

# TEST REPORT

**FCC ID: 2ANXU-LBT-120**

**Product: USB Direct Recording Turntable with BT Transmitter**

**Model No.: LBT-120BK(CA)**

**Additional Model No.: LBT-120WH(CA), TT208**

**Trade Mark: Lenco**

**Report No.: TCT180619E025**

**Issued Date: Jul. 02, 2018**

Issued for:

**Shenzhen Jiayinking Technology Holding Company Limited  
No.11, 11-1, Anye Road, Anliang village, Yuanshan Town, Longgang District,  
Shenzhen, Guangdong, 518000 China**

Issued By:

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**Appendix A: Photographs of Test Setup****Appendix B: Photographs of EUT**

## 1. Test Certification

<b>Product:</b>	USB Direct Recording Turntable with BT Transmitter
<b>Model No.:</b>	LBT-120BK(CA)
<b>Additional Model:</b>	LBT-120WH(CA), TT208
<b>Trade Mark:</b>	Lenco
<b>Applicant:</b>	Shenzhen Jiayinking Technology Holding Company Limited
<b>Address:</b>	No.11, 11-1, Anye Road, Anliang village, Yuanshan Town, Longgang District, Shenzhen, Guangdong, 518000 China
<b>Manufacturer:</b>	Shenzhen Jiayinking Technology Holding Company Limited
<b>Address:</b>	No.11, 11-1, Anye Road, Anliang village, Yuanshan Town, Longgang District, Shenzhen, Guangdong, 518000 China
<b>Date of Test:</b>	Jun. 20, 2018 – Jun. 29, 2018
<b>Applicable Standards:</b>	FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:

*Jerry Xie*

Date:

*Jun. 29, 2018*

Reviewed By:

*Beryl Zhao*

Date:

*Jul. 02, 2018*

Approved By:

*Tomsin*

Date:

*Jul. 02, 2018*

## 2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(1) §2.1046	PASS
20dB Occupied Bandwidth	§15.247 (a)(1) §2.1049	PASS
Carrier Frequencies Separation	§15.247 (a)(1)	PASS
Hopping Channel Number	§15.247 (a)(1)	PASS
Dwell Time	§15.247 (a)(1)	PASS
Radiated Emission	§15.205/§15.209 §2.1053, §2.1057	PASS
Band Edge	§15.247(d) §2.1051, §2.1057	PASS

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 3. EUT Description

<b>Product Name:</b>	USB Direct Recording Turntable with BT Transmitter
<b>Model :</b>	LBT-120BK(CA)
<b>Additional Model:</b>	LBT-120WH(CA), TT208
<b>Trade Mark:</b>	<b>Lenco</b>
<b>Hardware Version:</b>	LBT-120 V1.0
<b>Software Version:</b>	V1.0
<b>Bluetooth version:</b>	V4.0
<b>Operation Frequency:</b>	2402MHz~2480MHz
<b>Transfer Rate:</b>	1/2/3 Mbits/s
<b>Number of Channel:</b>	79
<b>Modulation Type:</b>	GFSK, π/4-DQPSK, 8DPSK
<b>Modulation Technology:</b>	FHSS
<b>Antenna Type:</b>	PCB Antenna
<b>Antenna Gain:</b>	0dBi
<b>Power Supply:</b>	AC 120V/60Hz
<b>AC adapter:</b>	Adapter Information 1: MODEL: GKYPL0100120US1 INPUT: AC 100-240V, 50/60Hz, 0.5A OUTPUT: 12V, 1000mA Adapter Information 2: MODEL: BSYB120100U W INPUT: AC 100-240V, 50/60Hz, 0.4A OUTPUT: 12V, 1.0A Adapter Information 3: MODEL: RHD20W120100 INPUT: AC 100-240V, 50/60Hz, 1.5A OUTPUT: 12V, 1000mA
<b>Remark:</b>	1. All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement. 2. All adapters are tested, and the worst result (adapter1) is recorded in the report.

**Operation Frequency each of channel for GFSK, π/4-DQPSK, 8DPSK**

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
...	...	...	...	...	...	...	...
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
...	...	...	...	...	...	...	...
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		-

Remark: Channel 0, 39 & 78 have been tested for GFSK, π/4-DQPSK, 8DPSK modulation mode.

## 4. General Information

### 4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery
<p>The sample was placed 0.8m &amp; 1.5m for the measurement below &amp; above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y &amp; Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

### 4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

#### Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

## 5. Facilities and Accreditations

### 5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

Tel: 86-755-27673339

### 5.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

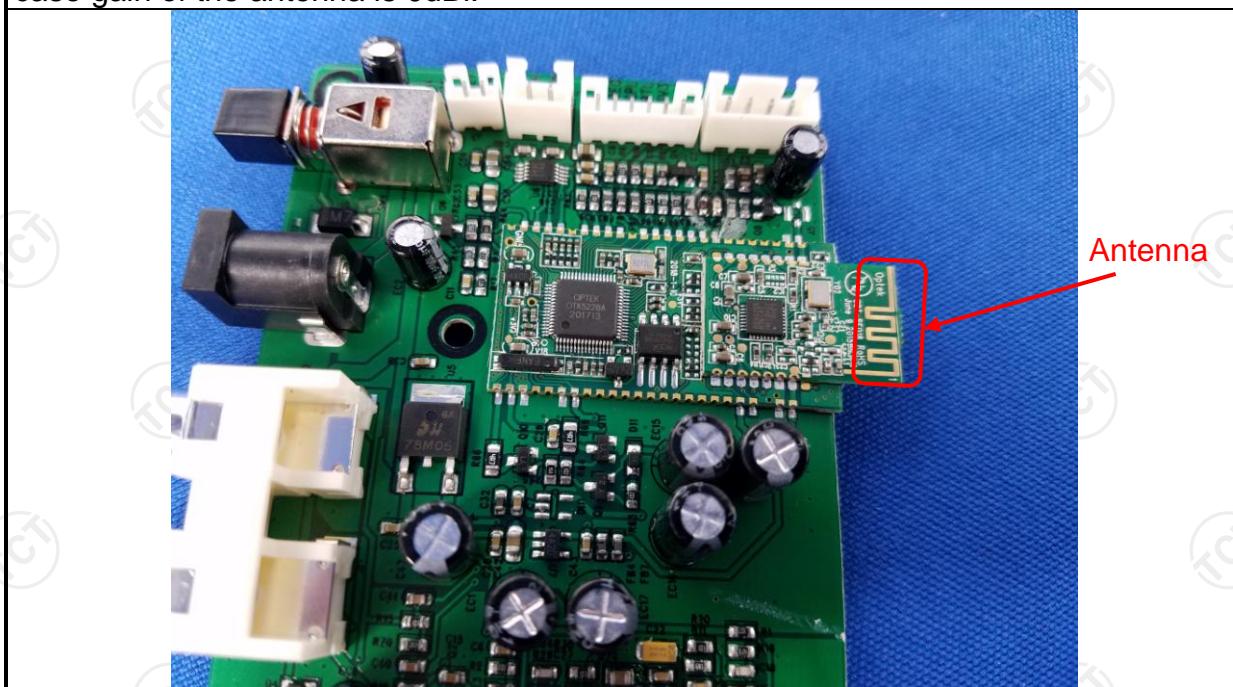
## 6. Test Results and Measurement Data

### 6.1. Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	

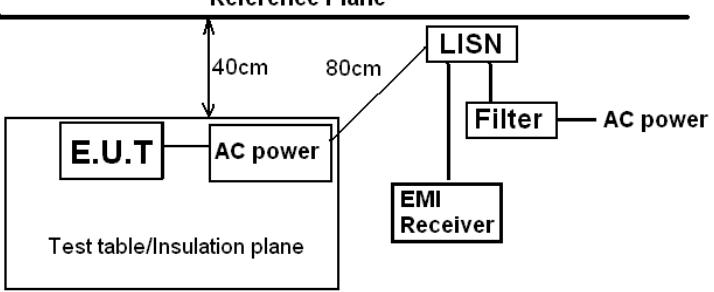
**E.U.T Antenna:**

The Bluetooth antenna is PCB antenna which permanently attached, and the best case gain of the antenna is 0dBi.



