



Project No.: TM-2305000074P Report No.: TMWK2305001406KR FCC ID: P4Q-N635RN IC: 2420C-N635RN

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# 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** 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.

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	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	<ol> <li>Powered from AC Adapter. I/P: 100-240Vac, 50-60Hz, 0.3A; O/P: Vdc,5V 2.0A</li> <li>Powered from car charge. I/P: 12-24Vdc; O/P: 5Vdc, 2A (Max)</li> <li>Powered from Rechargeable Li-ion Polymer Battery. Rating: 3.7VDC, 4000mAh, 14.8Wh</li> </ol>	
HW Version	R02	
SW Version	R15	
Serial number	HGM37E0001	

#### Remark:

1. For more details, please refer to the User's manual of the EUT.

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.

<sup>2.</sup> Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.



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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.



# **1.3 EUT CHANNEL INFORMATION**

Frequency Range	2402MHz-2480MHz
Modulation Type	<ol> <li>GFSK for BDR-1Mbps</li> <li>π/4-DQPSK for EDR-2Mbps</li> <li>8DPSK for EDR-3Mbps</li> </ol>
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 inNumber ofLocation in frequencywhich device operatesfrequenciesrange 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



# **1.7 INSTRUMENT CALIBRATION**

Conducted_FCC/IC/NCC (AII)					
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+18233 0	2023-02-22	2024-02-21
Horn Antenna	ETC	MCTD 1209	DRH13M02003	2023-01-12	2024-01-11
High Pass Filters	Titan Microwave	T04H30001800070S0 1	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+211 012	2022-12-12	2023-12-11
Cable	EMCI	EMC101G	221213+221011+221 012	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	Manufacture r	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.



# **1.8 SUPPORT AND EUT ACCESSORIES EQUIPMENT**

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

Support Unit List						
NO	Kind	Brand	Model	Core	Length	
1	NB(D)	Lenovo	ThinkPad X260	N/A	N/A	
А	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.



# 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)	RSS-GEN 8.9,	4.8	Dediction Rond Edge	Deee
15.205	8.10	4.0	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: 2441MHz 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.



# 3.2 THE WORST MODE OF MEASUREMENT

Ra	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	<ul> <li>Placed in fixed position.</li> <li>Placed in fixed position at X-Plane (E2-Plane)</li> <li>Placed in fixed position at Y-Plane (E1-Plane)</li> <li>Placed in fixed position at Z-Plane (H-Plane)</li> </ul>				

Ra	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	Test ConditionAC 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:	<b>25.3</b> ℃	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 GFSK 1M DH3 2441MHz



Dwell Time\_GFSK\_1M\_DH5\_2441MHz















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Dwell Time\_8DPSK\_3M\_DH1\_2441MHz



EYSIGH1 →→ I	Input: F Couplin Align: A		Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Log Trig: Free Run		* 2.441000000 GHz	Setting
Spectrum ale/Div 10	dB	•		Ref Lvi Offset 0. Ref Level 20.50		Δ	Mkr3 2.500 m 0.00 d	S 0.00000000 Hz	
0.5 i00 50	~	X	Y					Full Span	
9.5								Start Freq 2.441000000 GHz	
9.5 9.5 9.5	14-6-1	N-RV4		unal.	an Maria	*	www	Stop Freq 2.441000000 GHz	
nter 2.4410 s BW 1.0 N		Hz		#Video BW 3.0	MHz	Swee	Span 0 ep 10.0 ms (1001 pt		
larker Table Mode	Trace	Scale	x	Y	Function	Function Width	Function Value	Auto	
1 Δ2	1		Δ) 1.640 ms		1 01101011	anoosh what	r anodori value		
2 F	1		1.830 ms	7.728 dBm				Freq Offset	
3 ∆4		t	Δ) 2.500 ms					0 Hz	
4 F 5			1.830 ms	7.728 dBm				X Axis Scale Log Lin	

