC/NCC (All)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Sensor	Anritsu	MA2411B	1911386	2023-07-25	2024-07-24
Power Sensor	Anritsu	MA2411B	1911387	2023-07-25	2024-07-24
Power Meter	Anritsu	ML2496A	2136002	2022-11-24	2023-11-23
EXA Signal Analyzer	Keysight	N9010B	MY60242460	2023-02-02	2024-02-01
Software	Radio Test Software Ver. 21				

966A_Radiated Wi-Fi 2.4GHz					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Preamplifier	EMEC	EM330	060609	2023-02-22	2024-02-21
Thermo-Hygro Meter	WISEWIND	1206	D07	2022-12-19	2023-12-18
Signal Analyzer	KEYSIGHT	N9010A	MY54200716	2023-10-13	2024-10-12
Preamplifier	HP	8449B	3008A00965	2022-12-23	2023-12-22
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2023-08-08	2024-08-07
Cable	Huber+Suhner	104PEA	20995+21000+182330	2023-02-22	2024-02-21
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-01-12	2024-01-11
High Pass Filters	Titan Microwave	T04H30001800070S01	22011402-4	2023-06-17	2024-06-16
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2022-12-30	2023-12-29
Pre-Amplifier	EMCI	EMC184045SE	980860	2022-12-27	2023-12-26
Cable	EMCI	EMC101G	211010+211011+211012	2022-12-12	2023-12-11
Cable	EMCI	EMC101G	221213+221011+221012	2023-10-17	2024-10-16
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Software	e3 V9-210616c				

RF_Conduction(RF)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI	100064	2023-06-07	2024-06-06
LISN	TESEQ	LN2-16N	22012	2023-03-08	2024-03-07
Cable	EMCI	CFD300-NL	CERF	2023-06-27	2024-06-26
Software	EZ-EMC(CCS-3A1-CE-WUKU)				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

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1.8 SUPPORT AND EUT ACCESSORIES EQUIPMENT

Conducted_Sup_Units					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
NB(E)	Lenovo	T460	N/A	N/A	N/A
Cable	SP	Type C Cable	N/A	N/A	N/A

Support Unit List					
N0	Kind	Brand	Model	Core	Length
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A
A	TypeA to TypeC	N/A	N/A	N/A	N/A

RF_Conduction(RF)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
NB	Lenovo	IBM 7663	N/A	N.C.R	N.C.R

1.9 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 662911, KDB 558074, RSS-247 Issue 3 and RSS-GEN Issue 5.

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2. TEST SUMMARY

FCC Standard Section	IC Standard Section	Report Section	Test Item	Result
15.203	RSS-GEN 6.8	1.3	Antenna Requirement	Pass
15.207(a)	RSS-GEN 8.8	4.1	AC Conducted Emission	Pass
15.247(a)(1)	RSS-247(5.1)(a)	4.2	20 dB Bandwidth	Pass
-	RSS-GEN 6.7	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(1)	RSS-247(5.4)(b)	4.3	Output Power Measurement	Pass
15.247(a)(1)	RSS-247(5.1)(b)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(d)	4.5	Number of Hopping	Pass
15.247(d)	RSS-247(5.5)	4.6	Conducted Band Edge	Pass
15.247(d)	RSS-247(5.5)	4.6	Conducted Spurious Emission	Pass
15.247(a)(1)(iii)	RSS-247(5.1)(d)	4.7	Time of Occupancy	Pass
15.247(d) 15.205	RSS-GEN 8.9, 8.10	4.8	Radiation Band Edge	Pass
15.247(d) 15.205	RSS-GEN 8.9, 8.10	4.8	Radiation Spurious Emission	Pass

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3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	GFSK for BDR-1Mbps (DH5) π/4-DQPSK for 2Mbps (2DH5) 8DPSK for EDR-3Mbps (3DH5)
Test Channel Frequencies	**GFSK for BDR-1Mbps:** 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz **π/4-DQPSK for 2Mbps:** 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz **8DPSK for EDR-3Mbps:** 1.Lowest Channel: 2402MHz 2.Middle Channel: 2441MHz 3.Highest Channel: 2480MHz

Remark:
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

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3.2 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Above 1G	
Test Condition	**Radiated Emission Above 1G**
Power supply Mode	**Mode 1: EUT power by Adapter without Cradle**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Worst Position	☐ **Placed in fixed position.** ☒ **Placed in fixed position at X-Plane (E2-Plane)** ☐ **Placed in fixed position at Y-Plane (E1-Plane)** ☐ **Placed in fixed position at Z-Plane (H-Plane)**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Adapter without Cradle** **Mode 2: EUT power by N635_V+CarCharger** **Mode 3: EUT power by N564_TN+CarCharger** **Mode 4: EUT power by N635_V+Adapter** **Mode 5: EUT power by N564_TN+Adapter**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

AC Power Line Conducted Emission	
Test Condition	**AC Power line conducted emission for line and neutral**
Power supply Mode	**Mode 1: EUT power by NB** **Mode 2: EUT power by Adapter**
Worst Mode	☒ **Mode 1** ☒ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

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3.3 EUT DUTY CYCLE

Temperature: 25.3℃ **Test date:** October 12, 2023

Humidity: 59% RH **Tested by:** David Li

Duty Cycle				
Configuration	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
DH1	30.80	5.11	2.60	3.00
DH3	65.60	1.83	0.61	1.00
DH5	76.80	1.15	0.35	1.00
2DH1	31.20	5.06	2.56	3.00
2DH3	65.60	1.83	0.61	1.00
2DH5	76.80	1.15	0.35	1.00
3DH1	31.20	5.06	2.56	3.00
3DH3	65.60	1.83	0.61	1.00
3DH5	77.20	1.12	0.35	1.00

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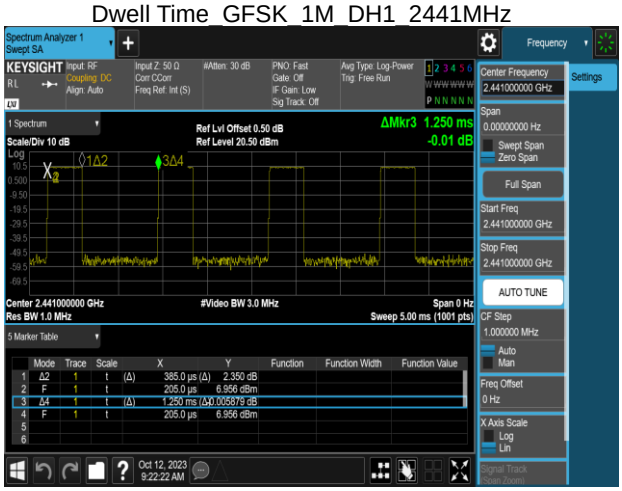
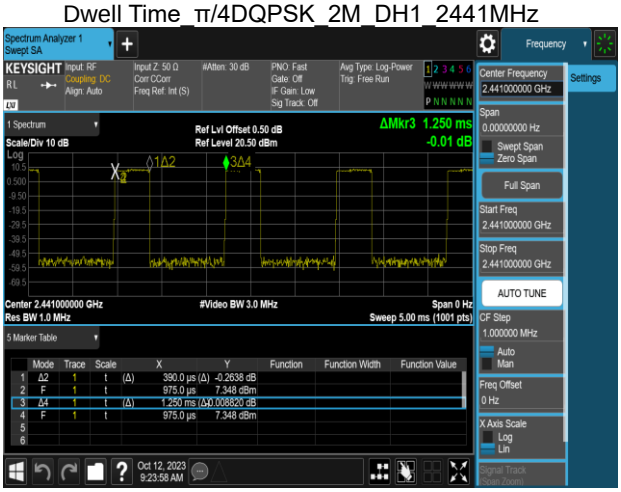
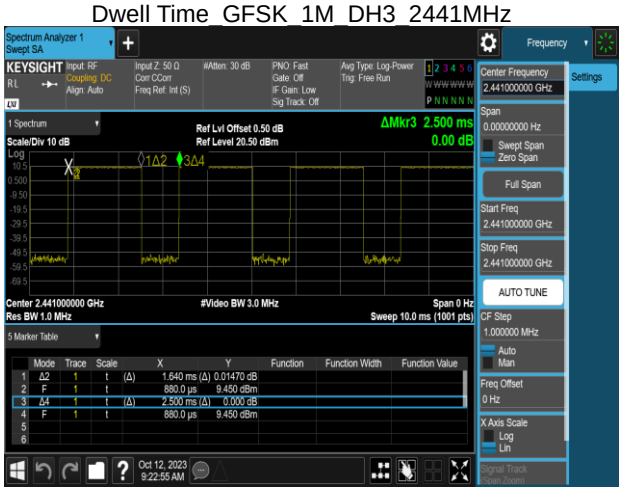
Dwell Time_GFSK_1M_DH1_2441MHz



Dwell Time_π/4DQPSK_2M_DH1_2441MHz



Dwell Time_GFSK_1M_DH3_2441MHz



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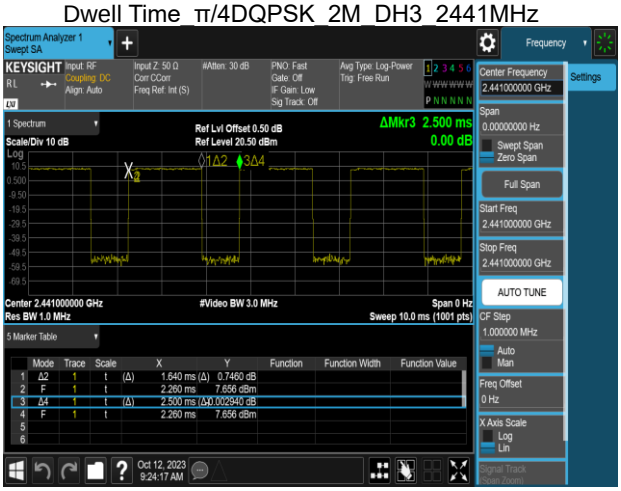
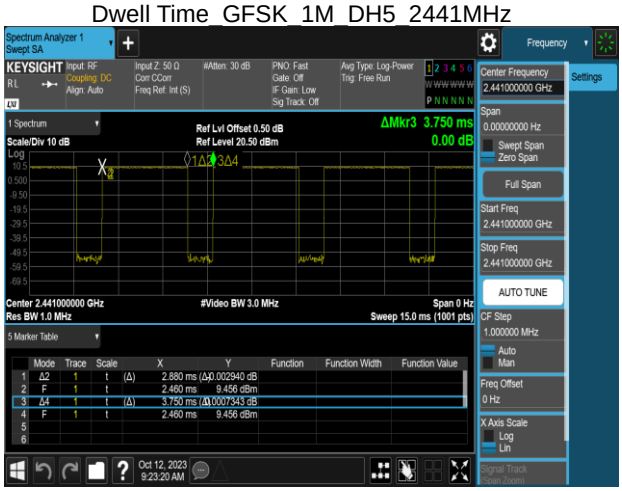
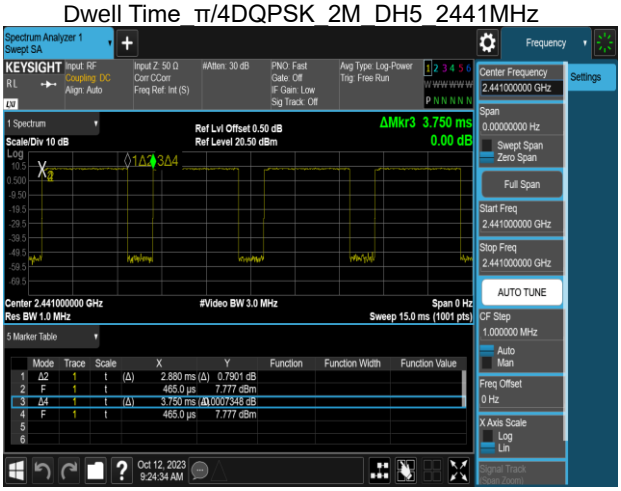


