FCC TEST REPORT

FOR

Shenzhen Kailuhong Technology Co., Ltd

Wireless stereo headphones

Model No.: S128

Additional Model No.: S188, S168, VKAKA

Prepared for	:	Shenzhen Kailuhong Technology Co., Ltd
Address	:	First Floor, Building 4, New second industrial zone, Shajing, Baoan, Shenzhen, China
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	September 27, 2017
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	September 27, 2017~October 31, 2017
Date of Report	:	October 31, 2017

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FCC TEST REPORT

FCC CFR 47 PART 15 C(15.247): 2016

Report Reference No. ..... :	**LCS170927027AE1**
Date of Issue ..... :	October 31, 2017
Testing Laboratory Name ..... :	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address ..... :	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure..... :	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name..... :	**Shenzhen Kailuhong Technology Co., Ltd**
Address ..... :	First Floor, Building 4, New second industrial zone, Shajing, Baoan, Shenzhen, China
Test Specification	
Standard..... :	FCC CFR 47 PART 15 C(15.247): 2016
Test Report Form No. ..... :	LCSEMC-1.0
TRF Originator ..... :	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ..... :	Dated 2011-03

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Test Item Description. ..... :	**Wireless stereo headphones**
Trade Mark..... :	N/A
Model/ Type reference..... :	S128
Ratings ..... :	DC 3.7V(110mAh) by battery, Recharge Voltage: DC 5V/0.5A
Result ..... :	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Linda He	Dick Su	Gavin Liang
Linda He/ File administrators	Dick Su/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCS170927027AE1**	October 31, 2017 Date of issue

Type / Model.....	: S128
EUT.....	: Wireless stereo headphones
Applicant.....	**: Shenzhen Kailuhong Technology Co., Ltd**
Address.....	: First Floor, Building 4, New second industrial zone, Shajing, Baoan, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Shenzhen Kailuhong Technology Co., Ltd**
Address.....	: First Floor, Building 4, New second industrial zone, Shajing, Baoan, Shenzhen, China
Telephone.....	: /
Fax.....	: /
Factory.....	: **Shenzhen Kailuhong Technology Co., Ltd**
Address.....	: First Floor, Building 4, New second industrial zone, Shajing, Baoan, Shenzhen, China
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	October 31, 2017	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	:	Wireless stereo headphones
Additional Model No.	:	S188, S168, VKAKA
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Test Model	:	S128
Power Supply	:	DC 3.7V(110mAh) by battery, Recharge Voltage: DC 5V/0.5A
Hardware Version	:	IN-KLHS128-CSR8645-V03
Software Version	:	V022
Frequency Range	:	2402MHz-2480MHz (Channel Frequency=2402+1(K-1), K=1, 2, 3…..79)
Bluetooth Version	:	V4.0
Channel Number	:	79 Channels for Bluetooth V4.0(DSS)
Modulation Technology	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V4.0(DSS)
Data Rates	:	Bluetooth V4.0(DSS): 1~3Mbps
Antenna Type And Gain	:	Internal antenna,2dBi

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

1.3 External I/O Cable

I/O Port Description	Quantity	Cable
--	--	--

1.4 Description of Test Facility

CNAS Registration Number. is L4595.
FCC Registration Number. is 254912.
Industry Canada Registration Number. is 9642A-1.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001.
NVLAP Registration Code is 600167-0.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
		26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

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

1.7 Description of Test Modes

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With basic data rate feature, the data rates can be up to 1 Mb/s by modulating the RF carrier using GFSK techniques. The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

Mode of Operations	Frequency Range (MHz)	Data Rate (Mbps)
BT V4.0	2402	1/2/3
	2441	1/2/3
	2480	1/2/3
For Conducted Emission		
Test Mode	TX Mode	
For Radiated Emission		
Test Mode	TX Mode	

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was the mode and channel with the highest output power that was determined to be TX (1Mbps).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be TX(1Mbps-Low Channel).

Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/60Hz, recorded worst case.

AC conducted emission pre-test at power from AC mains modes, recorded worst case;

1.8. Frequency of Channels

Bluetooth V4.0 (BT Classics)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	40	2442
1	2403	---	---
2	2404	---	---
---	---	76	2478
---	---	77	2479
38	2440	78	2480
39	2441		

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions

The EUT is directly placed on the ground. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turntable, which is directly placed on the ground. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

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3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (CSR BlueSuite 2.4.8) provided by application.

3.3. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	B470	--	DOC
Lenovo	AC/DC ADAPTER	ADP-90DDB	--	DOC

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C		
FCC Rules	Description of Test	Result
§15.247(b)(1)	Maximum Conducted Output Power	Compliant
§15.247(c)	Frequency Separation And 20 dB Bandwidth	Compliant
§15.247(a)(1)(ii)	Number Of Hopping Frequency	Compliant
§15.247(a)(1)(iii)	Time Of Occupancy (Dwell Time)	Compliant
§15.209, §15.205	Conducted Spurious Emissions and Band Edges Test	Compliant
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	Compliant
§15.205	Emissions at Restricted Band	Compliant
§15.207(a)	Conducted Emissions	Compliant
§15.203	Antenna Requirements	Compliant
§15.247(i)§2.1093	RF Exposure	Compliant

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5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Meter	R&S	NRVS	100444	2017-06-17	2018-06-16
2	Power Sensor	R&S	NRV-Z81	100458	2017-06-17	2018-06-16
3	Power Sensor	R&S	NRV-Z32	10057	2017-06-17	2018-06-16
4	EPM Series Power Meter	Agilent	E4419B	MY45104493	2017-06-17	2018-06-16
5	E-SERIES AVG POWER SENSOR	Agilent	E9301H	MY41495234	2017-06-17	2018-06-16
6	ESA-E SERIES SPECTRUM ANALYZER	Agilent	E4407B	MY41440754	2016-11-18	2017-11-17
7	MXA Signal Analyzer	Agilent	N9020A	MY49100040	2017-06-17	2018-06-16
8	SPECTRUM ANALYZER	R&S	FSP	100503	2017-06-17	2018-06-16
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17	2018-06-16
10	Positioning Controller	MF	MF-7082	/	2017-06-17	2018-06-16
11	EMI Test Software	AUDIX	E3	N/A	2017-06-17	2018-06-16
12	EMI Test Receiver	ROHDE & SCHWARZ	ESR 7	101181	2017-06-17	2018-06-16
13	AMPLIFIER	QuieTek	QTK-A2525G	CHM10809065	2016-11-18	2017-11-17
14	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2017-06-23	2018-06-22
15	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2017-05-02	2018-05-01
16	Horn Antenna	EMCO	3115	6741	2017-06-23	2018-06-22
17	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-17	2018-06-16
18	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-17	2018-06-16
19	TEST RECEIVER	R&S	ESCI	101142	2017-06-17	2018-06-16
20	RF Cable-CON	UTIFLEX	3102-26886-4	CB049	2017-06-17	2018-06-16
21	10dB Attenuator	SCHWARZBECK	MTS-IMP136	261115-001-0032	2017-06-17	2018-06-16
22	Artificial Mains	R&S	ENV216	101288	2017-06-17	2018-06-16

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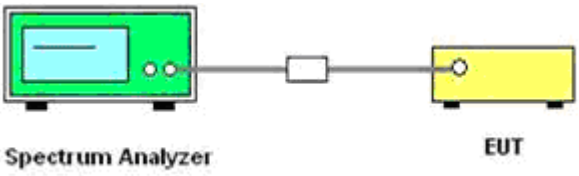
6. MEASUREMENT RESULTS

6.1 Peak Power

6.1.1 Block Diagram of Test Setup



6.1.2 Limit

According to §15.247(b)(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.

