

Project No: TM-2404000058P
Report No.: TMWK2404001090KR

FCC ID: 2AUXK-F7MU820H

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RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.247
Product name	METER CONTROL UNIT ASSY
Brand Name	YAMAHA
Model No.	F7M-U820H
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:

Sehni, Hu

Sehni Hu
Supervisor

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.
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	May 23, 2024	Initial Issue	ALL	Peggy Tsai

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	CHAO LONG MOTOR PARTS CORP. No.10, Lane 151, Sec.2, Guangming Rd., Luzhu Dist., Taoyuan City, 33848, Taiwan.
Manufacturer	CHAO LONG MOTOR PARTS CORP. No.10, Lane 151, Sec.2, Guangming Rd., Luzhu Dist., Taoyuan City 338, Taiwan, R.O.C.
Equipment	METER CONTROL UNIT ASSY
Model	F7M-U820H
Model Discrepancy	N/A
Brand Name	YAMAHA
Received Date	April 8, 2024
Date of Test	April 12 ~May 2, 2024
Power Supply	Power from DC Power Supply. (DC 9~16V, typical: 14V)
PMN	F7M-U820H
EUT Serial #	F7M-U320H-00
HW Version	V1.2
SW Version	4.9.6

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.

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

The Rx input bandwidths shift frequencies in synchronization with the transmitted signals.

In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in standard when the transmitter is presented with a continuous data (or information) system.

In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

1.3 EUT CHANNEL INFORMATION

Frequency Range	2402MHz-2480MHz
Modulation Type	1. GFSK for BDR-1Mbps 2. $\pi/4$ -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 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 ☐ Chip
Antenna Gain	Gain: 2 dBi
Antenna Connector	N/A

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.

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	± 3.761 dB
Radiated Emission_30MHz-200MHz	± 3.473 dB
Radiated Emission_200MHz-1GHz	± 3.946 dB
Radiated Emission_1GHz-6GHz	± 4.797 dB
Radiated Emission_6GHz-18GHz	± 4.803 dB
Radiated Emission_18GHz-26GHz	± 3.459 dB
Radiated Emission_26GHz-40GHz	± 3.297 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.

1.6 FACILITIES AND TEST LOCATION

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

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

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	-	Not applicable, because EUT not connect to AC Main Source direct.
Radiation	Tony Chao 、Ray Li	-
RF Conducted	Marco Chan	-

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

1.7 INSTRUMENT CALIBRATION

Conducted_FCC/IC/NCC (All)					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Sensor	Anritsu	MA2411B	1911387	2023-07-25	2024-07-24
Power Meter	Anritsu	ML2496A	2136002	2023-11-16	2024-11-15
EXA Signal Analyzer	Keysight	N9030B	MY62291089	2023-10-13	2024-10-12
Software	Radio Test Software Ver. 21				

966A_Radiated					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Signal Analyzer	KEYSIGHT	N9010A	MY54200716	2023-10-13	2024-10-12
Thermo-Hygro Meter	WISEWIND	1206	D07	2023-12-08	2024-12-07
Loop Antenna	COM-POWER	AL-130	121051	2023-05-23	2024-05-22
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2023-08-08	2024-08-07
Preamplifier	EMEC	EM330	060609	2024-02-21	2025-02-20
Cable	Huber+Suhner	104PEA	20995+21000+182330	2024-02-21	2025-02-20
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-12-28	2024-12-27
Preamplifier	HP	8449B	3008A00965	2023-12-22	2024-12-21
Cable	EMCI	EMC101G	221213+221011+221012	2023-10-17	2024-10-16
Attenuator	Mini-Circuits	BW-S9W5	BWS9W5-09-966A-01	2024-02-07	2025-02-06
High Pass Filters	Titan Microwave	T04H30001800070S01	22011402-4	2023-06-17	2024-06-16
Horn Antenna	SCHWARZBECK	BBHA9170	1047	2023-12-13	2024-12-12
DC Power Source	GWINSTEK	SPS-3610	GPE880163	2023-10-02	2024-10-01
Pre-Amplifier	EMCI	EMC184045SE	980860	2023-12-12	2024-12-11
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
Site Validation	CCS	966A	N/A	2023-07-10	2024-07-09
Software	e3 V9-210616c				

Remark:

- Each piece of equipment is scheduled for calibration once a year.
- N.C.R. = No Calibration Required.

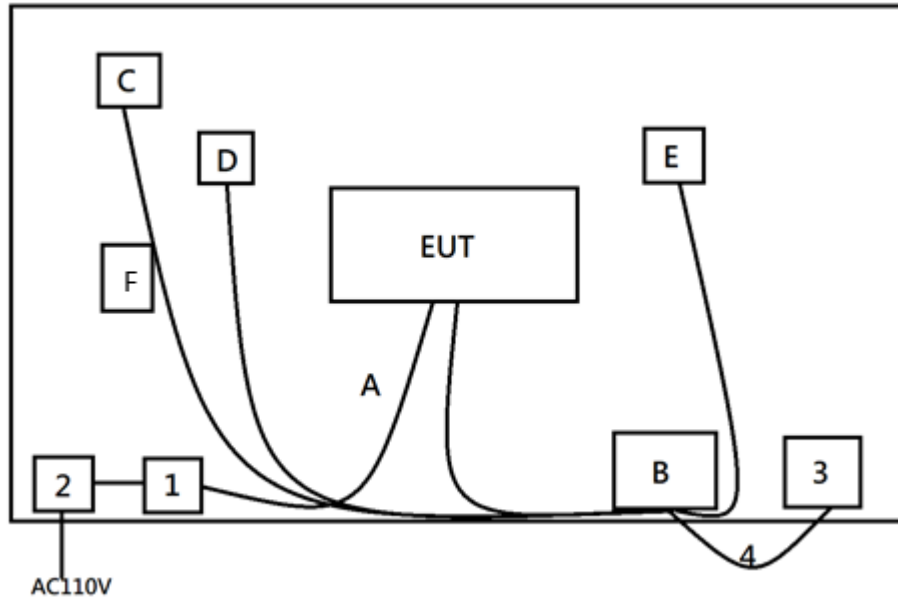
1.8 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment						
No.	Equipment	Brand	Model	Series No.	FCC ID	IC
	N/A					

Support Equipment (Conducted)						
No.	Equipment	Brand	Model	Series No.	FCC ID	
1	NB(B)	Lenovo	T470	N/A	N/A	

Support Equipment (RSE)						
No.	Equipment	Brand	Model	Series No.	FCC ID	
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A	
2	Adapter	Lenovo	ADLX45DLC3A	N/A	N/A	
3	DC Power Source	GWINSTEK	SPS-3610	GPE880163	N/A	
4	DC PowerCable	MISUMI	MCR3S-RE	N/A	N/A	
A	USB Cable	Chaolong	USB to 1.27mm	N/A	N/A	
B	Test Box	Chaolong	Test Fixture	N/A	N/A	
C	Display	Chaolong	F7M-U820J-00-00	N/A	N/A	
D	CAR Charger(DC 12V)	TOYO JIANN TSANG ELECTRIC CO., LTD	F7M-H254B-00-00	N/A	N/A	
E	CAR Charger(DC 5V)	Chaolong	F7M-H21E1-00-00	N/A	N/A	
F	Display Cable	Rosenberger	F7M-U823K-00-00	N/A	N/A	

1.9 TEST SET UP DIAGRAM



1.10 TEST PROGRAM

The EUT connection corresponds to the surrounding fixture control board. This EUT uses "BlueSuite v.3.2.3.29" software to set the frequency, modulation, and power to allow the sample to continuously transmit (including frequency hopping mode).

