

Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :51 of 81

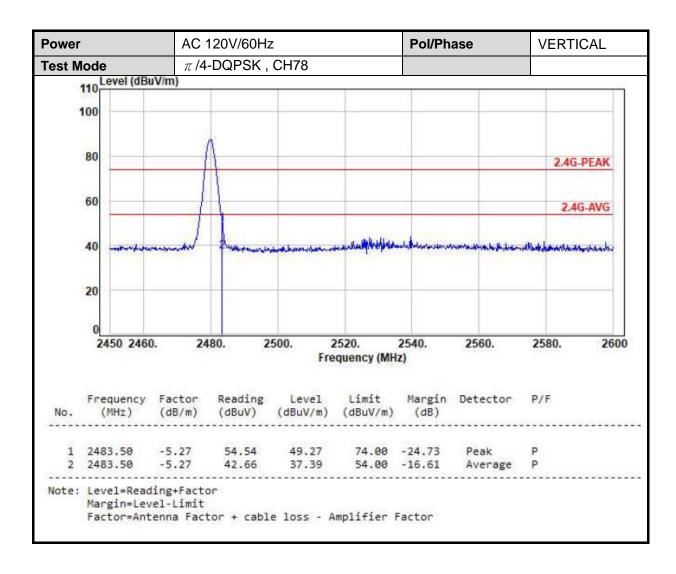
**Power** AC 120V/60Hz Pol/Phase **HORIZONTAL**  $\pi$  /4-DQPSK , CH00 **Test Mode** 110 Level (dBuV/m) 100 80 2.4G-PEAK 60 2.4G-AVG 40 20 2300 2310. 2330. 2350. 2370. 2390. 2410. 2420 Frequency (MHz) Frequency Factor Reading Level Limit Margin Detector P/F (MHz) (dB/m) (dBuV) (dBuV/m) (dBuV/m) (dB) 1 2390.00 -5.59 43.60 38.01 2 2390.00 -5.59 31.45 25.86 74.00 -35.99 Peak 25.86 54.00 -28.14 Average P Note: Level=Reading+Factor Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

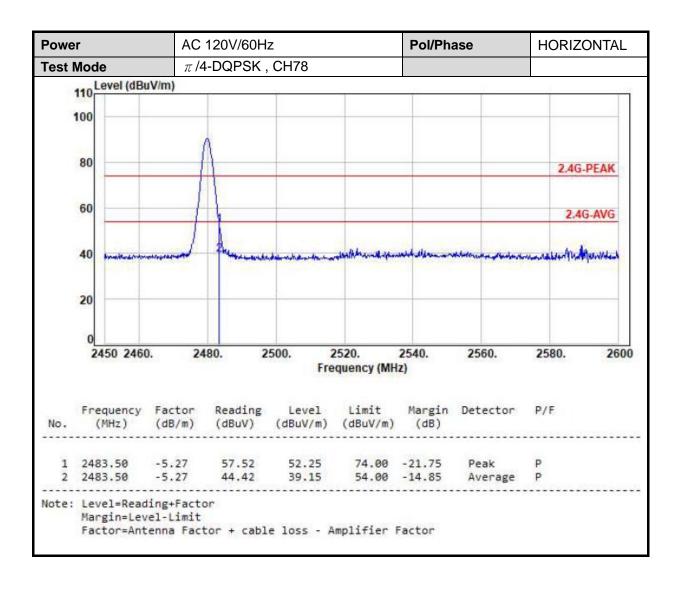
D-FD-507-0 V1.1 Page No. :52 of 81



Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :53 of 81



Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :54 of 81

AC 120V/60Hz **Power** Pol/Phase **VERTICAL Test Mode** 8DPSK, CH00 110 Level (dBuV/m) 100 80 2.4G-PEAK 60 2.4G-AVG 20 2370. 2330. 2350. 2390. 2410. 2420 2300 2310. Frequency (MHz) Frequency Factor Reading Level Limit Margin Detector P/F (MHz) (dB/m) (dBuV/m) (dBuV/m) No. (dB) 1 2390.00 -5.59 43.76 38.17 74.00 -35.83 2 2390.00 -5.59 32.18 26.59 54.00 -27.41 Peak Average Note: Level=Reading+Factor Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :55 of 81

AC 120V/60Hz **Power** Pol/Phase **HORIZONTAL Test Mode** 8DPSK, CH00 110 Level (dBuV/m) 100 80 2.4G-PEAK 60 2.4G-AVG 40 20 2310. 2330. 2350. 2370. 2390. 2410. 2420 Frequency (MHz) Frequency Factor Reading Level Limit Margin Detector P/F No. (MHz) (dB/m) (dBuV/m) (dBuV/m) (dB) 1 2390.00 -5.59 44.00 38.41 74.00 -35.59 2 2390.00 -5.59 32.38 26.79 54.00 -27.21 Peak Average P Note: Level=Reading+Factor Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :56 of 81

