

# Appendix Report

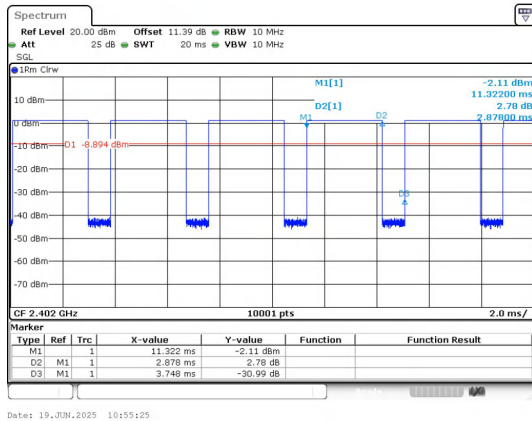
|                |               |
|----------------|---------------|
| Project No.:   | CISR250617190 |
| Test Engineer: | James Wang    |
| Supervised by: | Rory Huang    |

# 1) Duty Cycle

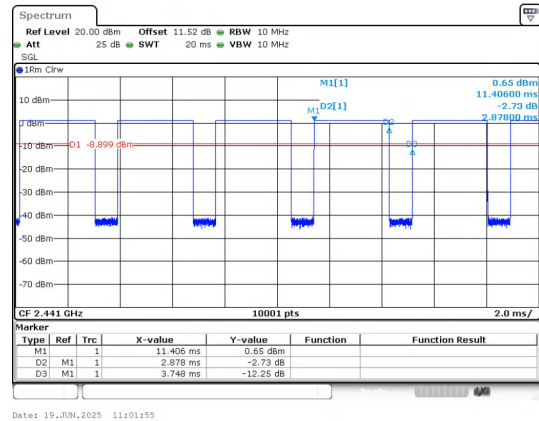
## Test Result

| Modulation    | Packets | Channel | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle (linear) | Duty Cycle Factor (dB) | 1/T    |
|---------------|---------|---------|--------------|-------------|----------------|---------------------|------------------------|--------|
| GFSK          | DH5     | 0       | 2.878        | 3.748       | 76.79          | 0.7679              | 1.147                  | 0.3475 |
|               |         | 39      | 2.878        | 3.748       | 76.79          | 0.7679              | 1.147                  | 0.3475 |
|               |         | 78      | 2.878        | 3.748       | 76.79          | 0.7679              | 1.147                  | 0.3475 |
| $\pi/4$ DQPSK | 2-DH5   | 0       | 2.884        | 3.748       | 76.95          | 0.7695              | 1.1379                 | 0.3467 |
|               |         | 39      | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |
|               |         | 78      | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |
| 8DPSK         | 3-DH5   | 0       | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |
|               |         | 39      | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |
|               |         | 78      | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |

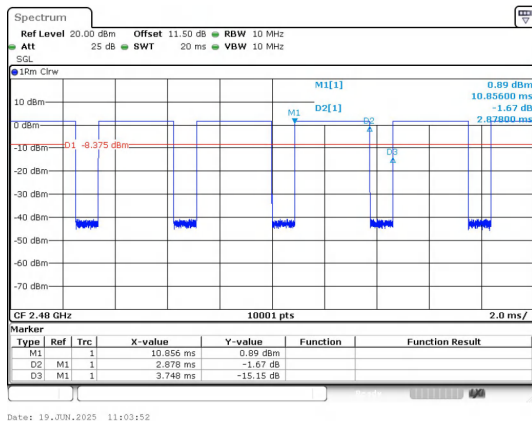
## Test Graphs



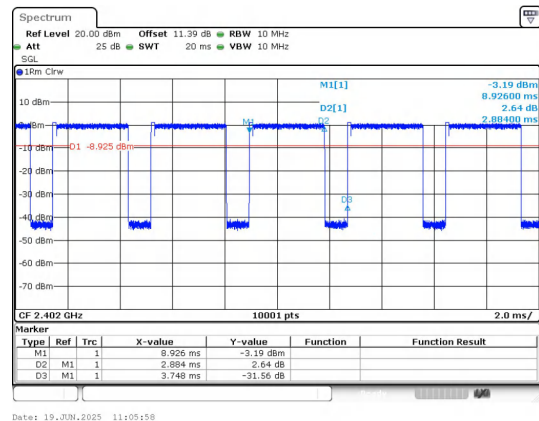
GFSK(DH5)\_Channel 0

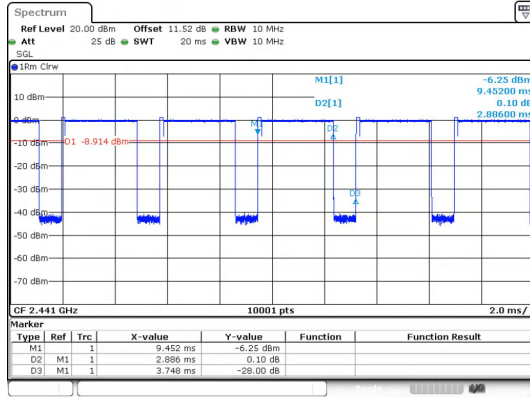


GFSK(DH5)\_Channel 39

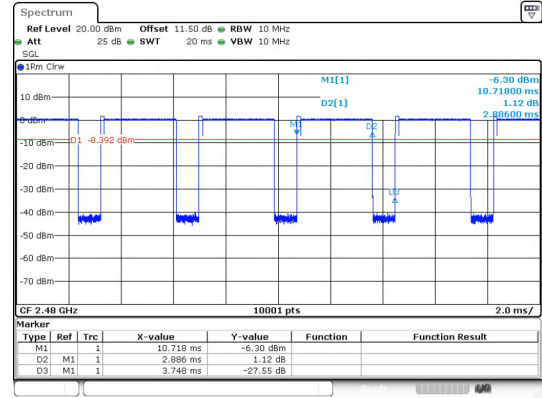


GFSK(DH5)\_Channel 78

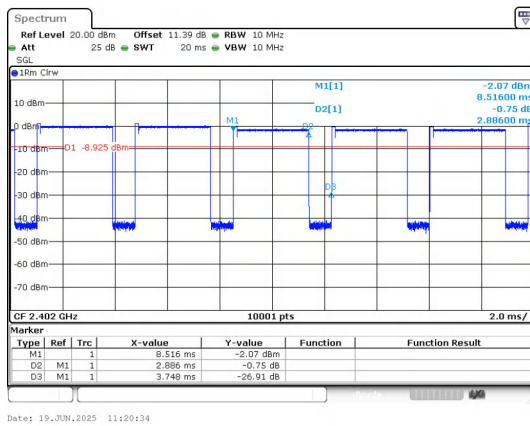

 $\pi/4$ DQPSK(2-DH5)\_Channel 0



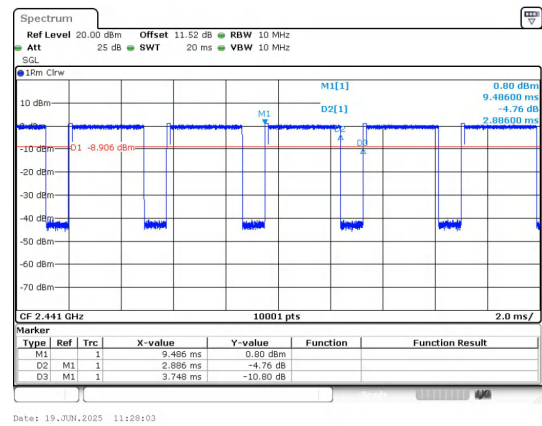
$\pi/4$ DQPSK(2-DH5)\_Channel 39



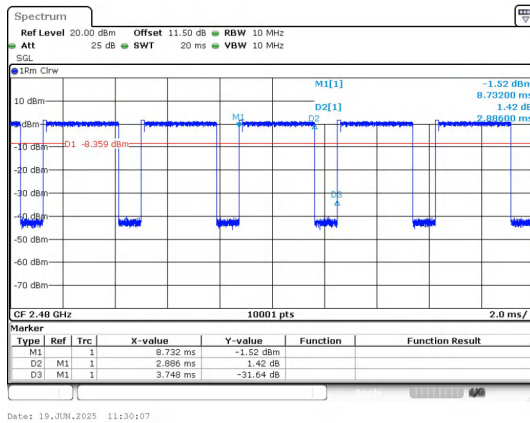
$\pi/4$ DQPSK(2-DH5)\_Channel 78



8DPSK(3-DH5)\_Channel 0



8DPSK(3-DH5)\_Channel 39



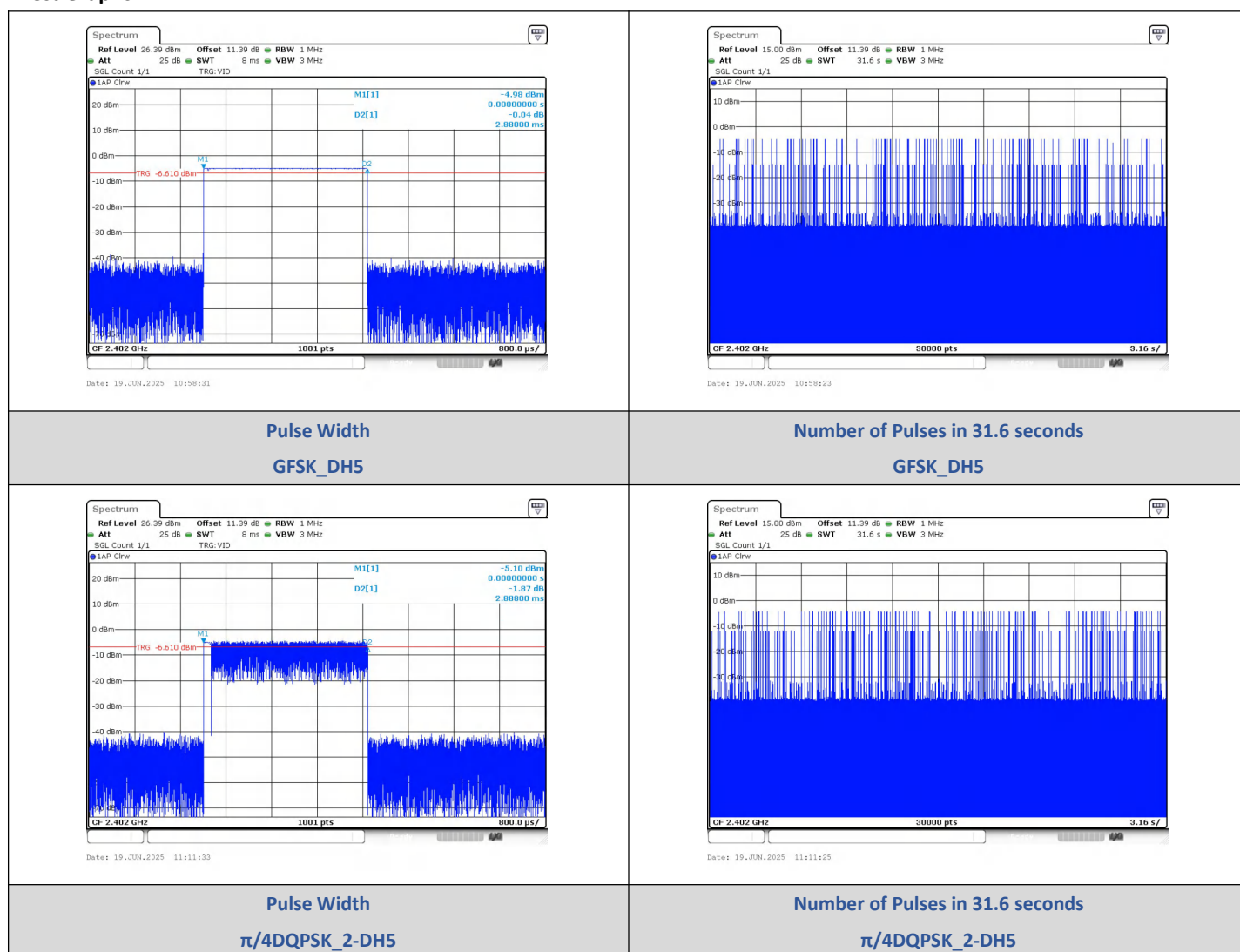
8DPSK(3-DH5)\_Channel 78

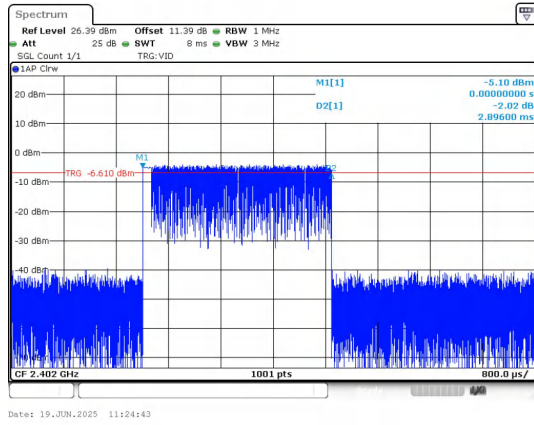
## 2) Dwell Time

### Test Result

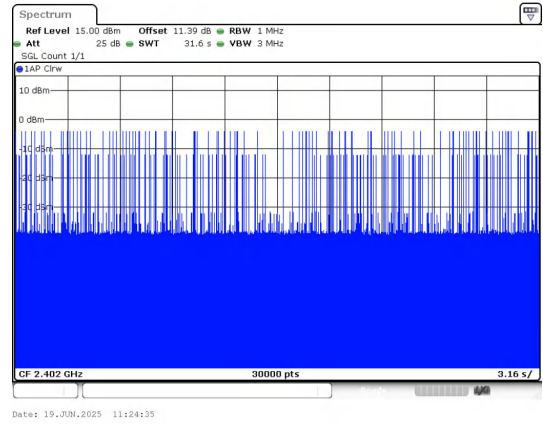
| Modulation    | Packet | Channel          | Pulse Width (ms) | Number of Pulses in 31.6 seconds | Dwell Time (ms) | Limit (ms) | Result |
|---------------|--------|------------------|------------------|----------------------------------|-----------------|------------|--------|
| GFSK          | DH5    | CH0<br>(2402MHz) | 2.880            | 100                              | 288.0           | < 400      | PASS   |
| $\pi/4$ DQPSK | 2-DH5  |                  | 2.888            | 116                              | 335.01          |            | PASS   |
| 8DPSK         | 3-DH5  |                  | 2.896            | 99                               | 286.7           |            | PASS   |