6.1.3 Test Procedure

The transmitter output (antenna port) was connected to the spectrum analyzer.
According to ANSI C63.10:2013 Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices; this is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:
1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.
b) Allow trace to stabilize.
c) Use the marker-to-peak function to set the marker to the peak of the emission.
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

6.1.4 Test Results

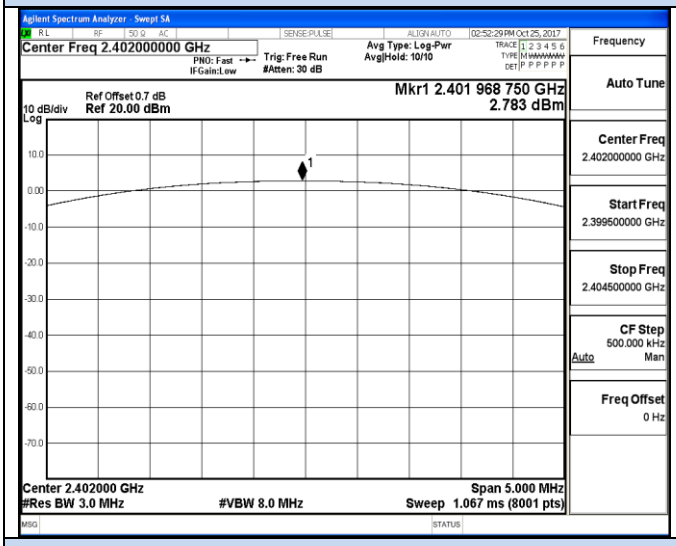
Test Mode	Channel	Frequency (MHz)	Measured Maximum Peak Power (dBm)	Limits (dBm)	Verdict
GFSK	0	2402	2.783	30	PASS
	39	2441	2.449		
	78	2480	2.271		
π/4-DQPSK	0	2402	1.857	21	PASS
	39	2441	1.722		
	78	2480	1.573		
8-DPSK	0	2402	2.012	21	PASS
	39	2441	1.844		
	78	2480	1.705		

Remark:

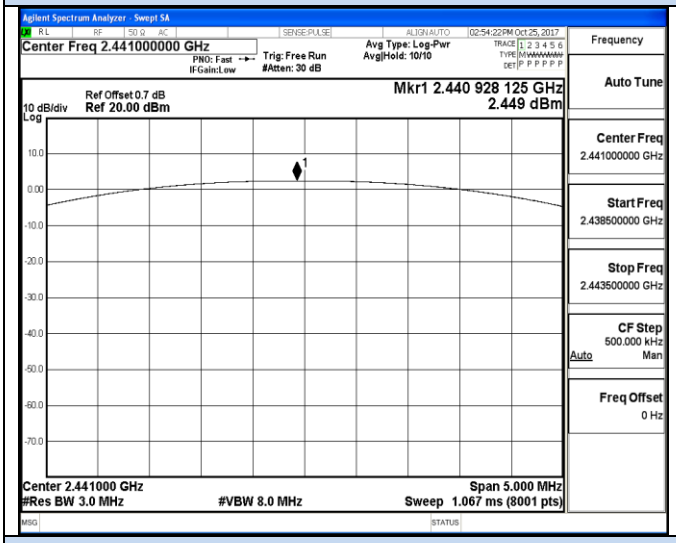
1. *Test results including cable loss;*
2. *Please refer to following plots;*
3. *Measured output power at difference Packet Type for each mode and recorded worst case for each mode.*