AC 120V/60Hz **Power** Pol/Phase **VERTICAL Test Mode** 8DPSK, CH78 110 Level (dBuV/m) 100 80 2.4G-PEAK 60 2.4G-AVG 40 20 2450 2460. 2480. 2500. 2520. 2540. 2560. 2580. 2600 Frequency (MHz) Frequency Factor Reading Level Limit Margin Detector P/F (MHz) (dB/m) (dBuV) (dBuV/m) (dBuV/m) (dB) No. 1 2483.50 -5.27 54.52 49.25 74.00 -24.75 2 2483.50 -5.27 43.67 38.40 54.00 -15.60 Peak Average P Note: Level=Reading+Factor Margin=Level-Limit Factor=Antenna Factor + cable loss - Amplifier Factor

Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :57 of 81

**Power** AC 120V/60Hz Pol/Phase **HORIZONTAL Test Mode** 8DPSK, CH78 110 Level (dBuV/m) 100 80 2.4G-PEAK 60 2.4G-AVG 40 20 2540. 2500. 2520. 2560. 2450 2460. 2480. 2580. 2600 Frequency (MHz) Frequency Factor Reading Level Limit Margin Detector P/F (MHz) (dB/m) (dBuV/m) (dBuV/m) (dB) No. 1 2483.50 -5.27 57.77 52.50 74.00 -21.50 2 2483.50 -5.27 44.67 39.40 54.00 -14.60 Peak Average P Note: Level=Reading+Factor Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

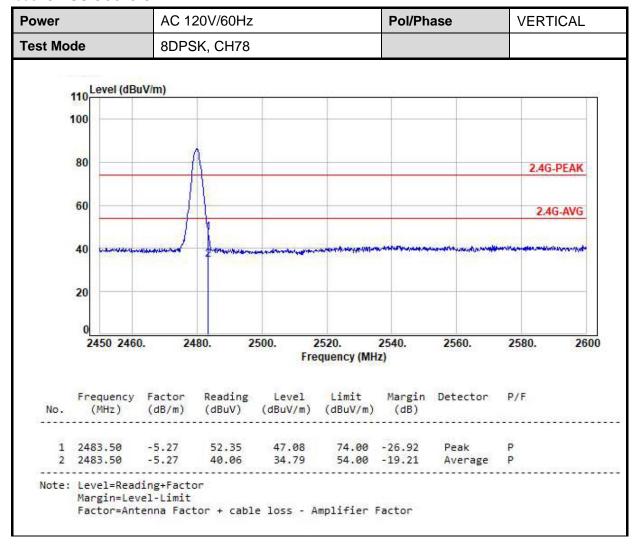
Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :58 of 81



#### Model CRIUS CO310-G1



Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :59 of 81

**Power** AC 120V/60Hz Pol/Phase **HORIZONTAL Test Mode** 8DPSK, CH78 110 Level (dBuV/m) 100 80 2.4G-PEAK 60 2.4G-AVG 40 20 2450 2460. 2480. 2500. 2520. 2540. 2560. 2580. 2600 Frequency (MHz) Frequency Factor Reading Level Limit Margir (MHz) (dB/m) (dBuV) (dBuV/m) (dBuV/m) (dB) Frequency Factor Margin Detector P/F No. 1 2483.50 -5.27 55.77 50.50 2 2483.50 -5.27 43.78 38.51 50.50 74.00 -23.50 54.00 -15.49 Average P Note: Level=Reading+Factor Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

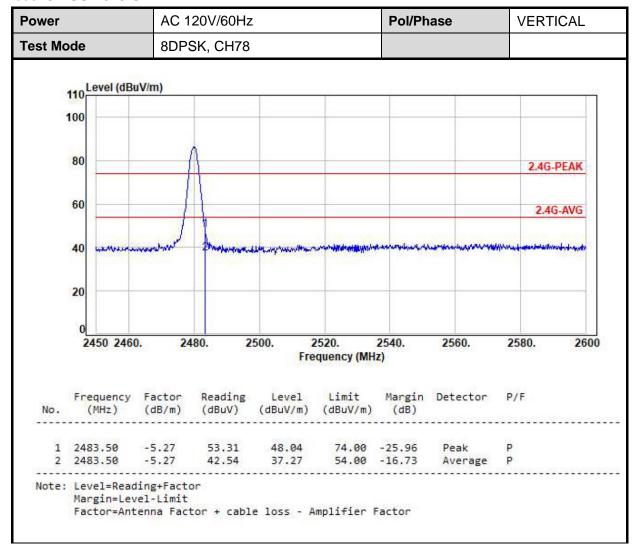
Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :60 of 81



