



## Appendix A

### RF Test Data for BT(BDR/EDR) (Conducted Measurement)

Product Name: True Wireless Earphone

Trade Mark: N/A

Test Model: TWS-T11

#### Environmental Conditions

|                    |             |
|--------------------|-------------|
| Temperature:       | 24.9℃       |
| Relative Humidity: | 53.1%       |
| ATM Pressure:      | 101Kpa      |
| Test Engineer:     | Simba Huang |
| Supervised by:     | Seal Chen   |

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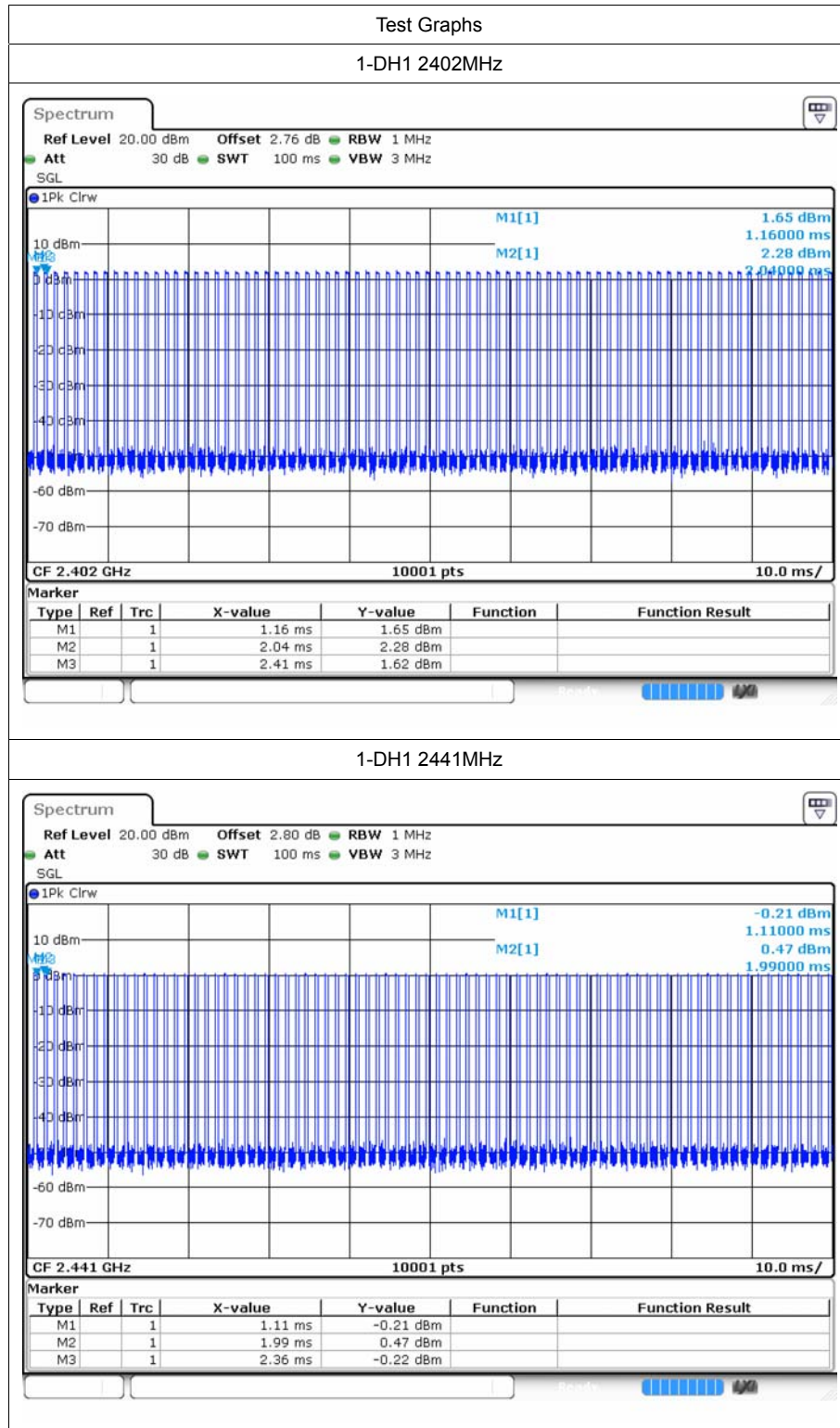
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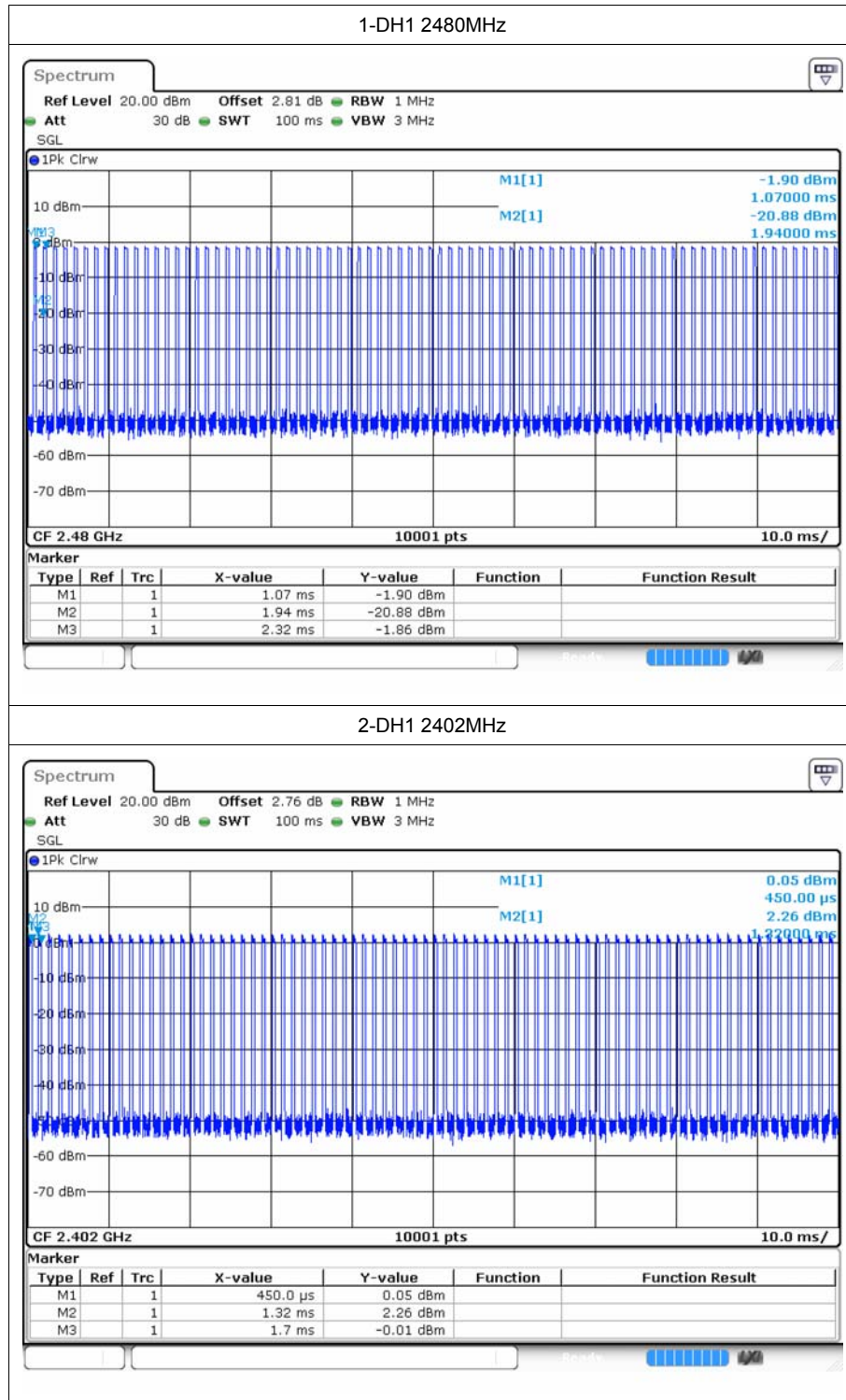
# 1 Duty Cycle

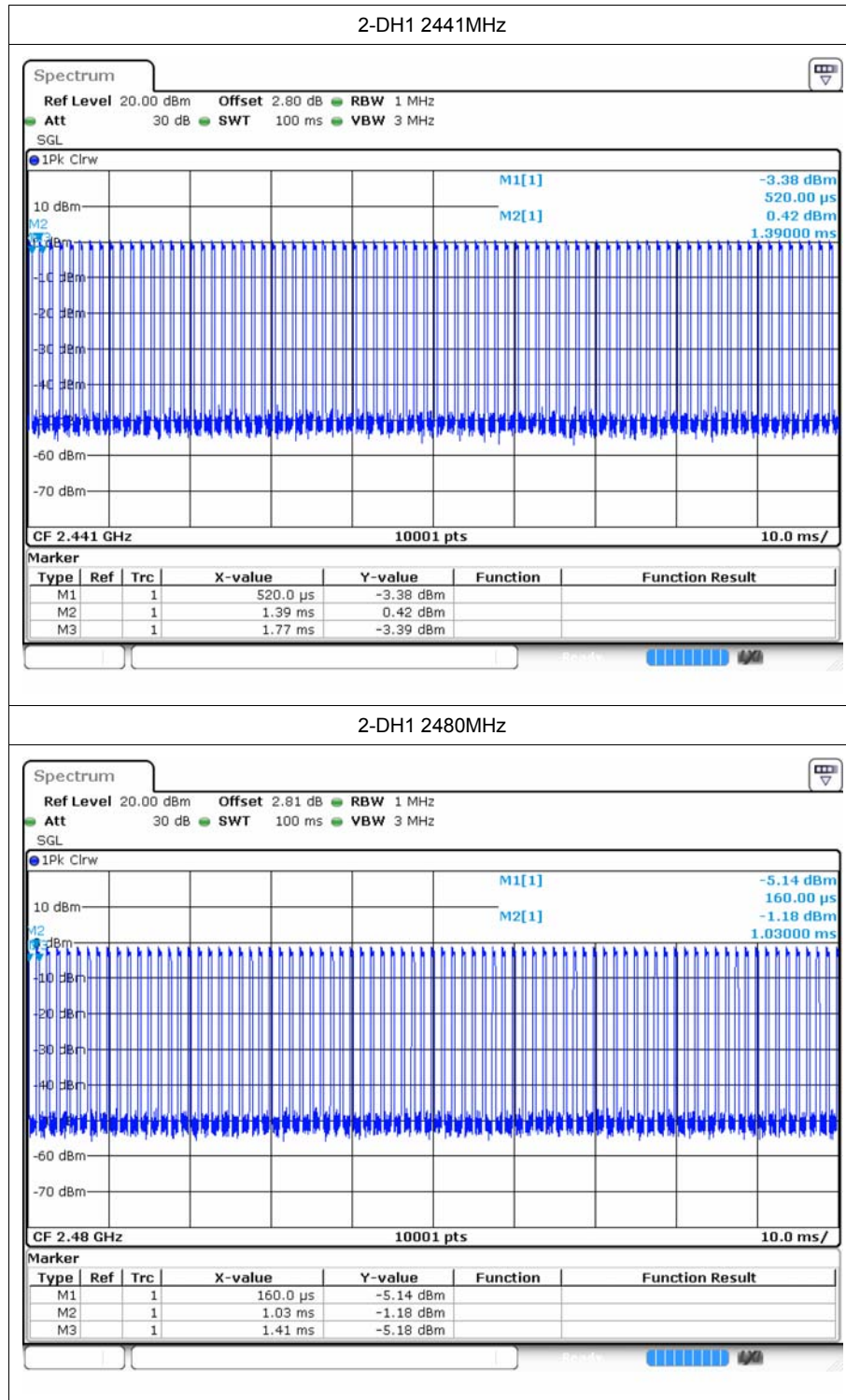
## 1.1 Test Result

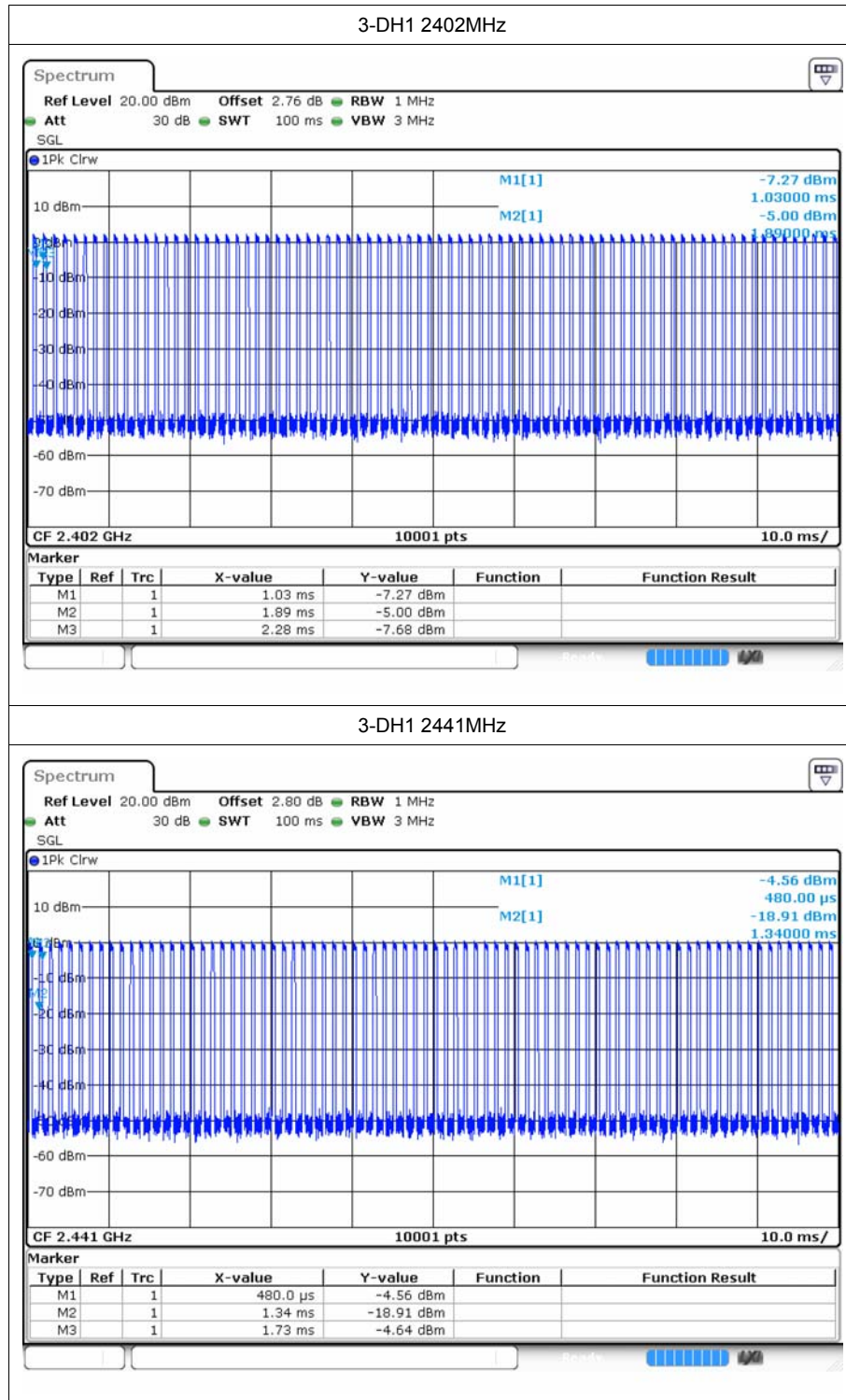
| Mode  | Frequency (MHz) | Duty Cycle (%) | 1/T (kHz) |
|-------|-----------------|----------------|-----------|
| 1-DH1 | 2402            | 30.4           | 2.7       |
| 1-DH1 | 2441            | 30.4           | 2.7       |
| 1-DH1 | 2480            | 31.2           | 2.63      |
| 2-DH1 | 2402            | 31.2           | 2.63      |
| 2-DH1 | 2441            | 31.55          | 2.63      |
| 2-DH1 | 2480            | 31.6           | 2.63      |
| 3-DH1 | 2402            | 31.47          | 2.56      |
| 3-DH1 | 2441            | 31.66          | 2.56      |
| 3-DH1 | 2480            | 31.69          | 2.63      |