Dwell Time\_8DPSK\_3M\_DH5\_2441MHz

	0.		0_001	01.01	/i_Di i0_		vii i2	
Spectrum Anal Swept SA	yzer 1	+					Frequency	· • 🛞
KEYSIGHT RL →→→	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr CCorr Freq Ref: Int (S	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Log-Powe Trig: Free Run	1 2 3 4 5 6 WWWWW PNNNNN	Center Frequency 2.441000000 GHz Span	Settings
1 Spectrum	,		Ref Lvl Offset 0.	.50 dB	ΔMkr	3 3.750 ms	Span 0.00000000 Hz	
Scale/Div 10 d	B	0142304	Ref Level 20.50	dBm		0.00 dB	Swept Span Zero Span	
10.5 0.500 X2							Full Span	
-9.50 -19.5 -29.5							Start Freq 2.441000000 GHz	
-39.5 -49.5 -59.5		nmhr	mali		hearing	MARA	Stop Freq 2.441000000 GHz	
-69.5 Center 2.4410	00000 GHz		#Video BW 3.0	MHz		Span 0 Hz	AUTO TUNE	
Res BW 1.0 M					Sweep 15	.0 ms (1001 pts)	CF Step	
5 Marker Table	•						1.000000 MHz	
Mode	Trace Scal		Y	Function F	unction Width FL	inction Value	Auto Man	
1 Δ2 2 F		(Δ) 2.895 (Δ) 210.0	ms (Δ) 0.6151 dB us 7.720 dBm				Freq Offset	
<u>3</u> Δ4	1 t		ns (A0,0007348 dB				0 Hz	
4 F 5 6	1 t	210.0					X Axis Scale Log Lin	
<b>1</b>	2	Oct 12, 2023 9:25:44 AM	$\mathbf{P}$			: X	Signal Track (Span Zoom)	



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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	Limits(dBµV)				
(MHz)	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			

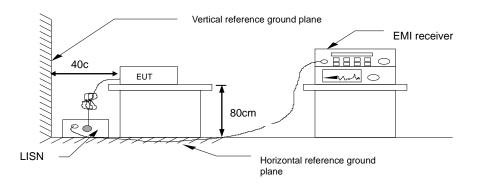
\* Decreases with the logarithm of the frequency.

## 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

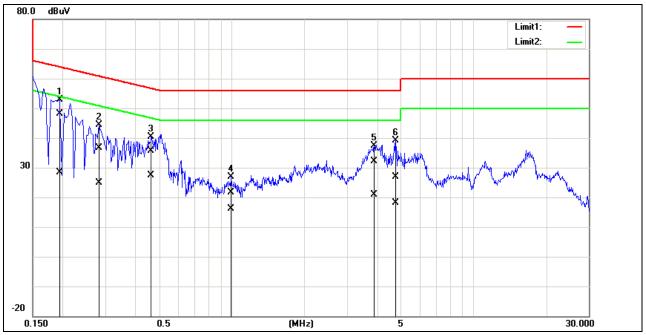


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## Test Data

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

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

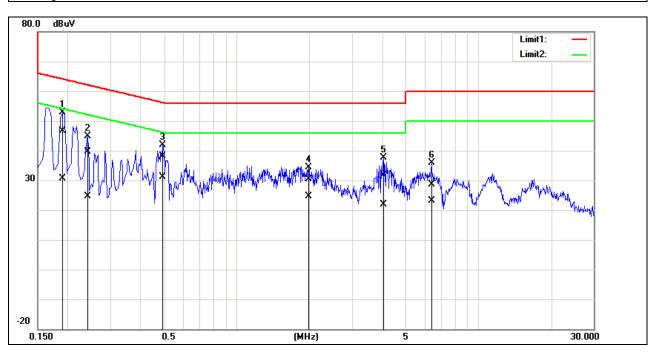


No	Frequenc	QuasiPea	Averag	Correctio	QuasiPea	Averag	QuasiPea	Averag	QuasiPea	Averag	Remar
	У	k	e	n	k	е	k	е	k	e	k
		reading	reading	factor	result	result	limit	limit	margin	margin	
	(MHz)	(dBuV)	(dBuV)	( <b>dB</b> )	(dBuV)	(dBuV)	(dBuV)	(dBuV)	( <b>dB</b> )	( <b>dB</b> )	
1*	0.1940	47.91	28.35	0.15	48.06	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.(°C)/Hum.(%):	24.3(°C)/52%
Test item:	Conduction test	Test By:	Tony.Chao
Line:	Ν	Test Voltage:	AC 120V/60Hz
Model:	Mode 1		