Dwell Time_GFSK_1M_DH5_2441MHz



Dwell Time_π/4DQPSK_2M_DH5_2441MHz



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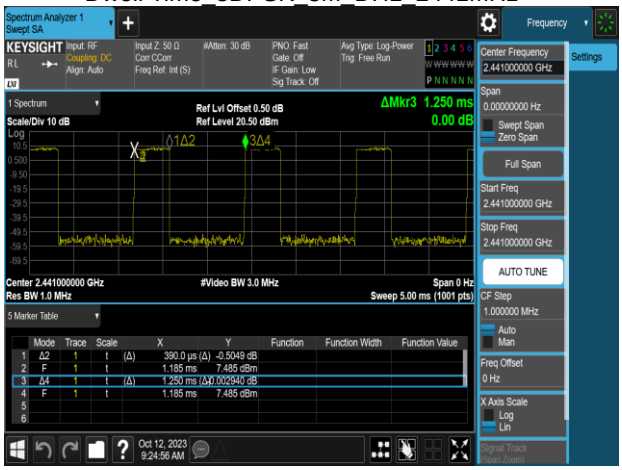
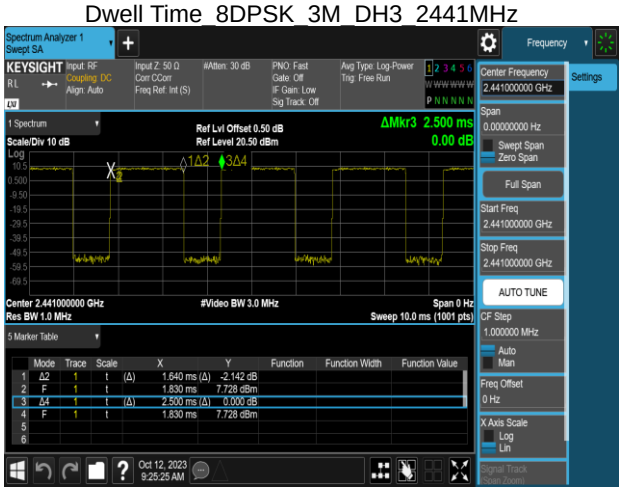
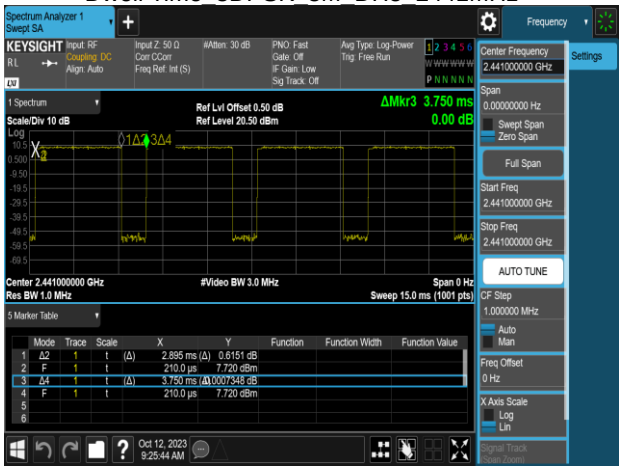
Dwell Time_8DPSK_3M_DH1_2441MHz



Dwell Time_8DPSK_3M_DH3_2441MHz



Dwell Time_8DPSK_3M_DH5_2441MHz



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4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a) and RSS-GEN section 8.8,

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

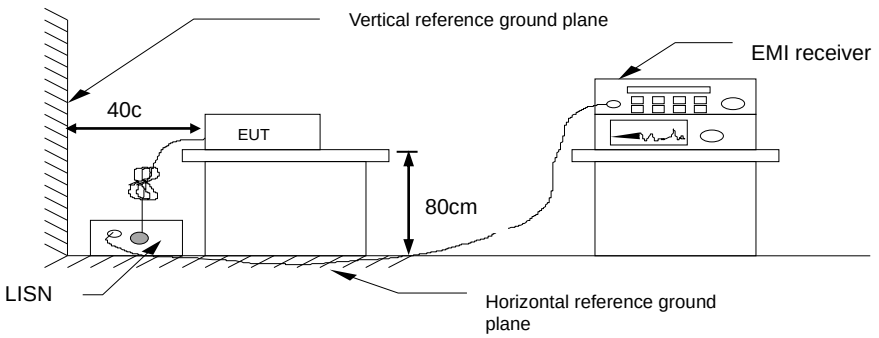
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

4.1.3 Test Setup



4.1.4 Test Result

PASS

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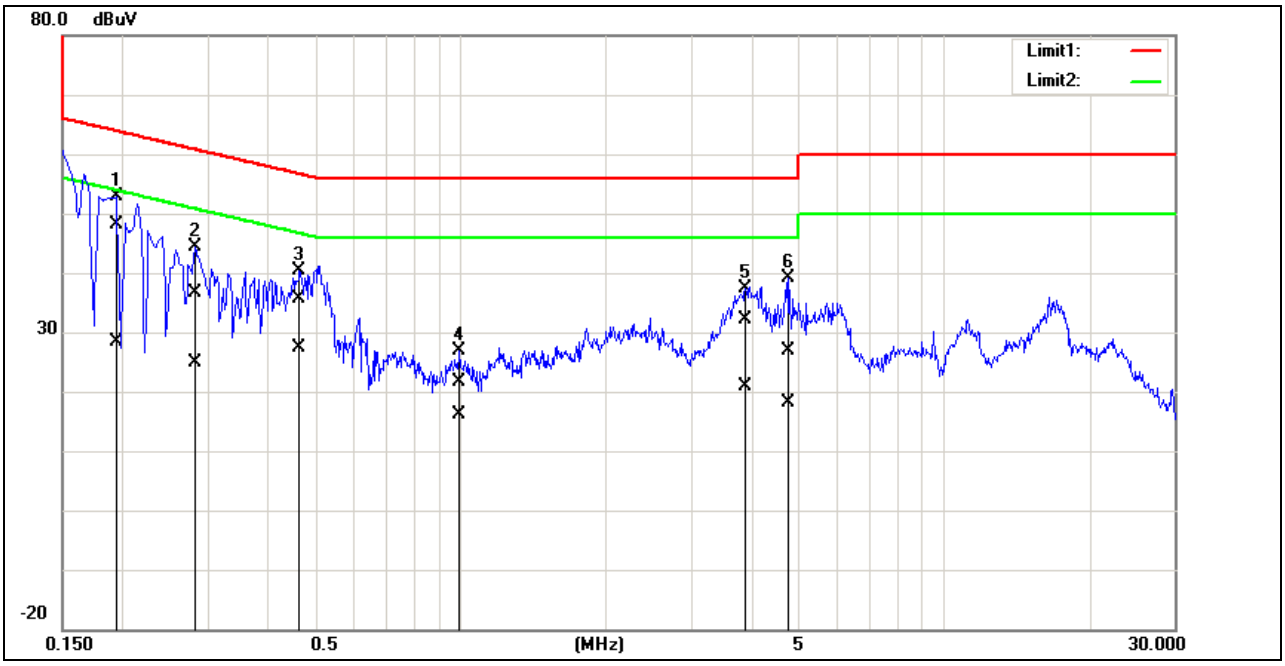
Test Data

Note: 1. Correction factor = LISN loss + Cable loss.

Project No.:	**TM-2305000074P**	**Date:**	**2023/10/26**
Standard:	**NCC/FCC/IC QP**	**Temp.(℃)/Hum.(%):**	**24.3(℃)/52%**
Test item:	**Conduction test**	**Test By:**	**Tony.Chao**
Line:	**L1**	**Test Voltage:**	**AC 120V/60Hz**
Model:	**Mode 1**		
Description:			



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1940	47.91	28.35	0.15	48.06	28.50	63.86	53.86	-15.80	-25.36	Pass
2	0.2820	36.59	24.71	0.15	36.74	24.86	60.76	50.76	-24.02	-25.90	Pass
3	0.4660	35.52	27.33	0.15	35.67	27.48	56.58	46.58	-20.91	-19.10	Pass
4	0.9980	21.43	15.94	0.16	21.59	16.10	56.00	46.00	-34.41	-29.90	Pass
5	3.8940	31.97	20.72	0.26	32.23	20.98	56.00	46.00	-23.77	-25.02	Pass
6	4.7740	26.70	17.74	0.27	26.97	18.01	56.00	46.00	-29.03	-27.99	Pass

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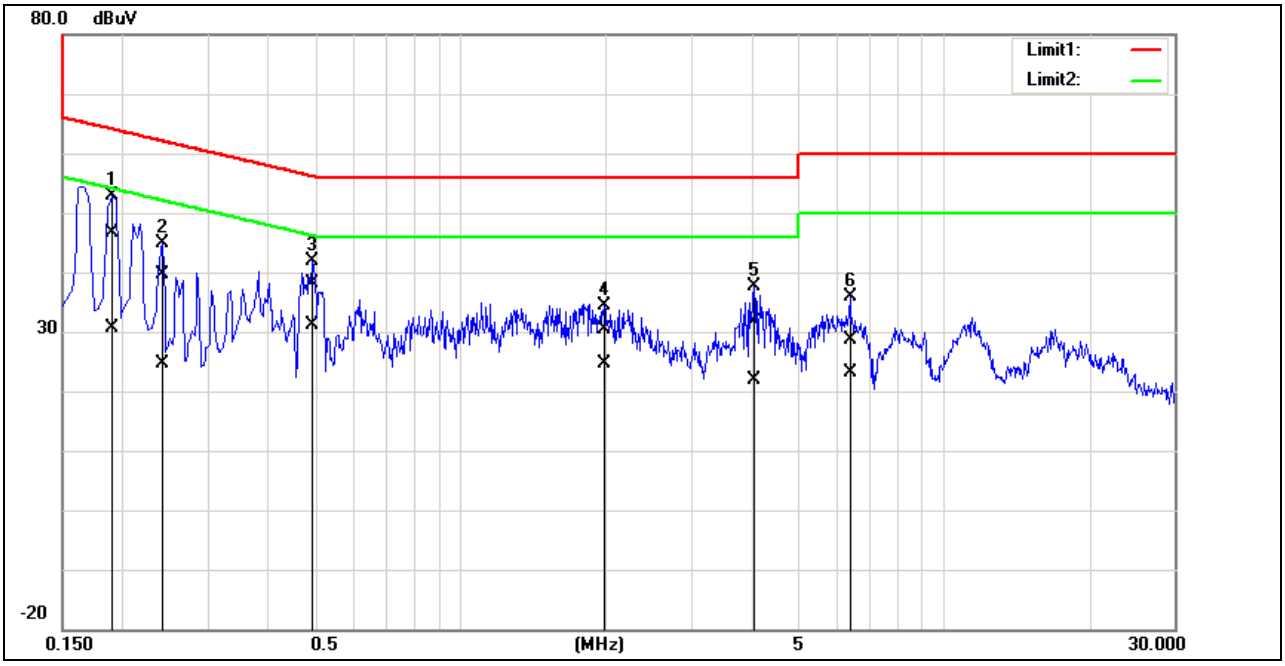
Project No.:	**TM-2305000074P**	**Date:**	**2023/10/26**
Standard:	**NCC/FCC/IC QP**	**Temp.(℃)/Hum.(%):**	**24.3(℃)/52%**
Test item:	**Conduction test**	**Test By:**	**Tony.Chao**
Line:	**N**	**Test Voltage:**	**AC 120V/60Hz**
Model:	**Mode 1**		
Description:			



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1900	46.33	30.50	0.19	46.52	30.69	64.04	54.04	-17.52	-23.35	Pass
2	0.2420	39.51	24.50	0.19	39.70	24.69	62.03	52.03	-22.33	-27.34	Pass
3*	0.4940	37.98	30.89	0.19	38.17	31.08	56.10	46.10	-17.93	-15.02	Pass
4	1.9900	30.15	24.41	0.26	30.41	24.67	56.00	46.00	-25.59	-21.33	Pass
5	4.0500	31.34	21.66	0.31	31.65	21.97	56.00	46.00	-24.35	-24.03	Pass
6	6.3900	28.23	22.79	0.34	28.57	23.13	60.00	50.00	-31.43	-26.87	Pass