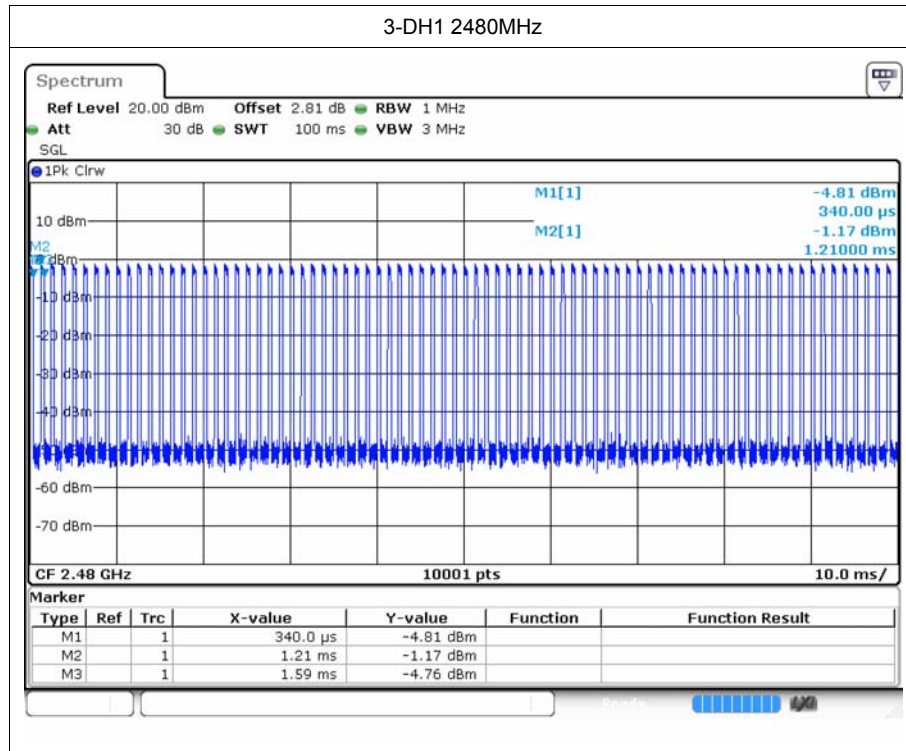
## 1.2 Test Graphs









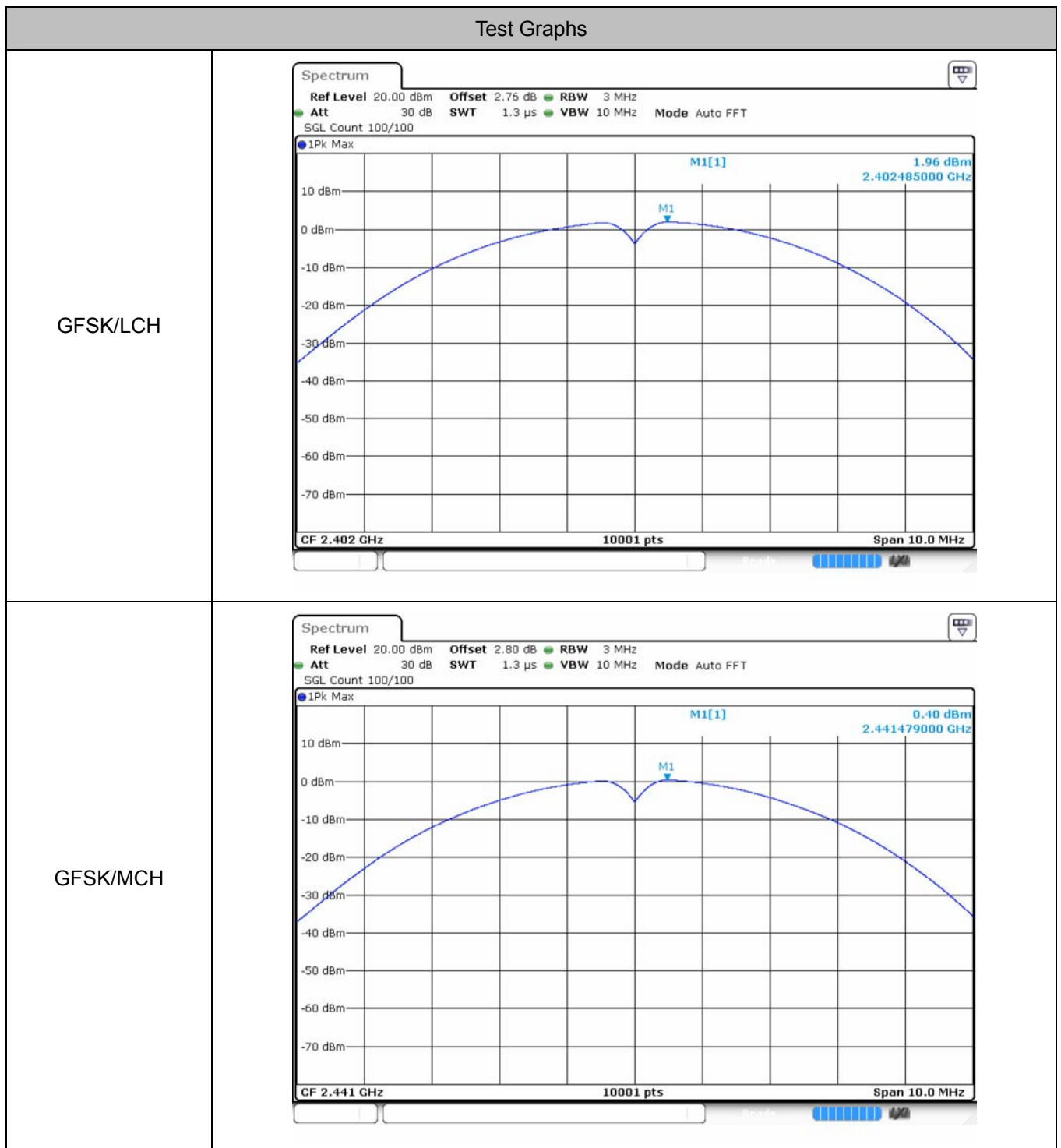


## 2 Maximum Conducted Peak Output Power

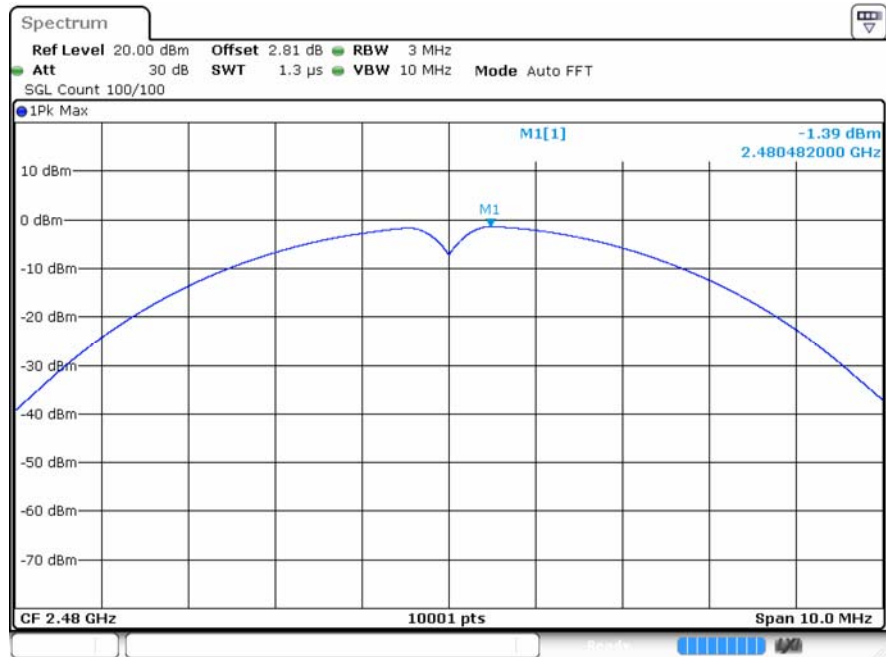
### 2.1 Test Result

| Mode          | Channel. | Maximum Peak Output Power [dBm] | Limit [dBm] | Verdict |
|---------------|----------|---------------------------------|-------------|---------|
| GFSK          | LCH      | 1.96                            | 21          | Pass    |
|               | MCH      | 0.4                             | 21          | Pass    |
|               | HCH      | -1.39                           | 21          | Pass    |
| $\pi/4$ DQPSK | LCH      | 1.84                            | 21          | Pass    |
|               | MCH      | 0.41                            | 21          | Pass    |
|               | HCH      | -1.49                           | 21          | Pass    |
| 8DPSK         | LCH      | 1.88                            | 21          | Pass    |
|               | MCH      | 0.07                            | 21          | Pass    |
|               | HCH      | -1.72                           | 21          | Pass    |

## 2.2 Test Graphs



GFSK/HCH



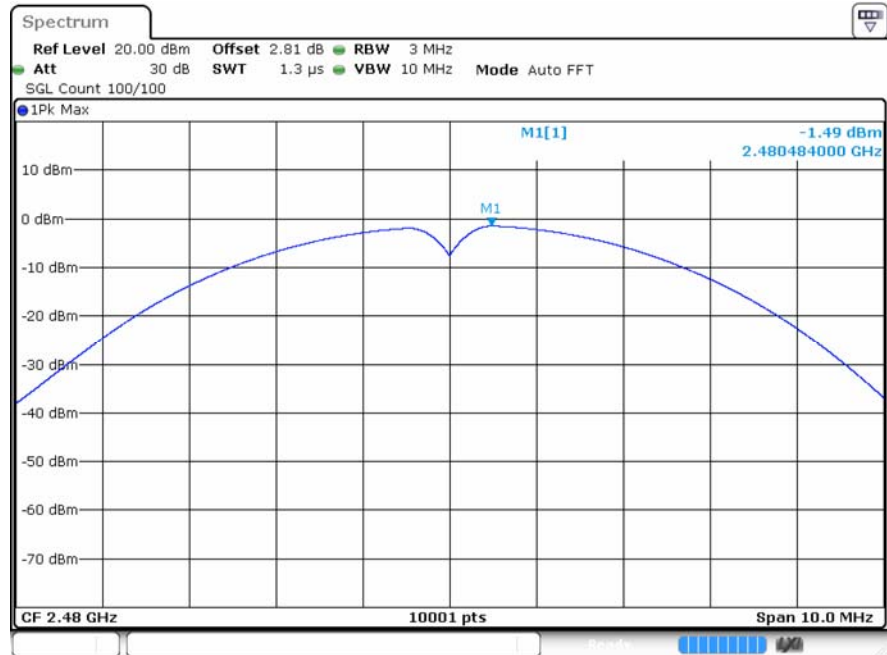
$\pi/4$ DQPSK/LCH



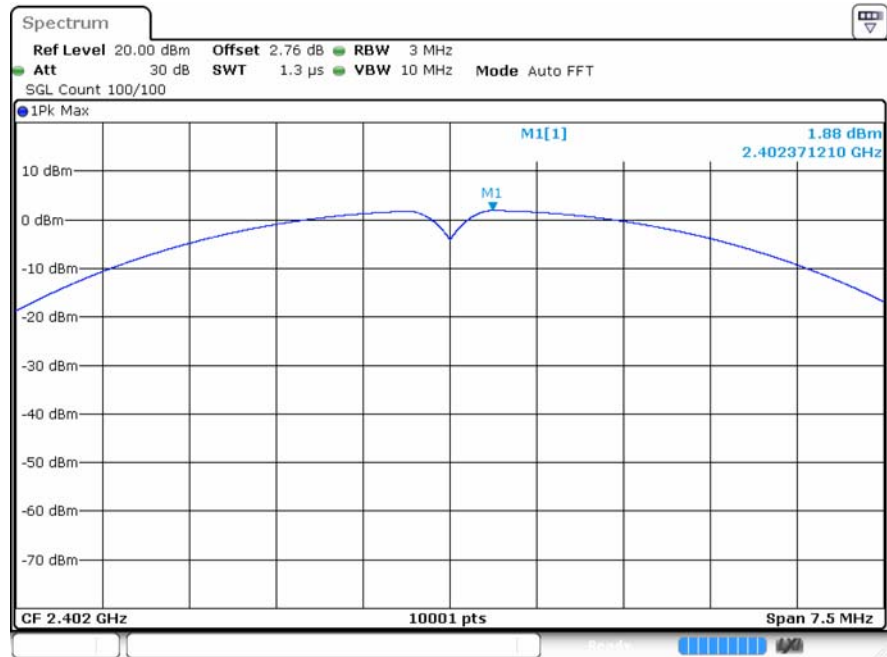
$\pi/4$ DQPSK/MCH



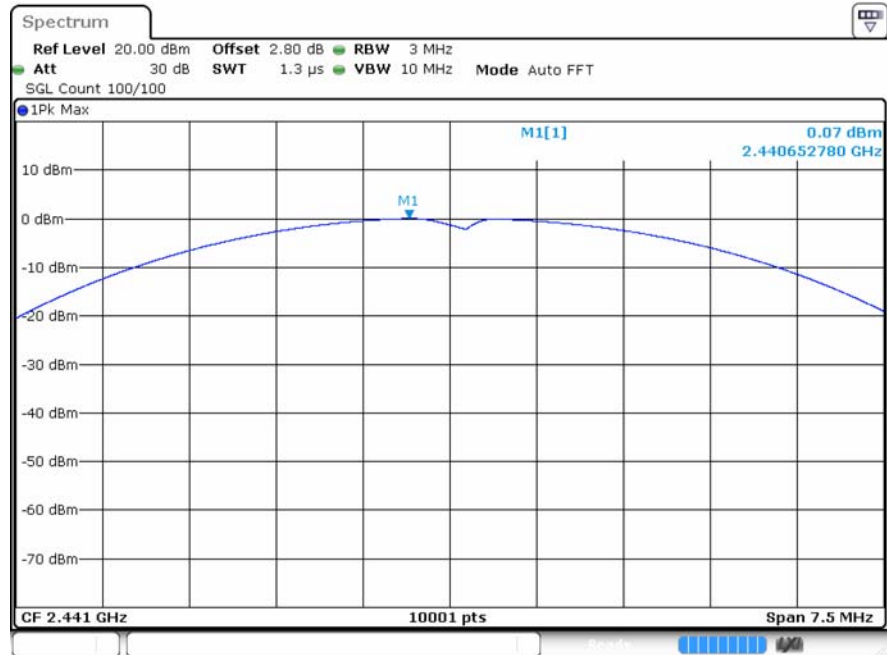
$\pi/4$ DQPSK/HCH



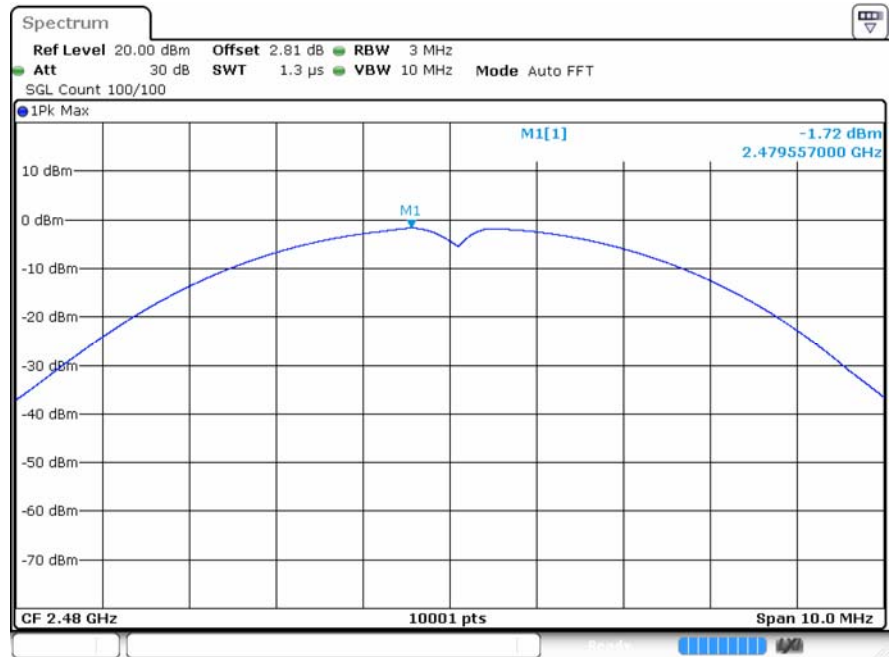
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

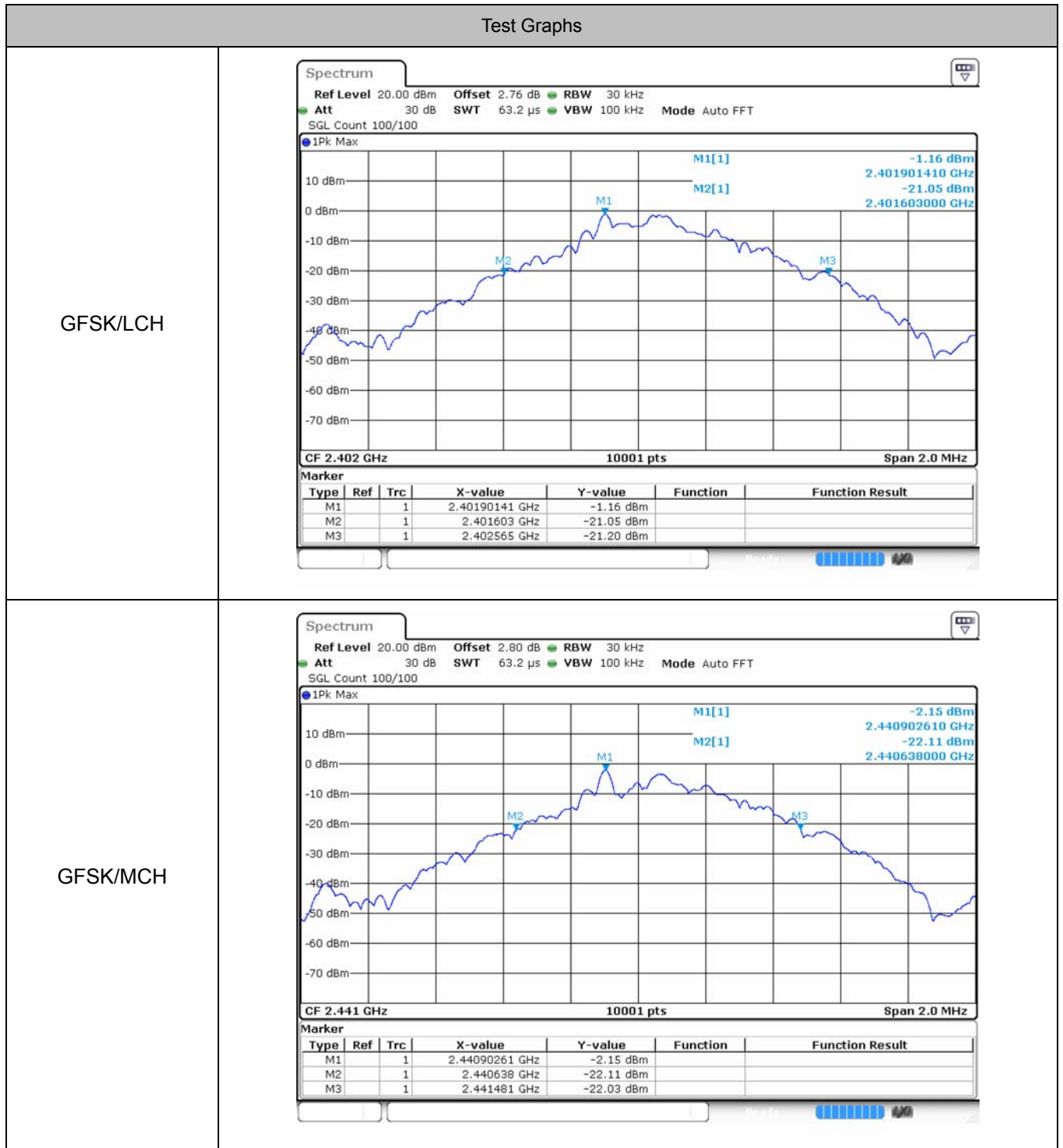


### 3 20dB Bandwidth

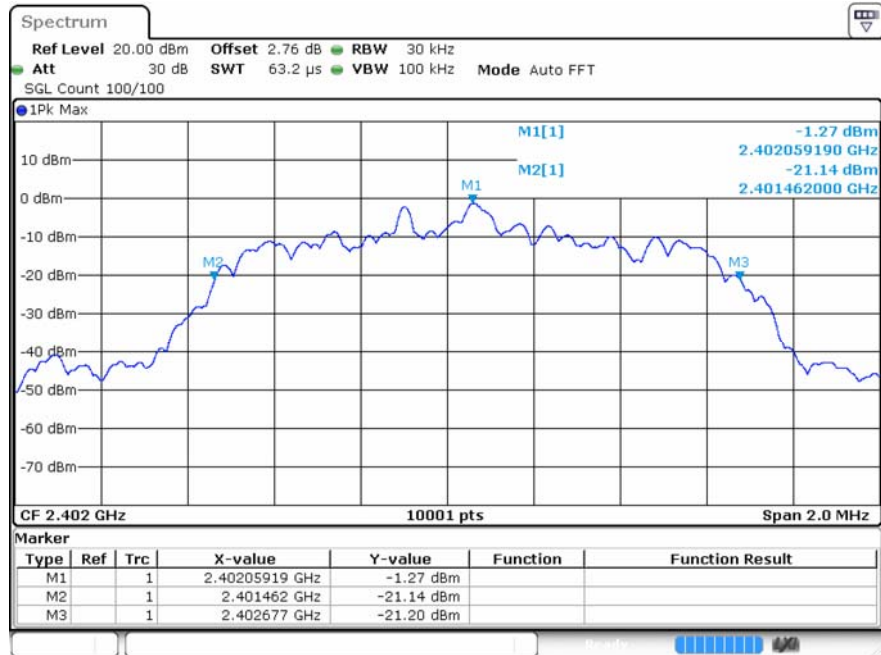
#### 3.1 Test Result

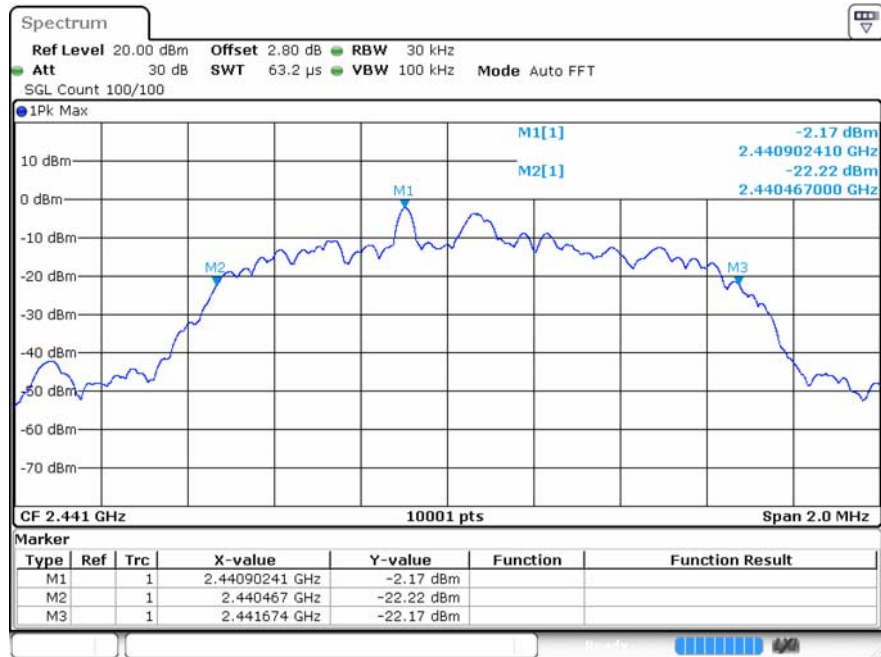
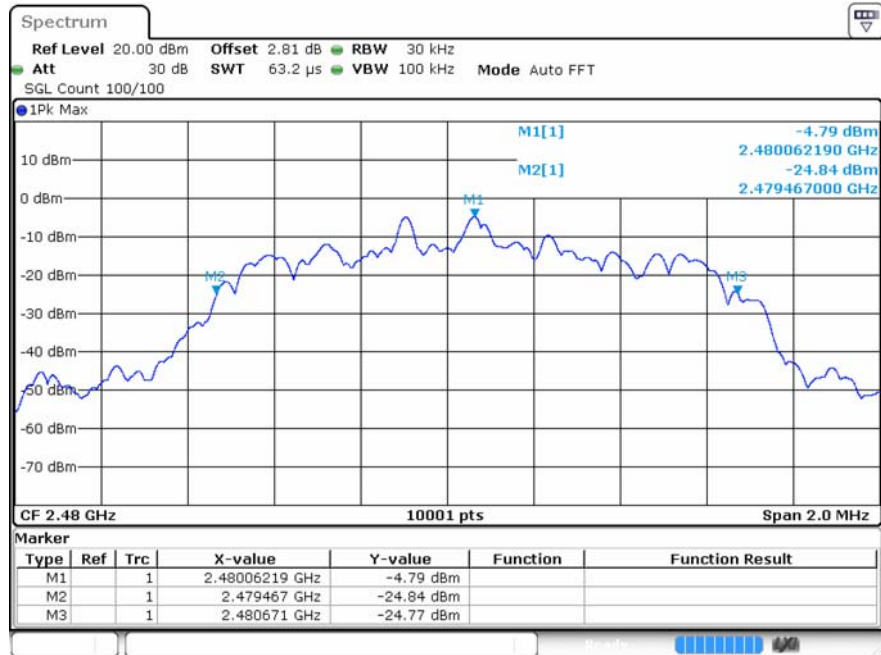
| Mode          | Channel. | 20dB Bandwidth [MHz] | Limit [MHz]   | Verdict |
|---------------|----------|----------------------|---------------|---------|
| GFSK          | LCH      | 0.962                | Not Specified | Pass    |
|               | MCH      | 0.844                | Not Specified | Pass    |
|               | HCH      | 0.936                | Not Specified | Pass    |
| $\pi/4$ DQPSK | LCH      | 1.216                | Not Specified | Pass    |
|               | MCH      | 1.206                | Not Specified | Pass    |
|               | HCH      | 1.204                | Not Specified | Pass    |
| 8DPSK         | LCH      | 1.199                | Not Specified | Pass    |
|               | MCH      | 1.209                | Not Specified | Pass    |
|               | HCH      | 1.172                | Not Specified | Pass    |