1.11 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 558074.

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	N/A
15.247(a)(1)	4.2	20 dB Bandwidth	Pass
-	4.2	Occupied Bandwidth (99%)	Pass
15.247(b)(1)	4.3	Output Power Measurement	Pass
15.247(a)(1)	4.4	Frequency Separation	Pass
15.247(a)(1)(iii)	4.5	Number of Hopping	Pass
15.247(d)	4.6	Conducted Band Edge	Pass
15.247(d)	4.6	Conducted Spurious Emission	Pass
15.247(a)(1)(iii)	4.7	Time of Occupancy	Pass
15.247(d) 15.205, 15.209	4.8	Radiation Band Edge	Pass
15.247(d) 15.205, 15.209	4.8	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	GFSK for BDR-1Mbps (DH5) $\pi/4$ -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 $\pi/4$-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.
- 2.The system support GFSK , $\pi/4$ DQPSK ,8DPSK , the $\pi/4$ DQPSK were reduced since the identical parameters with 8dpsk. In the following test items, frequency hopping, radiated band edge and spurious emissions.

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 DC Power Supply(14V)
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 DC Power Supply(14V) Mode 2: EUT power by DC Power Supply(9V) Mode 3: EUT power by DC Power Supply(16V)
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



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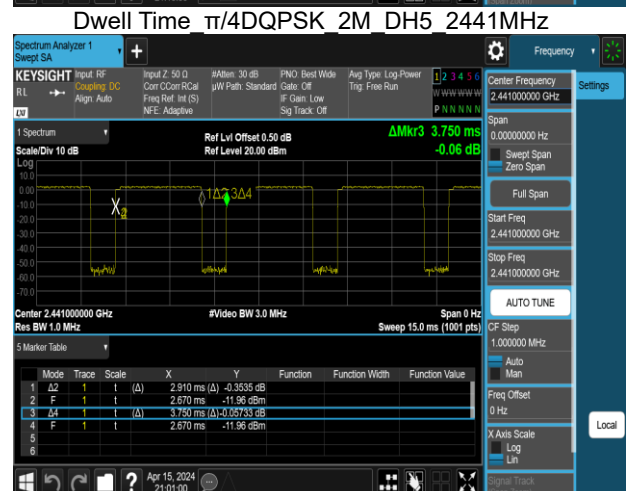
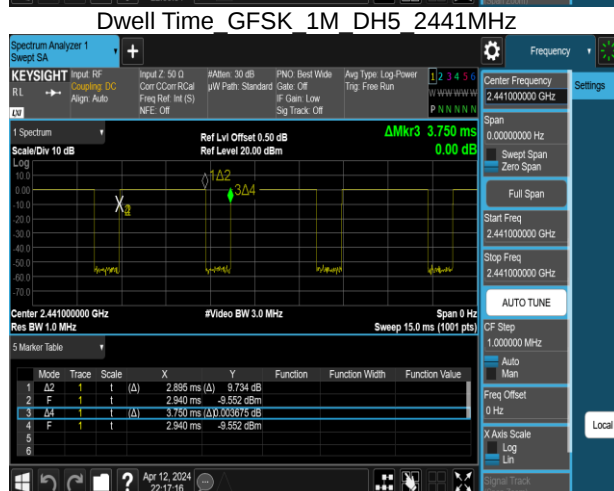
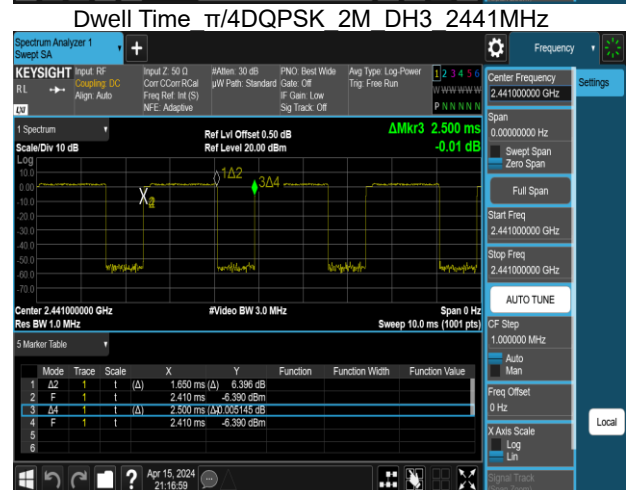
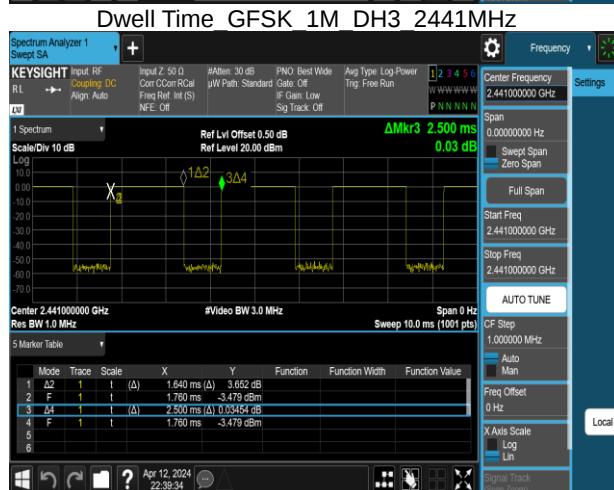
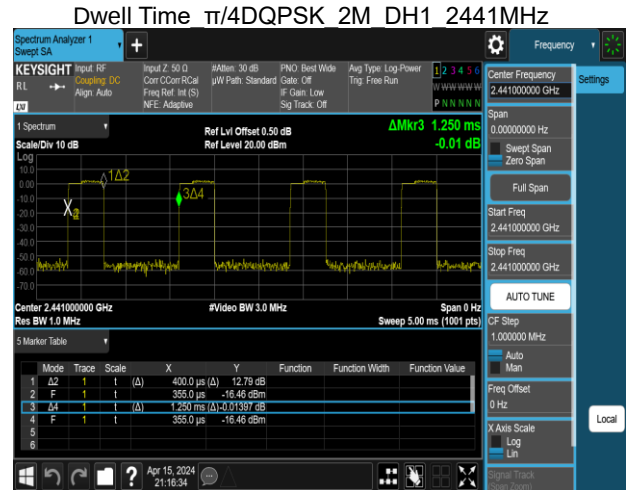
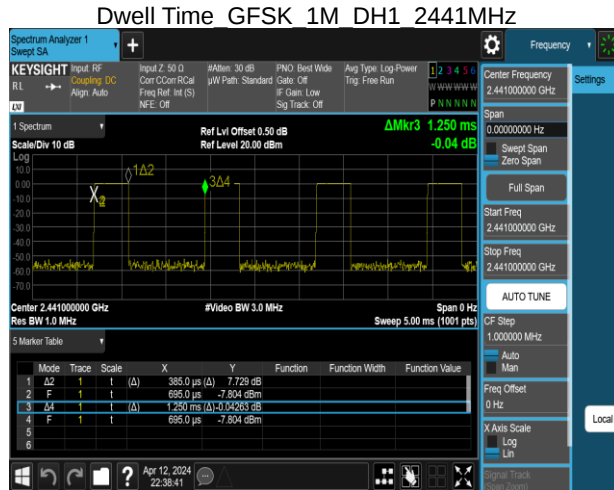
3.3 EUT DUTY CYCLE

