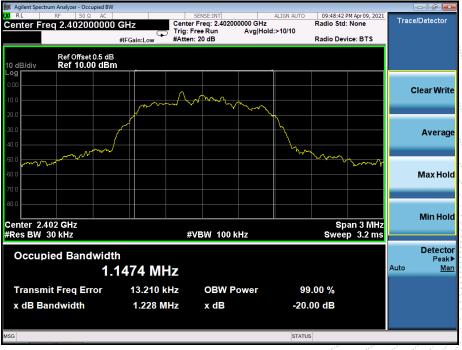




Pi/4 DQPSK High Channel

8DPSK Low Channel







8DPSK Middle Channel

8DPSK High Channel





11. MAXIMUM PEAK OUTPUT POWER

11.1 Block Diagram Of Test Setup



11.2 Limit

FCC Part15 (15.247), Subpart C							
Section	Test Item	Limit	Frequency Range (MHz)	Result			
15.247(b)(1)	Peak Output Power	0.125 watt or 21dBm	2400-2483.5	PASS			

11.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 3MHz. VBW = 3MHz. Sweep = auto; Detector Function = Peak.

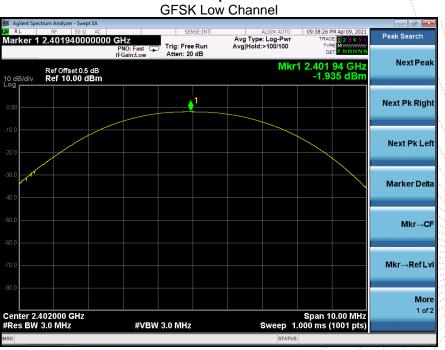
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.



11.4 Test Result

Temperature :	26°C	Relative Humidity:	54%
Test Voltage :	DC 3.7V	Remark:	N/A

Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	-1.935	21
GFSK	Middle	-1.580	21
GFSK	High	-1.504	21
Pi/4 DQPSK	Low	-0.799	21
Pi/4 DQPSK	Middle	-0.374	21
Pi/4 DQPSK	High	-0.203	21
8DPSK	Low	-0.624	21
8DPSK	Middle	-0.093	21
8DPSK	High	-0.005	21



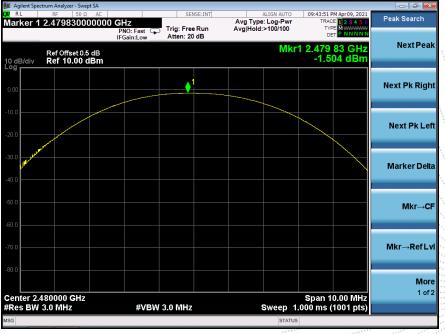
Test plots





GFSK Middle Channel

GFSK High Channel

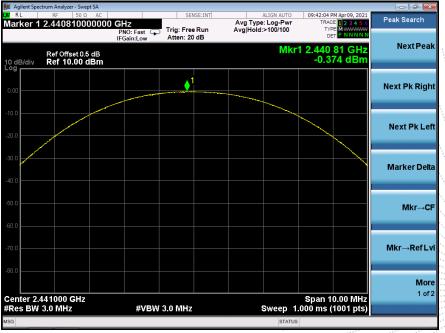




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Agilent Spectrum Analyzer - Swept SA RL RF 50 Ω AC		SENSE:INT	ALIGN AUTO	09:39:19 PM Apr 09, 2021	
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G	WARAS		STATUS		

Pi/4 DQPSK Low Channel

Pi/4 DQPSK Middle Channel

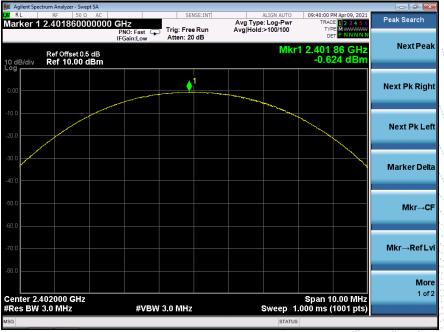






Pi/4 DQPSK High Channel

8DPSK Low Channel

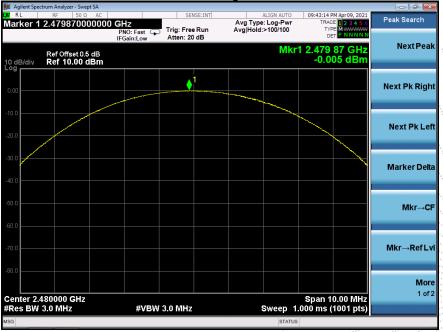






8DPSK Middle Channel

8DPSK High Channel



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12. HOPPING CHANNEL SEPARATION

12.1 Block Diagram Of Test Setup



12.2 Limit

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 0.125W.