### 3.2 Test Graphs

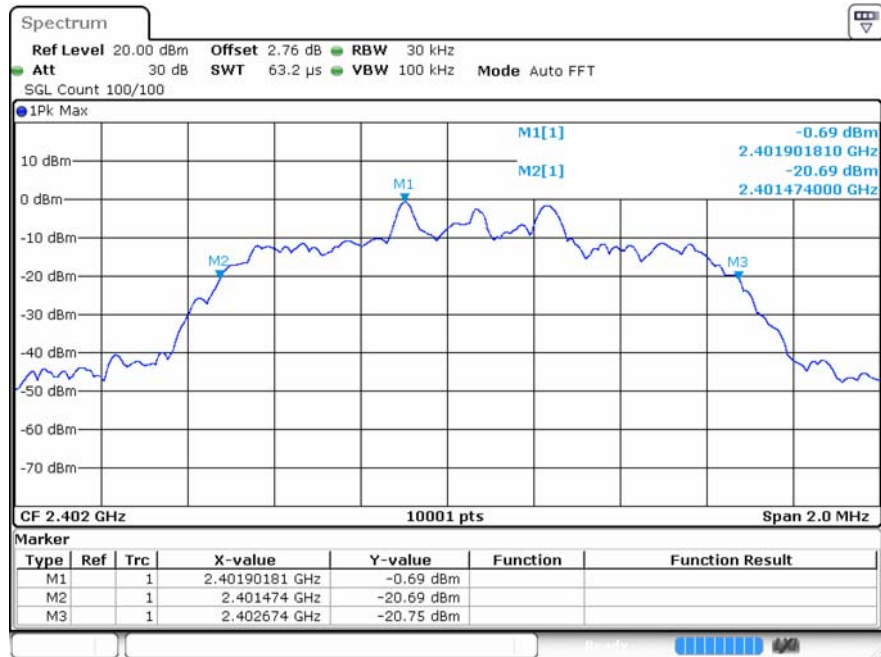


GFSK/HCH

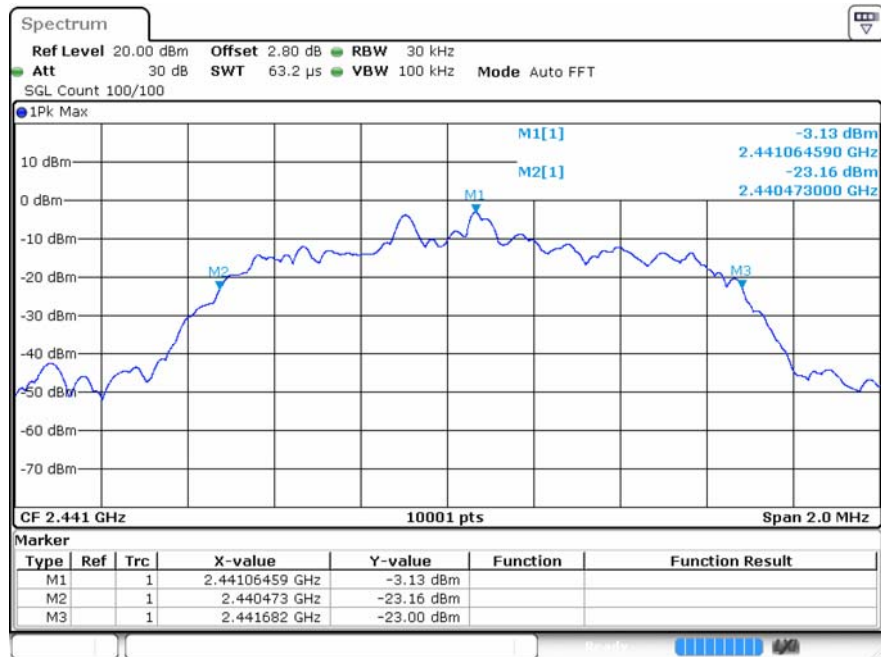

 $\pi/4$ DQPSK/LCH


$\pi/4$ DQPSK/MCH

 $\pi/4$ DQPSK/HCH


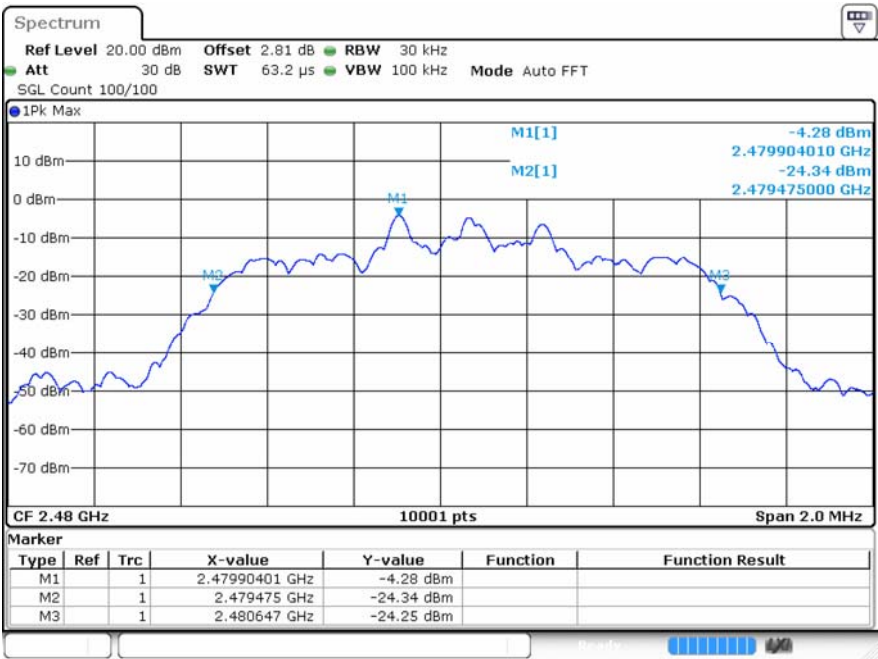
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

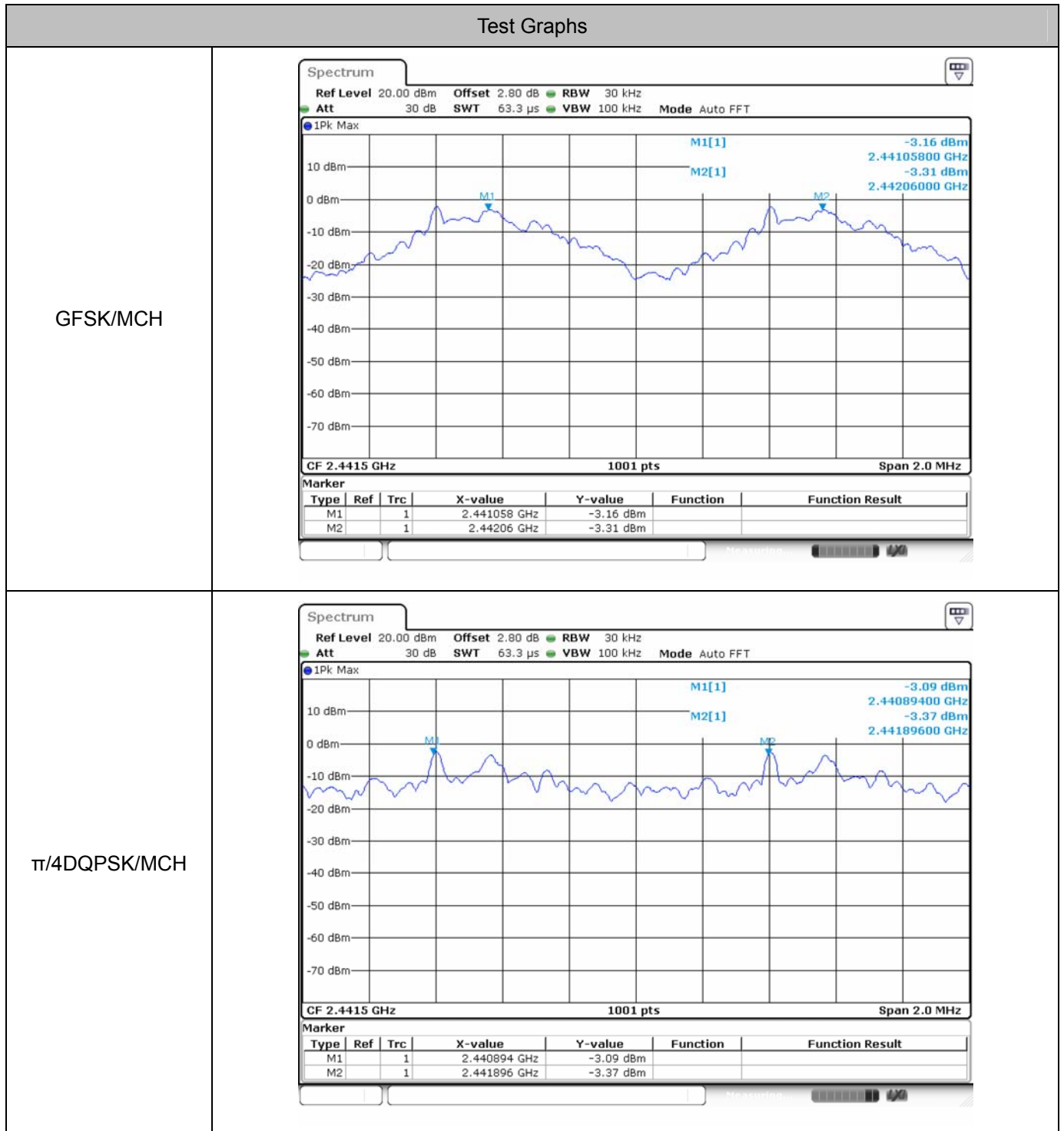


## 4 Carrier Frequency Separation

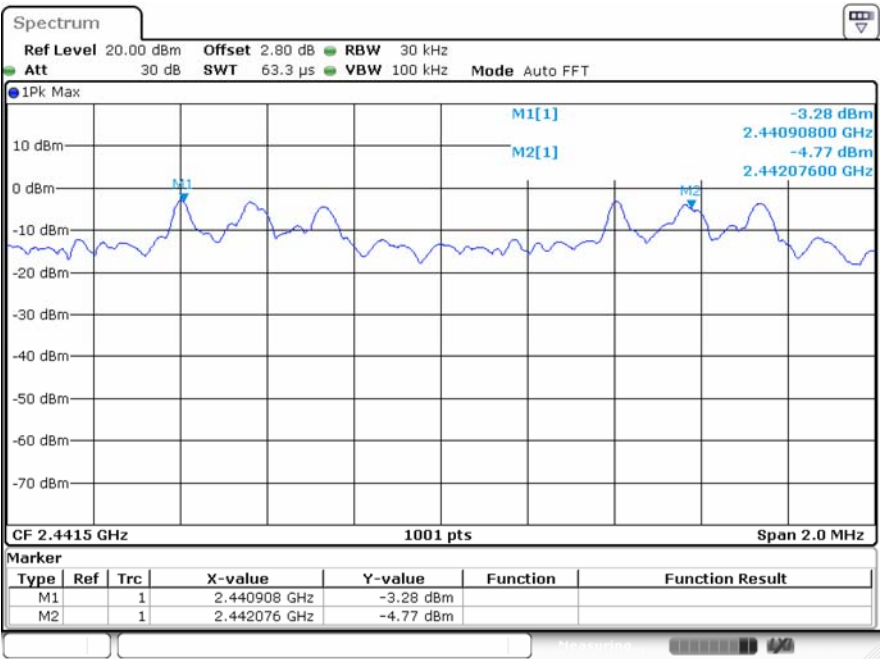
### 4.1 Test Result

| Mode          | Channel. | Carrier Frequency Separation [MHz] | Limit [MHz] | Verdict |
|---------------|----------|------------------------------------|-------------|---------|
| GFSK          | MCH      | 1.002                              | 0.563       | Pass    |
| $\pi/4$ DQPSK | MCH      | 1.002                              | 0.804       | Pass    |
| 8DPSK         | MCH      | 1.168                              | 0.806       | Pass    |

## 4.2 Test Graphs



8DPSK/MCH

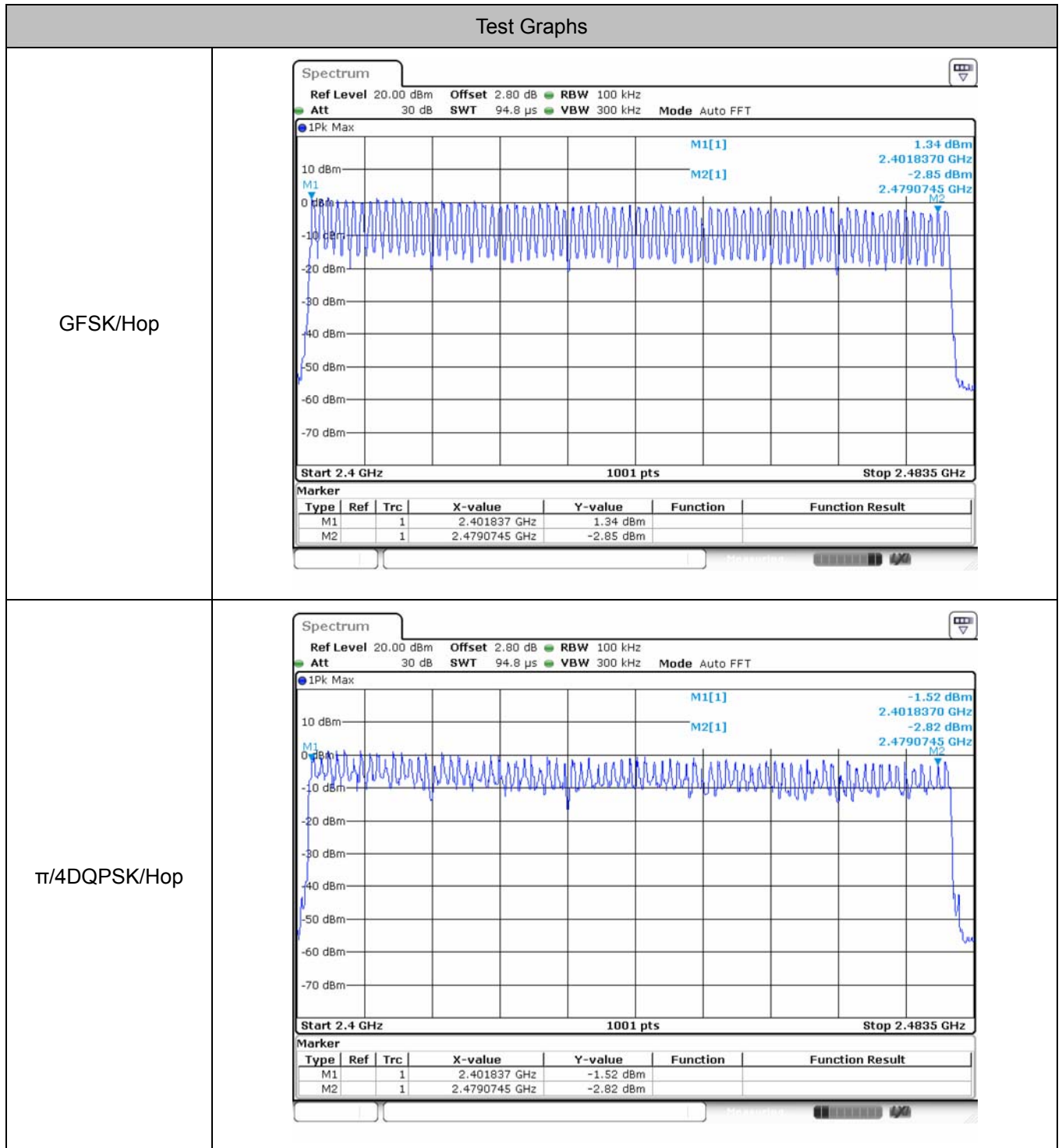


## 5 Hopping Channel Number

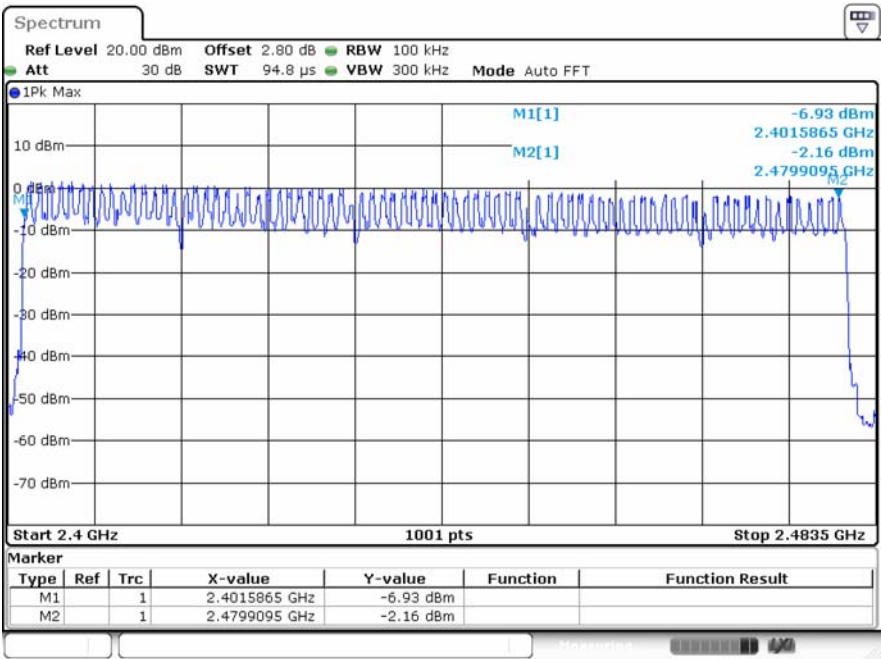
### 5.1 Test Result

| Mode          | Channel. | Number of Hopping Channel [N] | Limit [N] | Verdict |
|---------------|----------|-------------------------------|-----------|---------|
| GFSK          | Hop      | 79                            | $\geq 15$ | PASS    |
| $\pi/4$ DQPSK | Hop      | 79                            | $\geq 15$ | PASS    |
| 8DPSK         | Hop      | 79                            | $\geq 15$ | PASS    |