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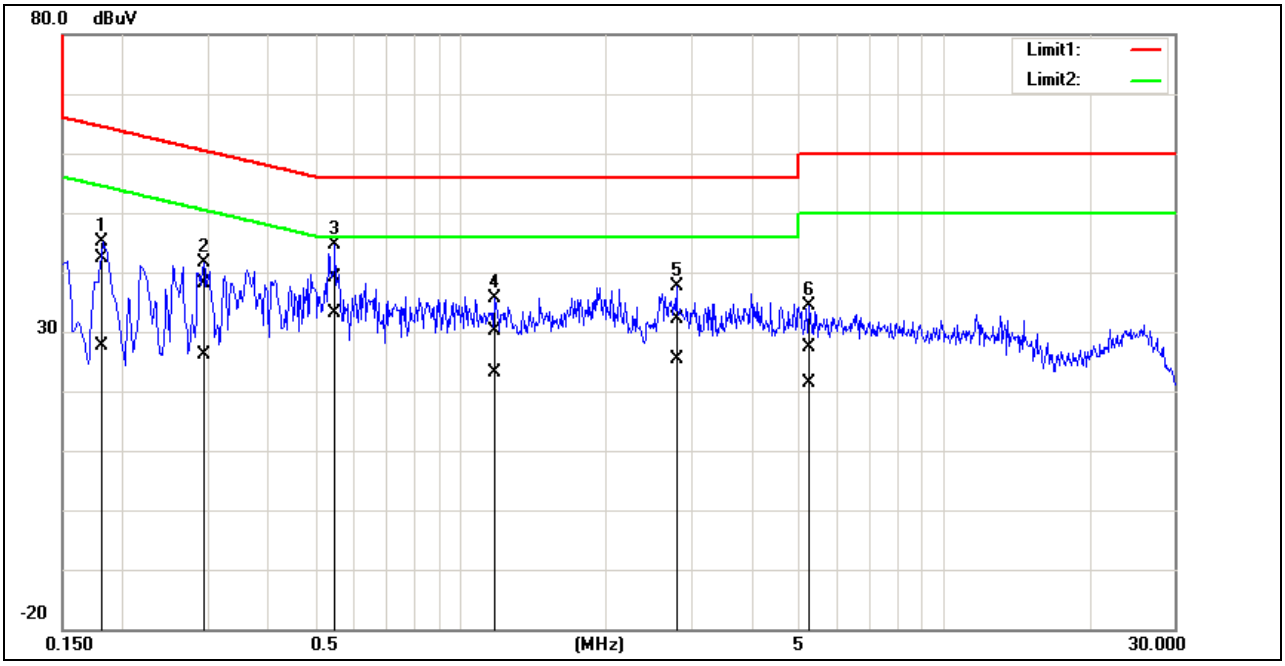
Project No.:	**TM-2305000074P**	**Date:**	**2023/11/3**
Standard:	**NCC/FCC/IC QP**	**Temp.(℃)/Hum.(%):**	**24.3(℃)/52%**
Test item:	**Conduction test**	**Test By:**	**Tony.Chao**
Line:	**L1**	**Test Voltage:**	**AC 120V/60Hz**
Model:	**Mode 2**		
Description:			



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1820	42.30	27.38	0.15	42.45	27.53	64.39	54.39	-21.94	-26.86	Pass
2	0.2940	37.90	26.08	0.15	38.05	26.23	60.41	50.41	-22.36	-24.18	Pass
3*	0.5500	38.86	33.06	0.15	39.01	33.21	56.00	46.00	-16.99	-12.79	Pass
4	1.1740	30.00	23.01	0.17	30.17	23.18	56.00	46.00	-25.83	-22.82	Pass
5	2.8060	31.77	25.08	0.24	32.01	25.32	56.00	46.00	-23.99	-20.68	Pass
6	5.2500	27.19	21.20	0.28	27.47	21.48	60.00	50.00	-32.53	-28.52	Pass

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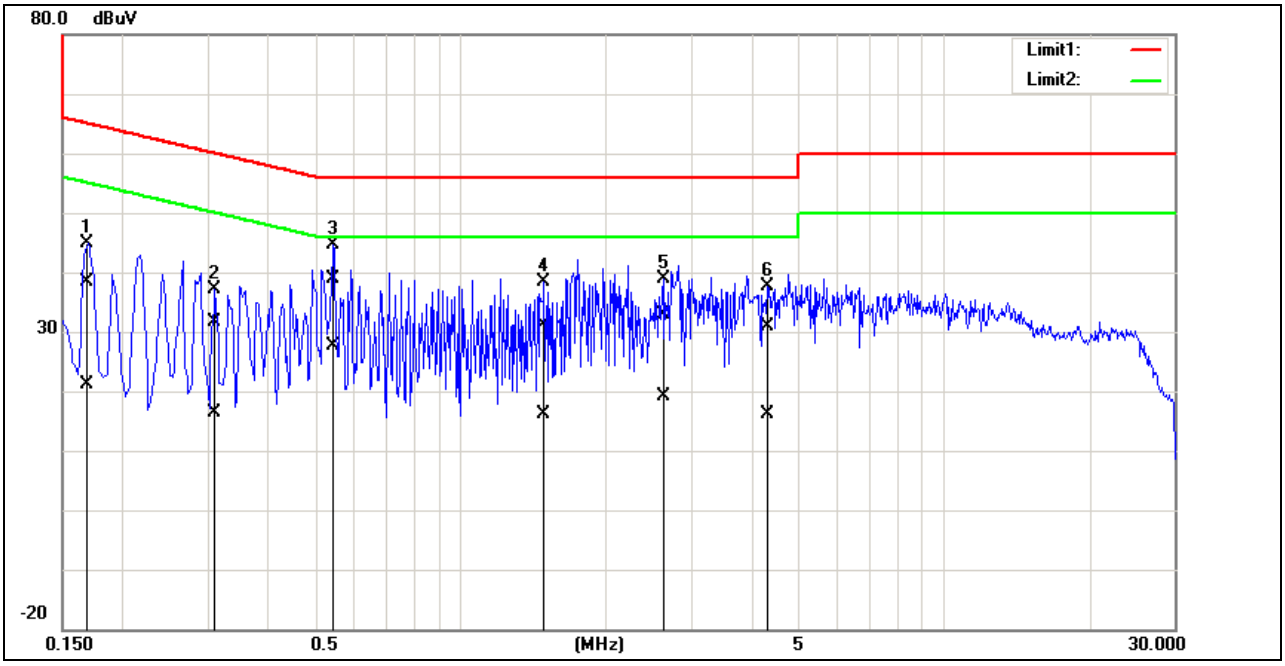
Project No.:	**TM-2305000074P**	**Date:**	**2023/11/3**
Standard:	**NCC/FCC/IC QP**	**Temp.(℃)/Hum.(%):**	**24.3(℃)/52%**
Test item:	**Conduction test**	**Test By:**	**Tony.Chao**
Line:	**N**	**Test Voltage:**	**AC 120V/60Hz**
Model:	**Mode 2**		
Description:			



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1700	38.11	20.94	0.19	38.30	21.13	64.96	54.96	-26.66	-33.83	Pass
2	0.3100	31.40	16.15	0.19	31.59	16.34	59.97	49.97	-28.38	-33.63	Pass
3*	0.5460	38.69	27.44	0.19	38.88	27.63	56.00	46.00	-17.12	-18.37	Pass
4	1.4940	31.00	15.81	0.23	31.23	16.04	56.00	46.00	-24.77	-29.96	Pass
5	2.6260	32.53	18.97	0.28	32.81	19.25	56.00	46.00	-23.19	-26.75	Pass
6	4.3260	30.47	15.93	0.31	30.78	16.24	56.00	46.00	-25.22	-29.76	Pass

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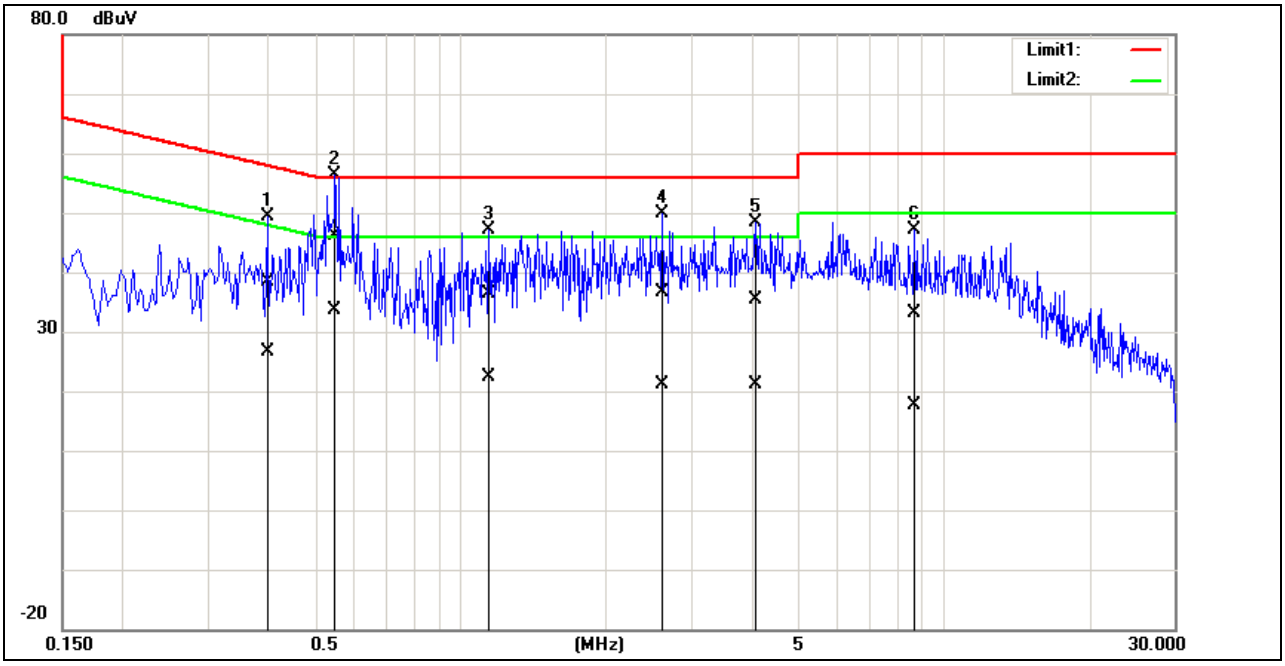
Project No.:	**TM-2305000074P**	**Date:**	**2023/11/6**
Standard:	**NCC/FCC/IC QP**	**Temp.(℃)/Hum.(%):**	**24.3(℃)/52%**
Test item:	**Conduction test**	**Test By:**	**Tony.Chao**
Line:	**L1**	**Test Voltage:**	**AC 230V/50Hz**
Model:	**Mode 2**		
Description:			



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.3980	28.19	16.34	10.19	38.38	26.53	57.90	47.90	-19.52	-21.37	Pass
2*	0.5500	35.87	23.46	10.19	46.06	33.65	56.00	46.00	-9.94	-12.35	Pass
3	1.1420	26.17	12.25	10.22	36.39	22.47	56.00	46.00	-19.61	-23.53	Pass
4	2.6180	26.24	10.77	10.29	36.53	21.06	56.00	46.00	-19.47	-24.94	Pass
5	4.0780	25.03	10.81	10.31	35.34	21.12	56.00	46.00	-20.66	-24.88	Pass
6	8.7100	22.89	7.18	10.35	33.24	17.53	60.00	50.00	-26.76	-32.47	Pass

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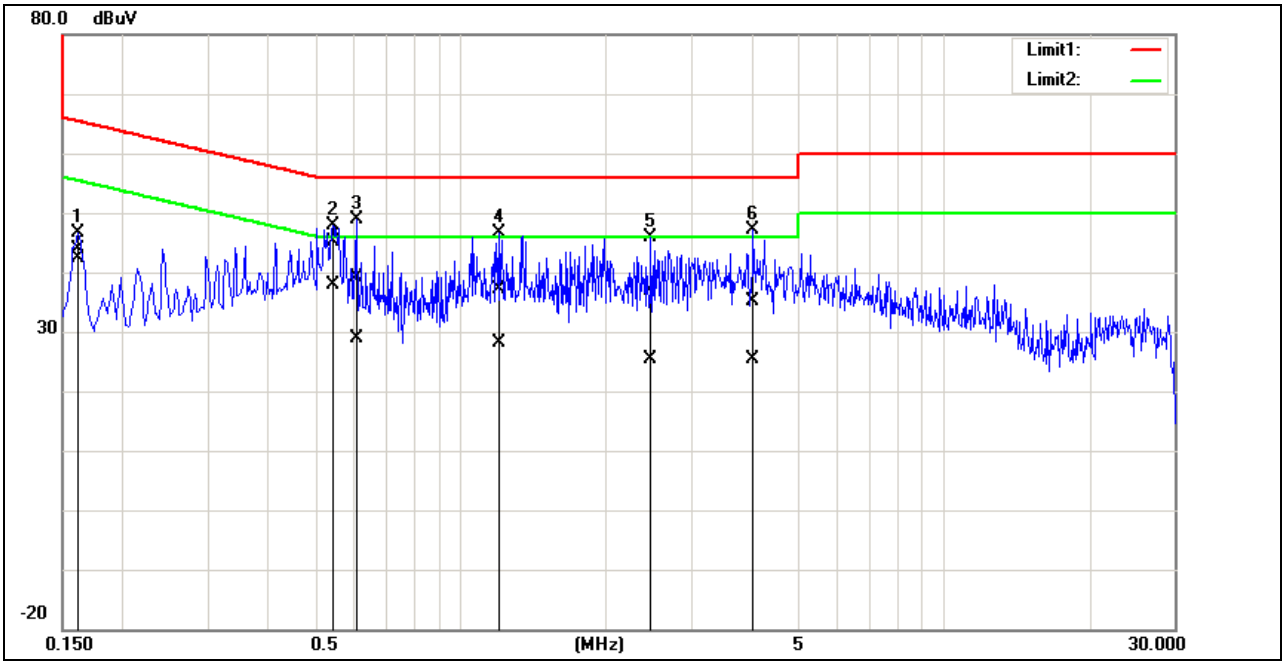
Project No.:	**TM-2305000074P**	**Date:**	**2023/11/6**
Standard:	**NCC/FCC/IC QP**	**Temp.(℃)/Hum.(%):**	**24.3(℃)/52%**
Test item:	**Conduction test**	**Test By:**	**Tony.Chao**
Line:	**N**	**Test Voltage:**	**AC 230V/50Hz**
Model:	**Mode 2**		
Description:			