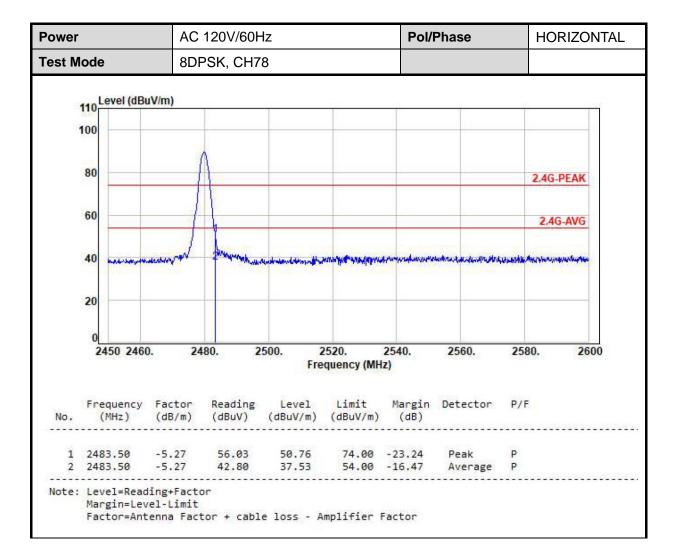
#### Model CRIUS N320-G1



Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :61 of 81



Report No.: DEFB2310067

## 7. Test of Conducted Spurious Emission

#### 7.1 Test Limit

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

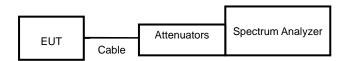
#### 7.2 Test Procedure

- a. The transmitter output was connected to the spectrum analyzer via a low loss cable.
- b. Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.

Report No.: DEFB2310067

c. The band edges was measured and recorded.

### 7.3 Test Setup Layout



#### 7.4 Test Result and Data

Note: Test plots refer to the following pages.

Cerpass Technology Corp. Issued Date : Dec. 06, 2023

Page No.

:63 of 81

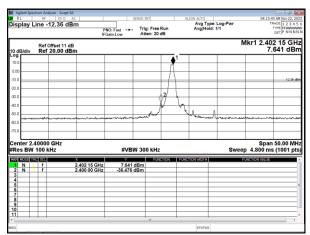
D-FD-507-0 V1.1

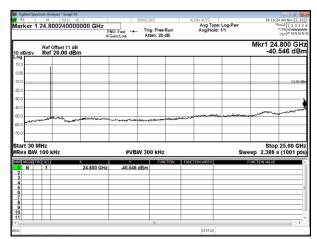
Report No.: DEFB2310067

Single test

Modulation Standard: GFSK (1Mbps)

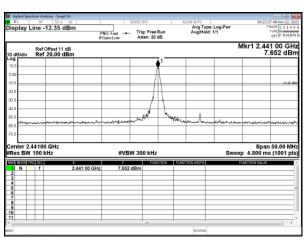
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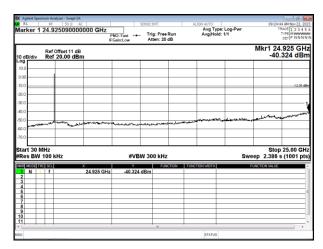




Modulation Standard: GFSK (1Mbps)

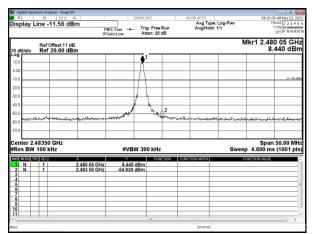
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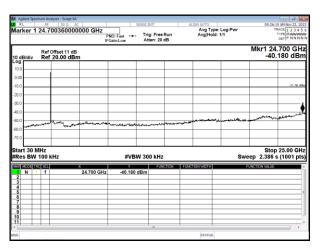




Modulation Standard: GFSK (1Mbps)

Channel: 78



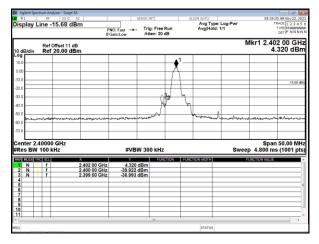


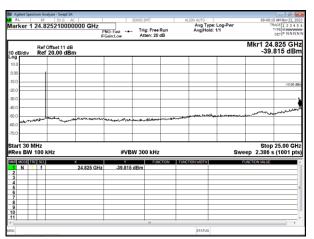
Issued Date : Dec. 06, 2023 D-FD-507-0 V1.1 Page No. :64 of 81

ERPASS TECHNOLOGY CORP. Report No.: DEFB2310067

Modulation Standard:  $\pi/4$  DQPSK (2Mbps)