## 5.2 Test Graphs



8DPSK/Hop

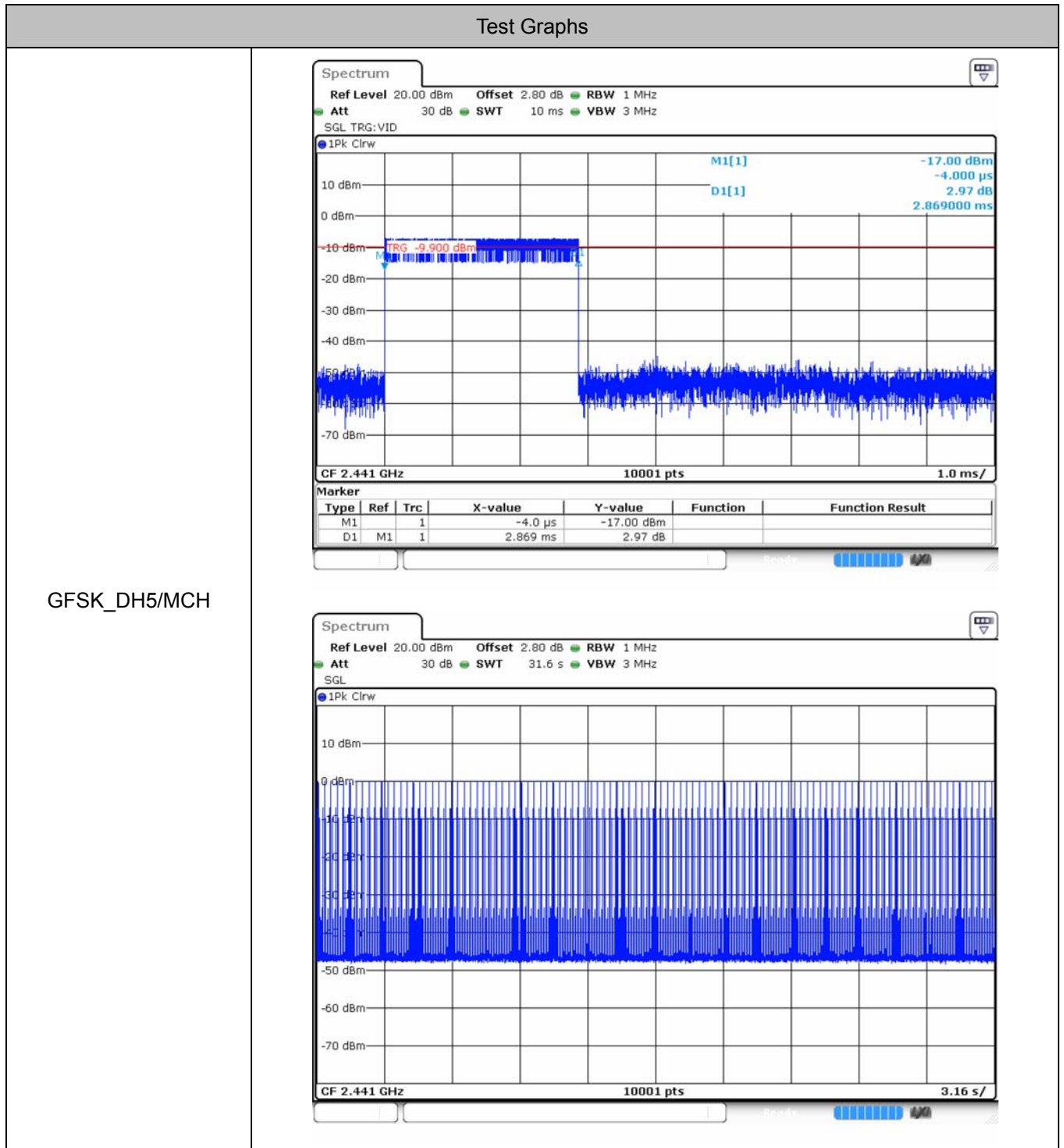


## 6 Dwell Time

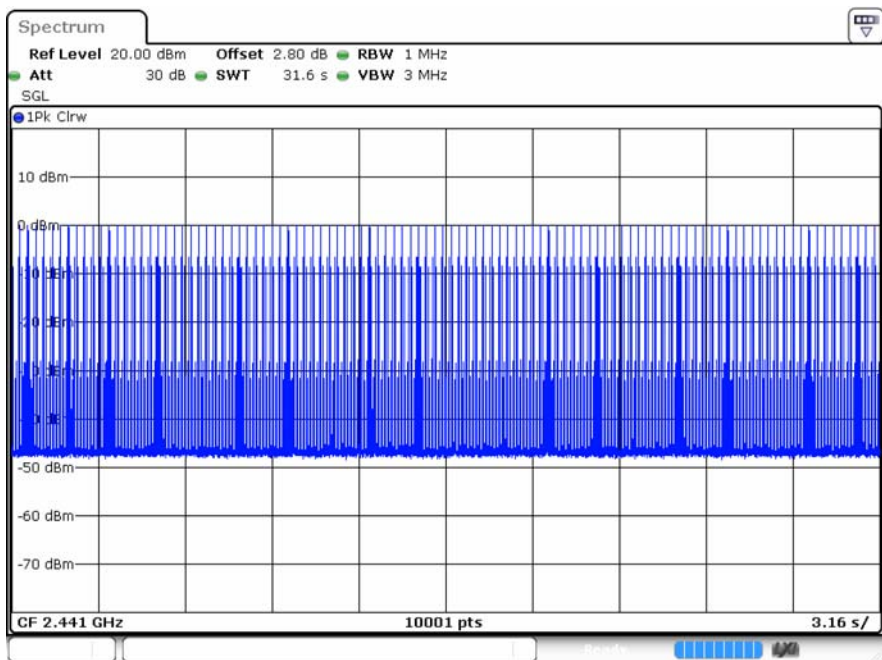
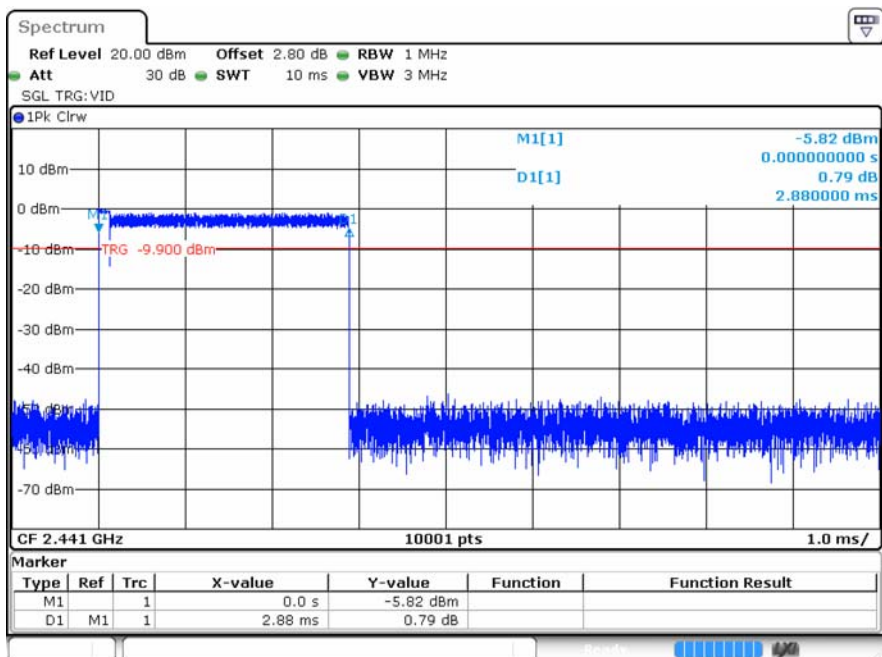
### 6.1 Test Result

| Mode          | Packet | Channel | Burst Width<br>[ms/hop/ch] | Total<br>Hops[hop*ch] | Dwell Time[ms] | Limit [s] | Verdict |
|---------------|--------|---------|----------------------------|-----------------------|----------------|-----------|---------|
| GFSK          | DH5    | MCH     | 2.869                      | 107                   | 306.983        | 0.4       | Pass    |
| $\pi/4$ DQPSK | 2DH5   | MCH     | 2.88                       | 106                   | 305.28         | 0.4       | Pass    |
| 8DPSK         | 3DH5   | MCH     | 2.88                       | 107                   | 308.16         | 0.4       | Pass    |

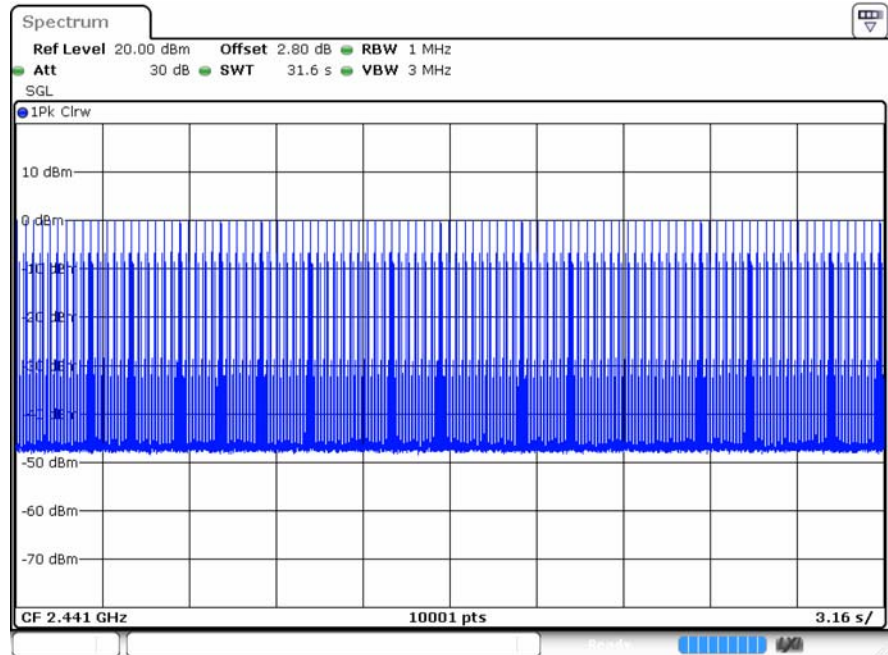
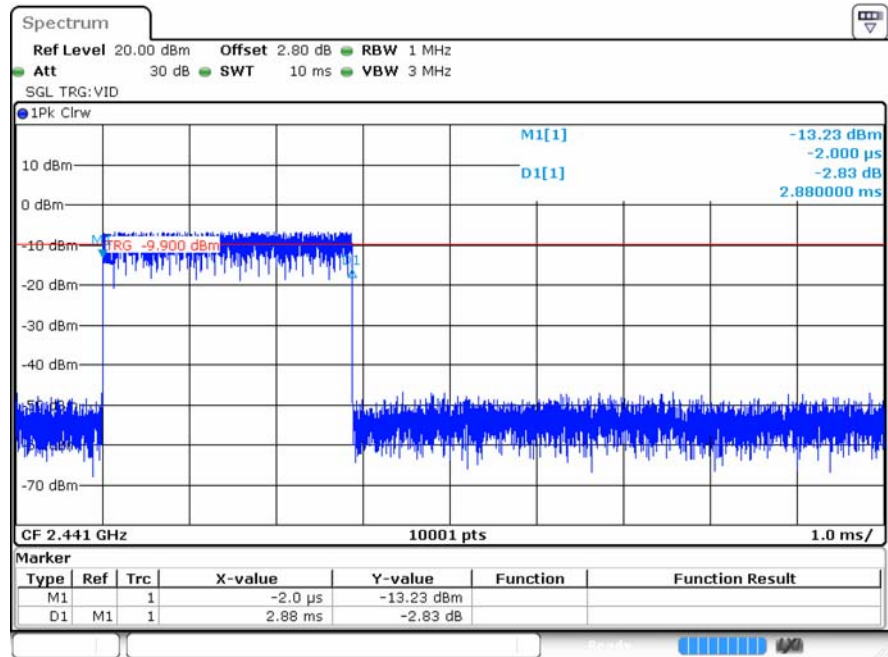
## 6.2 Test Graphs



$\pi/4$ DQPSK  
\_2DH5/MCH



8DPSK\_3DH5/MCH

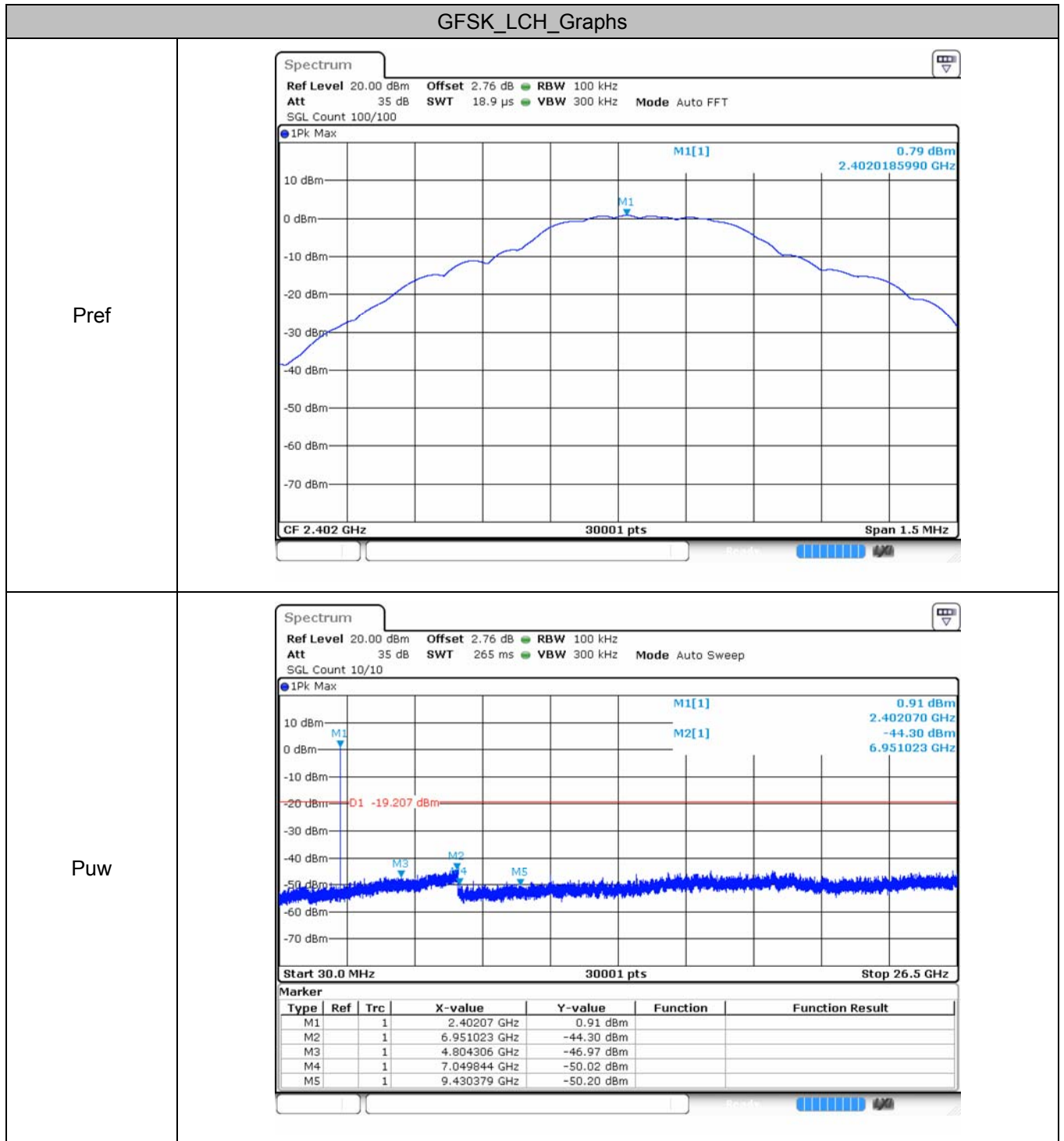


## 7 RF Conducted Spurious Emissions

### 7.1 Test Result

| Mode          | Channel | Max. Level [dBc] | Limit [dBc] | Verdict |
|---------------|---------|------------------|-------------|---------|
| GFSK          | LCH     | -45.09           | -20         | Pass    |
|               | MCH     | -41.29           | -20         | Pass    |
|               | HCH     | -41.14           | -20         | Pass    |
| $\pi/4$ DQPSK | LCH     | -45.12           | -20         | Pass    |
|               | MCH     | -43.81           | -20         | Pass    |
|               | HCH     | -42.27           | -20         | Pass    |
| 8DPSK         | LCH     | -44.96           | -20         | Pass    |
|               | MCH     | -43.96           | -20         | Pass    |
|               | HCH     | -42.34           | -20         | Pass    |