### Test Graphs





**Pulse Width**  
**8DPSK\_3-DH5**



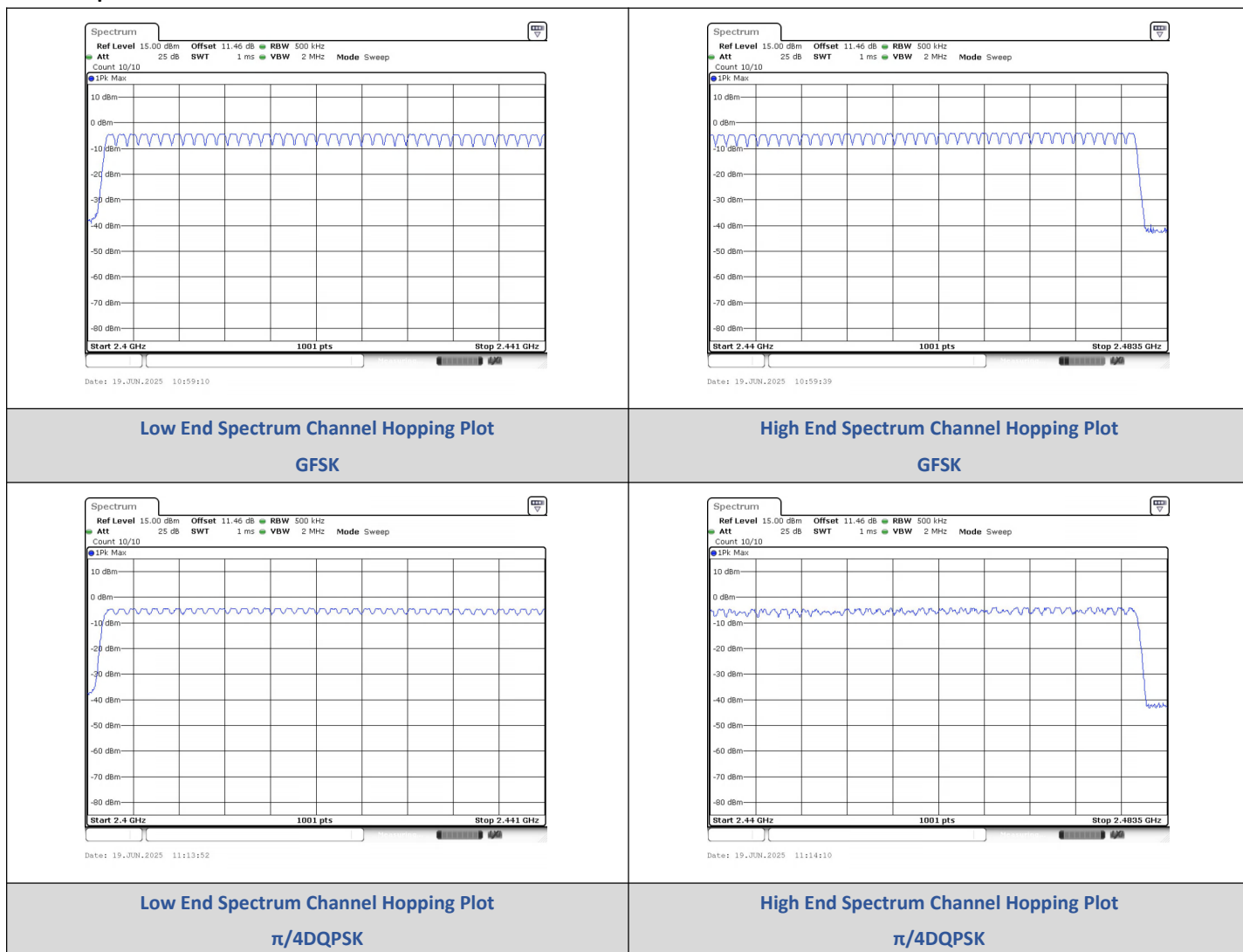
**Number of Pulses in 31.6 seconds**  
**8DPSK\_3-DH5**

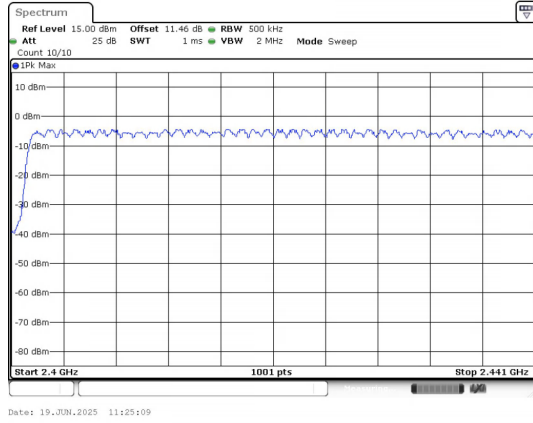
### 3) Number Of Hopping Channel

#### Test Result

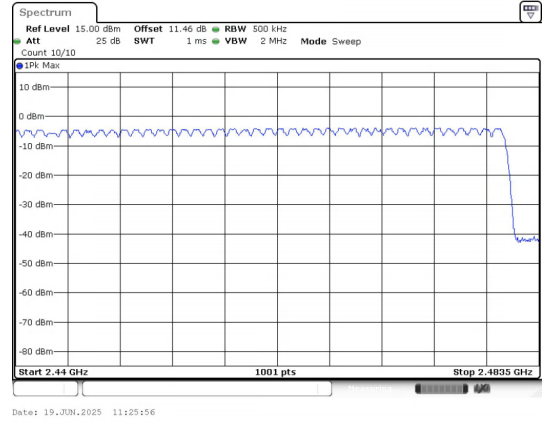
| Modulation    | Packet | Number of Hopping Channel | Limit | Result |
|---------------|--------|---------------------------|-------|--------|
| GFSK          | DH5    | 79                        | 15    | PASS   |
| $\pi/4$ DQPSK | 2-DH5  | 79                        | 15    | PASS   |
| 8DPSK         | 3-DH5  | 79                        | 15    | PASS   |

#### Test Graphs





Low End Spectrum Channel Hopping Plot  
8DPSK



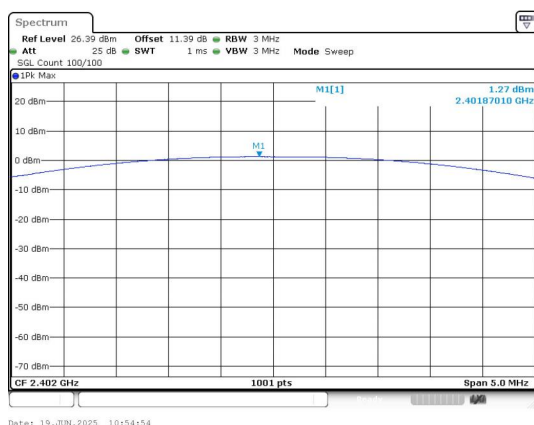
High End Spectrum Channel Hopping Plot  
8DPSK

## 4) Conducted Output Power

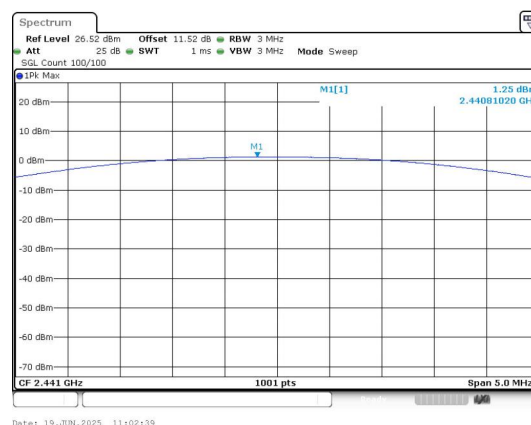
### Test Result

| Modulation    | Packet Type | Channel | Peak Output Power (dBm) | Peak Output Power (mW) | Limit (dBm) | Result |
|---------------|-------------|---------|-------------------------|------------------------|-------------|--------|
| GFSK          | DH5         | 0       | 1.27                    | 1.34                   | ≤30         | PASS   |
|               |             | 39      | 1.25                    | 1.33                   |             | PASS   |
|               |             | 78      | 1.79                    | 1.51                   |             | PASS   |
| $\pi/4$ DQPSK | 2-DH5       | 0       | 2.12                    | 1.63                   | ≤20.97      | PASS   |
|               |             | 39      | 2.13                    | 1.63                   |             | PASS   |
|               |             | 78      | 2.66                    | 1.85                   |             | PASS   |
| 8DPSK         | 3-DH5       | 0       | 2.51                    | 1.78                   |             | PASS   |
|               |             | 39      | 2.55                    | 1.80                   |             | PASS   |
|               |             | 78      | 3.07                    | 2.03                   |             | PASS   |