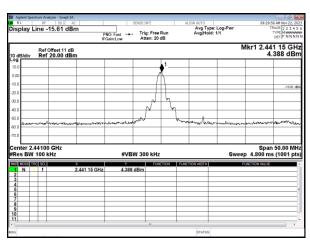
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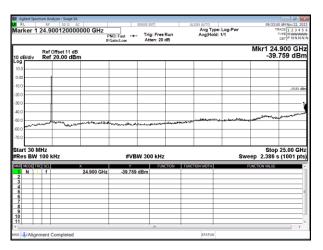




Modulation Standard:  $\pi$  /4 DQPSK (2Mbps)

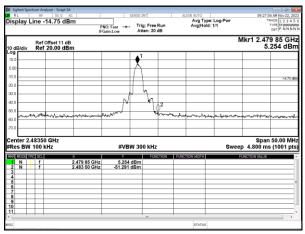
Channel: 39

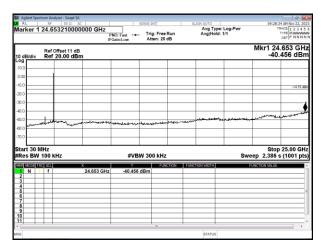




Modulation Standard:  $\pi/4$  DQPSK (2Mbps)

Channel: 78



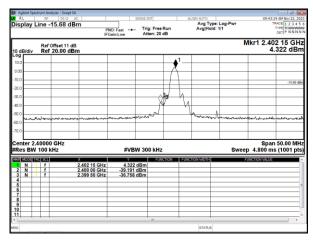


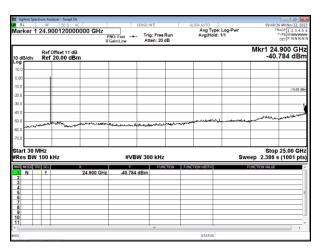
Cerpass Technology Corp.Issued Date : Dec. 06, 2023D-FD-507-0 V1.1Page No. : 65 of 81

RPASS TECHNOLOGY CORP. Report No.: DEFB2310067

Modulation Standard: 8DPSK (3Mbps)

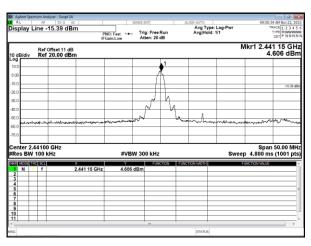
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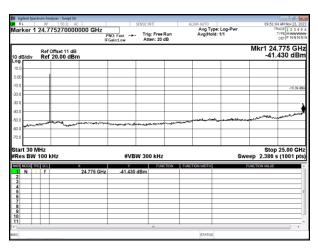




Modulation Standard: 8DPSK (3Mbps)

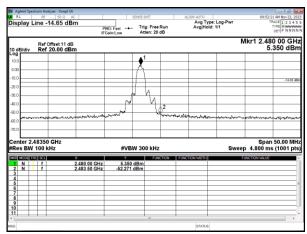
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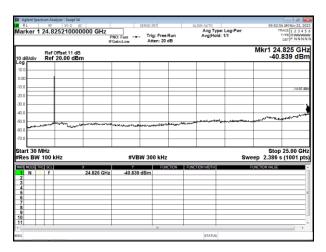




Modulation Standard: 8DPSK (3Mbps)

Channel: 78



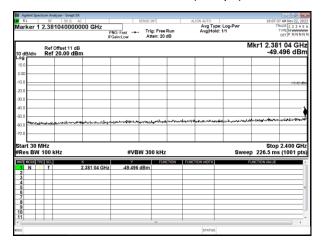


Cerpass Technology Corp. Issued Date : Dec. 06, 2023

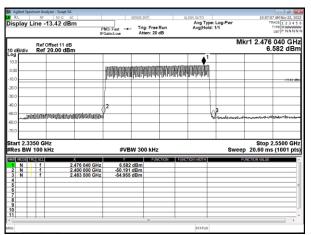
D-FD-507-0 V1.1 Page No. :66 of 81

#### Hopping test

Modulation Standard: GFSK (1Mbps)

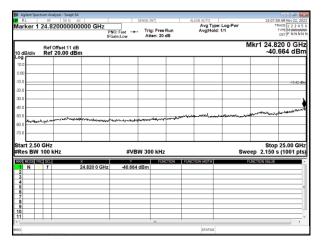


#### Modulation Standard: GFSK (1Mbps)

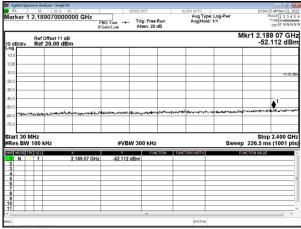


Report No.: DEFB2310067

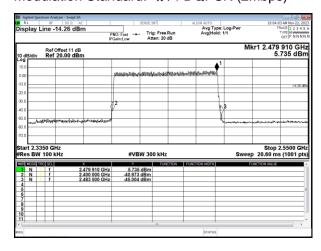
#### Modulation Standard: GFSK (1Mbps)



