

## TEST REPORT

**Product** : Wireless Speaker  
**Trade mark** : MINISO  
**Model/Type reference** : M15  
**Serial Number** : N/A  
**Report Number** : EED32L00362201  
**FCC ID** : 2AFJVM15  
**Date of Issue:** : Dec. 30, 2019  
**Test Standards** : 47 CFR Part 15 Subpart C  
**Test result** : PASS

Prepared for:

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Prepared by:

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Dec. 30, 2019

Check No.: 3096342601



**2 Version**

Version No.	Date	Description
00	Dec. 30, 2019	Original

### 3 Test Summary

Test Item	Test Requirement	Test method	Result
<b>Antenna Requirement</b>	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
<b>AC Power Line Conducted Emission</b>	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10-2013	PASS
<b>Conducted Peak Output Power</b>	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10-2013	PASS
<b>20dB Occupied Bandwidth</b>	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
<b>Carrier Frequencies Separation</b>	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
<b>Hopping Channel Number</b>	47 CFR Part 15, Subpart C Section 15.247 (b)	ANSI C63.10-2013	PASS
<b>Dwell Time</b>	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10-2013	PASS
<b>Pseudorandom Frequency Hopping Sequence</b>	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10-2013	PASS
<b>Band-edge for RF Conducted Emissions</b>	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
<b>RF Conducted Spurious Emissions</b>	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
<b>Radiated Spurious emissions</b>	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
<b>Restricted bands around fundamental frequency (Radiated Emission)</b>	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

The tested samples and the sample information are provided by the client.

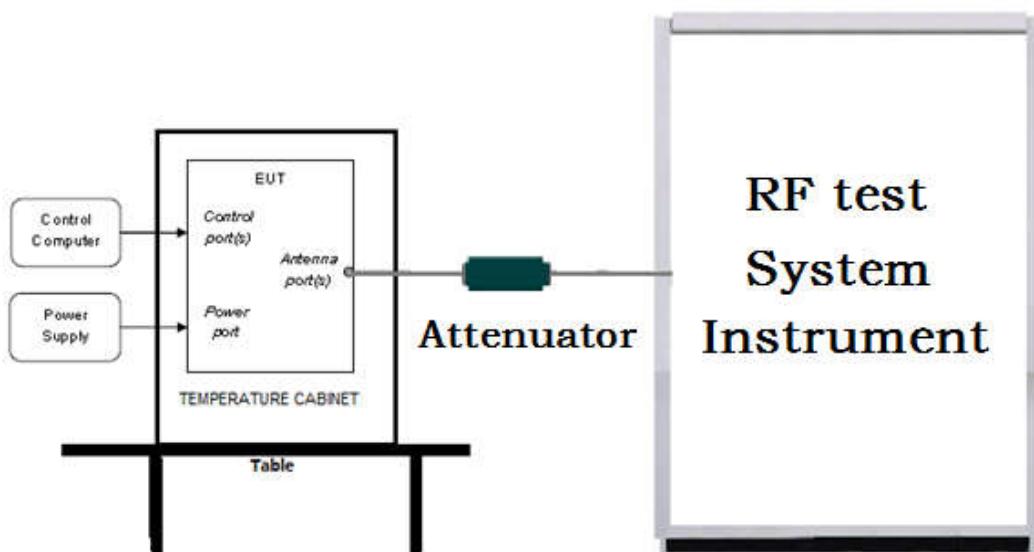
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## 5 Test Requirement

### 5.1 Test setup

#### 5.1.1 For Conducted test setup



#### 5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

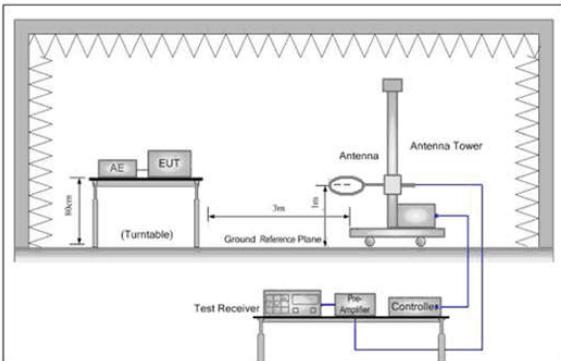


Figure 1. Below 30MHz

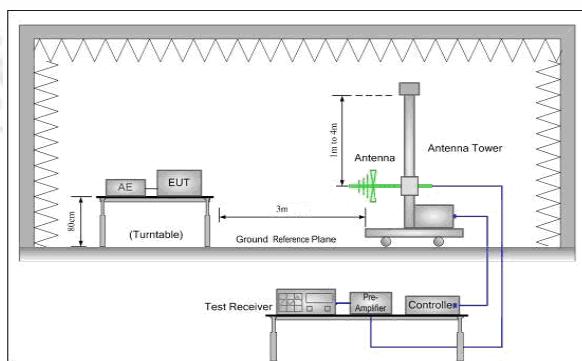


Figure 2. 30MHz to 1GHz

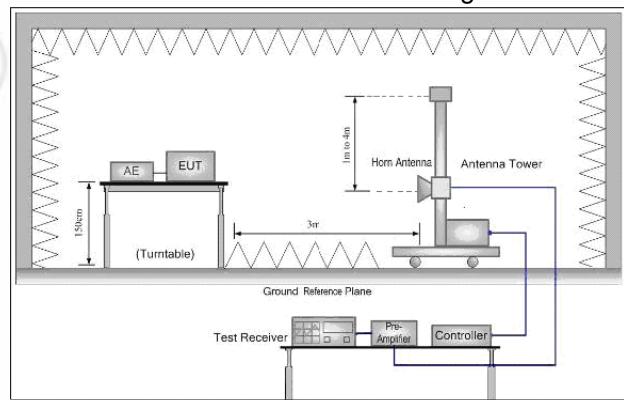
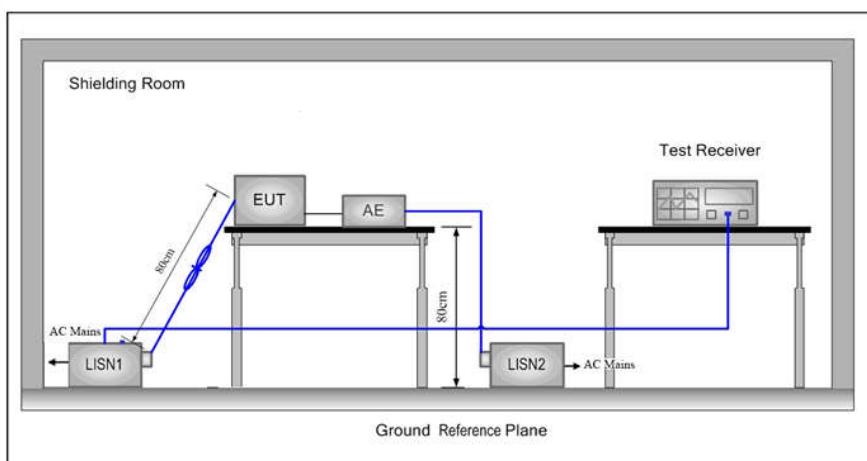


Figure 3. Above 1GHz

### 5.1.3 For Conducted Emissions test setup

#### Conducted Emissions setup



## 5.2 Test Environment

Operating Environment:	
Temperature:	23.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010mbar

## 5.3 Test Condition

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
GFSK/ $\pi$ /4DQPSK	2402MHz ~2480 MHz	Channel 1 2402MHz	Channel 40 2441MHz	Channel 79 2480MHz

## 6 General Information

### 6.1 Client Information

Applicant:	Shenzhen HuaZeng Technology Co., Ltd
Address of Applicant:	8F, 6 Building, the 3rd Industrial Zone, TangWei Community, GongMing Street, GuangMing New District, Shenzhen, China
Manufacturer:	Shenzhen HuaZeng Technology Co., Ltd
Address of Manufacturer:	8F, 6 Building, the 3rd Industrial Zone, TangWei Community, GongMing Street, GuangMing New District, Shenzhen, China
Factory:	Shenzhen HuaZeng Technology Co., Ltd
Address of Factory:	8F, 6 Building, the 3rd Industrial Zone, TangWei Community, GongMing Street, GuangMing New District, Shenzhen, China

### 6.2 General Description of EUT

Product Name:	Wireless Speaker	
Model No.(EUT):	M15	
Tark mark:	MINISO	
EUT Supports Radios application	BT 5.0+EDR Singl mode, 2402MHz to 2480MHz	
Power Supply:	Battery	18650 Li-ion Battery: DC 3.7V 1200mAh, Charge: DC 5V/500mA
Sample Received Date:	Nov. 29, 2019	
Sample tested Date:	Nov. 29, 2019 to Dec. 18, 2019	

### 6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	5.0
Modulation Type:	GFSK, π/4DQPSK
Number of Channel:	79
Test Power Grade:	GFSK:10, π/4DQPSK:7
Test Software of EUT:	FCCAssist2.4
Antenna Type:	PCB antenna
Antenna Gain:	-0.58 dBi
Test Voltage:	DC 3.7v

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

## 6.4 Description of Support Units

Associated equipment name		Manufacture	model	S/N serial number	Supplied by	Certification
D	Notebook	DELL	DELL 3490	D245DX2	DELL	CE&FCC

## 6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd  
 Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China  
 Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

None.

