

# Appendix Report

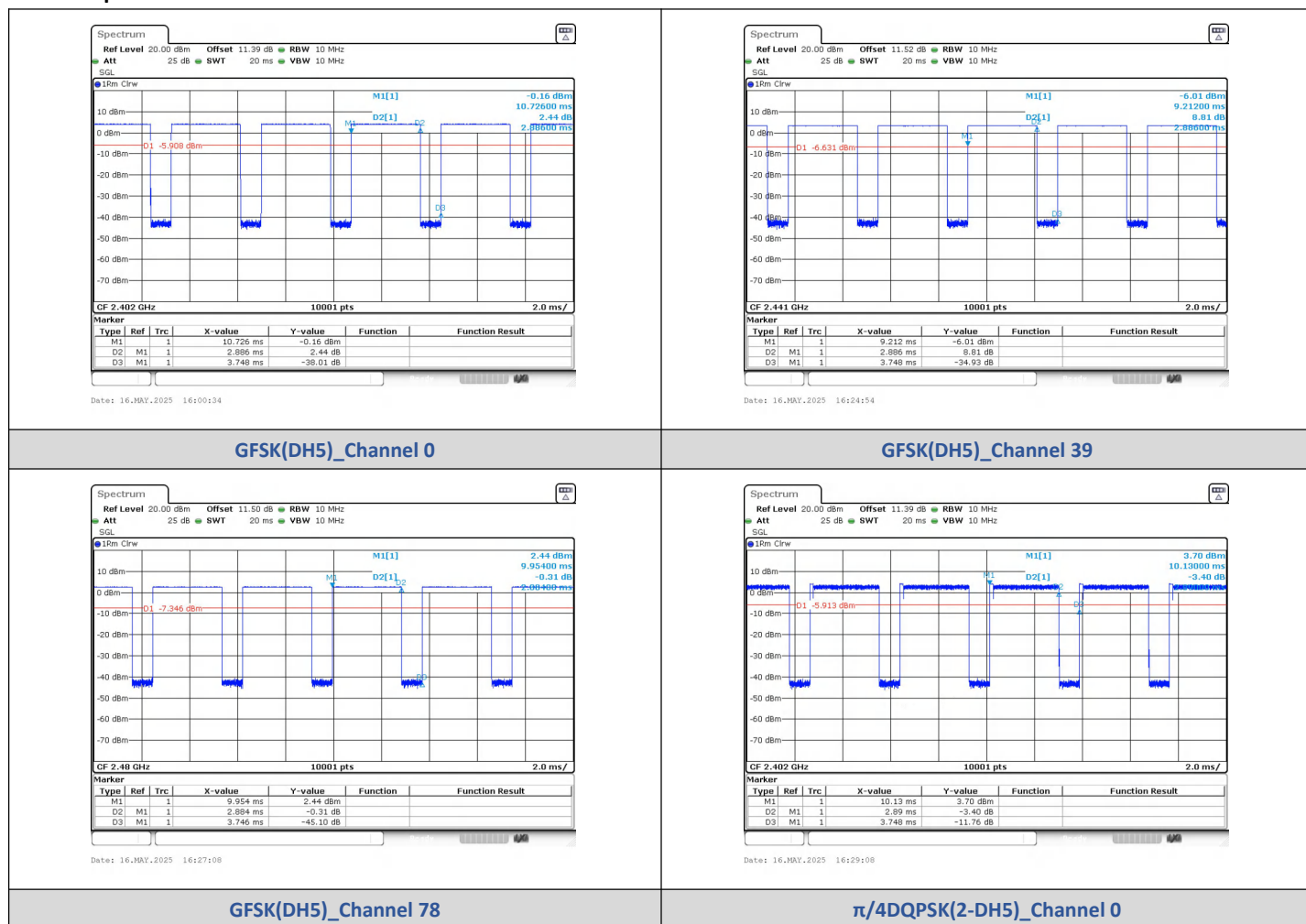
|                |               |
|----------------|---------------|
| Project No.:   | CISR250515084 |
| Test Engineer: | James Wang    |
| Supervised by: | Rory Huang    |

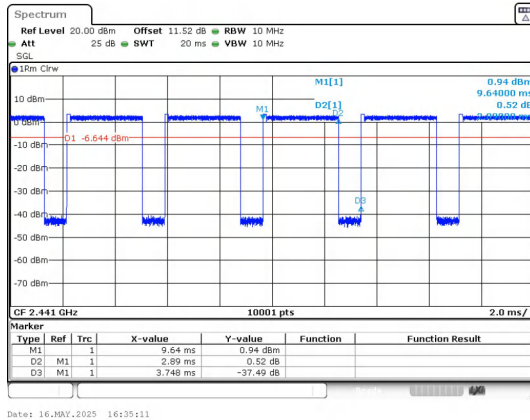
# 1) Duty Cycle

## Test Result

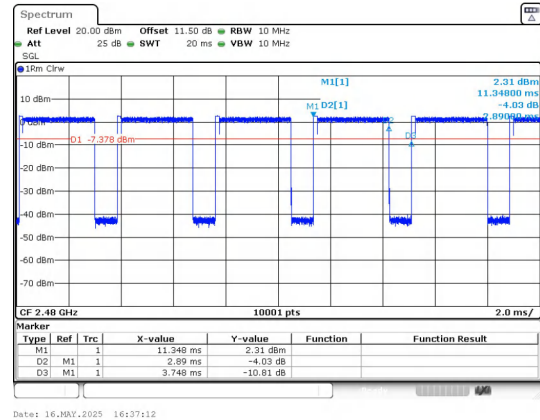
| Modulation    | Packets | Channel | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle (linear) | Duty Cycle Factor (dB) | 1/T    |
|---------------|---------|---------|--------------|-------------|----------------|---------------------|------------------------|--------|
| GFSK          | DH5     | 0       | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |
|               |         | 39      | 2.886        | 3.748       | 77.00          | 0.7700              | 1.1351                 | 0.3465 |
|               |         | 78      | 2.884        | 3.746       | 76.99          | 0.7699              | 1.1357                 | 0.3467 |
| $\pi/4$ DQPSK | 2-DH5   | 0       | 2.890        | 3.748       | 77.11          | 0.7711              | 1.1289                 | 0.3460 |
|               |         | 39      | 2.890        | 3.748       | 77.11          | 0.7711              | 1.1289                 | 0.3460 |
|               |         | 78      | 2.890        | 3.748       | 77.11          | 0.7711              | 1.1289                 | 0.3460 |
| 8DPSK         | 3-DH5   | 0       | 2.894        | 3.748       | 77.21          | 0.7721              | 1.1233                 | 0.3455 |
|               |         | 39      | 2.892        | 3.748       | 77.16          | 0.7716              | 1.1261                 | 0.3458 |
|               |         | 78      | 2.892        | 3.748       | 77.16          | 0.7716              | 1.1261                 | 0.3458 |