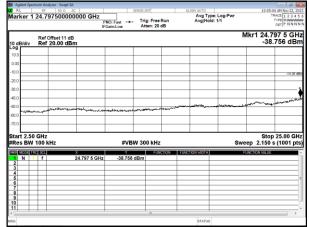
Modulation Standard:  $\pi/4$  DQPSK (2Mbps)



#### Modulation Standard: $\pi/4$ DQPSK (2Mbps)



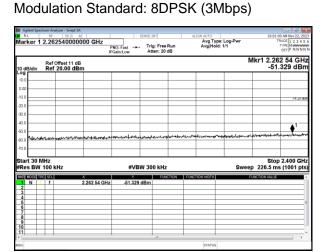
Modulation Standard:  $\pi$  /4 DQPSK (2Mbps)

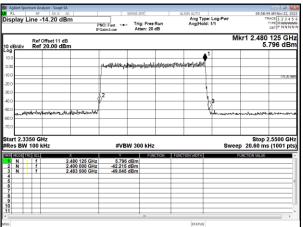


Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :67 of 81

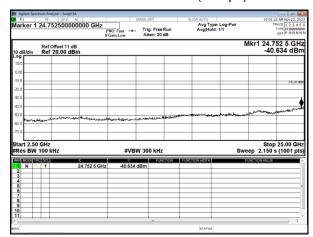
## Modulation Standard: 8DPSK (3Mbps)





Report No.: DEFB2310067

#### Modulation Standard: 8DPSK (3Mbps)



Cerpass Technology Corp. Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :68 of 81

#### 8. 20dB Bandwidth Measurement Data

#### 8.1 **Test Limit**

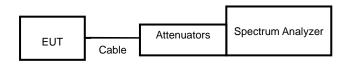
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that 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 125 mW.

Report No.: DEFB2310067

#### 8.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.
- c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

## 8.3 Test Setup Layout



#### 8.4 Test Result and Data

Modulation Type	Channel	Frequency (MHz)	20dB Bandwidth (MHz)	2/3 20dB Bandwidth(MHz)
0.5014	00	2402	0.988	0.659
GFSK (1Mbps)	39	2441	0.982	0.654
(TIVIDPS)	78	2480	0.989	0.659
π/4-DQPSK (2Mbps)	00	2402	1.439	0.959
	39	2441	1.441	0.961
	78	2480	1.438	0.959
8DPSK (3Mbps)	00	2402	1.440	0.960
	39	2441	1.448	0.965
	78	2480	1.474	0.983
Note	2/3*20dB Bandwidth=20dB Bandwidth x 2/3			

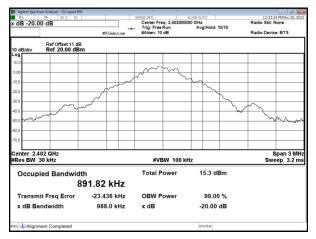
Issued Date : Dec. 06, 2023 Cerpass Technology Corp. Page No. :69 of 81

D-FD-507-0 V1.1

RPASS TECHNOLOGY CORP. Report No.: DEFB2310067

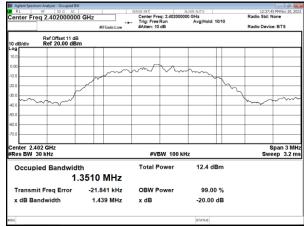
Modulation Type: GFSK (1Mbps)

Channel: 00

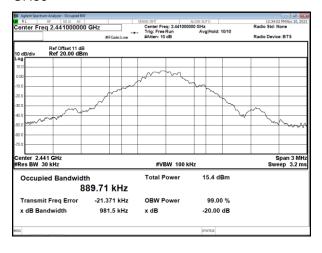


Modulation Type:  $\pi/4$ -DQPSK (2Mbps)

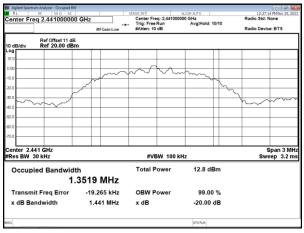
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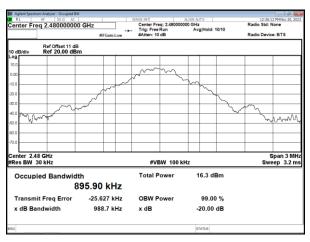
#### **CH39**