## 6.6 Abnormalities from Standard Conditions

None.

## 6.7 Other Information Requested by the Customer

None.

## 6.8 Measurement Uncertainty(95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	$7.9 \times 10^{-8}$
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.3dB (30MHz-1GHz)
		4.5dB (1GHz-12.75GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

## 7 Equipment List

RF test system					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. Date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-01-2019	02-29-2020
Signal Generator	Keysight	N5182B	MY53051549	03-01-2019	02-29-2020
Temperature/Humidity Indicator	biaozhi	HM10	1804186	07-26-2019	07-25-2020
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-09-2019	01-08-2020
High-pass filter	MICRO-TRONICS	SPA-F-63029-4	---	01-09-2019	01-08-2020
DC Power	Keysight	E3642A	MY56376072	03-01-2019	02-29-2020
PC-1	Lenovo	R4960d	---	03-01-2019	02-29-2020
BT&WI-FI Automatic control	R&S	OSP120	101374	03-01-2019	02-29-2020
RF control unit	JS Tonscend	JS0806-2	158060006	03-01-2019	02-29-2020
BT&WI-FI Automatic test software	JS Tonscend	JS1120-3	---	03-01-2019	02-29-2020

Conducted disturbance Test					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Receiver	R&S	ESCI	100435	05-20-2019	05-19-2020
Temperature/ Humidity Indicator	Defu	TH128	/	06-14-2019	06-13-2020
LISN	R&S	ENV216	100098	05-08-2019	05-07-2020
Barometer	changchun	DYM3	1188	06-20-2019	06-19-2020

3M Semi/full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	07-26-2019	07-25-2020
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938-003	10-21-2019	10-20-2020
Multi device Controller	maturo	NCD/070/107 11112	---	01-09-2019	01-08-2020
Temperature/Humidity Indicator	Shanghai qixiang	HM10	1804298	07-26-2019	07-25-2020
Cable line	Fulai(7M)	SF106	5219/6A	01-09-2019	01-08-2020
Cable line	Fulai(6M)	SF106	5220/6A	01-09-2019	01-08-2020
Cable line	Fulai(3M)	SF106	5216/6A	01-09-2019	01-08-2020
Cable line	Fulai(3M)	SF106	5217/6A	01-09-2019	01-08-2020

<b>3M full-anechoic Chamber</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial Number</b>	<b>Cal. date (mm-dd-yyyy)</b>	<b>Cal. Due date (mm-dd-yyyy)</b>
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	06-19-2019	06-18-2020
Receiver	Keysight	N9038A	MY57290136	03-27-2019	03-26-2020
Spectrum Analyzer	Keysight	N9020B	MY57111112	03-27-2019	03-26-2020
Spectrum Analyzer	Keysight	N9030B	MY57140871	03-27-2019	03-26-2020
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-25-2018	04-24-2021
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-25-2018	04-24-2021
Horn Antenna	ETS-LINDGREN	3117	00057407	07-10-2018	07-09-2021
Preamplifier	EMCI	EMC184055SE	980596	05-22-2019	5-21-2020
Preamplifier	EMCI	EMC001330	980563	05-08-2019	05-07-2020
Preamplifier	JS Tonscend	980380	EMC051845 SE	01-16-2019	01-15-2020
Temperature/Humidity Indicator	biaozhi	GM1360	EE1186631	04-30-2019	04-29-2020
Fully Anechoic Chamber	TDK	FAC-3	---	01-17-2018	01-16-2021
Filter bank	JS Tonscend	JS0806-F	188060094	04-10-2018	04-09-2021
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	01-09-2019	01-08-2020
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	01-09-2019	01-08-2020
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	01-09-2019	01-08-2020
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	01-09-2019	01-08-2020
Cable line	Times	EMC104-NMNM-1000	SN160710	01-09-2019	01-08-2020
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	01-09-2019	01-08-2020
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	01-09-2019	01-08-2020
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	01-09-2019	01-08-2020
Cable line	Times	HF160-KMKM-3.00M	393493-0001	01-09-2019	01-08-2020

## 8 Radio Technical Requirements Specification

### Reference documents for testing:

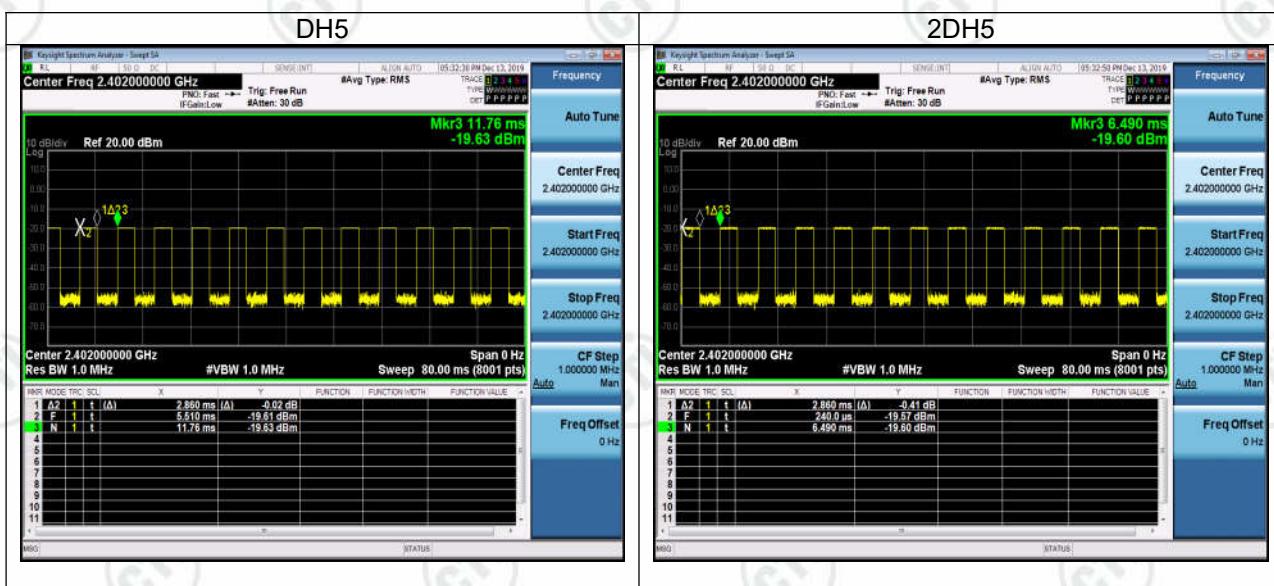
No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

### Test Results List:

Test requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(1)	ANSI 63.10	20dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (a)(1)	ANSI 63.10	Carrier Frequencies Separation	PASS	Appendix B)
Part15C Section 15.247 (a)(1)	ANSI 63.10	Dwell Time	PASS	Appendix C)
Part15C Section 15.247 (b)	ANSI 63.10	Hopping Channel Number	PASS	Appendix D)
Part15C Section 15.247 (b)(1)	ANSI 63.10	Conducted Peak Output Power	PASS	Appendix E)
Part15C Section 15.247(d)	ANSI 63.10	Band-edge for RF Conducted Emissions	PASS	Appendix F)
Part15C Section 15.247(d)	ANSI 63.10	RF Conducted Spurious Emissions	PASS	Appendix G)
Part15C Section 15.247 (a)(1)	ANSI 63.10	Pseudorandom Frequency	PASS	Appendix H)
Part15C Section 15.203/15.247 (c)	ANSI 63.10	Antenna Requirement	PASS	Appendix I)
Part15C Section 15.207	ANSI 63.10	AC Power Line Conducted	PASS	Appendix J)
Part15C Section 15.205/15.209	ANSI 63.10	Restricted bands around fundamental frequency	PASS	Appendix K)
Part15C Section 15.205/15.209	ANSI 63.10	Radiated Spurious Emissions	PASS	Appendix L)

## Duty Cycle

Duty Cycle			
Configuration	TX ON(ms)	TX ALL(ms)	Duty Cycle(%)
DH5	2.860	6.25	45.76%
2DH5	2.860	6.25	45.76%



## Appendix A): 20dB Occupied Bandwidth

### Test Limit

According to §15.247(a) (1),

**20 dB Bandwidth** : For reporting purposes only.

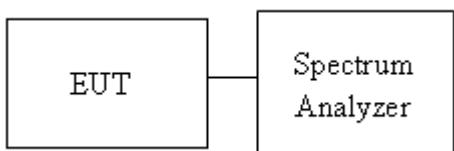
**Occupied Bandwidth(99%)** : For reporting purposes only.