## Test Graphs

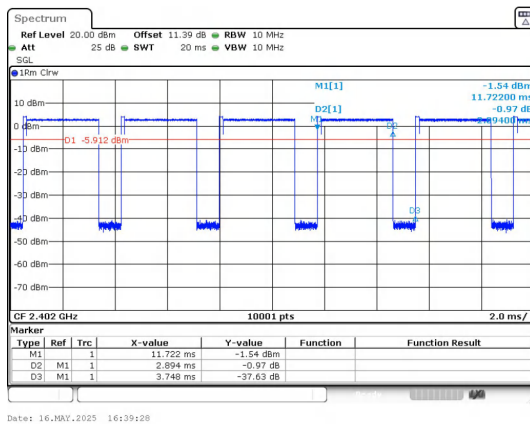




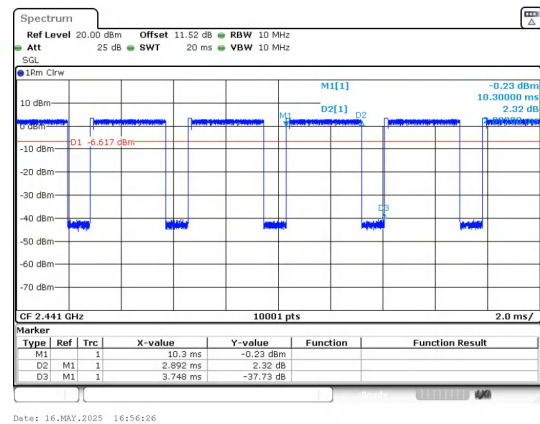
$\pi/4$ DQPSK(2-DH5)\_Channel 39



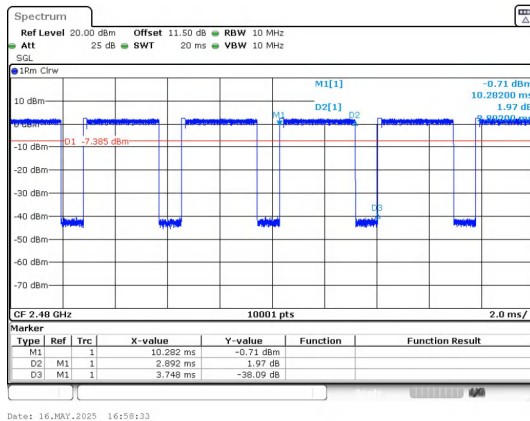
$\pi/4$ DQPSK(2-DH5)\_Channel 78



8DPSK(3-DH5)\_Channel 0



8DPSK(3-DH5)\_Channel 39



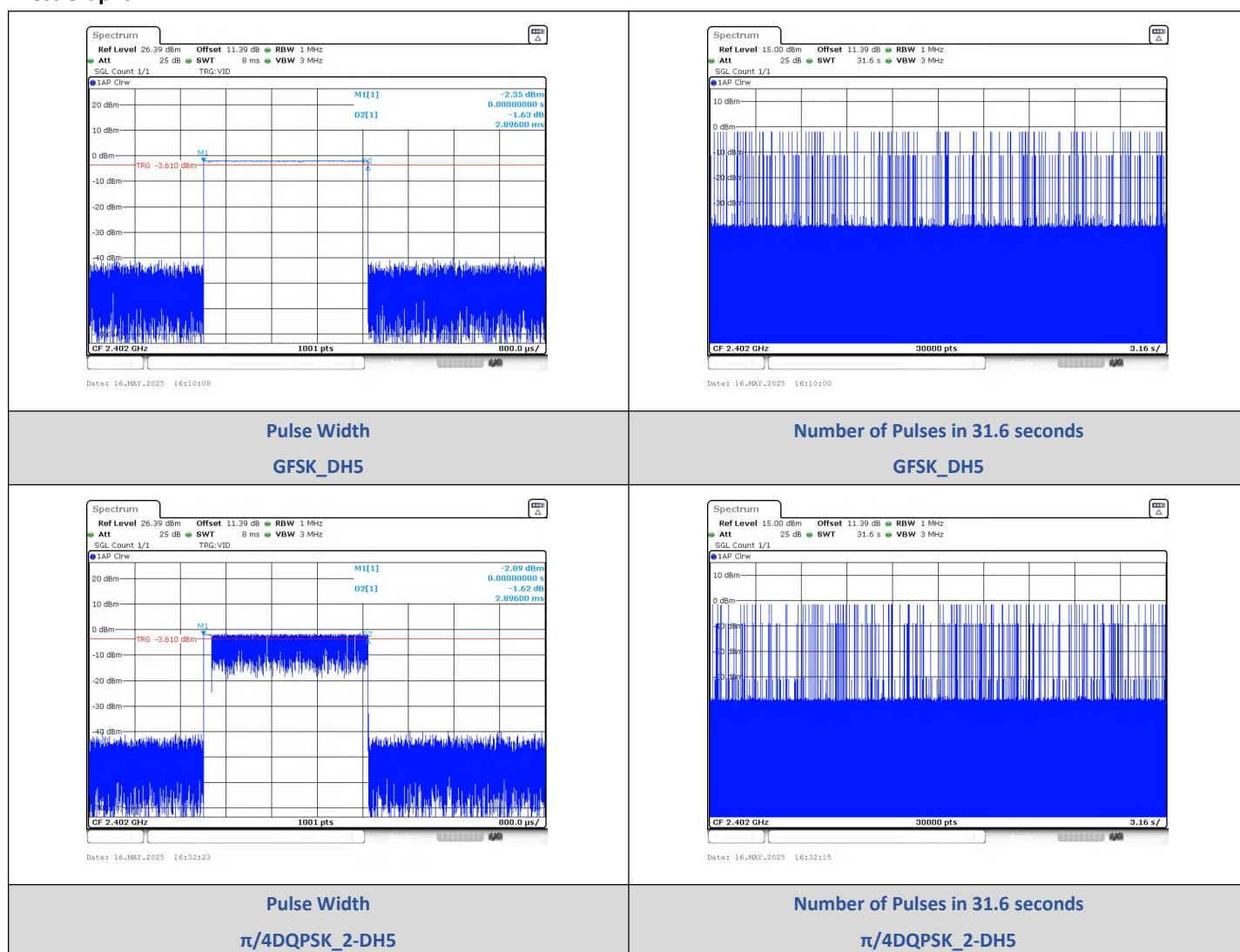
8DPSK(3-DH5)\_Channel 78

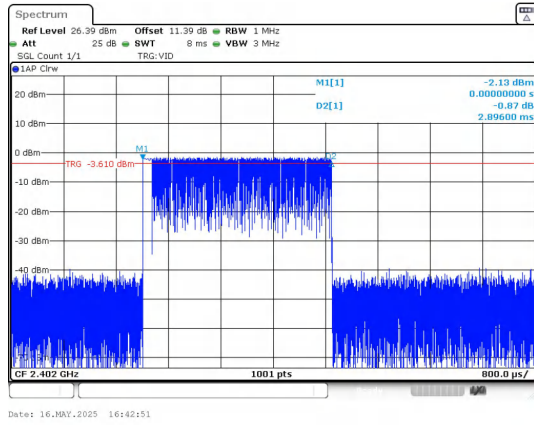
## 2) Dwell Time

### Test Result

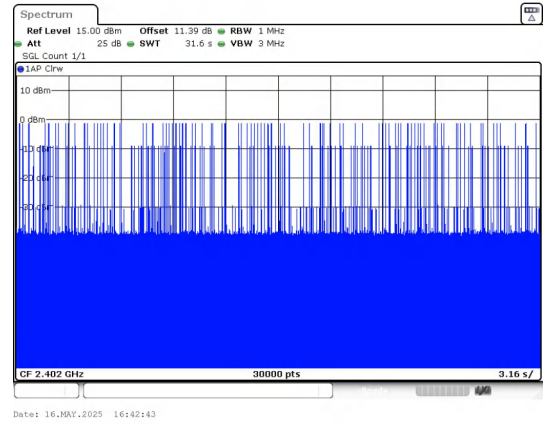
| Modulation    | Packet | Channel          | Pulse Width (ms) | Number of Pulses in 31.6 seconds | Dwell Time (ms) | Limit (ms) | Result |
|---------------|--------|------------------|------------------|----------------------------------|-----------------|------------|--------|
| GFSK          | DH5    | CH0<br>(2402MHz) | 2.896            | 102                              | 295.39          | < 400      | PASS   |
| $\pi/4$ DQPSK | 2-DH5  |                  | 2.896            | 112                              | 324.35          |            | PASS   |
| 8DPSK         | 3-DH5  |                  | 2.896            | 108                              | 312.77          |            | PASS   |