## 7.2 Test Graphs

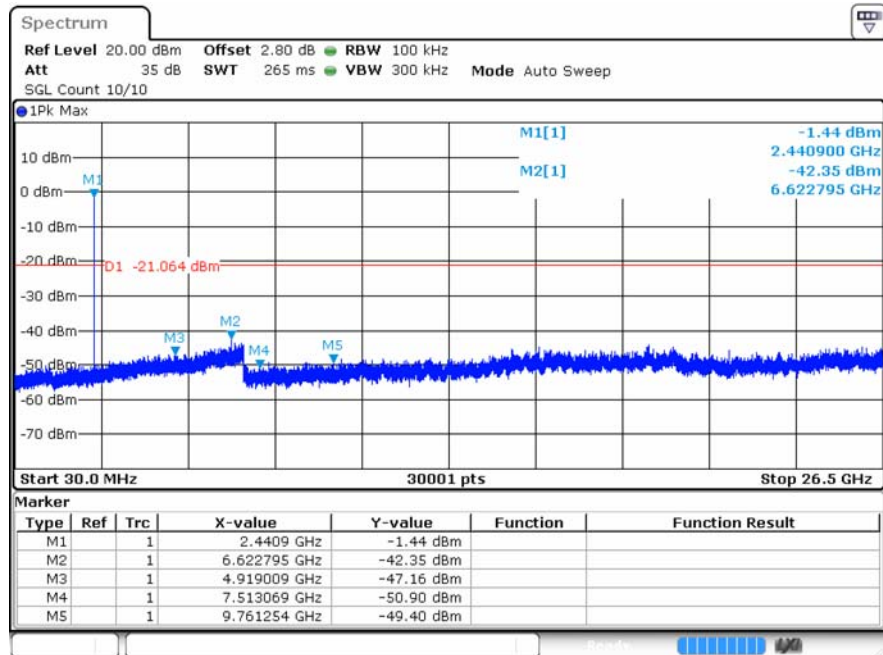


## GFSK\_MCH\_Graphs

Pref



Puw

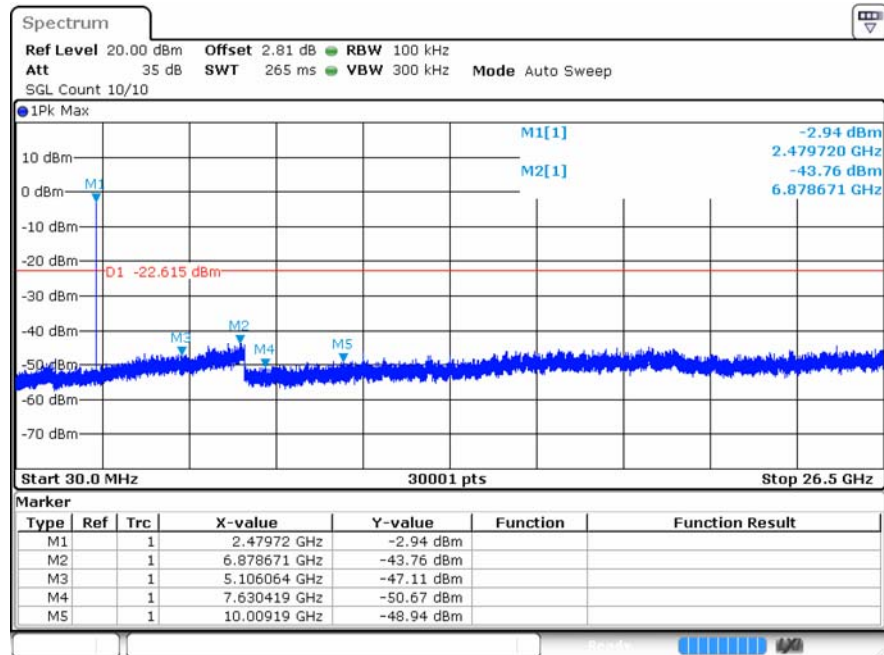


## GFSK\_HCH\_Graphs

Pref



Puw

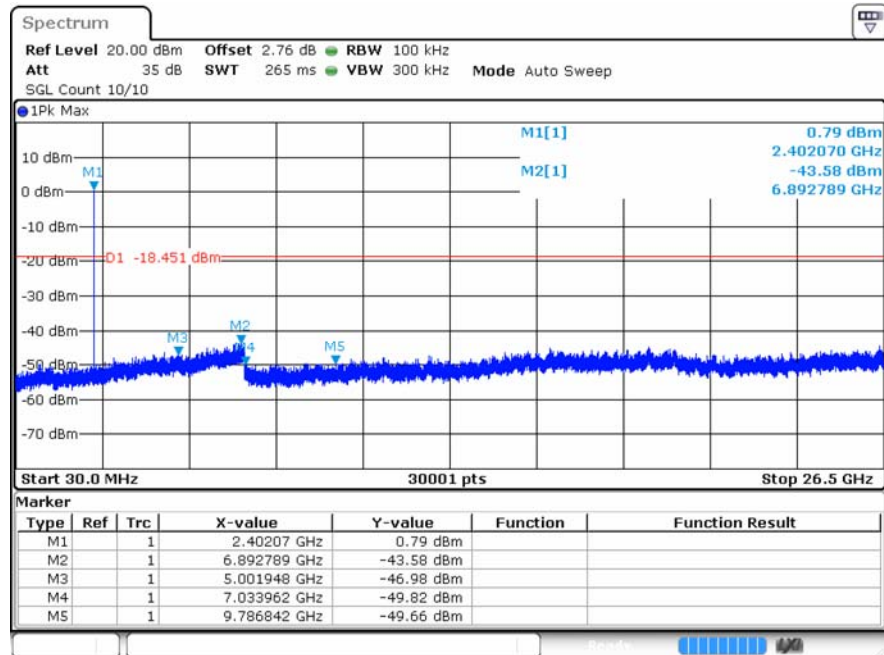


### $\pi/4$ DQPSK\_LCH\_Graphs

Pref



Puw

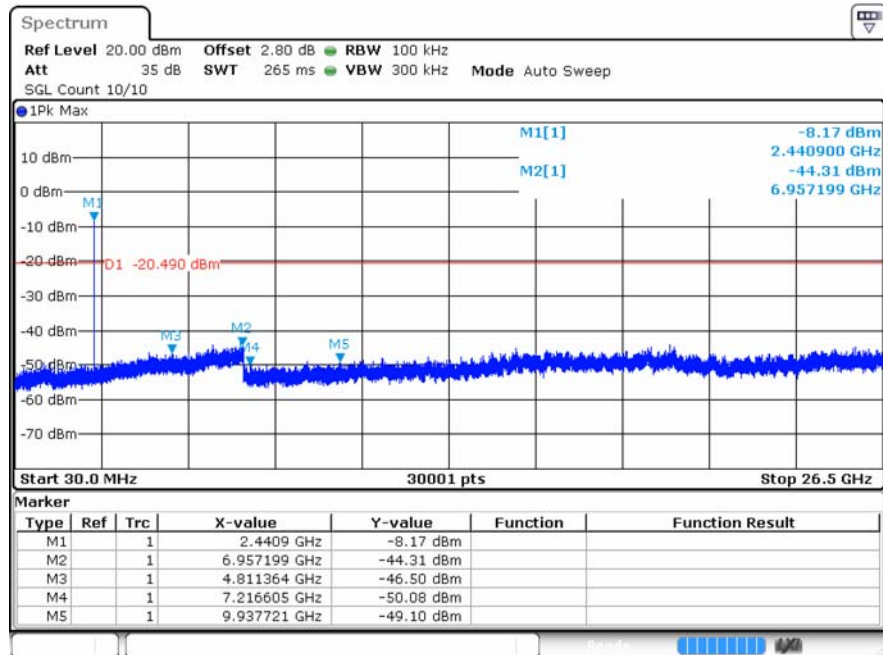


$\pi/4$ DQPSK\_MCH\_Graphs

Pref



Puw

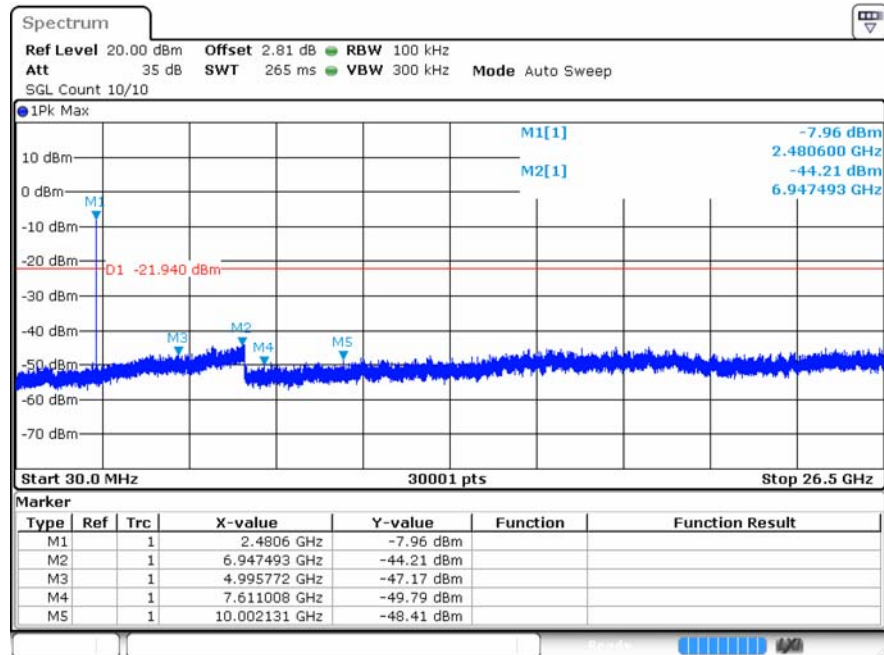


# $\pi/4$ DQPSK\_HCH\_Graphs

Pref



Puw

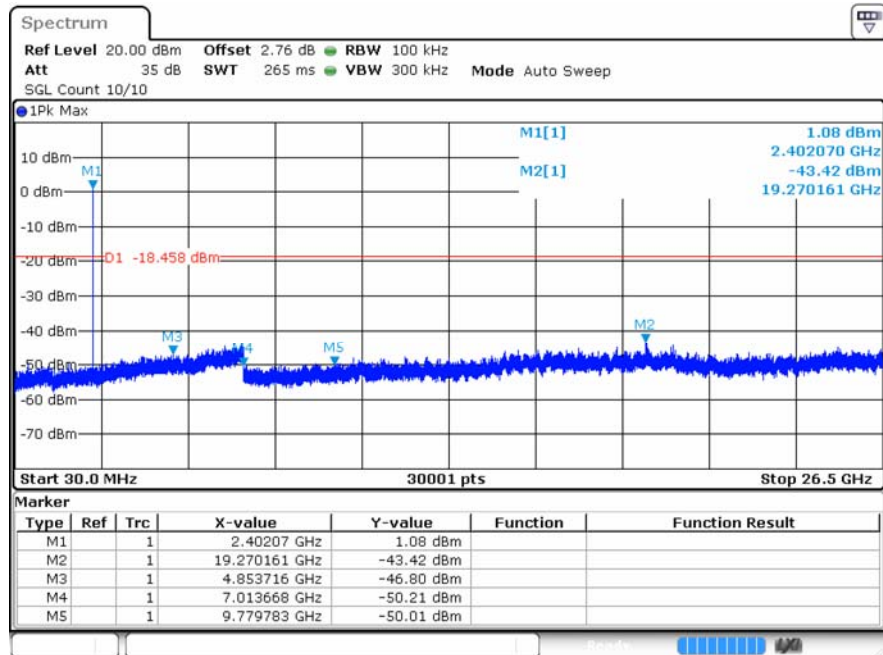


## 8DPSK\_LCH\_Graphs

Pref

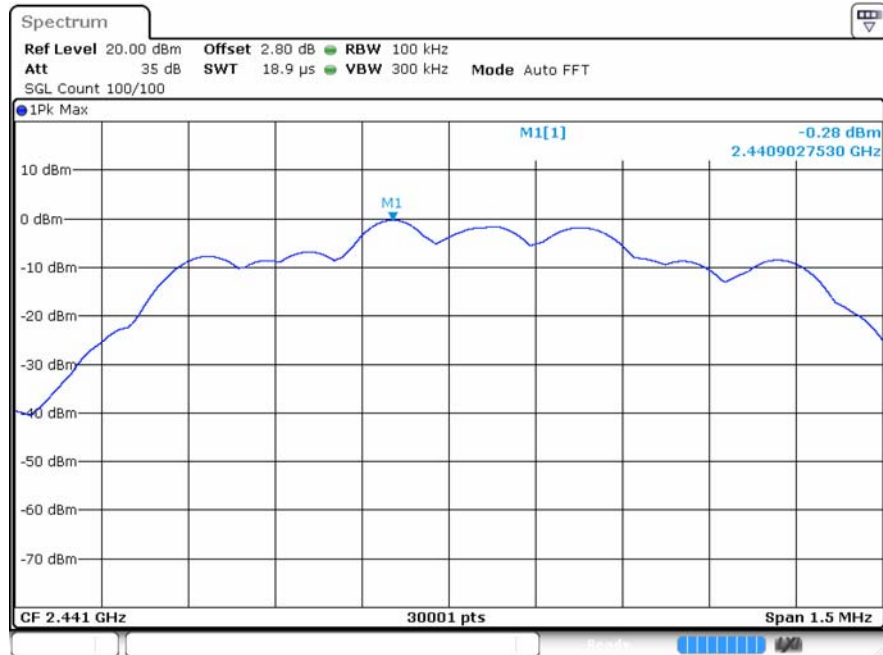


Puw

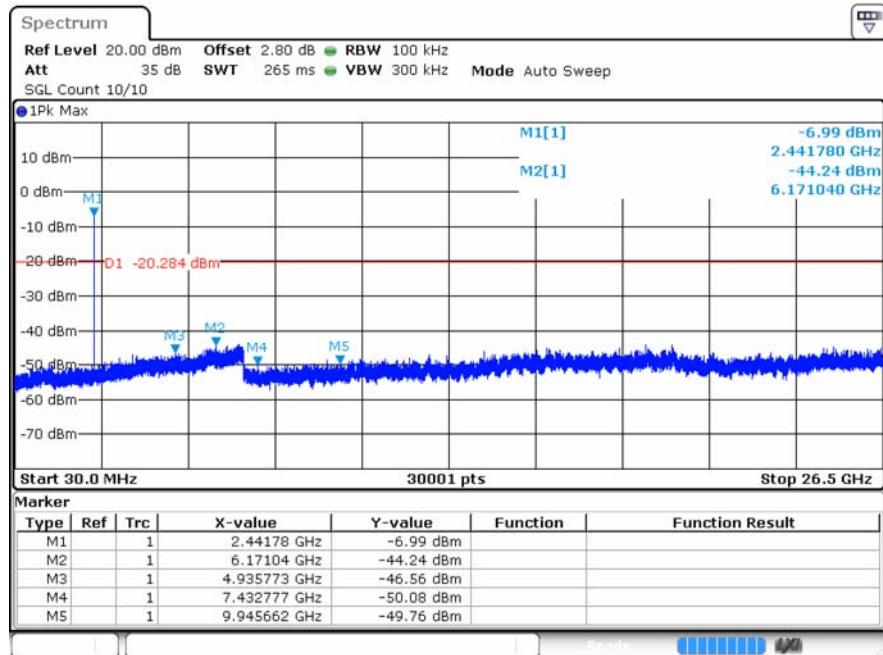


## 8DPSK\_MCH\_Graphs

Pref



Puw

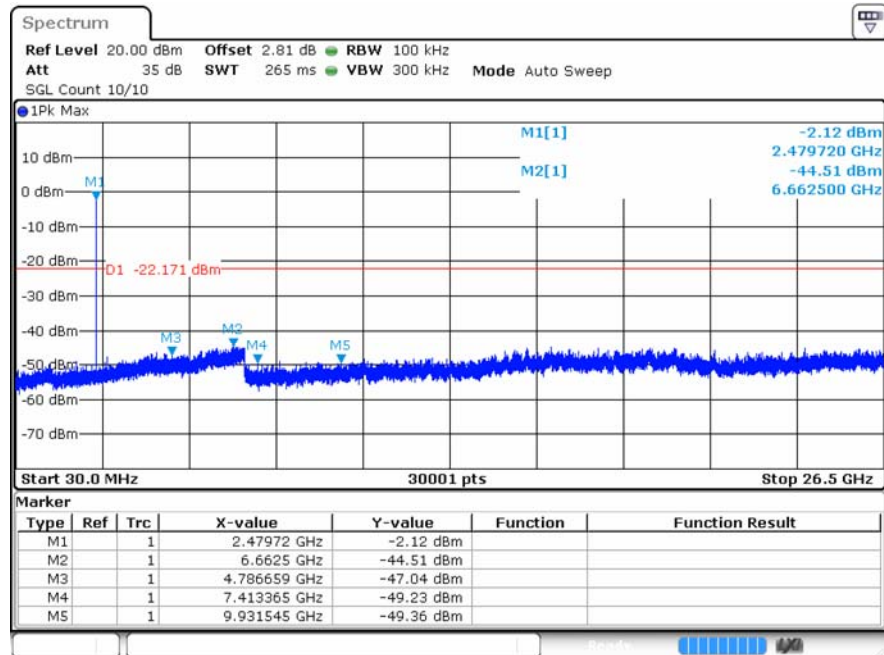


## 8DPSK\_HCH\_Graphs

Pref



Puw

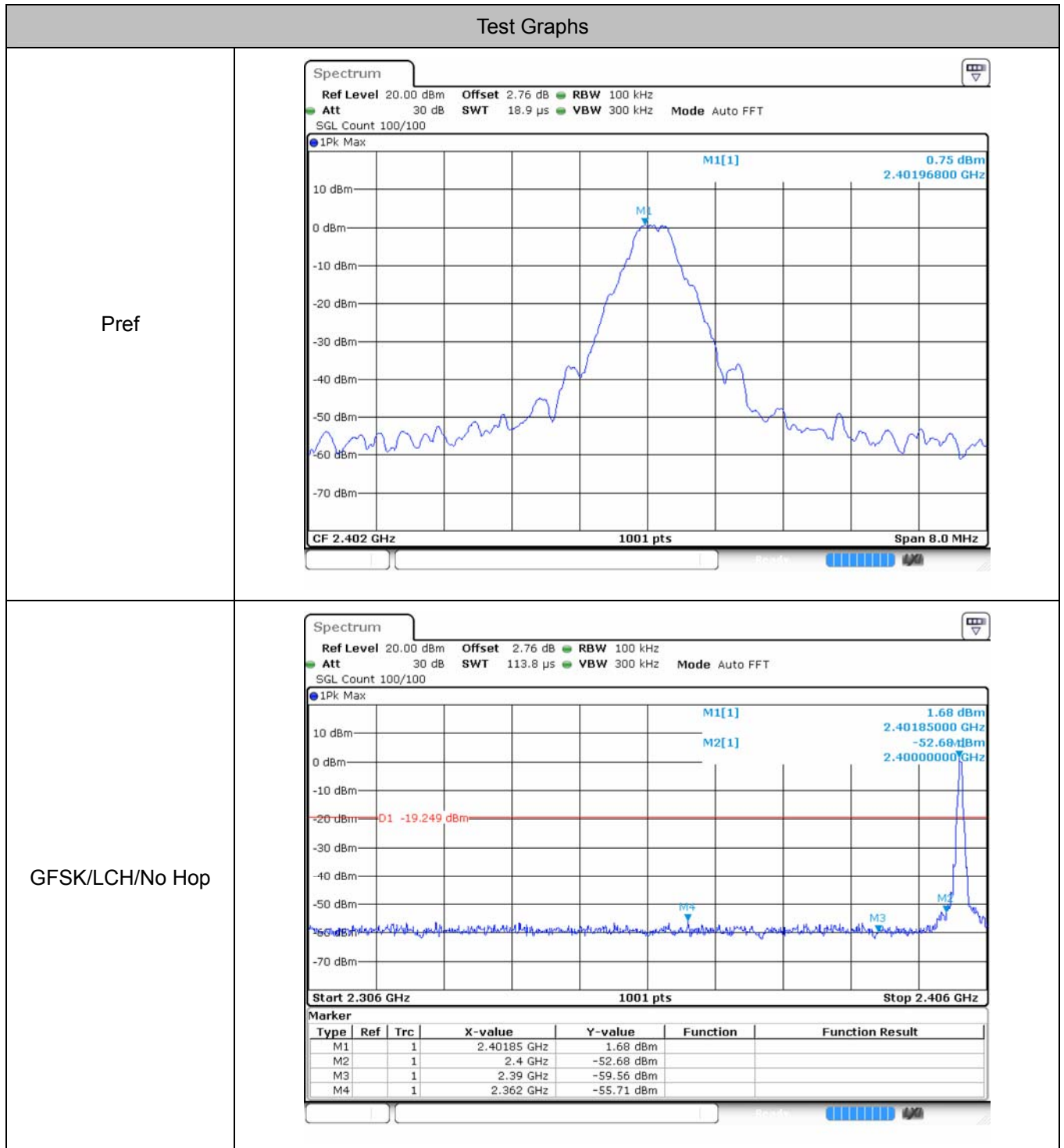


## 8 Band-edge for RF Conducted Emissions

### 8.1 Test Result

| Mode          | Channel | Carrier Frequency [MHz] | Frequency Hopping | Max Spurious Level [dBc] | Limit [dBc] | Verdict |
|---------------|---------|-------------------------|-------------------|--------------------------|-------------|---------|
| GFSK          | LCH     | 2402                    | Off               | -56.45                   | -20         | Pass    |
|               |         |                         | On                | -56.4                    | -20         | Pass    |
|               | HCH     | 2480                    | Off               | -53.43                   | -20         | Pass    |
|               |         |                         | On                | -53.1                    | -20         | Pass    |
| $\pi/4$ DQPSK | LCH     | 2402                    | Off               | -56.24                   | -20         | Pass    |
|               |         |                         | On                | -56.65                   | -20         | Pass    |
|               | HCH     | 2480                    | Off               | -53.51                   | -20         | Pass    |
|               |         |                         | On                | -52.7                    | -20         | Pass    |
| 8DPSK         | LCH     | 2402                    | Off               | -57.26                   | -20         | Pass    |
|               |         |                         | On                | -55.79                   | -20         | Pass    |
|               | HCH     | 2480                    | Off               | -54.43                   | -20         | Pass    |
|               |         |                         | On                | -53.06                   | -20         | Pass    |