### Test Procedure

Test method Refer as Section 8.1 and 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 =100kHz, VBW = 300kHz and Detector = Peak, to measurement 20dB 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.

### Test Setup

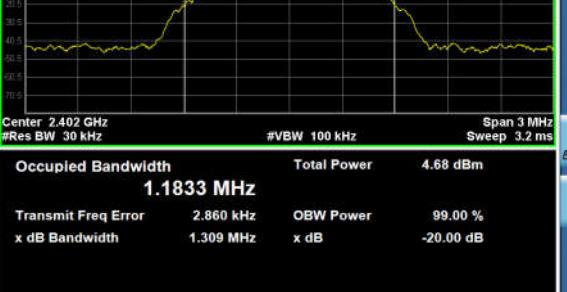
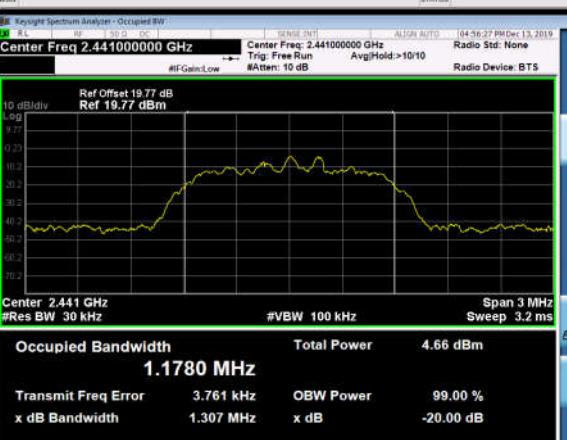


**Test Result**

Mode	Channel.	99% OBW [MHz]	Verdict
GFSK	LCH	0.84256	PASS
GFSK	MCH	0.83817	PASS
GFSK	HCH	0.84003	PASS
$\pi/4$ DQPSK	LCH	1.1833	PASS
$\pi/4$ DQPSK	MCH	1.1780	PASS
$\pi/4$ DQPSK	HCH	1.1785	PASS

### Test Graph

Graphs	
GFSK/LCH	 <p>Key parameters from the graph:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.402000000 GHz</li> <li>Occupied Bandwidth: 842.56 kHz</li> <li>Total Power: 6.90 dBm</li> <li>Transmit Freq Error: 1.918 kHz</li> <li>x dB Bandwidth: 949.2 kHz</li> <li>OBW Power: 99.00 %</li> <li>x dB: -20.00 dB</li> </ul>
GFSK/MCH	 <p>Key parameters from the graph:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.441000000 GHz</li> <li>Occupied Bandwidth: 838.17 kHz</li> <li>Total Power: 6.67 dBm</li> <li>Transmit Freq Error: 2.638 kHz</li> <li>x dB Bandwidth: 947.6 kHz</li> <li>OBW Power: 99.00 %</li> <li>x dB: -20.00 dB</li> </ul>
GFSK/HCH	 <p>Key parameters from the graph:</p> <ul style="list-style-type: none"> <li>Center Freq: 2.480000000 GHz</li> <li>Occupied Bandwidth: 840.03 kHz</li> <li>Total Power: 6.40 dBm</li> <li>Transmit Freq Error: 2.937 kHz</li> <li>x dB Bandwidth: 949.7 kHz</li> <li>OBW Power: 99.00 %</li> <li>x dB: -20.00 dB</li> </ul>

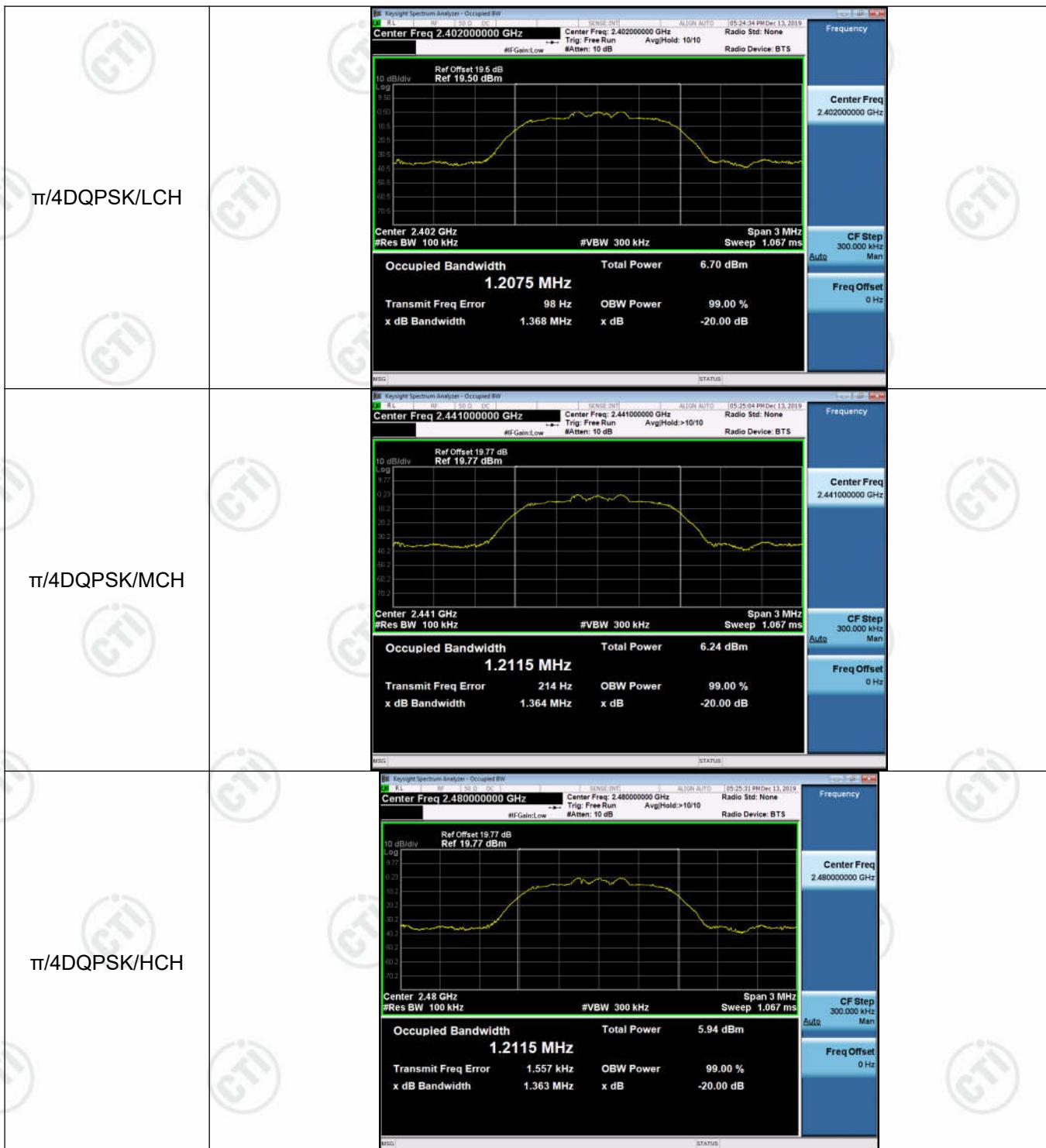
π/4DQPSK/LCH	 <p><b>Keysight Spectrum Analyzer - Occupied BW</b></p> <p>Center Freq: 2.402000000 GHz   Center: Free Run   Trig: Free Run   Avg/Hold:&gt;10/10   Radio Std: None   Radio Device: BTS</p> <p>Ref Offset 19.5 dB   Ref 19.50 dBm   #IFGain:Low   #Attenuation: 10 dB</p> <p>10 dB/div   Log   Span 3 MHz   Sweep 3.2 ms</p> <p>Center: 2.402 GHz   #Res BW: 30 kHz   #VBW: 100 kHz</p> <p>Occupied Bandwidth: 1.1833 MHz   Total Power: 4.68 dBm</p> <p>Transmit Freq Error: 2.860 kHz   OBW Power: 99.00 %</p> <p>x dB Bandwidth: 1.309 MHz   x dB: -20.00 dB</p> <p>MSG   STATUS</p>
π/4DQPSK/MCH	 <p><b>Keysight Spectrum Analyzer - Occupied BW</b></p> <p>Center Freq: 2.441000000 GHz   Center: Free Run   Trig: Free Run   Avg/Hold:&gt;10/10   Radio Std: None   Radio Device: BTS</p> <p>Ref Offset 19.77 dB   Ref 19.77 dBm   #IFGain:Low   #Attenuation: 10 dB</p> <p>10 dB/div   Log   Span 3 MHz   Sweep 3.2 ms</p> <p>Center: 2.441 GHz   #Res BW: 30 kHz   #VBW: 100 kHz</p> <p>Occupied Bandwidth: 1.1780 MHz   Total Power: 4.66 dBm</p> <p>Transmit Freq Error: 3.761 kHz   OBW Power: 99.00 %</p> <p>x dB Bandwidth: 1.307 MHz   x dB: -20.00 dB</p> <p>MSG   STATUS</p>
π/4DQPSK/HCH	 <p><b>Keysight Spectrum Analyzer - Occupied BW</b></p> <p>Center Freq: 2.480000000 GHz   Center: Free Run   Trig: Free Run   Avg/Hold:&gt;10/10   Radio Std: None   Radio Device: BTS</p> <p>Ref Offset 19.77 dB   Ref 19.77 dBm   #IFGain:Low   #Attenuation: 10 dB</p> <p>10 dB/div   Log   Span 3 MHz   Sweep 3.2 ms</p> <p>Center: 2.48 GHz   #Res BW: 30 kHz   #VBW: 100 kHz</p> <p>Occupied Bandwidth: 1.1785 MHz   Total Power: 4.32 dBm</p> <p>Transmit Freq Error: 3.581 kHz   OBW Power: 99.00 %</p> <p>x dB Bandwidth: 1.314 MHz   x dB: -20.00 dB</p> <p>MSG   STATUS</p>