### Test Graphs





Pulse Width  
8DPSK\_3-DH5



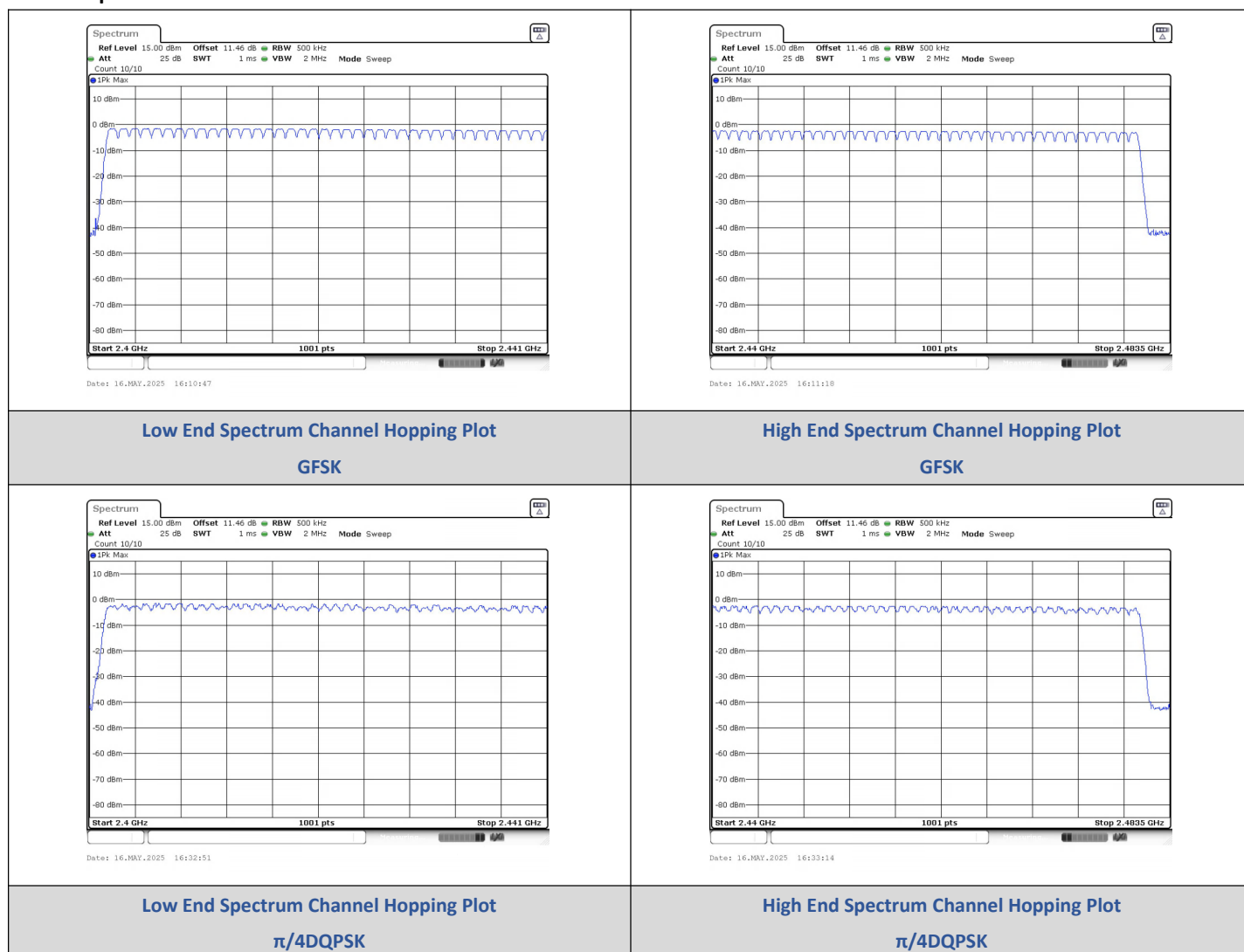
Number of Pulses in 31.6 seconds  
8DPSK\_3-DH5

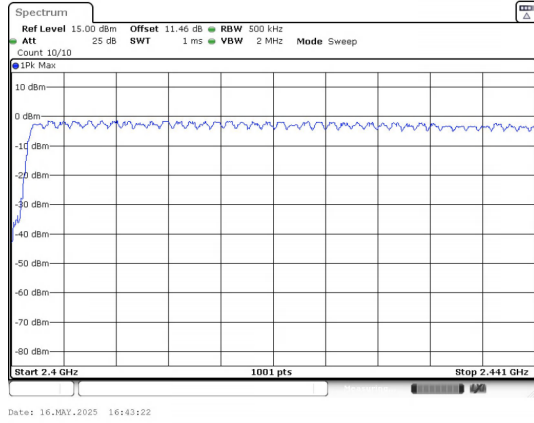
### 3) Number Of Hopping Channel

#### Test Result

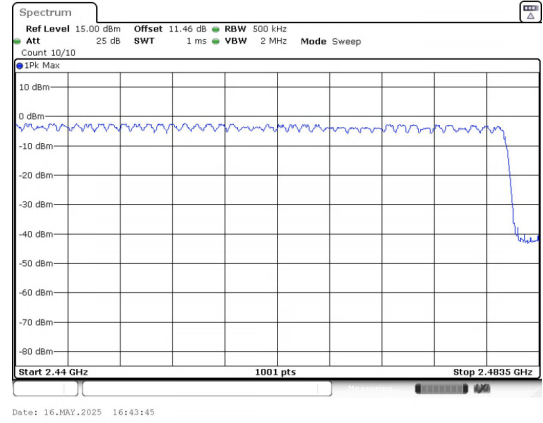
| Modulation    | Packet | Number of Hopping Channel | Limit | Result |
|---------------|--------|---------------------------|-------|--------|
| GFSK          | DH5    | 79                        | 15    | PASS   |
| $\pi/4$ DQPSK | 2-DH5  | 79                        | 15    | PASS   |
| 8DPSK     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

#### Test Graphs





Low End Spectrum Channel Hopping Plot  
8DPSK



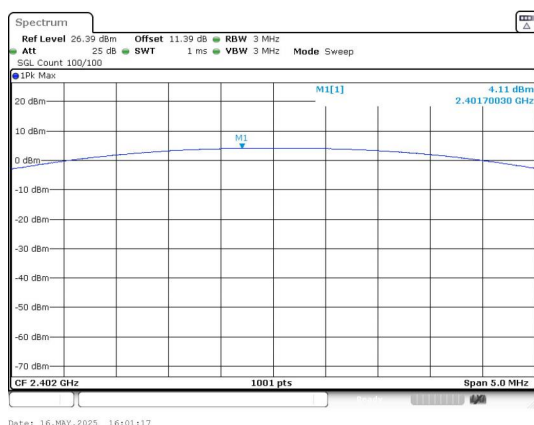
High End Spectrum Channel Hopping Plot  
8DPSK

## 4) Conducted Output Power

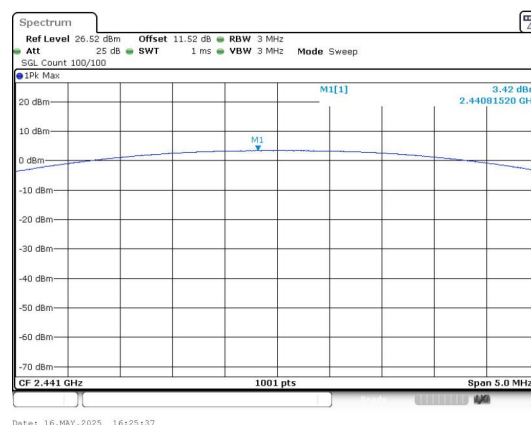
### Test Result

| Modulation    | Packet Type | Channel | Peak Output Power (dBm) | Peak Output Power (mW) | Limit (dBm) | Result |
|---------------|-------------|---------|-------------------------|------------------------|-------------|--------|
| GFSK          | DH5         | 0       | 4.11                    | 2.58                   | ≤30         | PASS   |
|               |             | 39      | 3.42                    | 2.20                   |             | PASS   |
|               |             | 78      | 2.70                    | 1.86                   |             | PASS   |
| $\pi/4$ DQPSK | 2-DH5       | 0       | 4.84                    | 3.05                   | ≤20.97      | PASS   |
|               |             | 39      | 4.24                    | 2.65                   |             | PASS   |
|               |             | 78      | 3.52                    | 2.25                   |             | PASS   |
| 8DPSK         | 3-DH5       | 0       | 5.09                    | 3.23                   |             | PASS   |
|               |             | 39      | 4.54                    | 2.84                   |             | PASS   |
|               |             | 78      | 3.80                    | 2.40                   |             | PASS   |