Maximum Peak Output Power

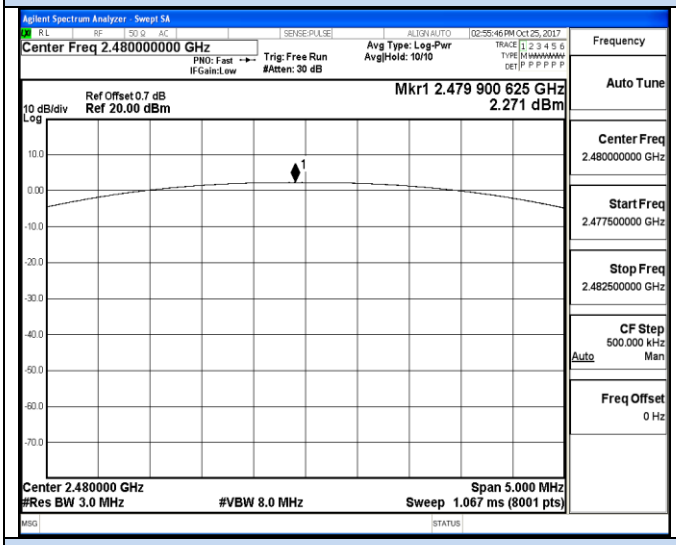
GFSK



Channel 0 / 2402 MHz

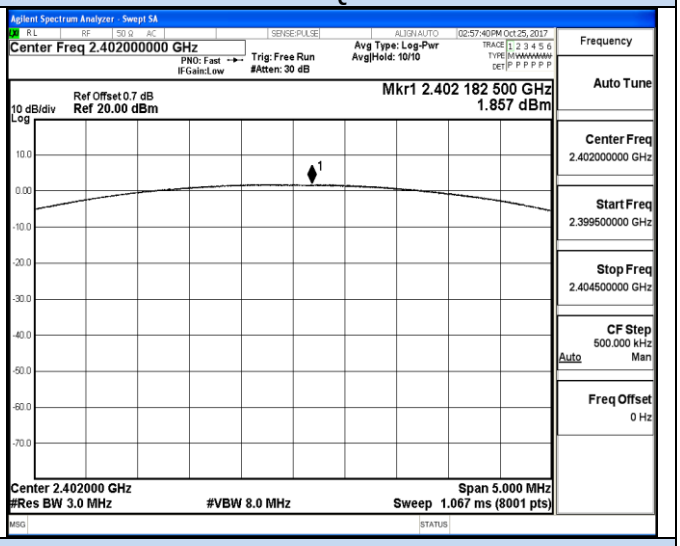


Channel 39 / 2441 MHz

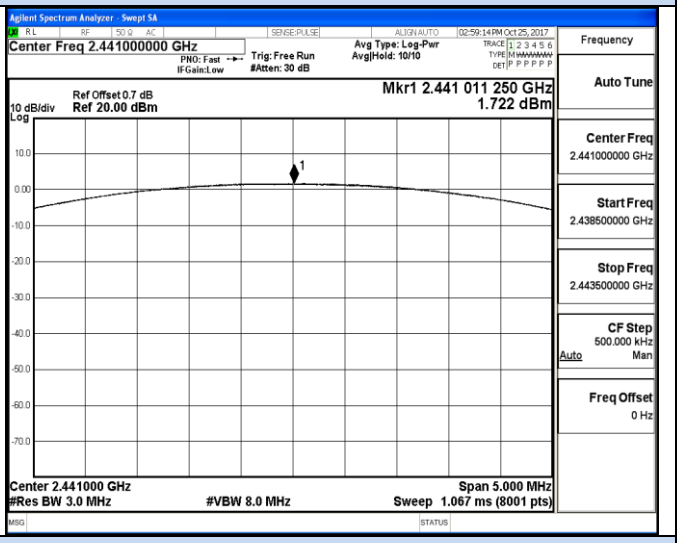


Channel 78 / 2480 MHz

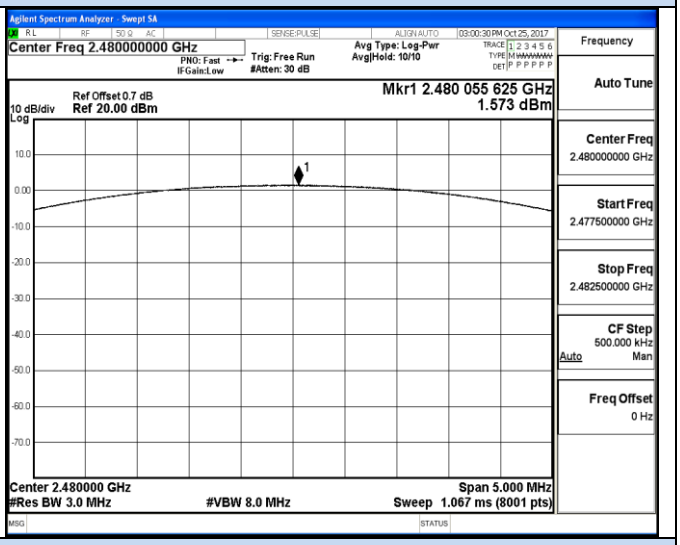
π/4-DQPSK



Channel 0 / 2402 MHz



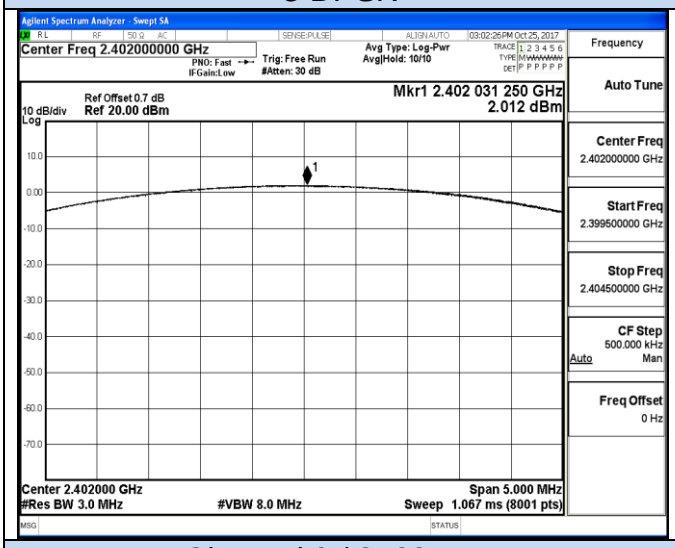
Channel 39 / 2441 MHz



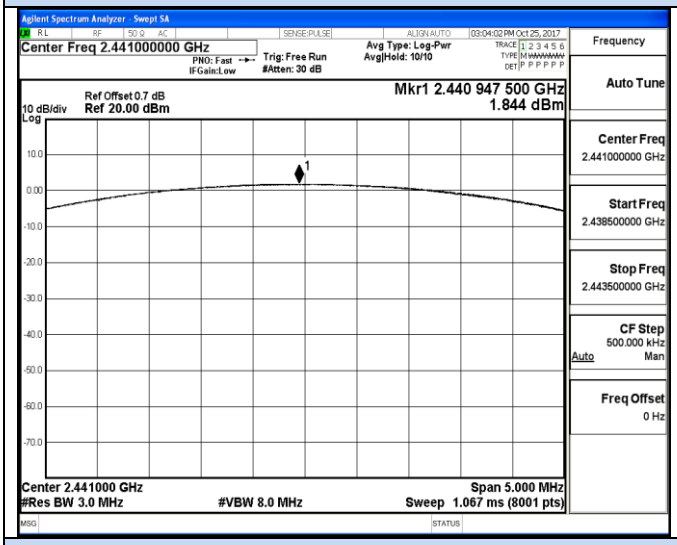
Channel 78 / 2480 MHz

Maximum Peak Output Power

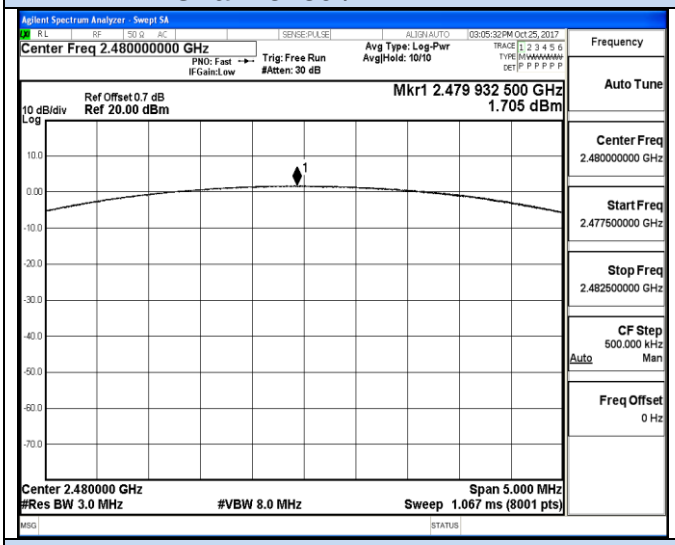
8-DPSK



Channel 0 / 2402 MHz



Channel 39 / 2441 MHz



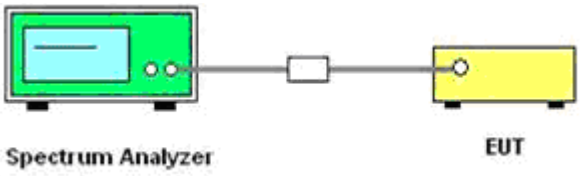
Channel 78 / 2480 MHz

6.2 Frequency Separation and 20 dB Bandwidth

6.2.1 Limit

According to §15.247(c) or A8.1(a), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

6.2.2 Block Diagram of Test Setup



6.2.3 Test Procedure

Frequency separation test procedure：

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

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = middle of hopping channel.

4). Set the Spectrum Analyzer as RBW = 30 kHz, VBW = 100 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.

5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure：

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.

2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.

3). Detector function = peak.

4). Trace = max hold.

6.2.4 Test Results

6.2.4.1 20dB Bandwidth

Test Mode	Channel	Frequency (MHz)	Measured Bandwidth (KHz)		Limits (KHz)	Verdict
			99%	20dB		
GFSK	0	2402	890.72	1035.00	No Limits	PASS
	39	2441	887.94	965.50		
	78	2480	889.87	1030.00		
π/4DQPSK	0	2402	1170.50	1291.00	No Limits	PASS
	39	2441	1174.90	1292.00		
	78	2480	1176.00	1311.00		
8DPSK	0	2402	1179.30	1294.00	No Limits	PASS
	39	2441	1185.40	1305.00		
	78	2480	1184.90	1300.00		

Remark:

1. *Test results including cable loss;*
2. *Measured 99% and 20dB Bandwidth at difference Packet Type for each mode and recorded worst case for each mode.*
3. *Worst case data at DH5 for GFSK, 2DH5 for π/4DQPSK, 3DH5 for 8DPSK modulation type;*
4. *Please refer following test plots;*