**Test Result**

Mode	Channel.	20dB Bandwidth [MHz]	Verdict
GFSK	LCH	1.092	PASS
GFSK	MCH	1.095	PASS
GFSK	HCH	1.086	PASS
$\pi/4$ DQPSK	LCH	1.368	PASS
$\pi/4$ DQPSK	MCH	1.364	PASS
$\pi/4$ DQPSK	HCH	1.363	PASS

### Test Graph

Graphs	
GFSK/LCH	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq 2.402000000 GHz Ref Offset 19.5 dB Ref 19.50 dBm Center 2.402 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms Occupied Bandwidth 922.87 kHz Transmit Freq Error 3.821 kHz x dB Bandwidth 1.092 MHz Total Power 5.75 dBm OBW Power 99.00 % x dB 20.00 dB</p>
GFSK/MCH	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq 2.441000000 GHz Ref Offset 19.77 dB Ref 19.77 dBm Center 2.441 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms Occupied Bandwidth 924.24 kHz Transmit Freq Error 4.639 kHz x dB Bandwidth 1.095 MHz Total Power 5.38 dBm OBW Power 99.00 % x dB 20.00 dB</p>
GFSK/HCH	 <p>KeySight Spectrum Analyzer - Occupied BW Center Freq 2.480000000 GHz Ref Offset 19.77 dB Ref 19.77 dBm Center 2.48 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms Occupied Bandwidth 925.03 kHz Transmit Freq Error 2.862 kHz x dB Bandwidth 1.086 MHz Total Power 5.07 dBm OBW Power 99.00 % x dB 20.00 dB</p>



## Appendix B): Carrier Frequency Separation

### Test Limit

According to §15.247(a)(1),

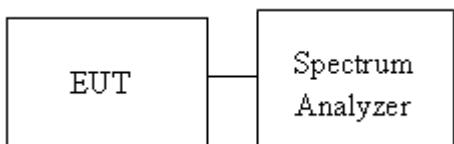
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

Limit	> two-thirds of the 20 dB bandwidth
-------	-------------------------------------

### 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 = 30kHz, VBW = 100kHz, Sweep = auto.  
Max hold, mark 3 peaks of hopping channel and record the 3 peaks frequency

### Test Setup

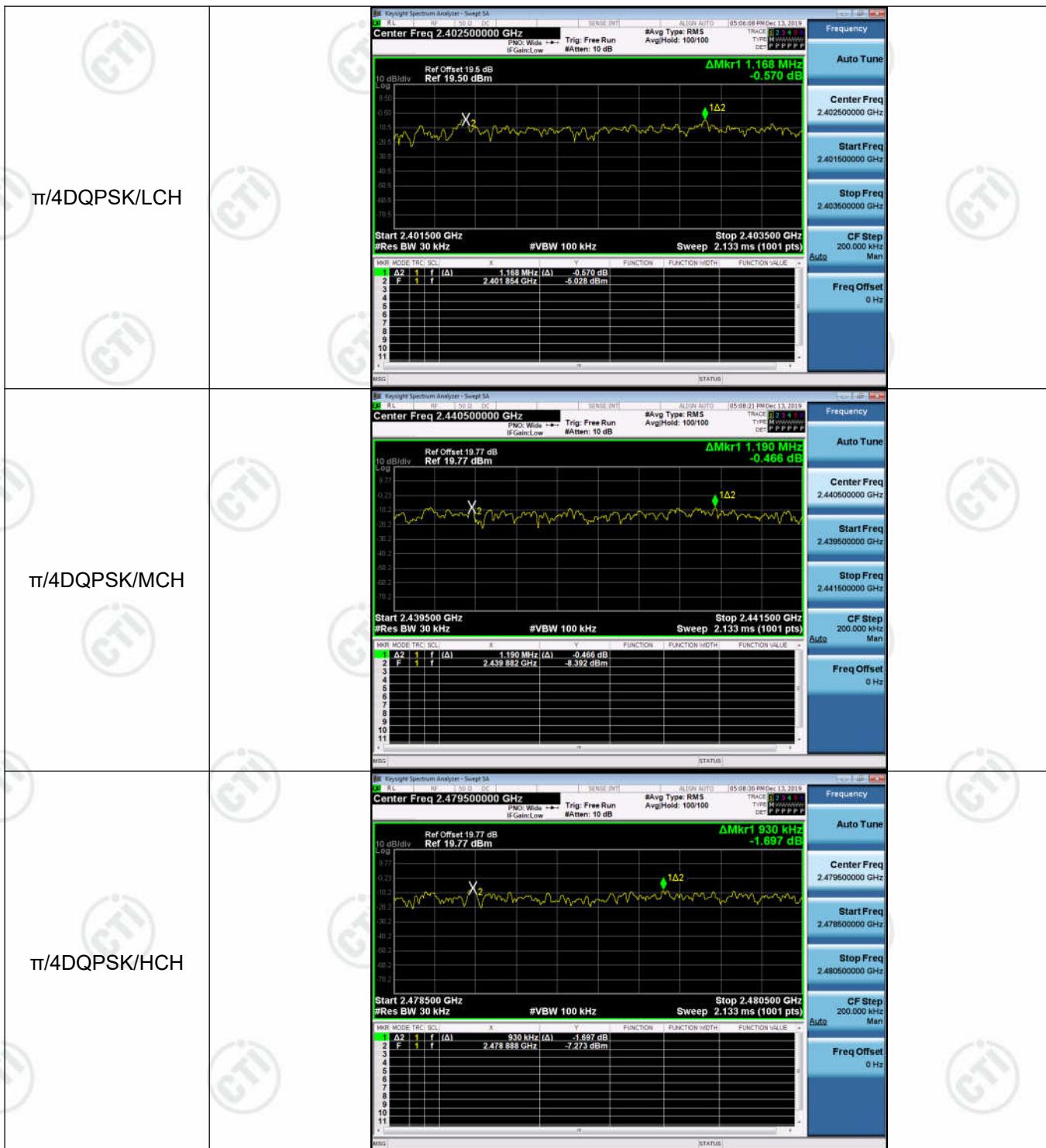


**Result Table**

Mode	Channel.	Carrier Frequency Separation [MHz]	Verdict
GFSK	LCH	1.106	PASS
GFSK	MCH	0.976	PASS
GFSK	HCH	1.072	PASS
$\pi/4$ DQPSK	LCH	1.168	PASS
$\pi/4$ DQPSK	MCH	1.190	PASS
$\pi/4$ DQPSK	HCH	0.930	PASS

