

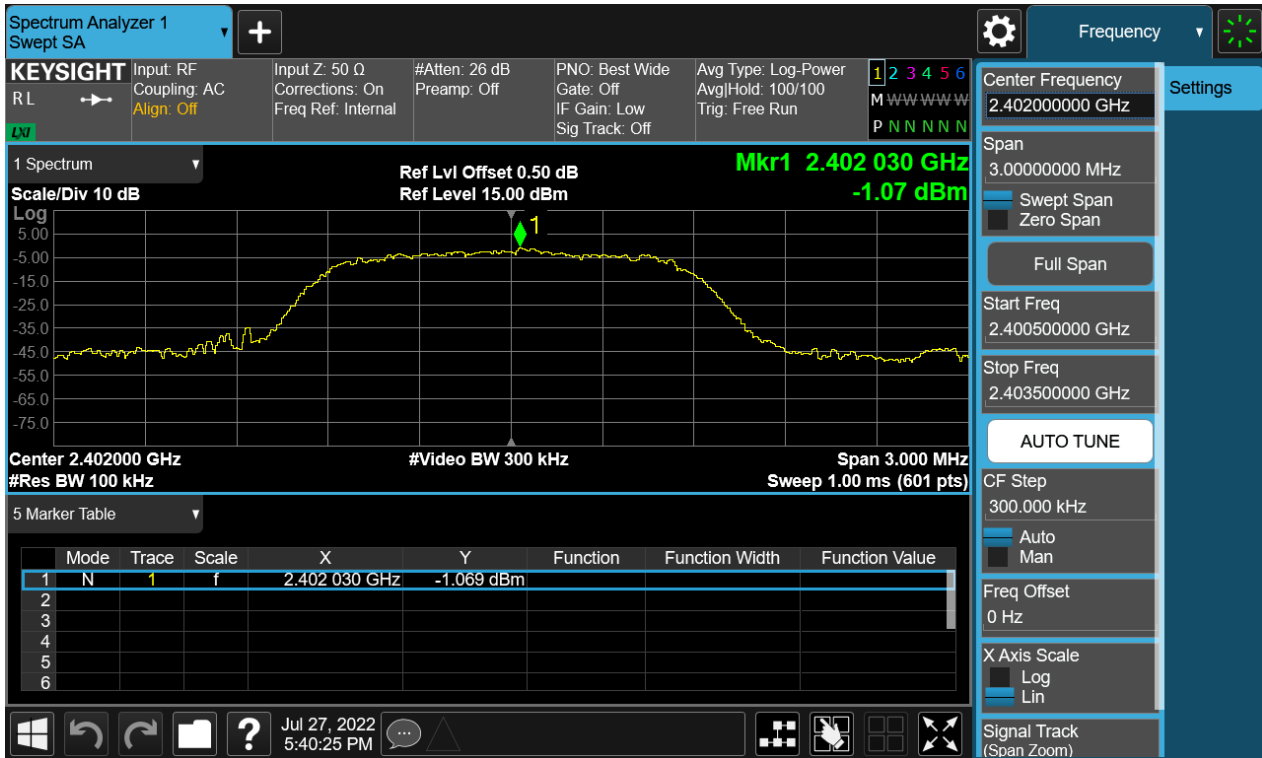
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Figure 25: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, 8-DPSK Carrier Level



## Band Edge



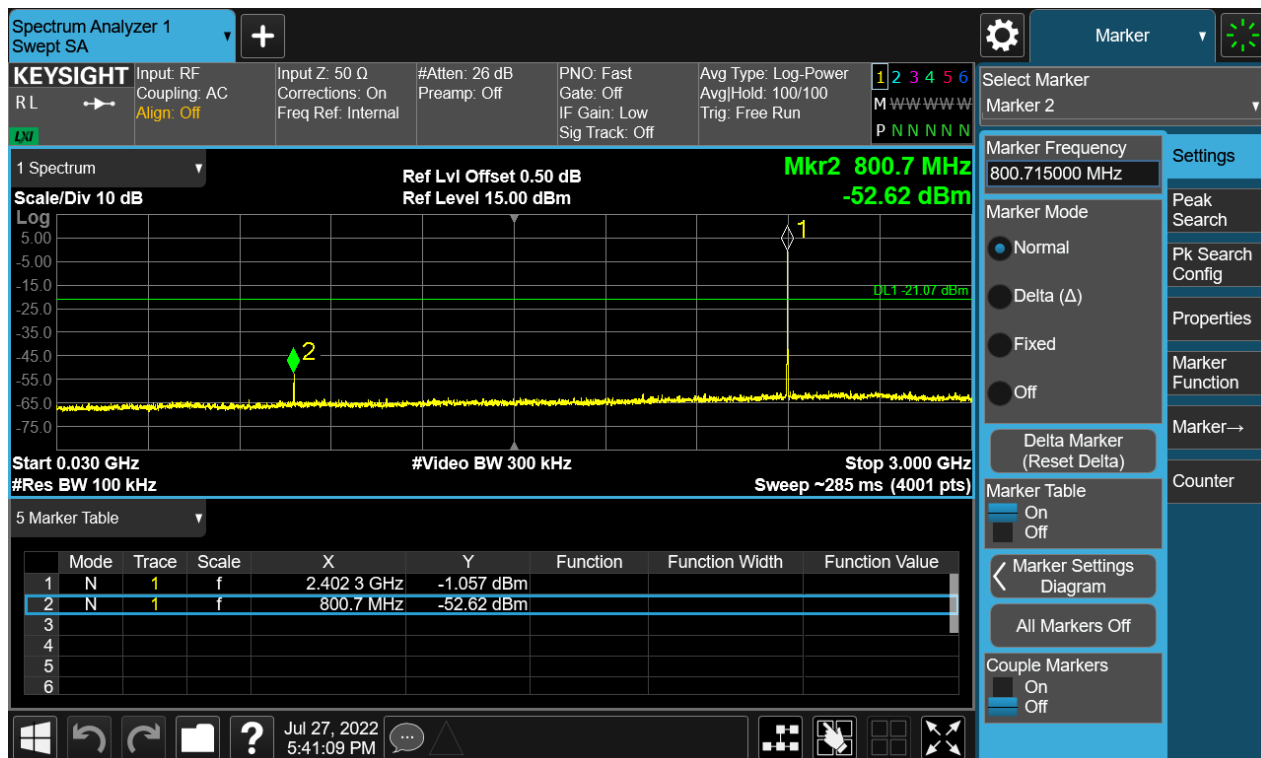
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## Conducted spurious emissions 30MHz-25GHz



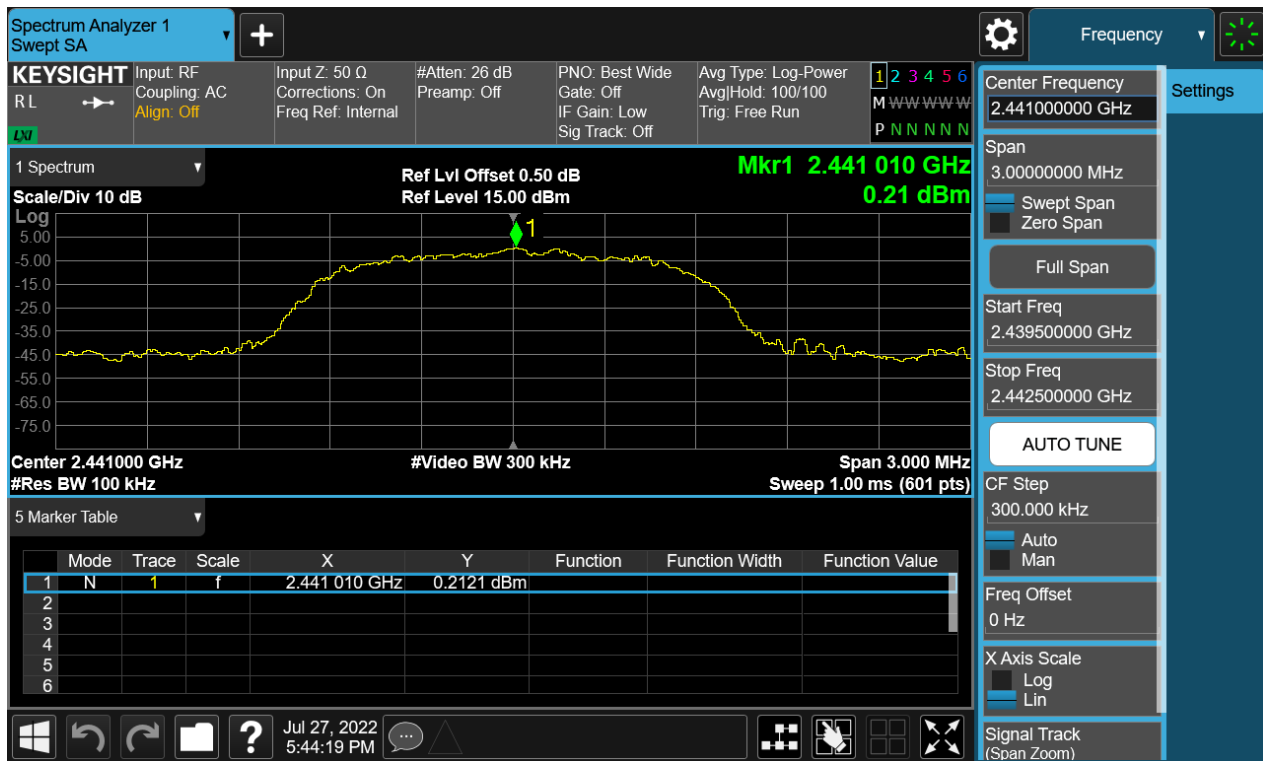
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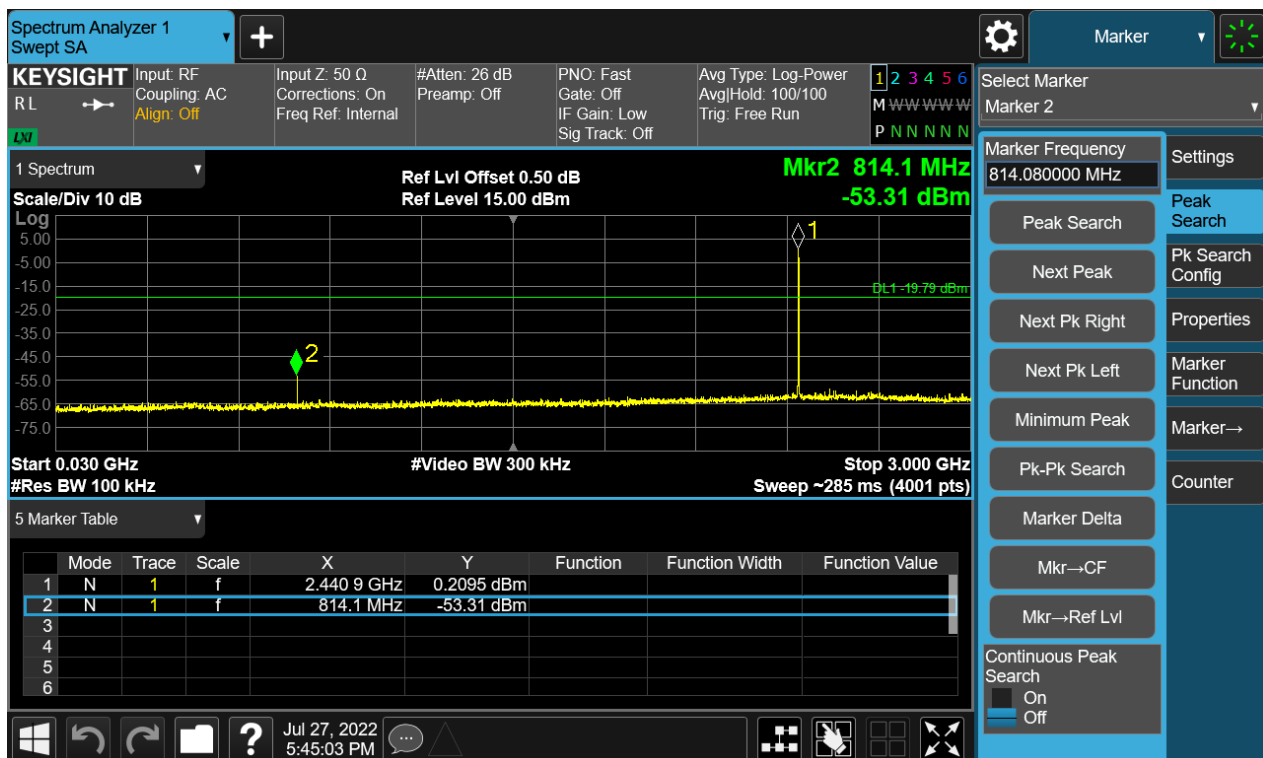
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Figure 26: Conducted Spurious Emission & Authorized-band band-edge, 2441MHz, 8-DPSK Carrier Level