## 6.2. Conducted Emission

### 6.2.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.207														
<b>Test Method:</b>	ANSI C63.10:2013														
<b>Frequency Range:</b>	150 kHz to 30 MHz														
<b>Receiver setup:</b>	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
<b>Limits:</b>	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
<b>Test Setup:</b>	<p>Reference Plane</p>  <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
<b>Test Mode:</b>	Refer to item 4.1														
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</li> </ol>														
<b>Test Result:</b>	PASS														

### 6.2.2. Test Instruments

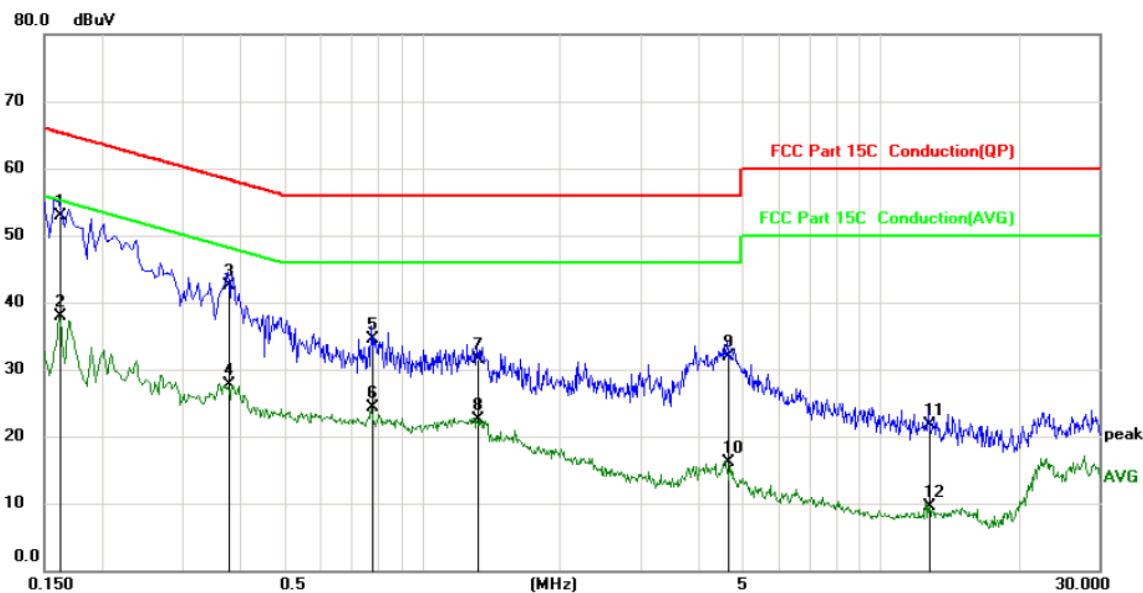
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Sep. 27, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



### 6.2.3. Test data

Please refer to following diagram for individual  
**Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)**



Site				Phase:	<b>L1</b>	Temperature:	25	
Limit: FCC Part 15C Conduction(QP)				Power:	AC 120V/60Hz	Humidity:	55 %	
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dB $\mu$ V	dB	dB $\mu$ V	dB	Detector	Comment
1	*	0.1620	41.50	11.49	52.99	65.36	-12.37	QP
2		0.1620	26.34	11.49	37.83	55.36	-17.53	AVG
3		0.3780	31.10	11.37	42.47	58.32	-15.85	QP
4		0.3780	16.36	11.37	27.73	48.32	-20.59	AVG
5		0.7780	23.20	11.22	34.42	56.00	-21.58	QP
6		0.7780	13.03	11.22	24.25	46.00	-21.75	AVG
7		1.3220	20.10	11.37	31.47	56.00	-24.53	QP
8		1.3220	11.17	11.37	22.54	46.00	-23.46	AVG
9		4.6420	21.20	10.75	31.95	56.00	-24.05	QP
10		4.6420	5.39	10.75	16.14	46.00	-29.86	AVG
11		12.7299	10.30	11.50	21.80	60.00	-38.20	QP
12		12.7299	-1.96	11.50	9.54	50.00	-40.46	AVG

**Note:**

Freq. = Emission frequency in MHz

Reading level (dB $\mu$ V) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dB $\mu$ V) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Limit (dB $\mu$ V) = Limit stated in standard

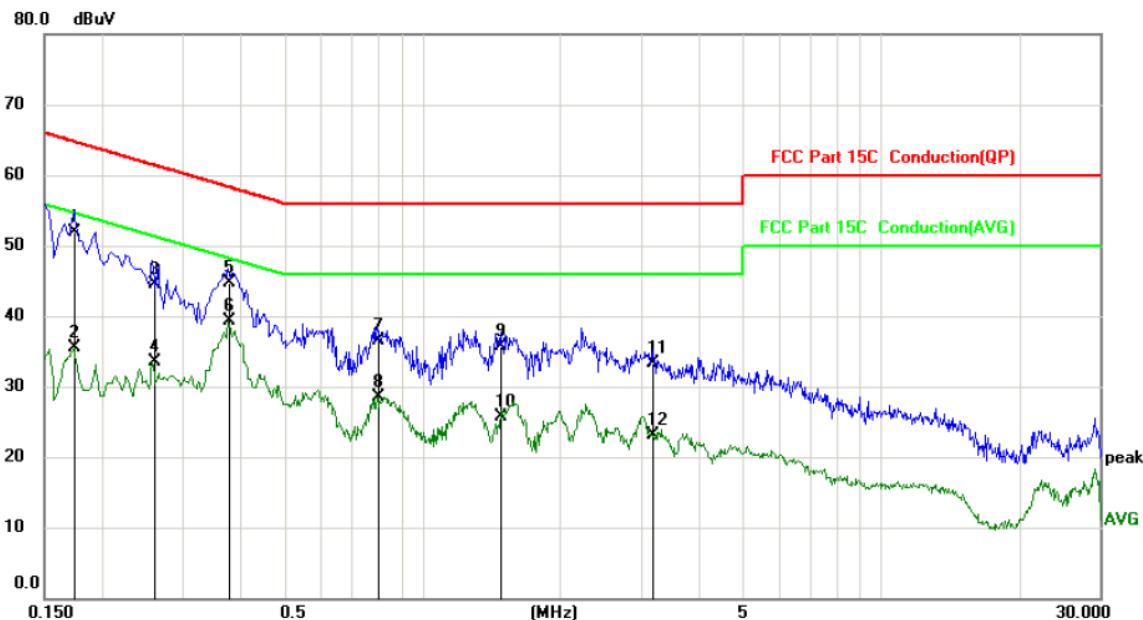
Margin (dB) = Measurement (dB $\mu$ V) – Limits (dB $\mu$ V)

Q.P. =Quasi-Peak

AVG =average

\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz

**Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)**



Site				Phase: <i>N</i>		Temperature: 25		
Limit: FCC Part 15C Conduction(QP)				Power: AC 120V/60Hz		Humidity: 55 %		
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dB	Detector	Comment
1		0.1749	40.40	11.48	51.88	64.72	-12.84	QP
2		0.1749	23.93	11.48	35.41	54.72	-19.31	AVG
3		0.2589	33.00	11.44	44.44	61.47	-17.03	QP
4		0.2589	22.14	11.44	33.58	51.47	-17.89	AVG
5		0.3780	33.30	11.37	44.67	58.32	-13.65	QP
6	*	0.3780	27.94	11.37	39.31	48.32	-9.01	AVG
7		0.7980	25.30	11.22	36.52	56.00	-19.48	QP
8		0.7980	17.33	11.22	28.55	46.00	-17.45	AVG
9		1.4819	24.20	11.44	35.64	56.00	-20.36	QP
10		1.4819	14.20	11.44	25.64	46.00	-20.36	AVG
11		3.1780	22.00	11.28	33.28	56.00	-22.72	QP
12		3.1780	11.89	11.28	23.17	46.00	-22.83	AVG

**Note1:**

Freq. = Emission frequency in MHz

Reading level (dB $\mu$ V) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dB $\mu$ V) = Reading level (dB $\mu$ V) + Corr. Factor (dB)

Limit (dB $\mu$ V) = Limit stated in standard

Margin (dB) = Measurement (dB $\mu$ V) – Limits (dB $\mu$ V)

Q.P. =Quasi-Peak AVG =average

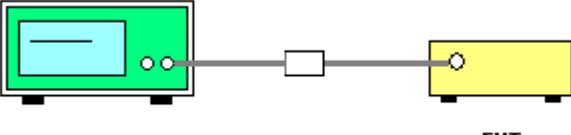
\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

**Note2:**

Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4DQPSK, 8DPSK), and the worst case Mode (Highest channel and 8DPSK) was submitted only.

## 6.3. Conducted Output Power

### 6.3.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (b)(3)
<b>Test Method:</b>	ANSI C63.10:2013
<b>Limit:</b>	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) 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.
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>      <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured $VBW \geq RBW$ Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
<b>Test Result:</b>	PASS

### 6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.3.3. Test Data

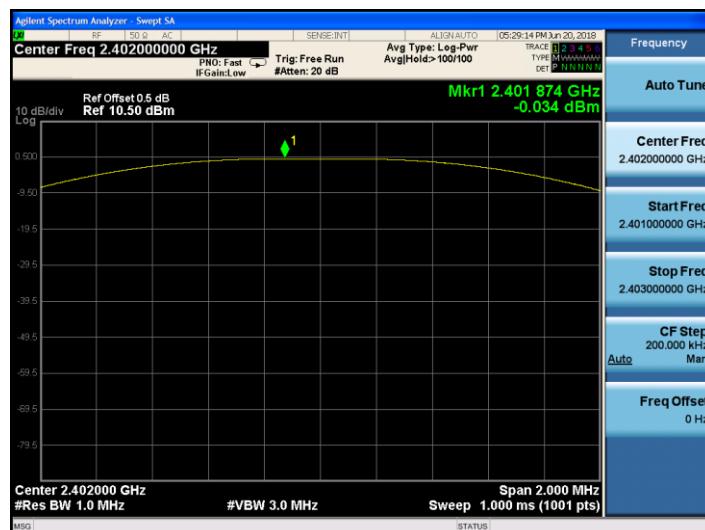
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-0.03	30.00	PASS
Middle	2.58	30.00	PASS
Highest	3.46	30.00	PASS