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1620	33.63	32.12	10.17	43.80	42.29	65.36	55.36	-21.56	-13.07	Pass
2*	0.5460	34.97	27.74	10.18	45.15	37.92	56.00	46.00	-10.85	-8.08	Pass
3	0.6100	29.03	18.81	10.18	39.21	28.99	56.00	46.00	-16.79	-17.01	Pass
4	1.2020	27.04	17.83	10.21	37.25	28.04	56.00	46.00	-18.75	-17.96	Pass
5	2.4860	26.59	15.17	10.25	36.84	25.42	56.00	46.00	-19.16	-20.58	Pass
6	4.0380	24.91	15.03	10.29	35.20	25.32	56.00	46.00	-20.80	-20.68	Pass

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4.2 20dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.2.1 Test Limit

According to §15.247(a) (1), RSS-247 section 5.1(a) and RSS-GEN 6.7,

20 dB Bandwidth ：For reporting purposes only.

Occupied Bandwidth(99%) ：For reporting purposes only.

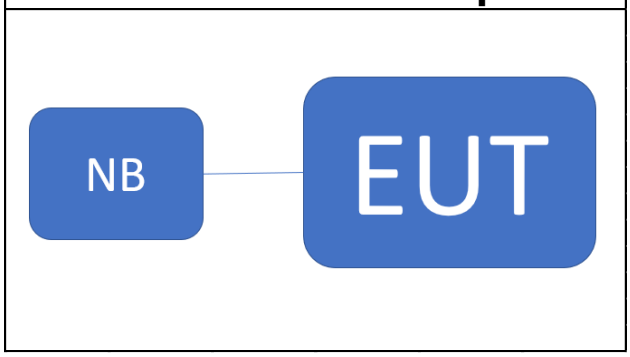
4.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 7.8.7,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 1% ~ 5% OBW, VBW ≥3*RBW and Detector = Peak, to measurement 20 dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW ≥ three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup

Conducted Setup



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4.2.4 Test Result

Temperature:	25.3℃	**Test date:**	October 12, 2023
Humidity:	59% RH	**Tested by:**	David Li

20dB BANDWIDTH

GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.9592	0.64
Mid	0.96	0.64
High	0.963	0.64

π/4-DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.281	0.85
Mid	1.282	0.85
High	1.283	0.86

8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.295	0.86
Mid	1.296	0.86
High	1.293	0.86

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BANDWIDTH 99%

GFSK

CH	99% BW (MHz)
Low	0.89838
Mid	0.89925
High	0.901

π/4-DQPSK

CH	99% BW (MHz)
Low	1.1731
Mid	1.1730
High	1.1723

8-DPSK

CH	99% BW (MHz)
Low	1.1752
Mid	1.1762
High	1.1765

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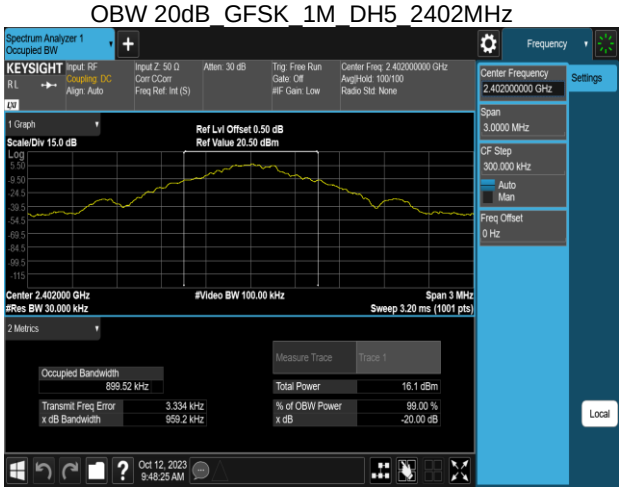
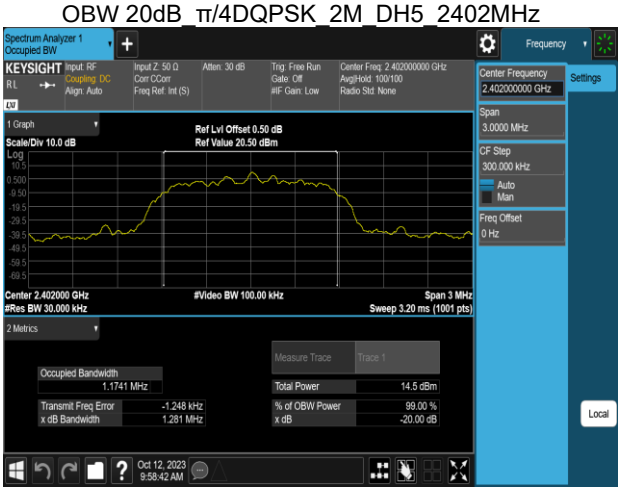
Test Data (20dB BANDWIDTH)

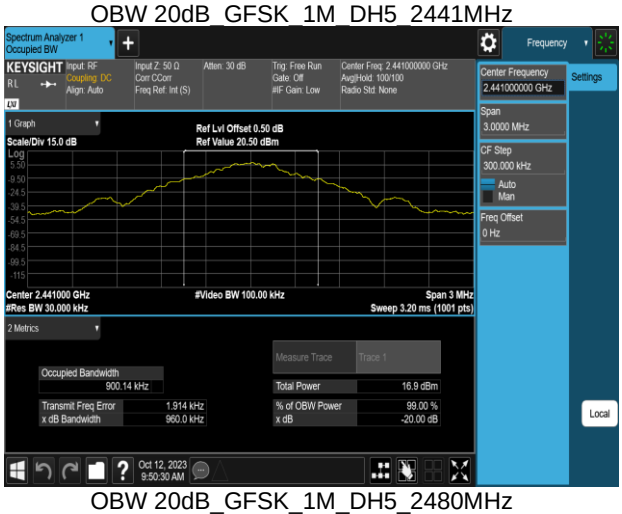
OBW 20dB_GFSK_1M_DH5_2402MHz



OBW 20dB_π/4DQPSK_2M_DH5_2402MHz

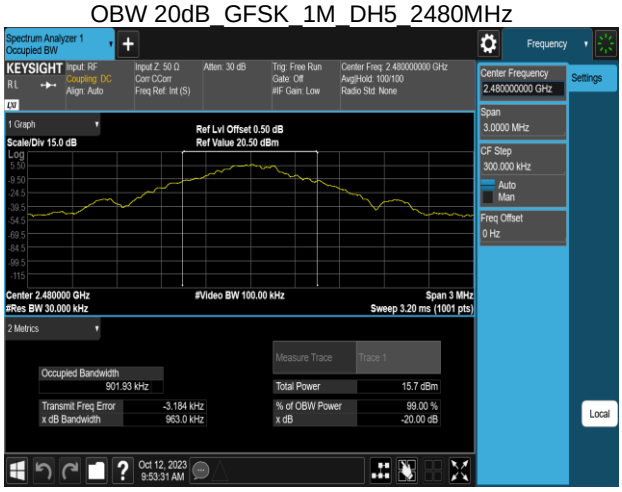


OBW 20dB_GFSK_1M_DH5_2441MHz

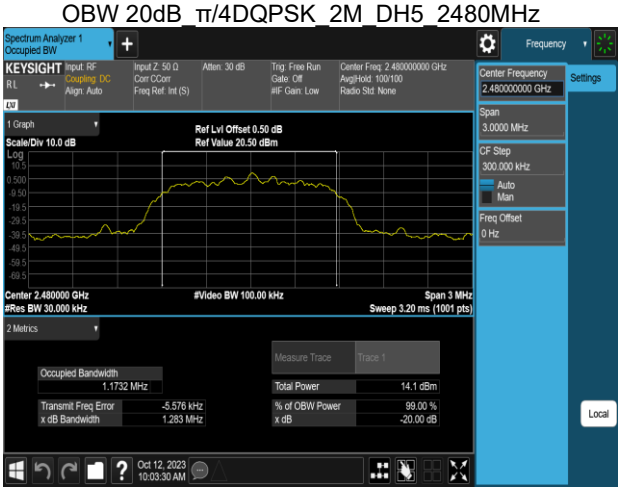


OBW 20dB_π/4DQPSK_2M_DH5_2441MHz

OBW 20dB_GFSK_1M_DH5_2480MHz



OBW 20dB_π/4DQPSK_2M_DH5_2480MHz



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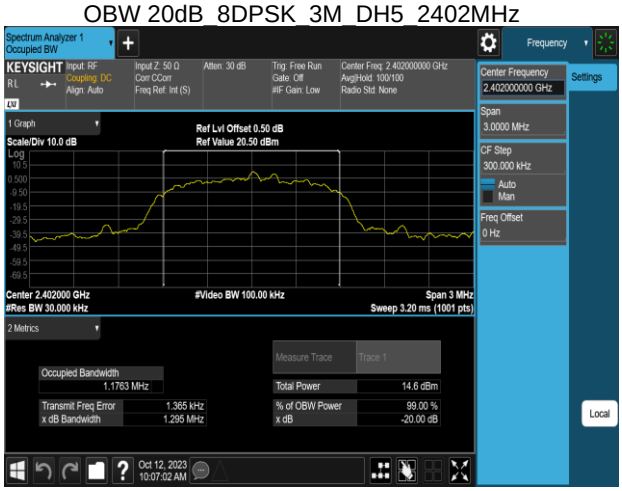
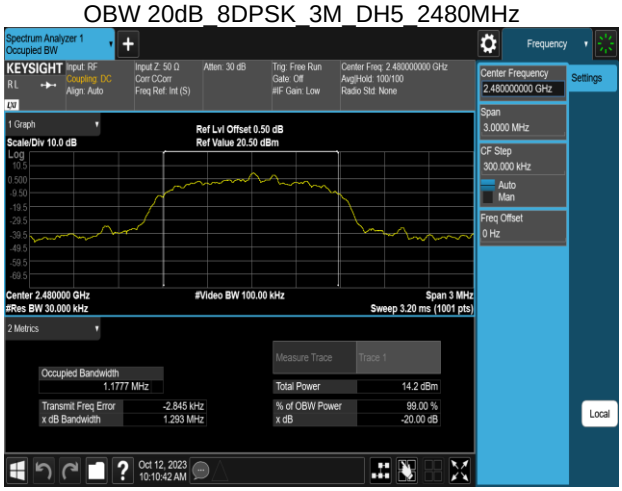
OBW 20dB_8DPSK_3M_DH5_2402MHz