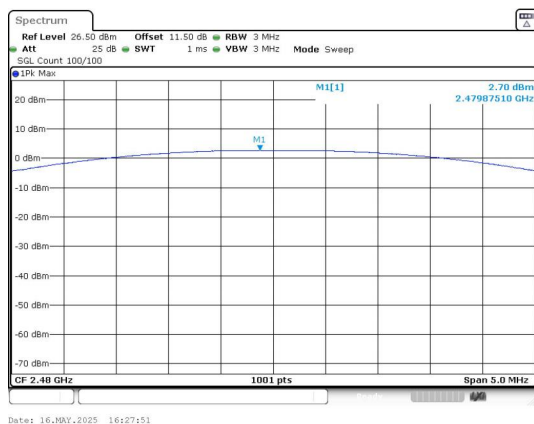
### Test Graphs



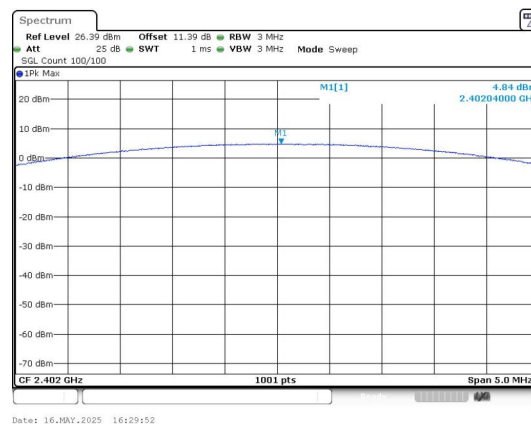
Peak Output Power  
GFSK\_Channel 0



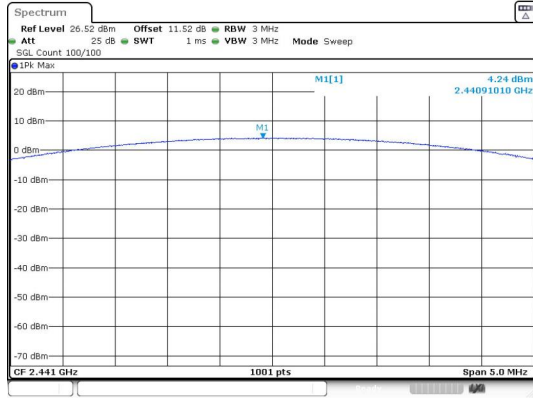
Peak Output Power  
GFSK\_Channel 39



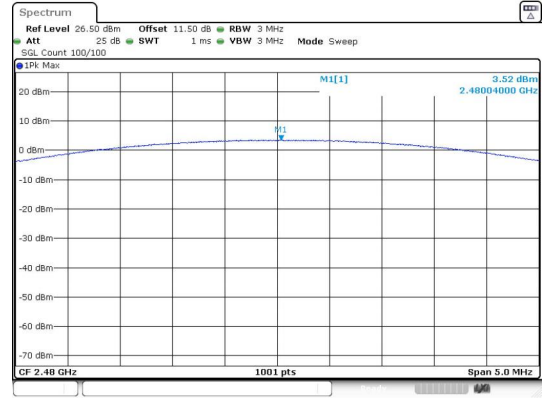
Peak Output Power  
GFSK\_Channel 78



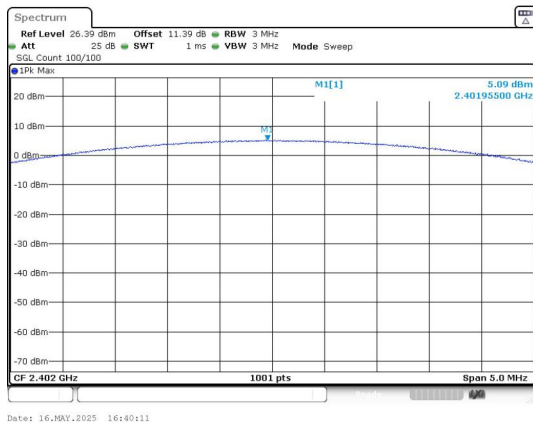
Peak Output Power  
 $\pi/4$ DQPSK\_Channel 0



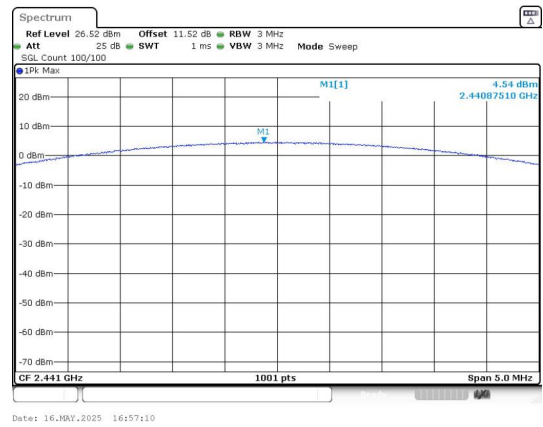
**Peak Output Power**  
 **$\pi/4$ DQPSK\_Channel 39**



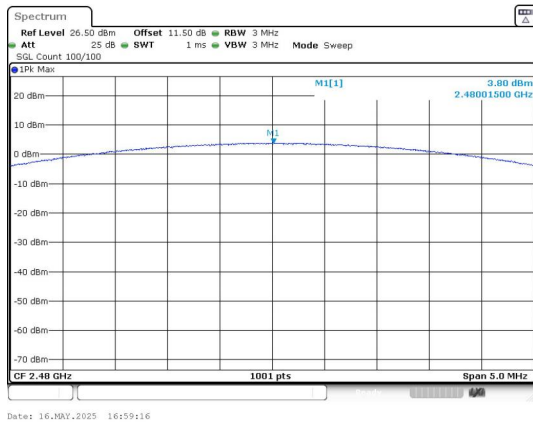
**Peak Output Power**  
 **$\pi/4$ DQPSK\_Channel 78**



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



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



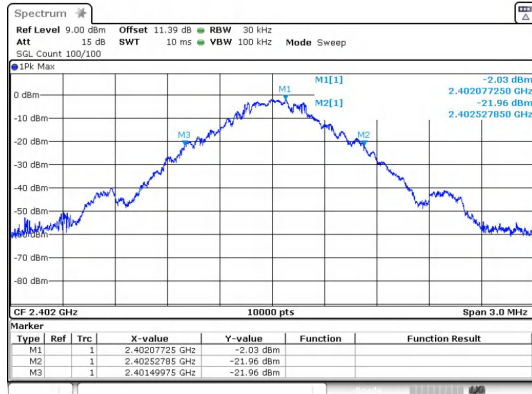
**Peak Output Power**  
**8DPSK\_Channel 78**

## 5) 20dB Bandwidth

### Test Result

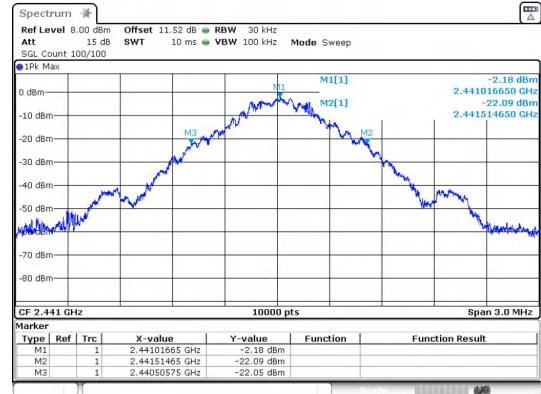
| Modulation    | Channel | Center Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---------------|---------|------------------------|-----------------------|
| GFSK          | 0       | 2402 MHz               | 1.03                  |
|               | 39      | 2441 MHz               | 1.03                  |
|               | 78      | 2480 MHz               | 1.03                  |
| $\pi/4$ DQPSK | 0       | 2402 MHz               | 1.310                 |
|               | 39      | 2441 MHz               | 1.320                 |
|               | 78      | 2480 MHz               | 1.310                 |
| 8DPSK         | 0       | 2402 MHz               | 1.280                 |
|               | 39      | 2441 MHz               | 1.290                 |
|               | 78      | 2480 MHz               | 1.280                 |