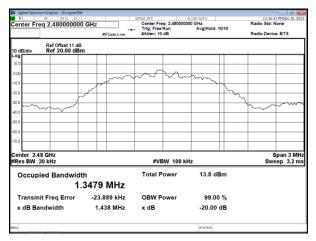
#### CH39



#### **CH78**



#### **CH78**



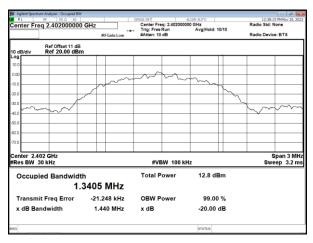
:70 of 81

Cerpass Technology Corp. Issued Date : Dec. 06, 2023

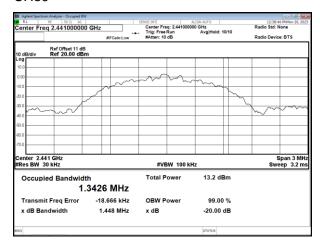
D-FD-507-0 V1.1 Page No.

Modulation Type: 8DPSK (3Mbps)

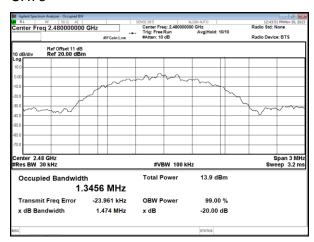
Channel: 00



#### CH39



#### **CH78**



D-FD-507-0 V1.1

Page No. :71 of 81

Report No.: DEFB2310067

## 9. Frequencies Separation

#### 9.1 Test Limit

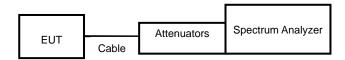
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Report No.: DEFB2310067

#### 9.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.
- c. By using the MaxHold function record the separation of two adjacent channels.
- d. Measure the frequency difference of these two adjacent channels.

#### 9.3 Test Setup Layout



#### 9.4 Test Result and Data

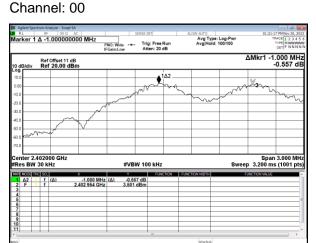
Modulation Type	Channel	Channel Separation (MHz)	Limit (MHz)
GFSK	00	1.000	0.659
	39	1.000	0.654
	78	1.000	0.659
	00	1.000	0.959
π/4-DQPSK	39	1.000	0.961
	78	1.000	0.959
	00	1.000	0.960
8DPSK	39	1.000	0.965
	78	1.000	0.983

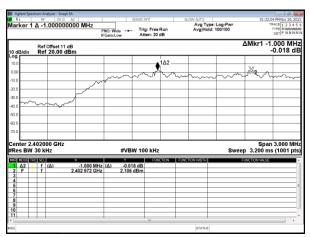
 Cerpass Technology Corp.
 Issued Date : Dec. 06, 2023

 D-FD-507-0 V1.1
 Page No. :72 of 81

Modulation Type: GFSK (1Mbps)

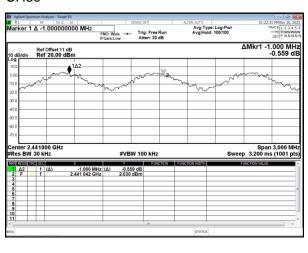
Modulation Type:  $\pi/4$ -DQPSK (2Mbps) Channel: 00



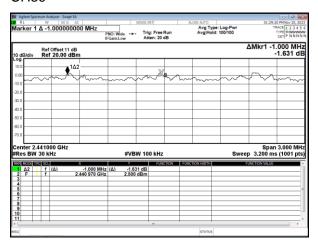


Report No.: DEFB2310067

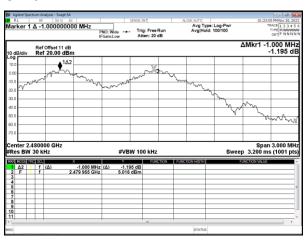
#### **CH39**



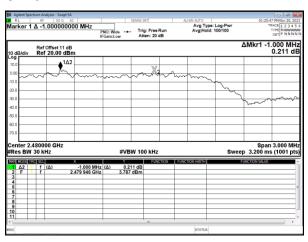
#### CH39



#### **CH78**



#### CH78



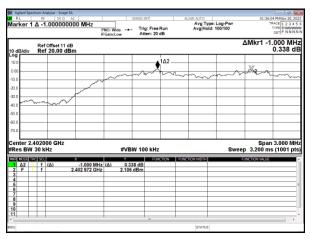
Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :73 of 81

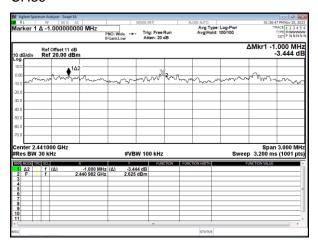
CORP. Report No.: DEFB2310067

Modulation Type: 8DPSK (3Mbps)

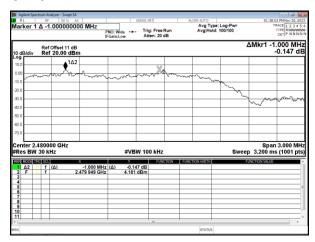
Channel: 00



#### **CH39**



#### **CH78**



D-FD-507-0 V1.1

Page No. :74 of 81

## 10. Dwell Time on each channel

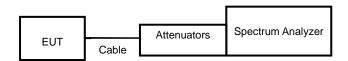
#### 10.1 Test Limit

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.

