

# Appendix Report

|                |                |
|----------------|----------------|
| Report No.:    | CISRR241225201 |
| Test Engineer: | Mark Fu        |
| Supervised by: | Rory Huang     |

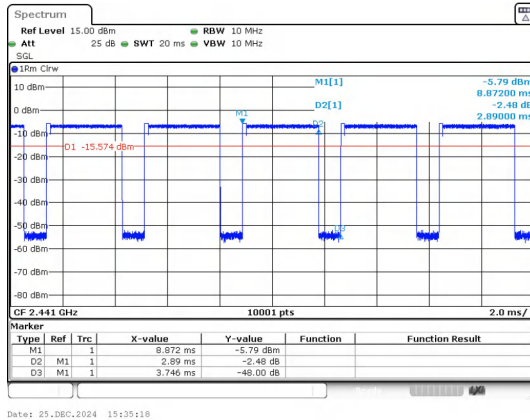
# 1) Duty Cycle

## Test Result

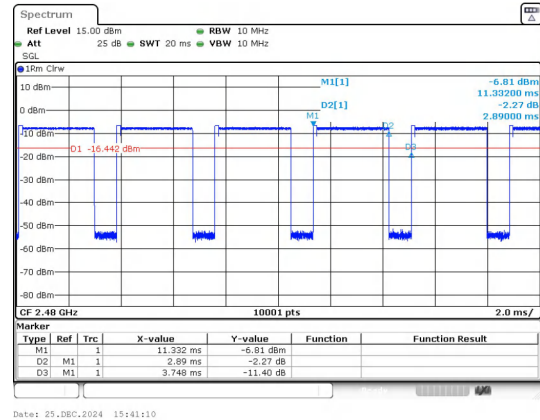
| Modulation    | Packets | Channel | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle (linear) | Duty Cycle Factor (dB) | 1/T    |
|---------------|---------|---------|--------------|-------------|----------------|---------------------|------------------------|--------|
| GFSK          | DH5     | 0       | 2.884        | 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 |
| $\pi/4$ DQPSK | 2-DH5   | 0       | 2.892        | 3.748       | 77.16          | 0.7716              | 1.1261                 | 0.3458 |
|               |         | 39      | 2.890        | 3.746       | 77.15          | 0.7715              | 1.1266                 | 0.3460 |
|               |         | 78      | 2.890        | 3.748       | 77.11          | 0.7711              | 1.1289                 | 0.3460 |
| 8DPSK         | 3-DH5   | 0       | 2.892        | 3.748       | 77.16          | 0.7716              | 1.1261                 | 0.3458 |
|               |         | 39      | 2.894        | 3.748       | 77.21          | 0.7721              | 1.1233                 | 0.3455 |
|               |         | 78      | 2.894        | 3.748       | 77.21          | 0.7721              | 1.1233                 | 0.3455 |