Pi/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.36	21.00	PASS
Middle	3.96	21.00	PASS
Highest	4.80	21.00	PASS

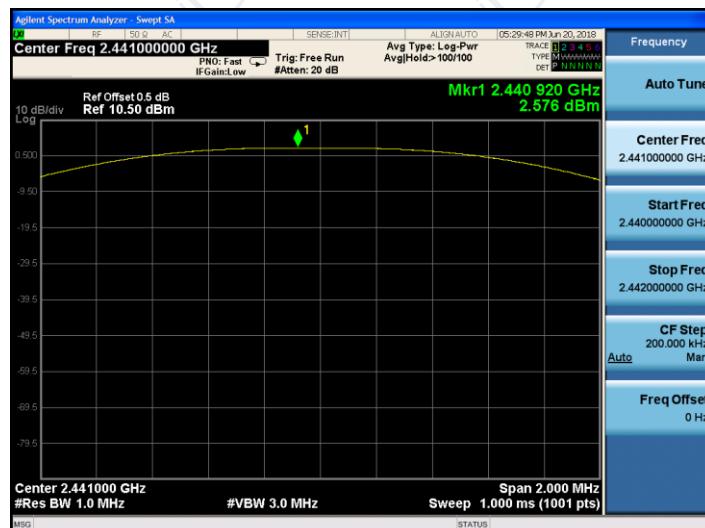
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.55	21.00	PASS
Middle	4.17	21.00	PASS
Highest	4.95	21.00	PASS

Test plots as follows:

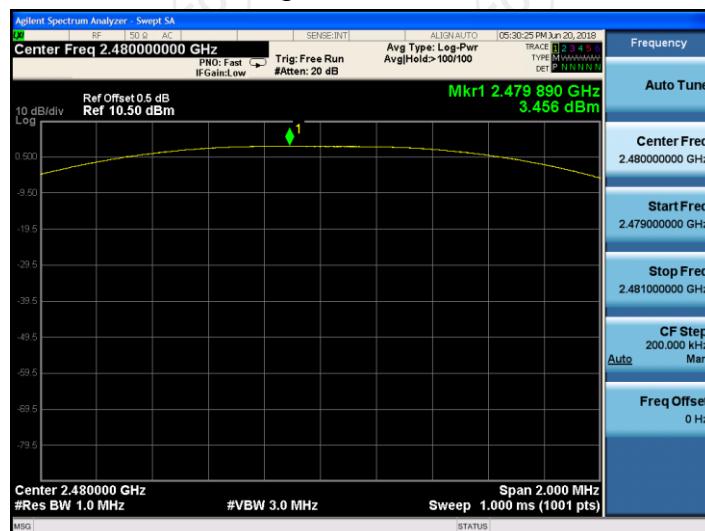
### Lowest channel



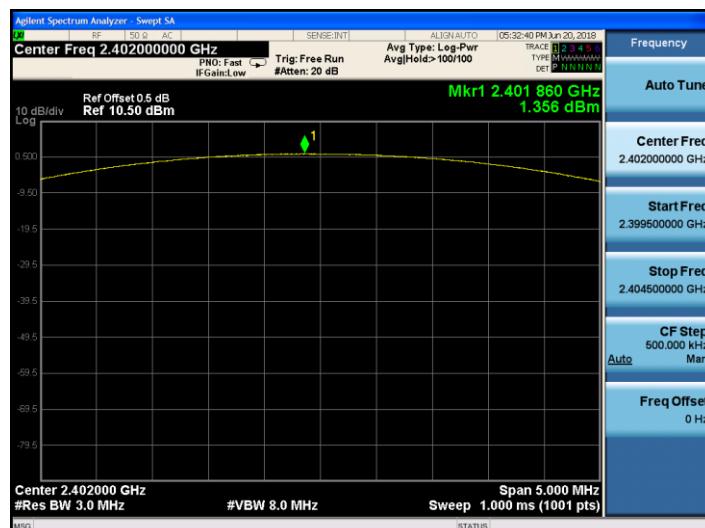
### Middle channel



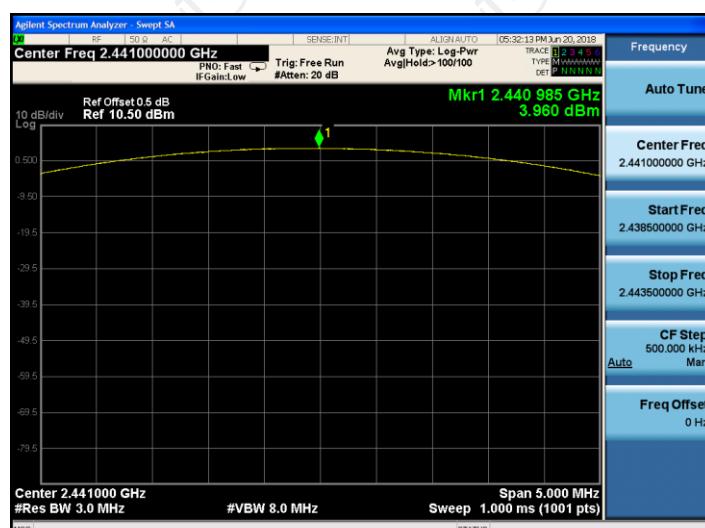
### Highest channel



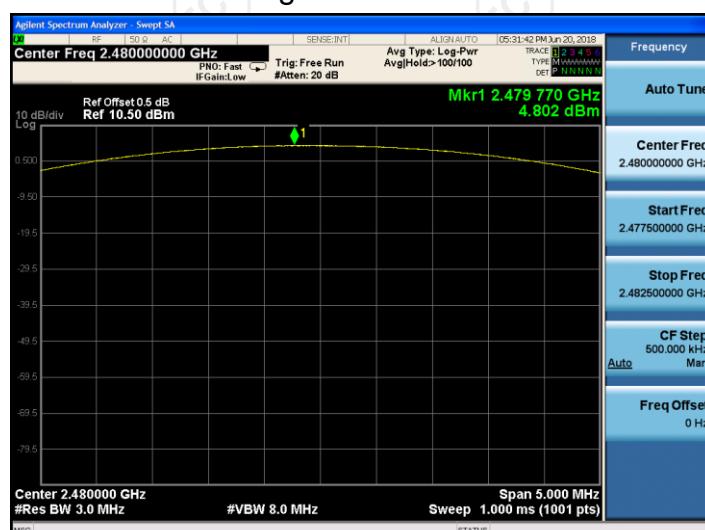
### Lowest channel



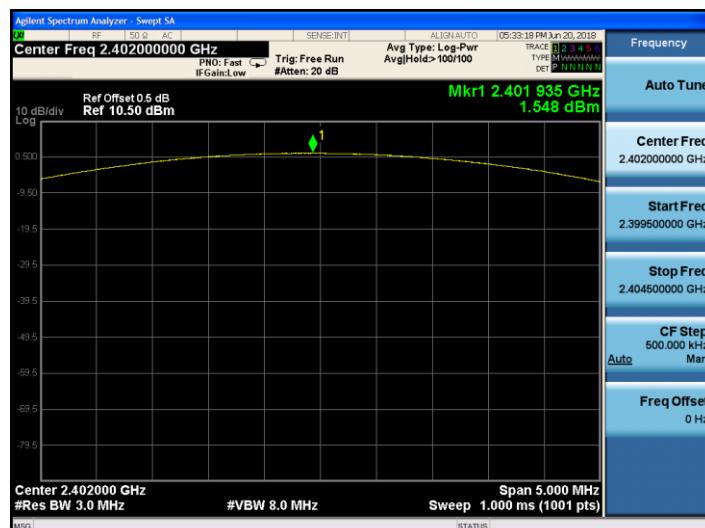
### Middle channel



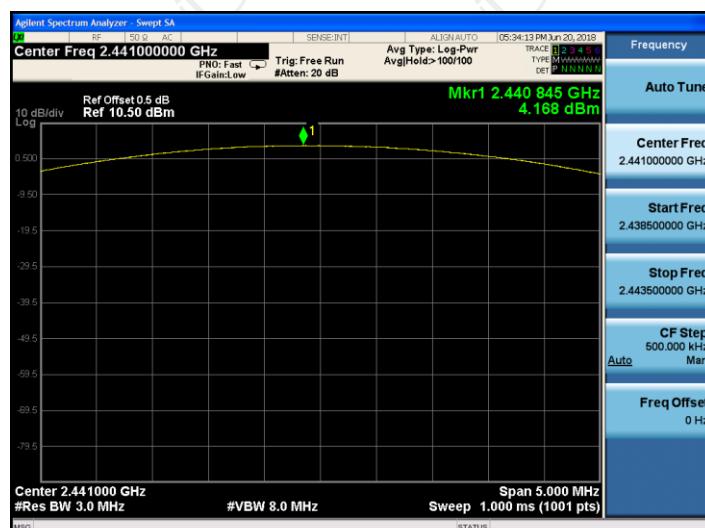
### Highest channel



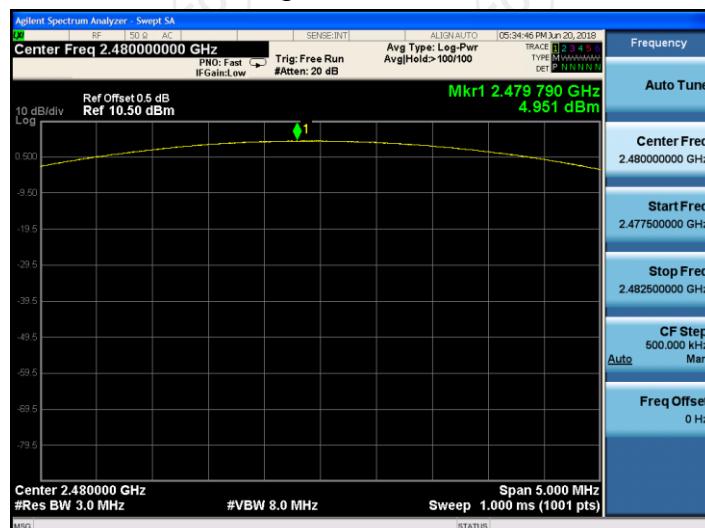
### Lowest channel



### Middle channel



### Highest channel



## 6.4. 20dB Occupy Bandwidth

### 6.4.1. Test Specification

## 6.4.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.4.3. Test data**

Test channel	20dB Occupy Bandwidth (kHz)			
	GFSK	$\pi/4$ -DQPSK	8DPSK	Conclusion
Lowest	913.7	1226	1274	PASS
Middle	925.8	1240	1269	PASS
Highest	898.2	1217	1281	PASS

**Test plots as follows:**

## Lowest channel



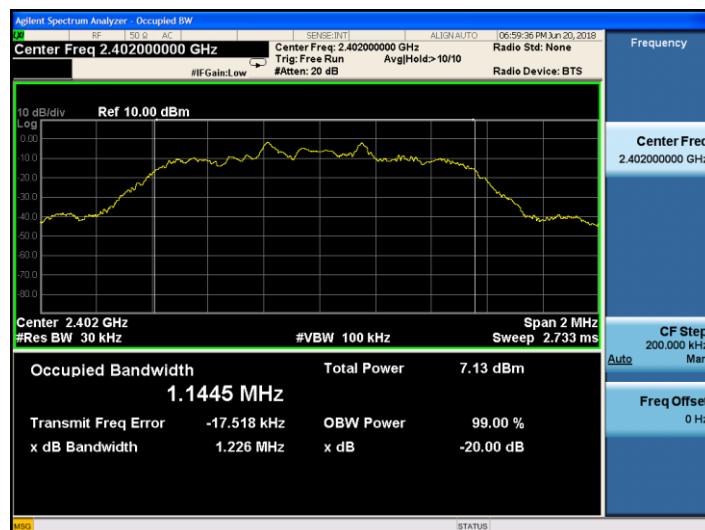
## Middle channel



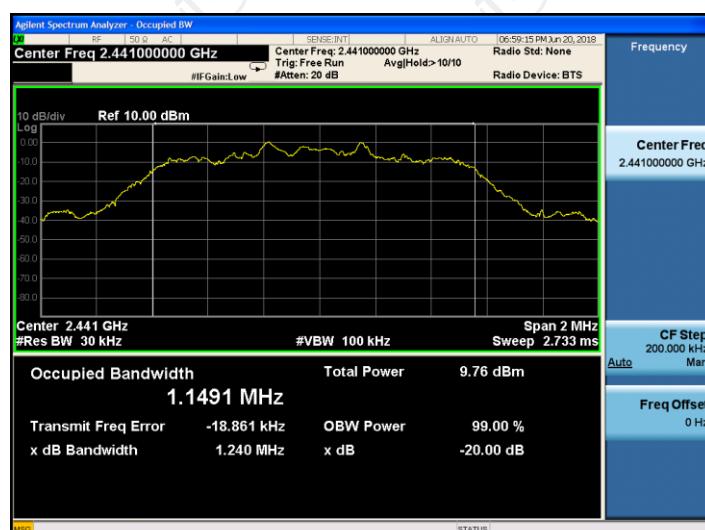
## Highest channel



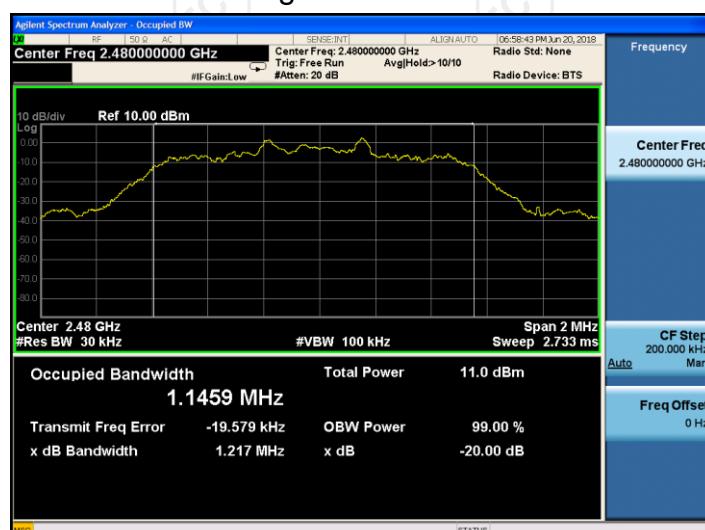
## Lowest channel



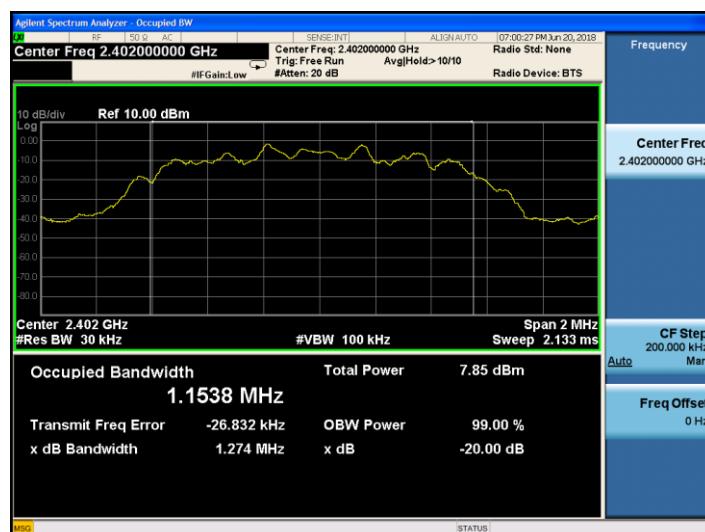
## Middle channel



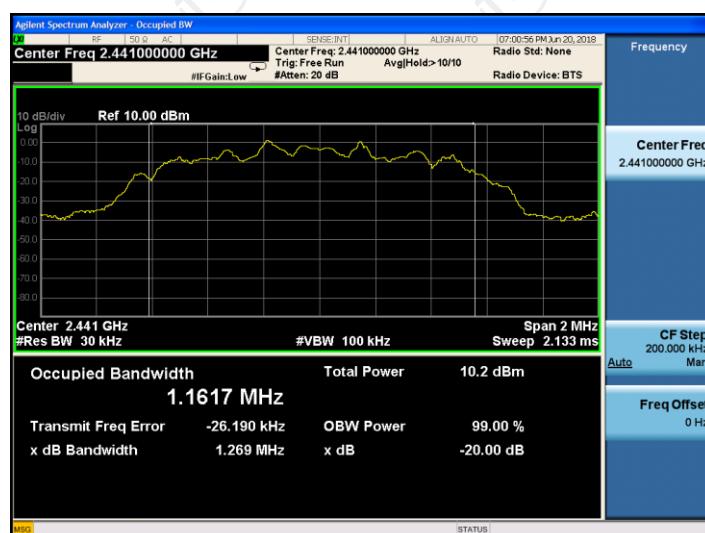
## Highest channel



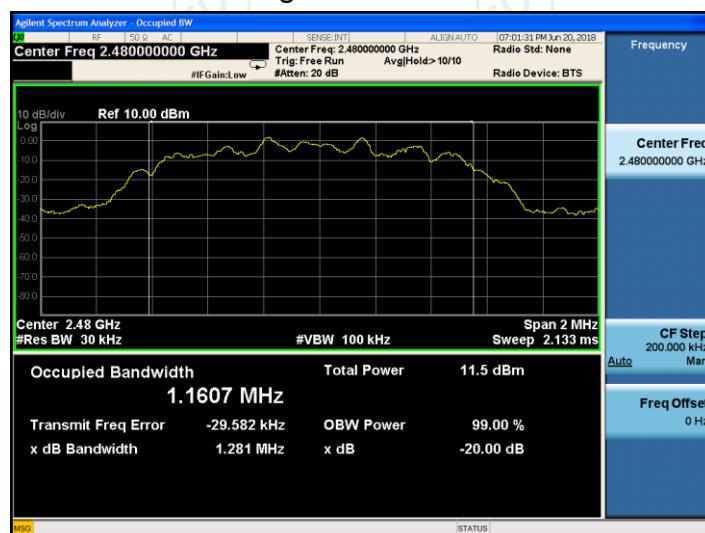
### Lowest channel



### Middle channel



### Highest channel



## 6.5. Carrier Frequencies Separation

### 6.5.1. Test Specification

## 6.5.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.5.3. Test data**

GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	925.80	PASS
Middle	1002	925.80	PASS
Highest	1000	925.80	PASS