#### 10.2 Test Procedures

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. Adjust the center frequency to measure frequency, then set zero span mode.
- 2. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
- 4. Measure the time duration of one transmission on the measured frequency.

## 10.3 Test Setup Layout



#### 10.4 Test Result and Data

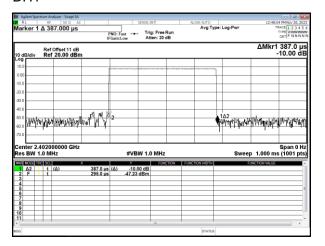
Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec

Modulation Type	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 31.6 (79 Hopping*0.4)	Dwell Time (ms)	Limit (ms)
GFSK (DH1)	2402	0.387	320.00	123.84	400
GFSK (DH3)	2402	1.647	160.00	263.52	400
GFSK (DH5)	2402	2.895	106.67	308.80	400
π/4-DQPSK (DH1)	2402	0.394	320.00	126.08	400
π/4-DQPSK (DH3)	2402	1.656	160.00	264.96	400
π/4-DQPSK (DH5)	2402	2.915	106.67	310.93	400
8DPSK (DH1)	2402	0.394	320.00	126.08	400
8DPSK (DH3)	2402	1.653	160.00	264.48	400
8DPSK (DH5)	2402	2.905	106.67	309.87	400

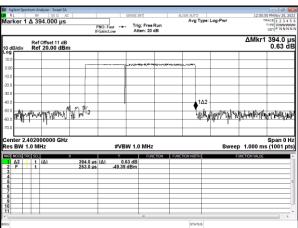
Cerpass Technology Corp. D-FD-507-0 V1.1 Page No. :75 of 81

Report No.: DEFB2310067

Modulation Type: GFSK (1Mbps) DH1

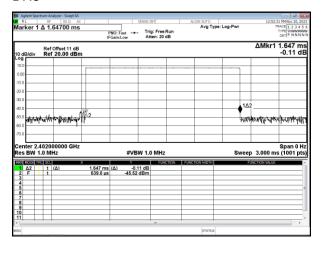


Modulation Type:  $\pi/4$ -DQPSK (2Mbps) DH1

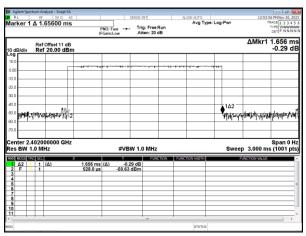


Report No.: DEFB2310067

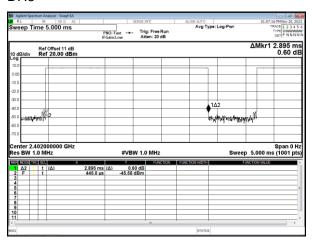
#### DH3



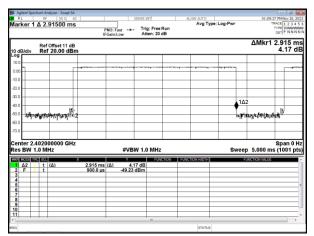
DH3



#### DH5



#### DH5



Issued Date : Dec. 06, 2023

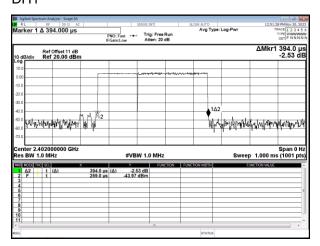
D-FD-507-0 V1.1 Page No. :76 of 81



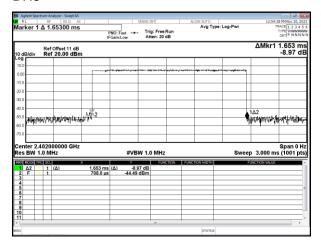
Report No.: DEFB2310067

Issued Date : Dec. 06, 2023

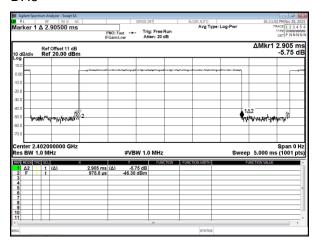
Modulation Type: 8DPSK (3Mbps) DH1



#### DH3



#### DH5



Cerpass Technology Corp.