OBW 20dB_8DPSK_3M_DH5_2441MHz

OBW 20dB_8DPSK_3M_DH5_2480MHz



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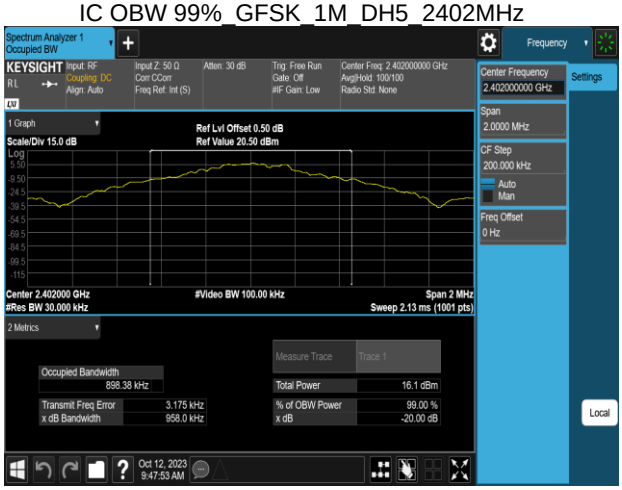
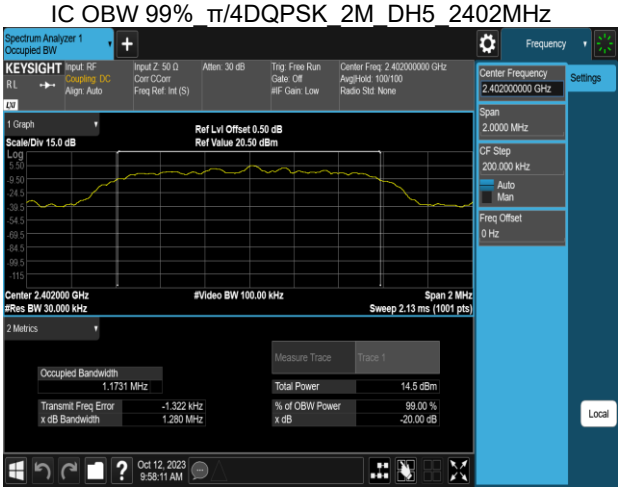
Test Data (BANDWIDTH 99%)

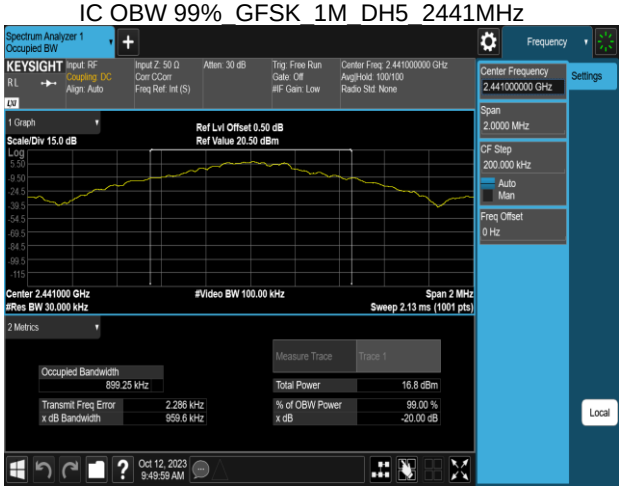
IC OBW 99%_GFSK_1M_DH5_2402MHz



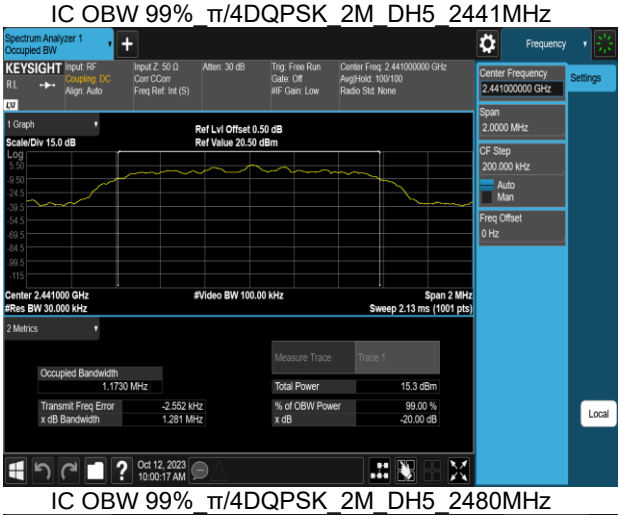
IC OBW 99%_π/4DQPSK_2M_DH5_2402MHz



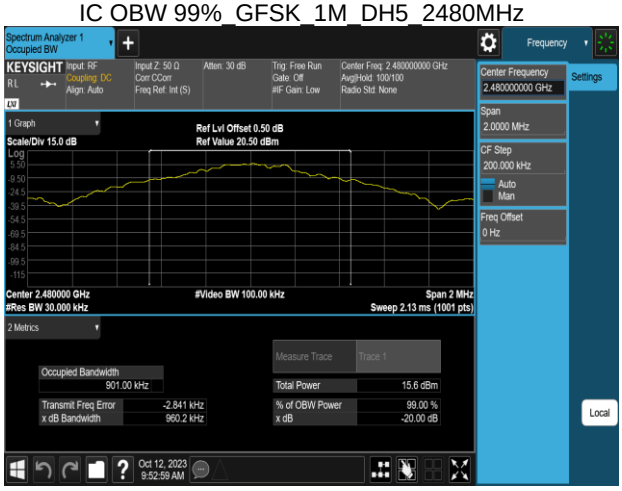
IC OBW 99%_GFSK_1M_DH5_2441MHz



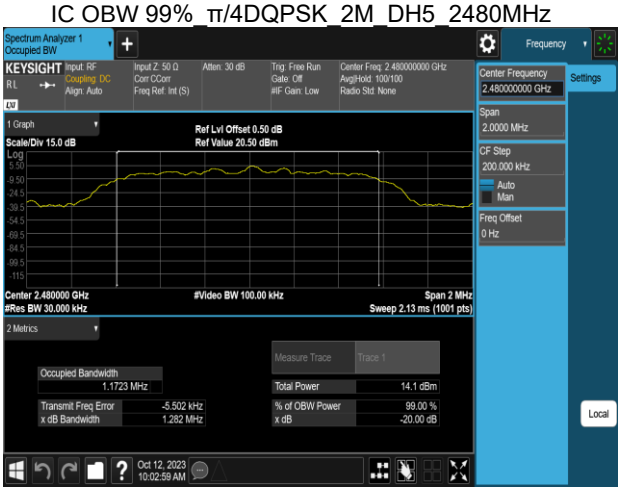
IC OBW 99%_π/4DQPSK_2M_DH5_2441MHz



IC OBW 99%_GFSK_1M_DH5_2480MHz



IC OBW 99%_π/4DQPSK_2M_DH5_2480MHz



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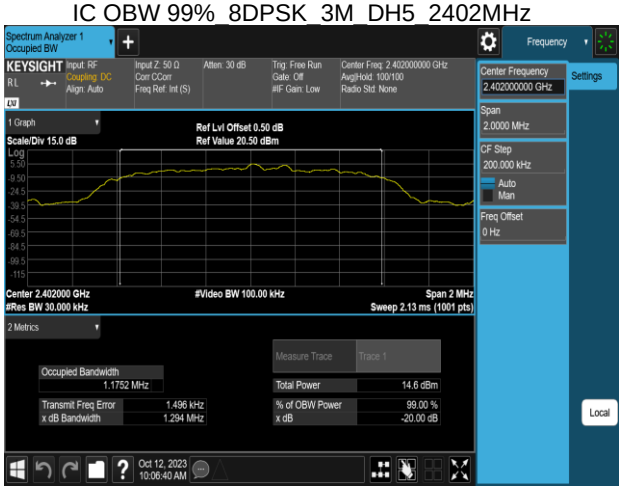
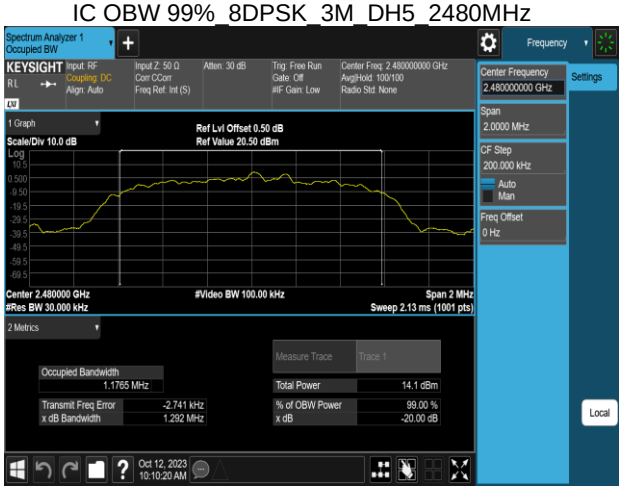
IC OBW 99%_8DPSK_3M_DH5_2402MHz



IC OBW 99%_8DPSK_3M_DH5_2441MHz

IC OBW 99%_8DPSK_3M_DH5_2480MHz



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4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(a)(1) and RSS-247 section 5.4(b)

Peak output power：

FCC

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.

IC

According to RSS-247 section 5.4(b), For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

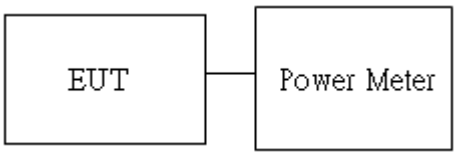
Limit	☒ Antenna not exceed 6 dBi：21dBm ☐ Antenna with DG greater than 6 dBi：21dBm [Limit = 30 – (DG – 6)]

Average output power：For reporting purposes only.

4.3.2 Test Procedure

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

4.3.3 Test Setup



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4.3.4 Test Result

Temperature: 25.3℃ **Test date:** October 12, 2023

Humidity: 59% RH **Tested by:** David Li

Peak & Average output power：

1M BR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	9	8.82	7.621	1000
Mid	2441	9	**9.22**	8.356	1000
High	2480	9	8.55	7.161	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	9	8.79	7.562	1000
Mid	2441	9	9.18	8.273	1000
High	2480	9	8.48	7.041	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	9	8.92	7.798	125
Mid	2441	9	**9.32**	8.551	125
High	2480	9	8.67	7.362	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	9	6.68	4.652	125
Mid	2441	9	7.18	5.220	125
High	2480	9	6.39	4.351	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power set	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	9	9.17	8.260	125
Mid	2441	9	**9.58**	9.078	125
High	2480	9	8.90	7.762	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power set	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	9	6.69	4.671	125
Mid	2441	9	7.19	5.241	125
High	2480	9	6.40	4.369	125

Note: Max. Output include tune up tolerance Power measured by using average detector.

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EIRP：

1M BR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	9	8.79	1.31	10.224	4000
Mid	2441	9	9.18	1.31	11.185	4000
High	2480	9	8.48	1.31	9.520	4000

2M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	9	6.68	1.31	6.290	4000
Mid	2441	9	7.18	1.31	7.057	4000
High	2480	9	6.39	1.31	5.884	4000

3M EDR mode EIRP

Channel	Frequency (MHz)	Power set	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Limit (mW)
Low	2402	9	6.69	1.31	6.315	4000
Mid	2441	9	7.19	1.31	7.086	4000
High	2480	9	6.40	1.31	5.907	4000

***Note:** EIRP = Average Power + Gain

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4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

According to §15.247(a)(1) and RSS-247 section 5.1(b)

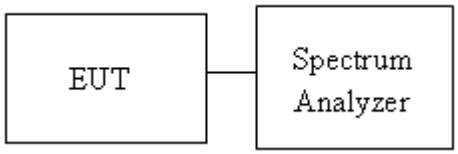
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

Limit	> two-thirds of the 20 dB bandwidth

4.4.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Sweep = auto. Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency

4.4.3 Test Setup



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4.4.4 Test Result

Temperature: 25.3℃ **Test date:** October 12, 2023

Humidity: 59% RH **Tested by:** David Li

Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz				
Channel	**Frequency (MHz)**	**Channel Separation (MHz)**	**Channel Separation Limits (MHz)**	**Result**
Low	2402	1.000	0.64	PASS
Mid	2441	1.000	0.64	PASS
High	2480	1.000	0.64	PASS

Test mode: π/4-DQPSK_2Mbps mode / 2402-2480 MHz				
Channel	**Frequency (MHz)**	**Channel Separation (MHz)**	**Channel Separation Limits (MHz)**	**Result**
Low	2402	1.000	0.85	PASS
Mid	2441	1.000	0.85	PASS
High	2480	1.000	0.86	PASS

Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	**Frequency (MHz)**	**Channel Separation (MHz)**	**Channel Separation Limits (MHz)**	**Result**
Low	2402	1.000	0.86	PASS
Mid	2441	1.000	0.86	PASS
High	2480	1.000	0.86	PASS