Temperature: 22.1 ~ 23.9°C
Humidity: 55 ~ 56% RH

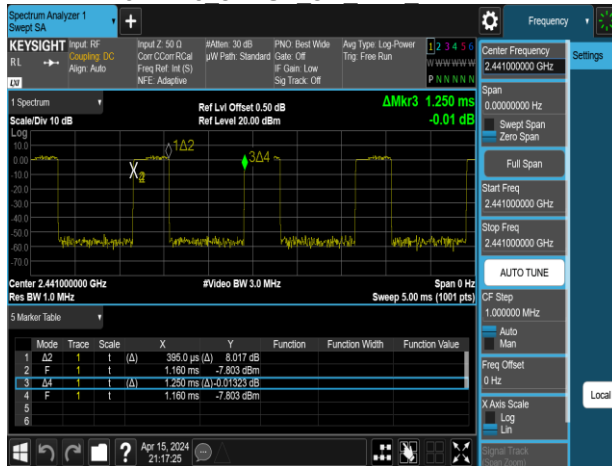
Test date: April 12 ~ 15, 2024
Tested by: Marco Chan

	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	77.20	1.12	0.35	1.00
2DH1	32.00	4.95	2.50	3.00
2DH3	66.00	1.80	0.61	1.00
2DH5	77.60	1.10	0.34	1.00
3DH1	31.60	5.00	2.53	3.00
3DH3	65.60	1.83	0.61	1.00
3DH5	77.20	1.12	0.35	1.00

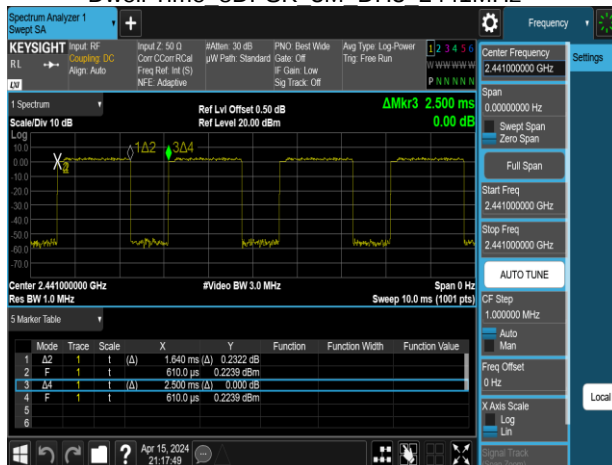
Report No.: TMWK2404001090KR



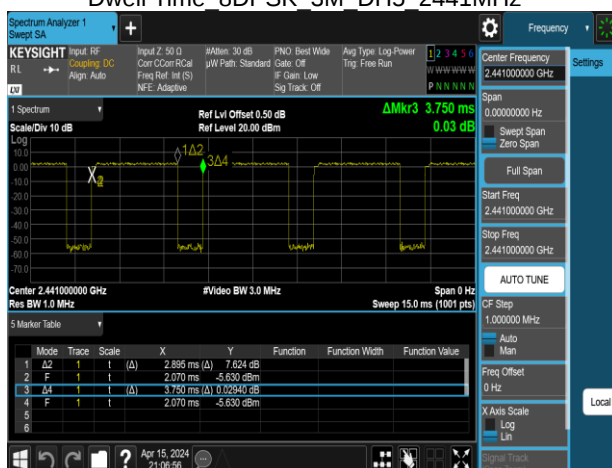
Dwell Time 8DPSK 3M DH1 2441MHz



Dwell Time 8DPSK 3M DH3 2441MHz



Dwell Time 8DPSK 3M DH5 2441MHz



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

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

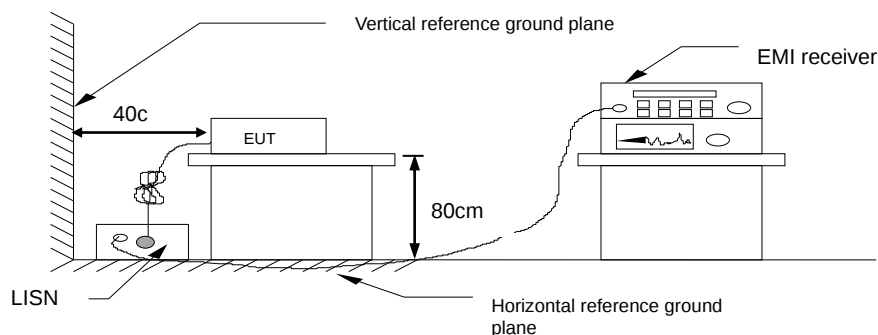
* Decreases with the logarithm of the frequency.

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

Not applicable, because EUT not connect to AC Main Source direct.

4.2 20dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.2.1 Test Limit

According to §15.247(a) (1),

20 dB Bandwidth : For reporting purposes only.

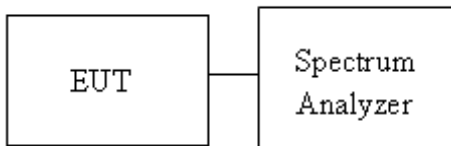
Occupied Bandwidth(99%) : For reporting purposes only.

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 = 30kHz, VBW = 100kHz and Detector = Peak, to measurement 20 dB Bandwidth and 99% Bandwidth.
4. Measure and record the result of 20 dB Bandwidth and 99% Bandwidth. in the test report.