### Test Graphs



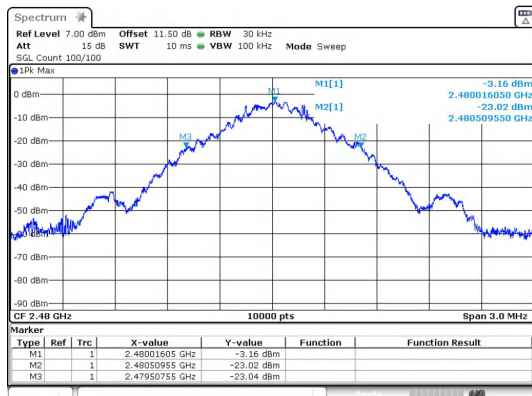
Date: 16.MAY.2025 16:01:01

GFSK\_DH5\_Channel 0



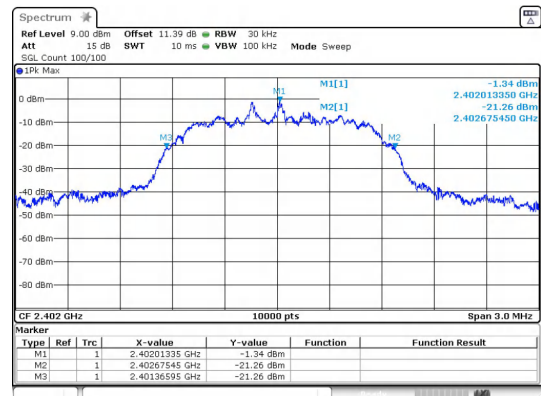
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GFSK\_DH5\_Channel 39



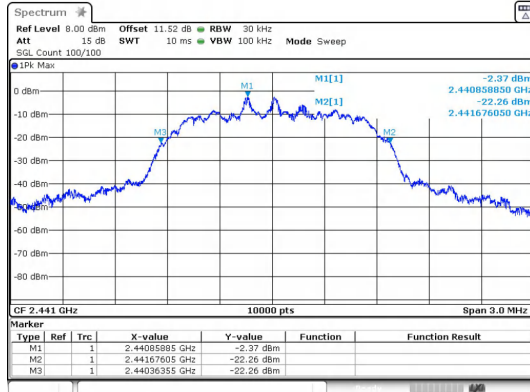
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GFSK\_DH5\_Channel 78