Conducted spurious emissions 30MHz-25GHz



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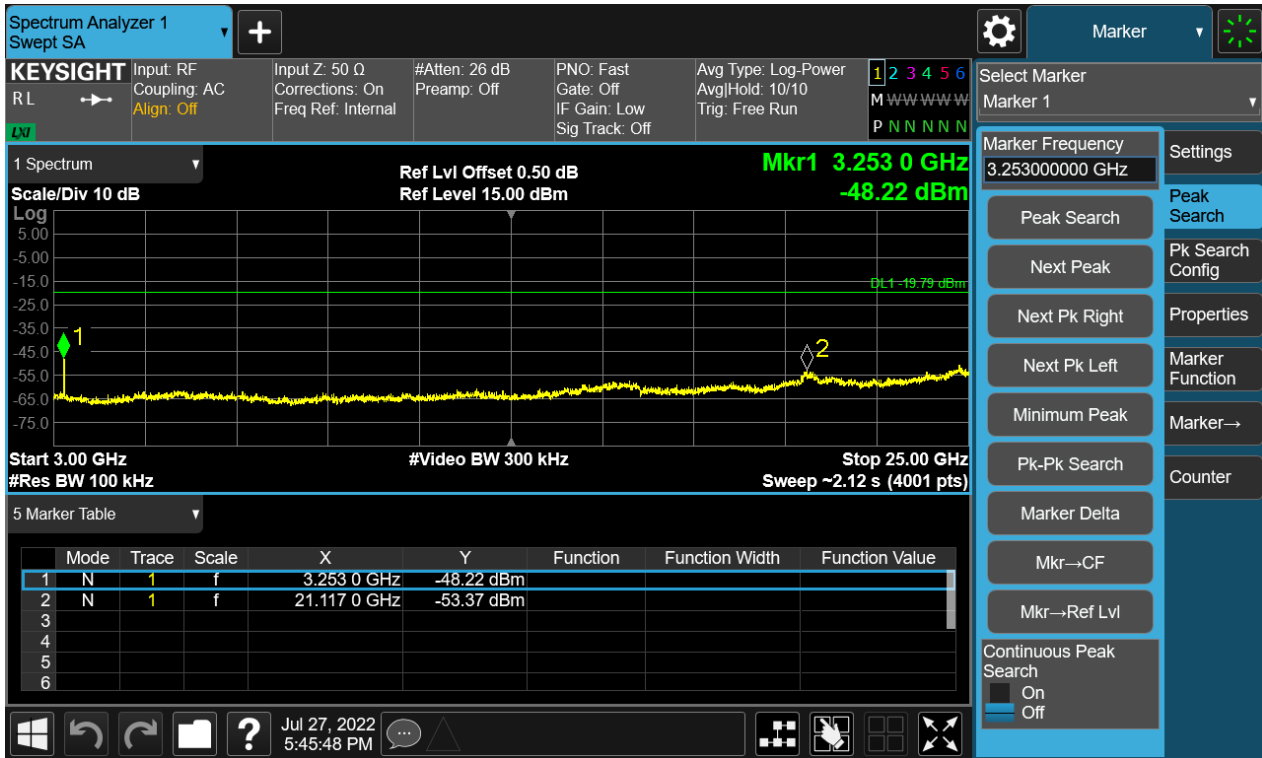
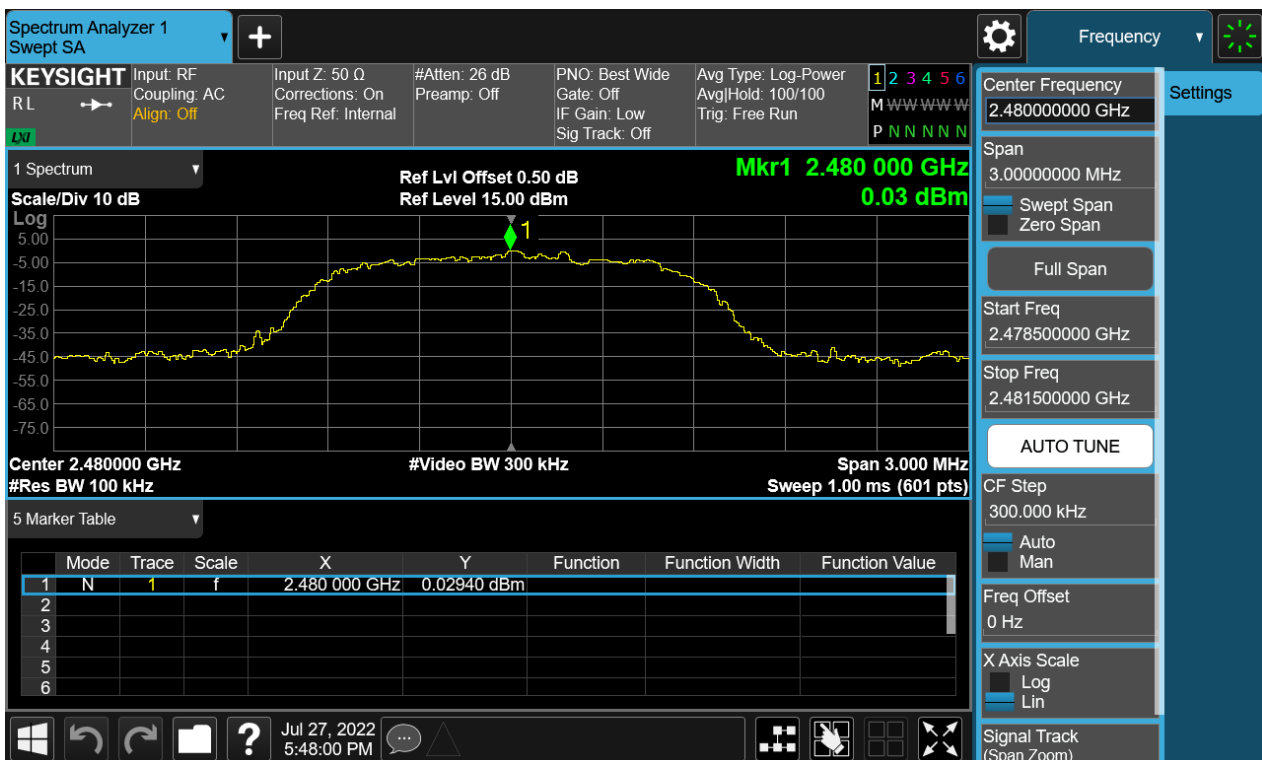


Figure 27: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, 8-DPSK Carrier Level



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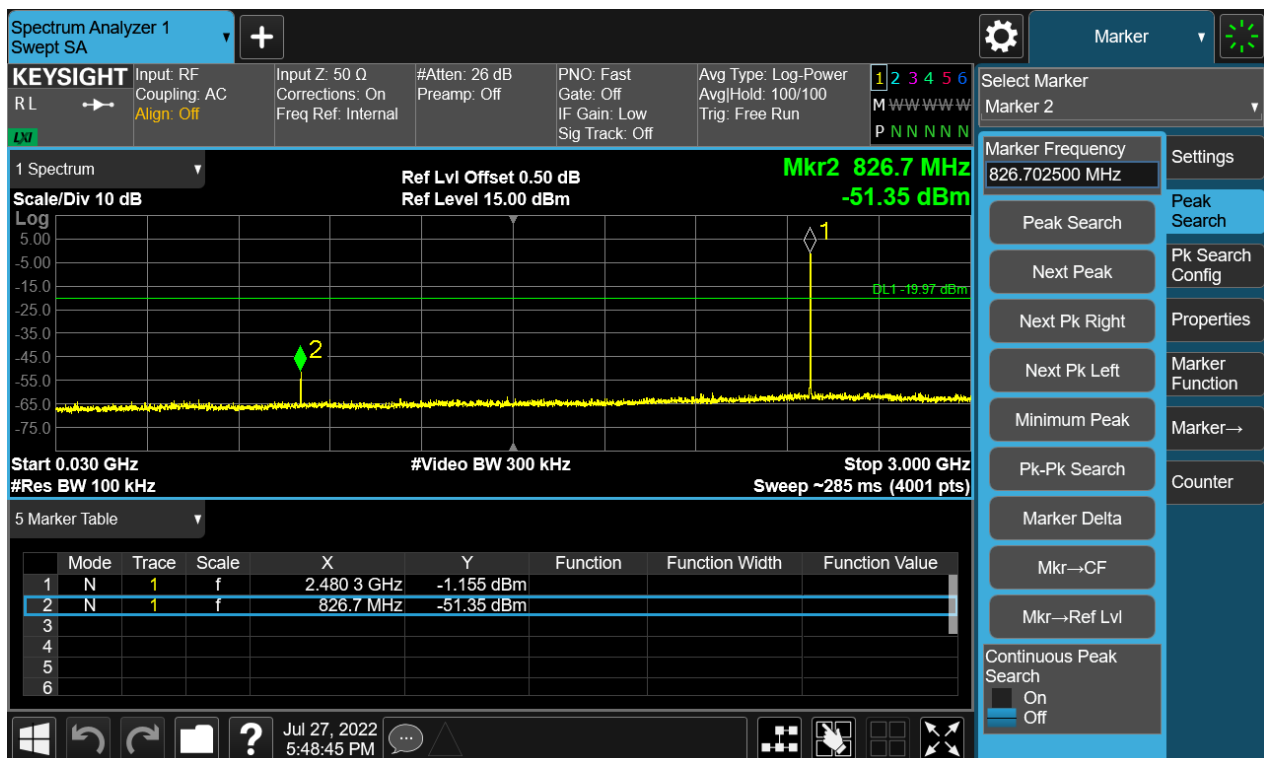
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## Band Edge



## Conducted spurious emissions 30MHz-25GHz



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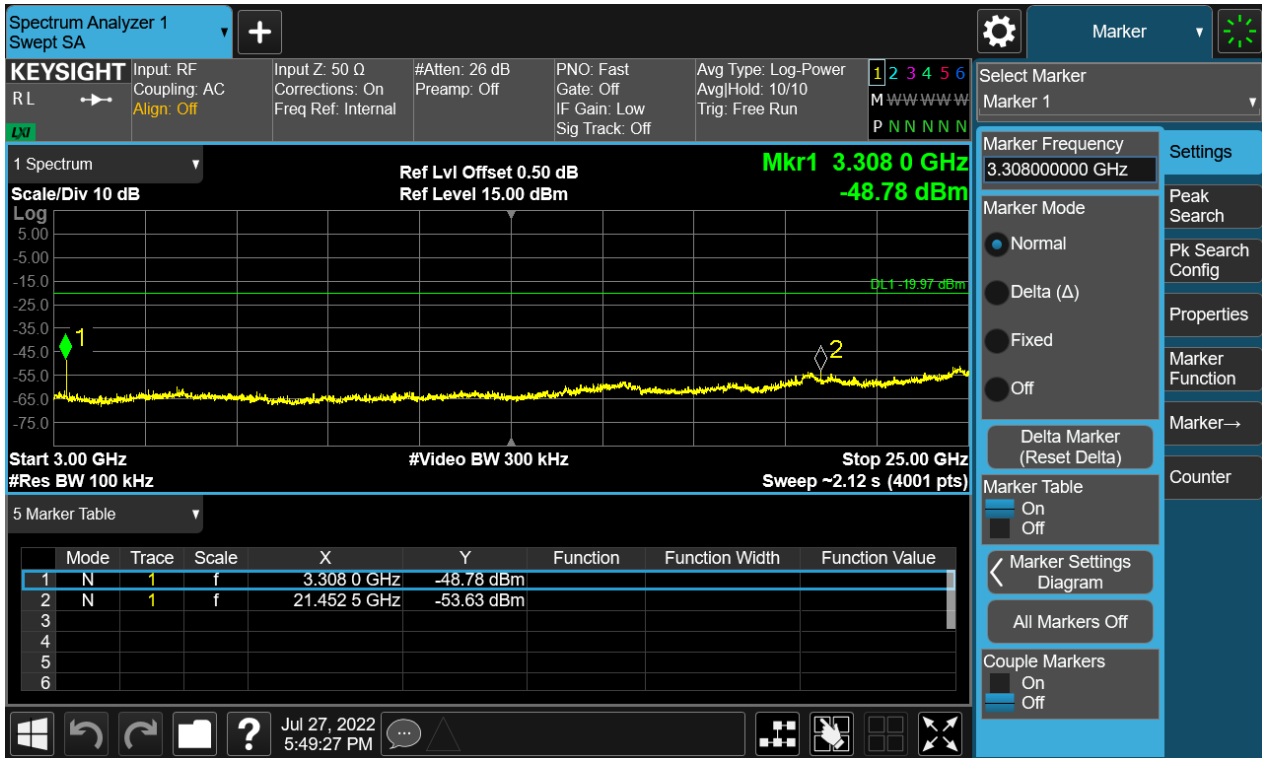
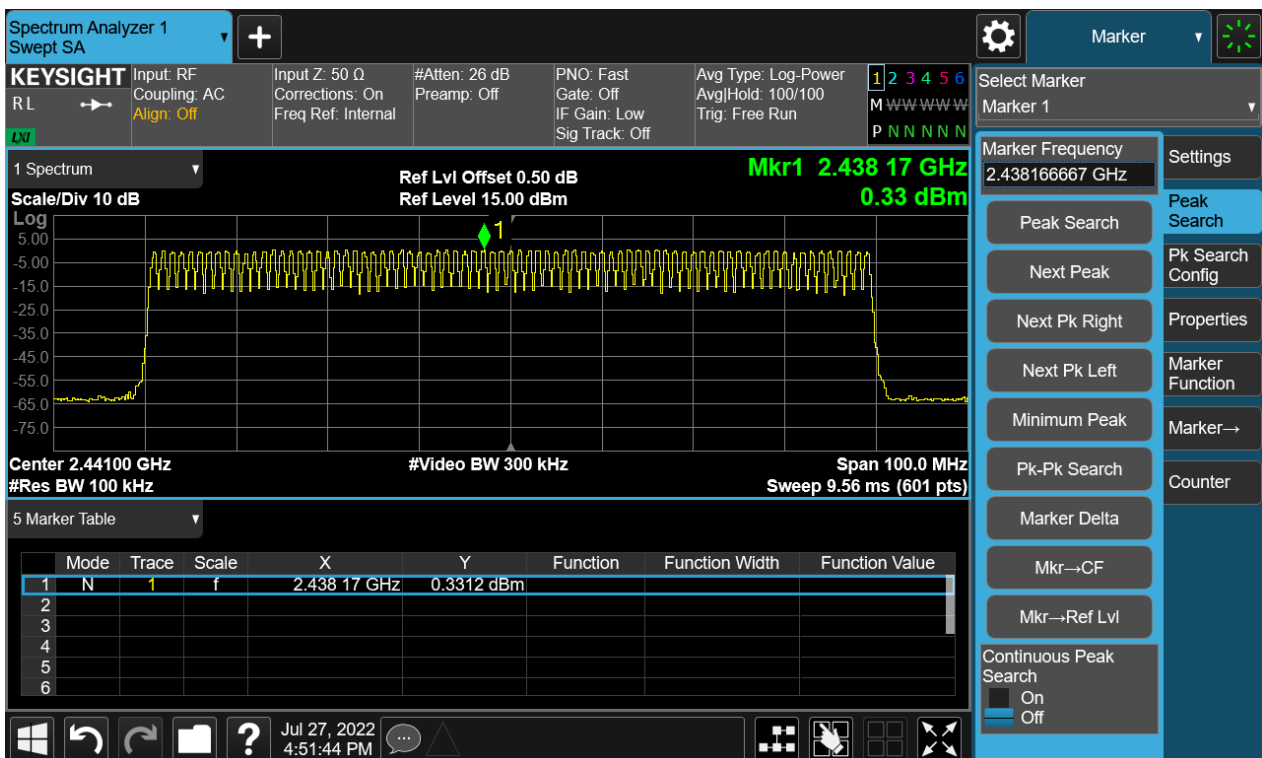