Pi/4DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1005	826.67	PASS
Middle	1008	826.67	PASS
Highest	998	826.67	PASS

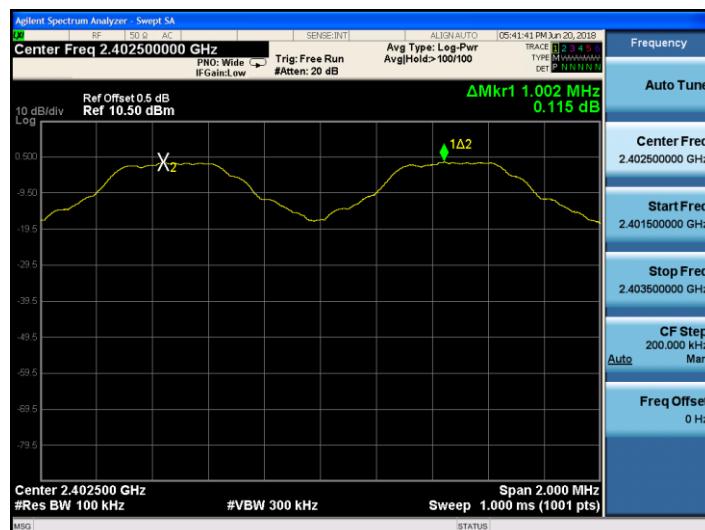
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	854.00	PASS
Middle	996	854.00	PASS
Highest	999	854.00	PASS

**Note: According to section 6.4**

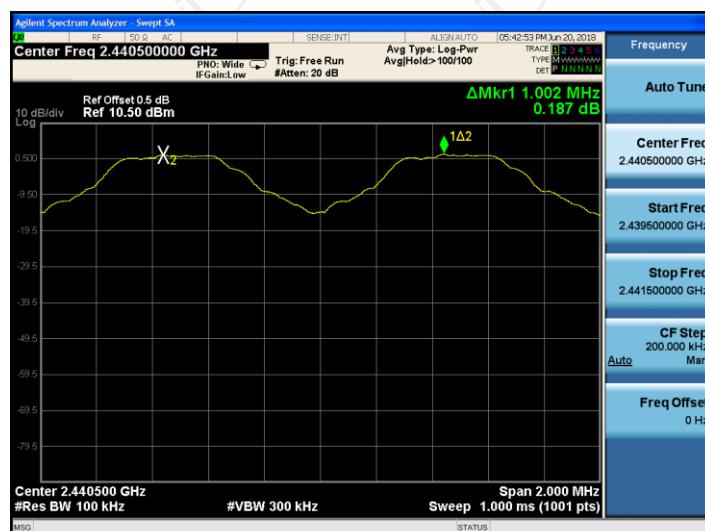
Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	925.8	925.80
$\pi/4$ -DQPSK	1240	826.67
8DPSK	1281	854.00

**Test plots as follows:**

### Lowest channel



### Middle channel



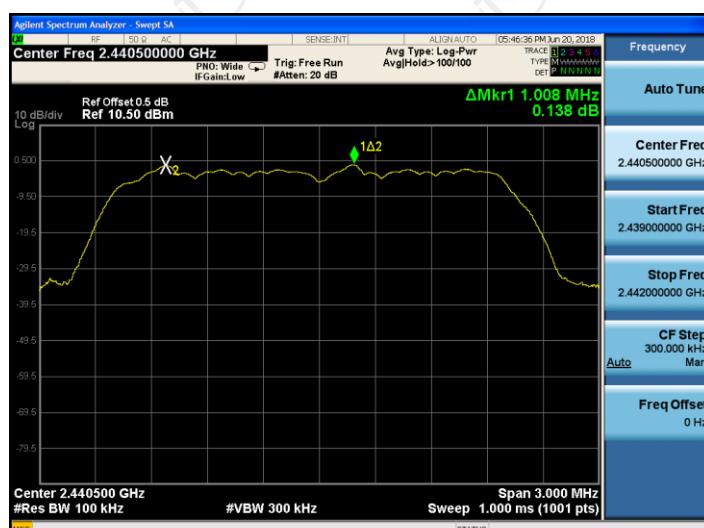
### Highest channel



### Lowest channel



## Middle channel



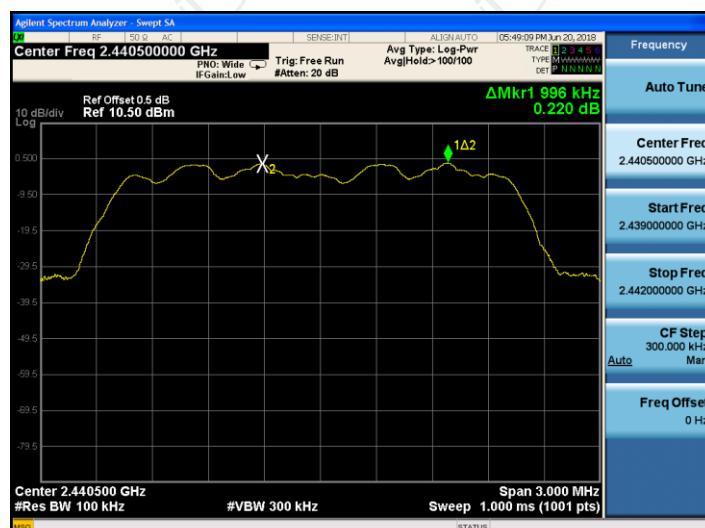
## Highest channel



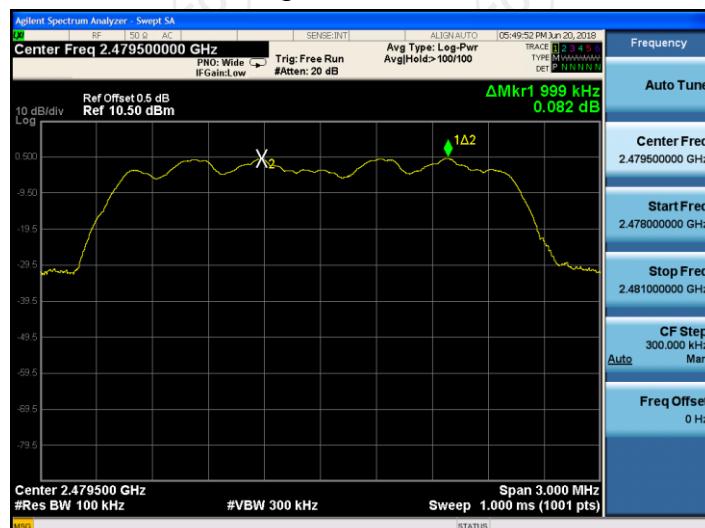
### Lowest channel



## Middle channel

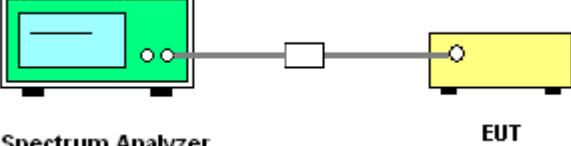


## Highest channel



## 6.6. Hopping Channel Number

### 6.6.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (a)(1)
<b>Test Method:</b>	ANSI C63.10:2013
<b>Limit:</b>	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                    <b>EUT</b></p>
<b>Test Mode:</b>	Hopping mode
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The testing follows ANSI C63.10:2013 Measurement Guidelines.</li> <li>2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>3. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>4. Enable the EUT hopping function.</li> <li>5. Use the following spectrum analyzer settings: Span = the frequency band of operation; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>6. The number of hopping frequency used is defined as the number of total channel.</li> <li>7. Record the measurement data in report.</li> </ol>
<b>Test Result:</b>	PASS

## 6.6.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

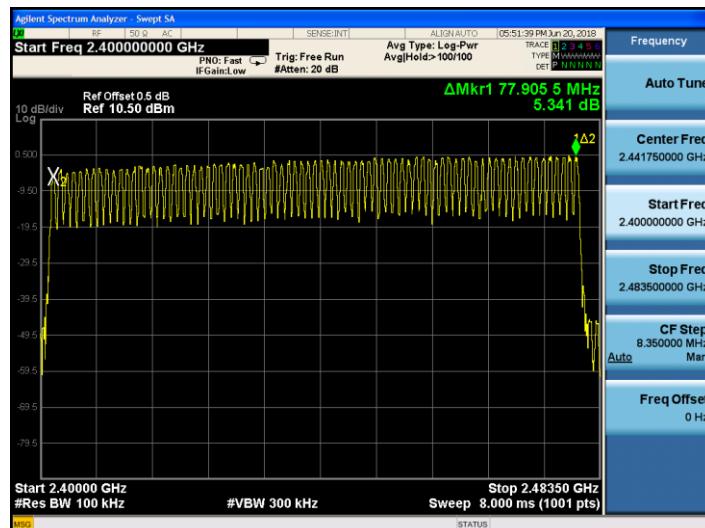
**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.6.3. Test data**