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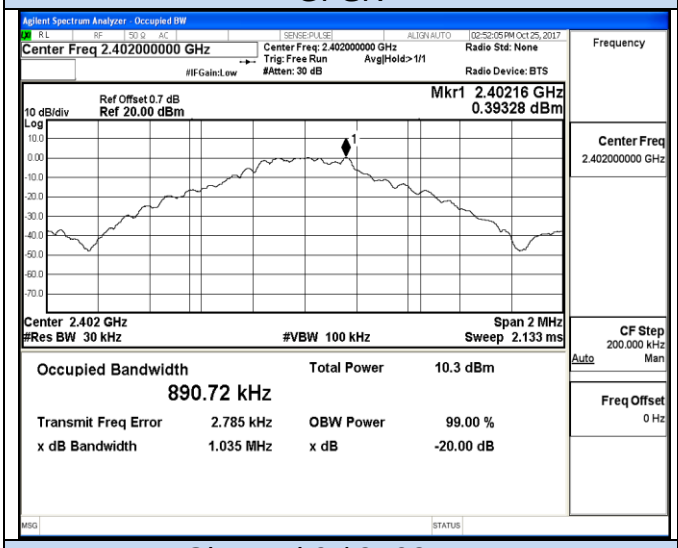
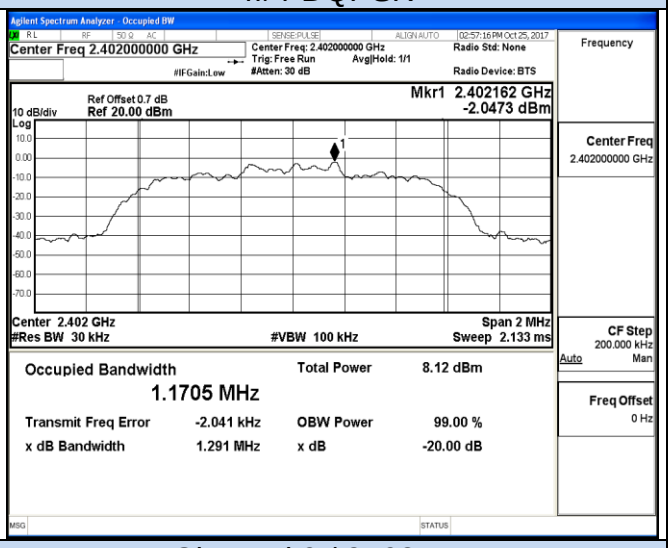
99% & 20dB Bandwidth