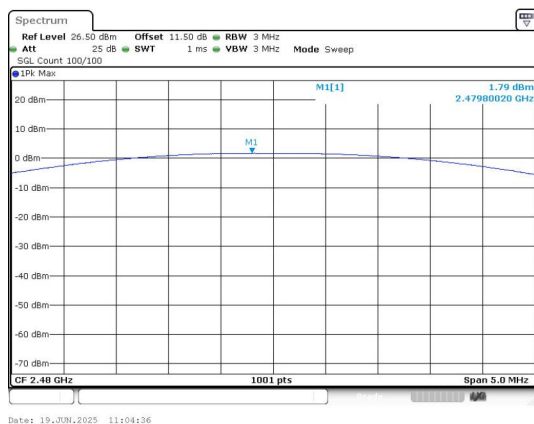
### Test Graphs



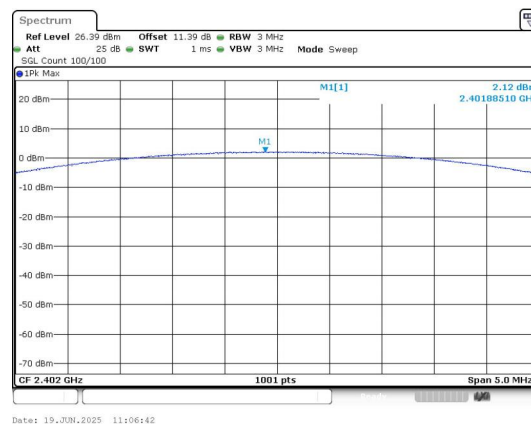
Peak Output Power  
GFSK\_Channel 0



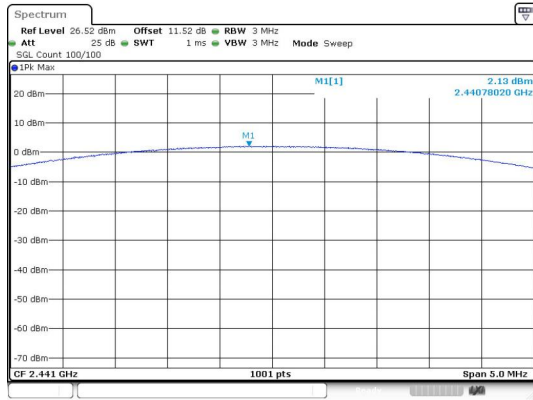
Peak Output Power  
GFSK\_Channel 39



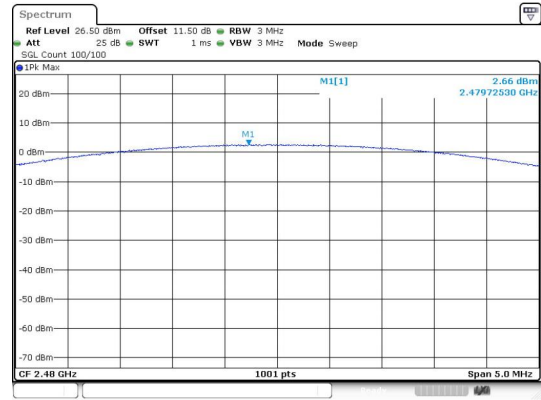
Peak Output Power  
GFSK\_Channel 78



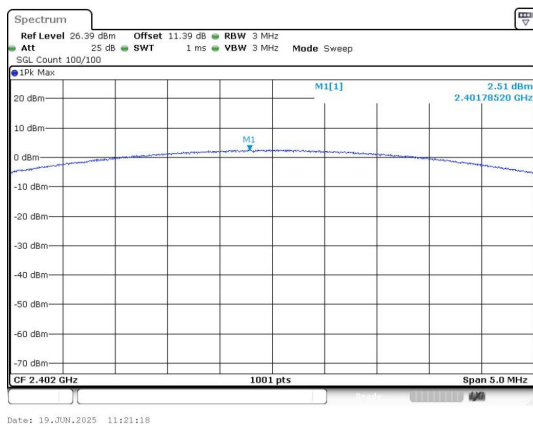
Peak Output Power  
 $\pi/4$ DQPSK\_Channel 0



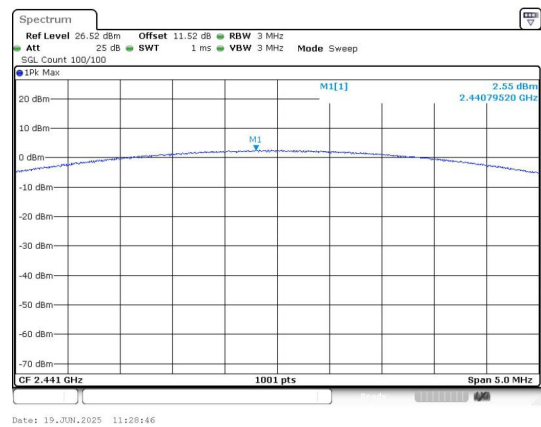
**Peak Output Power**  
 **$\pi/4$ DQPSK\_Channel 39**



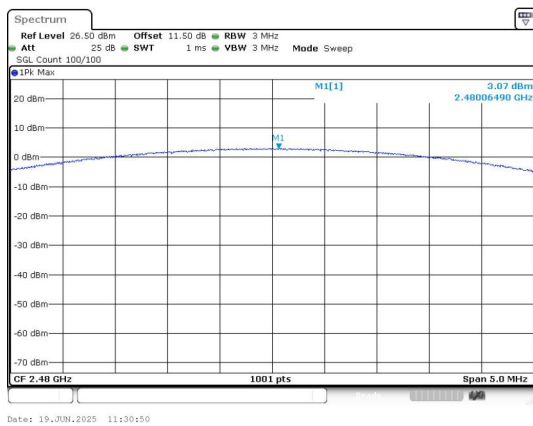
**Peak Output Power**  
 **$\pi/4$ DQPSK\_Channel 78**



**Peak Output Power**  
**8DPSK\_Channel 0**



**Peak Output Power**  
**8DPSK\_Channel 39**



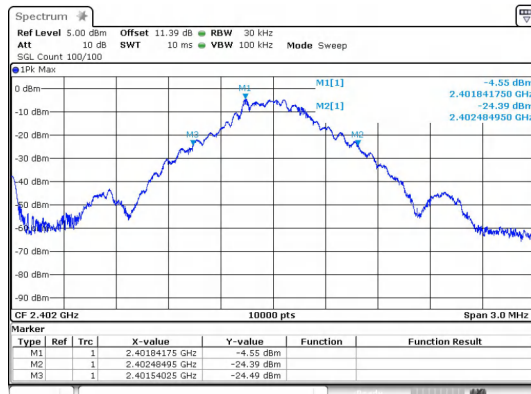
**Peak Output Power**  
**8DPSK\_Channel 78**

## 5) 20dB Bandwidth

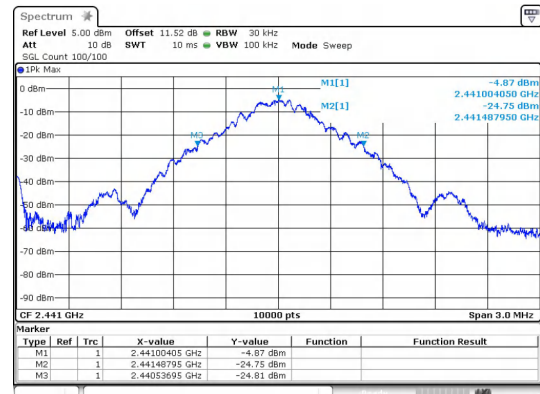
### Test Result

| Modulation    | Channel | Center Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---------------|---------|------------------------|-----------------------|
| GFSK          | 0       | 2402 MHz               | 0.94                  |
|               | 39      | 2441 MHz               | 0.94                  |
|               | 78      | 2480 MHz               | 0.94                  |
| $\pi/4$ DQPSK | 0       | 2402 MHz               | 1.280                 |
|               | 39      | 2441 MHz               | 1.280                 |
|               | 78      | 2480 MHz               | 1.300                 |
| 8DPSK         | 0       | 2402 MHz               | 1.290                 |
|               | 39      | 2441 MHz               | 1.290                 |
|               | 78      | 2480 MHz               | 1.290                 |