## Test Graphs

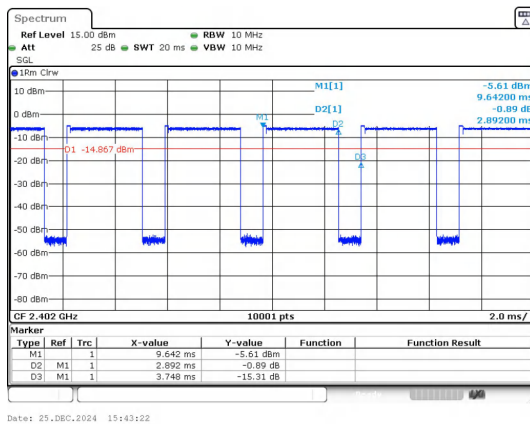




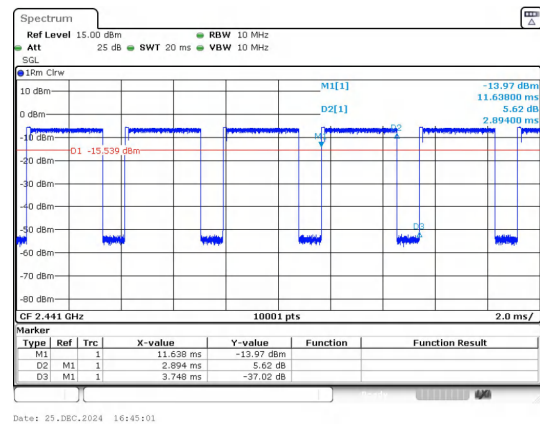
$\pi/4$ DQPSK(2-DH5)\_Channel 39



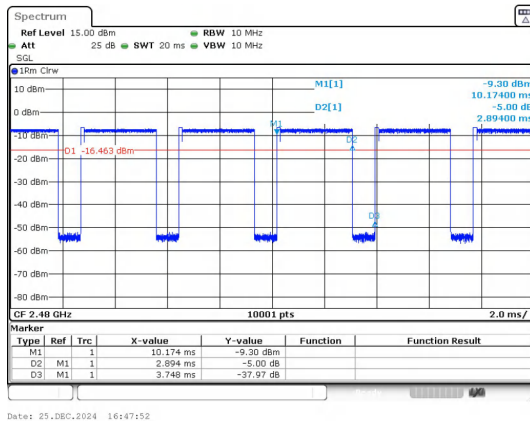
$\pi/4$ DQPSK(2-DH5)\_Channel 78



8DPSK(3-DH5)\_Channel 0



8DPSK(3-DH5)\_Channel 39



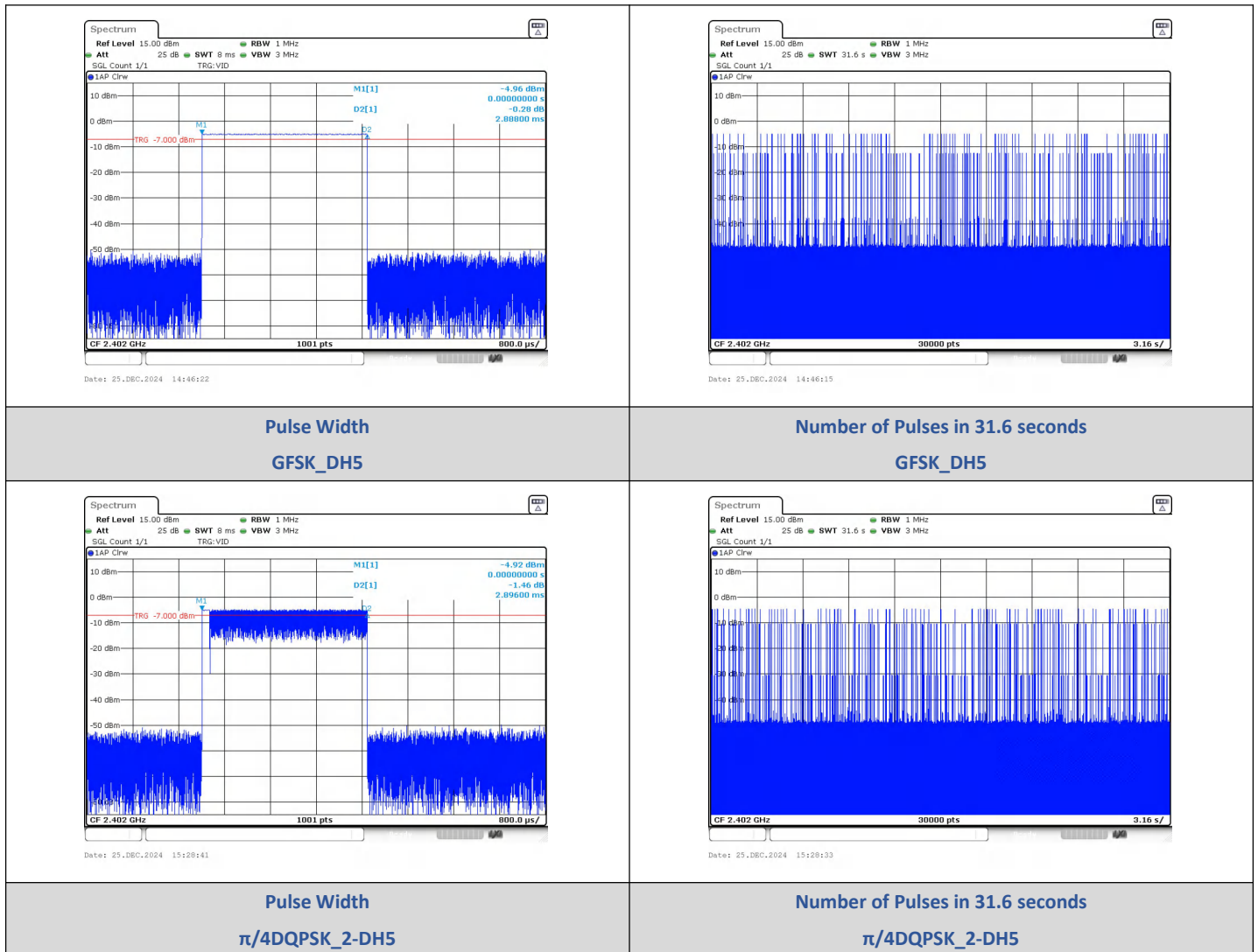
8DPSK(3-DH5)\_Channel 78

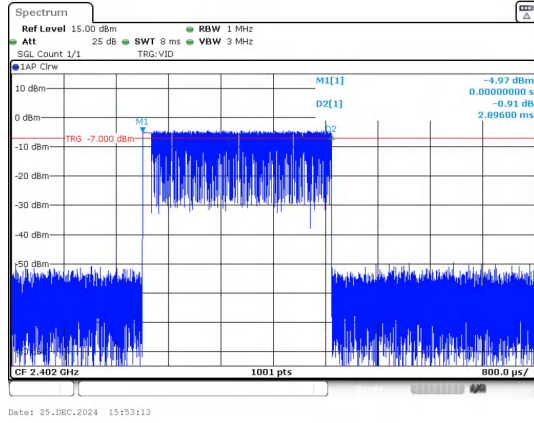
## 2) Dwell Time

### Test Result

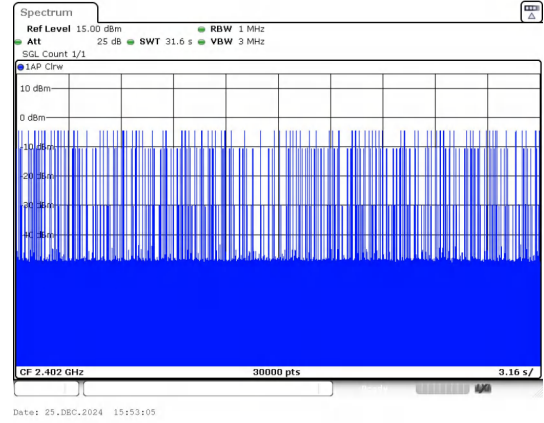
| Modulation    | Packet | Channel          | Pulse Width (ms) | Number of Pulses in 31.6 seconds | Dwell Time (ms) | Limit (ms) | Result |
|---------------|--------|------------------|------------------|----------------------------------|-----------------|------------|--------|
| GFSK          | DH5    | CH0<br>(2402MHz) | 2.888            | 99                               | 285.91          | < 400      | PASS   |
| $\pi/4$ DQPSK | 2-DH5  |                  | 2.896            | 99                               | 286.7           |            | PASS   |
| 8DPSK         | 3-DH5  |                  | 2.896            | 106                              | 306.98          |            | PASS   |

### Test Graphs





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



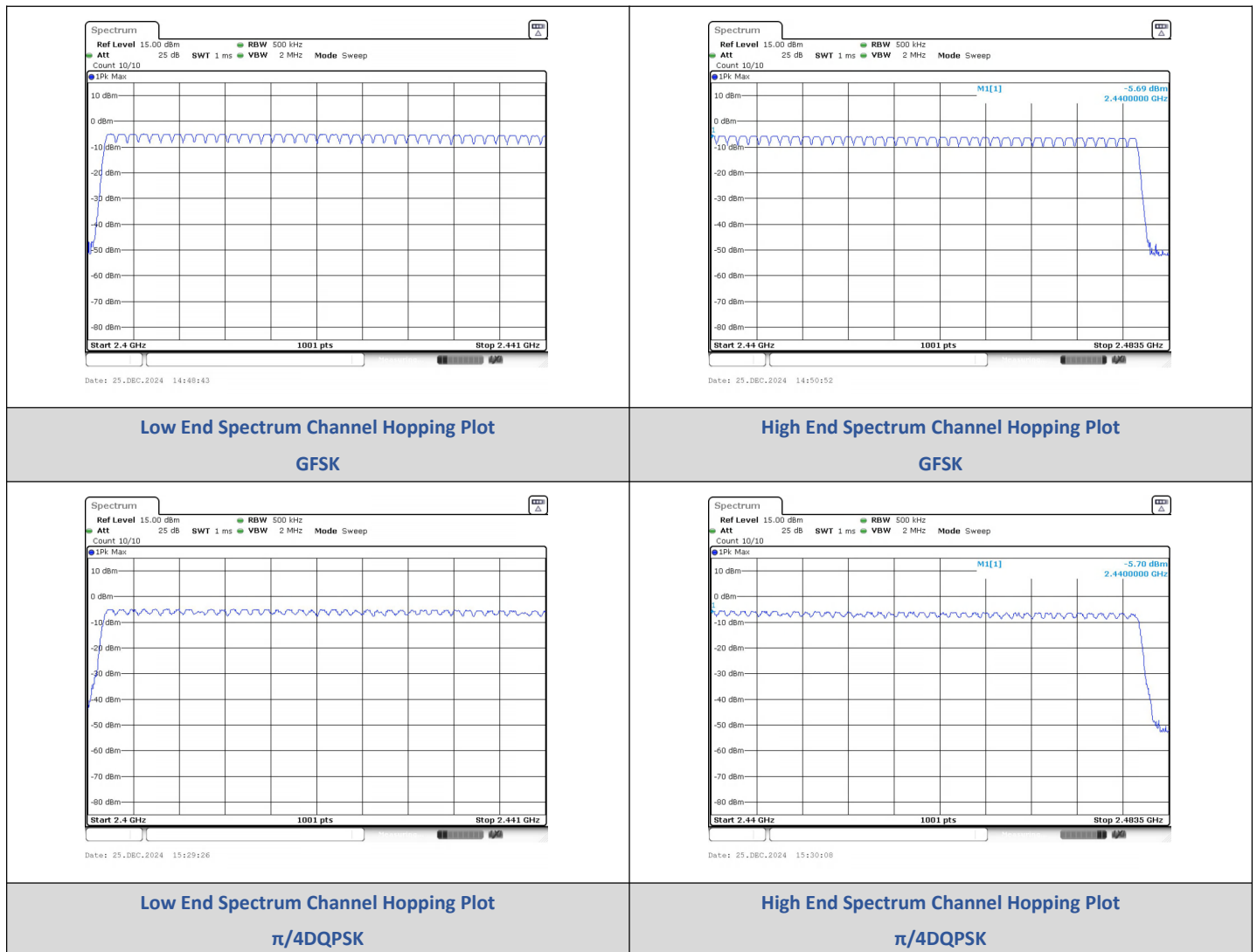
**Number of Pulses in 31.6 seconds**  
**8DPSK\_3-DH5**