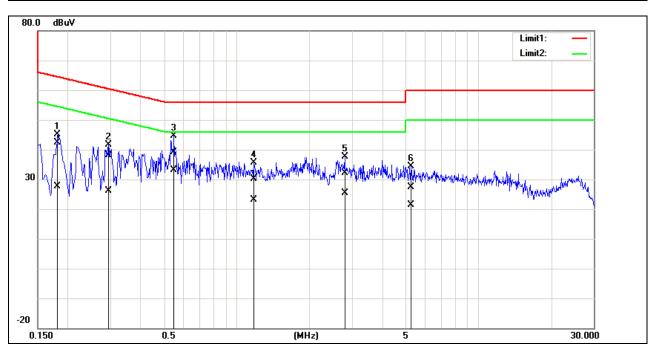


No	Frequenc	QuasiPea	Averag	Correctio	QuasiPea	Averag	QuasiPea	Averag	QuasiPea	Averag	Remar
•	У	k reading	e reading	n factor	k result	e	k limit	e limit	k	e	k
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	result (dBuV)	(dBuV)	(dBuV)	margin (dB)	margin (dB)	
1	0.1900	46.33	30.50	0.19	46.52	30.69	64.04	54.04	-17.52	-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	<b>Temp.(°C)/Hum.(%):</b>	24.3(°C)/52%
Test item:	Conduction test	Test By:	Tony.Chao
Line:	L1	Test Voltage:	AC 120V/60Hz
Model:	Mode 2	-	

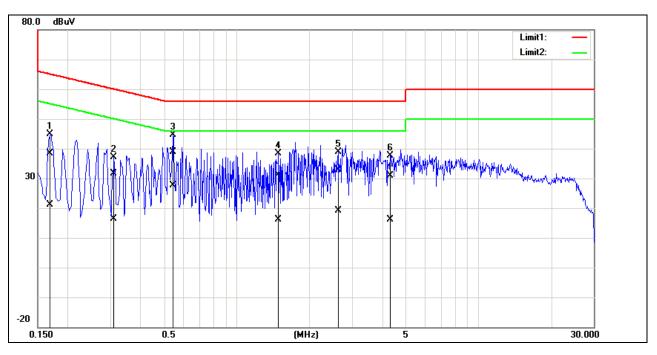


No	Frequenc	QuasiPea	Averag	Correctio	QuasiPea	Averag	QuasiPea	Averag	QuasiPea	Averag	Remar
•	У	k reading	e reading	n factor	k result	e result	k limit	e limit	k	e	k
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	margin (dB)	margin (dB)	
1	0.1820	42.30	27.38	0.15	42.45	27.53	64.39	54.39	-21.94	-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	<b>Temp.(°C)/Hum.(%):</b>	24.3(°C)/52%
Test item:	Conduction test	Test By:	Tony.Chao
Line:	Ν	Test Voltage:	AC 120V/60Hz
Model:	Mode 2		

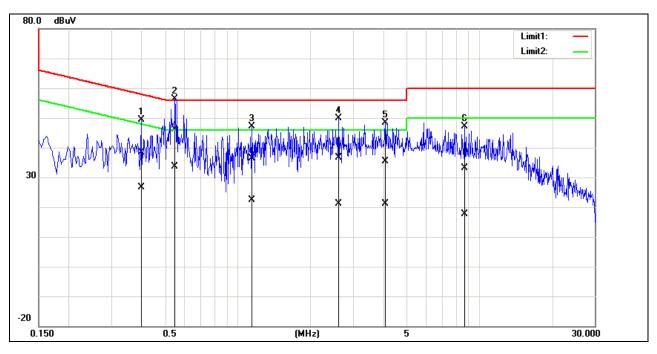


No	Frequenc	QuasiPea	Averag	Correctio	QuasiPea	Averag	QuasiPea	Averag	QuasiPea	Averag	Remar
•	У	k reading	e reading	n footor	k result	e	k limit	e limit	k	e	k
	(MHz)	(dBuV)	(dBuV)	factor (dB)	(dBuV)	result (dBuV)	(dBuV)	(dBuV)	margin (dB)	margin (dB)	
1	0.1700	38.11	20.94	0.19	38.30	21.13	64.96	54.96	-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.(°C)/Hum.(%):	24.3(°C)/52%
Test item:	Conduction test	Test By:	Tony.Chao
Line:	L1	Test Voltage:	AC 230V/50Hz
Model:	Mode 2	6	