12.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port

to the spectrum.

2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.



12.4 Test Result

Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	1.002	0.624	PASS
GFSK	Middle	0.998	0.597	PASS
GFSK	High	1.002	0.597	PASS
Pi/4 DQPSK	Low	0.998	0.859	PASS
Pi/4 DQPSK	Middle	1.002	0.848	PASS
Pi/4 DQPSK	High	1.002	0.857	PASS
8DPSK	Low	1.002	0.819	PASS
8DPSK	Middle	0.998	0.819	PASS
8DPSK	High	1.000	0.818	PASS

Test plots GFSK Low Channel







GFSK Middle Channel

GFSK High Channel

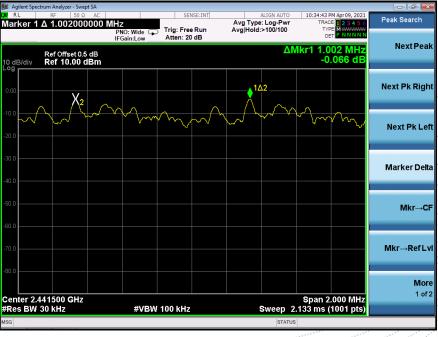






Pi/4 DQPSK Low Channel

Pi/4 DQPSK Middle Channel







Pi/4 DQPSK High Channel

8DPSK Low Channel

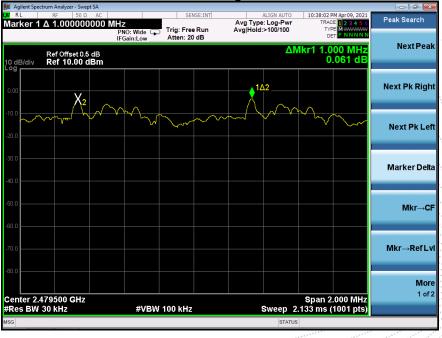






8DPSK Middle Channel

8DPSK High Channel





13. NUMBER OF HOPPING FREQUENCY

13.1 Block Diagram Of Test Setup



13.2 Limit

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

13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. In order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;



13.4 Test Result

Test Plots:

79 Channels in total GFSK



Pi/4 DQPSK

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More 1 of 2											
	350 GHz 1001 pts)	stop 2.48 .000 ms (Sweep 8			300 kHz	#VBW			t 2.40000 s BW 100	
		;	STATUS								MSG





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art 2.40000 GHz Stop 2.48350 GHz tes BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (1001 pts)				
es BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (1001 pts)	Z	Sto	op 2.48350 GHz	10



14. DWELL TIME

14.1 Block Diagram Of Test Setup



14.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

14.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set spectrum analyzer span = 0. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).



14.4 Test Result

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

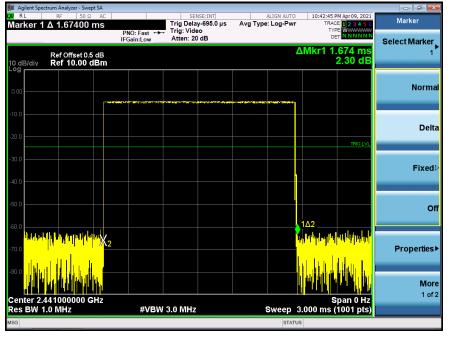
DH5:1600/79/6*0.4*79*(MkrDelta)/1000 DH3:1600/79/4*0.4*79*(MkrDelta)/1000 DH1:1600/79/2*0.4*79*(MkrDelta)/1000 Remark: Mkr Delta is once pulse time.

Modulation	Channel Data	Packet	pulse time(ms)	Dwell Time(s)	Limits(s)
		DH1	0.410	0.131	0.4
GFSK	Middle	DH3	1.674	0.268	0.4
		DH5	2.930	0.313	0.4
		2DH1	0.422	0.135	0.4
Pi/4DQPSK	Middle	2DH3	1.680	0.269	0.4
		2DH5	2.930	0.313	0.4
		3DH1	0.424	0.136	0.4
8DPSK	Middle	3DH3	1.686	0.270	0.4
		3DH5	2.940	0.314	0.4