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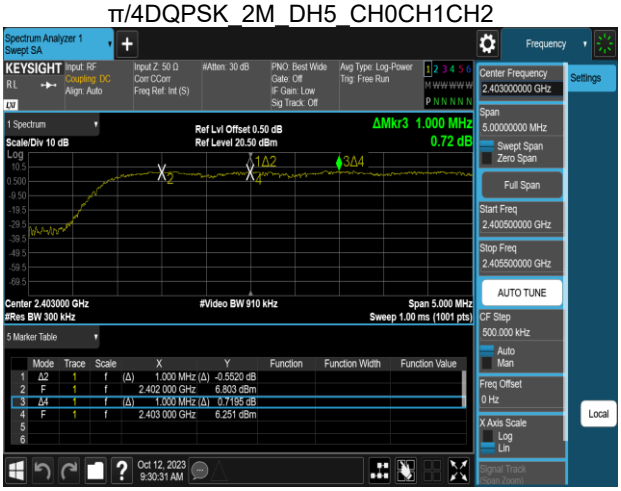
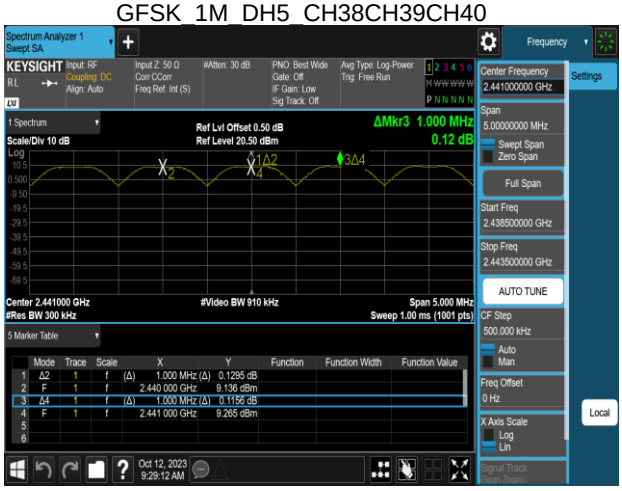
Test Data

GFSK_1M_DH5_CH0CH1CH2

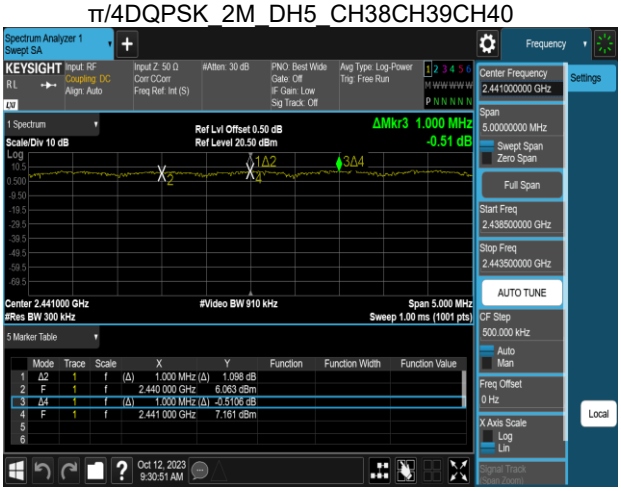
π/4DQPSK_2M_DH5_CH0CH1CH2



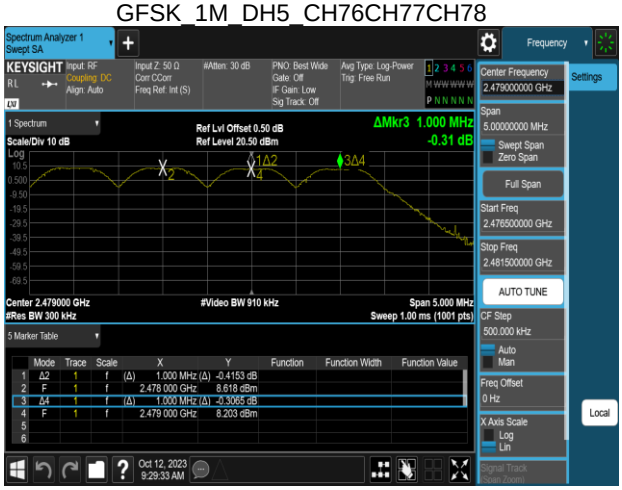
GFSK_1M_DH5_CH38CH39CH40



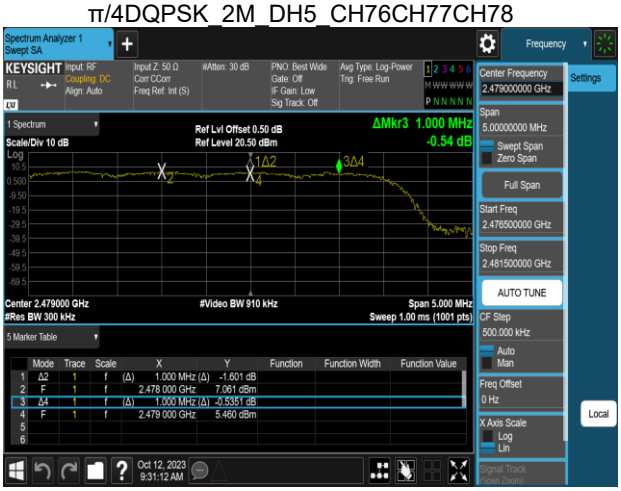
π/4DQPSK_2M_DH5_CH38CH39CH40



GFSK_1M_DH5_CH76CH77CH78



π/4DQPSK_2M_DH5_CH76CH77CH78



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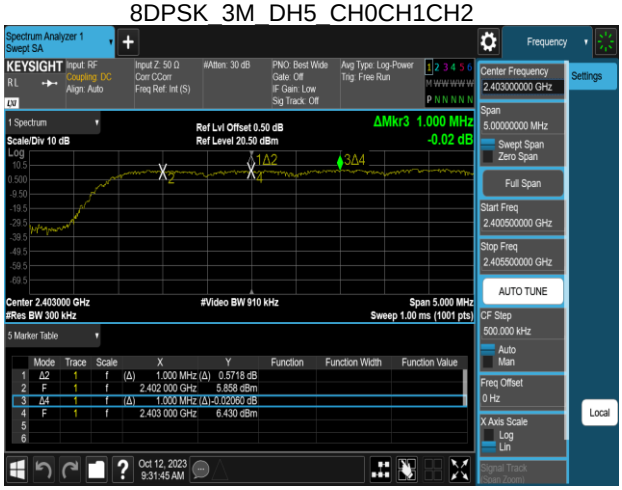
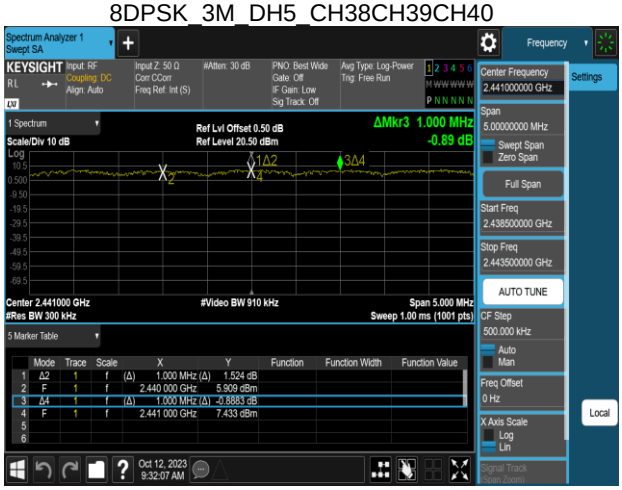
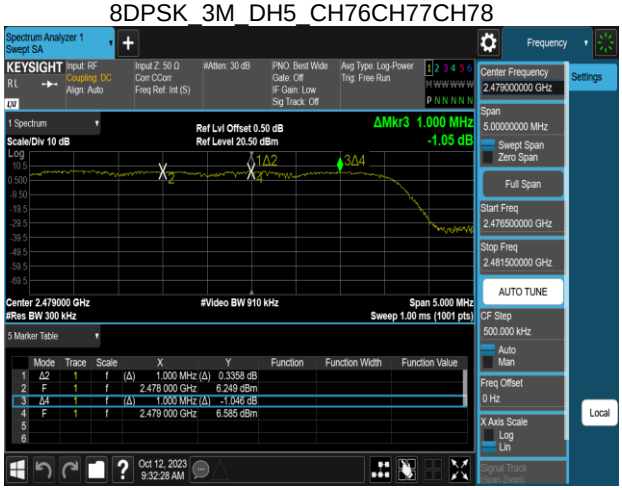
8DPSK_3M_DH5_CH0CH1CH2



8DPSK_3M_DH5_CH38CH39CH40



8DPSK_3M_DH5_CH76CH77CH78



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4.5 NUMBER OF HOPPING

4.5.1 Test Limit

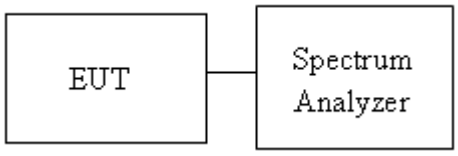
According to §15.247(a)(1)(iii) and RSS-247 section 5.1(d)

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

4.5.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 7.8.3
1. Place the EUT on the table and set it in transmitting mode.
2. EUT RF output port connected to the SA by RF cable.
3. Set spectrum analyzer Start Freq. = 2400 MHz, Stop Freq. = 2483.5 MHz, RBW =100KHz, VBW = 300KHz.
4. Max hold, view and count how many channel in the band.

4.5.3 Test Setup



4.5.4 Test Result

Temperature: 25.3℃ **Test date:** October 12, 2023

Humidity: 59% RH **Tested by:** David Li

Number of Hopping				
Mode	**Frequency (MHz)**	**Hopping Channel Number**	**Hopping Channel Number Limits**	**Result**
BDR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

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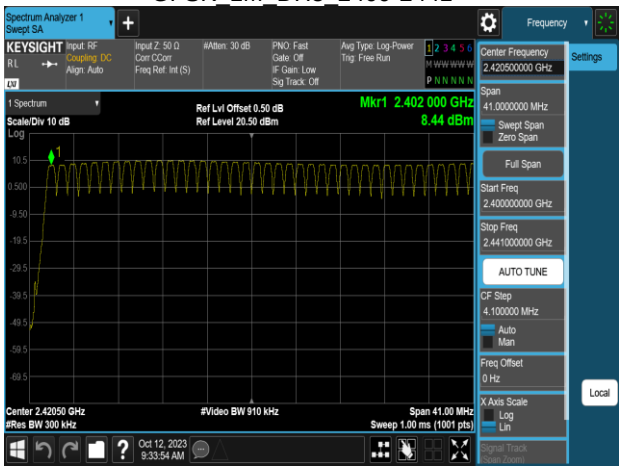
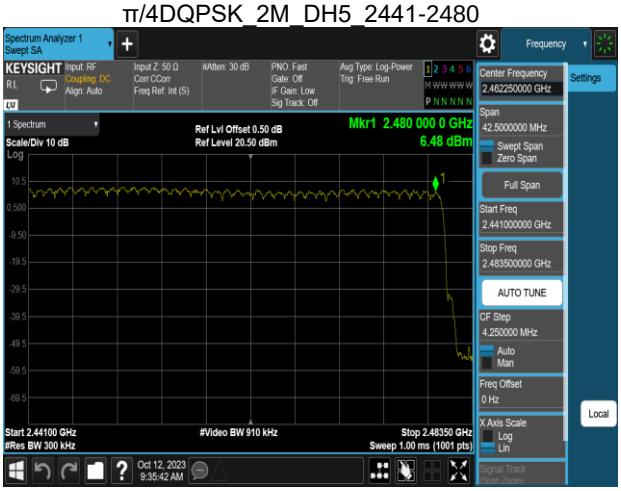
Test Data