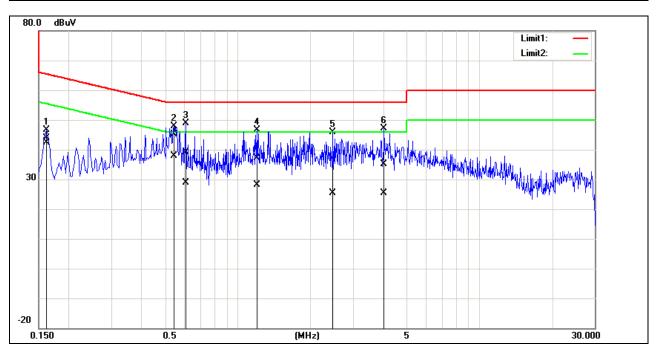


No	Frequenc	QuasiPea	Averag	Correctio	QuasiPea	Averag	QuasiPea	Averag	QuasiPea	Averag	Remar
•	У	k reading	e reading	n factor	k result	e result	k limit	e limit	k	e	k
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	margin (dB)	margin (dB)	
1	0.3980	28.19	16.34	10.19	38.38	26.53	57.90	47.90	-19.52	-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.(°C)/Hum.(%):	24.3(°C)/52%
Test item:	Conduction test	Test By:	Tony.Chao
Line:	Ν	Test Voltage:	AC 230V/50Hz
Model:	Mode 2	-	



No	Frequenc	QuasiPea	Averag	Correctio	QuasiPea	Averag	QuasiPea	Averag	QuasiPea	Averag	Remar
•	У	k	е	n	k	е	k	е	k	е	k
		reading	reading	factor	result	result	limit	limit	margin	margin	
	(MHz)	(dBuV)	(dBuV)	( <b>dB</b> )	(dBuV)	(dBuV)	(dBuV)	(dBuV)	( <b>dB</b> )	( <b>dB</b> )	
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,

**<u>20 dB Bandwidth</u>** : For reporting purposes only.

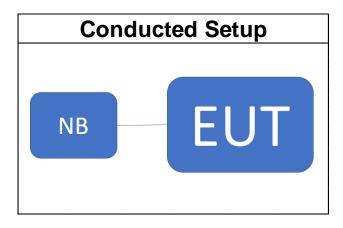
**Occupied Bandwidth(99%)** : For reporting purposes only.

## 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.
- 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





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## 4.2.4 Test Result

Temperature:	<b>25.3</b> ℃	Test date:	October 12, 2023
Humidity:	59% RH	Tested by:	David Li

## 20dB BANDWIDTH

GFSK			
СН	20 dB BW	2/3 BW	
СП	(MHz)	(MHz)	
Low	0.9592	0.64	
Mid	0.96	0.64	
High	0.963	0.64	
π/4-D0	QPSK		
СЦ	20 dB BW	2/3 BW	
СН	20 dB BW (MHz)	2/3 BW (MHz)	
CH Low			
	(MHz)	(MHz)	