Figure 28: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, GFSK Carrier Level



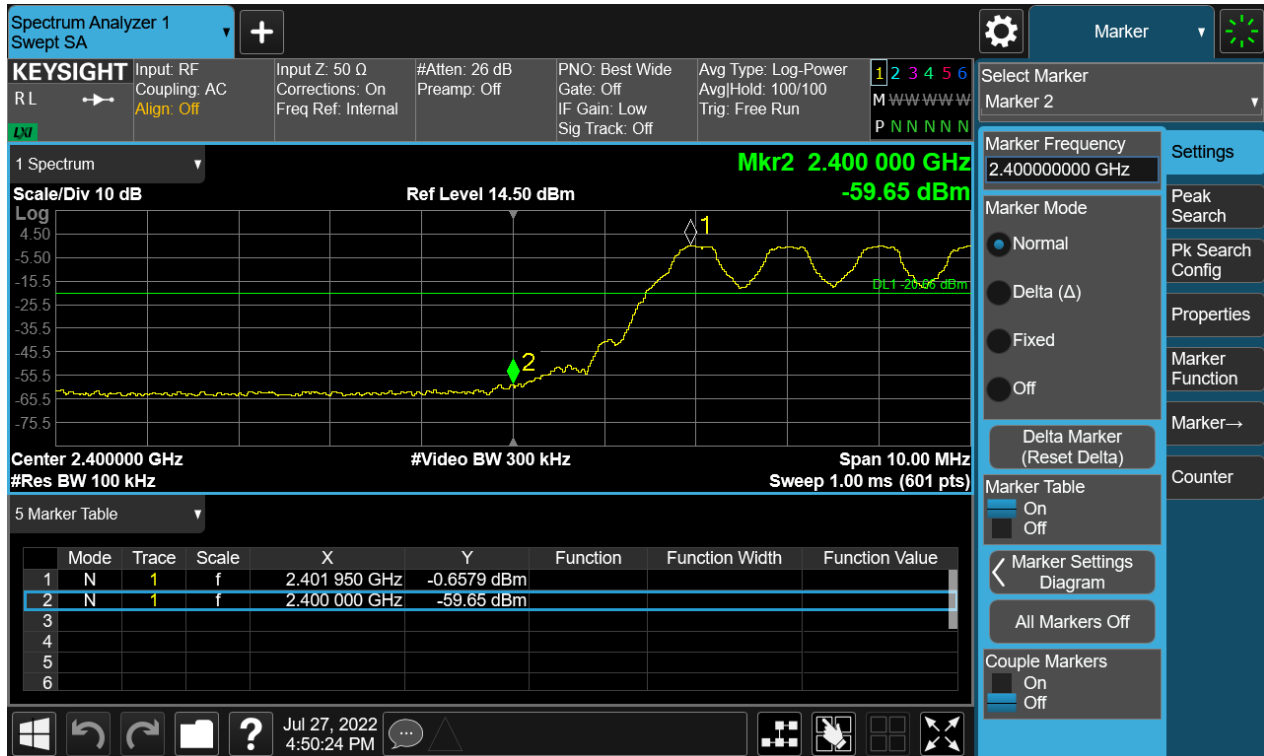
# TEST REPORT

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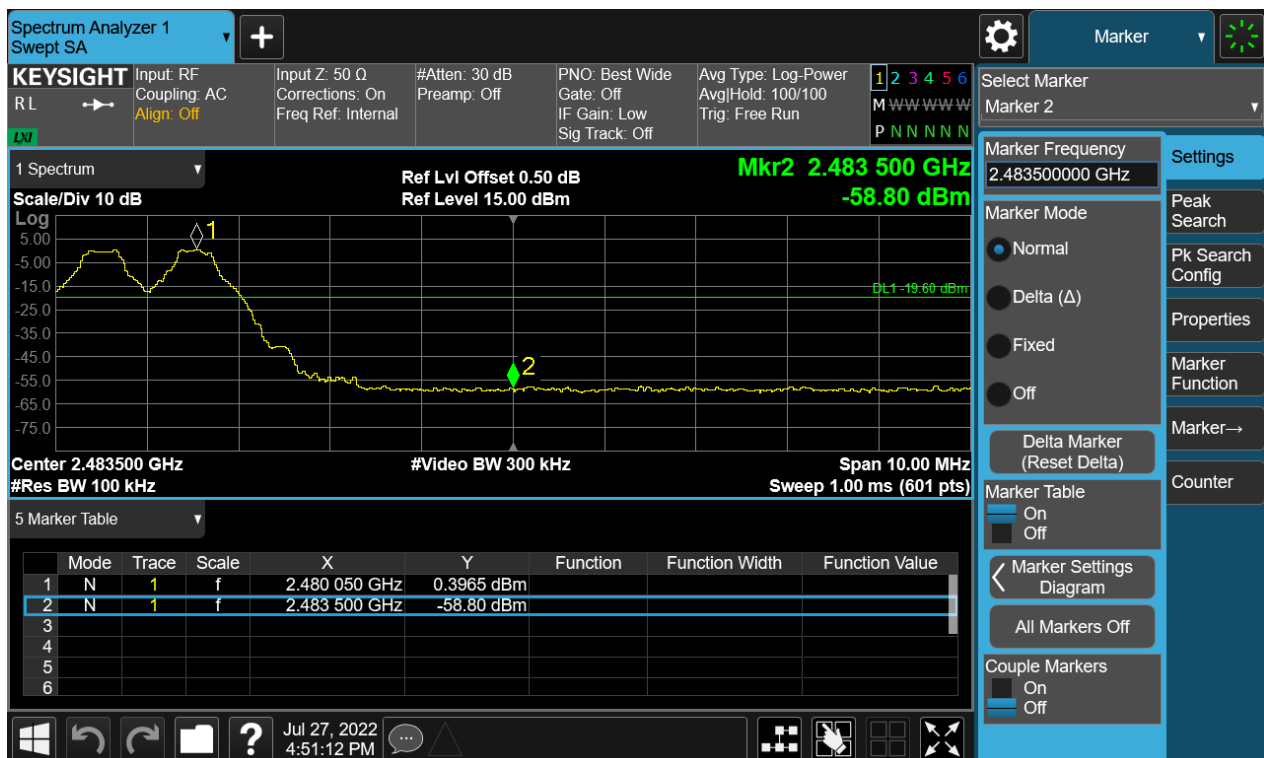
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## Band Edge(Low)



## Band Edge(High)



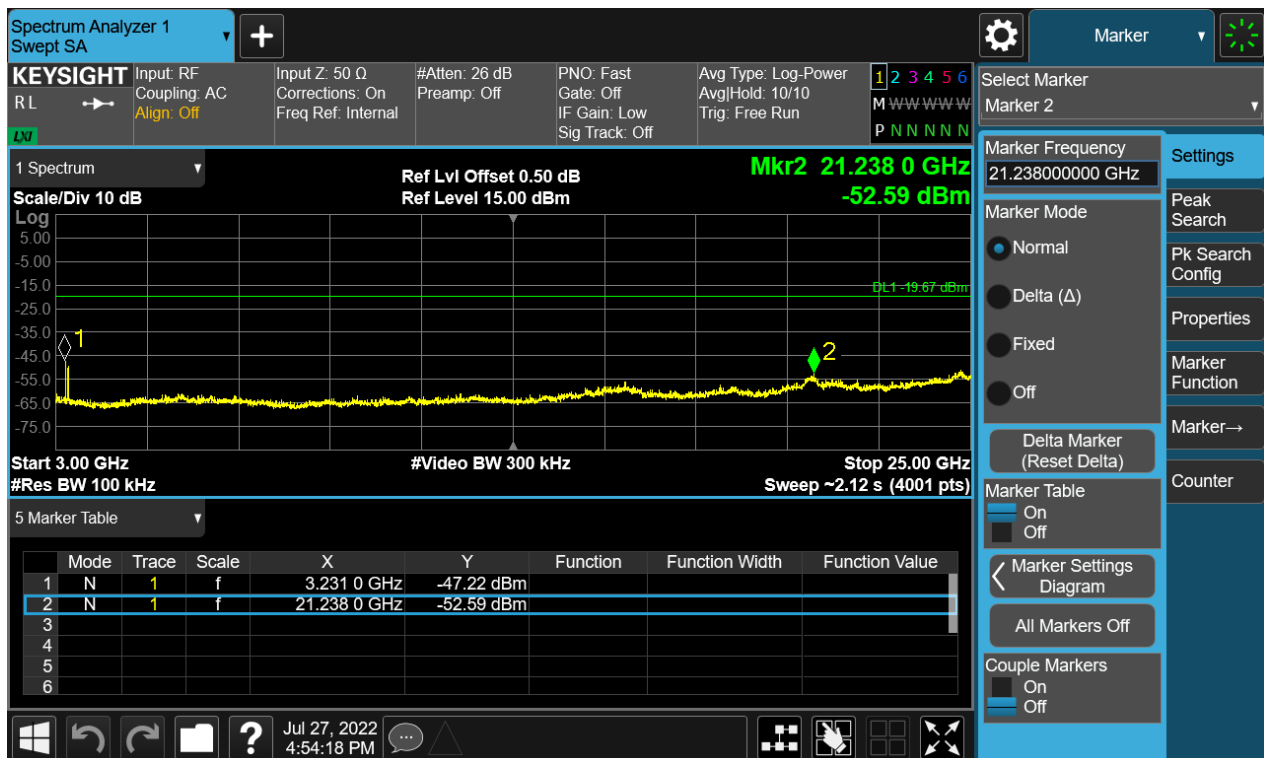
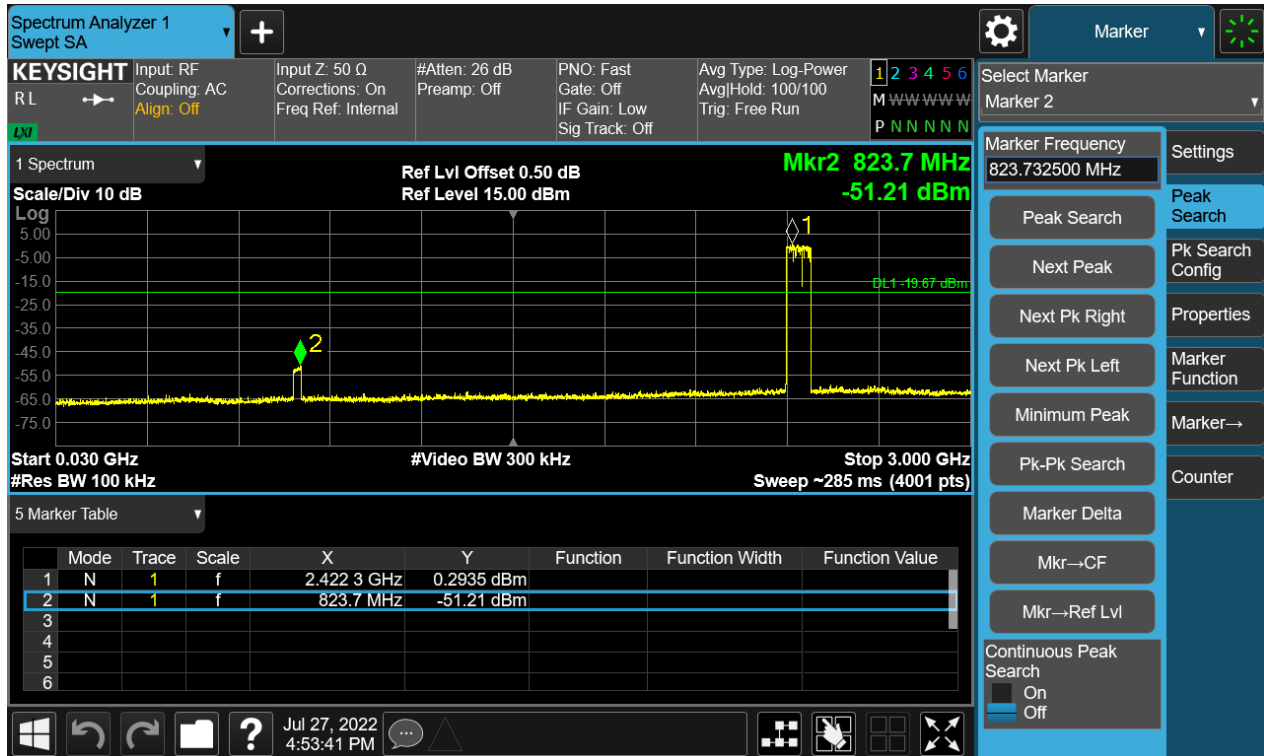
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## Conducted spurious emissions 30MHz-25GHz