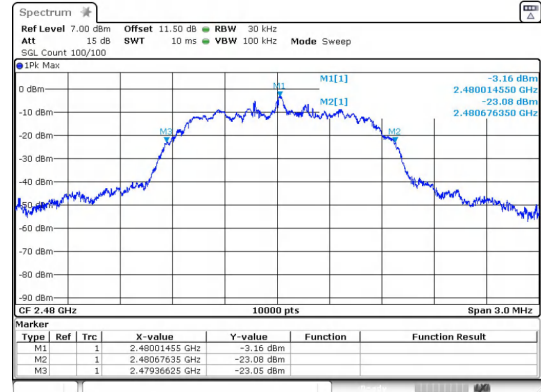


Date: 16.MAY.2025 16:29:36

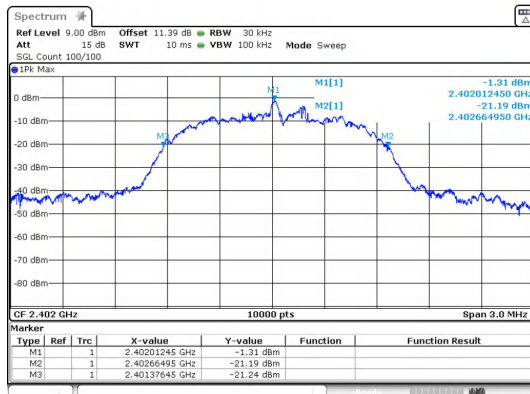
 $\pi/4$ DQPSK\_2-DH5\_Channel 0



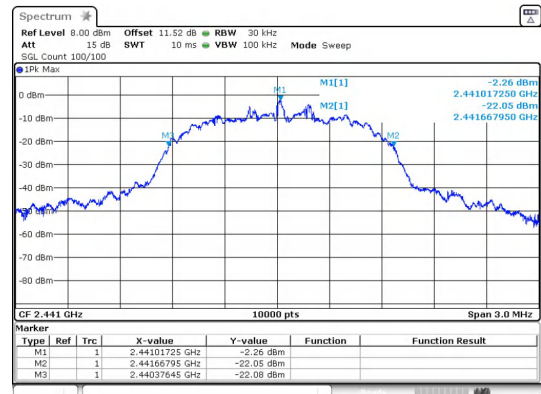
$\pi/4$ DQPSK\_2-DH5\_Channel 39



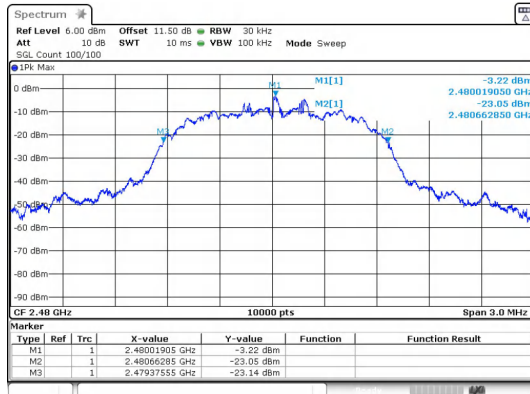
$\pi/4$ DQPSK\_2-DH5\_Channel 78



8DPSK\_3-DH5\_Channel 0



8DPSK\_3-DH5\_Channel 39



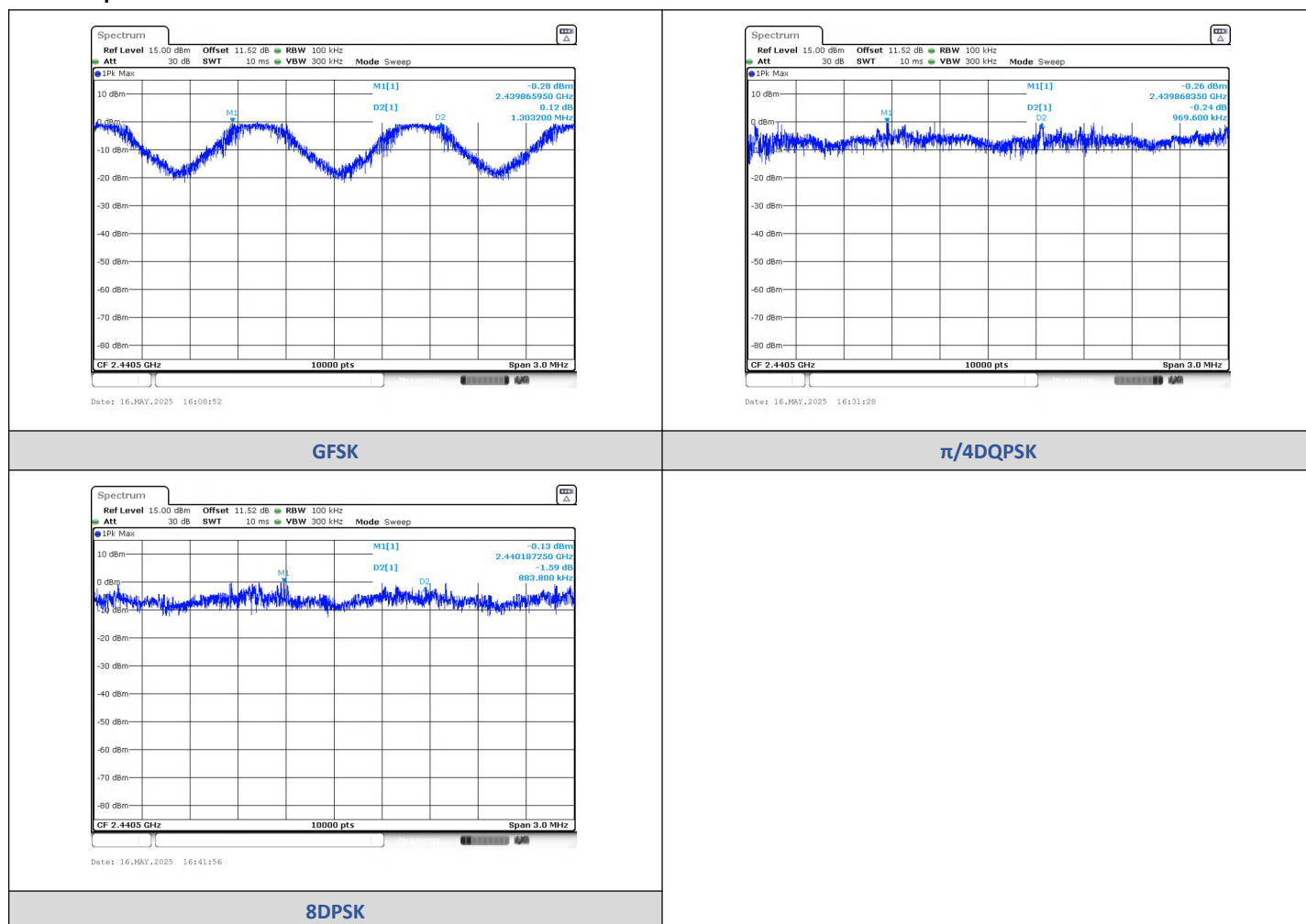
8DPSK\_3-DH5\_Channel 78

## 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    | 2439.8659                   | 2441.1692                    | 1.3032                             | 1.03        | PASS   |
| $\pi/4$ QPSK | 2-DH5  | 2439.8684                   | 2440.838                     | 0.9696                             | 0.873       | PASS   |
| 8DPSK        | 3-DH5  | 2440.1872                   | 2441.0711                    | 0.8838                             | 0.853       | PASS   |

### Test Graphs



## 7) Conducted Out Of Band Emission

### Test Result

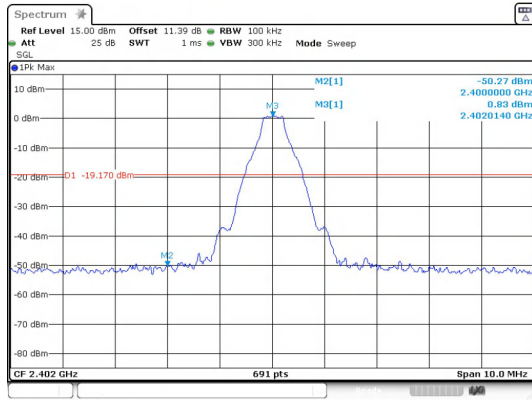
#### Non-Hopping

| Modulation    | Packet | Channel | OOB Emission Frequency (MHz) | OOB Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result |
|---------------|--------|---------|------------------------------|--------------------------|-------------|-----------------|--------|
| GFSK          | DH5    | 0       | 1782.48                      | -46.260                  | -19.17      | -27.090         | PASS   |
|               |        |         | 2400.00                      | -50.270                  | -19.17      | -31.100         | PASS   |
|               |        | 39      | 9763.72                      | -47.396                  | -20.01      | -27.386         | PASS   |
|               |        | 78      | 2483.50                      | -50.150                  | -20.69      | -29.460         | PASS   |
|               |        |         | 9920.20                      | -44.475                  | -20.69      | -23.785         | PASS   |
| $\pi/4$ DQPSK | 2-DH5  | 0       | 2399.00                      | -49.791                  | -19.48      | -30.311         | PASS   |
|               |        |         | 2400.00                      | -50.070                  | -19.48      | -30.590         | PASS   |
|               |        |         | 9608.10                      | -47.810                  | -19.48      | -28.330         | PASS   |
|               |        | 39      | 9763.72                      | -47.233                  | -19.96      | -27.273         | PASS   |
|               |        | 78      | 2483.50                      | -51.700                  | -20.72      | -30.980         | PASS   |
|               |        |         | 9920.20                      | -45.055                  | -20.72      | -24.335         | PASS   |
| 8DPSK         | 3-DH5  | 0       | 2400.00                      | -48.690                  | -19.34      | -29.350         | PASS   |
|               |        |         | 9608.08                      | -48.284                  | -19.34      | -28.944         | PASS   |
|               |        | 39      | 9763.72                      | -47.538                  | -20.06      | -27.478         | PASS   |
|               |        | 78      | 2483.50                      | -52.580                  | -20.77      | -31.810         | PASS   |
|               |        |         | 9920.20                      | -44.237                  | -20.77      | -23.467         | PASS   |

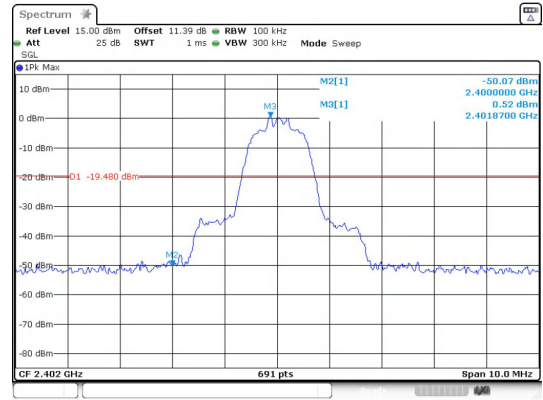
#### Hopping

| 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 | 2396.86                            | -48.656                        | -19.18         | -29.476            | PASS   |
|               |        |         | 2400.00                            | -49.990                        | -19.18         | -30.810            | PASS   |
|               |        |         | 2483.50                            | -49.550                        | -20.7          | -28.850            | PASS   |
| $\pi/4$ DQPSK | 2-DH5  |         | 2398.38                            | -49.228                        | -19.55         | -29.678            | PASS   |
|               |        |         | 2400.00                            | -51.790                        | -19.55         | -32.240            | PASS   |
|               |        |         | 2483.50                            | -51.630                        | -21.48         | -30.150            | PASS   |
| 8DPSK         | 3-DH5  |         | 2400.00                            | -48.260                        | -19.23         | -29.030            | PASS   |
|               |        |         | 2483.50                            | -51.120                        | -23.25         | -27.870            | PASS   |

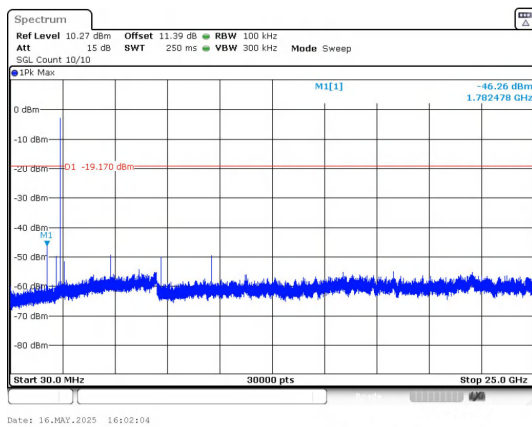
### Test Graphs



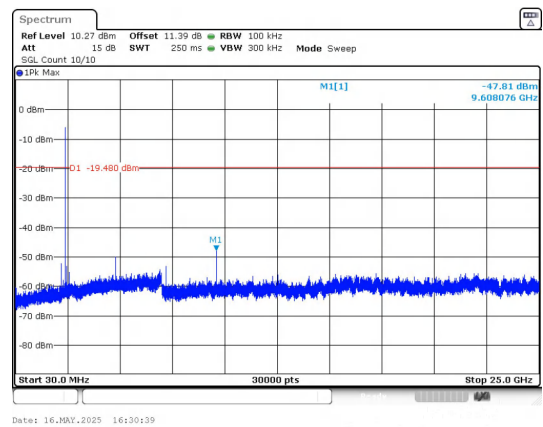
Out Of Band Emission  
GFSK\_DH5\_Channel 0