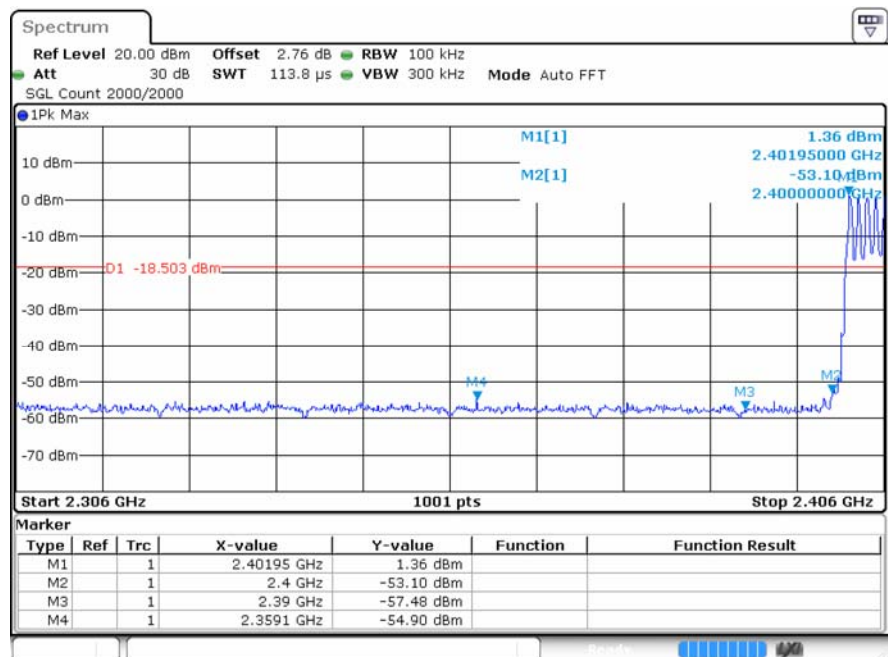
## 8.2 Test Graphs



Ref



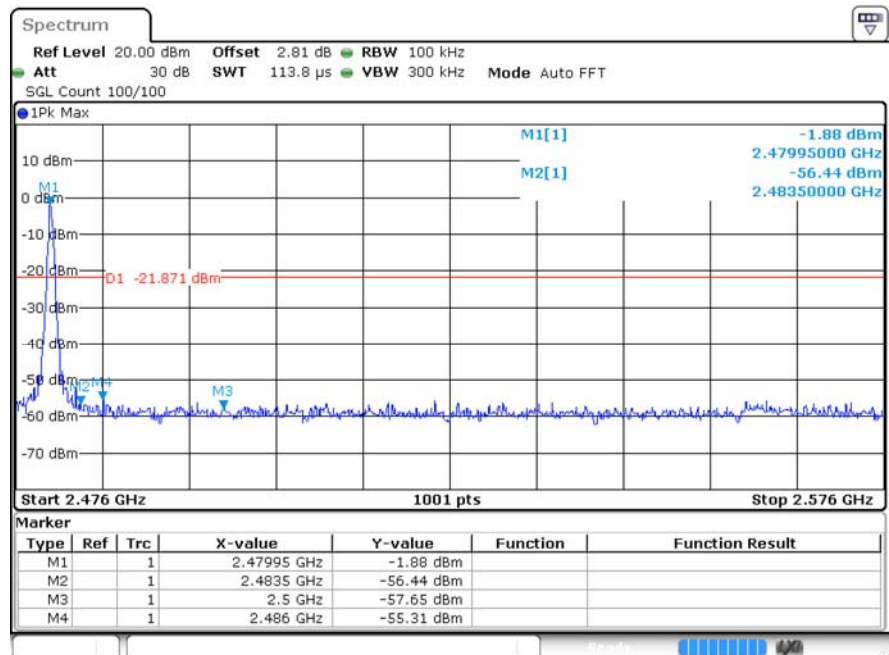
GFSK/LCH/Hop



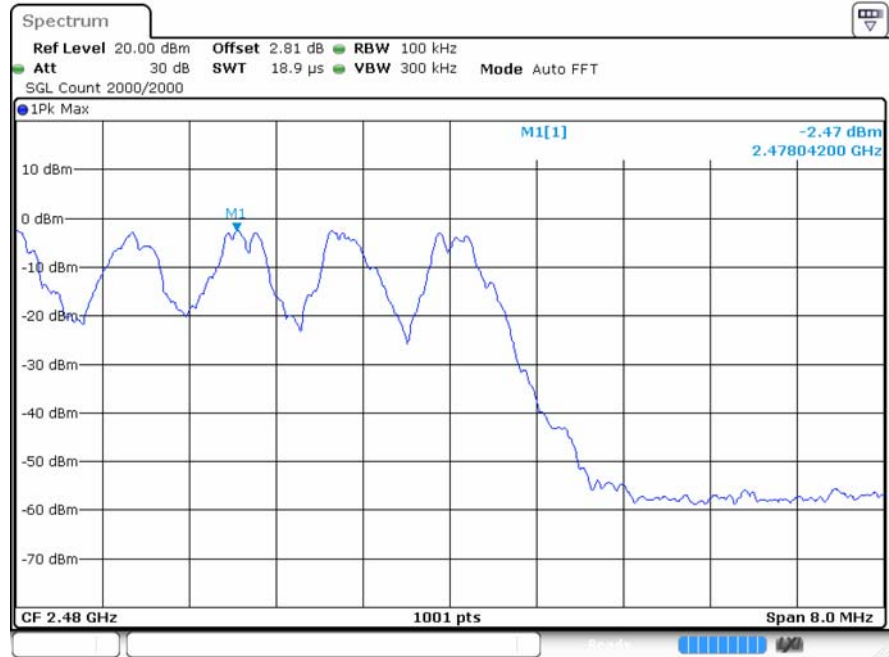
Ref



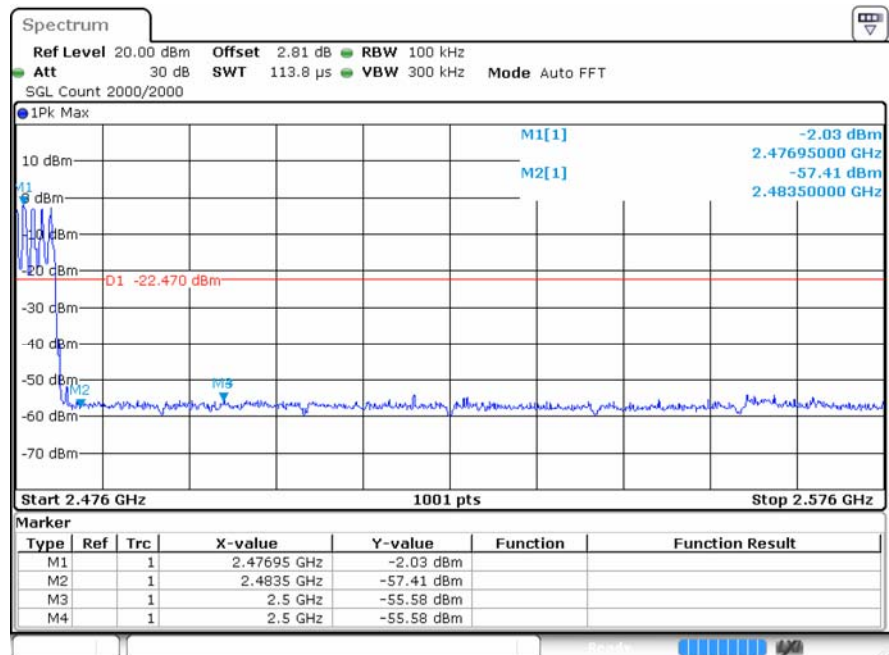
GFSK/HCH/No Hop



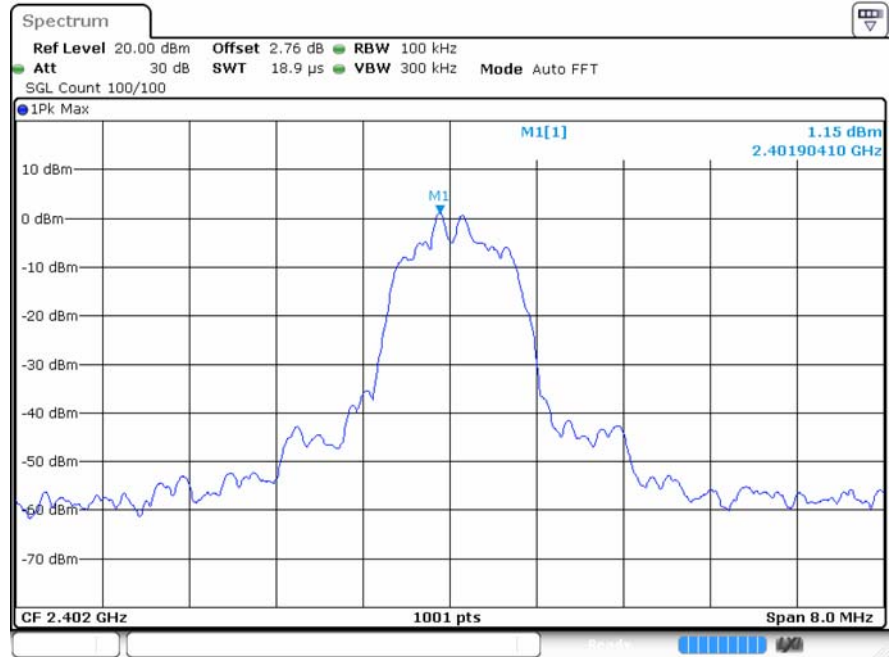
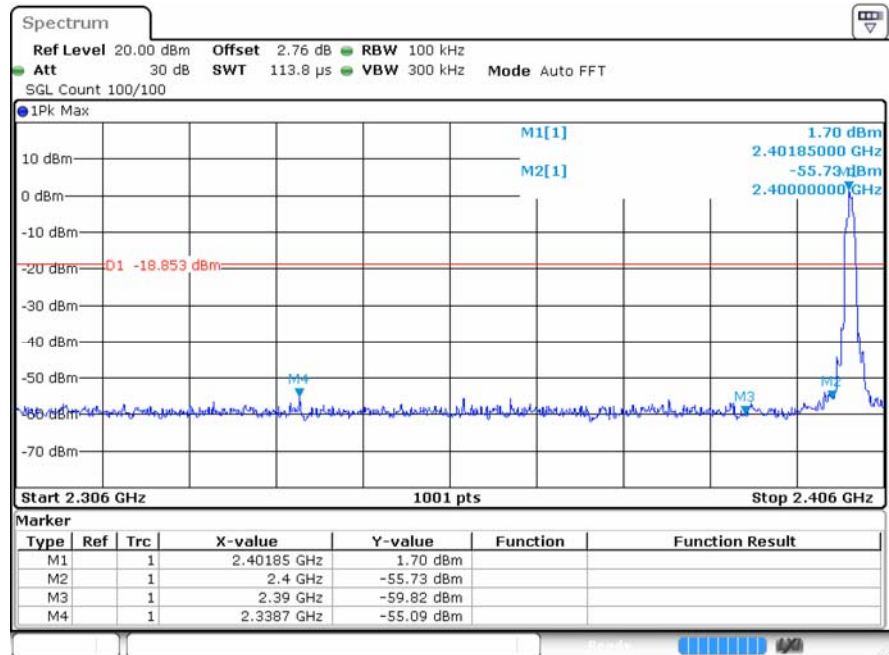
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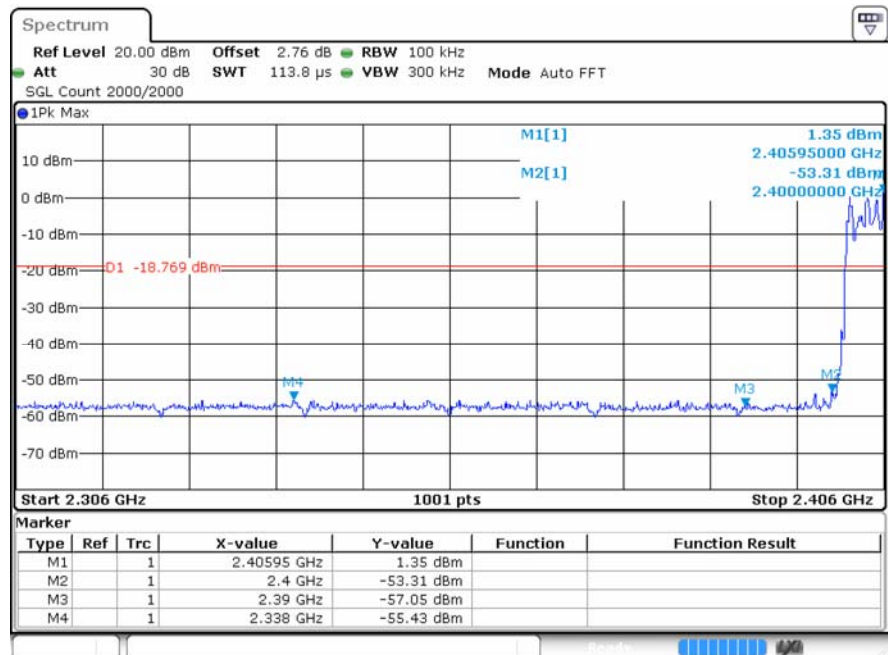
GFSK/HCH/Hop



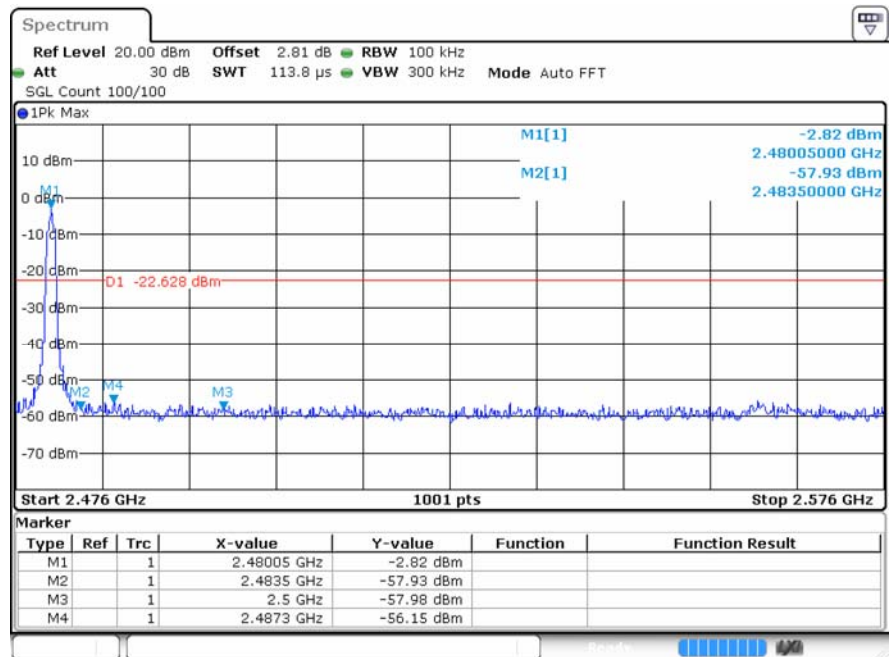
Ref


 $\pi/4$ DQPSK/LCH/No  
Hop


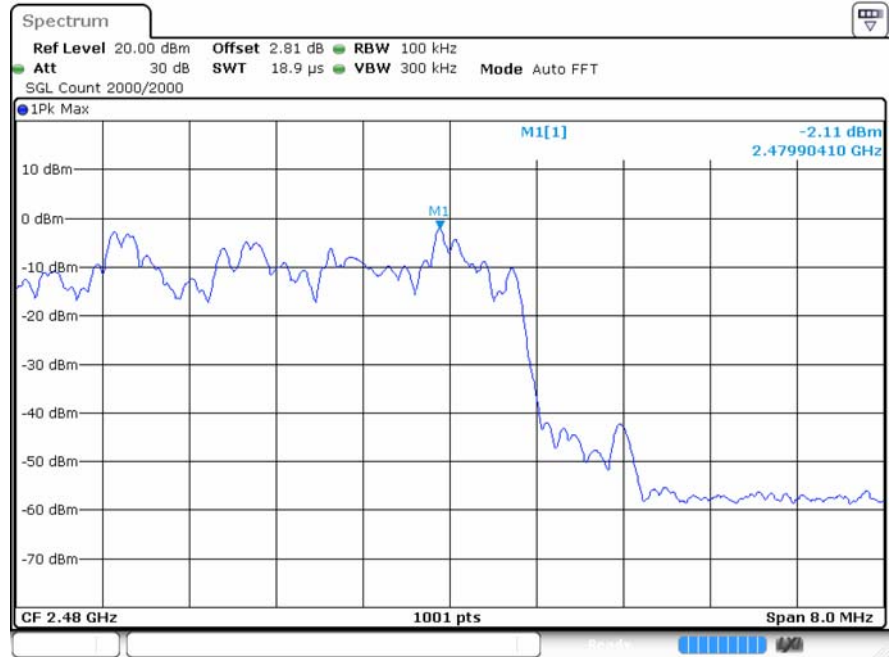
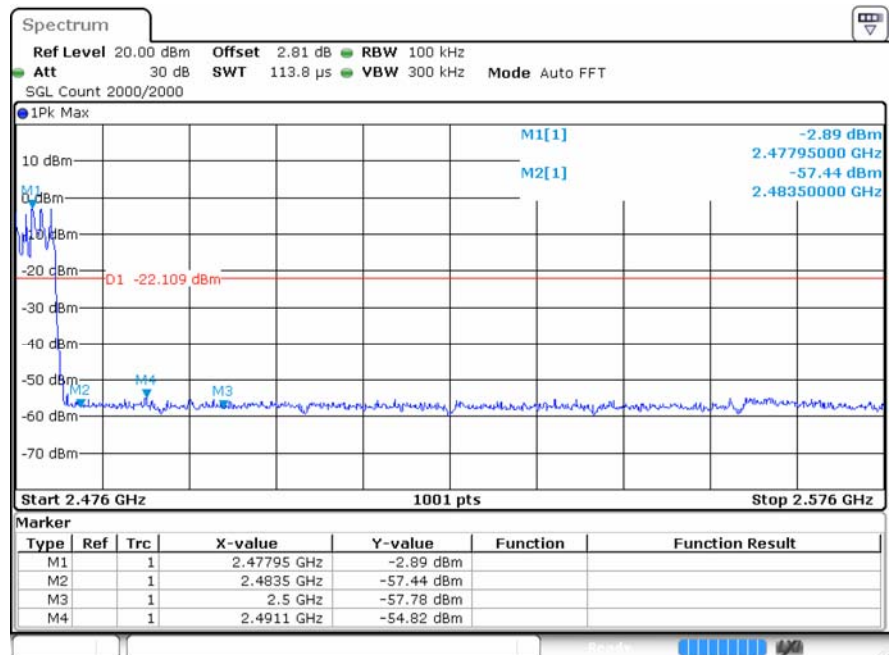
Ref


 $\pi/4$ DQPSK/LCH/Hop


Ref


 $\pi/4$ DQPSK/HCH/No  
Hop


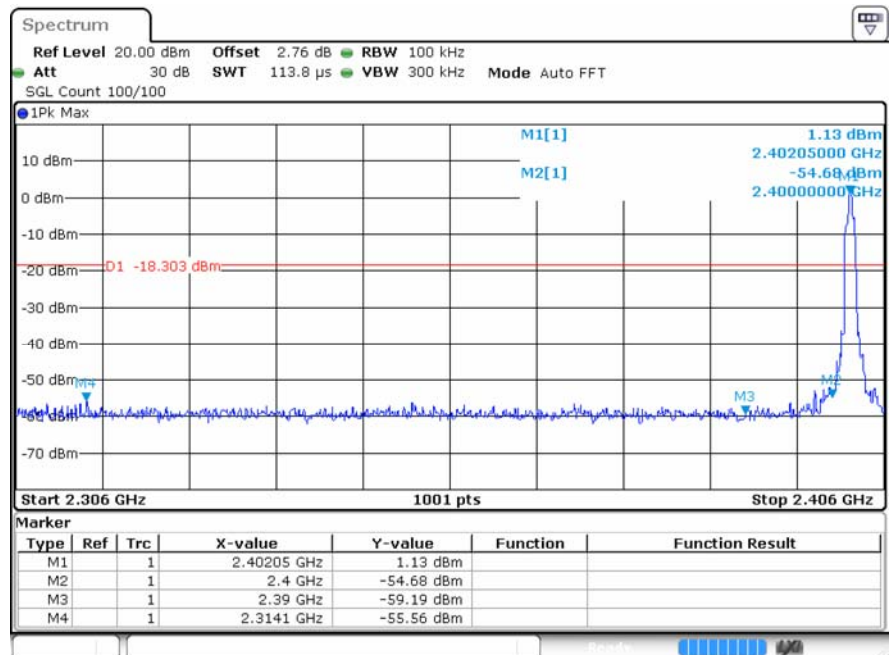
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 $\pi/4$ DQPSK/HCH/Hop