4.2.3 Test Setup



4.2.4 Test Result

Temperature: 22.1 ~ 23.9°C

Test date: April 12 ~ 15, 2024

Humidity: 55 ~ 56% RH

Tested by: Marco Chan

20dB BANDWIDTH

GFSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	0.9565	0.64
Mid	0.9561	0.64
High	0.9554	0.64

$\pi/4$ -DQPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.338	0.89
Mid	1.337	0.89
High	1.341	0.89

8-DPSK

CH	20 dB BW (MHz)	2/3 BW (MHz)
Low	1.303	0.87
Mid	1.303	0.87
High	1.303	0.87

BANDWIDTH 99%

GFSK

CH	99% BW (MHz)
Low	0.86906
Mid	0.86798
High	0.86571

$\pi/4$ -DQPSK

CH	99% BW (MHz)
Low	1.1923
Mid	1.1930
High	1.1940

8-DPSK

CH	99% BW (MHz)
Low	1.1814
Mid	1.1797
High	1.1805

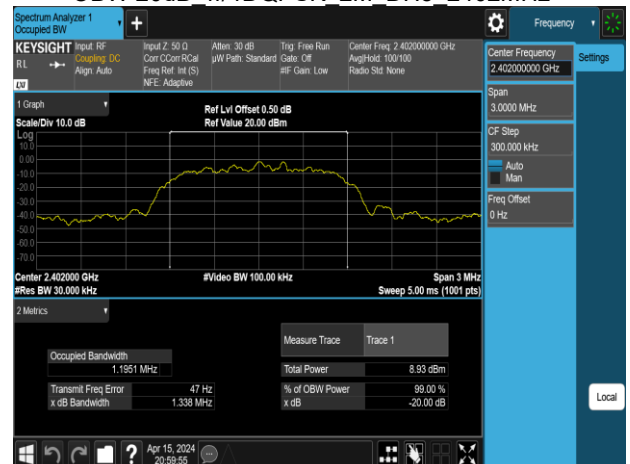
Test Data

20dB BANDWIDTH

OBW 20dB GFSK 1M DH5 2402MHz



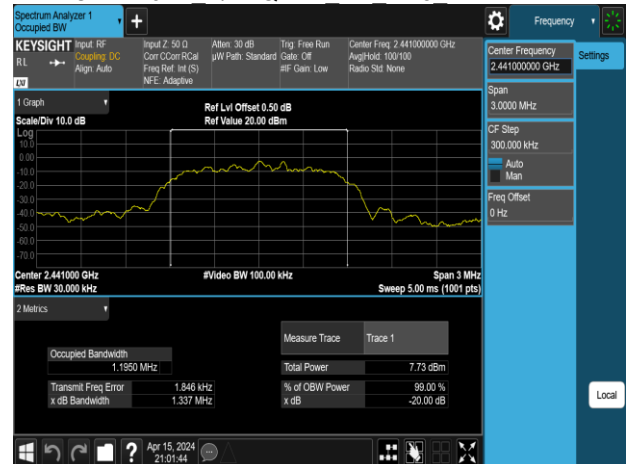
OBW 20dB $\pi/4$ DQPSK 2M DH5 2402MHz



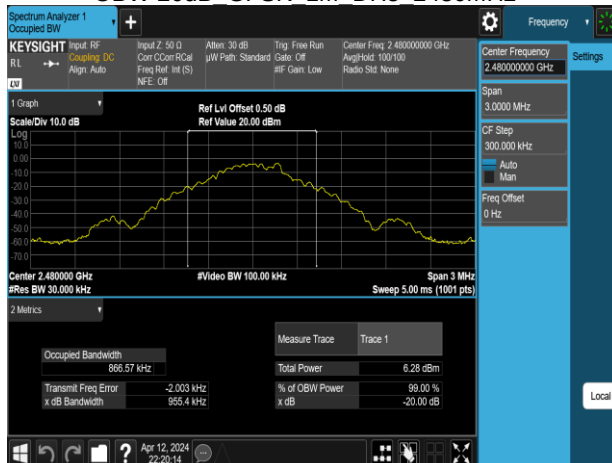
OBW 20dB GFSK 1M DH5 2441MHz



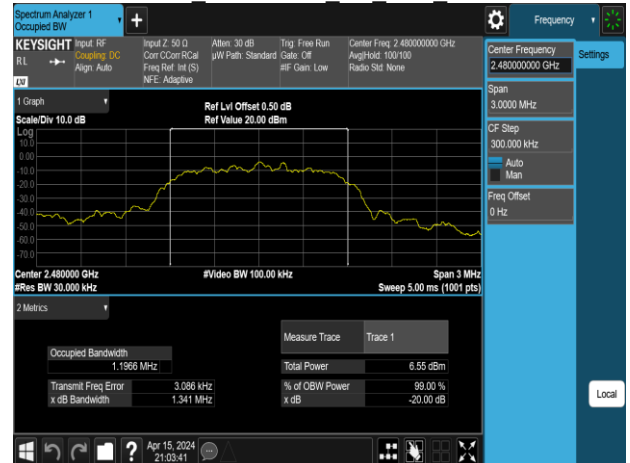
OBW 20dB $\pi/4$ DQPSK 2M DH5 2441MHz



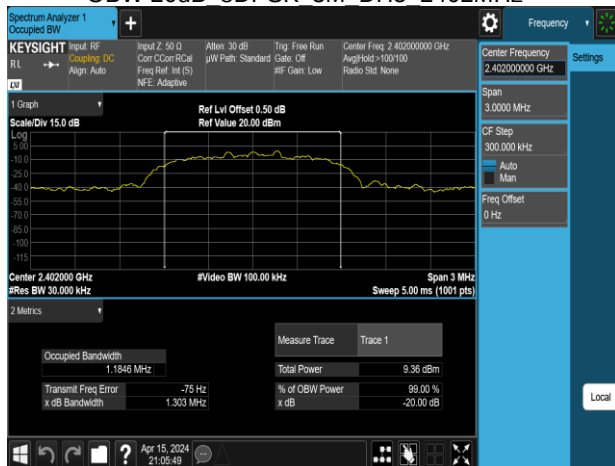
OBW 20dB GFSK 1M DH5 2480MHz



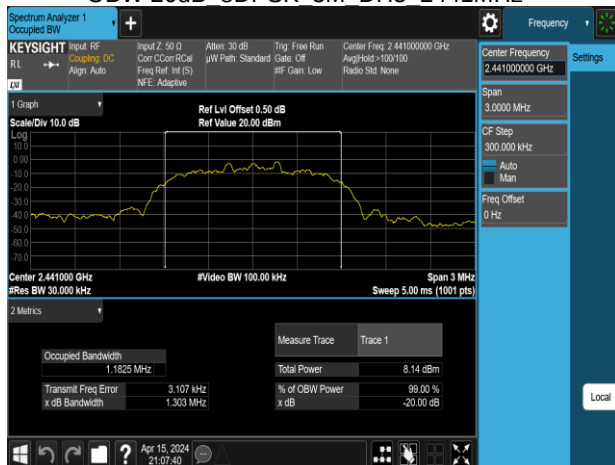
OBW 20dB $\pi/4$ DQPSK 2M DH5 2480MHz



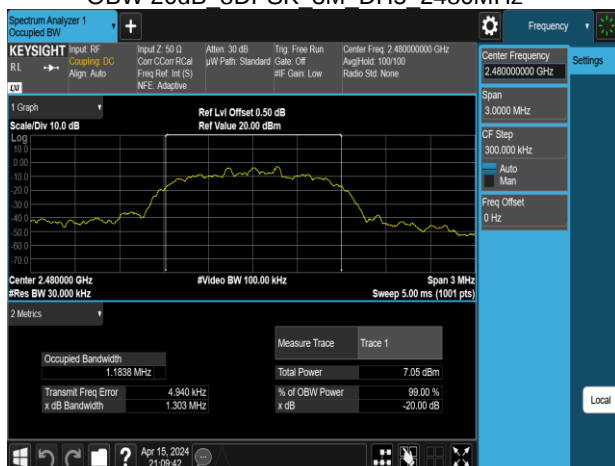
OBW 20dB 8DPSK 3M DH5 2402MHz



OBW 20dB 8DPSK 3M DH5 2441MHz



OBW 20dB 8DPSK 3M DH5 2480MHz



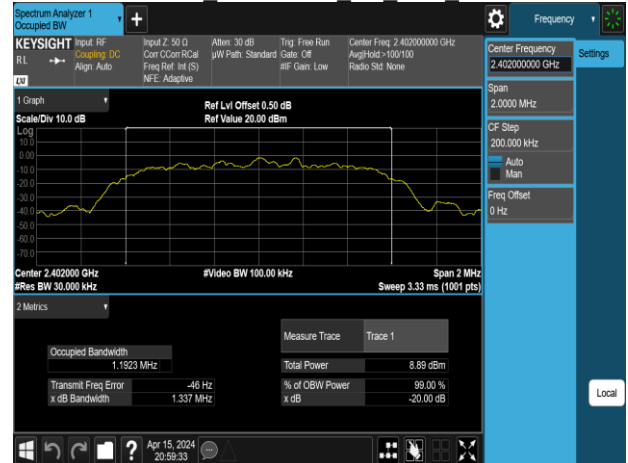
Test Data

BANDWIDTH 99%

IC OBW 99% GFSK 1M DH5 2402MHz



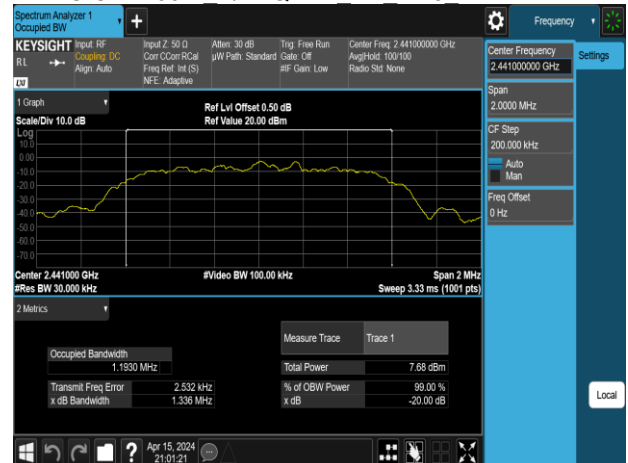
IC OBW 99% $\pi/4$ DQPSK 2M DH5 2402MHz



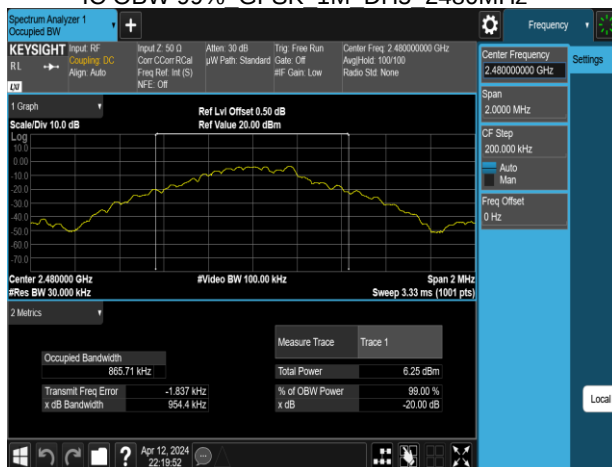