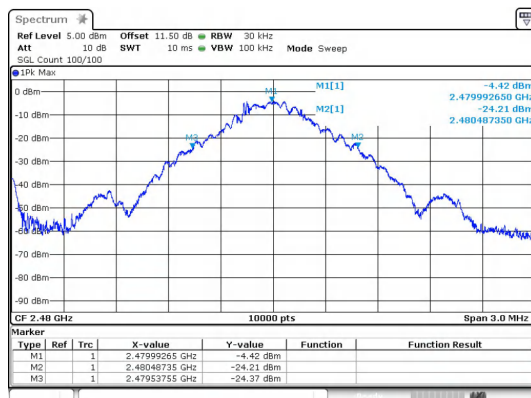
### Test Graphs



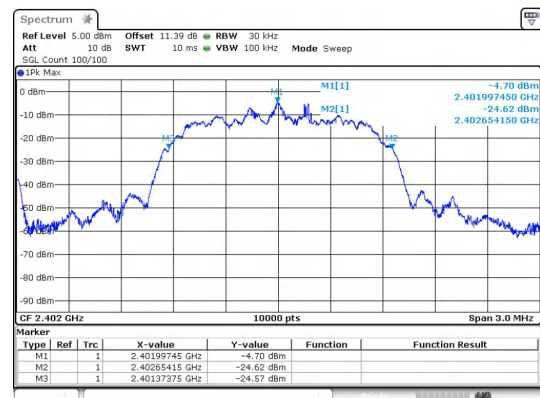
GFSK\_DH5\_Channel 0

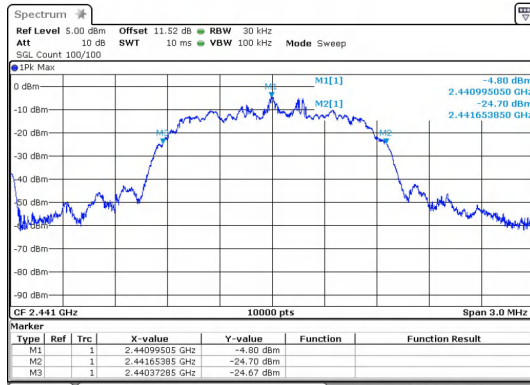


GFSK\_DH5\_Channel 39



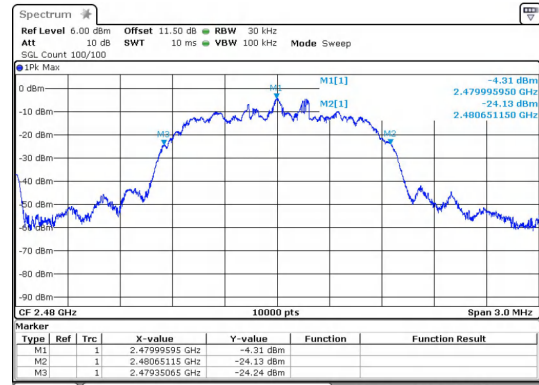
GFSK\_DH5\_Channel 78


 $\pi/4$ DQPSK\_2-DH5\_Channel 0



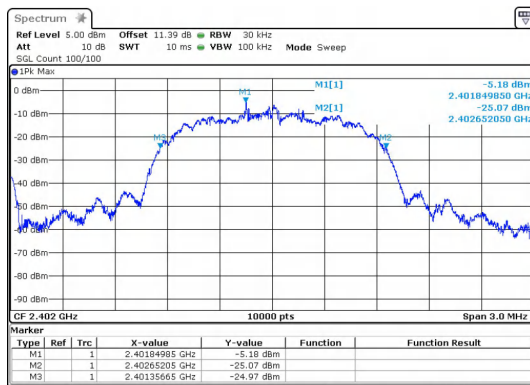
Date: 19.JUN.2025 11:16:30

$\pi/4$ DQPSK\_2-DH5\_Channel 39



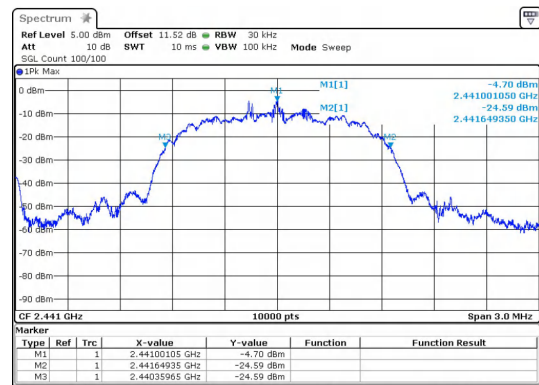
Date: 19.JUN.2025 11:18:30

$\pi/4$ DQPSK\_2-DH5\_Channel 78



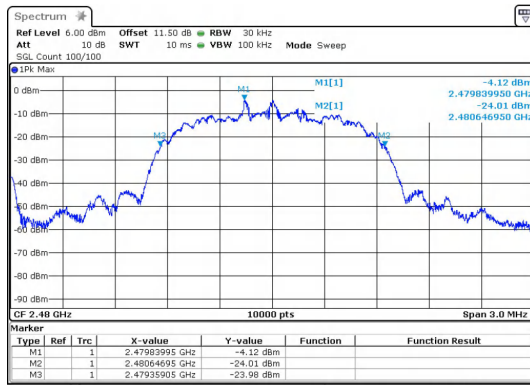
Date: 19.JUN.2025 11:21:01

8DPSK\_3-DH5\_Channel 0



Date: 19.JUN.2025 11:28:30

8DPSK\_3-DH5\_Channel 39



Date: 19.JUN.2025 11:30:34

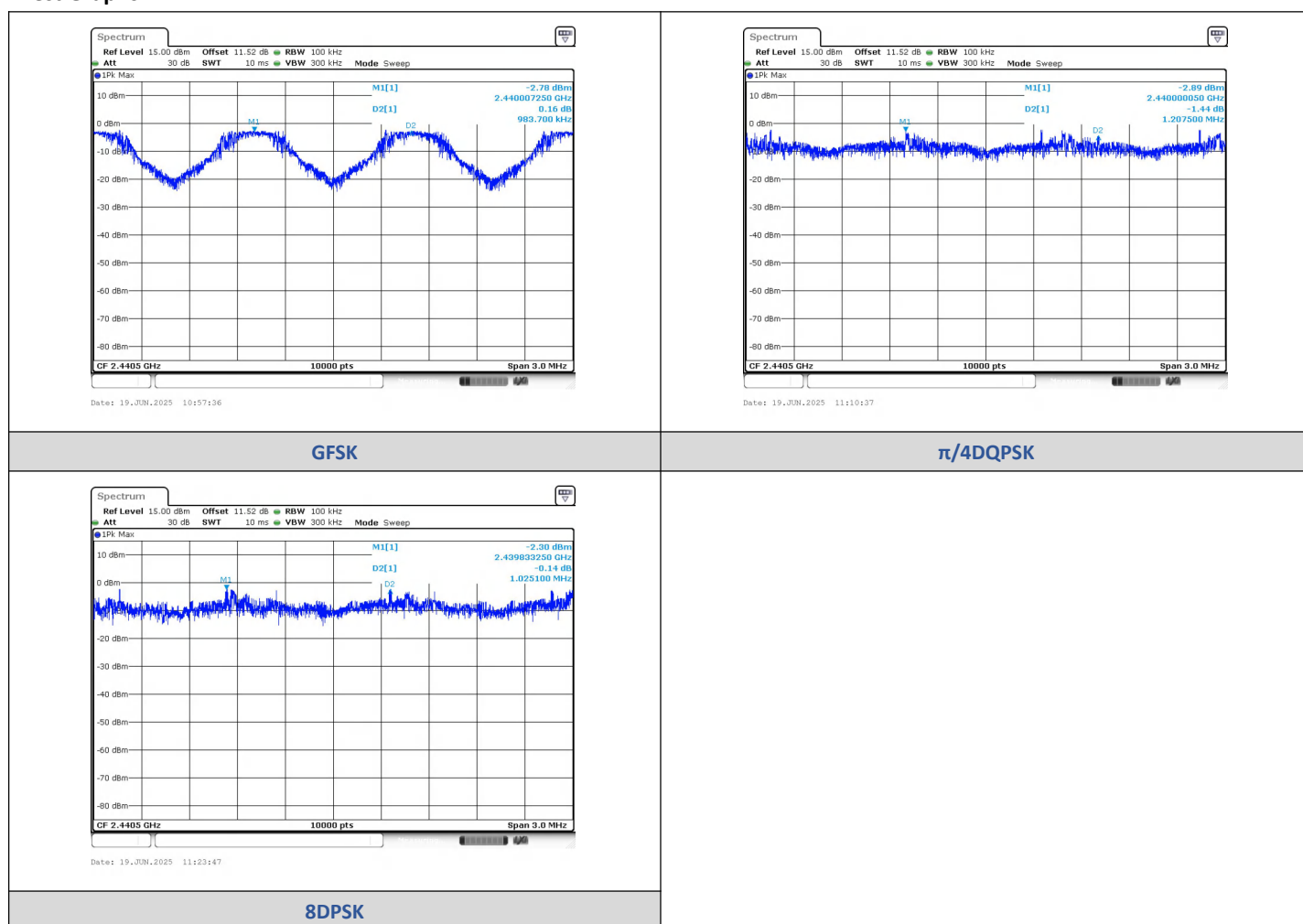
8DPSK\_3-DH5\_Channel 78

## 6) Carrier Frequencies Separation

### Test Result

| Modulation   | Packet | Left Center frequency (MHz) | Right Center frequency (MHz) | Hopping Frequency Separation (MHz) | Limit (MHz) | Result |
|--------------|--------|-----------------------------|------------------------------|------------------------------------|-------------|--------|
| GFSK         | DH5    | 2440.0073                   | 2440.9909                    | 0.9837                             | 0.94        | PASS   |
| $\pi/4$ QPSK | 2-DH5  | 2440.0001                   | 2441.2076                    | 1.2075                             | 0.853       | PASS   |
| 8DPSK        | 3-DH5  | 2439.8333                   | 2440.8583                    | 1.0251                             | 0.86        | PASS   |