#### 8-DPSK

СН	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

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

#### π/4-DQPSK

High

СН	99% BW
СП	(MHz)
Low	1.1731
Mid	1.1730
High	1.1723
8-DPSK	

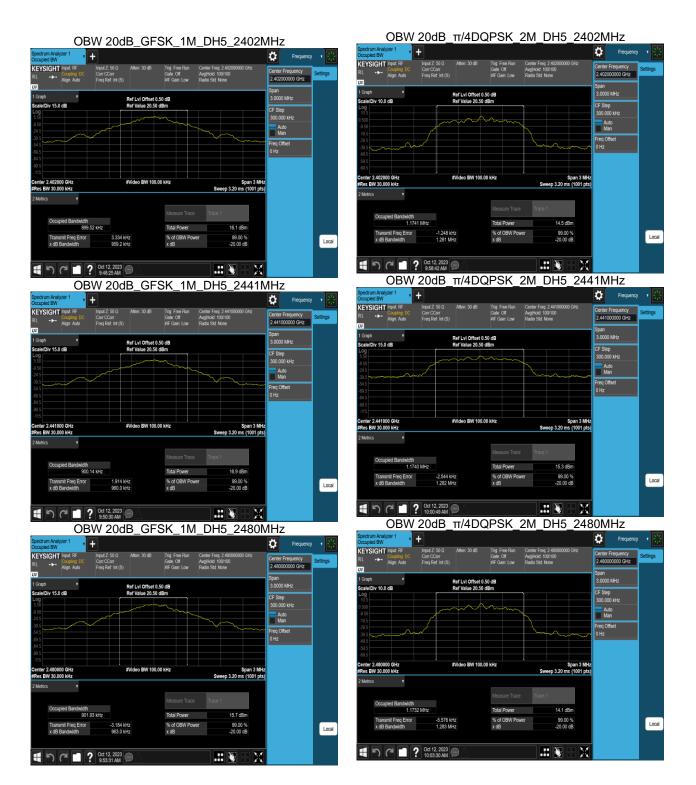
СН	99% BW (MHz)
Low	1.1752
Mid	1.1762

1.1765



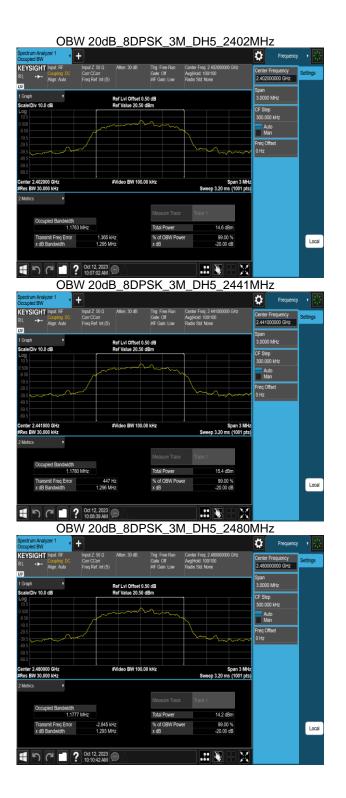
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# Test Data (20dB BANDWIDTH)





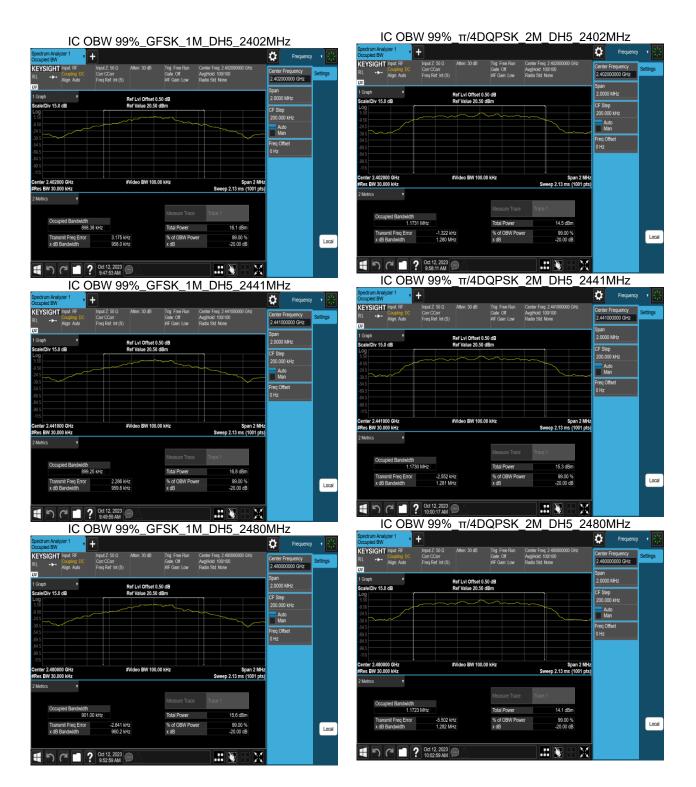
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# Test Data (BANDWIDTH 99%)