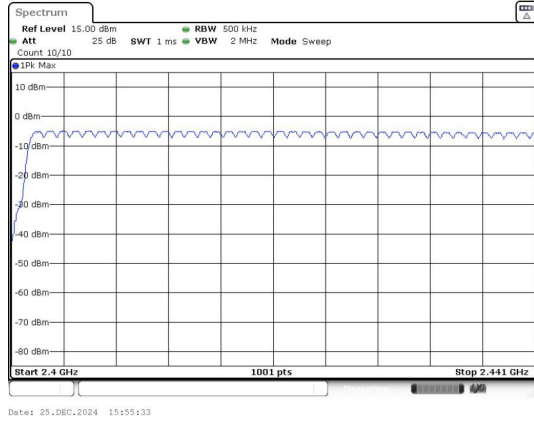
### 3) Number Of Hopping Channel

#### Test Result

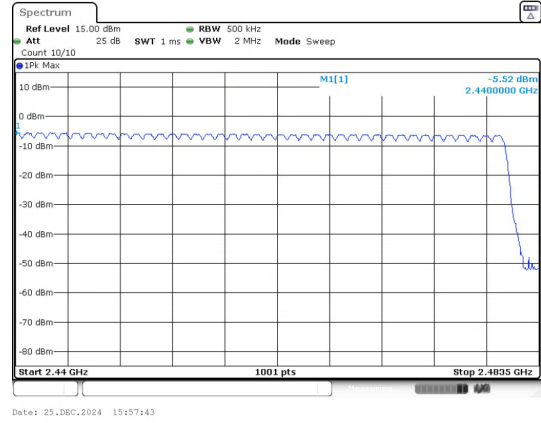
| Modulation    | Packet | Number of Hopping Channel | Limit | Result |
|---------------|--------|---------------------------|-------|--------|
| GFSK          | DH5    | 79                        | 15    | PASS   |
| $\pi/4$ DQPSK | 2-DH5  | 79                        | 15    | PASS   |
| 8DPSK     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

#### Test Graphs





Low End Spectrum Channel Hopping Plot  
8DPSK



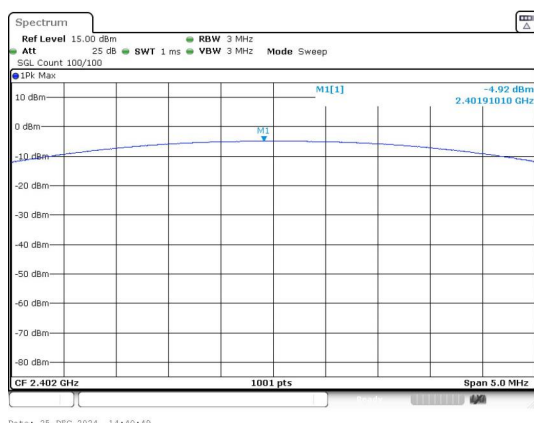
High End Spectrum Channel Hopping Plot  
8DPSK

## 4) Conducted Output Power

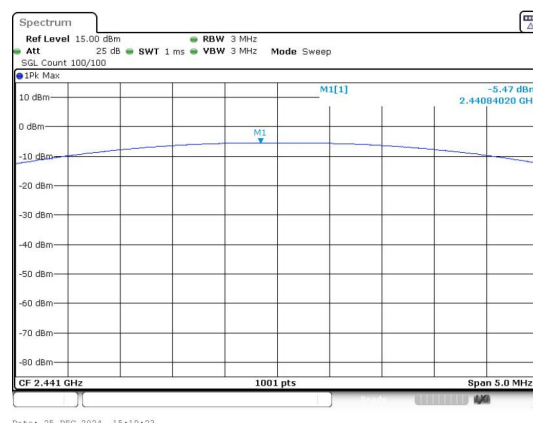
### Test Result

| Modulation    | Packet Type | Channel | Peak Output Power (dBm) | Peak Output Power (mW) | Limit (dBm) | Result |
|---------------|-------------|---------|-------------------------|------------------------|-------------|--------|
| GFSK          | DH5         | 0       | -4.92                   | 0.32                   | ≤30         | PASS   |
|               |             | 39      | -5.47                   | 0.28                   |             | PASS   |
|               |             | 78      | -6.42                   | 0.23                   |             | PASS   |
| $\pi/4$ DQPSK | 2-DH5       | 0       | -4.25                   | 0.38                   | ≤20.97      | PASS   |
|               |             | 39      | -4.98                   | 0.32                   |             | PASS   |
|               |             | 78      | -5.75                   | 0.27                   |             | PASS   |
| 8DPSK         | 3-DH5       | 0       | -4.03                   | 0.40                   |             | PASS   |
|               |             | 39      | -4.75                   | 0.33                   |             | PASS   |
|               |             | 78      | -5.60                   | 0.28                   |             | PASS   |