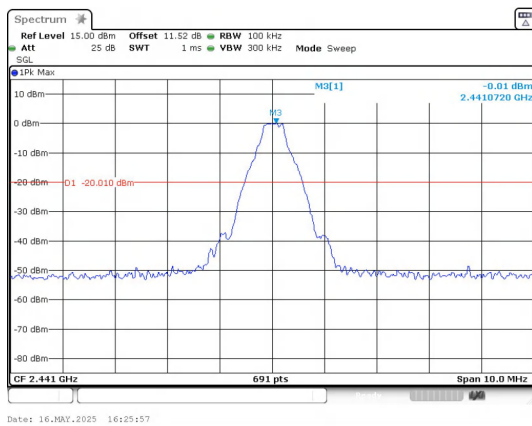
Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 0



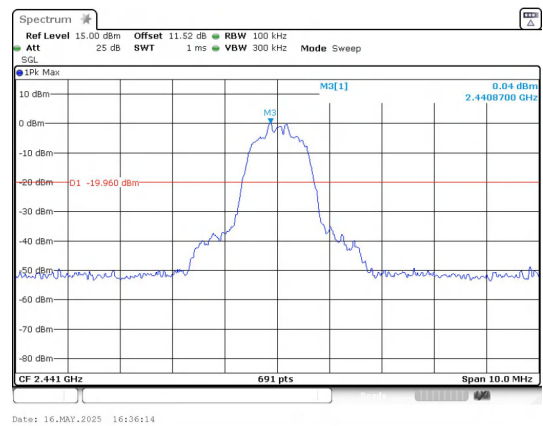
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 0



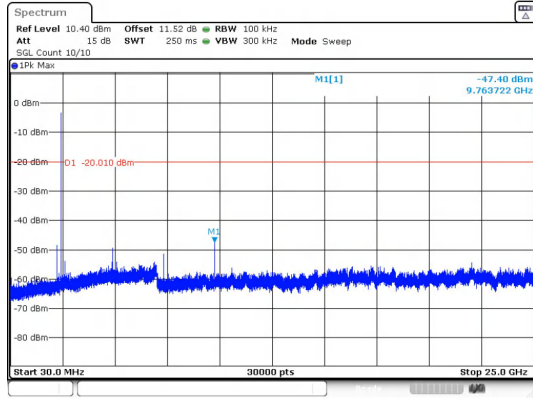
30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 0



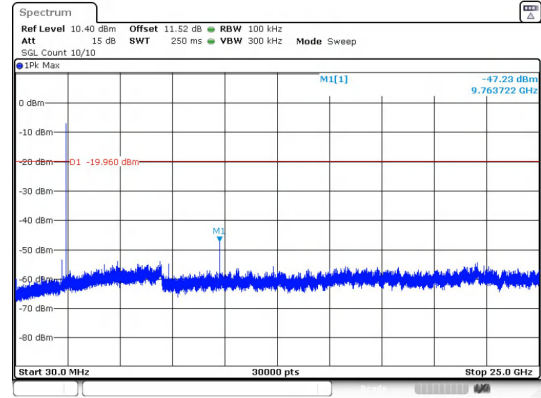
Out Of Band Emission  
GFSK\_DH5\_Channel 39



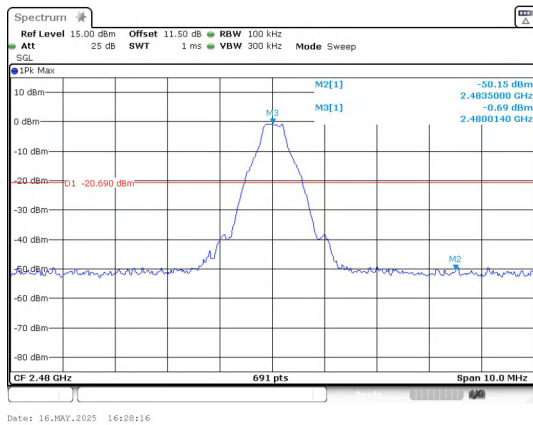
Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 39



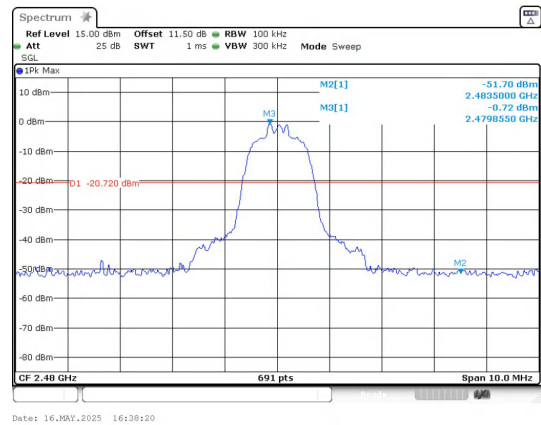
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 39



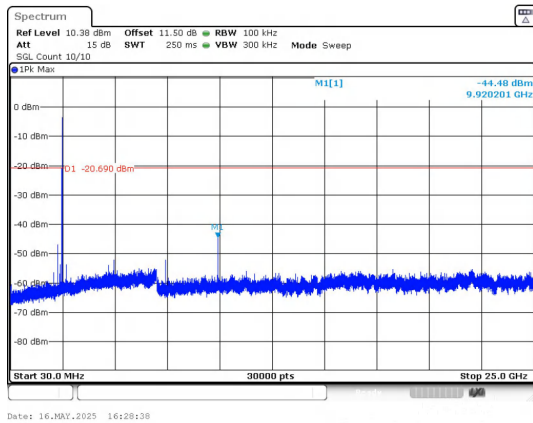
30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 39



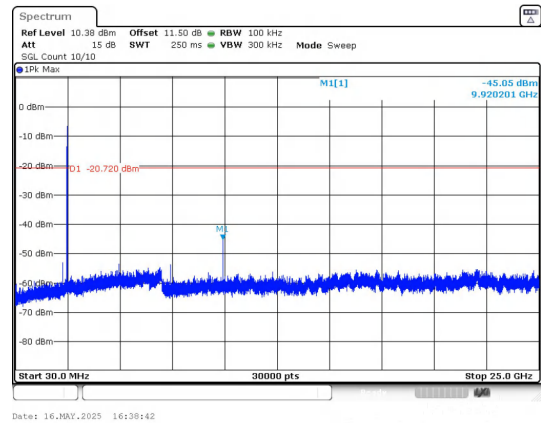
Out Of Band Emission  
GFSK\_DH5\_Channel 78