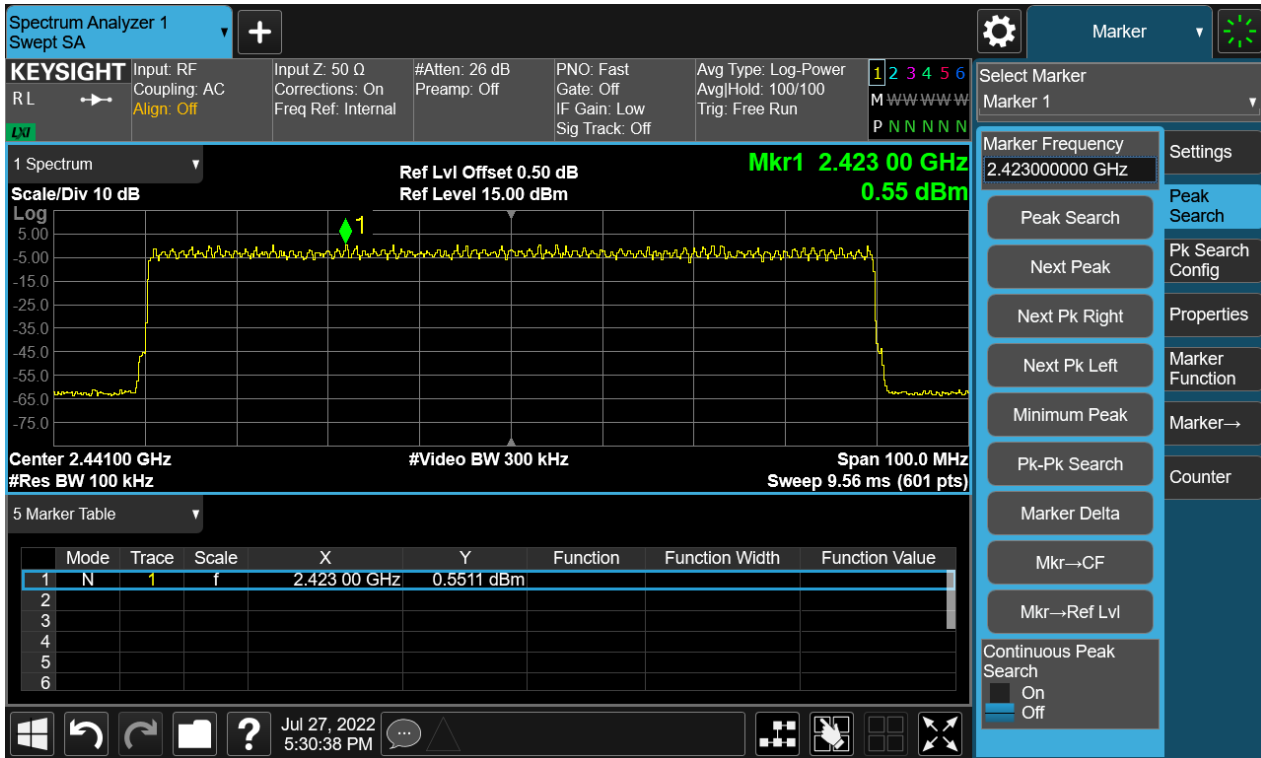
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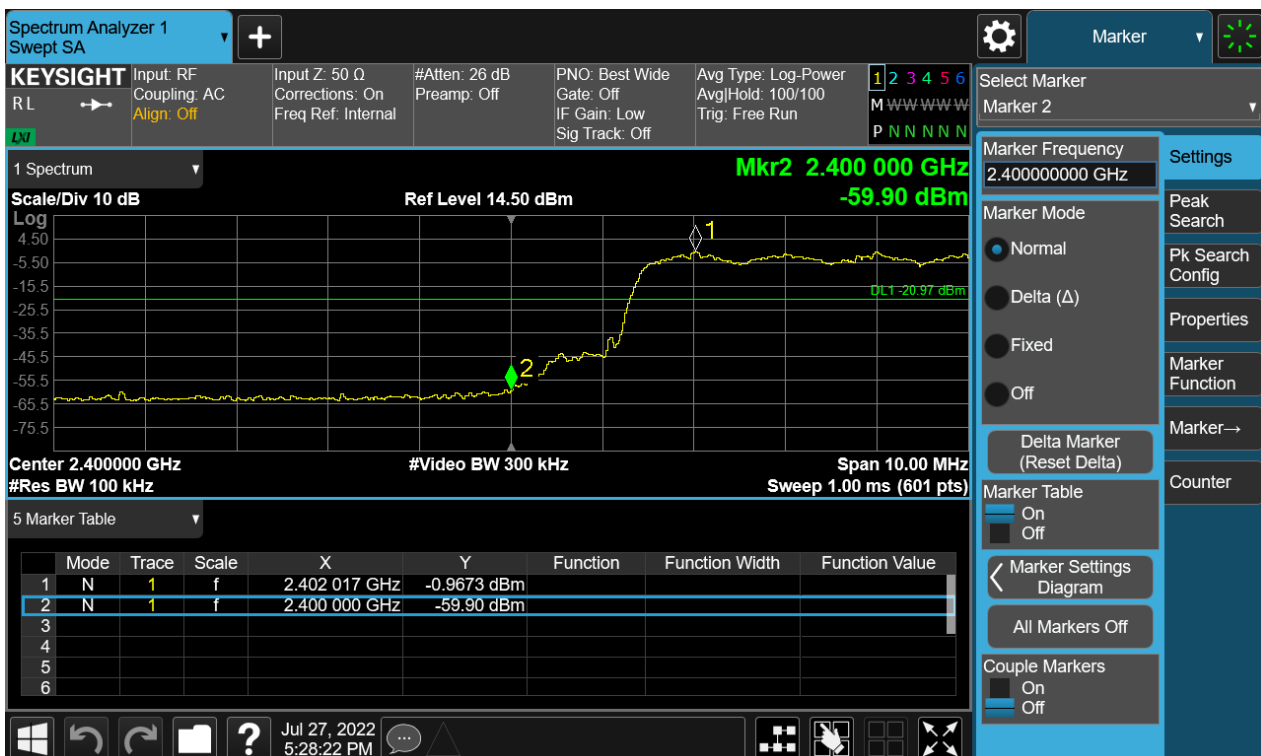
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Figure 29: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode,  $\pi/4$ -DQPSK Carrier Level