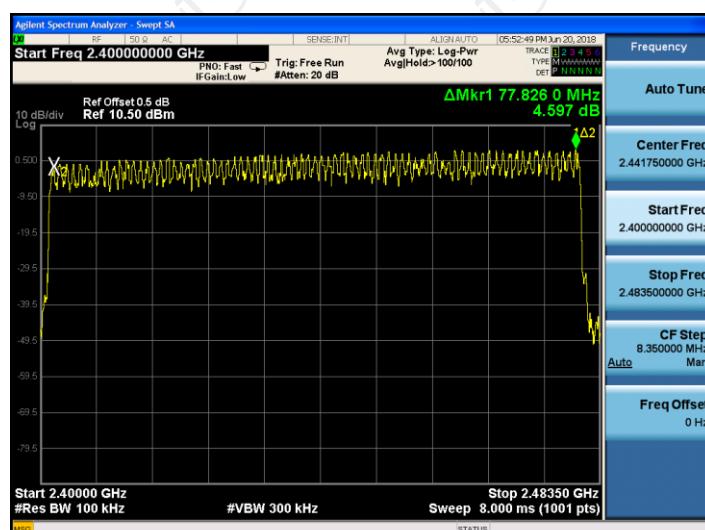
Mode	Hopping channel numbers	Limit	Result
GFSK, Pi/4DQPSK, 8DPSK	79	15	PASS

**Test plots as follows:**

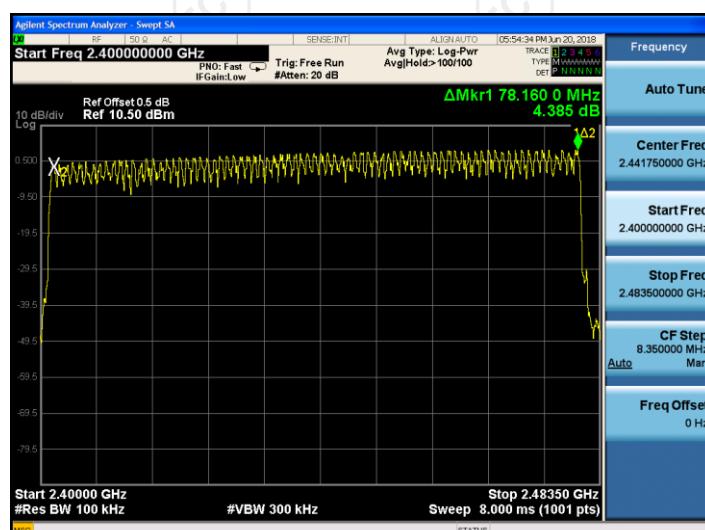
## GFSK



## Pi/4DQPSK



## 8DPSK



## 6.7. Dwell Time

### 6.7.1. Test Specification

## 6.7.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 6.7.3. Test Data

Mode	Packet	Hops Over Occupancy Time (hops)	Package Transfer Time (ms)	Dwell time (second)	Limit (second)	Result
GFSK	DH1	320	0.415	0.133	0.4	PASS
GFSK	DH3	160	1.683	0.269	0.4	PASS
GFSK	DH5	106.67	2.924	0.312	0.4	PASS
Pi/4 DQPSK	2-DH1	320	0.427	0.137	0.4	PASS
Pi/4 DQPSK	2-DH3	160	1.680	0.269	0.4	PASS
Pi/4 DQPSK	2-DH5	106.67	2.940	0.314	0.4	PASS
8DPSK	3-DH1	320	0.420	0.134	0.4	PASS
8DPSK	3-DH3	160	1.680	0.269	0.4	PASS
8DPSK	3-DH5	106.67	2.948	0.314	0.4	PASS

**Note:** 1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels.

For DH1, With channel hopping rate  $(1600 / 2 / 79)$  in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600 / 2 / 79) \times (0.4 \times 79) = 320$  hops

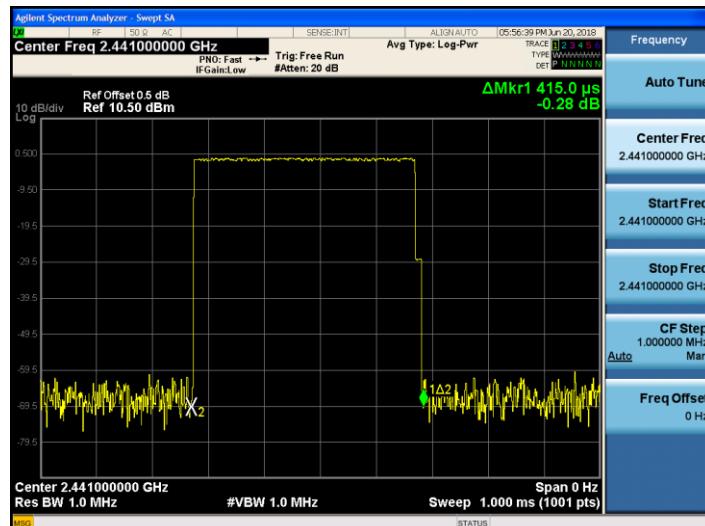
For DH3, With channel hopping rate  $(1600 / 6 / 79)$  in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600 / 6 / 79) \times (0.4 \times 79) = 160$  hops

For DH5, With channel hopping rate  $(1600 / 6 / 79)$  in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$  hops

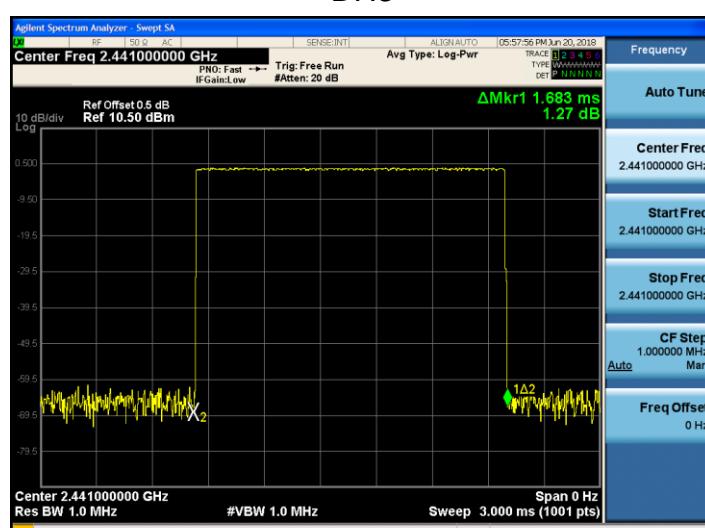
2. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

Test plots as follows:

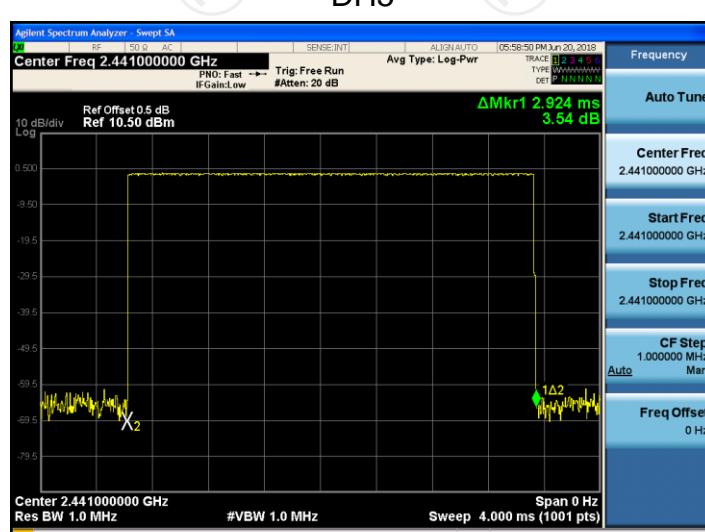
## GFSK DH1



## DH3

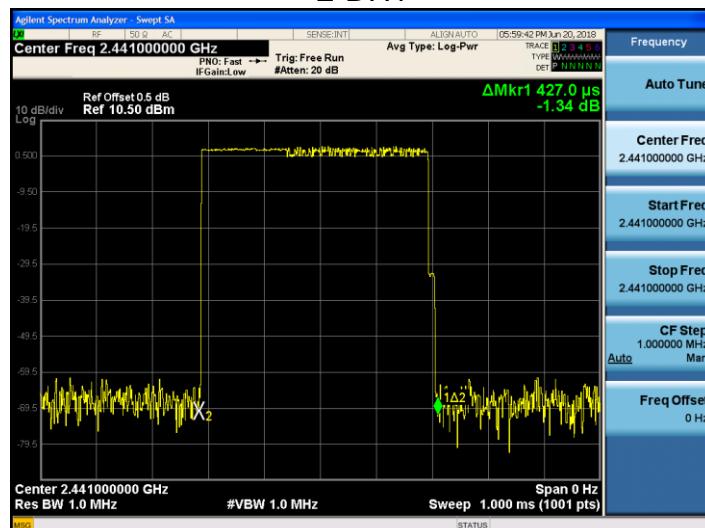


## DH5

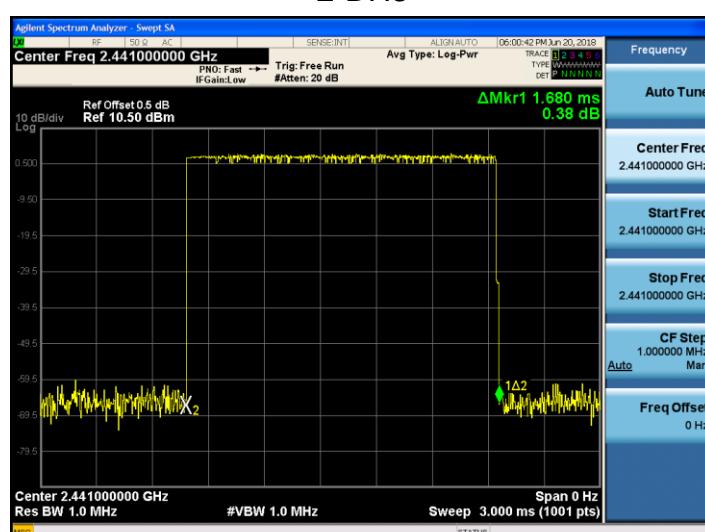


## Pi/4DQPSK

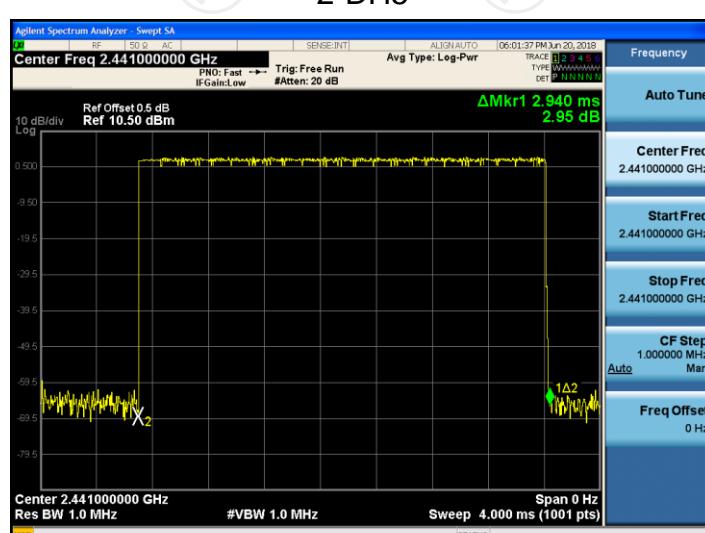
### 2-DH1



### 2-DH3

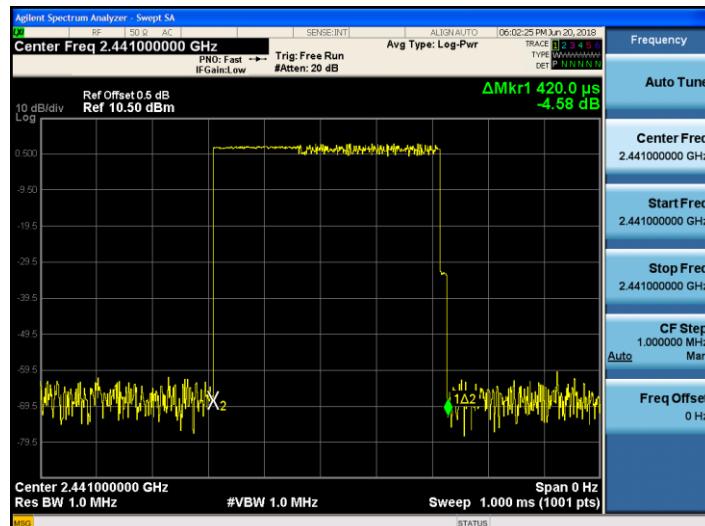


### 2-DH5

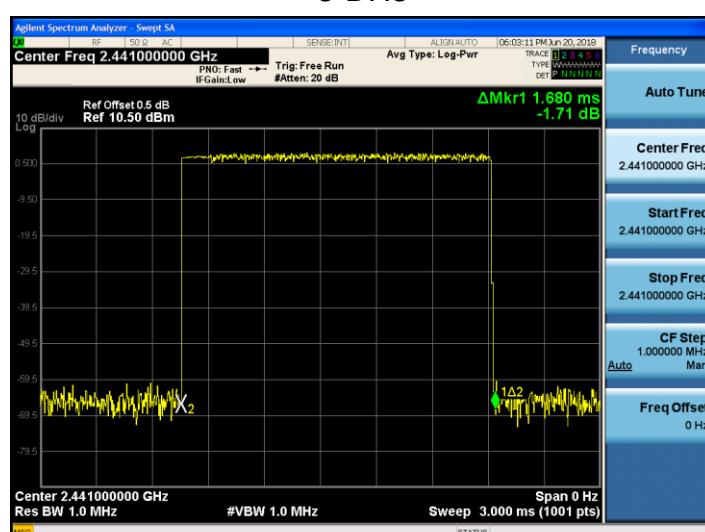


## 8DPSK

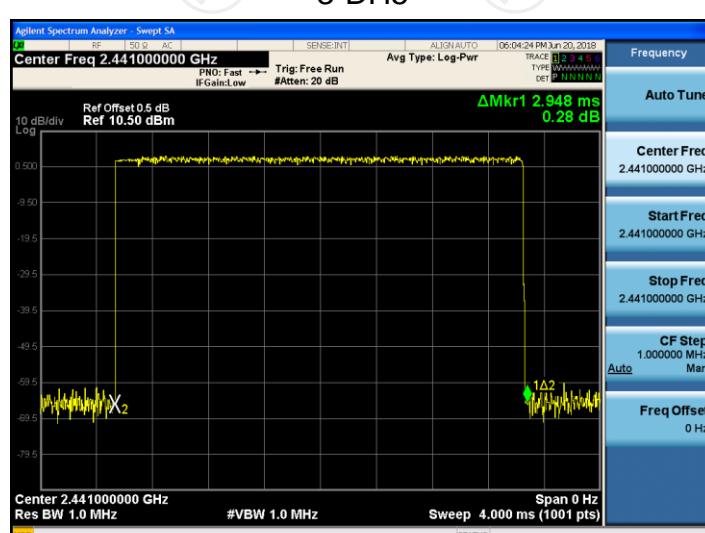
### 3-DH1



### 3-DH3



### 3-DH5



## 6.8. Pseudorandom Frequency Hopping Sequence

<b>Test Requirement:</b>	<b>FCC Part15 C Section 15.247 (a)(1) requirement:</b>
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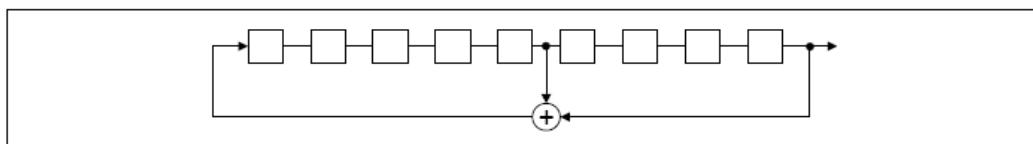
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

### EUT Pseudorandom Frequency Hopping Sequence

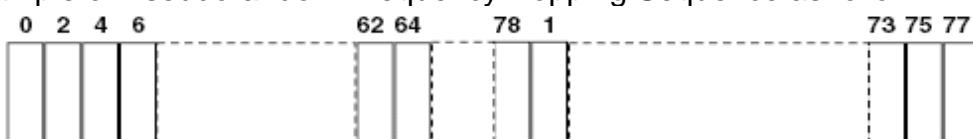
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized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

- Number of shift register stages: 9
- Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits
- Longest sequence of zeros: 8 (non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of Pseudorandom Frequency Hopping Sequence as follow:

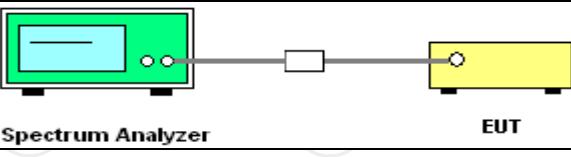


Each frequency used equally on the average by each transmitter.

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.