IC OBW 99% GFSK 1M DH5 2441MHz



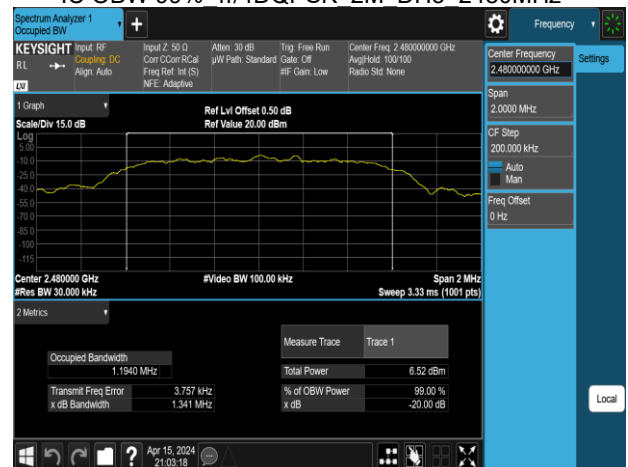
IC OBW 99% $\pi/4$ DQPSK 2M DH5 2441MHz



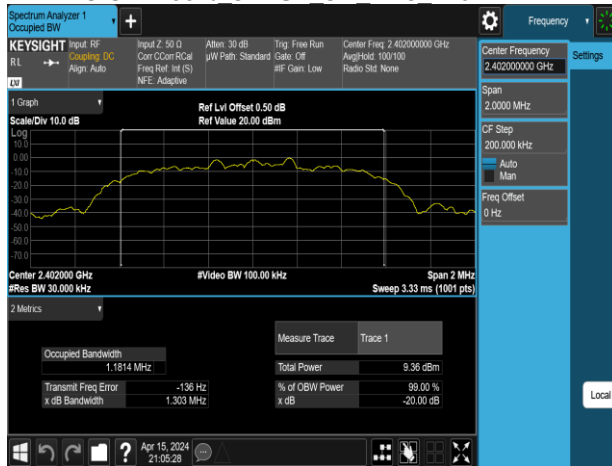
IC OBW 99% GFSK 1M DH5 2480MHz



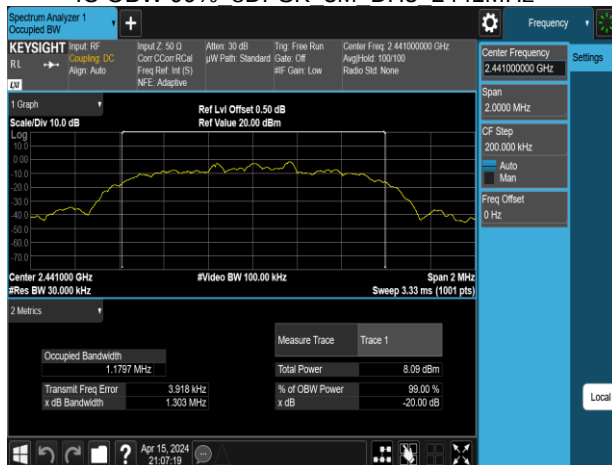
IC OBW 99% $\pi/4$ DQPSK 2M DH5 2480MHz



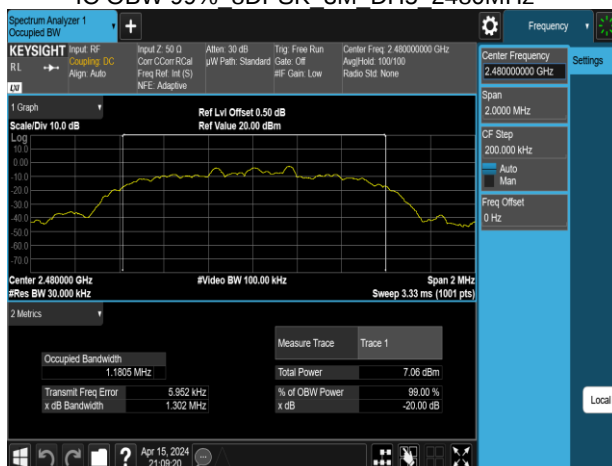
IC OBW 99% 8DPSK 3M DH5 2402MHz



IC OBW 99% 8DPSK 3M DH5 2441MHz



IC OBW 99% 8DPSK 3M DH5 2480MHz



4.3 OUTPUT POWER MEASUREMENT

4.3.1 Test Limit

According to §15.247(b)(1)

Peak output power :

FCC

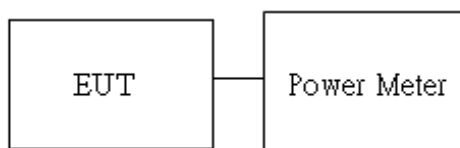
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

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



4.3.4 Test Result

Temperature: 22.1 ~ 23.9°C

Test date: April 12 ~ 15, 2024

Humidity: 55 ~ 56% RH

Tested by: Marco Chan

Peak & Average output power :

1M BR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	1.73	1.489	1000
Mid	2441	default	0.63	1.156	1000
High	2480	default	-0.34	0.925	1000

1M BR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	1.71	1.484	1000
Mid	2441	default	0.59	1.147	1000
High	2480	default	-0.35	0.923	1000

2M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	4.12	2.582	125
Mid	2441	default	2.75	1.884	125
High	2480	default	1.91	1.552	125

2M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	1.46	1.400	125
Mid	2441	default	0.15	1.035	125
High	2480	default	-0.66	0.859	125

3M EDR mode (Peak):

CH	Freq. (MHz)	Power Setting	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	4.68	2.938	125
Mid	2441	default	3.25	2.113	125