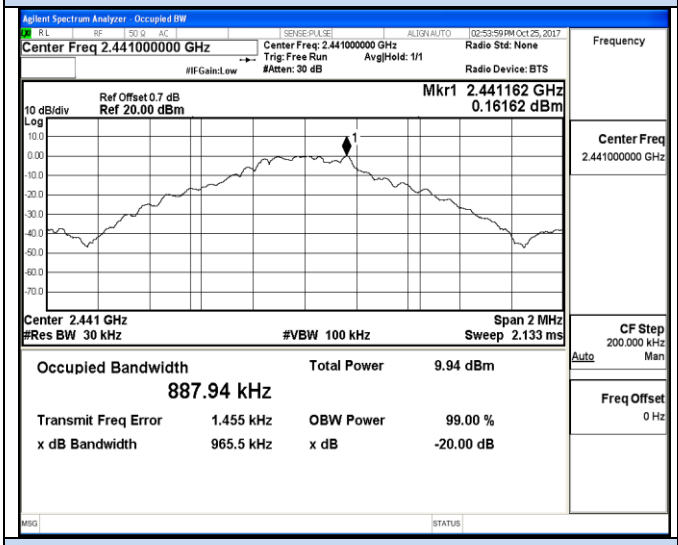
GFSK



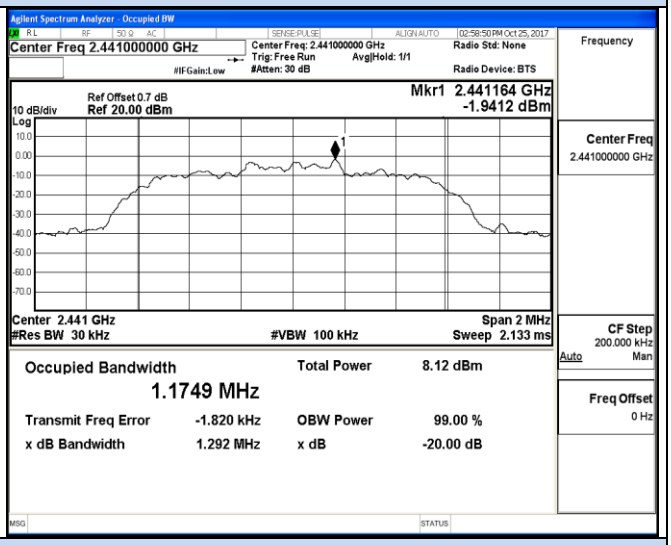
π/4-DQPSK



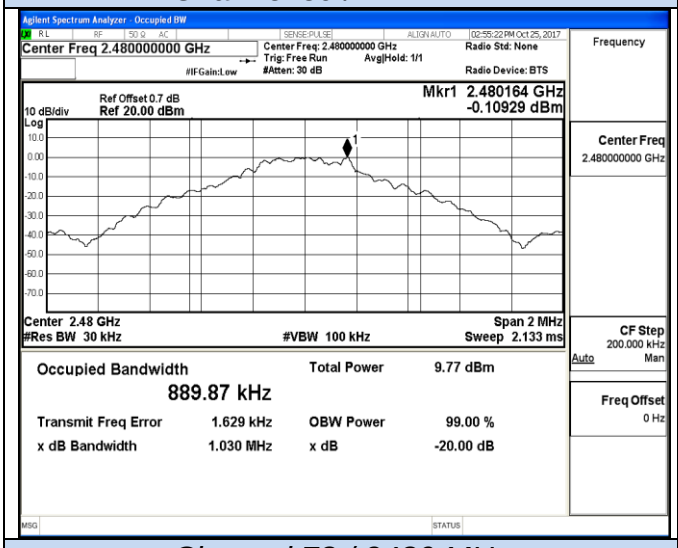
Channel 0 / 2402 MHz



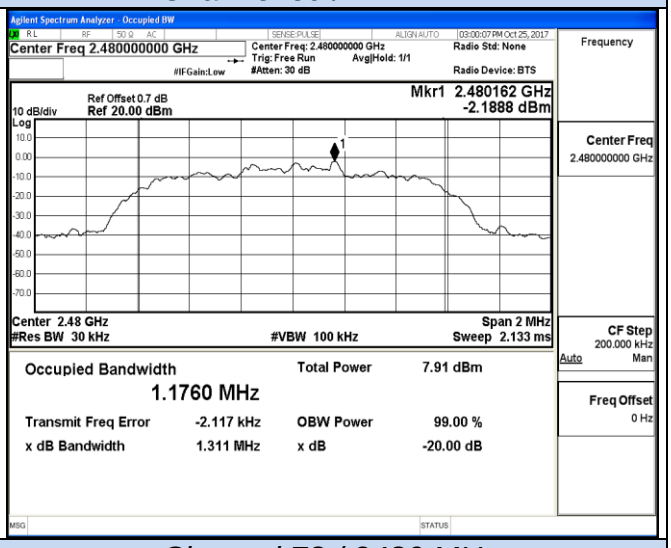
Channel 0 / 2402 MHz



Channel 39 / 2441 MHz



Channel 39 / 2441 MHz

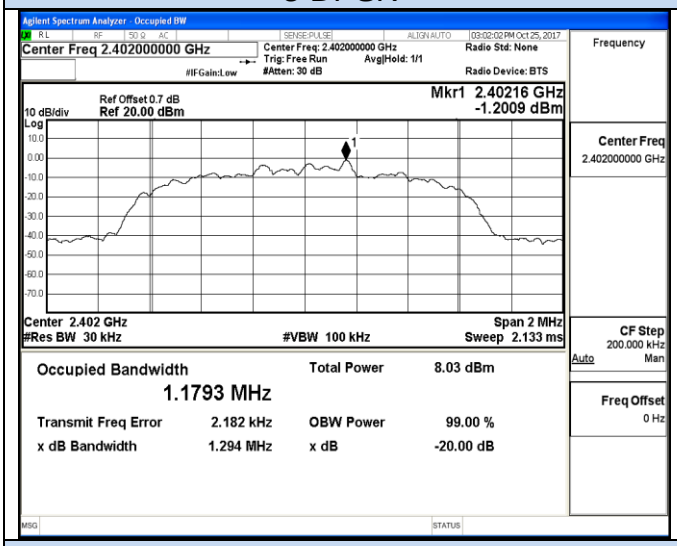


Channel 78 / 2480 MHz

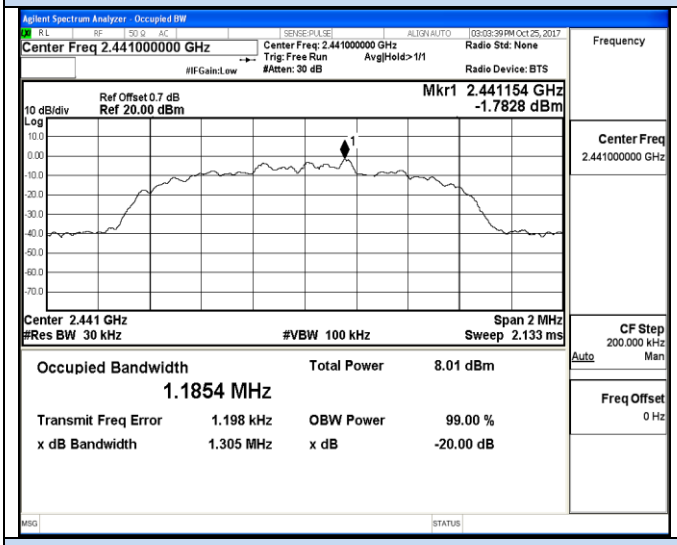
Channel 78 / 2480 MHz

99% & 20dB Bandwidth

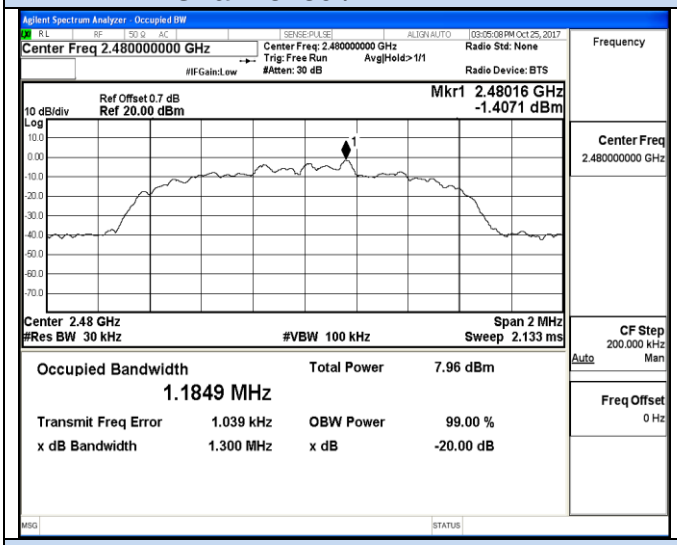
8-DPSK



Channel 0 / 2402 MHz



Channel 39 / 2441 MHz



Channel 78 / 2480 MHz

6.2.4.2 Frequency Separation

The Measurement Result With 1Mbps For GFSK Modulation				
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result
Low	1035.00	1.000	690.00	Pass
Middle	965.50		965.50	Pass
High	1030.00		686.67	Pass
The Measurement Result With 2Mbps For π/4-DQPSK Modulation				
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result
Low	1291.00	1.000	860.67	Pass
Middle	1292.00		861.33	Pass
High	1311.00		874.00	Pass
The Measurement Result With 3Mbps For 8-DPSK Modulation				
Channel	20dB Bandwidth (KHz)	Channel Separation (MHz)	Limit (KHz)	Result
Low	1294.00	1.000	862.67	Pass
Middle	1305.00		870.00	Pass
High	1300.00		866.67	Pass

Remark:
1. *Test results including cable loss;*
2. *Please refer to following plots;*
3. *Measured at difference Packet Type for each mode and recorded worst case for each mode.*
4. *Worst case data at DH5 for GFSK, 2DH5 for π/4-DQPSK, 3DH5 for 8DPSK modulation type;*

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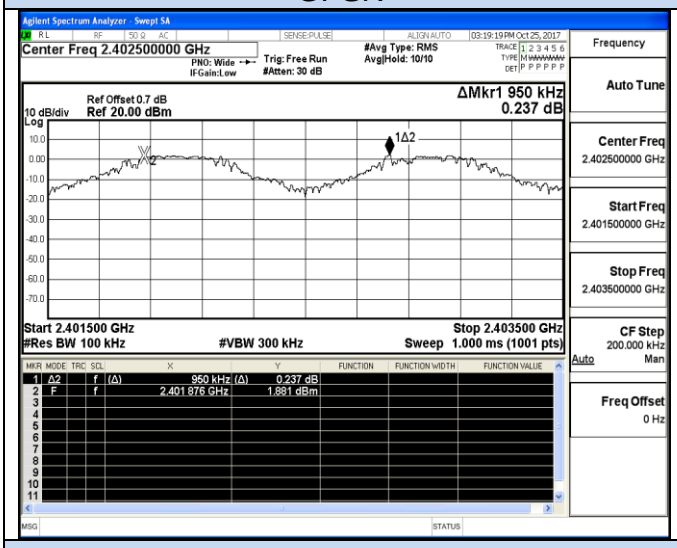
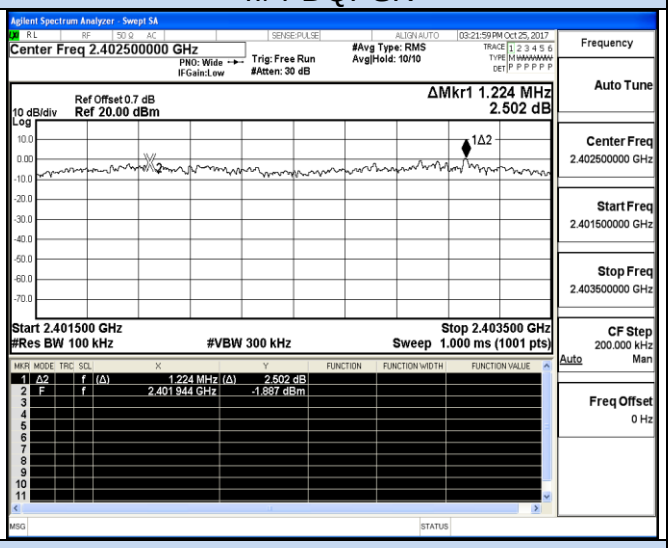
Frequency Separation