### Test Graphs



## 7) Conducted Out Of Band Emission

### Test Result

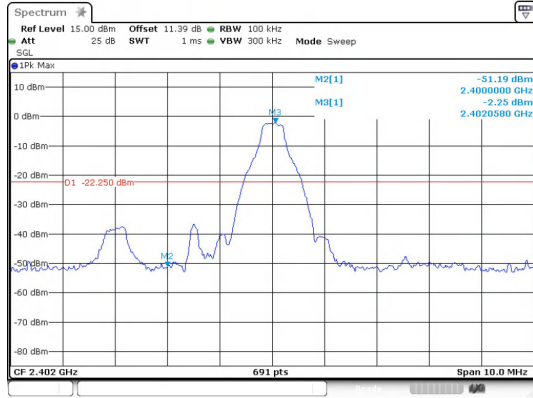
#### Non-Hopping

| Modulation    | Packet | Channel | OOB Emission Frequency (MHz) | OOB Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result |
|---------------|--------|---------|------------------------------|--------------------------|-------------|-----------------|--------|
| GFSK          | DH5    | 0       | 2399.00                      | -37.954                  | -22.25      | -15.704         | PASS   |
|               |        |         | 2400.00                      | -51.190                  | -22.25      | -28.940         | PASS   |
|               |        |         | 9602.20                      | -52.721                  | -22.25      | -30.471         | PASS   |
|               |        | 39      | 9757.90                      | -50.282                  | -22.17      | -28.112         | PASS   |
|               |        | 78      | 2483.50                      | -47.420                  | -21.7       | -25.720         | PASS   |
|               |        |         | 9914.37                      | -50.004                  | -21.7       | -28.304         | PASS   |
| $\pi/4$ DQPSK | 2-DH5  | 0       | 2398.83                      | -38.633                  | -22.13      | -16.503         | PASS   |
|               |        |         | 2400.00                      | -50.190                  | -22.13      | -28.060         | PASS   |
|               |        |         | 9602.20                      | -51.580                  | -22.13      | -29.450         | PASS   |
|               |        | 39      | 9757.90                      | -50.268                  | -22.2       | -28.068         | PASS   |
|               |        | 78      | 2483.50                      | -48.710                  | -21.65      | -27.060         | PASS   |
|               |        |         | 9914.37                      | -50.885                  | -21.65      | -29.235         | PASS   |
| 8DPSK         | 3-DH5  | 0       | 96.20                        | -40.506                  | -22.8       | -17.706         | PASS   |
|               |        |         | 2398.86                      | -38.778                  | -22.8       | -15.978         | PASS   |
|               |        |         | 2400.00                      | -51.250                  | -22.8       | -28.450         | PASS   |
|               |        | 39      | 96.17                        | -45.930                  | -22.22      | -23.710         | PASS   |
|               |        | 78      | 96.17                        | -40.292                  | -21.64      | -18.652         | PASS   |
|               |        |         | 2483.50                      | -47.600                  | -21.64      | -25.960         | PASS   |

#### Hopping

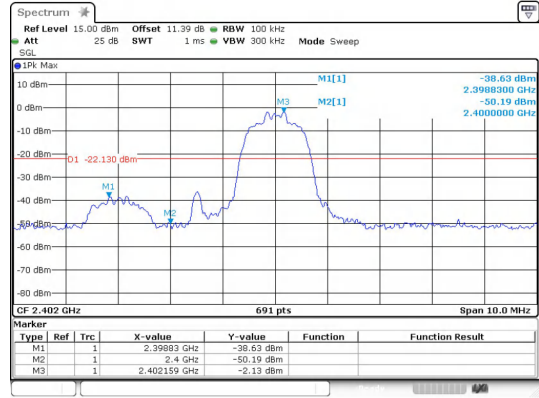
| Hopping       |        |         |                                    |                                |                |                    |        |
|---------------|--------|---------|------------------------------------|--------------------------------|----------------|--------------------|--------|
| Modulation    | Packet | Channel | OOB Emission<br>Frequency<br>(MHz) | OOB Emission<br>Level<br>(dBm) | Limit<br>(dBm) | Over Limit<br>(dB) | Result |
| GFSK          | DH5    | Hopping | 2400.00                            | -38.770                        | -22.47         | -16.300            | PASS   |
|               |        |         | 2483.50                            | -49.950                        | -21.83         | -28.120            | PASS   |
| $\pi/4$ DQPSK | 2-DH5  |         | 2400.00                            | -41.210                        | -22.28         | -18.930            | PASS   |
|               |        |         | 2483.50                            | -48.300                        | -23.7          | -24.600            | PASS   |
| 8DPSK         | 3-DH5  |         | 2398.99                            | -41.871                        | -22.76         | -19.111            | PASS   |
|               |        |         | 2400.00                            | -42.630                        | -22.76         | -19.870            | PASS   |
|               |        |         | 2483.50                            | -50.810                        | -23.9          | -26.910            | PASS   |