D-FD-507-0 V1.1 Page No. :77 of 81

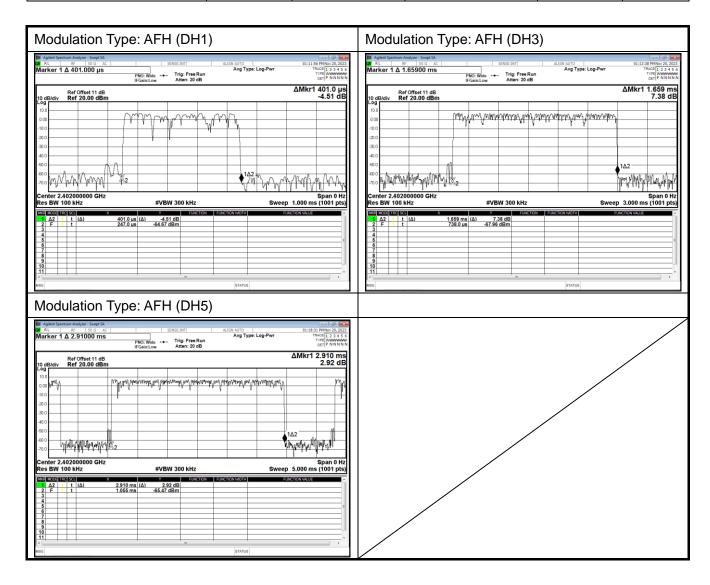


Test Period = 0.4 (second/ channel) x 20 Channel = 8 sec

Modulation Type	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 8 (20 Hopping*0.4)	Dwell Time (ms)	Limit (ms)
AFH (DH1)	2402-2421	0.401	160	64.16	400
AFH (DH3)	2402-2421	1.659	80	132.72	400
AFH (DH5)	2402-2421	2.91	53.33	155.19	400

Report No.: DEFB2310067

Issued Date : Dec. 06, 2023



D-FD-507-0 V1.1 Page No. :78 of 81

## 11. Number of Hopping Channels

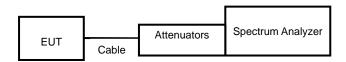
#### 11.1 Test Limit

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

#### 11.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 300 KHz and VBW to 300 KHz.
- c. Set the MaxHold function, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been record.

## 11.3 Test Setup Layout



#### 11.4 Test Result and Data

Modulation Type	Number of hopping channels
GFSK	79
π/4-DQPSK	79
8DPSK	79

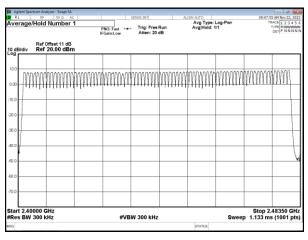
Cerpass Technology Corp. Issued Date : Dec. 06, 2023

D-FD-507-0 V1.1 Page No. :79 of 81

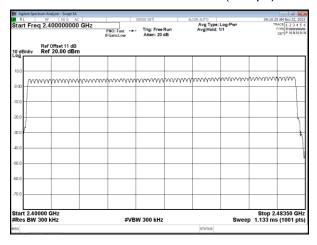
Report No.: DEFB2310067

# ERPASS TECHNOLOGY CORP. Report No.: DEFB2310067

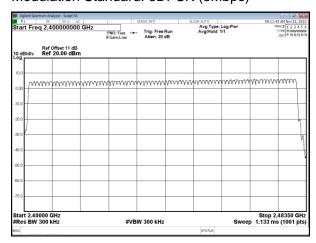
### Modulation Standard: GFSK (1Mbps)



#### Modulation Standard: $\pi/4$ -DQPSK (2Mbps)



#### Modulation Standard: 8DPSK (3Mbps)



## 12. Maximum Peak Output Power

#### 12.1 Test Limit

The Maximum Peak Output Power Measurement is 21dBm.

#### **12.2 Test Procedures**

The antenna port( RF output )of the EUT was connected to the input( RF input )of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

Report No.: DEFB2310067

## 12.3 Test Setup Layout



#### 12.4 Test Result and Data

Modulation Type	Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
0-014	00	2402	7.223	5.276
GFSK (1Mbps)	39	2441	7.621	5.782
(Tivibps)	78	2480	8.764	7.523
π /4 DQPSK (2Mbps)	00	2402	5.274	3.368
	39	2441	5.850	3.846
	78	2480	6.978	4.987
8DPSK (3Mbps)	00	2402	5.338	3.418
	39	2441	5.945	3.931
	78	2480	7.080	5.105

----- End of the report -----

Cerpass Technology Corp. Issued Date : Dec. 06, 2023 Page No. :81 of 81