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IC OBW 99%\_8DPSK\_3M\_DH5\_2402MHz Ö Frequency KEYSIGHT Trig: Free Gate: Off ar Freq: 2. fold: 100/1 Std: Non Corr CCorr Freg Ref: Int (S 2.4020 000 GH Span 2.0000 MHz Ref LvI Offset 0.50 dB Ref Value 20.50 dBm v 15 0 dB CF Step 200.000 kHz Auto Man Freq Offse 0 Hz #Video BW 100.00 kHz 00 GH Span 2 MH Sweep 2.13 ms (1001 pt 14.6 dBn Total Po 99.00 % -20.00 dB ransmit Freq Error 1.496 kHz 1.294 MHz % of OBW Po x dB Local モー? Oct 12, 2023 🗩 X IC OBW 99%\_8DPSK\_3M\_DH5\_2441MHz \$ + KEYSIGHT Input: F Trig: Free Rut Gate: Off #IE Gain: Low Center Freq: 2.44 Avg[Hold: 100/10] Radio Std None Center Frequency 2.441000000 GHz Corr CCorr Eren Ref: Int (S) Span 2.0000 MHz Ref LvI Offset 0.50 dB Ref Value 20.50 dBm v 15.0 dB CF Step 200.000 kHz Auto Man Freq Offset 0 Hz ater 2.441000 GHz s BW 30.000 kHz #Video BW 100.00 kHz Span 2 MH Sweep 2.13 ms (1001 pts Total Po 15.3 dBn 99.00 % 20.00 dB 648 Hz 1.295 MHz % of Local っ C\* I2, 2023 🗩 .: 🕃 M  $\blacksquare$ IC OBW 99%\_8DPSK\_3M\_DH5\_2480MHz ₿ + KEYSIGHT Input Trig: Free F Gate: Off #IE Gain: L Center Freq: 2.4 Avg[Hold: 100/10 Radio Std: None Center Frequency 2.480000000 GHz Corr CCorr Freq Ref: Int (S Span 2.0000 MHz Ref LvI Of et 0.50 dB CF Step 200.000 kHa Auto Man Freq Offse 0 Hz #Video BW 100.00 kHz Span 2 MH eep 2.13 ms (1001 pt 14.1 dBn Local -2.741 kHz 1.292 MHz

X

って ? Oct 12, 2023 🗩



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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.

#### <u>IC</u>

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).



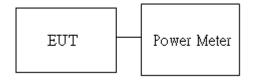
Antenna not exceed 6 dBi : 21dBm
 Antenna with DG greater than 6 dBi : 21dBm [Limit = 30 – (DG – 6)]

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





## 4.3.4 Test Result

Temperature:25.3℃Humidity:59% RH

# Test date:

Tested by:

October 12, 2023 David Li

### Peak & Average output power :

#### 1M BR mode (Peak):

СН	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

#### 2M EDR mode (Peak):

СН	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

#### 3M EDR mode (Peak):

СН	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

1M BR mode (Average):								
СН	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 (Average):

СН	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 (Average):

СН	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)

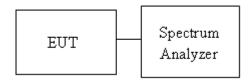
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

nit	> 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:	<b>25.3</b> ℃	Test date:	October 12, 2023
Humidity:	59% RH	Tested by:	David Li

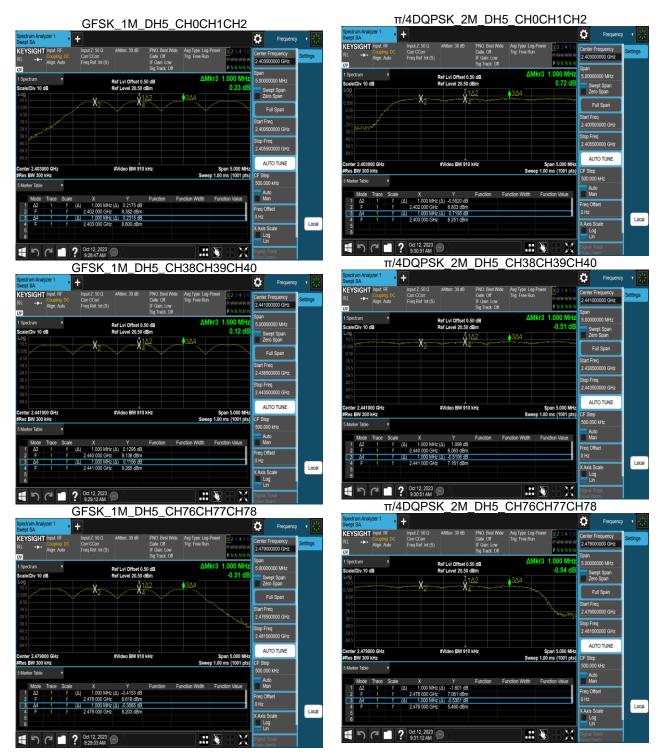
Test mode: GFSK_BDR-1Mbps mode / 2402-2480 MHz							
Channel	Channel Frequency Channel Channel (MHz) (MHz)		Channel Separation Limits (MHz)	Result			
Low	2402	1.000	0.64	PASS			
Mid	2441	1.000	0.64	PASS			
High	2480	1.000	0.64	PASS			

	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	hannel Frequency (MHz) Channel Separation (MHz) (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				



## Test Data



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#### 8DPSK\_3M\_DH5\_CH0CH1CH2







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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

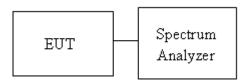
1. Place the EUT on the table and set it in transmitting mode.