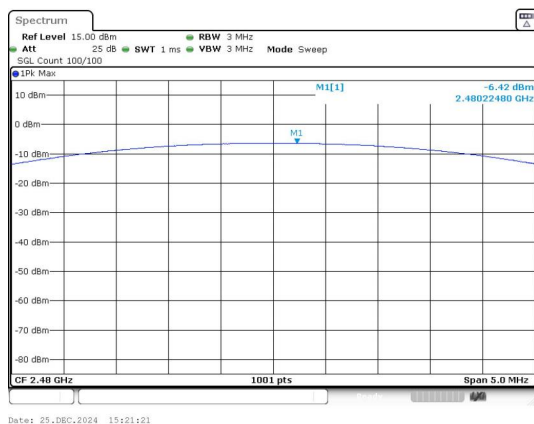
### Test Graphs



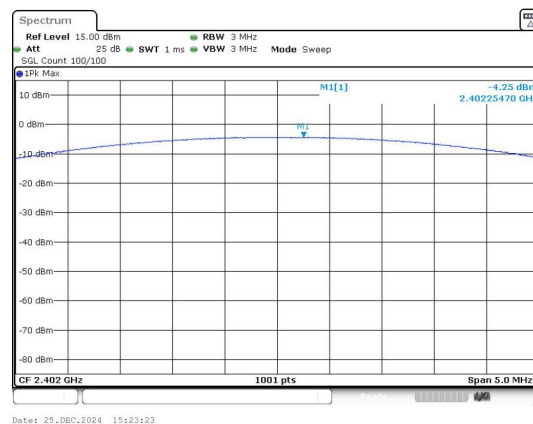
Peak Output Power  
GFSK\_Channel 0



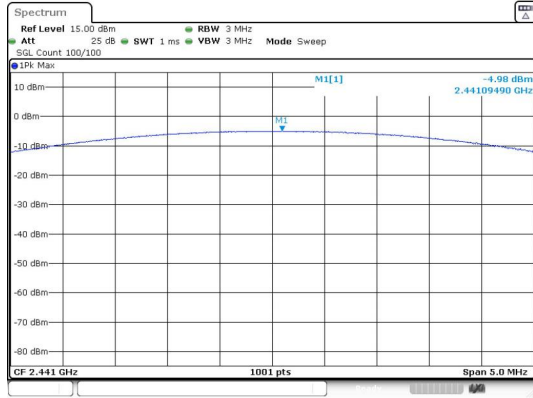
Peak Output Power  
GFSK\_Channel 39



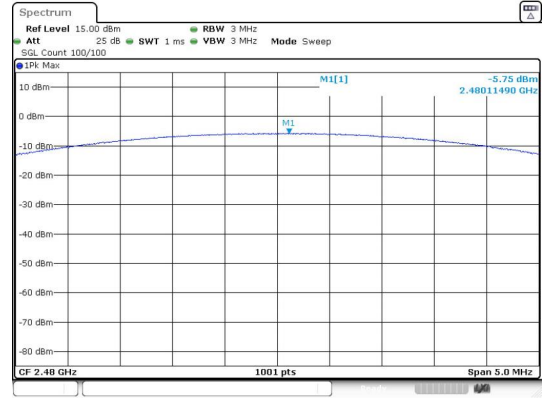
Peak Output Power  
GFSK\_Channel 78



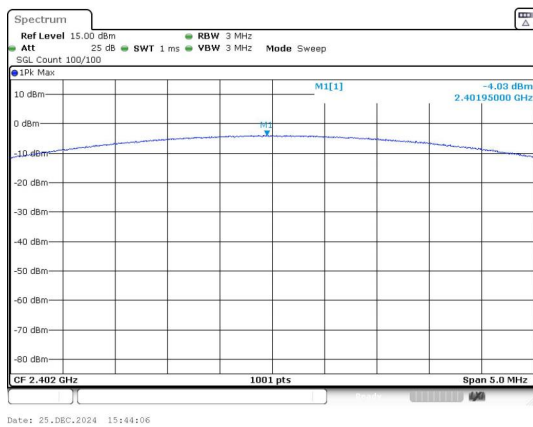
Peak Output Power  
 $\pi/4$ DQPSK\_Channel 0



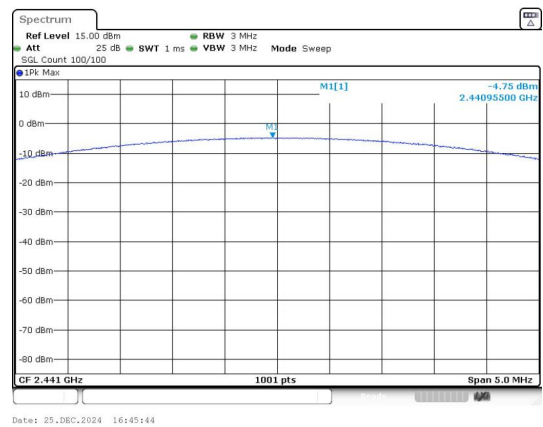
**Peak Output Power**  
 **$\pi/4$ DQPSK\_Channel 39**



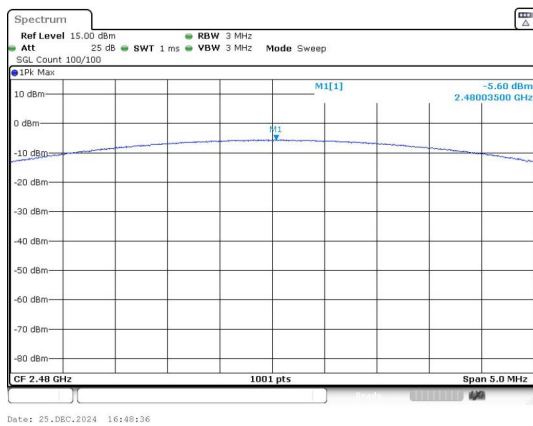
**Peak Output Power**  
 **$\pi/4$ DQPSK\_Channel 78**



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



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



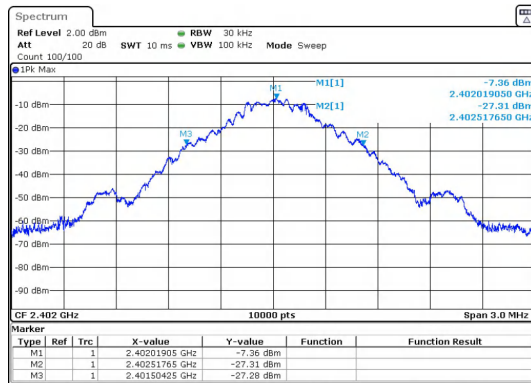
**Peak Output Power**  
**8DPSK\_Channel 78**

## 5) 20dB Bandwidth

### Test Result

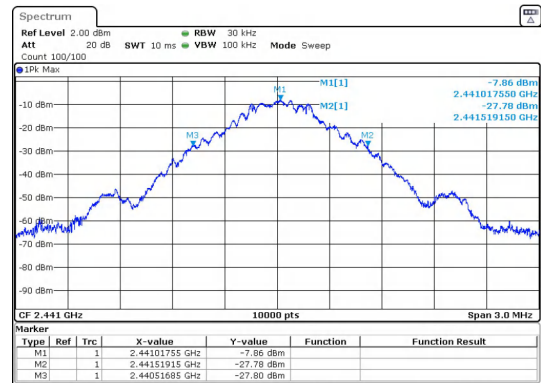
| Modulation    | Channel | Center Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---------------|---------|------------------------|-----------------------|
| GFSK          | 0       | 2402 MHz               | 1.020                 |
|               | 39      | 2441 MHz               | 1.000                 |
|               | 78      | 2480 MHz               | 1.000                 |
| $\pi/4$ DQPSK | 0       | 2402 MHz               | 1.310                 |
|               | 39      | 2441 MHz               | 1.310                 |
|               | 78      | 2480 MHz               | 1.310                 |
| 8DPSK         | 0       | 2402 MHz               | 1.300                 |
|               | 39      | 2441 MHz               | 1.300                 |
|               | 78      | 2480 MHz               | 1.290                 |

### Test Graphs



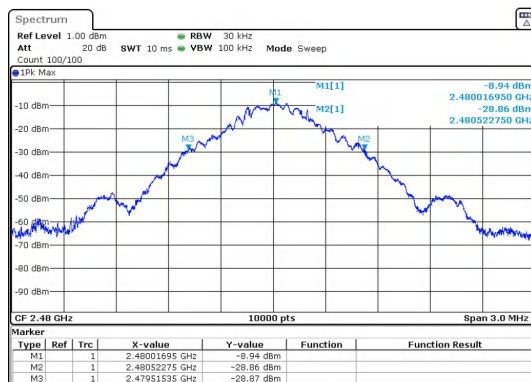
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GFSK\_DH5\_Channel 0



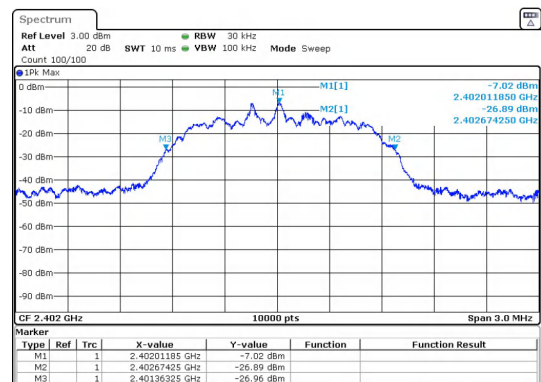
Date: 25.DEC.2024 15:19:05

GFSK\_DH5\_Channel 39



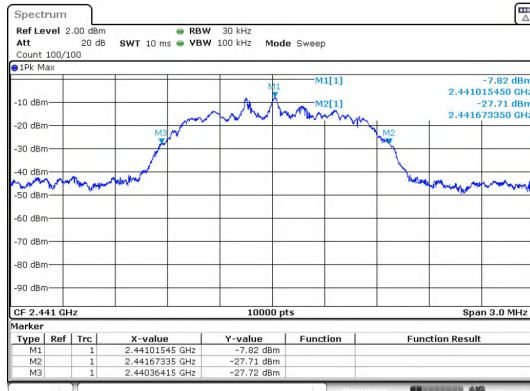
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GFSK\_DH5\_Channel 78