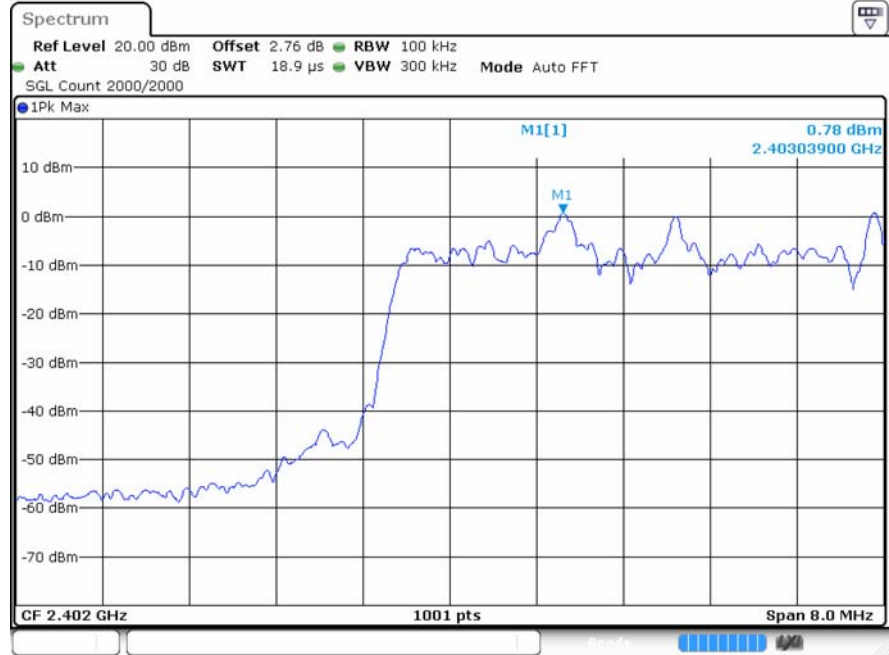
Ref



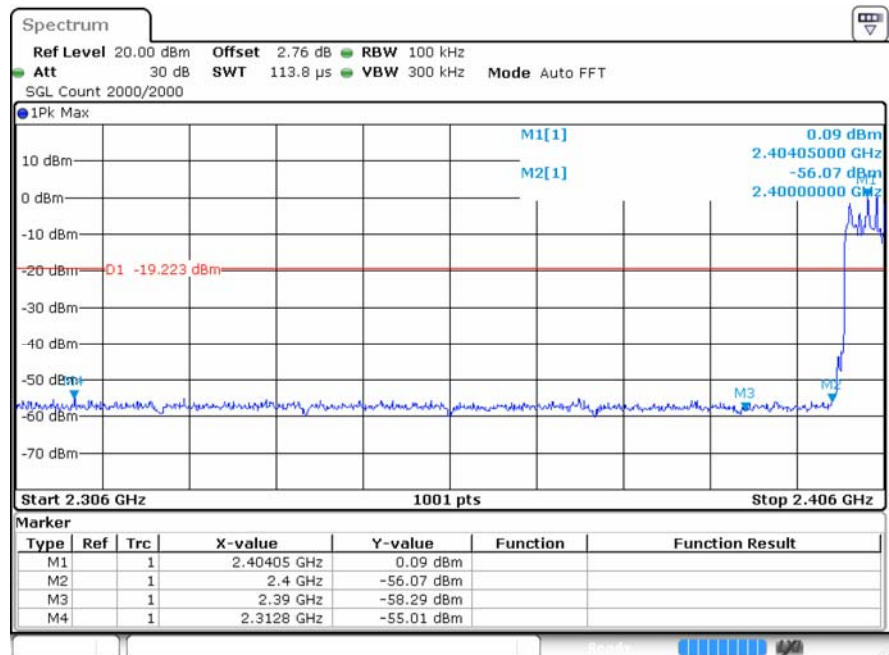
8DPSK/LCH/No Hop



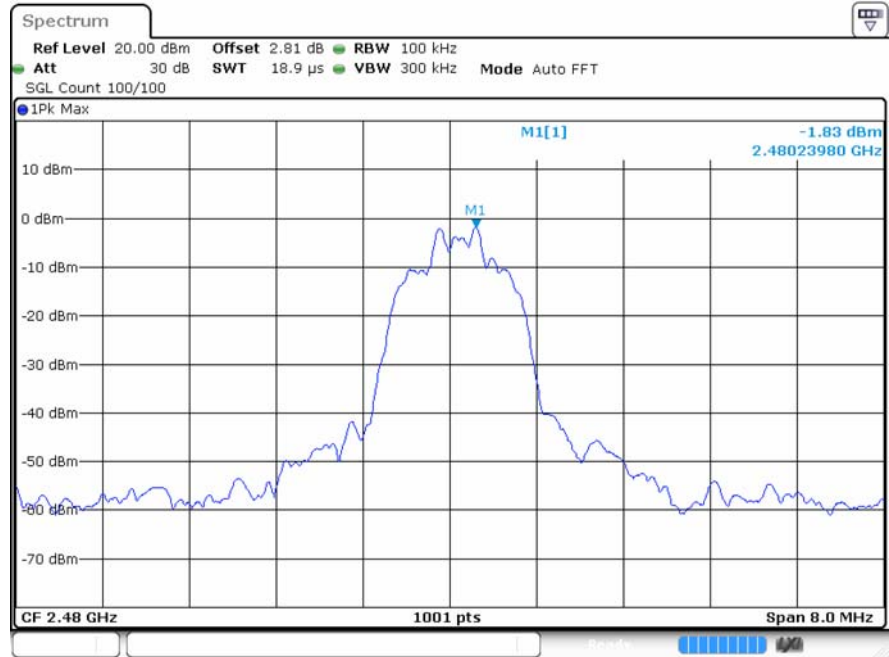
Ref



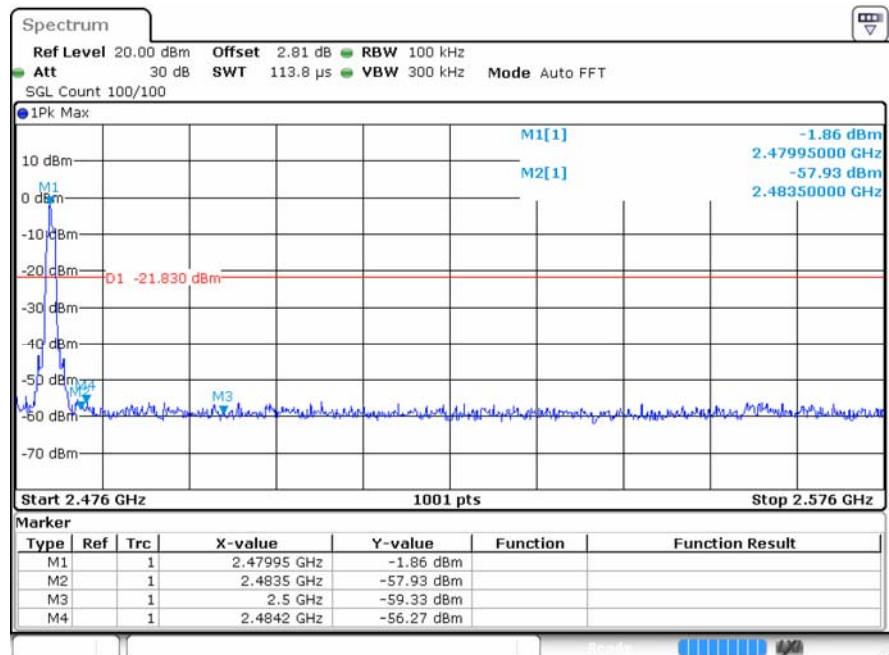
8DPSK/LCH/Hop



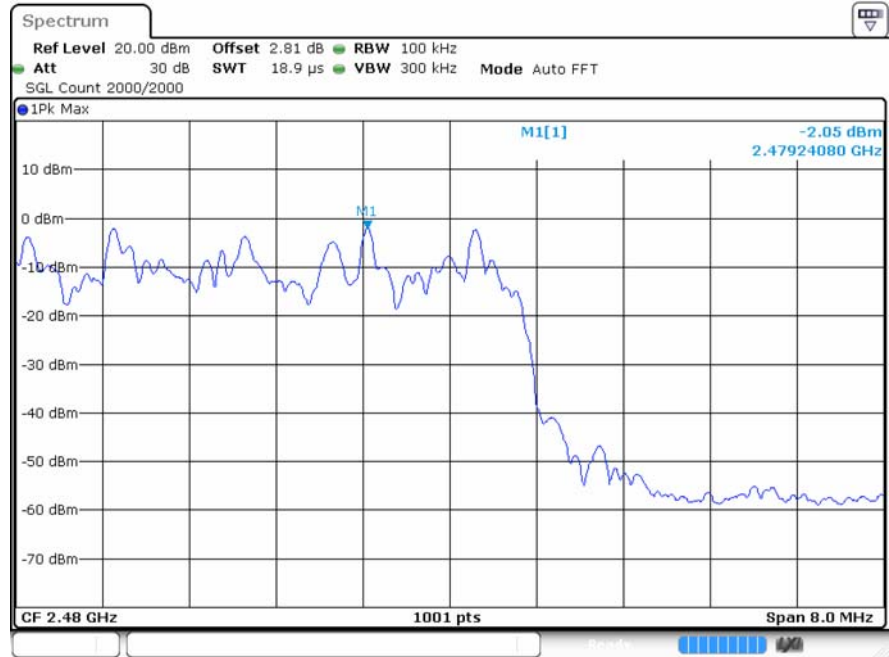
Ref



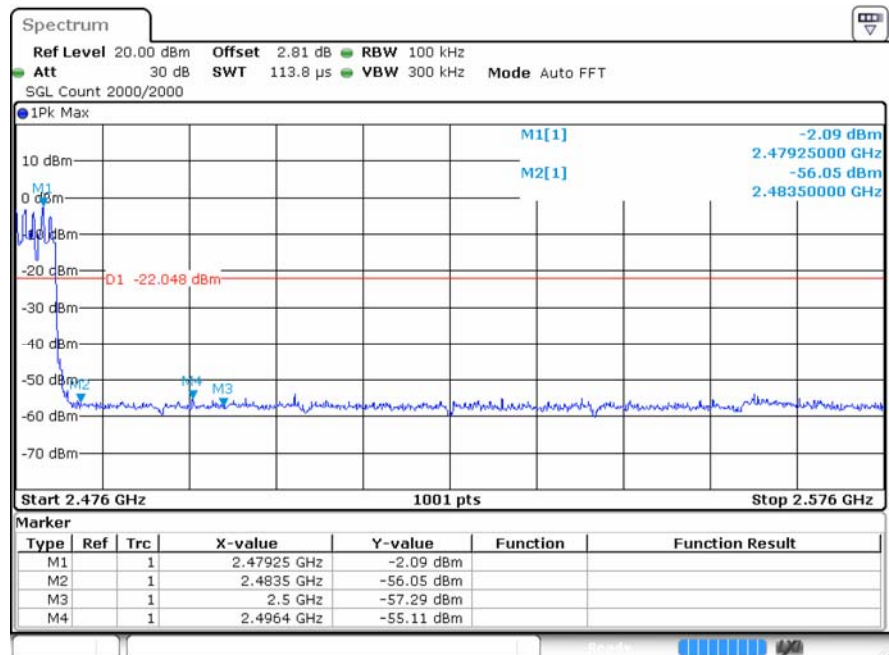
8DPSK/HCH/No Hop



Ref



8DPSK/HCH/Hop



## 9 Restrict-band band-edge measurements

### 9.1 Test Result

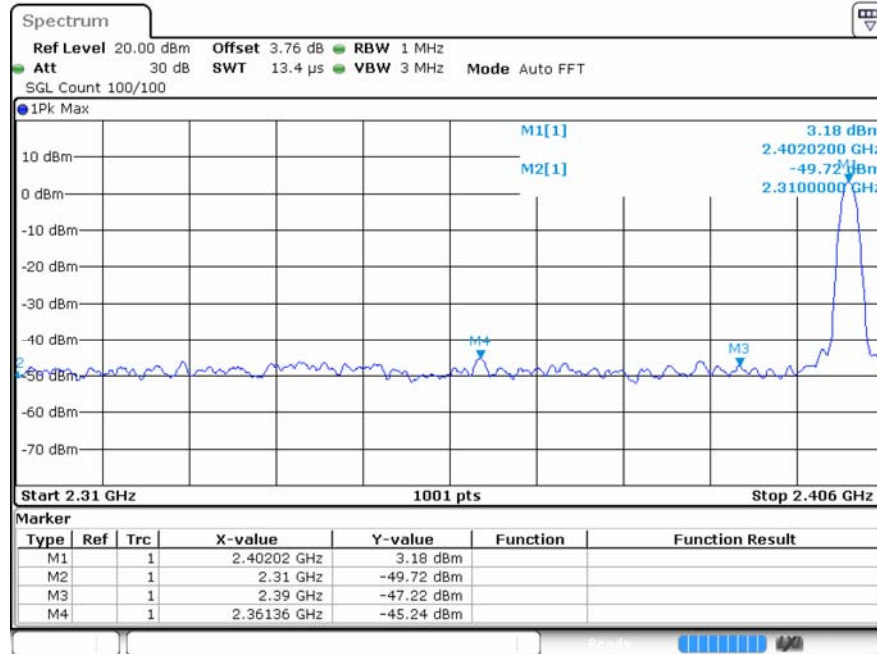
| Test Mode     | Hopping | Freq.    | Power [dBm] | Gain | E [dBuV/m] | Detector | Limit [dBuV/m] | Verdict |
|---------------|---------|----------|-------------|------|------------|----------|----------------|---------|
| GFSK          | Off     | 2310.0   | -49.72      | 2    | 47.54      | PEAK     | 74             | Pass    |
|               | Off     | 2310.0   | -57.08      | 2    | 40.18      | AV       | 54             | Pass    |
|               | Off     | 2361.36  | -45.23      | 2    | 52.03      | PEAK     | 74             | Pass    |
|               | Off     | 2338.32  | -54.75      | 2    | 42.51      | AV       | 54             | Pass    |
|               | Off     | 2390.0   | -47.21      | 2    | 50.05      | PEAK     | 74             | Pass    |
|               | Off     | 2390.0   | -56.92      | 2    | 40.34      | AV       | 54             | Pass    |
|               | Off     | 2483.5   | -46.61      | 2    | 50.65      | PEAK     | 74             | Pass    |
|               | Off     | 2483.5   | -54.6       | 2    | 42.66      | AV       | 54             | Pass    |
|               | Off     | 2483.512 | -46.61      | 2    | 50.65      | PEAK     | 74             | Pass    |
|               | Off     | 2483.752 | -54.56      | 2    | 42.7       | AV       | 54             | Pass    |
|               | Off     | 2500.0   | -49.03      | 2    | 48.23      | PEAK     | 74             | Pass    |
|               | Off     | 2500.0   | -56.77      | 2    | 40.49      | AV       | 54             | Pass    |
| $\pi/4$ DQPSK | Off     | 2310.0   | -48.39      | 2    | 48.87      | PEAK     | 74             | Pass    |
|               | Off     | 2310.0   | -57.23      | 2    | 40.03      | AV       | 54             | Pass    |
|               | Off     | 2347.248 | -46         | 2    | 51.26      | PEAK     | 74             | Pass    |
|               | Off     | 2341.488 | -54.73      | 2    | 42.53      | AV       | 54             | Pass    |
|               | Off     | 2390.0   | -47.59      | 2    | 49.67      | PEAK     | 74             | Pass    |
|               | Off     | 2390.0   | -56.67      | 2    | 40.59      | AV       | 54             | Pass    |
|               | Off     | 2483.5   | -48.15      | 2    | 49.11      | PEAK     | 74             | Pass    |
|               | Off     | 2483.5   | -55.34      | 2    | 41.92      | AV       | 54             | Pass    |
|               | Off     | 2489.416 | -47.32      | 2    | 49.94      | PEAK     | 74             | Pass    |
|               | Off     | 2483.656 | -55.29      | 2    | 41.97      | AV       | 54             | Pass    |
|               | Off     | 2500.0   | -49.33      | 2    | 47.93      | PEAK     | 74             | Pass    |
|               | Off     | 2500.0   | -56.71      | 2    | 40.55      | AV       | 54             | Pass    |
| 8DPSK         | Off     | 2310.0   | -49.71      | 2    | 47.55      | PEAK     | 74             | Pass    |
|               | Off     | 2310.0   | -56.73      | 2    | 40.53      | AV       | 54             | Pass    |
|               | Off     | 2322.672 | -45.55      | 2    | 51.71      | PEAK     | 74             | Pass    |
|               | Off     | 2338.416 | -54.95      | 2    | 42.31      | AV       | 54             | Pass    |



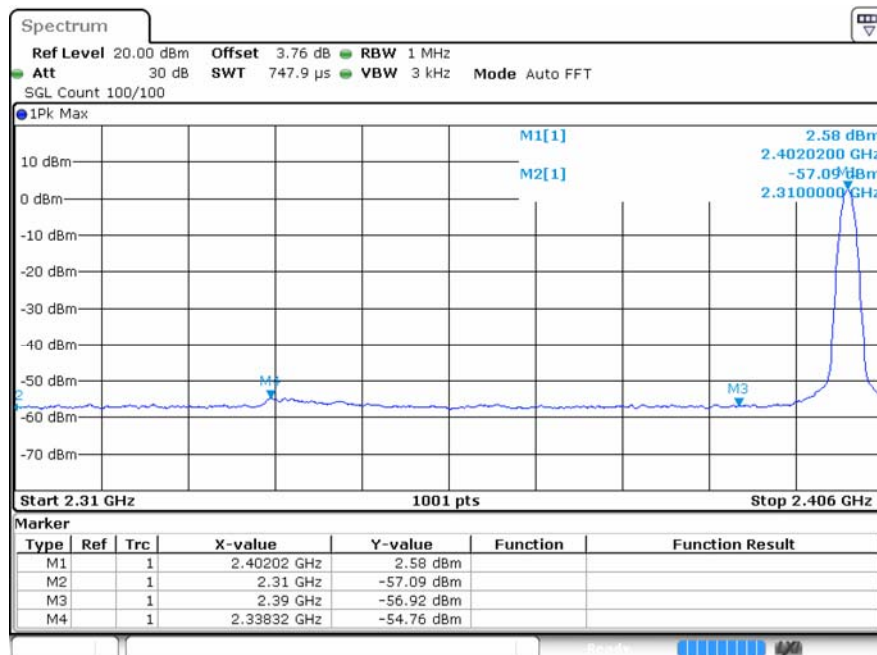
|  |     |          |        |   |       |      |    |      |
|--|-----|----------|--------|---|-------|------|----|------|
|  | Off | 2390.0   | -49.39 | 2 | 47.87 | PEAK | 74 | Pass |
|  | Off | 2390.0   | -57.27 | 2 | 39.99 | AV   | 54 | Pass |
|  | Off | 2483.5   | -46.37 | 2 | 50.89 | PEAK | 74 | Pass |
|  | Off | 2483.5   | -55.42 | 2 | 41.84 | AV   | 54 | Pass |
|  | Off | 2484.544 | -45.88 | 2 | 51.38 | PEAK | 74 | Pass |
|  | Off | 2483.512 | -55.42 | 2 | 41.84 | AV   | 54 | Pass |
|  | Off | 2500.0   | -47.17 | 2 | 50.09 | PEAK | 74 | Pass |
|  | Off | 2500.0   | -57.05 | 2 | 40.21 | AV   | 54 | Pass |