### Test Graphs



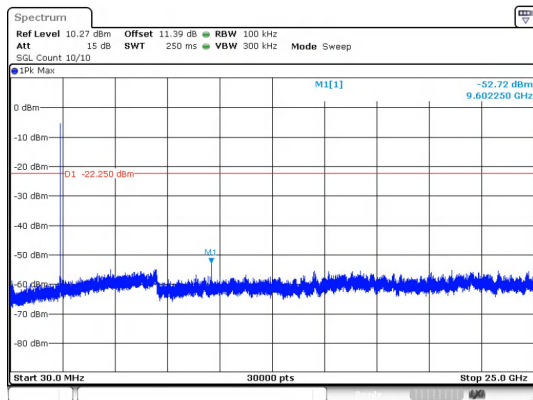
Date: 19 JUN 2025 10:56:17

Out Of Band Emission  
GFSK\_DH5\_Channel 0



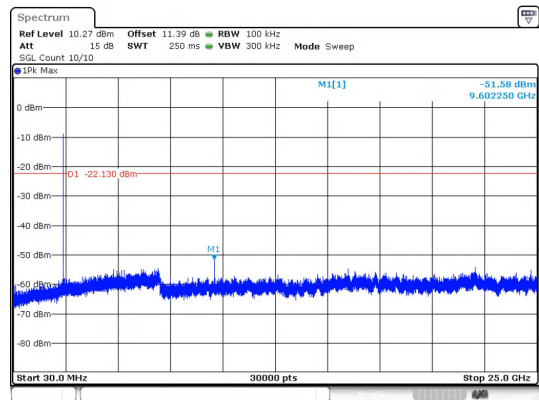
Date: 19 JUN 2025 11:07:07

Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 0



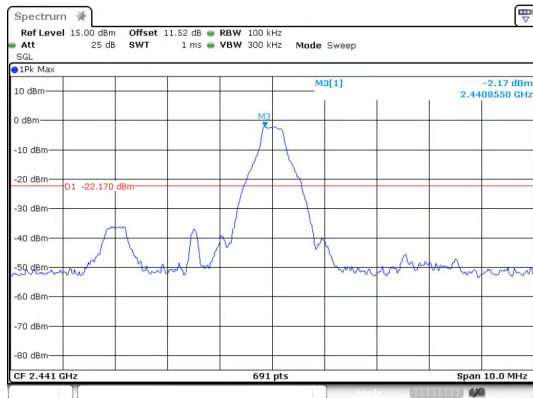
Date: 19 JUN 2025 10:56:40

30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 0



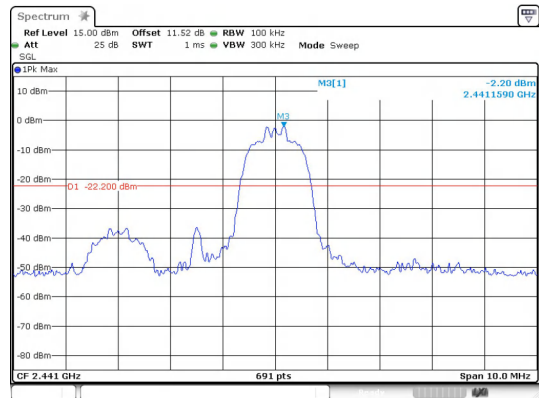
Date: 19 JUN 2025 11:07:30

30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 0



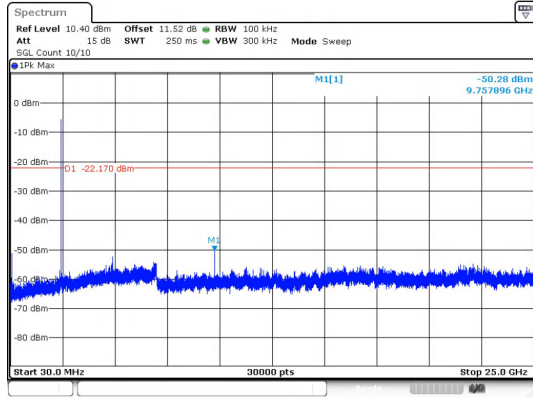
Date: 19 JUN 2025 11:02:58

Out Of Band Emission  
GFSK\_DH5\_Channel 39

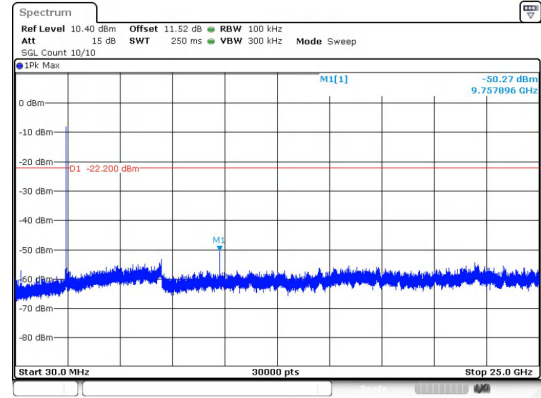


Date: 19 JUN 2025 11:17:07

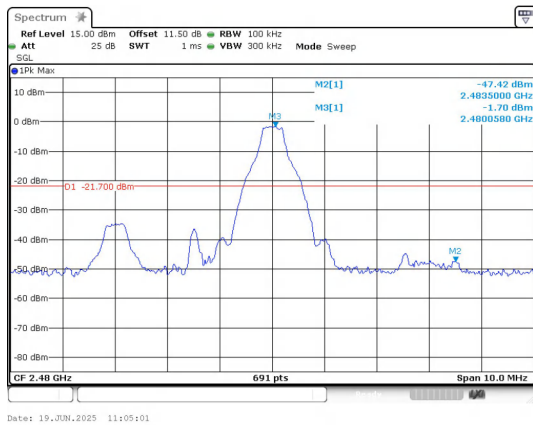
Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 39



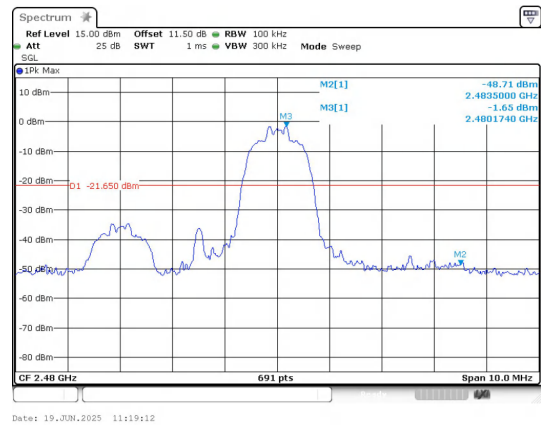
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 39



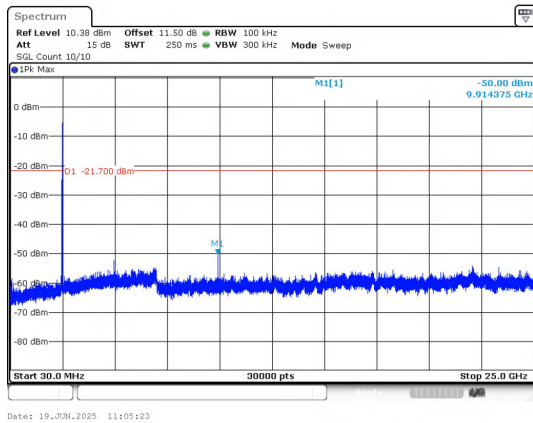
30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 39



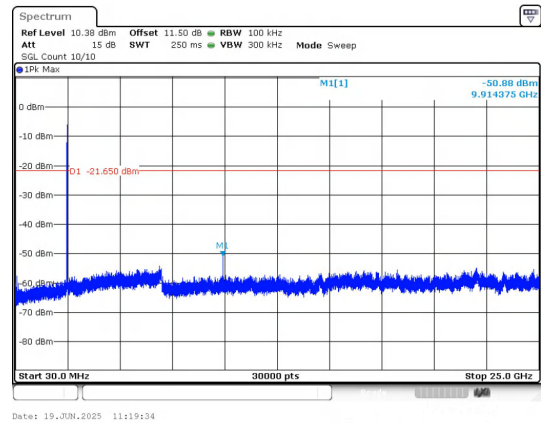
Out Of Band Emission  
GFSK\_DH5\_Channel 78



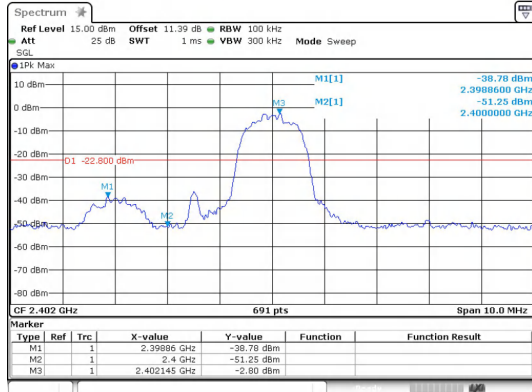
Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 78



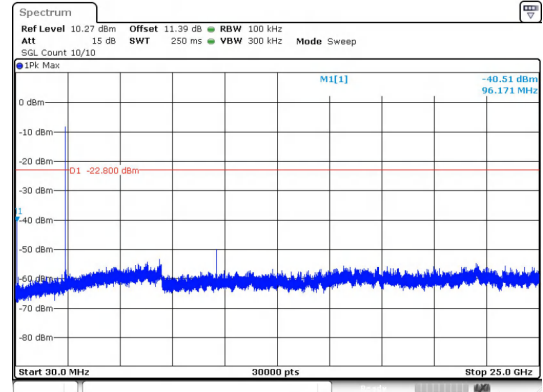
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 78