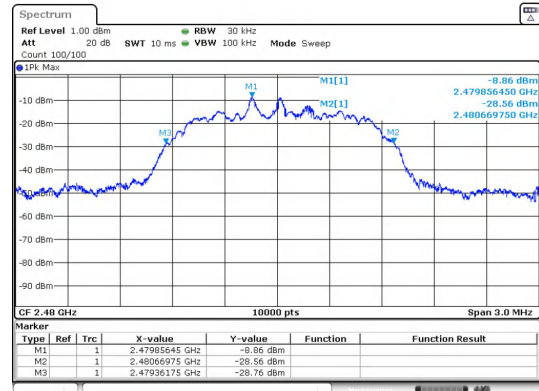


Date: 25.DEC.2024 15:23:05

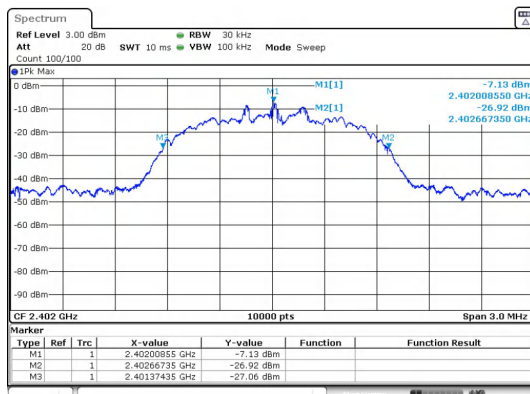
 $\pi/4$ DQPSK\_2-DH5\_Channel 0



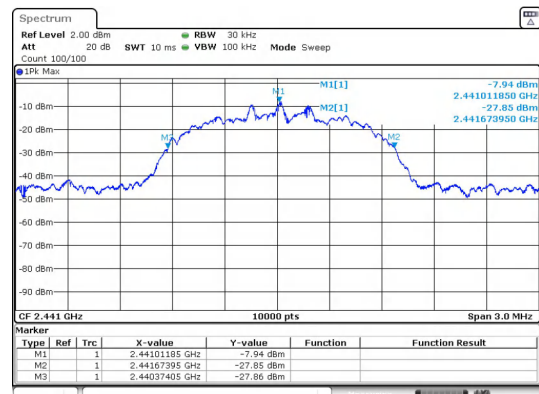
$\pi/4$ DQPSK\_2-DH5\_Channel 39



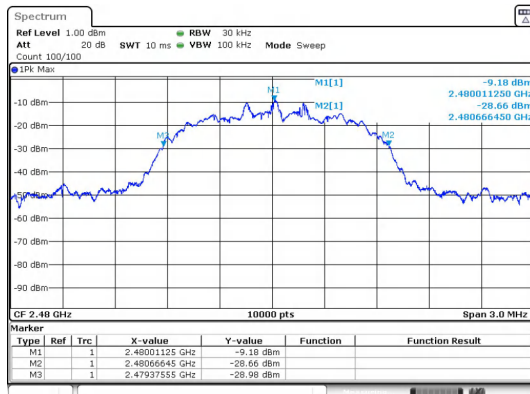
$\pi/4$ DQPSK\_2-DH5\_Channel 78



8DPSK\_3-DH5\_Channel 0



8DPSK\_3-DH5\_Channel 39



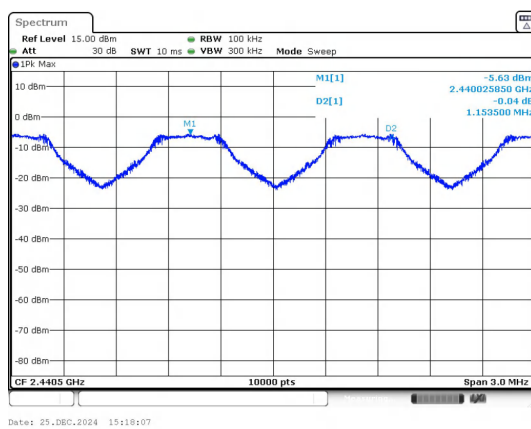
8DPSK\_3-DH5\_Channel 78

## 6) Carrier Frequencies Separation

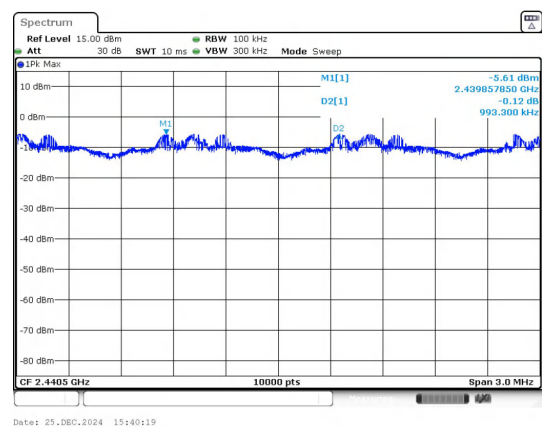
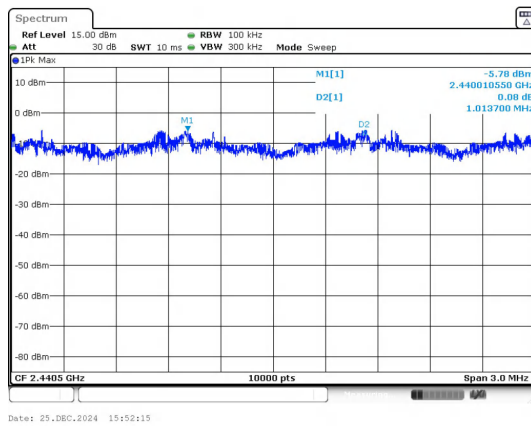
### Test Result

| Modulation   | Packet | Left Center frequency (MHz) | Right Center frequency (MHz) | Hopping Frequency Separation (MHz) | Limit (MHz) | Result |
|--------------|--------|-----------------------------|------------------------------|------------------------------------|-------------|--------|
| GFSK         | DH5    | 2440.0258                   | 2441.1793                    | 1.1535                             | 1.02        | PASS   |
| $\pi/4$ QPSK | 2-DH5  | 2439.8578                   | 2440.8511                    | 0.9933                             | 0.873       | PASS   |
| 8DPSK        | 3-DH5  | 2440.0105                   | 2441.0242                    | 1.0137                             | 0.867       | PASS   |