### Test Graph





## Appendix C): Dwell Time

### Test Limit

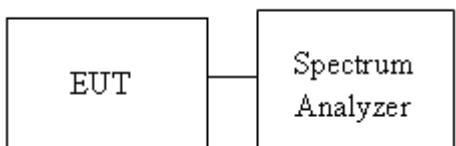
According to §15.247(a)(1)(iii),

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

### Test Procedure

1. EUT RF output port connected to the SA by RF cable.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Sweep = auto

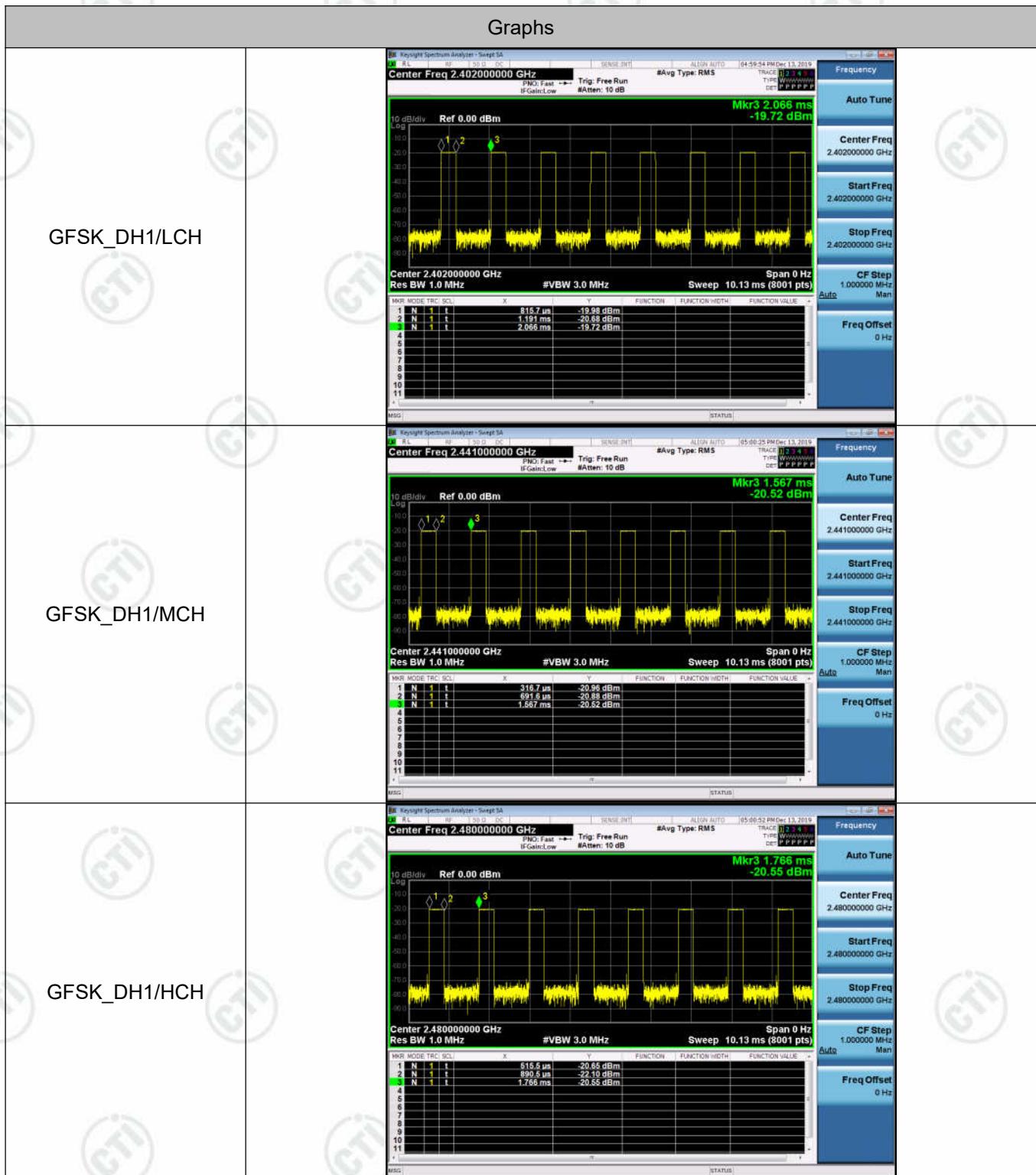
### Test Setup

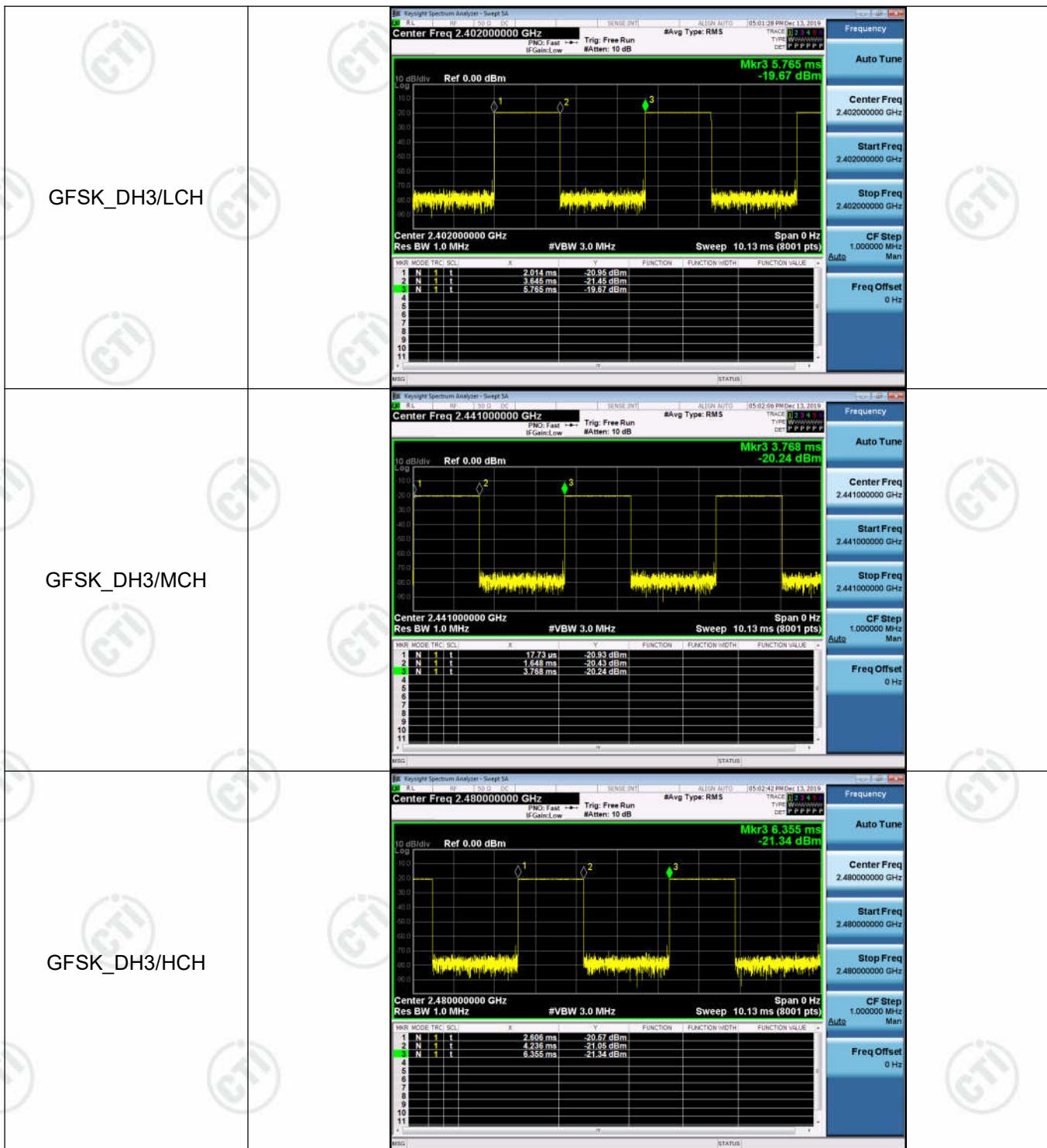


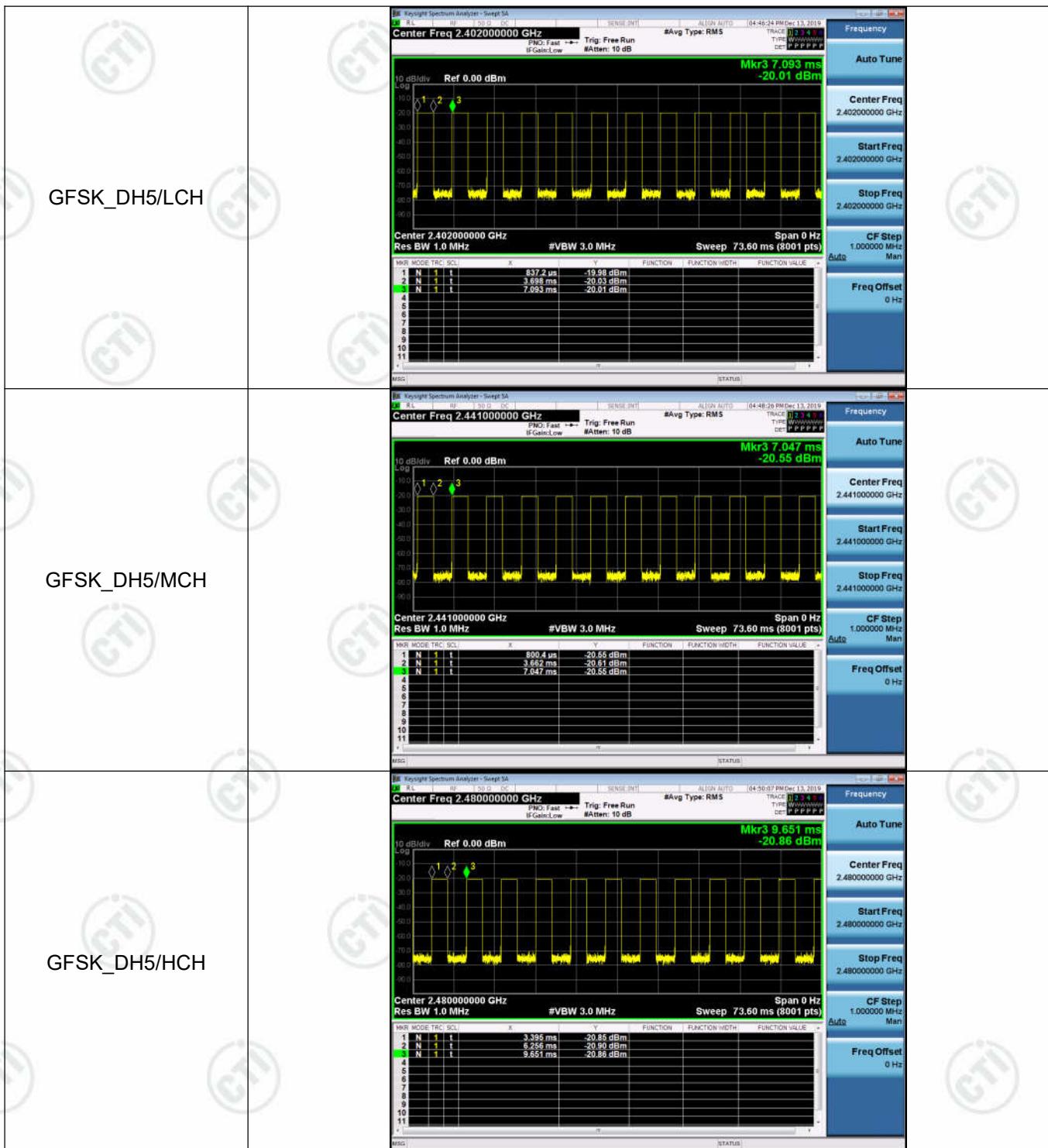
### Result Table

Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Duty Cycle [%]	Verdict
GFSK	DH1	LCH	0.374937	320	0.12	0.30	PASS
GFSK	DH1	MCH	0.374933	320	0.12	0.30	PASS
GFSK	DH1	HCH	0.374934	320	0.12	0.30	PASS
GFSK	DH3	LCH	1.6310	160	0.261	0.43	PASS
GFSK	DH3	MCH	1.6302	160	0.261	0.43	PASS
GFSK	DH3	HCH	1.6300	160	0.261	0.43	PASS
GFSK	DH5	LCH	2.8612	106.7	0.305	0.46	PASS
GFSK	DH5	MCH	2.8612	106.7	0.305	0.46	PASS
GFSK	DH5	HCH	2.8612	106.7	0.305	0.46	PASS