## Band Edge(Low)



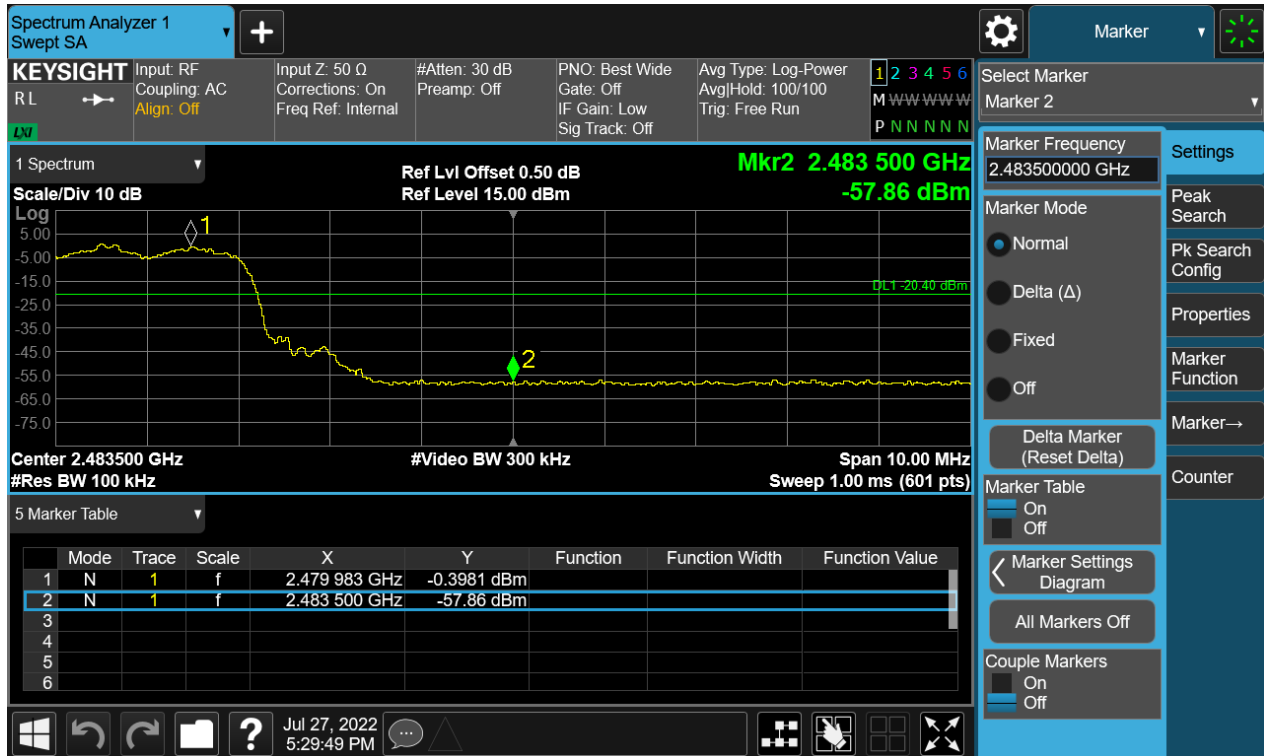
# TEST REPORT

Report No.: SHE22060090-02DE

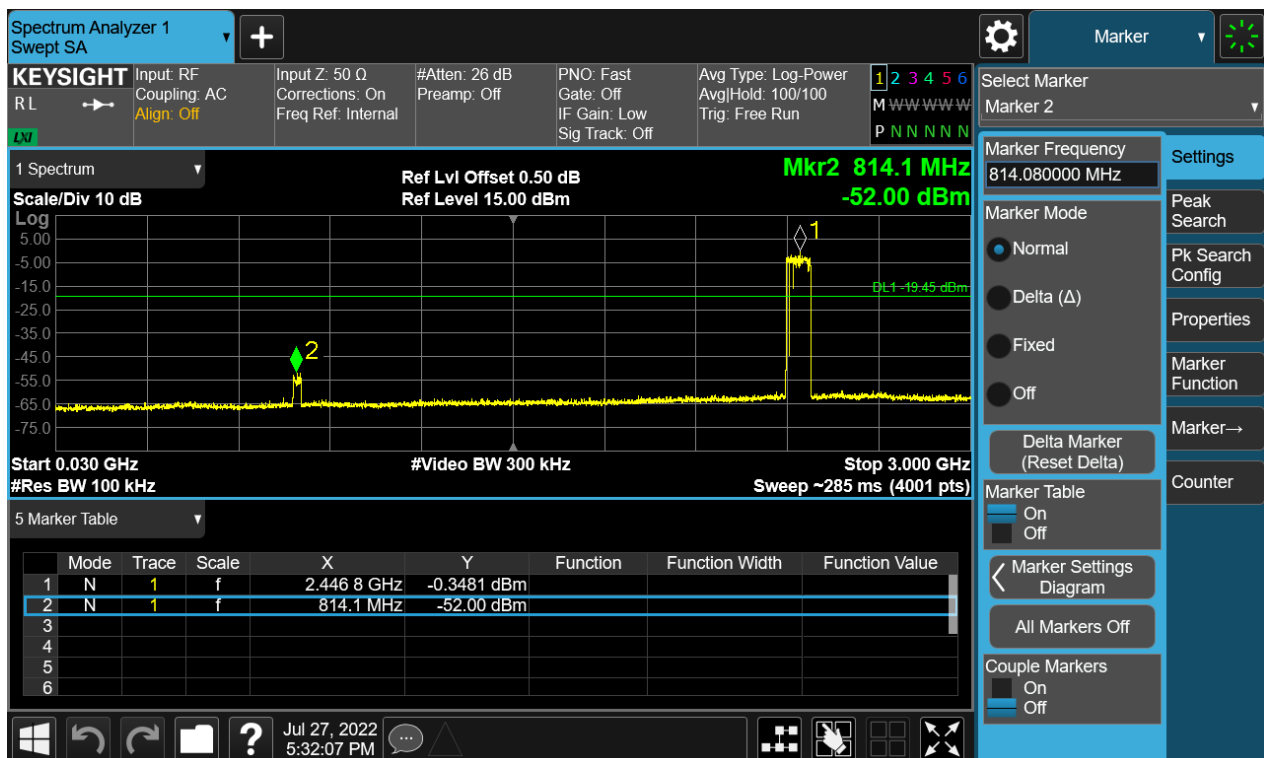
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## Band Edge(High)



## Conducted spurious emissions 30MHz-25GHz



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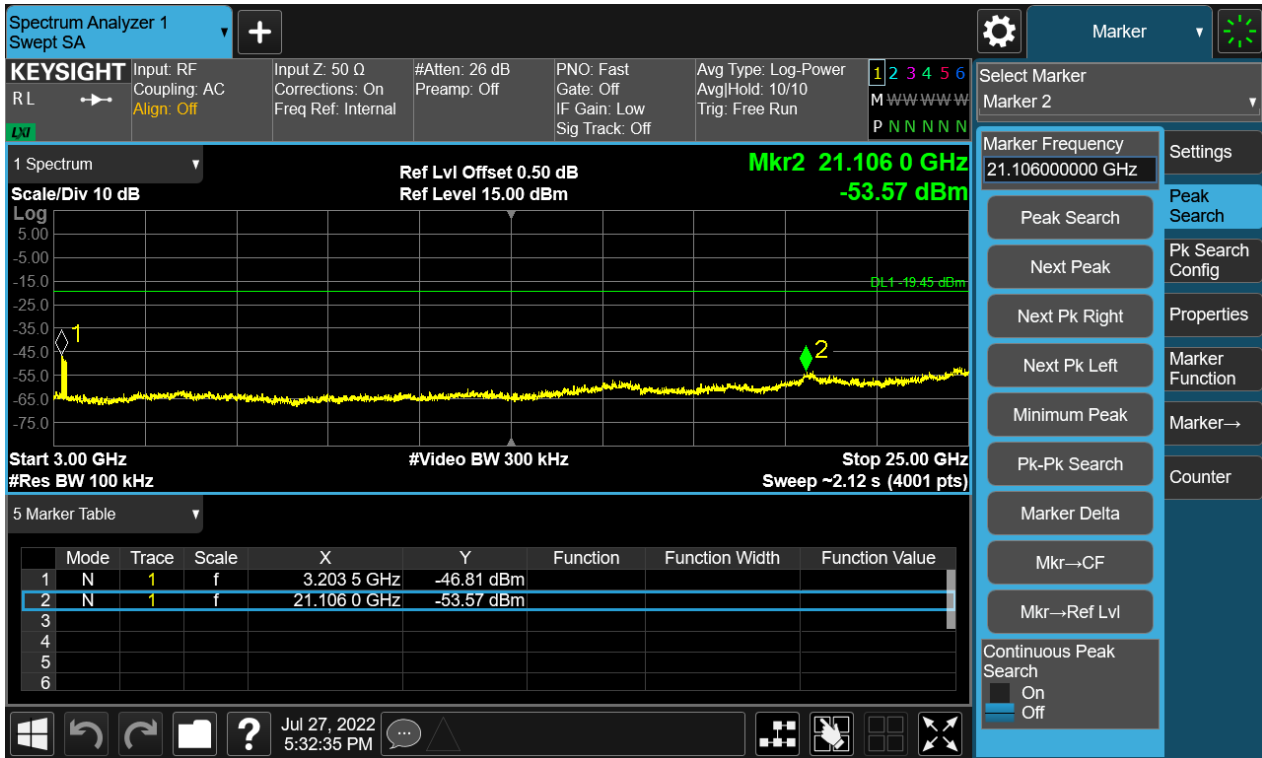
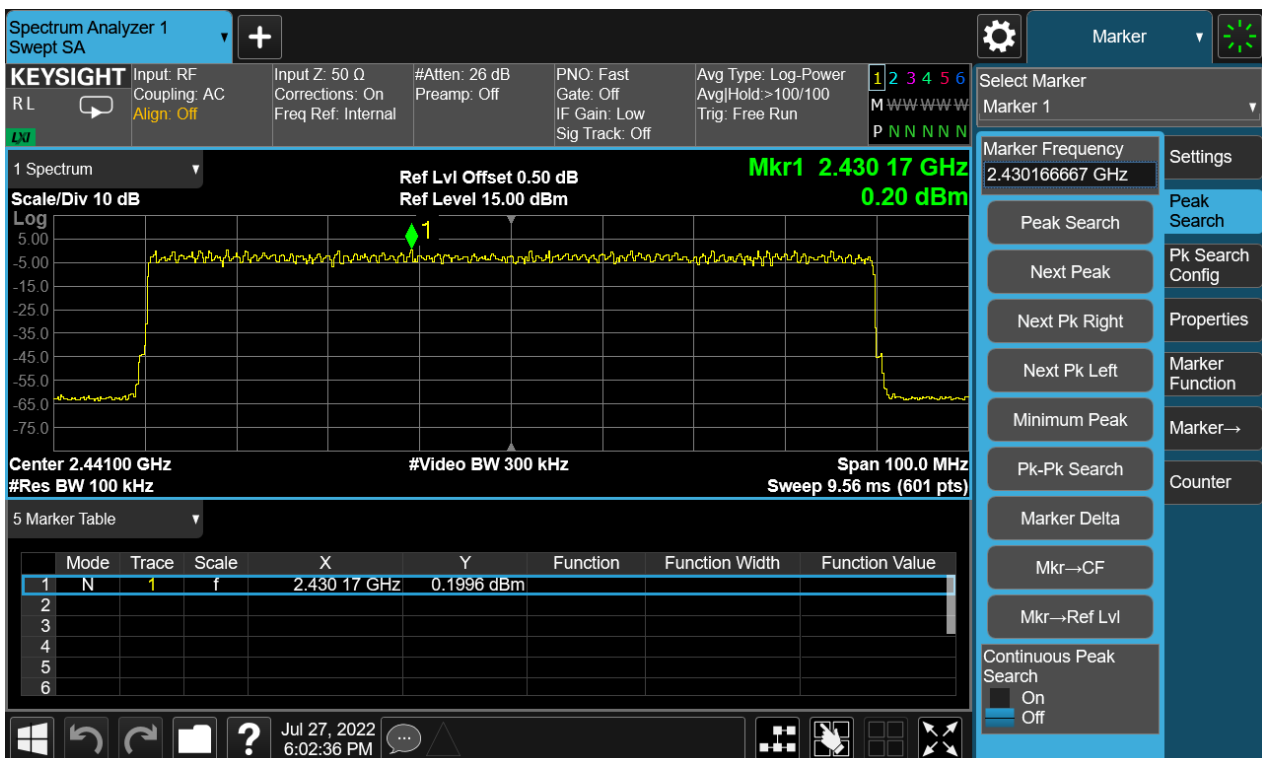


Figure 30: Conducted Spurious Emission & Authorized-band band-edge, Hopping Mode, 8-DPSK Carrier Level



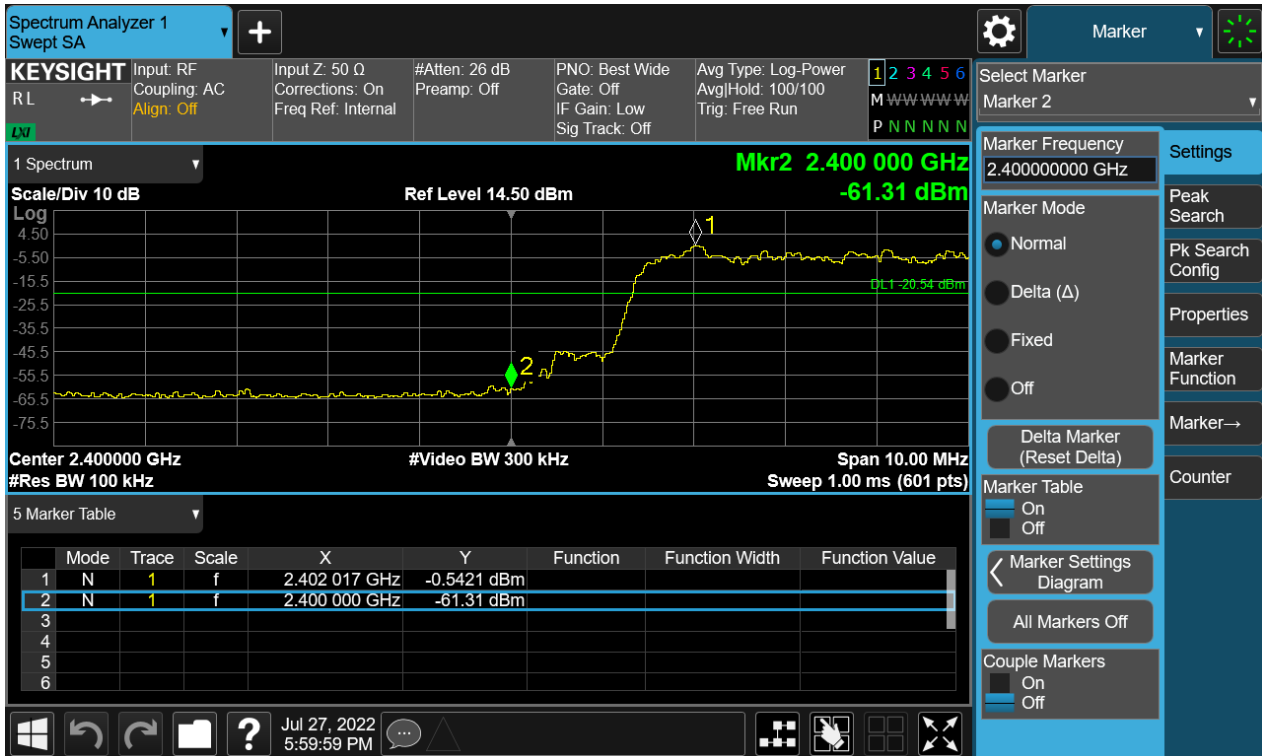
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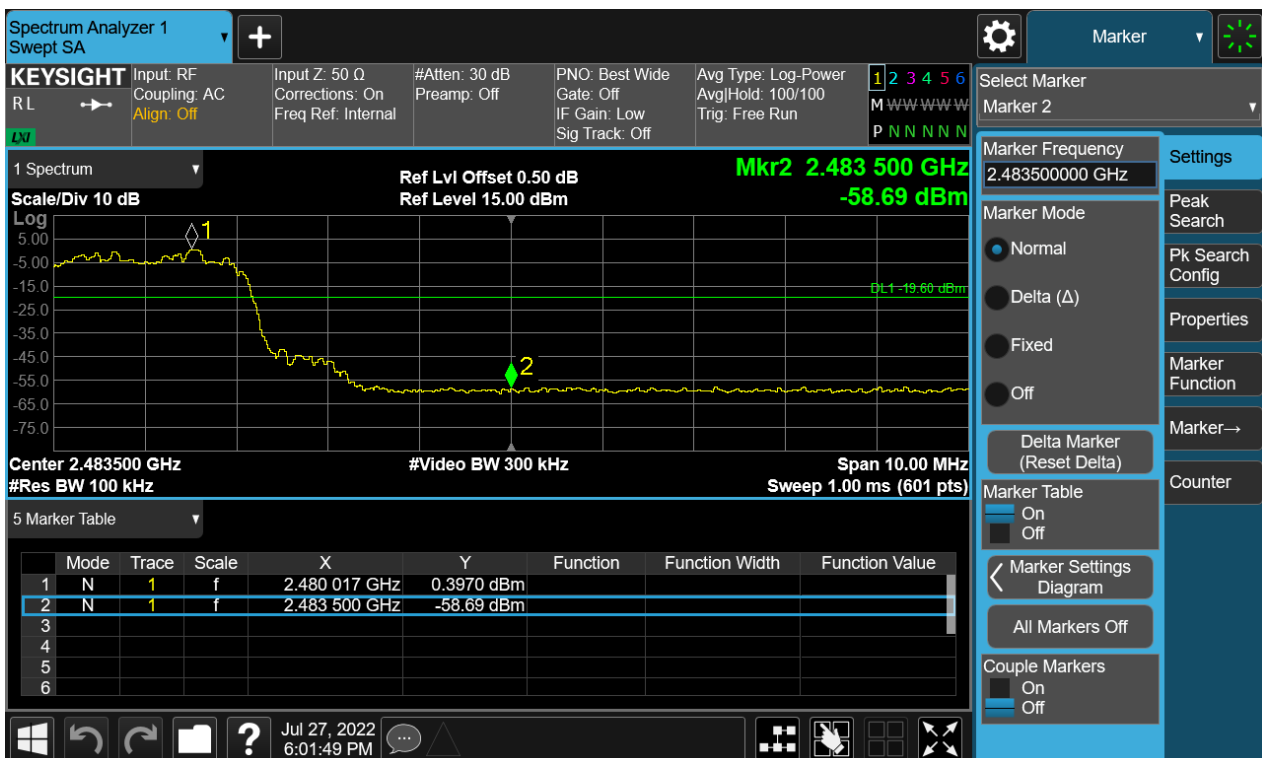
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## Band Edge(Low)