GFSK

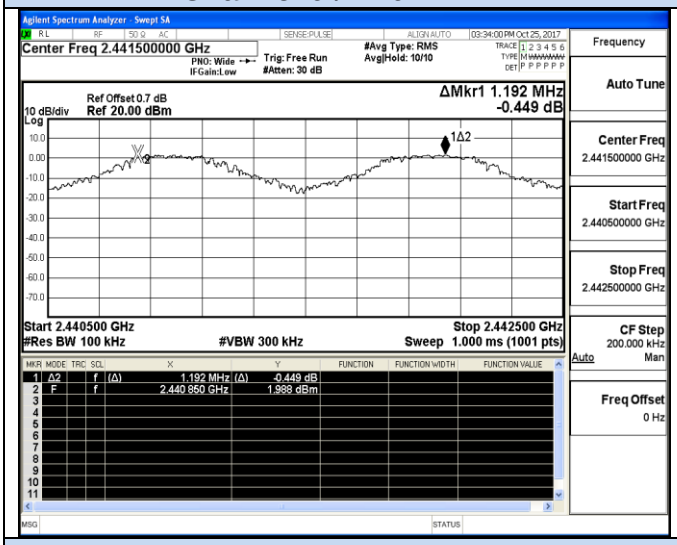


Channel 0 / 2402 MHz

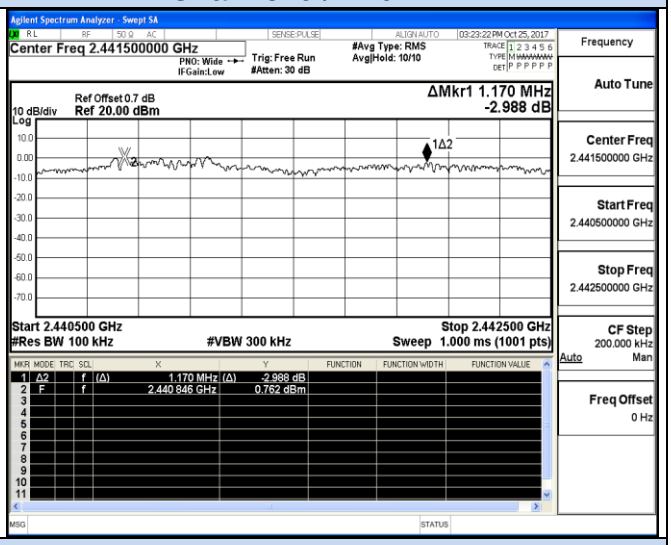
π/4-DQPSK



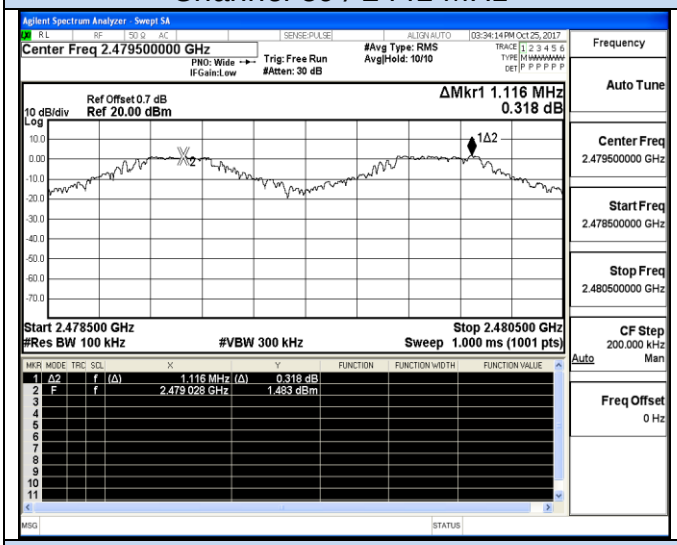
Channel 0 / 2402 MHz



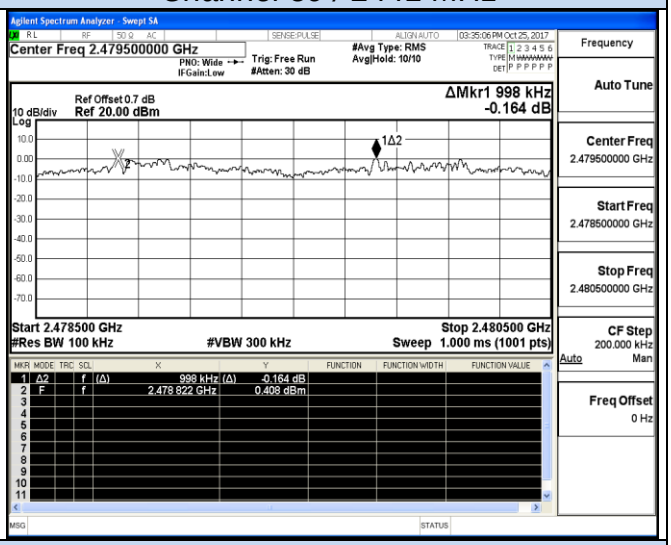
Channel 39 / 2441 MHz



Channel 39 / 2441 MHz



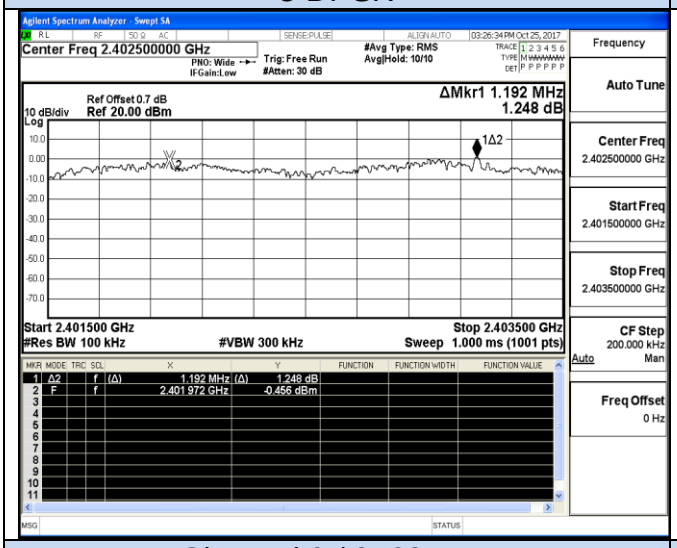
Channel 78 / 2480 MHz



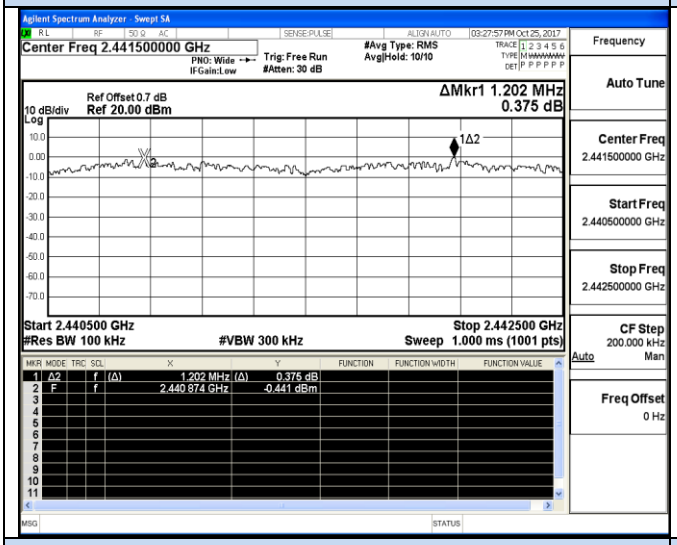
Channel 78 / 2480 MHz

Frequency Separation

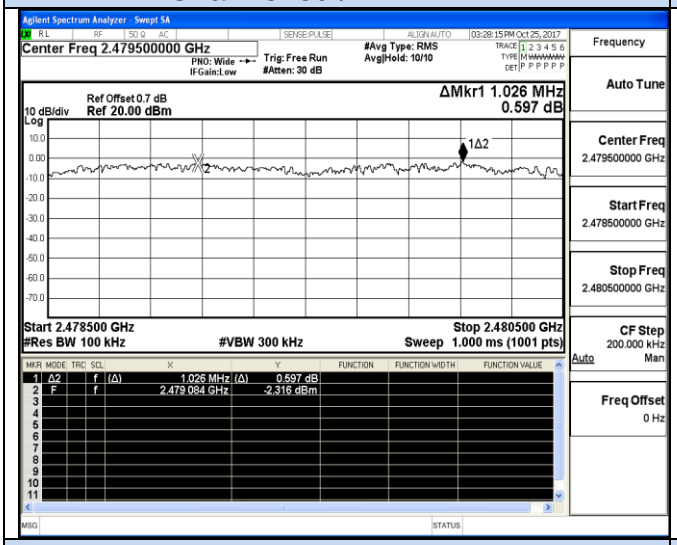
8-DPSK



Channel 0 / 2402 MHz



Channel 39 / 2441 MHz



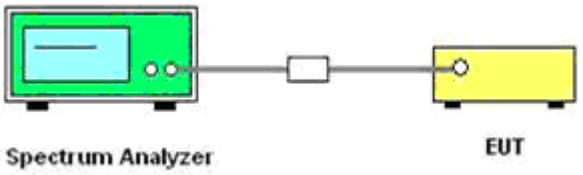
Channel 78 / 2480 MHz

6.3 Number of Hopping Frequency

6.3.1 Limit

According to §15.247(a)(1)(ii) or A8.1 (d), Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels.