### Test Graph







## Appendix D): Hopping Channel Number

### Test Limit

According to §15.247(a)(1)(iii)

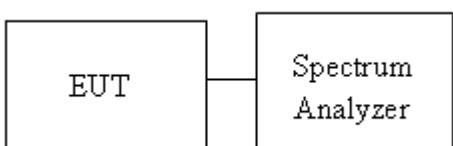
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 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.

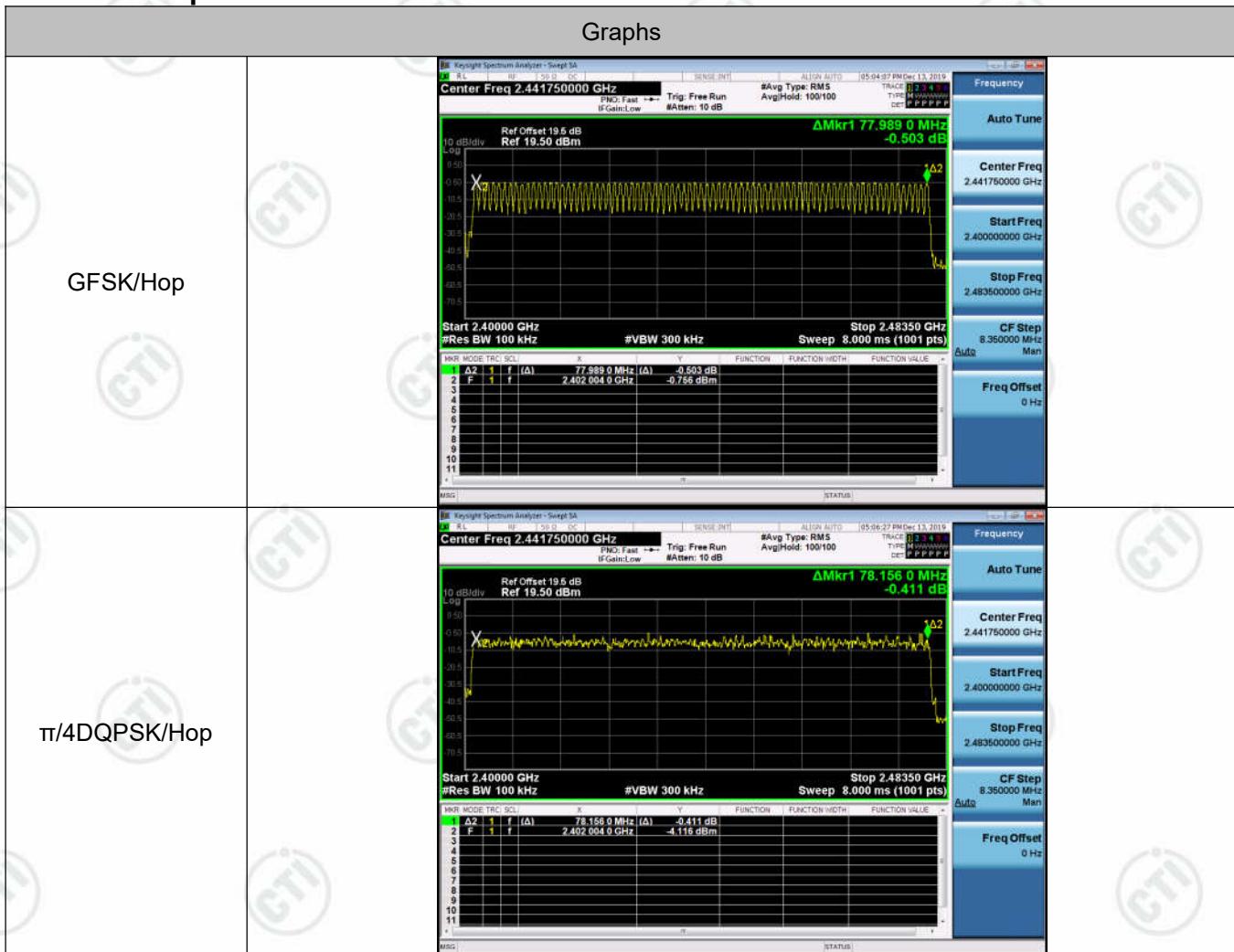
### Test Setup



**Result Table**

Mode	Channel.	Number of Hopping Channel	Verdict
GFSK	Hop	79	PASS
$\pi/4$ DQPSK	Hop	79	PASS

### Test Graph



## Appendix E): Conducted Peak Output Power Test Limit

According to §15.247(b)(1).

### 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.

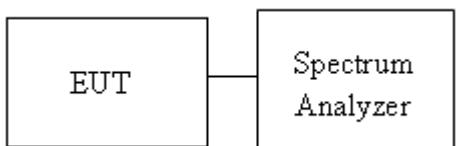
Limit	<input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 21dBm <input type="checkbox"/> Antenna with DG greater than 6 dBi : 21dBm [ Limit = 30 – (DG – 6) ]
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Average output power : For reporting purposes only.