30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 78



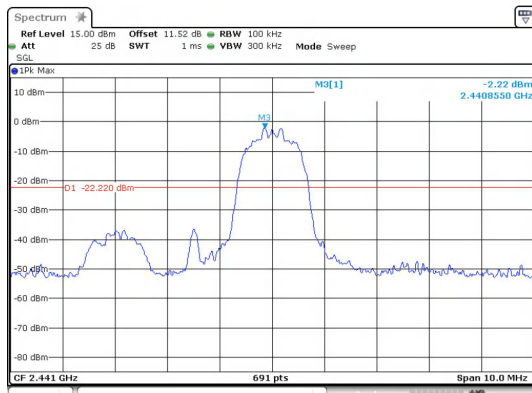
Date: 19.JUN.2025 11:21:43



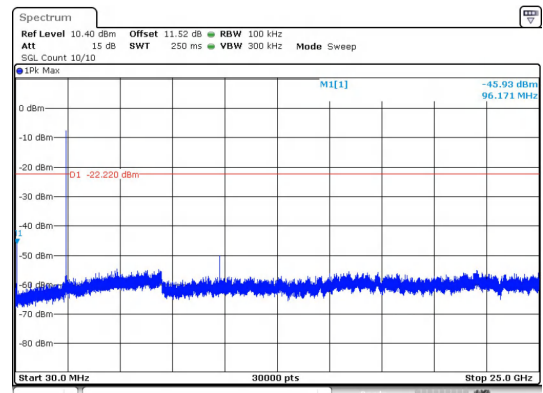
Date: 19.JUN.2025 11:22:05

**Out Of Band Emission**  
**8DPSK\_3-DH5\_Channel 0**

**30.0 MHz - 25000.0 MHz**  
**8DPSK\_3-DH5\_Channel 0**



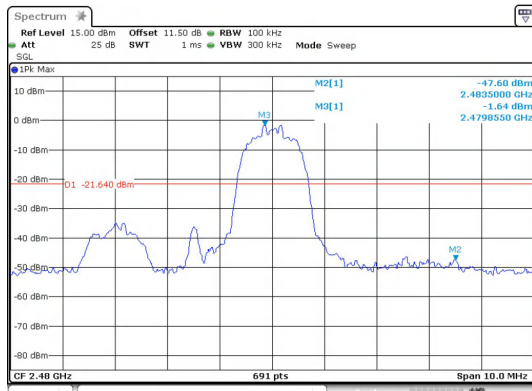
Date: 19.JUN.2025 11:29:06



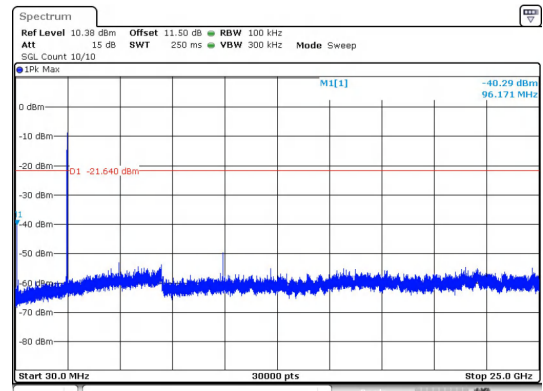
Date: 19.JUN.2025 11:29:29

**Out Of Band Emission**  
**8DPSK\_3-DH5\_Channel 39**

**30.0 MHz - 25000.0 MHz**  
**8DPSK\_3-DH5\_Channel 39**



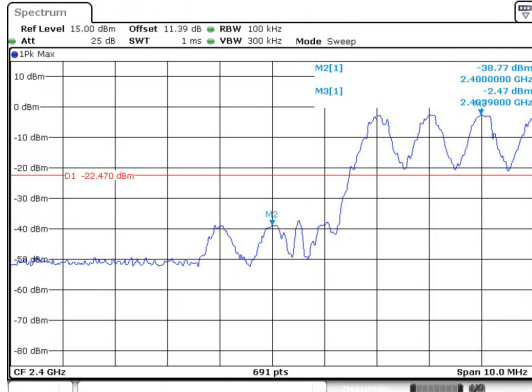
Date: 19.JUN.2025 11:31:15



Date: 19.JUN.2025 11:31:37

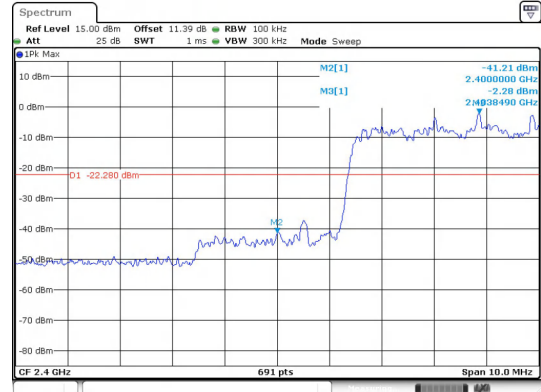
**Out Of Band Emission**  
**8DPSK\_3-DH5\_Channel 78**

**30.0 MHz - 25000.0 MHz**  
**8DPSK\_3-DH5\_Channel 78**



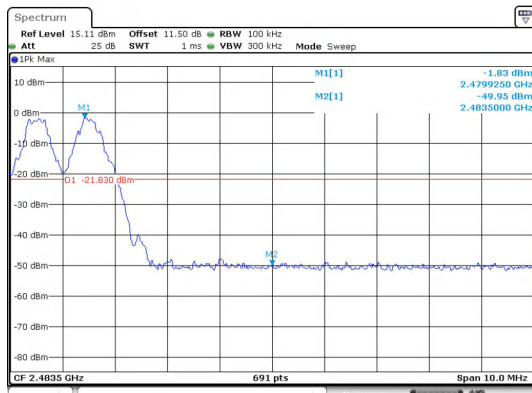
Date: 19 JUN 2025 11:00:50

**Out Of Band Emission(Left)**  
**GFSK\_DH5\_Channel Hopping**



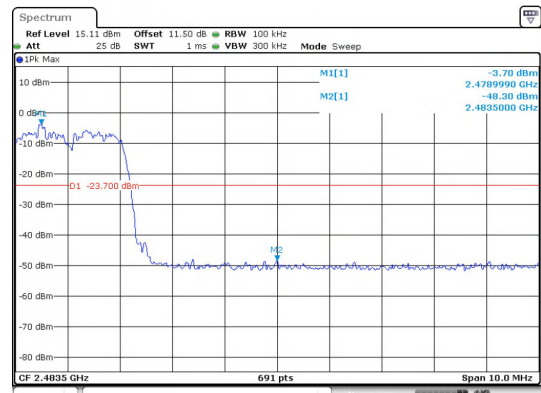
Date: 19 JUN 2025 11:15:03

**Out Of Band Emission(Left)**  
 **$\pi/4$ DQPSK\_2-DH5\_Channel Hopping**



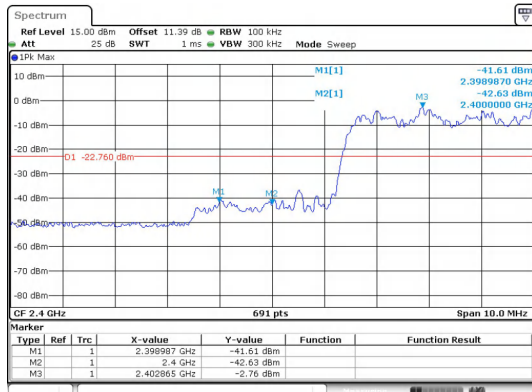
Date: 19 JUN 2025 11:01:20

**Out Of Band Emission(Right)**  
**GFSK\_DH5\_Channel Hopping**



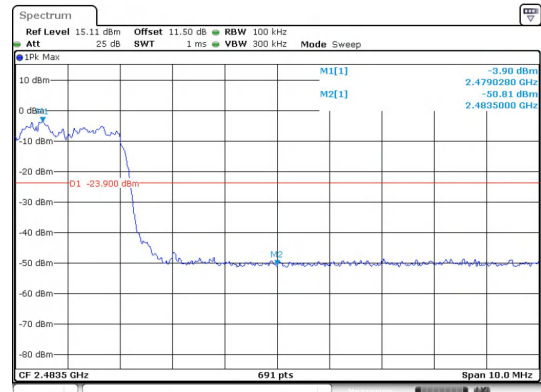
Date: 19 JUN 2025 11:15:32

**Out Of Band Emission(Right)**  
 **$\pi/4$ DQPSK\_2-DH5\_Channel Hopping**



Date: 19 JUN 2025 11:26:48

**Out Of Band Emission(Left)**  
**8DPSK\_3-DH5\_Channel Hopping**



Date: 19 JUN 2025 11:27:32

**Out Of Band Emission(Right)**  
**8DPSK\_3-DH5\_Channel Hopping**

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