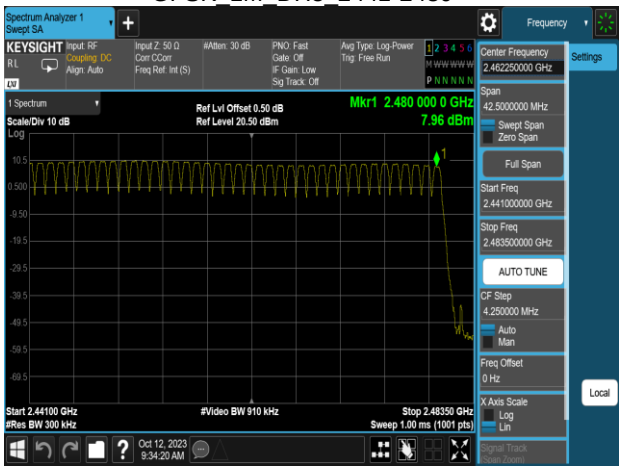
GFSK_1M_DH5_2400-2441



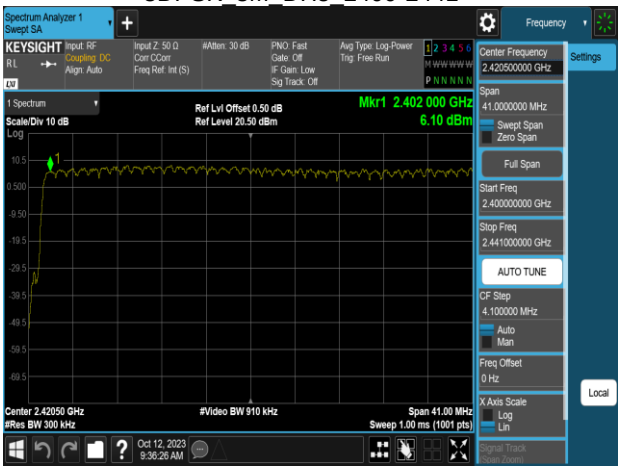
π/4DQPSK_2M_DH5_2441-2480



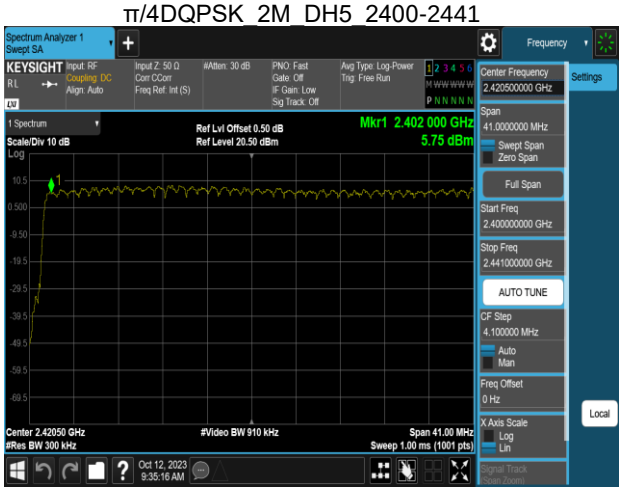
GFSK_1M_DH5_2441-2480



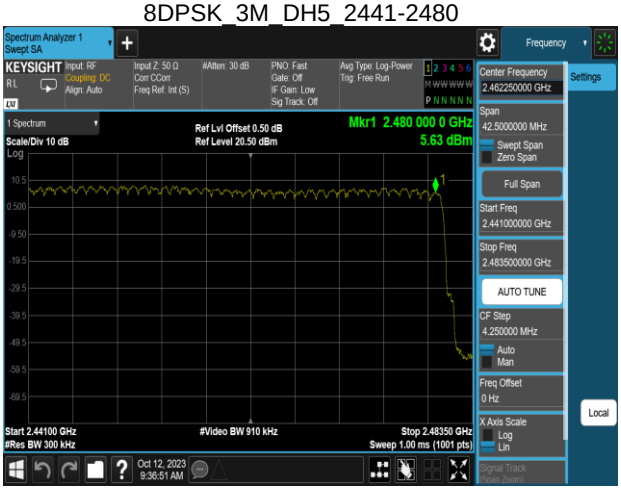
8DPSK_3M_DH5_2400-2441



π/4DQPSK_2M_DH5_2400-2441



8DPSK_3M_DH5_2441-2480



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4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

According to §15.247(d) and RSS-247 section 5.5

Limit	-20 dBc

.

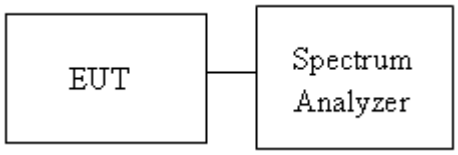
4.6.2 Test Procedure

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. The Band Edge at 2.4GHz and 2.4835GHz are investigated with both hopping “ON” and “OFF” modes “.

4.6.3 Test Setup



4.6.4 Test Result

Temperature:	25.3℃	**Test date:**	October 12, 2023
Humidity:	59% RH	**Tested by:**	David Li

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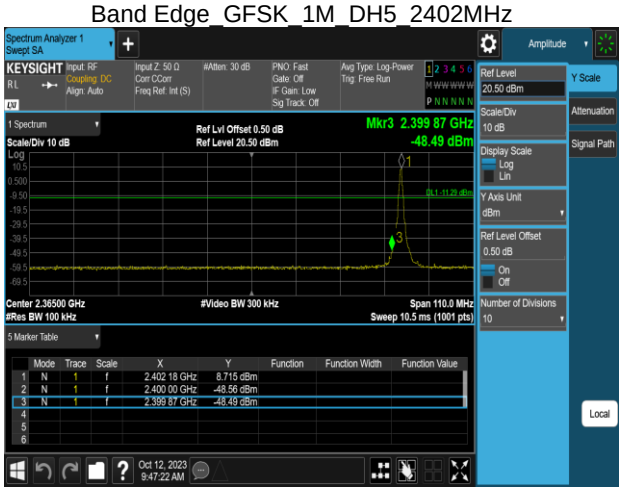
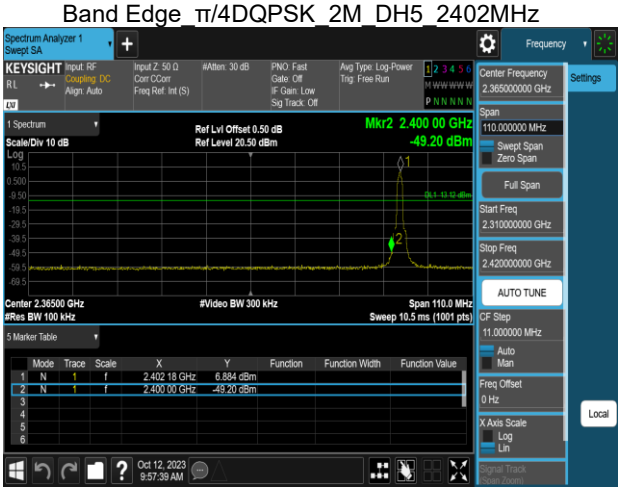
Test Data

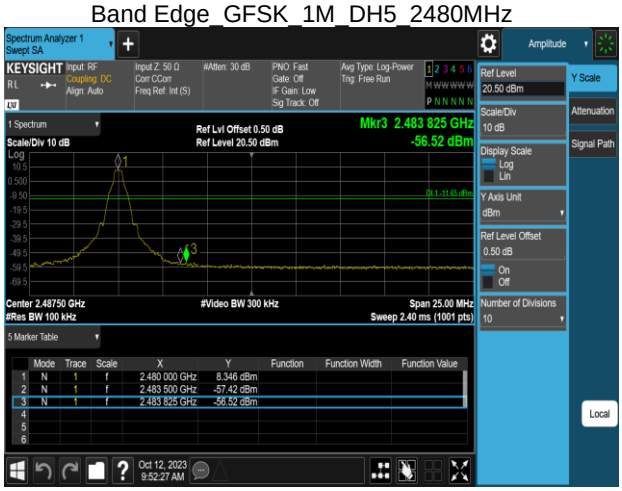
Band Edge_GFSK_1M_DH5_2402MHz



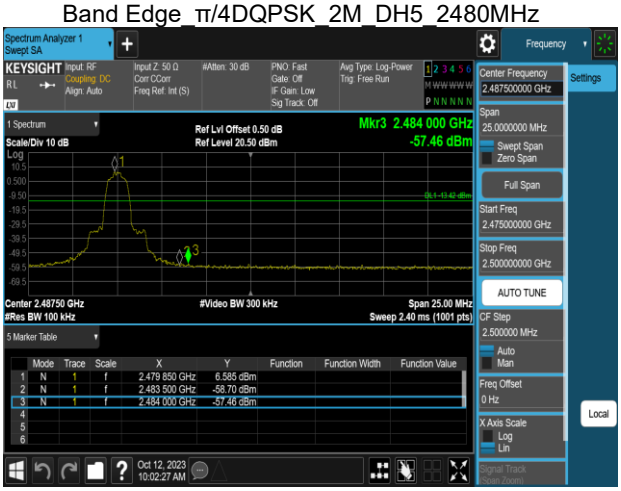
Band Edge_π/4DQPSK_2M_DH5_2402MHz



Band Edge_GFSK_1M_DH5_2480MHz



Band Edge_π/4DQPSK_2M_DH5_2480MHz



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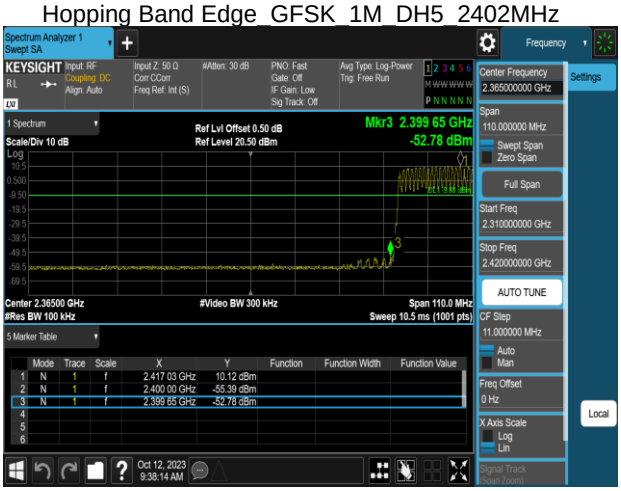
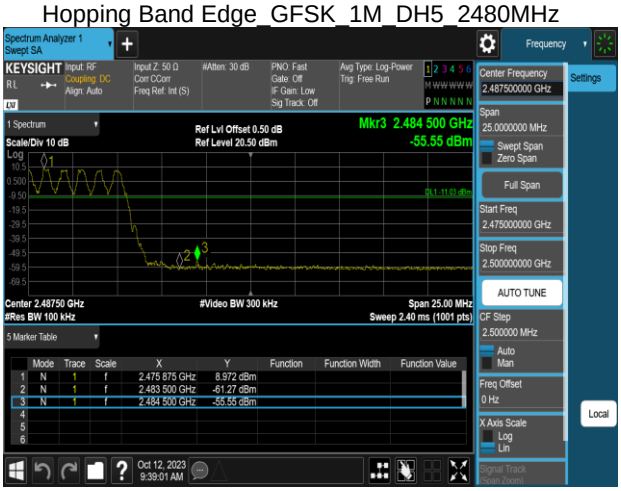
Band Edge_8DPSK_3M_DH5_2402MHz

Hopping Band Edge_GFSK_1M_DH5_2402MHz



Band Edge_8DPSK_3M_DH5_2480MHz

Hopping Band Edge_GFSK_1M_DH5_2480MHz



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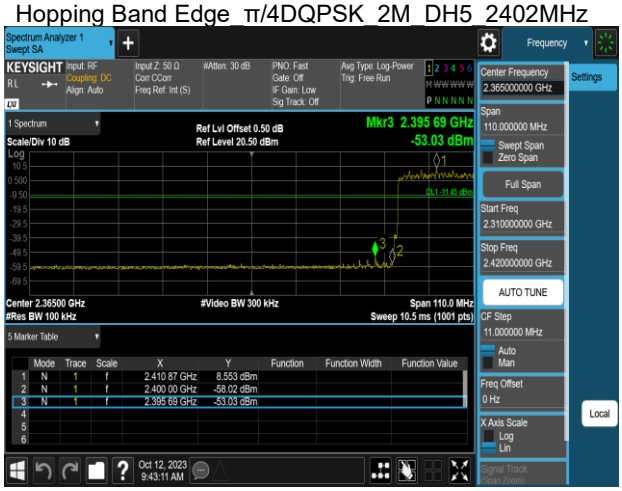
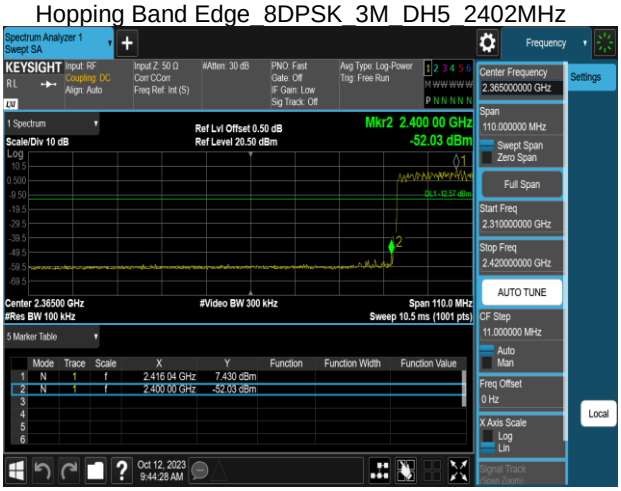
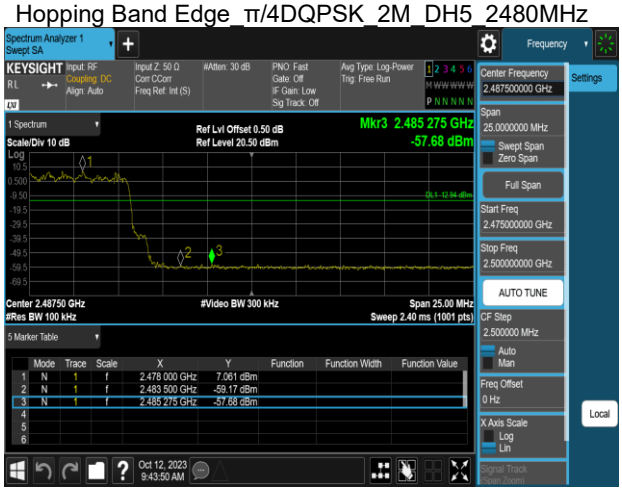
Hopping Band Edge_π/4DQPSK_2M_DH5_2402MHz