### 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.

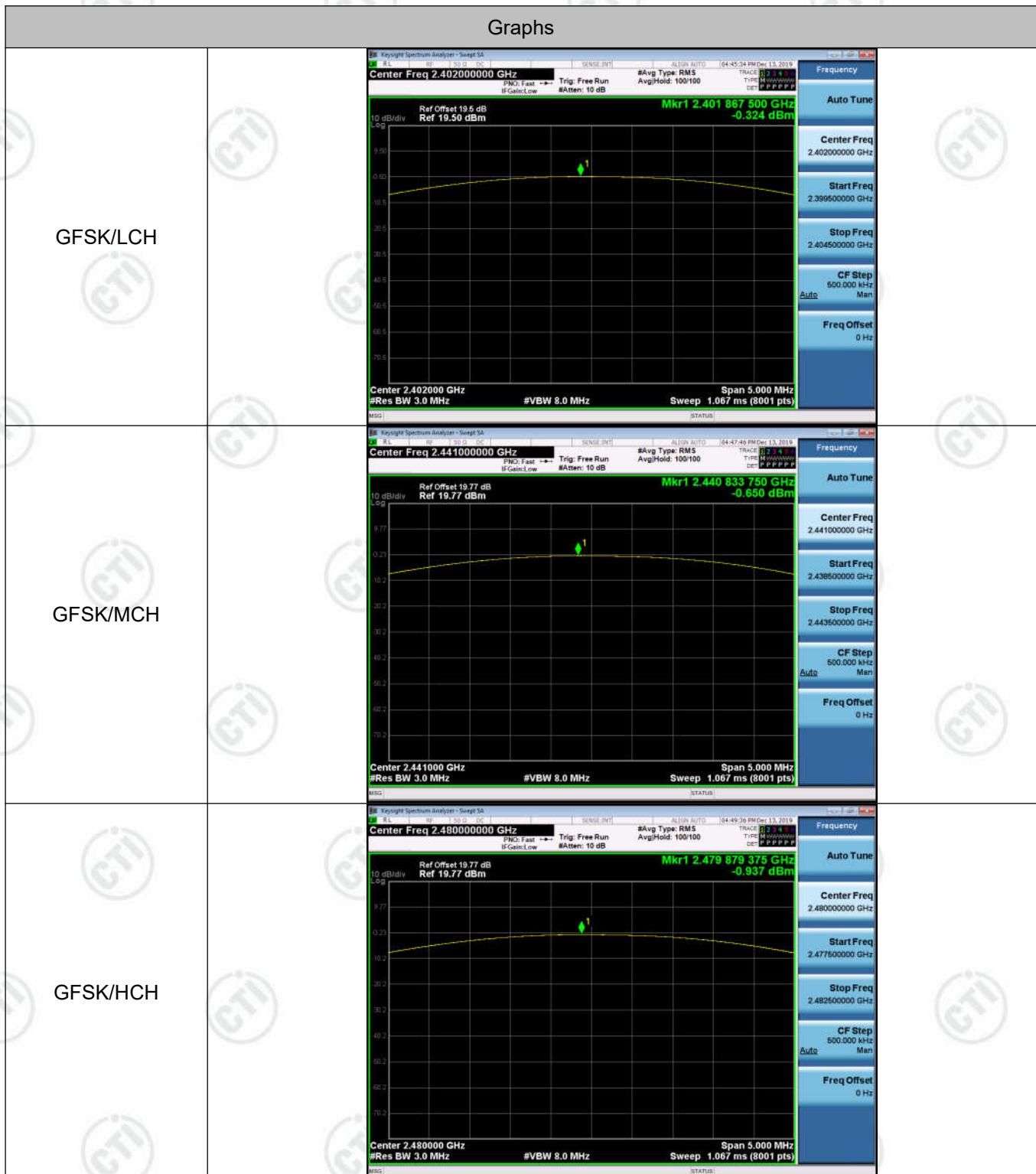
### Test Setup

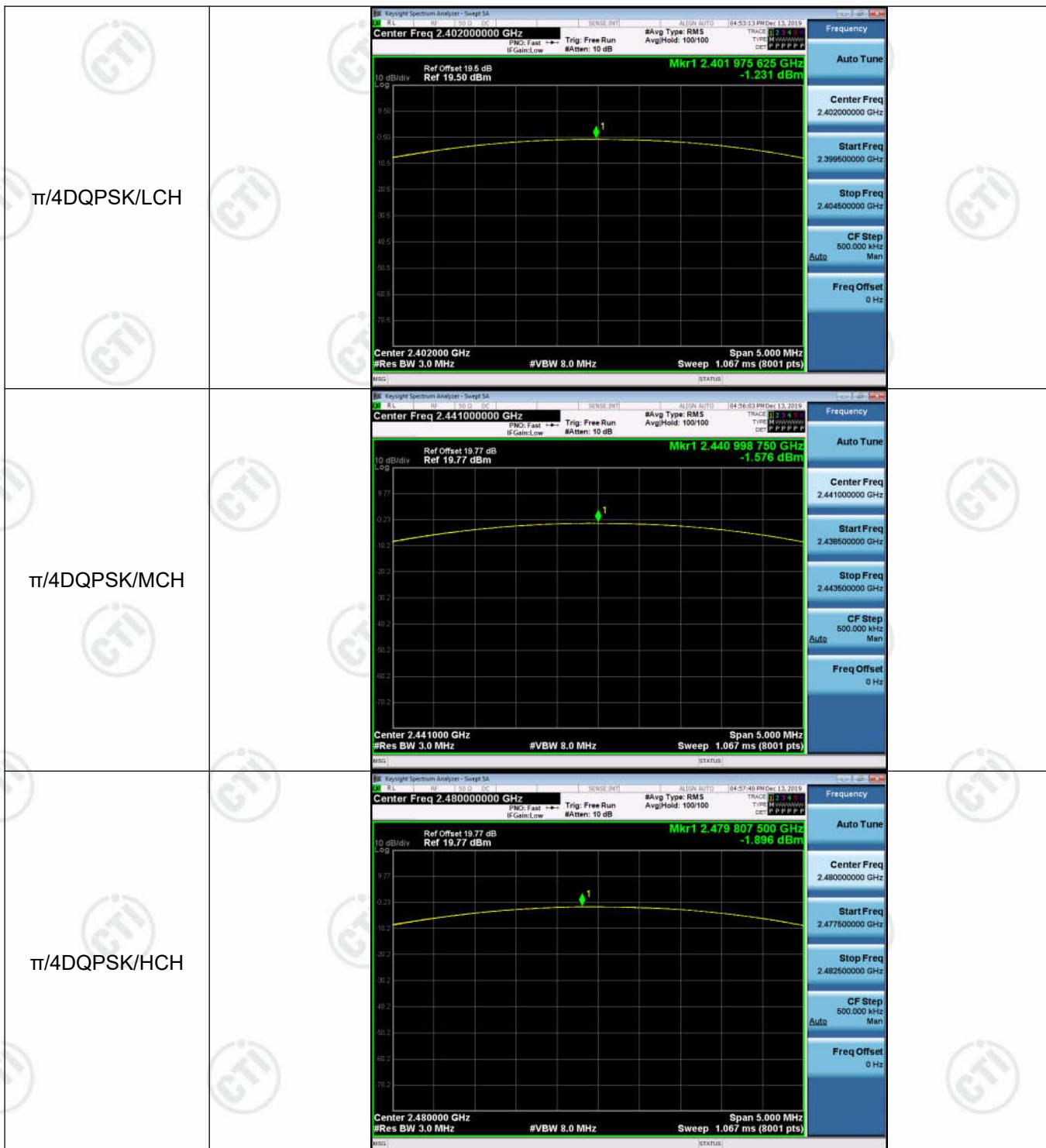


**Result Table**

Mode	Channel.	Maximum Peak Output Power [dBm]	Verdict
GFSK	LCH	-0.324	PASS
GFSK	MCH	-0.650	PASS
GFSK	HCH	-0.937	PASS
$\pi/4$ DQPSK	LCH	-1.231	PASS
$\pi/4$ DQPSK	MCH	-1.576	PASS
$\pi/4$ DQPSK	HCH	-1.896	PASS

### Test Graph





## Appendix F): Band-edge for RF Conducted Emissions

### Test Limit

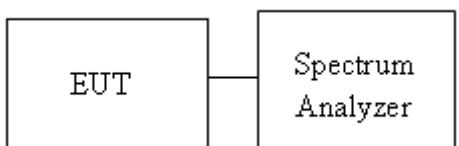
According to §15.247(d),

Limit	-20 dBc
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### 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 normal hopping mode.