## 6.9. Conducted Band Edge Measurement

### 6.9.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.247 (d)
<b>Test Method:</b>	ANSI C63.10:2013
<b>Limit:</b>	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
<b>Test Setup:</b>	 <p><b>Spectrum Analyzer</b>                                    <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of ANSI C63.10:2013 Measurement Guidelines.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Set RBW = 100 kHz (<math>\geq 1\%</math> span=10MHz), VBW = 300 kHz (<math>\geq</math>RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.</li> <li>4. Enable hopping function of the EUT and then repeat step 2 and 3.</li> <li>5. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

### 6.9.2. Test Instruments

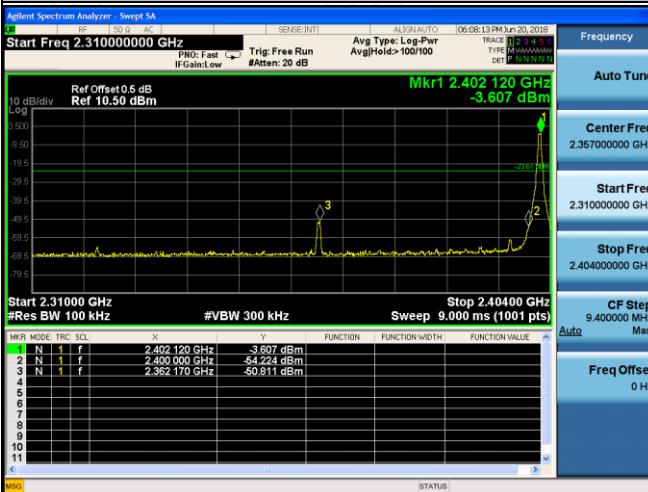
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

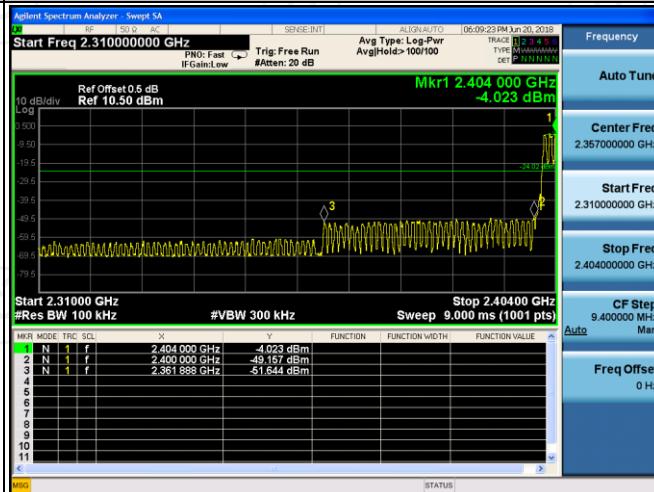
## 6.9.3. Test Data

### GFSK Modulation

#### Test channel:

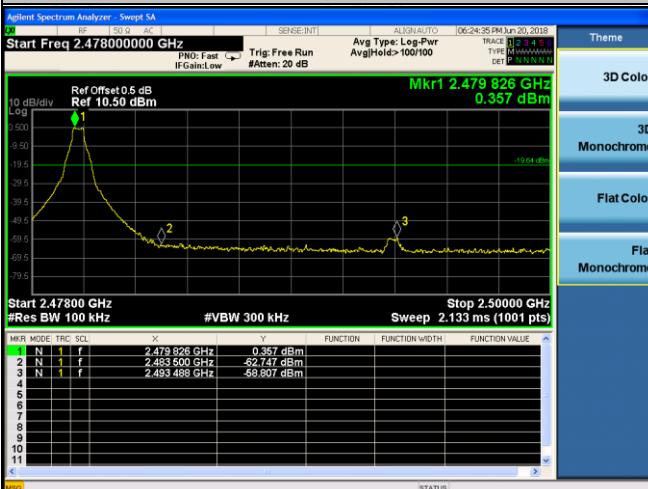


#### Lowest channel



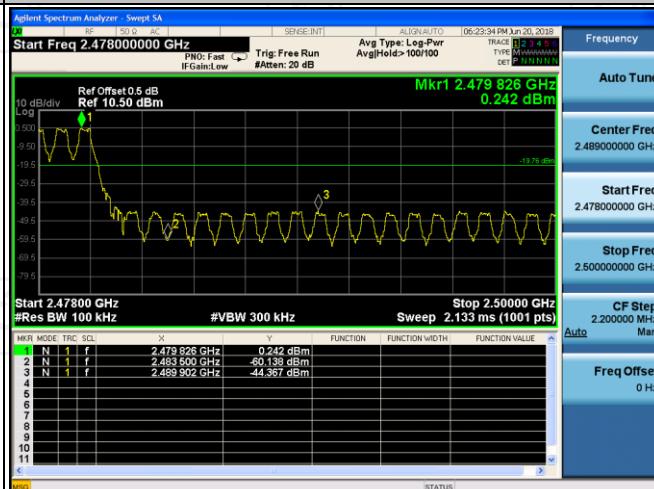
#### No-hopping mode

#### Test channel:



#### Hopping mode

#### Highest channel

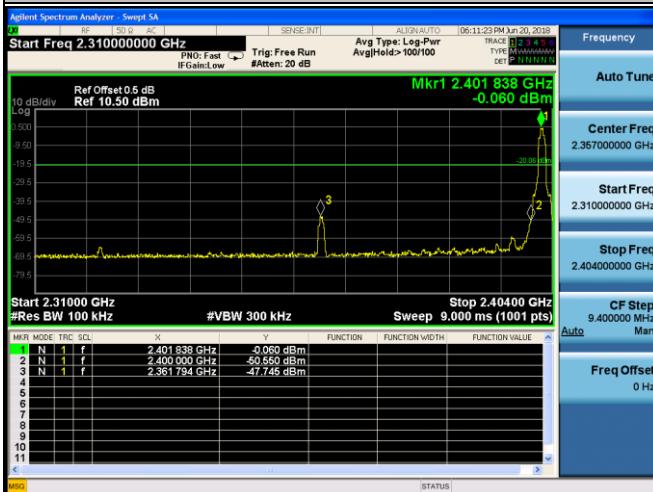


#### No-hopping mode

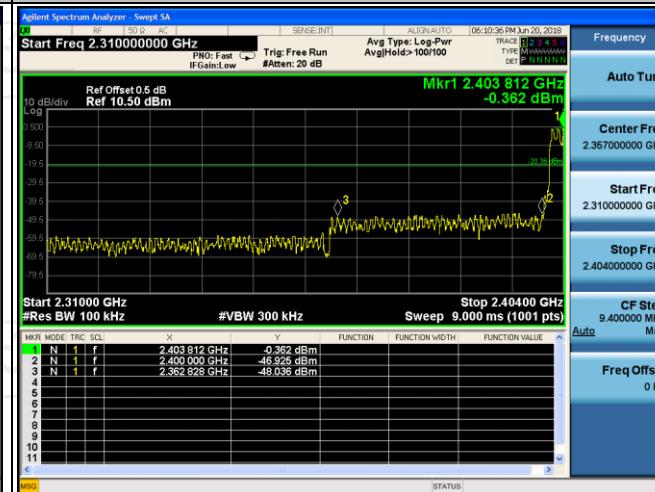
#### Hopping mode

## Pi/4DQPSK Modulation

### Test channel:

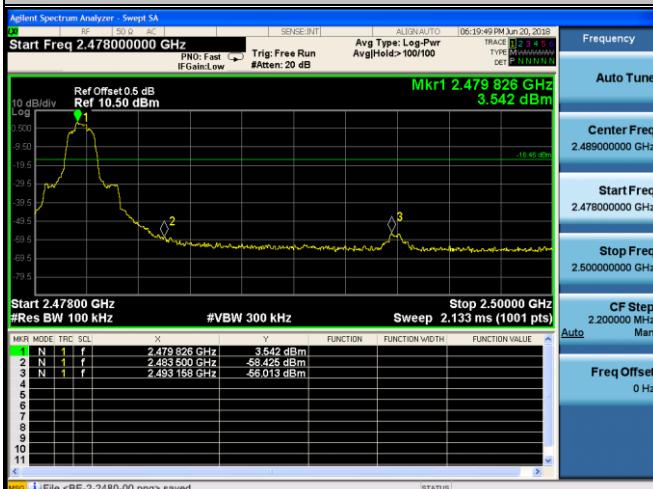


### Lowest channel



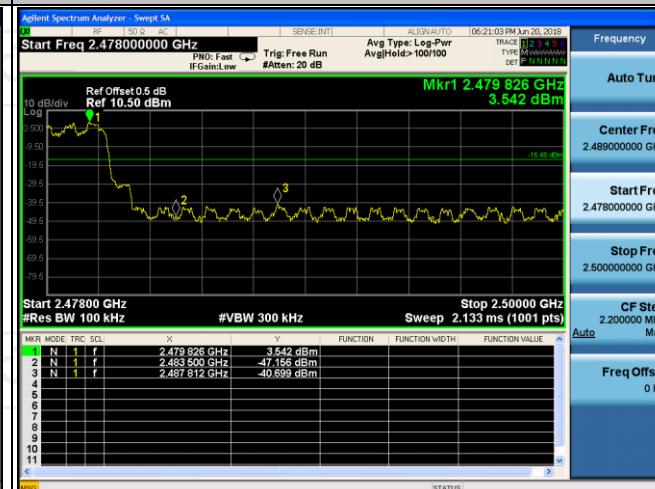
### No-hopping mode

### Test channel:



### Hopping mode

### Highest channel



### No-hopping mode

### Hopping mode