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

- =100KHz, VBW = 300KHz.
- 4. Max hold, view and count how many channel in the band.

## 4.5.3 Test Setup



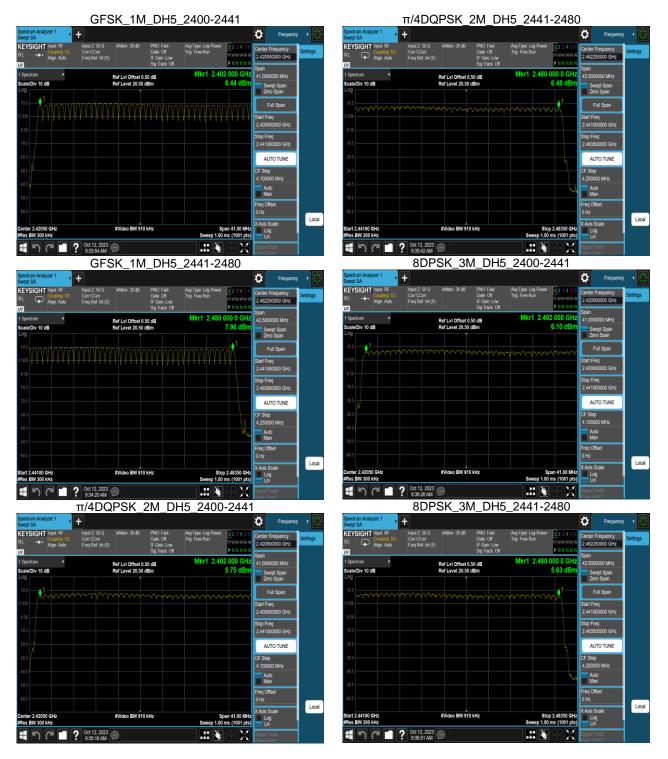
## 4.5.4 Test Result

Temperature:	<b>25.3</b> ℃	Test date:	October 12, 2023
Humidity:	59% RH	Tested by:	David Li

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



## Test Data





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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	
-------	---------	--

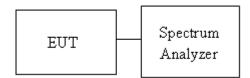
### 4.6.2 Test Procedure

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:	<b>25.3</b> ℃	Test date:	October 12, 2023
Humidity:	59% RH	Tested by:	David Li



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## Test Data



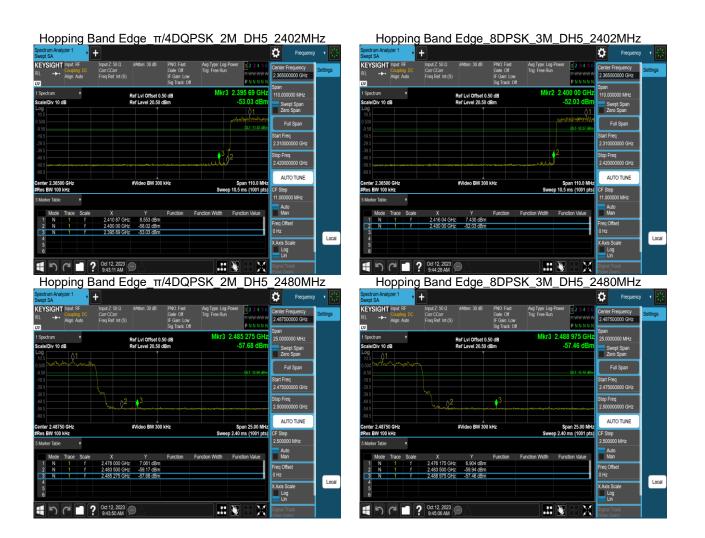


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Spurious Emission\_8DPSK\_3M\_DH5\_2402MHz