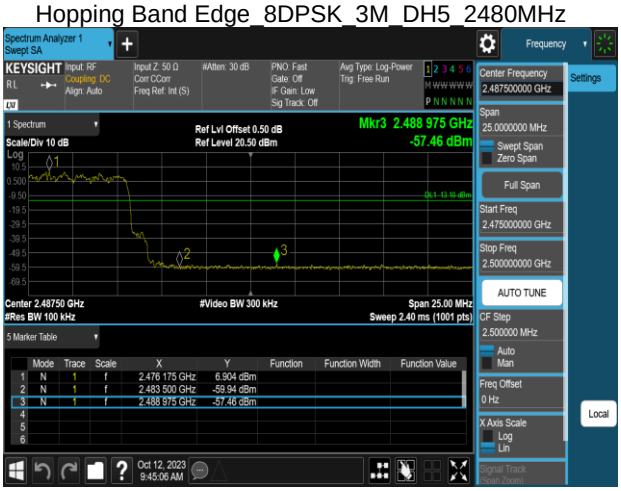
Hopping Band Edge_8DPSK_3M_DH5_2402MHz



Hopping Band Edge_π/4DQPSK_2M_DH5_2480MHz



Hopping Band Edge_8DPSK_3M_DH5_2480MHz



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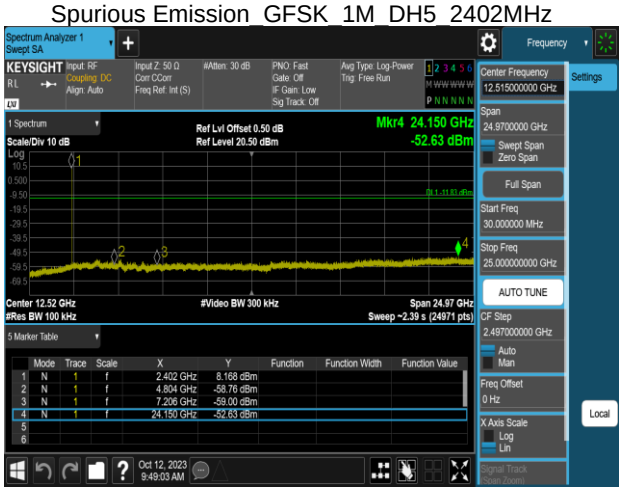
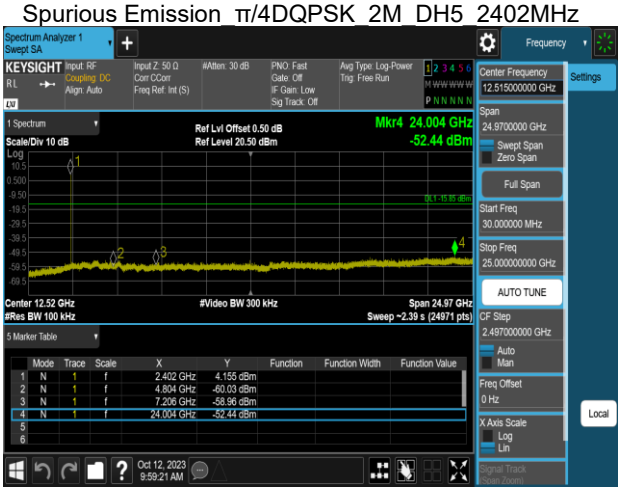
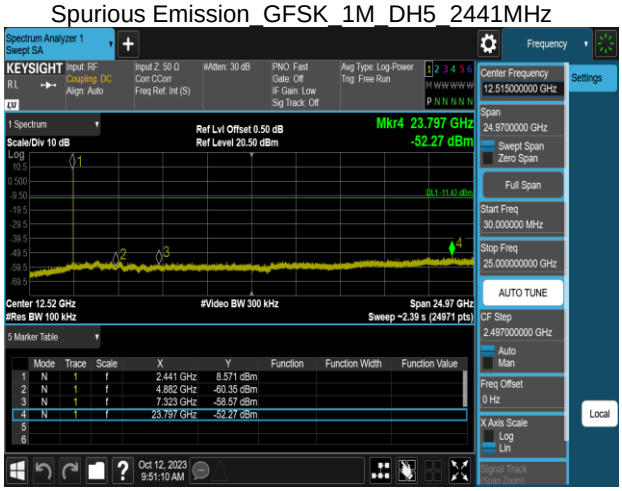
Spurious Emission_GFSK_1M_DH5_2402MHz



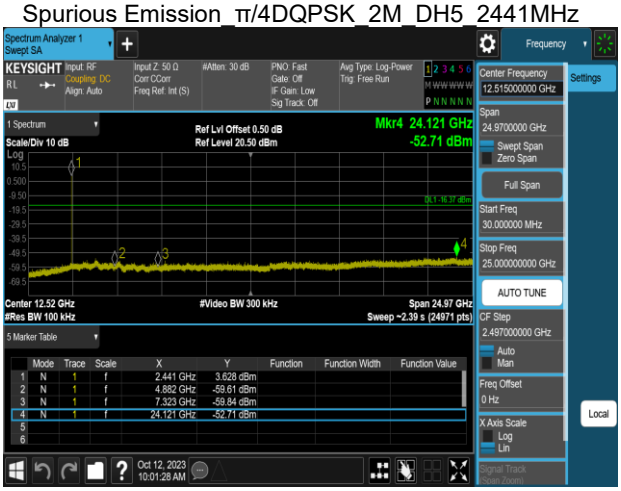
Spurious Emission_π/4DQPSK_2M_DH5_2402MHz



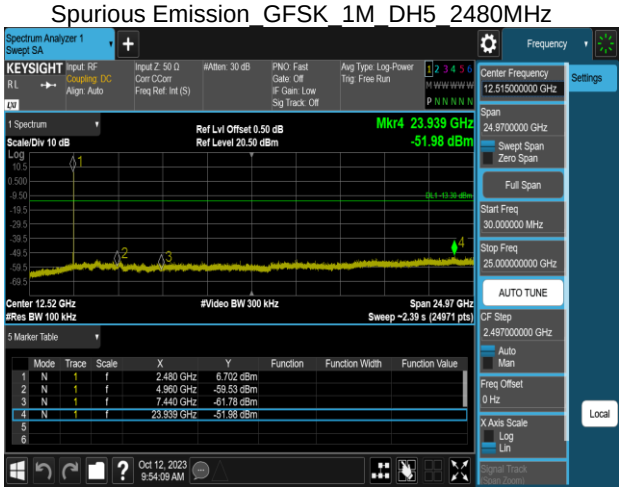
Spurious Emission_GFSK_1M_DH5_2441MHz



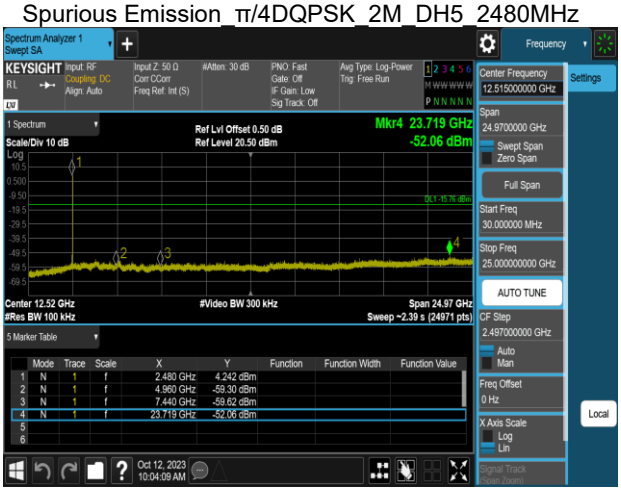
Spurious Emission_π/4DQPSK_2M_DH5_2441MHz



Spurious Emission_GFSK_1M_DH5_2480MHz



Spurious Emission_π/4DQPSK_2M_DH5_2480MHz



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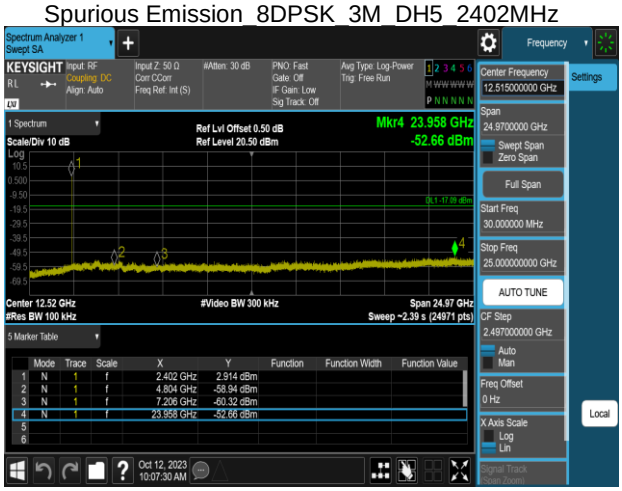
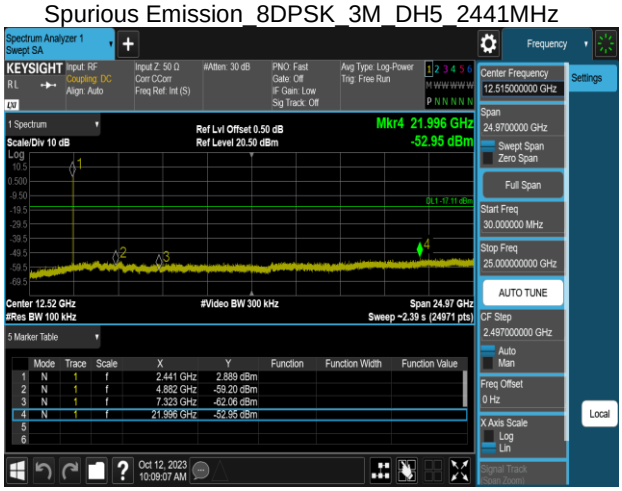
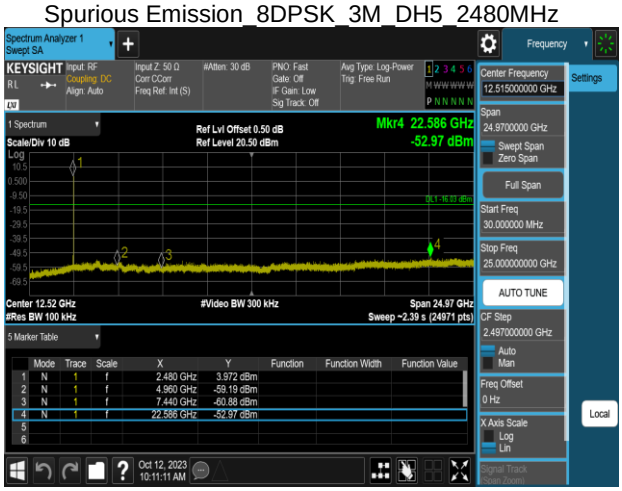
Spurious Emission_8DPSK_3M_DH5_2402MHz



Spurious Emission_8DPSK_3M_DH5_2441MHz



Spurious Emission_8DPSK_3M_DH5_2480MHz



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