## 9.2 Test Graphs

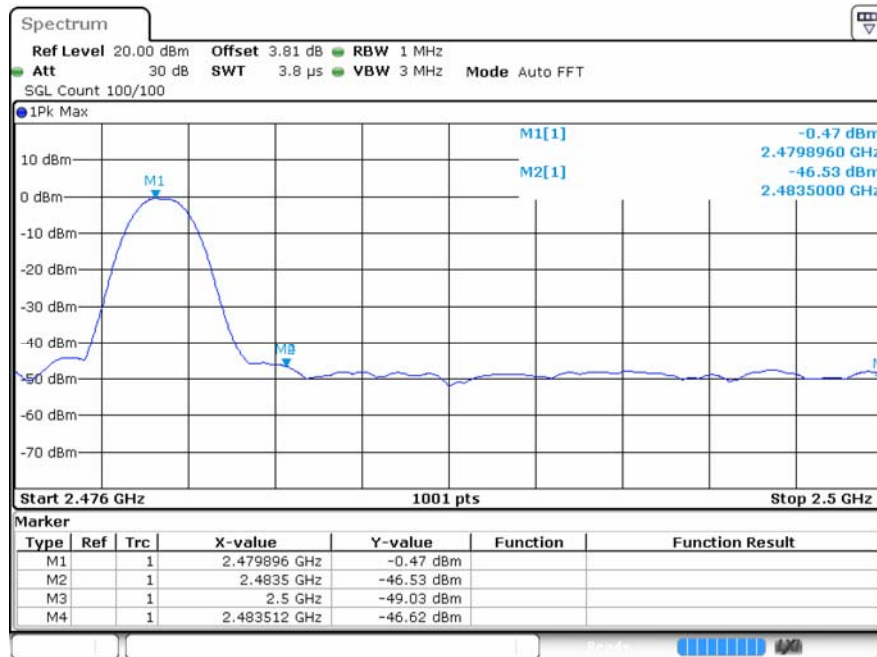
Restrict-band band-edge measurements\_Hopping Off\_ GFSK\_PEAK (Low Channel)



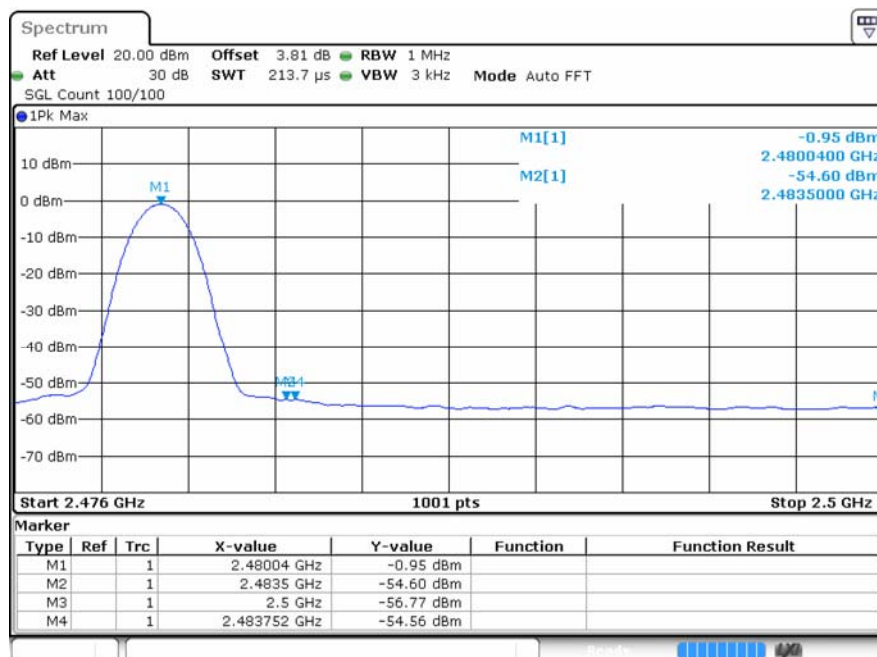
Restrict-band band-edge measurements\_Hopping Off\_ GFSK\_Average (Low Channel)



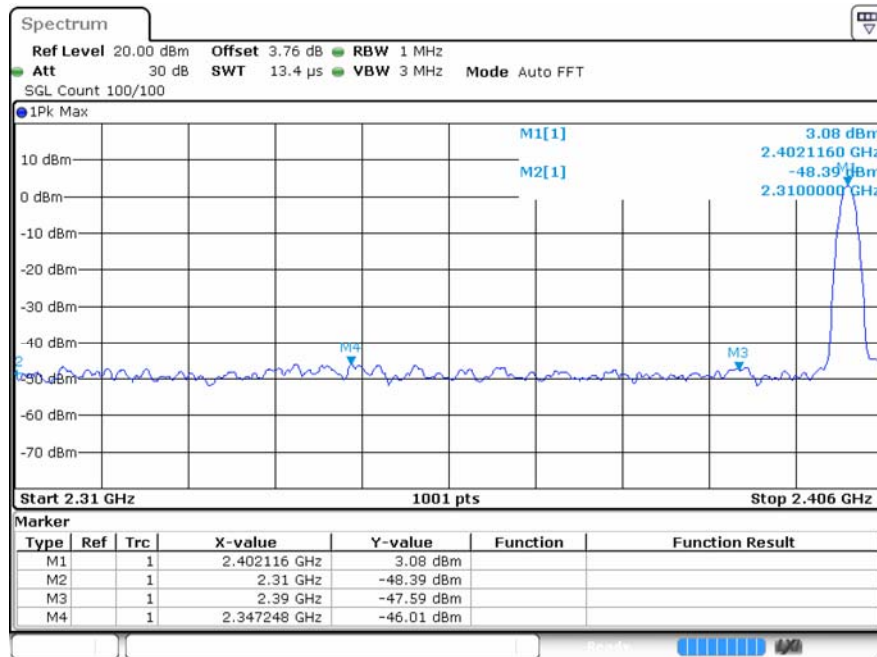
## Restrict-band band-edge measurements\_Hopping Off\_ GFSK\_PEAK (High Channel)



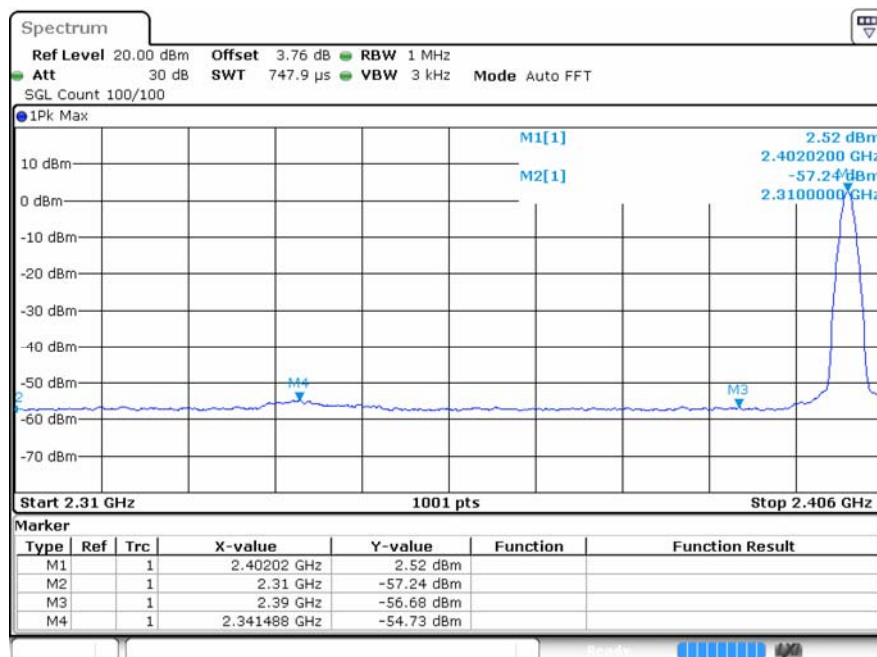
## Restrict-band band-edge measurements\_Hopping Off\_ GFSK\_Average (High Channel)



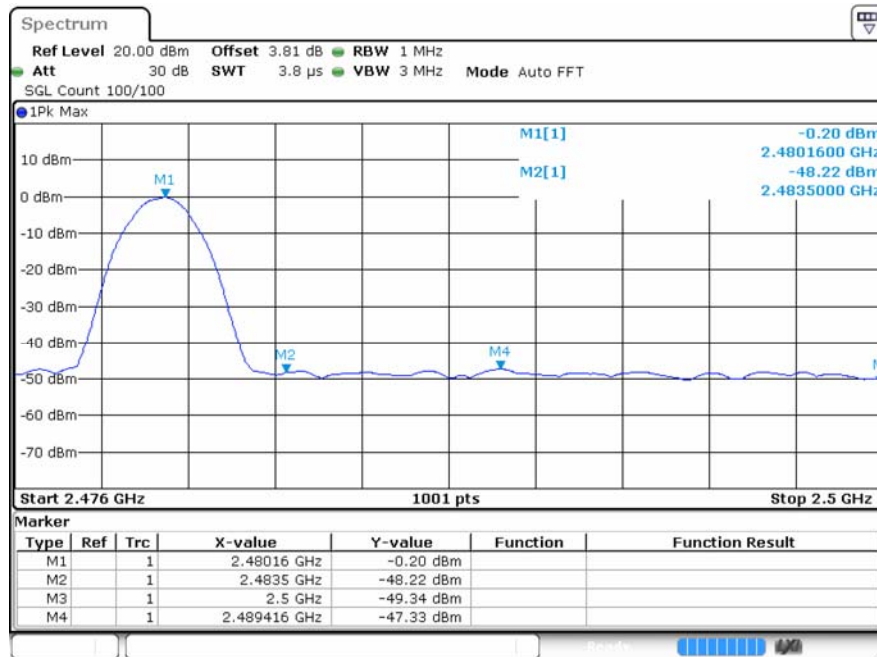
## Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_PEAK (Low Channel)



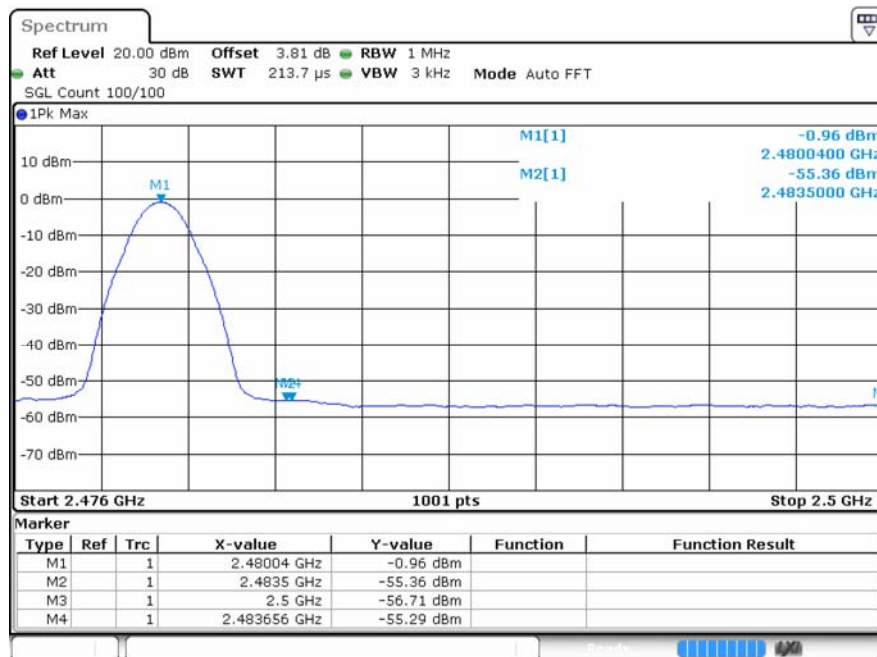
## Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_Average (Low Channel)



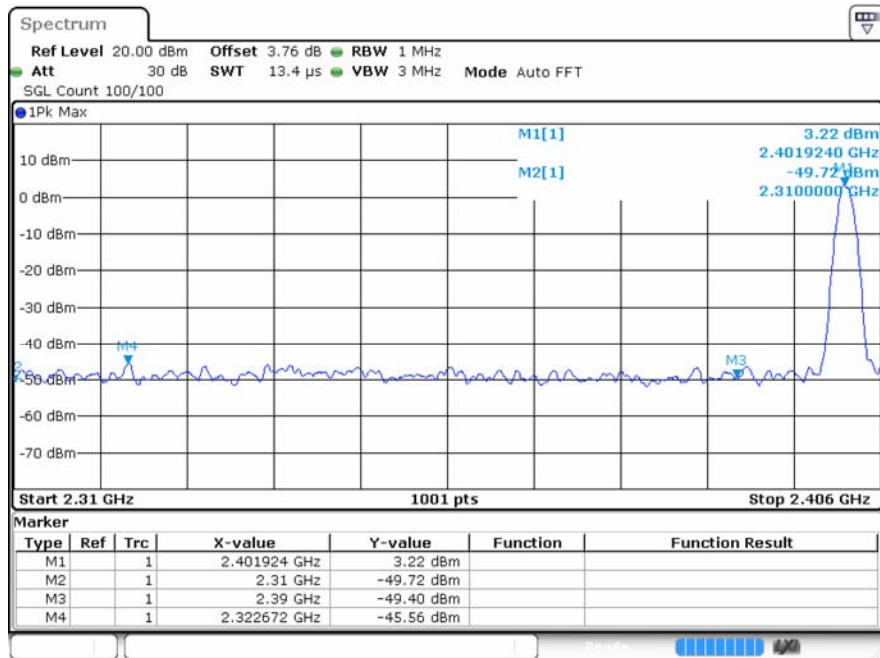
## Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_PEAK (High Channel)



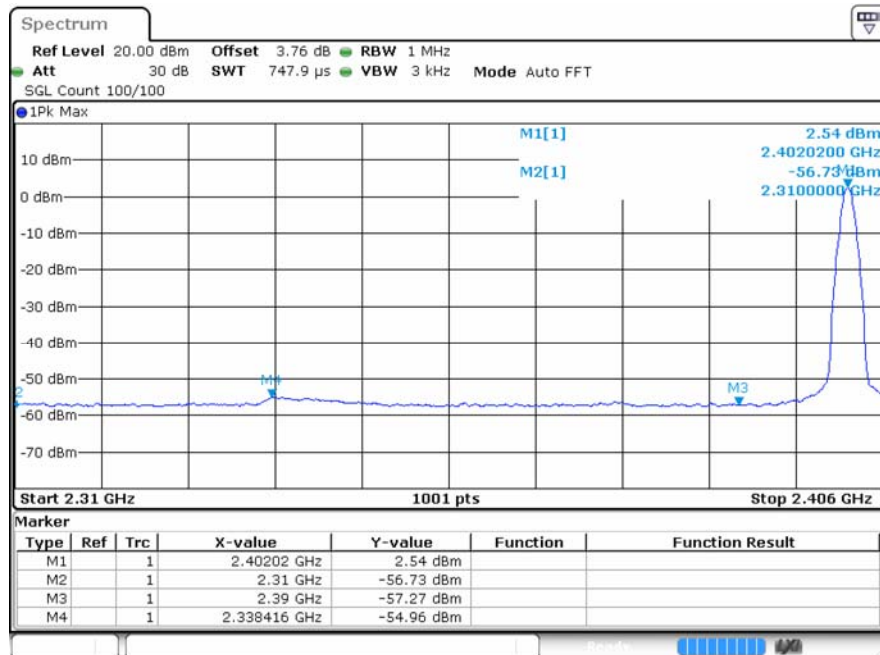
## Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_Average (High Channel)



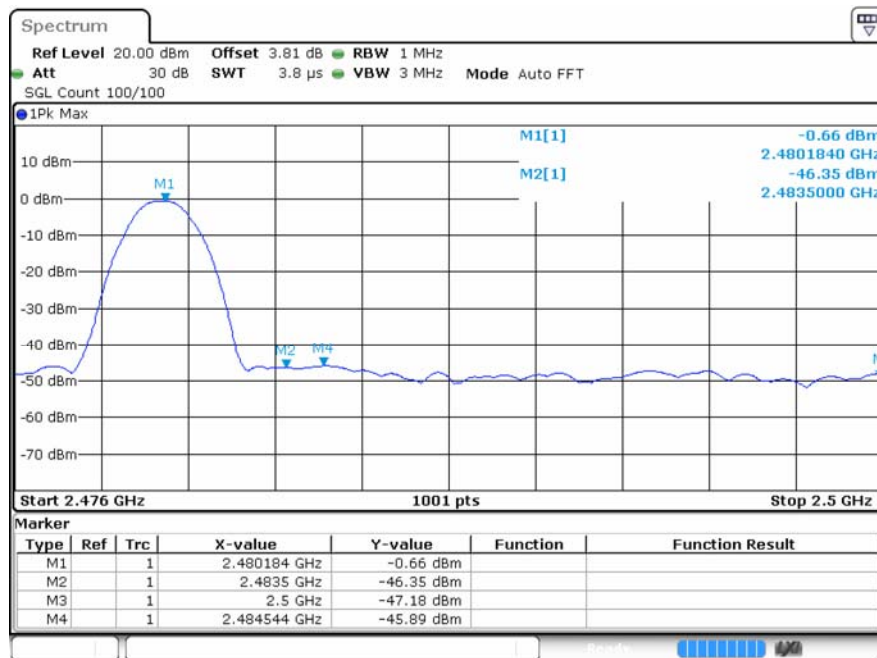
## Restrict-band band-edge measurements\_Hopping Off\_8DPSK\_PEAK (Low Channel)



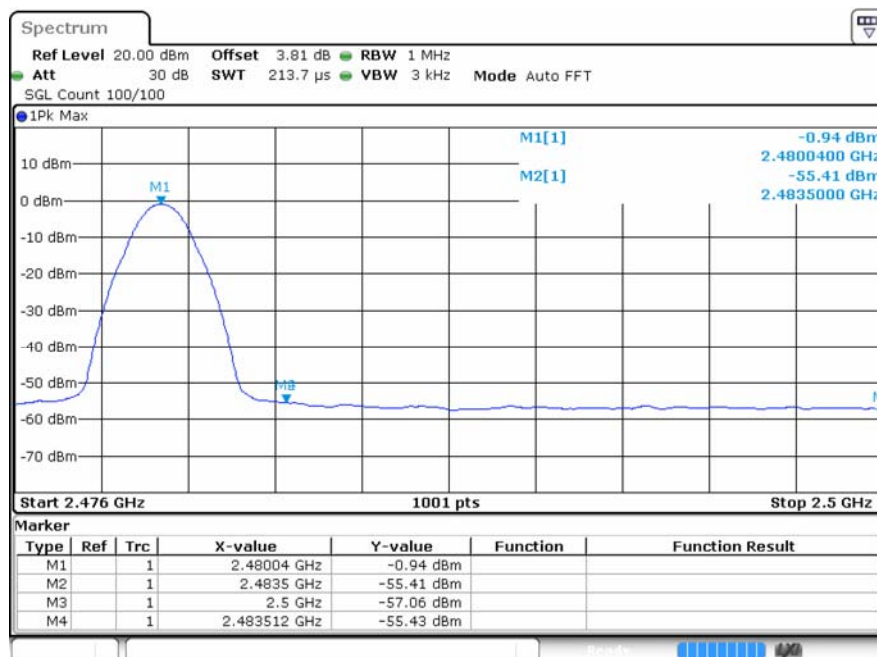
## Restrict-band band-edge measurements\_Hopping Off\_8DPSK\_Average (Low Channel)



## Restrict-band band-edge measurements\_Hopping Off\_8DPSK\_PEAK (High Channel)



## Restrict-band band-edge measurements\_Hopping Off\_8DPSK\_Average (High Channel)



---The End---