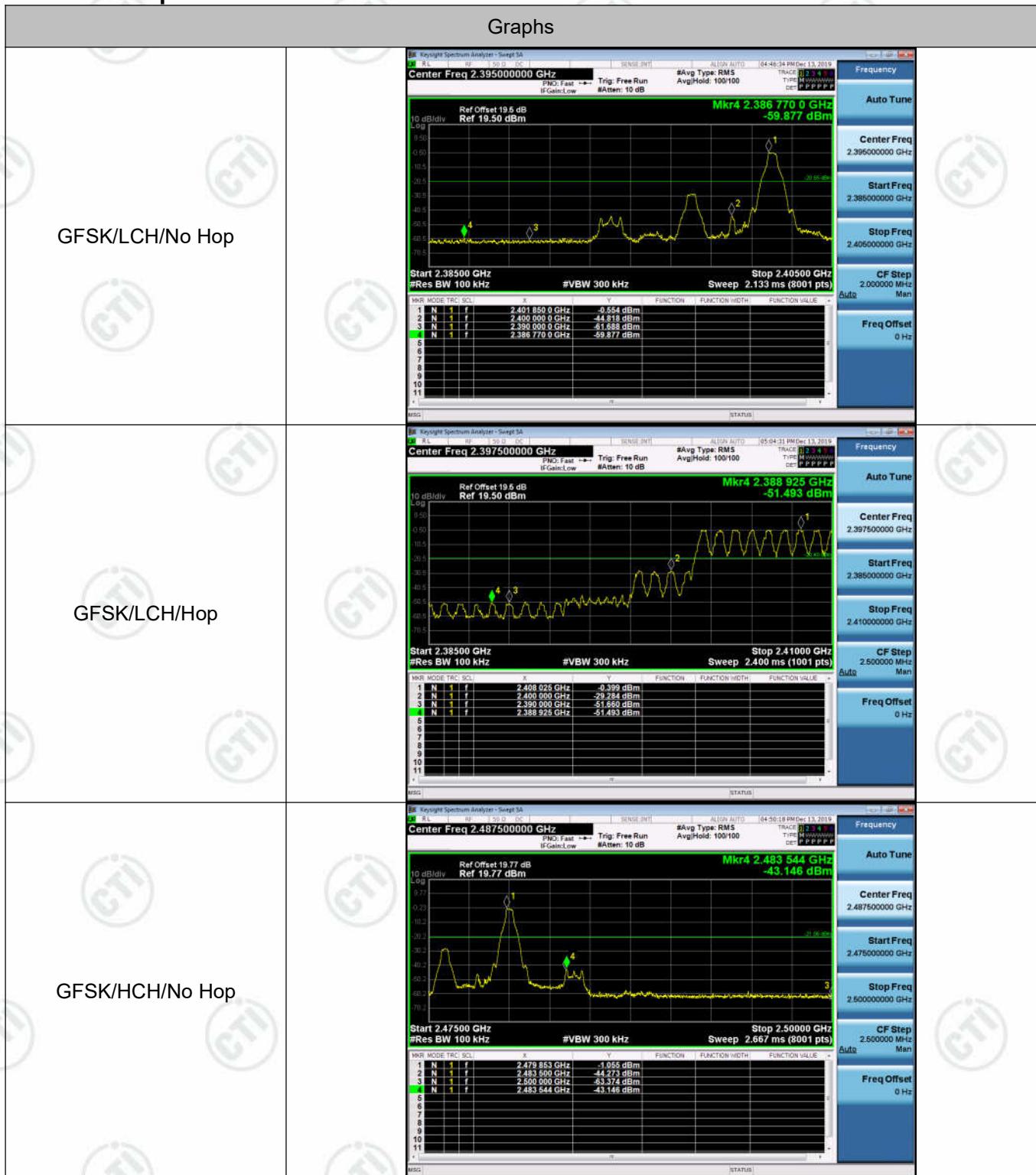
### Test Setup



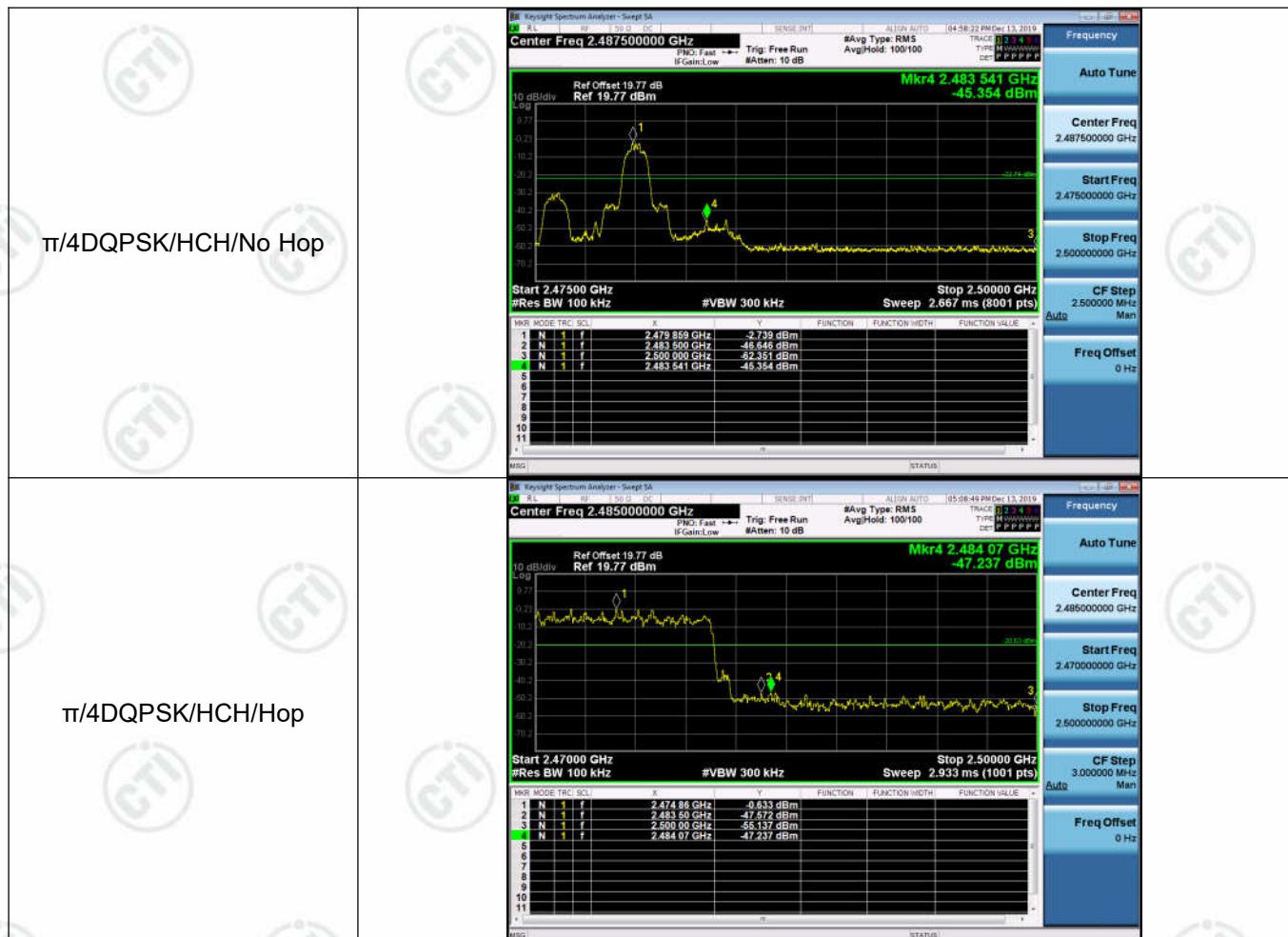
**Result Table**

Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-0.554	Off	-59.877	-20.55	PASS
			-0.399	On	-51.493	-20.4	PASS
GFSK	HCH	2480	-1.055	Off	-43.146	-21.06	PASS
			-0.483	On	-44.197	-20.48	PASS
$\pi/4$ DQPSK	LCH	2402	-2.206	Off	-59.729	-22.21	PASS
			-0.121	On	-51.260	-20.12	PASS
$\pi/4$ DQPSK	HCH	2480	-2.739	Off	-45.354	-22.74	PASS
			-0.633	On	-47.237	-20.63	PASS

## Test Graph







## Appendix G): RF Conducted Spurious Emissions

Test Limit

According to §15.247(d),

Limit	-20 dBc
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### 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.

### Test Setup



**Result Table**

Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
GFSK	LCH	-0.434	<Limit	PASS
GFSK	MCH	-0.816	<Limit	PASS
GFSK	HCH	-1.018	<Limit	PASS
$\pi/4$ DQPSK	LCH	-2.242	<Limit	PASS
$\pi/4$ DQPSK	MCH	-2.537	<Limit	PASS
$\pi/4$ DQPSK	HCH	-2.862	<Limit	PASS