High	2480	default	2.38	1.730	125

3M EDR mode (Average):

CH	Freq. (MHz)	Power Setting	Avg. Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	2402	default	1.57	1.437	125
Mid	2441	default	0.19	1.046	125
High	2480	default	-0.63	0.866	125

Note: Measured by power meter, cable loss + Duty cycle factor has been offsetted to the power meter for Avg. power and cable loss has been offsetted for Peak power measurement.

4.4 FREQUENCY SEPARATION

4.4.1 Test Limit

According to §15.247(a)(1)

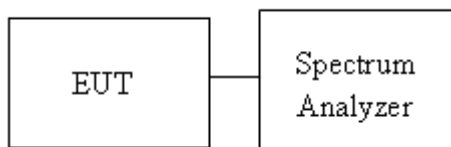
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

Limit	> two-thirds of the 20 dB bandwidth
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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 = 300kHz, VBW = 910kHz, Sweep = auto.
Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency

4.4.3 Test Setup



4.4.4 Test Result

Temperature: 22.1 ~ 23.9°C

Test date: April 12 ~ 15, 2024

Humidity: 55 ~ 56% RH

Tested by: Marco Chan

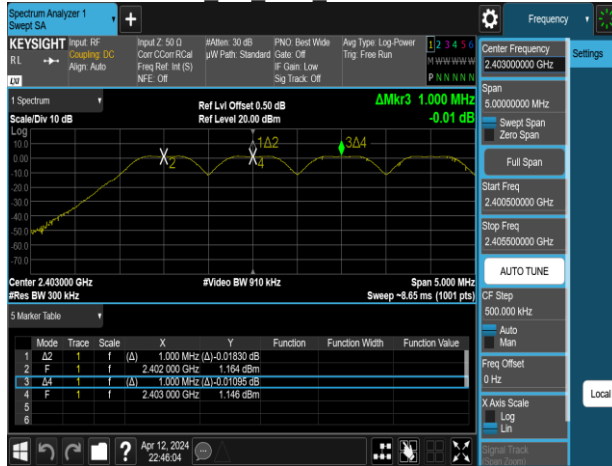
Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.64	PASS
Mid	2441	1.000	0.64	PASS
High	2480	1.000	0.64	PASS

Test mode: $\pi/4$ -DQPSK_2Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.89	PASS
Mid	2441	1.000	0.89	PASS
High	2480	1.000	0.89	PASS

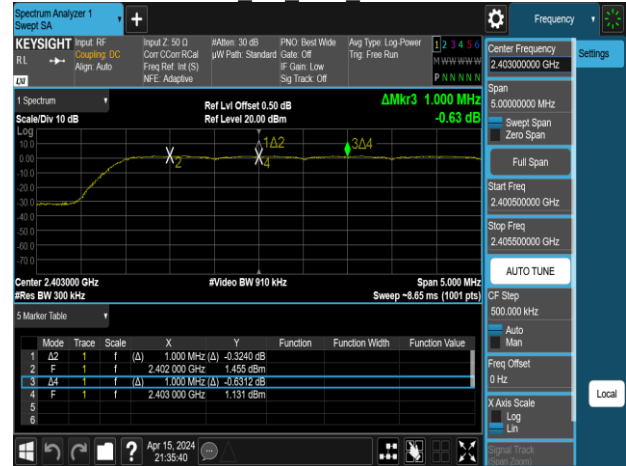
Test mode: 8DPSK_EDR-3Mbps mode / 2402-2480 MHz				
Channel	Frequency (MHz)	Channel Separation (MHz)	Channel Separation Limits (MHz)	Result
Low	2402	1.000	0.87	PASS
Mid	2441	1.000	0.87	PASS
High	2480	1.000	0.87	PASS