## Band Edge(High)



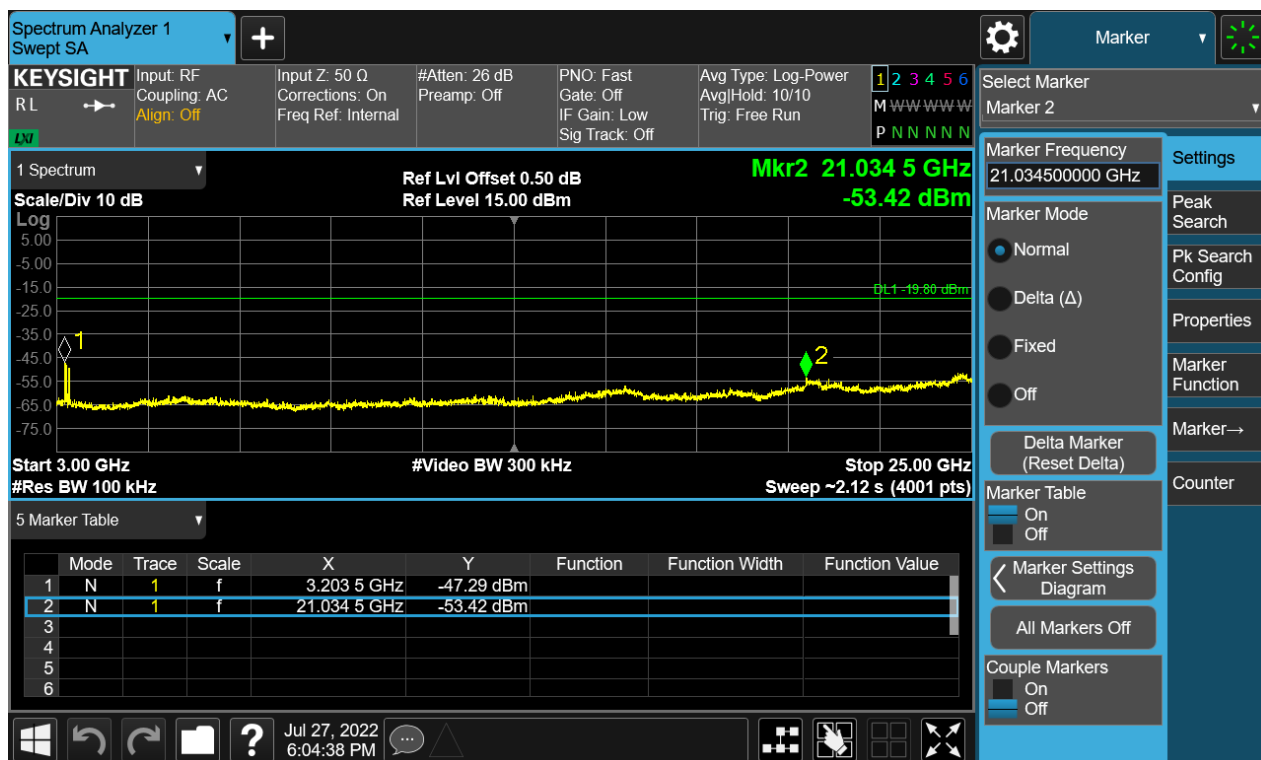
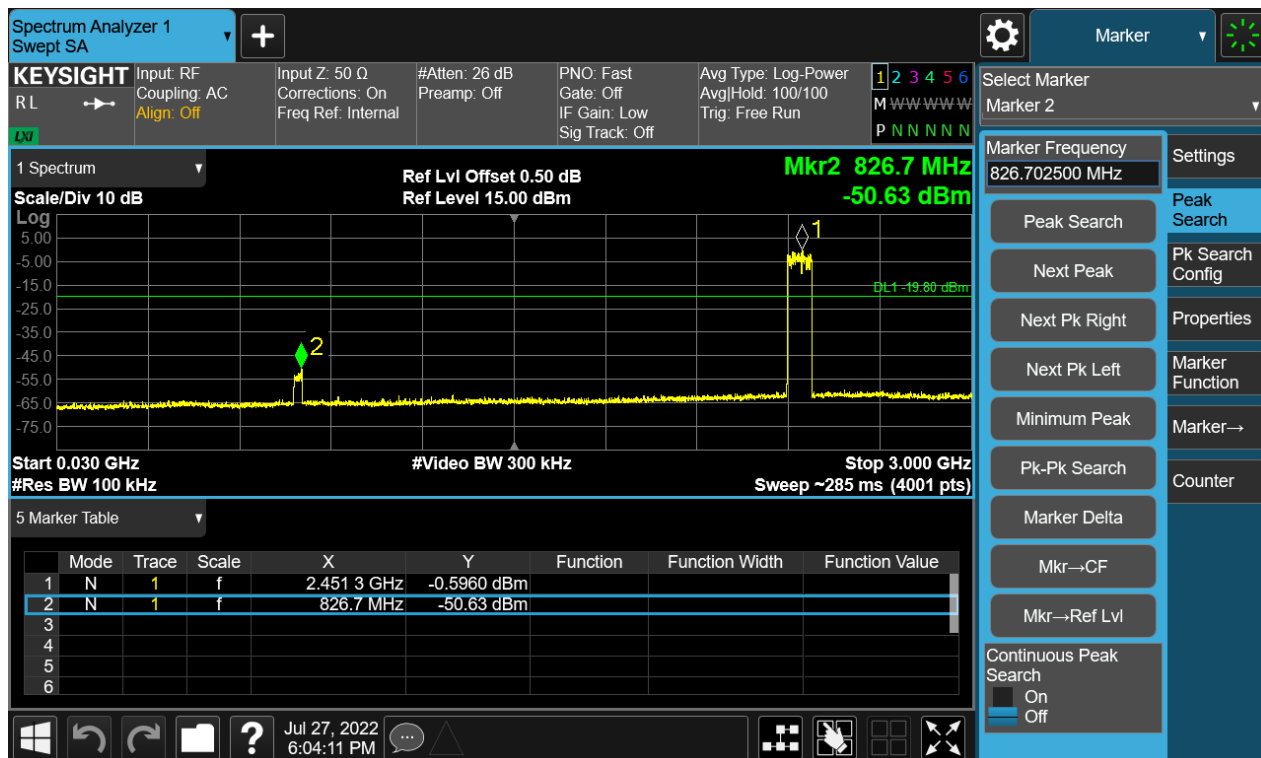
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## Conducted spurious emissions 30MHz-25GHz



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## 4.1.5 Radiated Spurious Emission

RESULT:

**PASS**

Test standard : FCC Part 15.247(d), 15.205, 15.209

Requirement : ANSI C63.10-2013, Clause 7.8.8

Kind of test site : 3m Semi-Anechoic Chamber

### Test setup

Test Channel : Low/Middle/High

Operation Mode : A

Ambient temperature : 22.1°C

Relative humidity : 52%

### Notes

*Test plots please refer to the annex document "SHE22060090-02DE DATA BDED-RX EXHIBIT A".*

- 1. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.*
- 2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.*
- 3. All test mode had been pre-test. Only the worst mode data of GFSK&8DPSK-hopping-DH5 and GFSK&8DPSK\_Middle channel (below 1GHz) were recorded in the test report.*
- 4. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.*

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## 4.1.6 Band Edge (Restricted-band band-edge)

RESULT:

**PASS**

Test standard : FCC Part 15.247(d), 15.205, 15.209

Requirement : ANSI C63.10-2013, Clause 7.8.6

Kind of test site : 3m Semi-Anechoic Chamber

### Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1

Ambient temperature : 23.1°C

Relative humidity : 52%

### Notes

1. Test plots please refer to the annex document "SHE22060090-02DE DATA BDED-R-TX EXHIBIT A".
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

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## 4.1.7 Hopping Frequency Separation

RESULT:

**PASS**

Test standard : FCC Part 15.247(a)(1)

Requirement : ANSI C63.10-2013, Clause 7.8.2  
KDB 558074 D01 v05r02, Clause 2.2

Kind of test site : Shielded room

### Test setup

Test Channel : Hopping

Operation Mode : A.1.a.iv

Ambient temperature : 24.9°C

Relative humidity : 51%

**Table 3: Hopping Frequency Separation**

| Mode           | Frequency (MHz) | Channel Separation (MHz) | Limit (MHz)                             |
|----------------|-----------------|--------------------------|---|
| GFSK           | 2441            | 0.990                    | ≥ 25kHz or two-thirds of 20dB bandwidth |
| $\pi$ /4-DQPSK | 2441            | 1.025                    |   |
| 8-DPSK         | 2441            | 1.025                    |   |

\*Note: The systems operate with an output power no greater than 125mW.



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Figure 31: Hopping Frequency Separation, Hopping Mode, GFSK