6.3.2 Block Diagram of Test Setup



6.3.3 Test Procedure

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

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set Spectrum Analyzer Start = 2400MHz, Stop = 2483.5MHz, Sweep = auto.

4). Set the Spectrum Analyzer as RBW=100KHz, VBW=300KHz.

5). Max hold, view and count how many channel in the band.

6.3.4 Test Results

Test Mode	Measurement Result (No. of Channels)	Limit (No. of Channels)	Result
GFSK	79	≥15	PASS
π/4DQPSK	79	≥15	PASS
8DPSK	79	≥15	PASS

Remark:
1. *Test results including cable loss;*
2. *Measured number of hopping channels at difference Packet Type for each mode and recorded worst case for each mode.*
3. *Worst case data at DH5 for GFSK, 2DH5 for π/4DQPSK, 3DH5 for 8DPSK modulation type;*
4. *Record test plots only for GFSK;*
5. *Please refer following test plots;*

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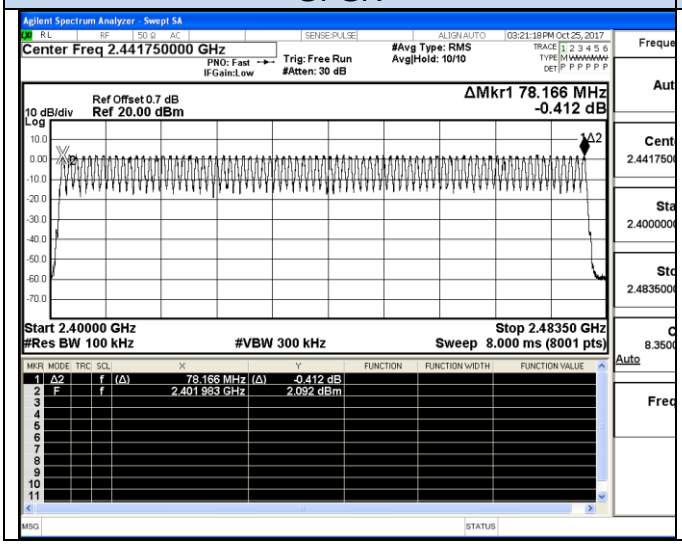
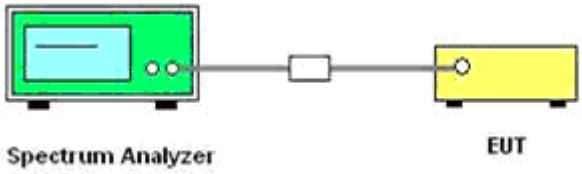
Number of Hopping Frequency	
GFSK	
	

6.4 Time of Occupancy (Dwell Time)

6.4.1 Limit

According to §15.247(a)(1)(iii) or A8.1 (d), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

6.4.2 Block Diagram of Test Setup



6.4.3 Test Procedure

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

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = operating frequency.

4). Set the Spectrum Analyzer as RBW=1MHz, VBW=3MHz, Span = 0Hz, Sweep = auto.

5). Repeat above procedures until all frequency measured was complete.

6.4.4 Test Results

The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4[s]*hopping number=0.4[s]*79[ch] =31.6[s*ch];
The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s]
The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch] =3.38 [hop/s];
The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch];
The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

Mode	Frequency (MHz)	Burst Type	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Verdict
GFSK	2402	DH5	2.874	0.3066	0.4	PASS
	2441		2.873	0.3065		
	2480		2.873	0.3065		
π/4-DQPSK	2402	2DH5	2.877	0.3069	0.4	PASS
	2441		2.877	0.3069		
	2480		2.877	0.3069		
8-DPSK	2402	3DH5	2.878	0.3070	0.4	PASS
	2441		2.879	0.3071		
	2480		2.879	0.3071		

Remark:

1. *Test results including cable loss;*
2. *Please refer to following plots;*
3. *Measured at difference Packet Type for each mode and recorded worst case for each mode.*
4. *Dwell Time Calculate formula:*
   DH5: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second
5. *Measured at DH1, DH3 and DH5 type, recorded worst at DH5 type;*