Test Data

GFSK 1M DH5 CH0CH1CH2



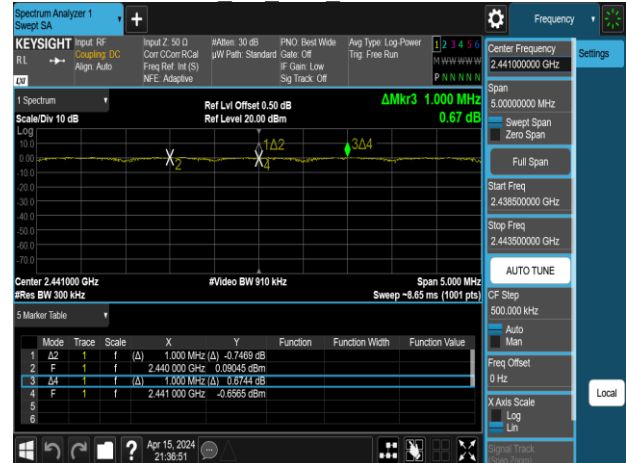
$\pi/4$ DQPSK 2M DH5 CH0CH1CH2



GFSK 1M DH5 CH38CH39CH40



$\pi/4$ DQPSK 2M DH5 CH38CH39CH40



GFSK 1M DH5 CH76CH77CH78



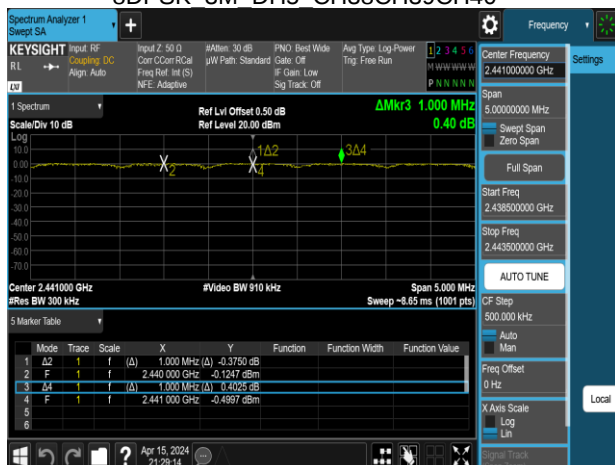
$\pi/4$ DQPSK 2M DH5 CH76CH77CH78



8DPSK 3M DH5 CH0CH1CH2



8DPSK 3M DH5 CH38CH39CH40



8DPSK 3M DH5 CH76CH77CH78



4.5 NUMBER OF HOPPING

4.5.1 Test Limit

According to §15.247(a)(1)(iii)

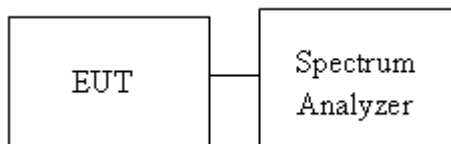
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

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. = 2441 MHz, RBW=300KHz, VBW =910kHz for left half.
4. Set spectrum analyzer Start Freq. = 2441 MHz, Stop Freq. = 2483.5 MHz, RBW=300KHz, VBW =910kHz for right half.
5. Max hold, view and count how many channel in the band.

4.5.3 Test Setup



4.5.4 Test Result

Temperature: 22.1 ~ 23.9°C

Test date: April 12 ~ 15, 2024

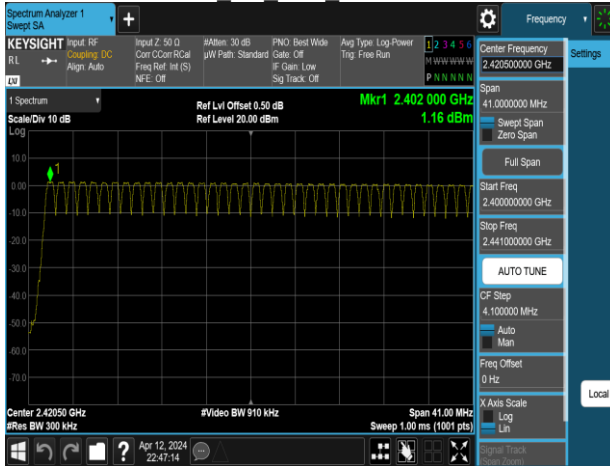
Humidity: 55 ~ 56% RH

Tested by: Marco Chan

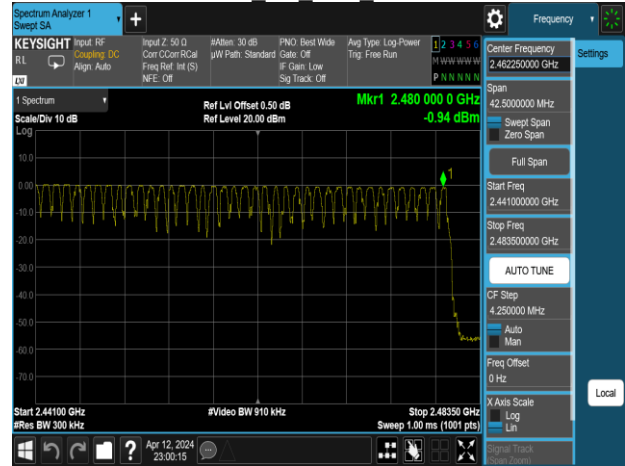
Number of Hopping				
Mode	Frequency (MHz)	Hopping Channel Number	Hopping Channel Number Limits	Result
BDR-1Mbps	2402-2480	79	15	Pass
EDR-3Mbps	2402-2480	79	15	