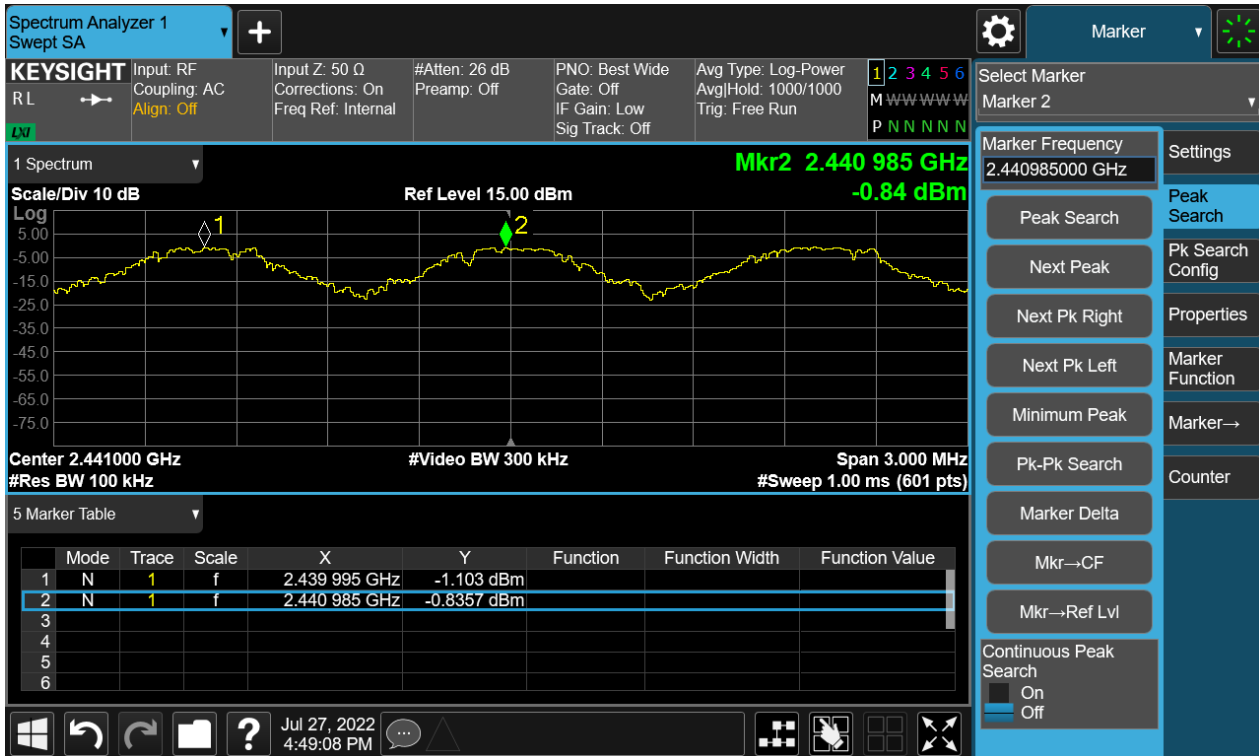
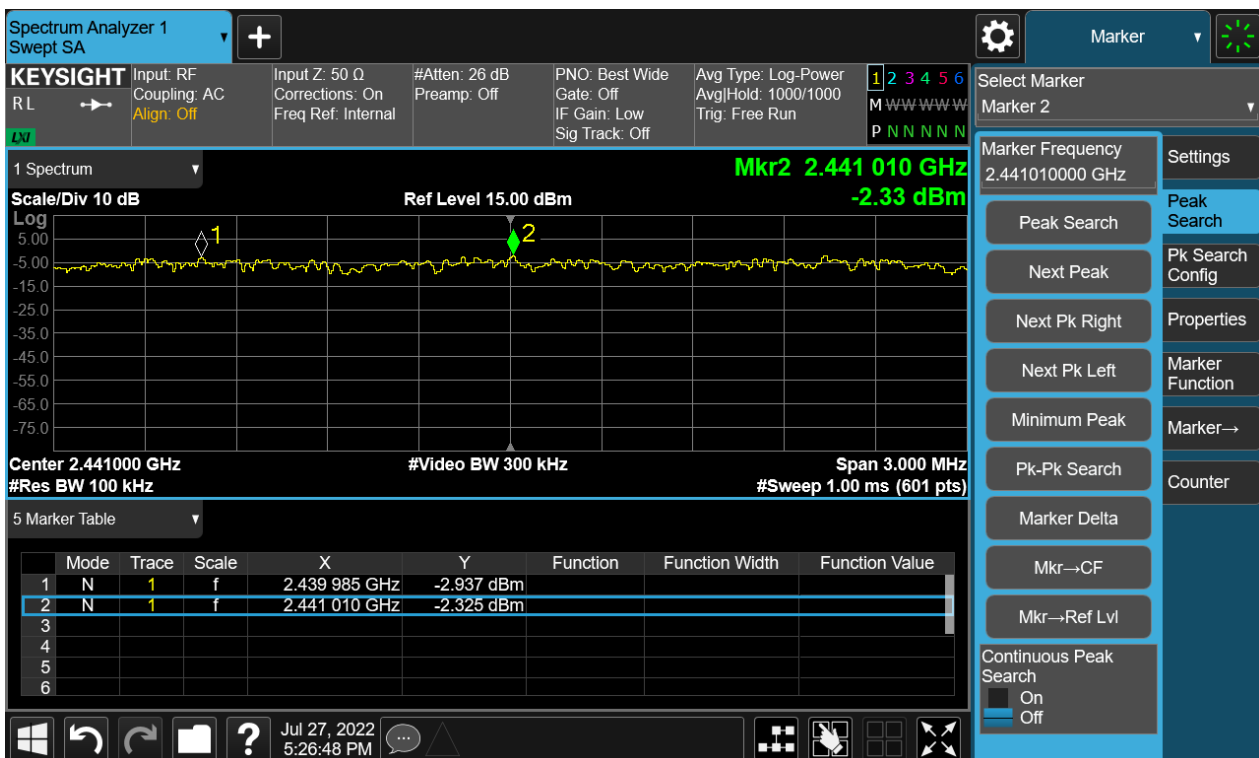


Figure 32: Hopping Frequency Separation, Hopping Mode,  $\pi/4$ -DQPSK



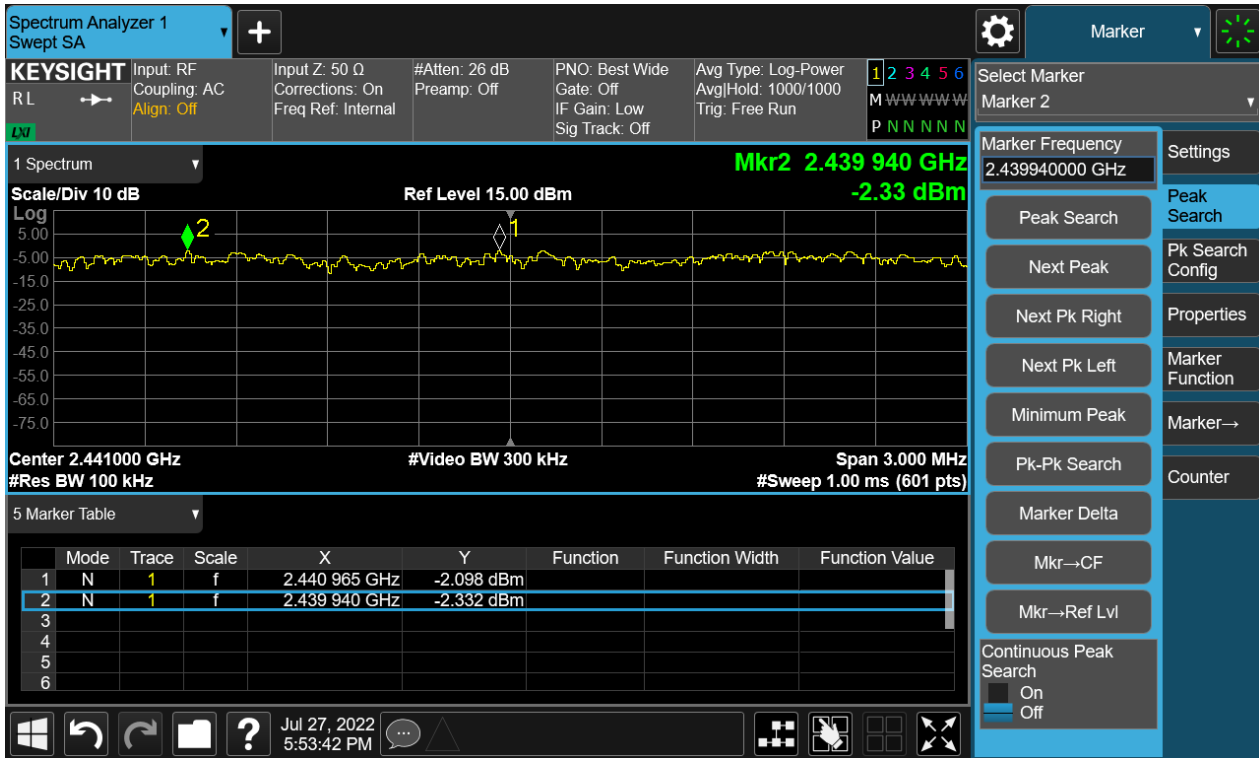
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Figure 33: Hopping Frequency Separation, Hopping Mode, 8DPSK



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## 4.1.8 Number of Hopping Frequency

RESULT:

**PASS**

Test standard : FCC Part 15.247(a)(1)(iii)

Requirement : ANSI C63.10-2013, Clause 7.8.3  
KDB 558074 D01 v05r02, Clause 2.2

Kind of test site : Shielded room

### Test setup

Test Channel : Hopping

Operation Mode : A.1.a.iv

Ambient temperature : 24.9°C

Relative humidity : 51%

**Table 4: Number of Hopping Frequency**

| Mode           | Frequency Range | Measured Quantity of Hopping Channel | Limit |
|----------------|-----------------|--------------------------------------|-------|
| GFSK           | 2400 – 2483.5   | 79                                   | ≥15   |
| $\pi/4$ -DQPSK | 2400 – 2483.5   | 79                                   | ≥15   |
| 8-DPSK         | 2400 – 2483.5   | 79                                   | ≥15   |

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Figure 34: Number of Hopping Frequency, Hopping Mode, GFSK

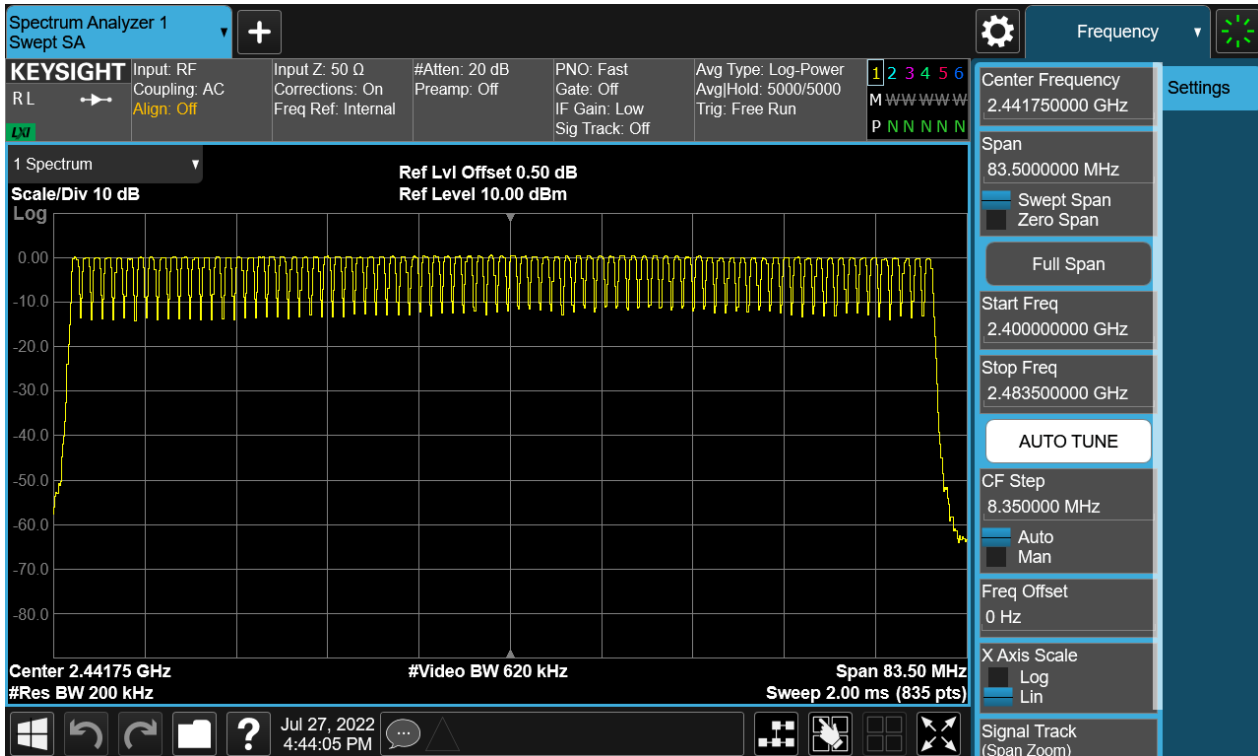
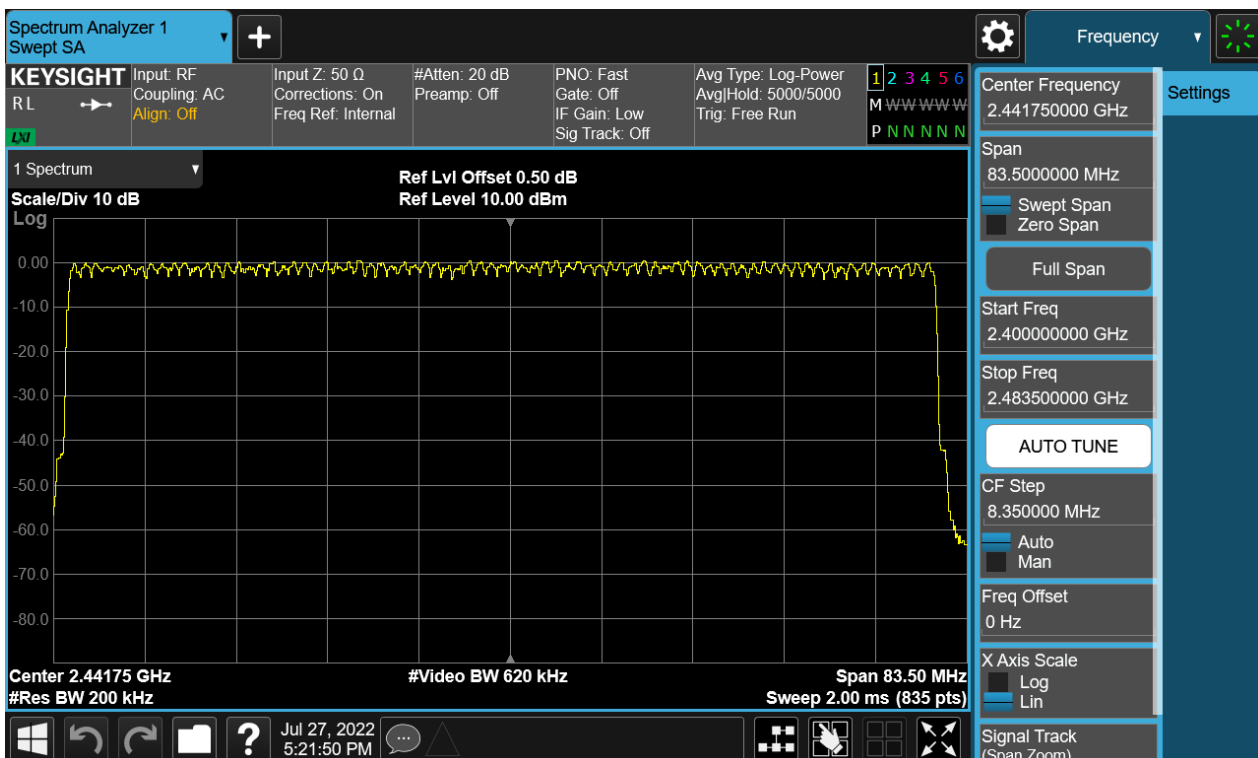