- 16   	Sight ++-	Couplin Couplin Align: /		Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: O		MWW	<del>rwww</del> I N N N		Frequency 000000 GHz	Settings
ale/	trum Div 10 d	iB	•		Ref LvI Offset 0. Ref Level 20.50		M	(r4 23.958 -52.66	GHz	24.970 Sw	0000 GHz vept Span ro Span	
0.5 00 50		0									ull Span	
9.5 9.5 9.5								QL1-17	7.09 dBm	Start Fr 30.000	eq 000 MHz	
1.5			^2	۸3					4	Stop Fr	eq	
1.5		-	~~ <sup>V</sup>			-				25.000	000000 GHz	
1.5 1.5	12.52 (	GHz			#Video BW 300	kHz		Span 24.9	97 GHz		000000 GHz JTO TUNE	
1.5 1.5 1 <b>te</b>	12.52 G BW 100			<u> </u>	#Video BW 300	kHz	Swee	Span 24.9 p ~2.39 s (249)		AL CF Ste	JTO TUNE	
9.5 9.5 nte 95 E			•		#Video BW 300	kHz	Swee			AL CF Stel 2.4970	JTO TUNE p 000000 GHz	
1.5 1.5 1.6	er Table Mode		, Scale	x	Y	kHz Function	Swee Function Width		71 pts)	AL CF Ste	JTO TUNE p 100000 GHz to	
1.5 1.5 ntei es E lark	er Table Mode N	kHz	• Scale f	X 2.402 GHz	Y 2.914 dBm			p ~2.39 s (249)	71 pts) lue	AL CF Ste 2.4970 Au Ma	DTO TUNE p 000000 GHz to in	
1 1 1 1 1 2	er Table Mode N	kHz Trace		X 2.402 GHz 4.804 GHz	Y 2.914 dBm -58.94 dBm			p ~2.39 s (249)	71 pts) lue	AL CF Stej 2.4970 Au Ma Freq O	DTO TUNE p 000000 GHz to in	
1 1 1 1 1 2 3	er Table Mode N N N	kHz Trace		X 2.402 GHz 4.804 GHz 7.206 GHz	Y 2.914 dBm -58.94 dBm -60.32 dBm			p ~2.39 s (249)	71 pts) lue	AL CF Ste 2.4970 Au Ma	DTO TUNE p 000000 GHz to in	
1 2 3 4	er Table Mode N	kHz Trace		X 2.402 GHz 4.804 GHz	Y 2.914 dBm -58.94 dBm -60.32 dBm			p ~2.39 s (249)	71 pts) lue	AL CF Stej 2.4970 Au Ma Freq Ol 0 Hz	JTO TUNE p 000000 GHz to in fiset	Loc
a 5 a 5 inter tes 1 Mark 1 2	er Table Mode N N N	kHz Trace		X 2.402 GHz 4.804 GHz 7.206 GHz	Y 2.914 dBm -58.94 dBm -60.32 dBm			p ~2.39 s (249)	71 pts) lue	AL CF Stej 2.4970 Au Ma Freq O	JTO TUNE p 000000 GHz to in fiset Scale g	Loc

Spurious Emission\_8DPSK\_3M\_DH5\_2441MHz

Swept				+					\$	Frequency	
KEY: RL	Sight ++-	Inputi I Coupli Align: I		Input Z: 50 Ω Corr CCorr Freq Ref: Int (S)	#Atten: 30 dB	PNO: Fast Gate: Off IF Gain: Low Sig Track: O			12.515	Frequency 5000000 GHz	Settings
1 Spec Scale Log	trum Div 10	dB	'		Ref Lvi Offset 0.5 Ref Level 20.50 d		MI	(r4 21.996 GHz -52.95 dBm	Sv	00000 GHz vept Span ro Span	
10.5 0.500 -9.50 -19.5		01						QL1 -17.11 dBm		Full Span	
-29.5 -39.5 -49.5 -59.5	and the second s		0	2				• <sup>4</sup>	Stop Fi	1000 MHz 1eq 1000000 GHz	
	r 12.52 BW 100				#Video BW 300	kHz	Swee	Span 24.97 GHz p ~2.39 s (24971 pts)		JTO TUNE	
5 Mark	er Table		•						AL		
1 2 3 4 5	Mode N N N	Trace 1 1 1	Scale f f f	X 2.441 GHz 4.882 GHz 7.323 GHz 21.996 GHz	-59.20 dBm -62.06 dBm	Function	Function Width	Function Value	Ma Freq O 0 Hz X Axis	lfset Scale	Local
6	٩	3		Oct 12, 2023 10:09:07 AM	ÐA		.:	N I X	Lo Li Signal (Snan 7	ig I n Tracik ioom)	

X Spurious Emission\_8DPSK\_3M\_DH5\_2480MHz



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