Test Data

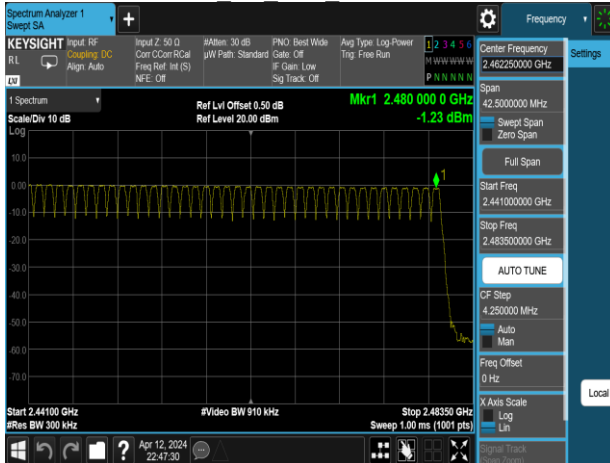
GFSK 1M DH5 2400-2441



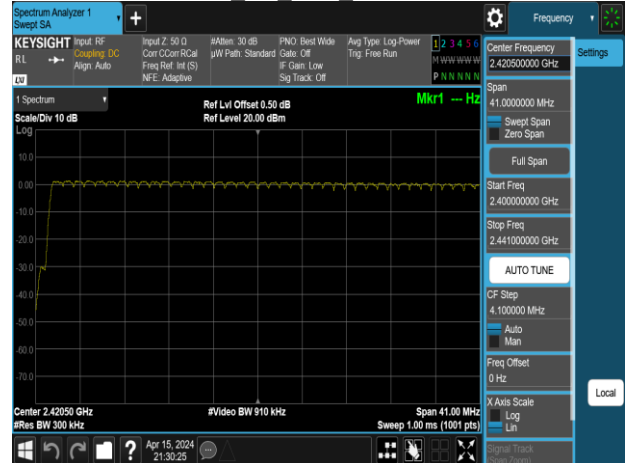
π /4DQPSK 2M DH5 2441-2480



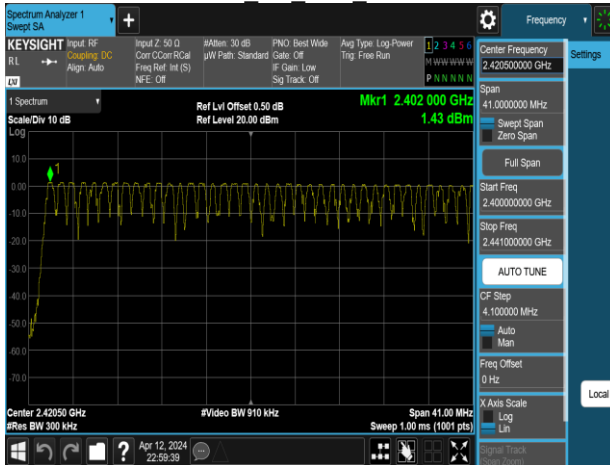
GFSK 1M DH5 2441-2480



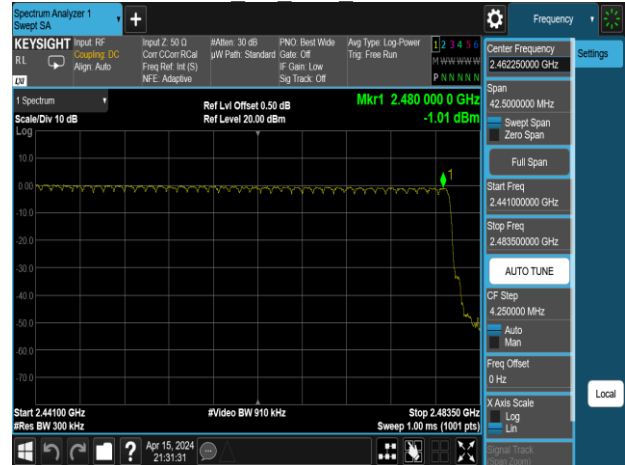
8DPSK 3M DH5 2400-2441



π /4DQPSK 2M DH5 2400-2441



8DPSK 3M DH5 2441-2480



4.6 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

4.6.1 Test Limit

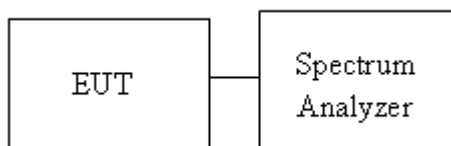
According to §15.247(d)

Limit	-20 dBc
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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: 22.1 ~ 23.9°C

Humidity: 55 ~ 56% RH

Test date: April 12 ~ 15, 2024

Tested by: Marco Chan

Test Data

Band Edge

Band Edge GFSK 1M DH5 2402MHz



Band Edge $\pi/4$ DQPSK 2M DH5 2480MHz



Band Edge GFSK 1M DH5 2480MHz



Band Edge 8DPSK 3M DH5 2402MHz



Band Edge $\pi/4$ DQPSK 2M DH5 2402MHz

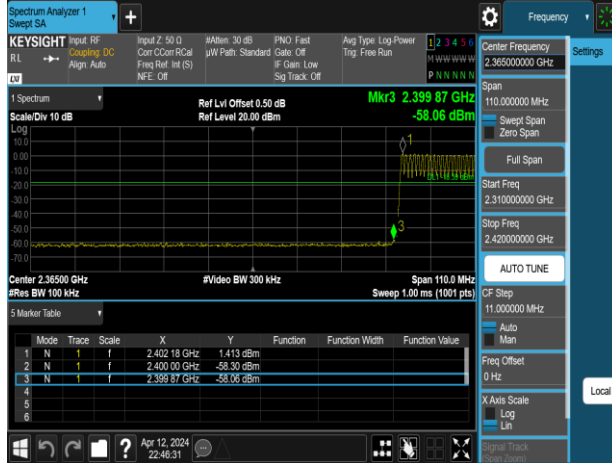


Band Edge 8DPSK 3M DH5 2480MHz

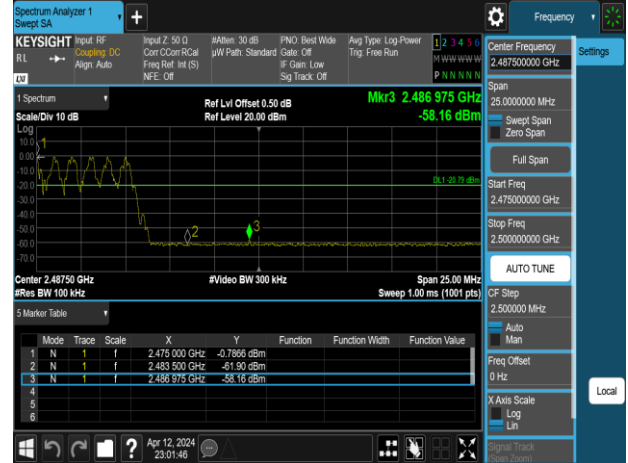


Hopping mode

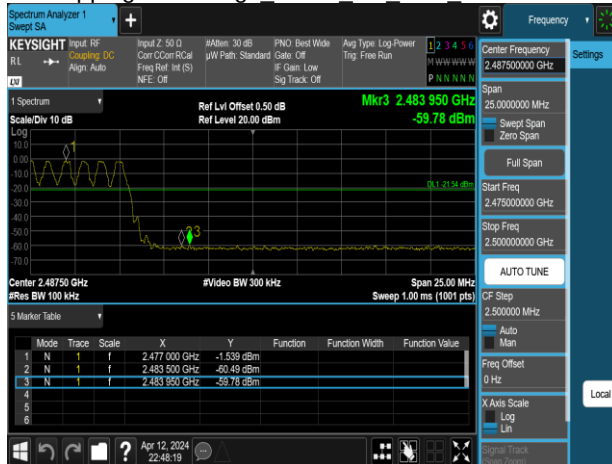
Hopping Band Edge GFSK 1M DH5 2402MHz



Hopping Band Edge π /4DQPSK 2M DH5 2480MHz



Hopping Band Edge GFSK 1M DH5 2480MHz



Hopping Band Edge 8DPSK 3M DH5 2402MHz



Hopping Band Edge π /4DQPSK 2M DH5 2402MHz



Hopping Band Edge 8DPSK 3M DH5 2480MHz