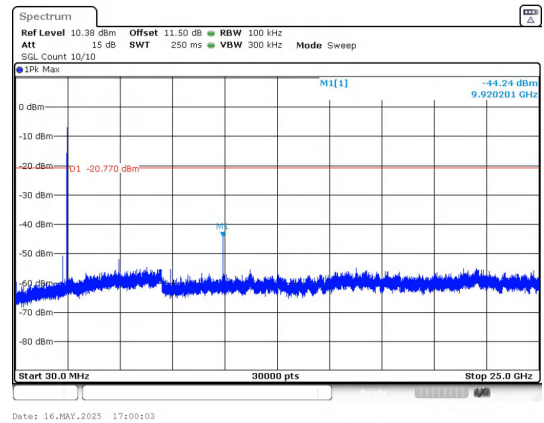
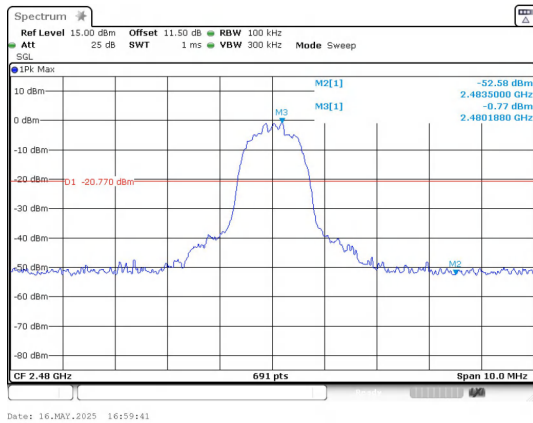
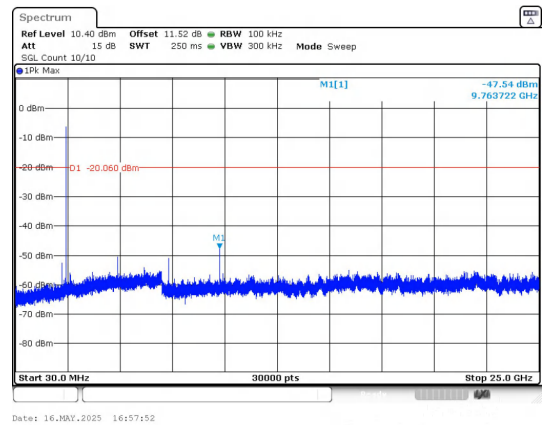
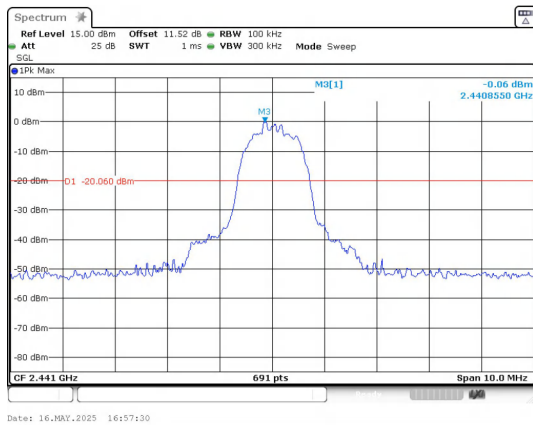
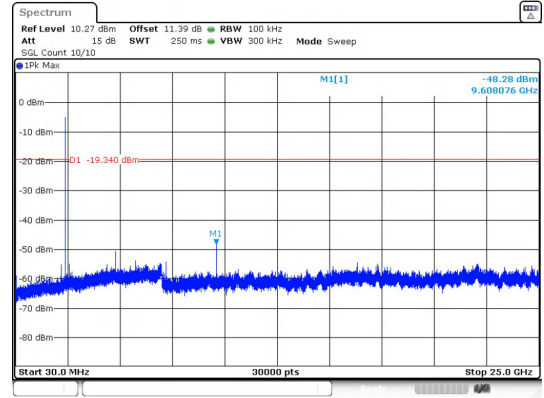
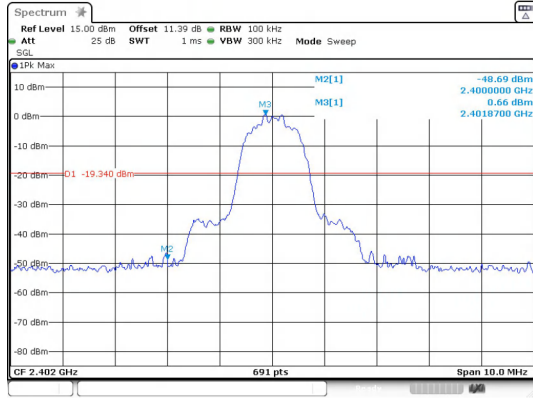
Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 78

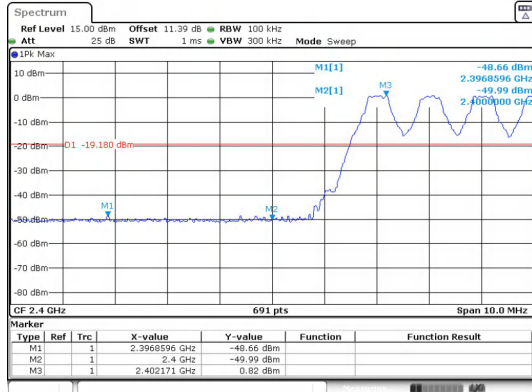


30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 78



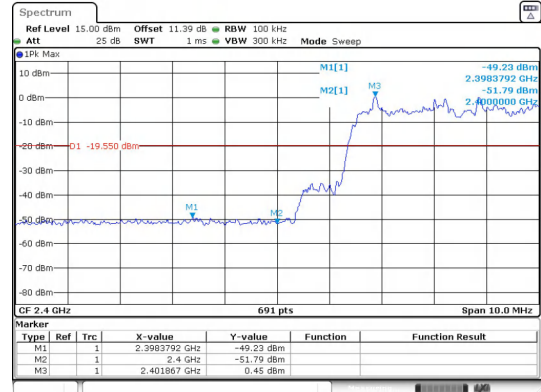
30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 78





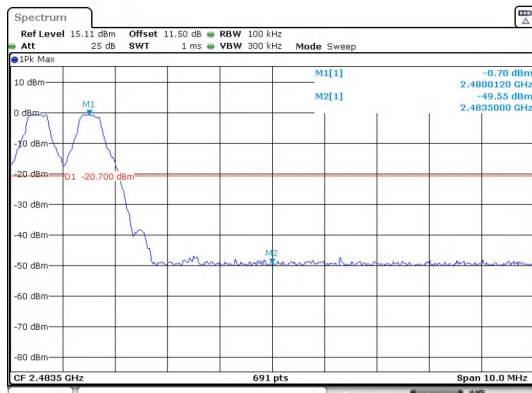
Date: 16.MAY.2025 16:11:26

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



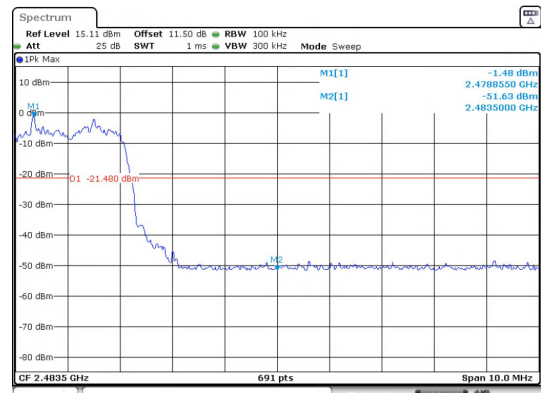
Date: 16.MAY.2025 16:13:03

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



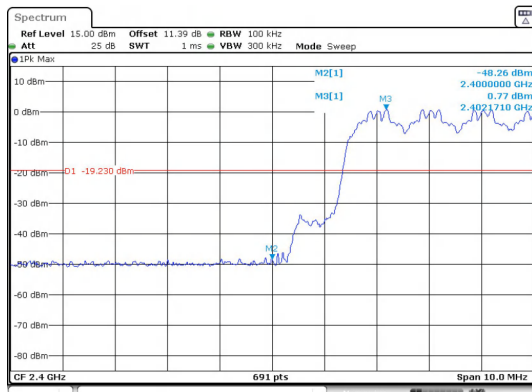
Date: 16.MAY.2025 16:12:15

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



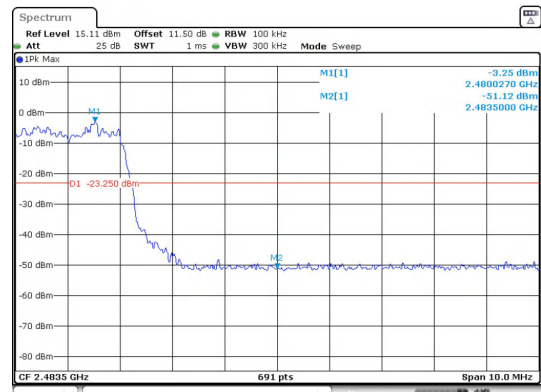
Date: 16.MAY.2025 16:13:43

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



Date: 16.MAY.2025 16:55:26

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



Date: 16.MAY.2025 16:55:59

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

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