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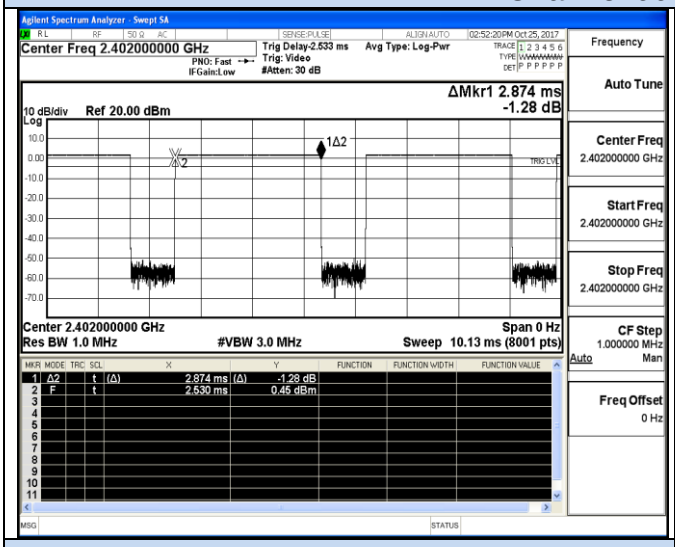
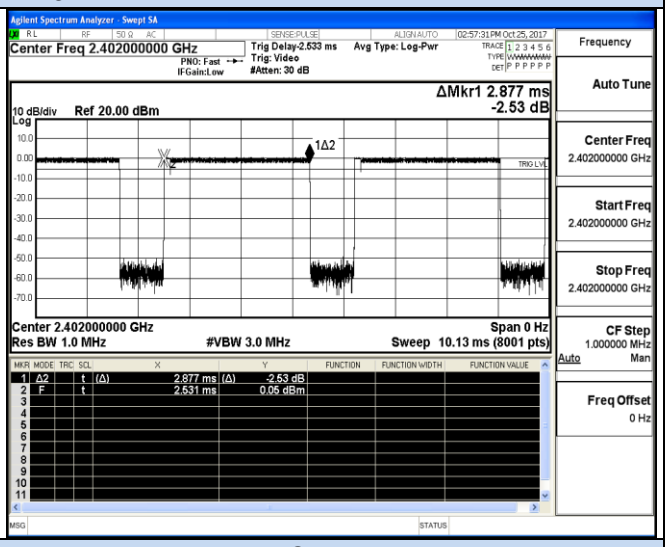
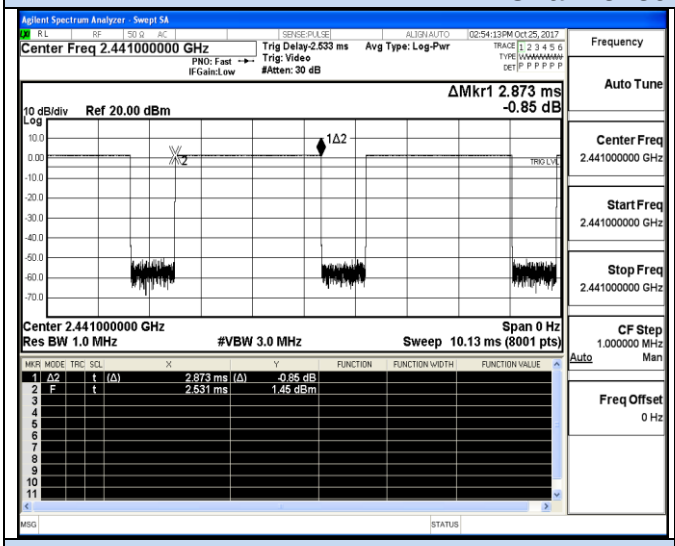
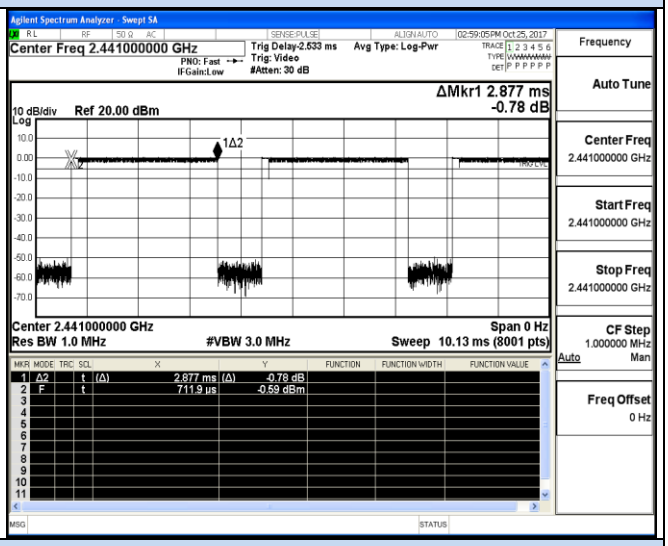
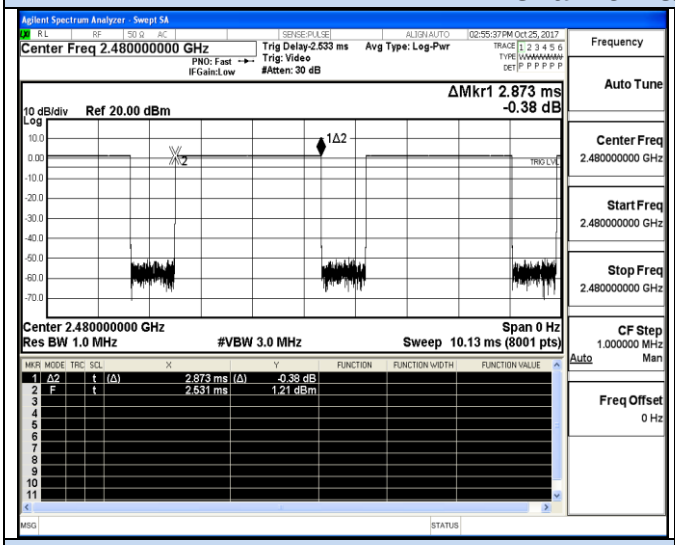
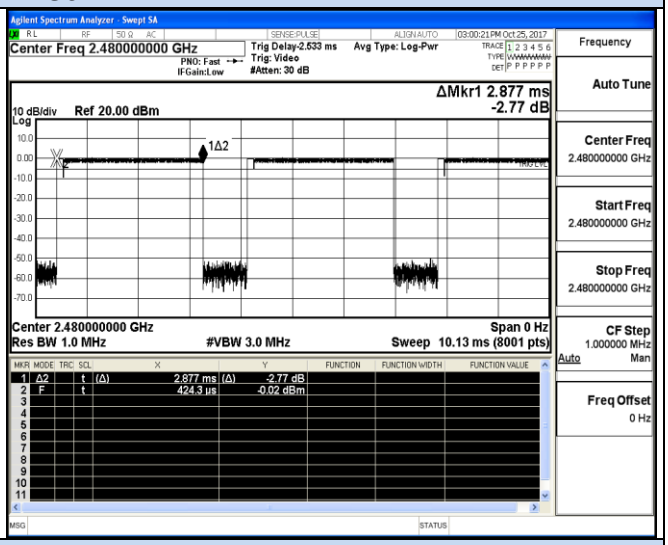
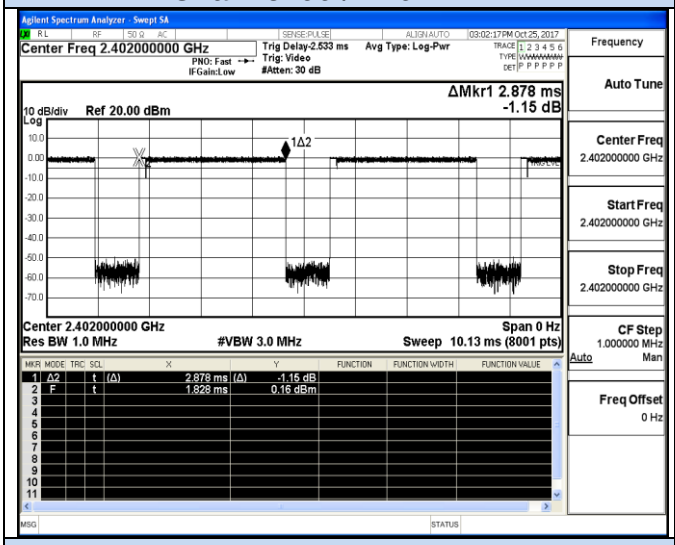
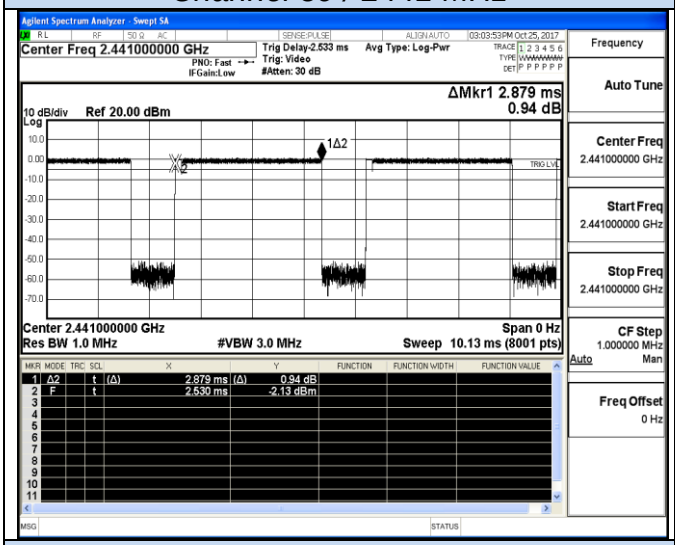
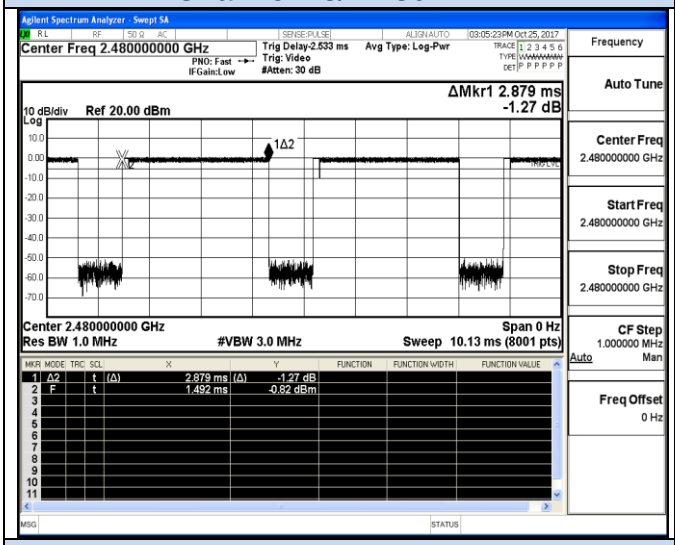
Dwell time

GFSK	π/4-DQPSK
Channel 00 / 2402 MHz	
	
DH5	2DH5
Channel 39 / 2441 MHz	
	
DH5	2DH5
Channel 78/ 2480 MHz	
	
DH5	2DH5

8-DPSK	
Channel 00 / 2402 MHz	
	
3DH5	
Channel 39 / 2441 MHz	
	
3DH5	
Channel 78/ 2480 MHz	
	
3DH5	