### Test Graphs



GFSK


 $\pi/4$ QPSK


8DPSK

## 7) Conducted Out Of Band Emission

### Test Result

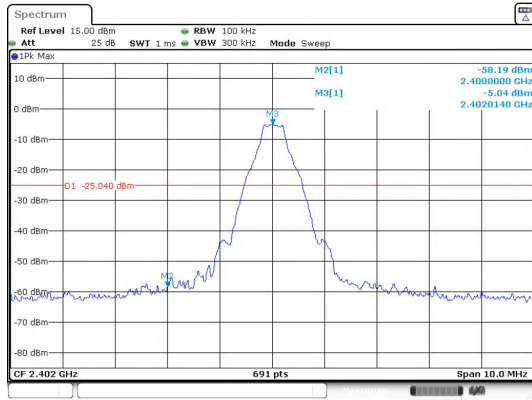
#### Non-Hopping

| Modulation    | Packet | Channel | OOB Emission Frequency (MHz) | OOB Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result |
|---------------|--------|---------|------------------------------|--------------------------|-------------|-----------------|--------|
| GFSK          | DH5    | 0       | 2400.00                      | -58.190                  | -25.04      | -33.150         | PASS   |
|               |        |         | 6944.61                      | -44.287                  | -25.04      | -19.247         | PASS   |
|               |        | 39      | 6897.17                      | -44.480                  | -25.69      | -18.790         | PASS   |
|               |        | 78      | 2483.50                      | -61.880                  | -26.56      | -35.320         | PASS   |
|               |        |         | 17298.0                      | -44.760                  | -26.56      | -18.200         | PASS   |
| $\pi/4$ DQPSK | 2-DH5  | 0       | 2400.00                      | -54.690                  | -24.99      | -29.700         | PASS   |
|               |        |         | 5825.12                      | -44.977                  | -24.99      | -19.987         | PASS   |
|               |        | 39      | 9763.72                      | -44.307                  | -25.79      | -18.517         | PASS   |
|               |        | 78      | 2483.50                      | -61.170                  | -26.58      | -34.590         | PASS   |
|               |        |         | 6930.46                      | -44.577                  | -26.58      | -17.997         | PASS   |
| 8DPSK         | 3-DH5  | 0       | 2400.00                      | -57.270                  | -24.93      | -32.340         | PASS   |
|               |        |         | 6917.14                      | -45.027                  | -24.93      | -20.097         | PASS   |
|               |        | 39      | 6992.05                      | -44.519                  | -25.62      | -18.899         | PASS   |
|               |        | 78      | 2483.50                      | -61.860                  | -26.93      | -34.930         | PASS   |
|               |        |         | 6896.33                      | -44.068                  | -26.93      | -17.138         | PASS   |

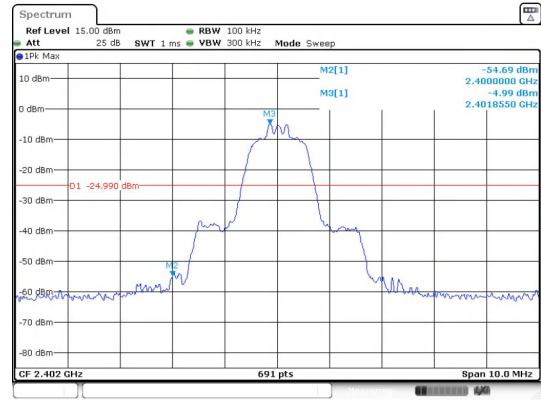
#### Hopping

| 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 | 2398.60                            | -58.208                        | -25.02         | -33.188            | PASS   |
|               |        |         | 2400.00                            | -60.020                        | -25.02         | -35.000            | PASS   |
|               |        |         | 2483.50                            | -59.720                        | -26.51         | -33.210            | PASS   |
| $\pi/4$ DQPSK | 2-DH5  |         | 2397.45                            | -58.961                        | -25.35         | -33.611            | PASS   |
|               |        |         | 2400.00                            | -60.160                        | -25.35         | -34.810            | PASS   |
|               |        |         | 2483.50                            | -60.990                        | -26.56         | -34.430            | PASS   |
| 8DPSK         | 3-DH5  |         | 2400.00                            | -58.660                        | -24.95         | -33.710            | PASS   |
|               |        |         | 2483.50                            | -59.950                        | -26.57         | -33.380            | PASS   |

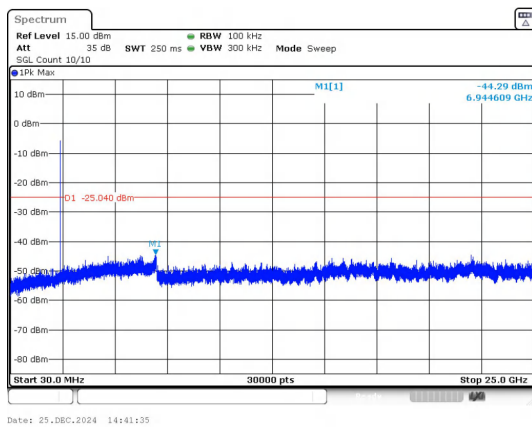
### Test Graphs



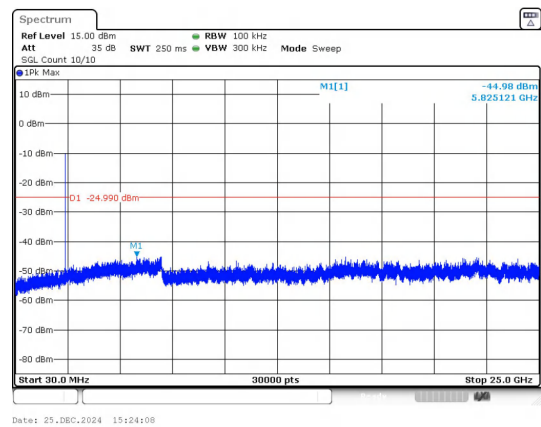
Out Of Band Emission  
GFSK\_DH5\_Channel 0



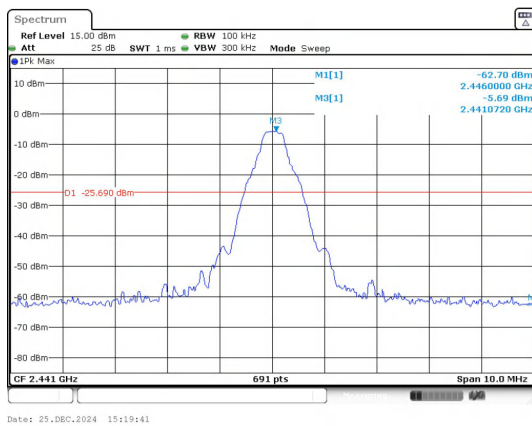
Out Of Band Emission  
 $\pi/4$ QPSK\_2-DH5\_Channel 0



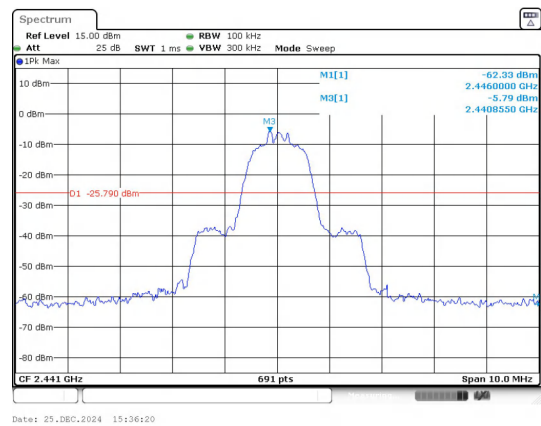
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 0