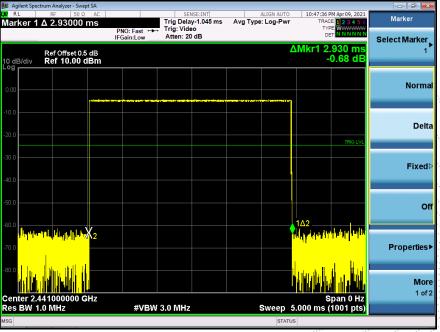
Test Plots GFSK DH1 Middle Channel



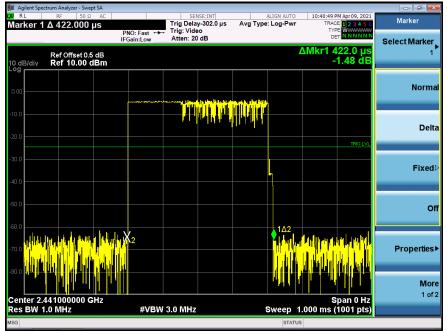


GFSK DH3 Middle Channel

GFSK DH5 High Middle Channel

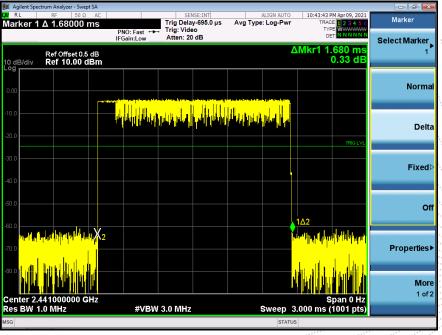




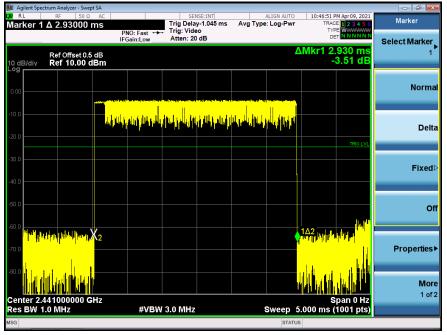


Pi/4DQPSK DH1 Middle Channel

Pi/4DQPSK DH3 Middle Channel

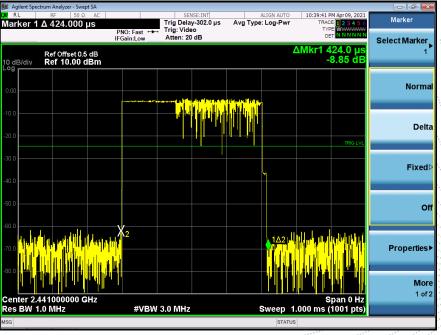




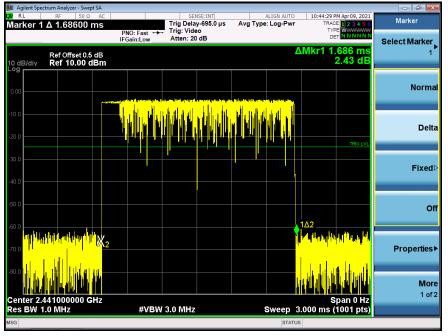


Pi/4DQPSK DH5 Middle Channel

8DPSK DH1 Middle Channel

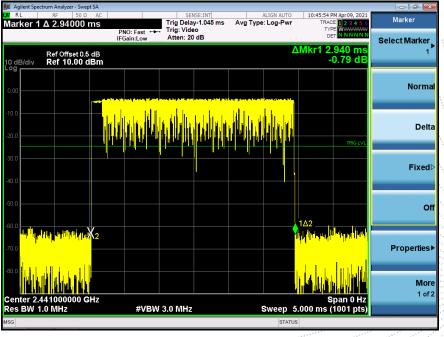






8DPSK DH3 Middle Channel

8DPSK DH5 Middle Channel





15. ANTENNA REQUIREMENT

15.1 Limit

15.203 requirement: For intentional device, according to 15.203: 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.

15.2 Test Result

The EUT antenna is Internal antenna, antenna Gain is -2.6dBi, fulfill the requirement of this section.



16. EUT PHOTOGRAPHS

EUT Photo 1



EUT Photo 2



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EUT Photo 3





17. EUT TEST SETUP PHOTOGRAPHS

Conducted emissions















STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without stamp of laboratory.

4. The test report is invalid without signature of person(s) testing and authorizing.

5. The test process and test result is only related to the Unit Under Test.

6. The quality system of our laboratory is in accordance with ISO/IEC17025.

7.If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website : http://www.bctc-lab.com

E-Mail : <u>bctc@bctc-lab.com.cn</u>

******** END ******

No. : BCTC/RF-EMC-005

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