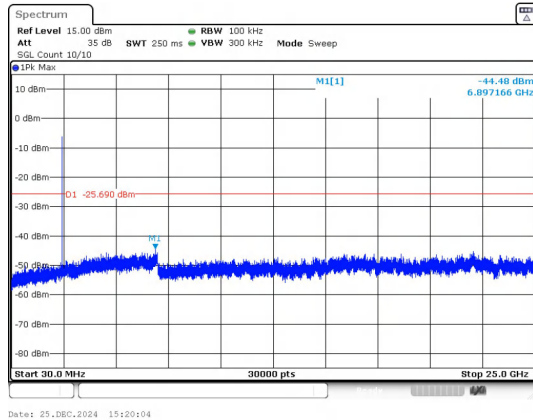
30.0 MHz - 25000.0 MHz  
 $\pi/4$ QPSK\_2-DH5\_Channel 0



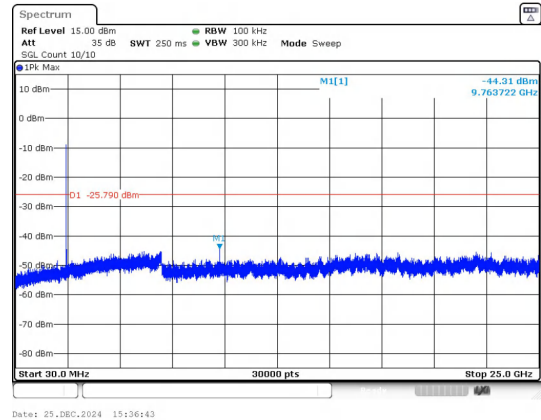
Out Of Band Emission  
GFSK\_DH5\_Channel 39



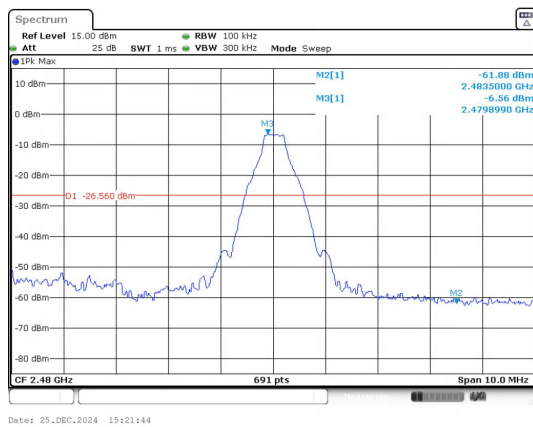
Out Of Band Emission  
 $\pi/4$ QPSK\_2-DH5\_Channel 39



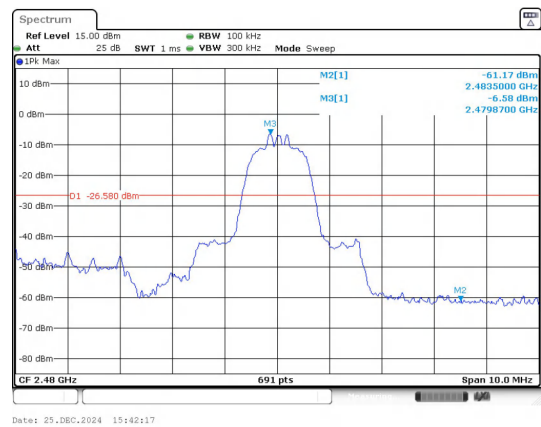
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 39



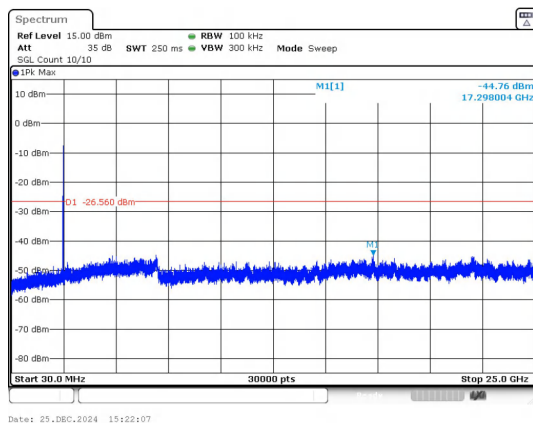
30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 39



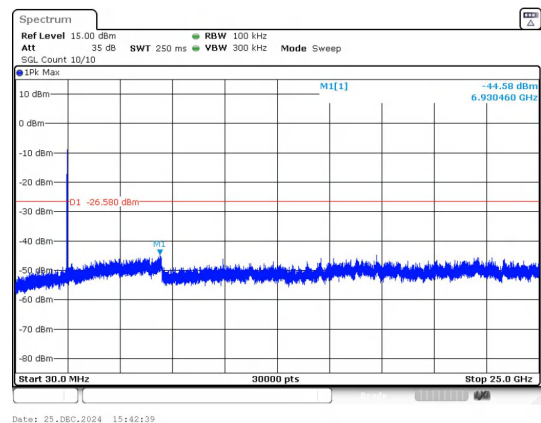
Out Of Band Emission  
GFSK\_DH5\_Channel 78



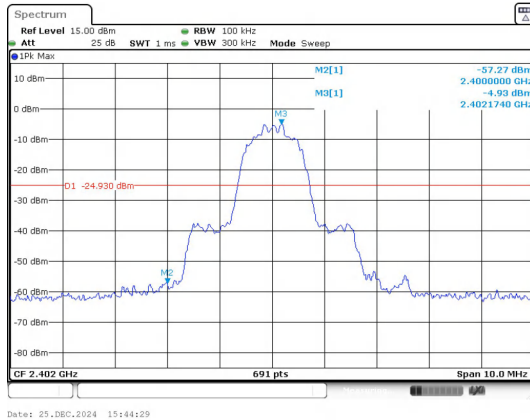
Out Of Band Emission  
 $\pi/4$ DQPSK\_2-DH5\_Channel 78



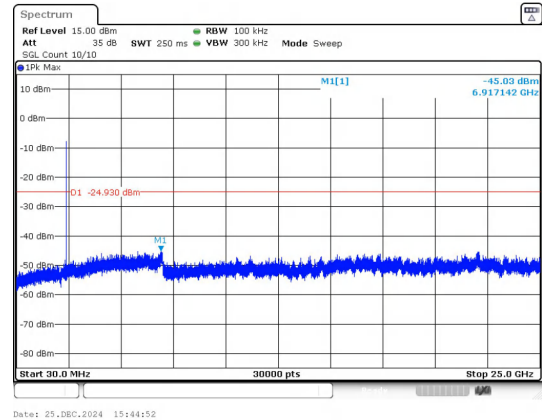
30.0 MHz - 25000.0 MHz  
GFSK\_DH5\_Channel 78



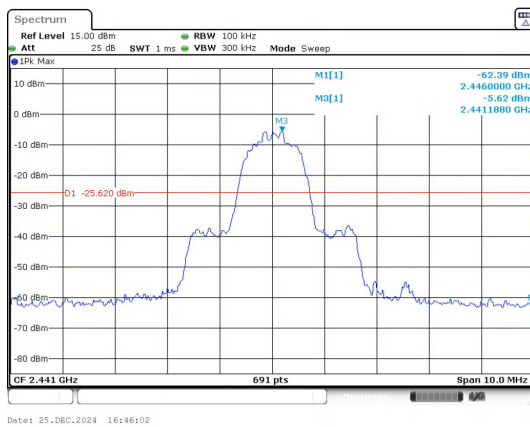
30.0 MHz - 25000.0 MHz  
 $\pi/4$ DQPSK\_2-DH5\_Channel 78



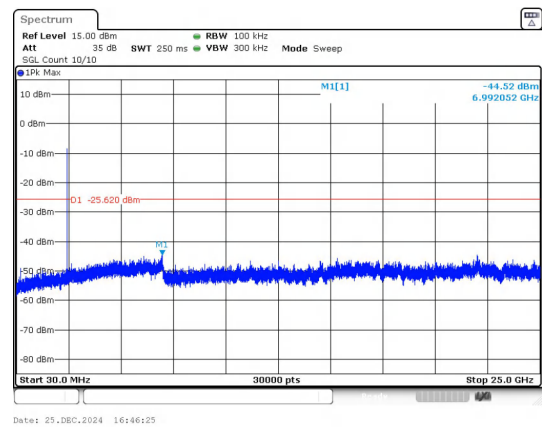
Out Of Band Emission  
8DPSK\_3-DH5\_Channel 0



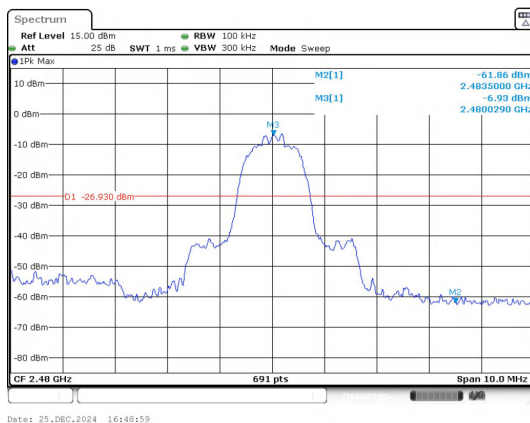
30.0 MHz - 25000.0 MHz  
8DPSK\_3-DH5\_Channel 0



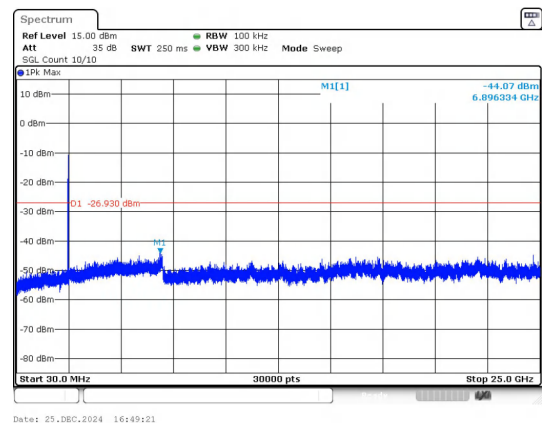
Out Of Band Emission  
8DPSK\_3-DH5\_Channel 39



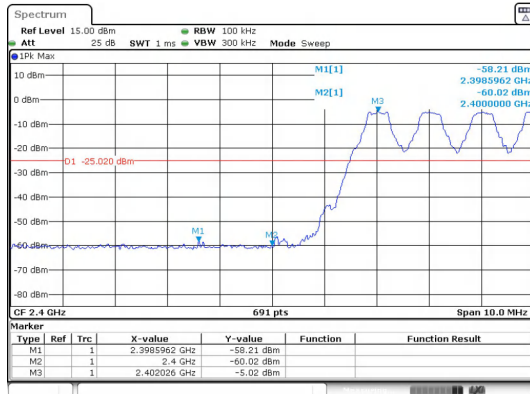
30.0 MHz - 25000.0 MHz  
8DPSK\_3-DH5\_Channel 39



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

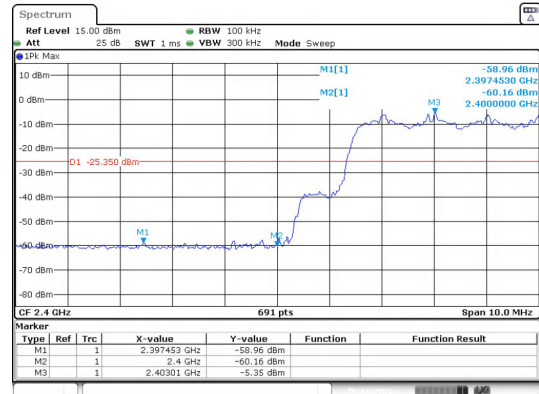


30.0 MHz - 25000.0 MHz  
8DPSK\_3-DH5\_Channel 78



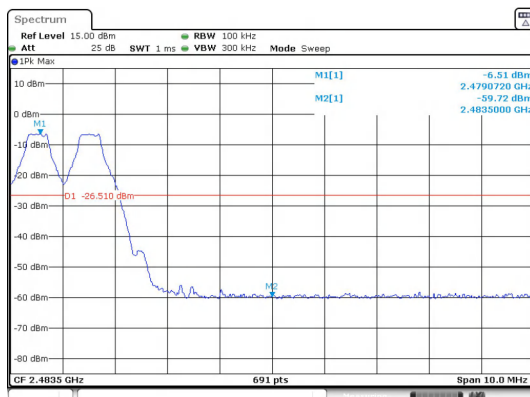
Date: 25.DEC.2024 14:54:09

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



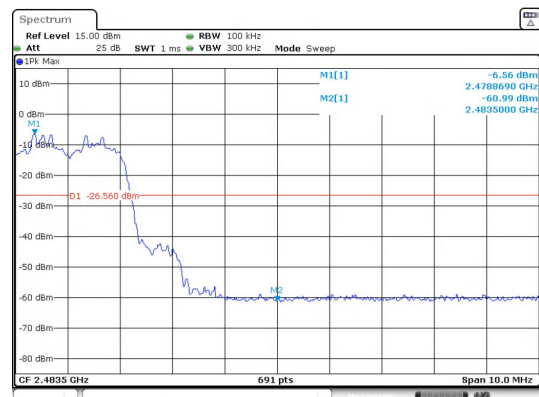
Date: 25.DEC.2024 15:32:35

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



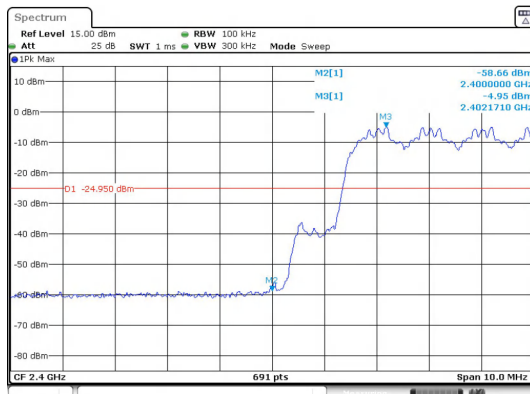
Date: 25.DEC.2024 15:08:40

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



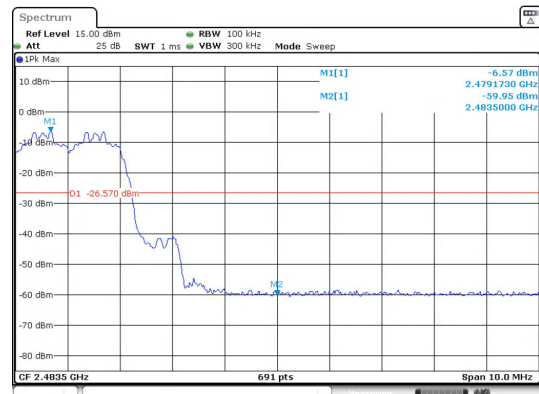
Date: 25.DEC.2024 15:34:45

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



Date: 25.DEC.2024 16:04:56

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



Date: 25.DEC.2024 16:19:16

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

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