Figure 35: Number of Hopping Frequency, Hopping Mode,  $\pi/4$ -DQPSK



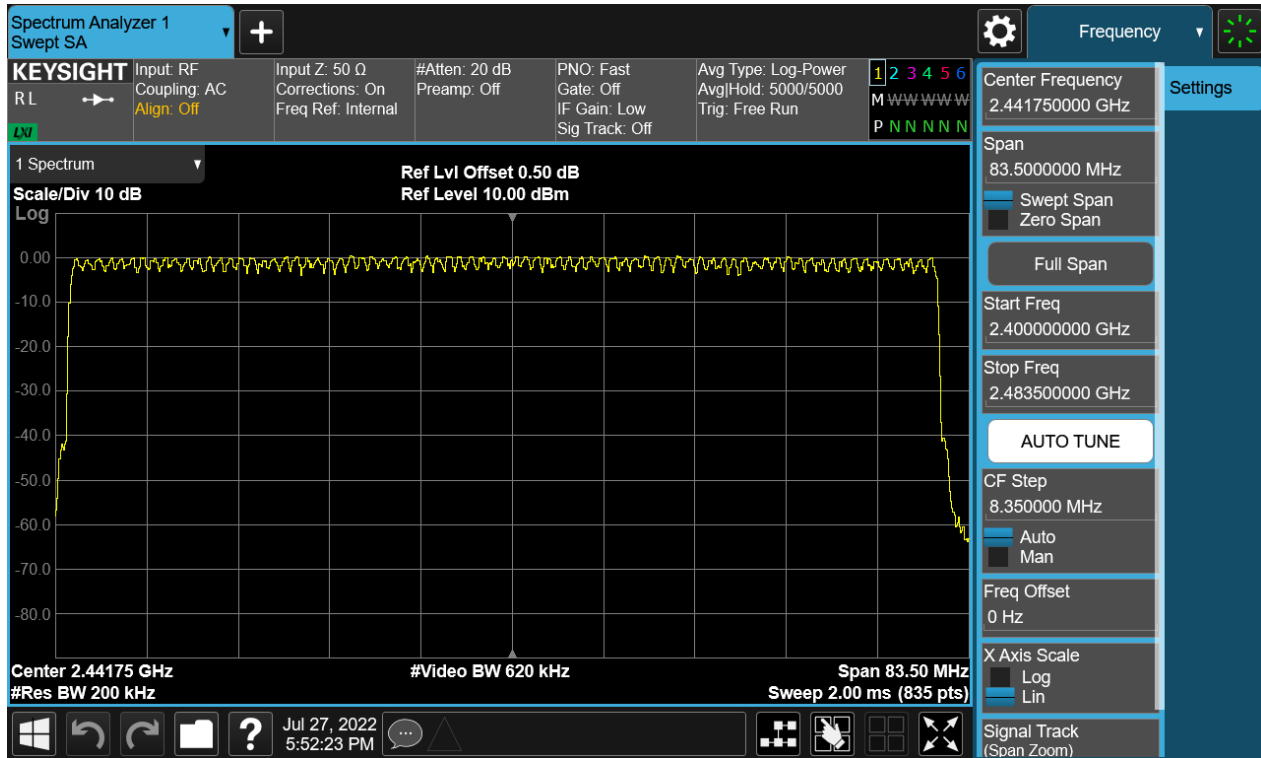
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Figure 36: Number of Hopping Frequency, Hopping Mode, 8-DPSK



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## 4.1.9 Time of Occupancy

RESULT:

PASS

Test standard : FCC Part 15.247(a)(1)(iii)

Requirement : ANSI C63.10-2013, Clause 7.8.4  
KDB 558074 D01 v05r02, Clause 2.2

Kind of test site : Shielded room

### Test setup

Test Channel : Middle

Operation Mode : A.1.a

Ambient temperature : 24.9°C

Relative humidity : 51%

Table 5: Time of Occupancy

| Mode           | Packet Type | Pulse Time (ms) | Total of Dwell Time (ms) | Total of Dwell Time (s) | Limit (s) |
|----------------|-------------|-----------------|--------------------------|-------------------------|-----------|
| GFSK           | DH1         | 0.3850          | 123.200                  | 0.1232                  | 0.4       |
|                | DH3         | 1.6500          | 264.000                  | 0.2640                  | 0.4       |
|                | DH5         | 2.9000          | 309.300                  | 0.3093                  | 0.4       |
| $\pi/4$ -DQPSK | DH1         | 0.3983          | 127.456                  | 0.1275                  | 0.4       |
|                | DH3         | 1.6550          | 264.800                  | 0.2648                  | 0.4       |
|                | DH5         | 2.9070          | 310.080                  | 0.3101                  | 0.4       |
| 8-DPSK         | DH1         | 0.3983          | 127.456                  | 0.1275                  | 0.4       |
|                | DH3         | 1.6550          | 264.800                  | 0.2648                  | 0.4       |
|                | DH5         | 2.9130          | 310.720                  | 0.3107                  | 0.4       |

Note:

For DH1 package type:

Total of Dwell = Pulse Time\*(1600/2)/Number of Hopping Frequency\*Period

Period = 0.4\* Number of Hopping Frequency

For DH3 package type:

Total of Dwell = Pulse Time\*(1600/4)/Number of Hopping Frequency\*Period

Period = 0.4\* Number of Hopping Frequency

For DH5 package type:

Total of Dwell = Pulse Time\*(1600/6)/Number of Hopping Frequency\*Period

Period = 0.4\* Number of Hopping Frequency

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Figure 37: Time of Occupancy, 2441MHz, GFSK DH1

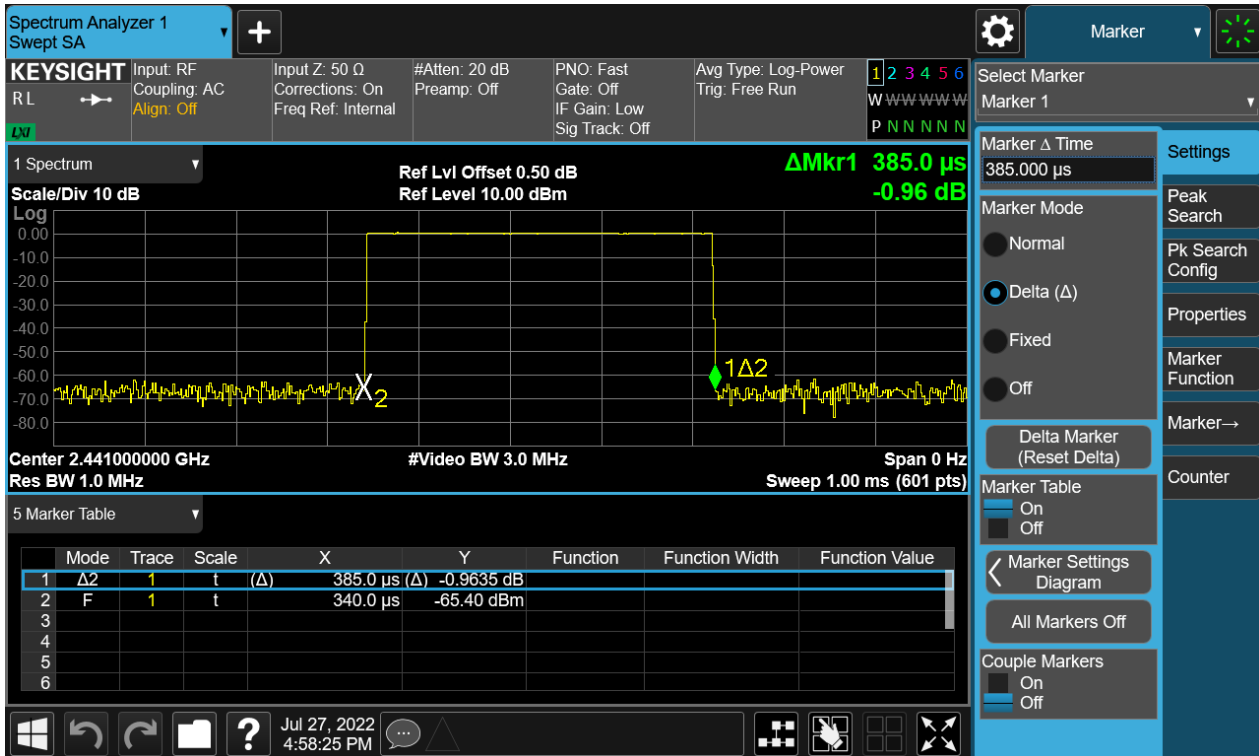
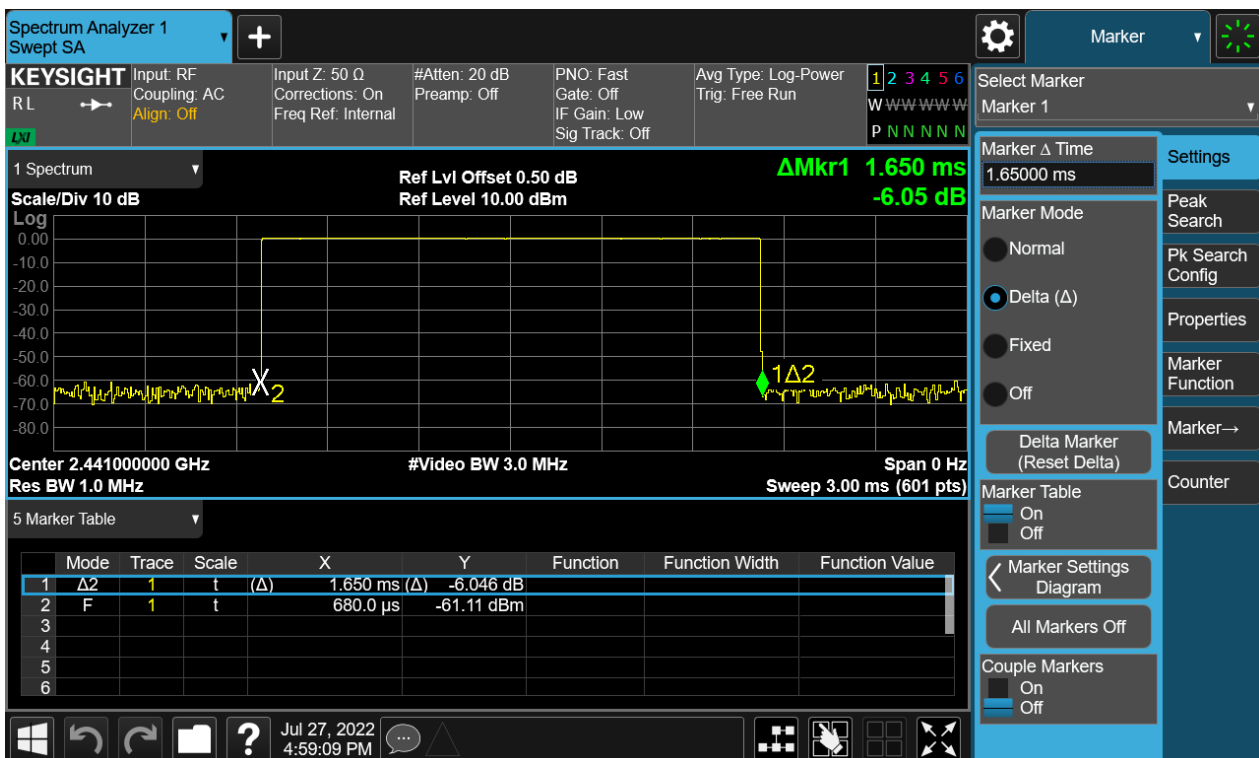


Figure 38: Time of Occupancy, 2441MHz, GFSK DH3



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Figure 39: Time of Occupancy, 2441MHz, GFSK DH5

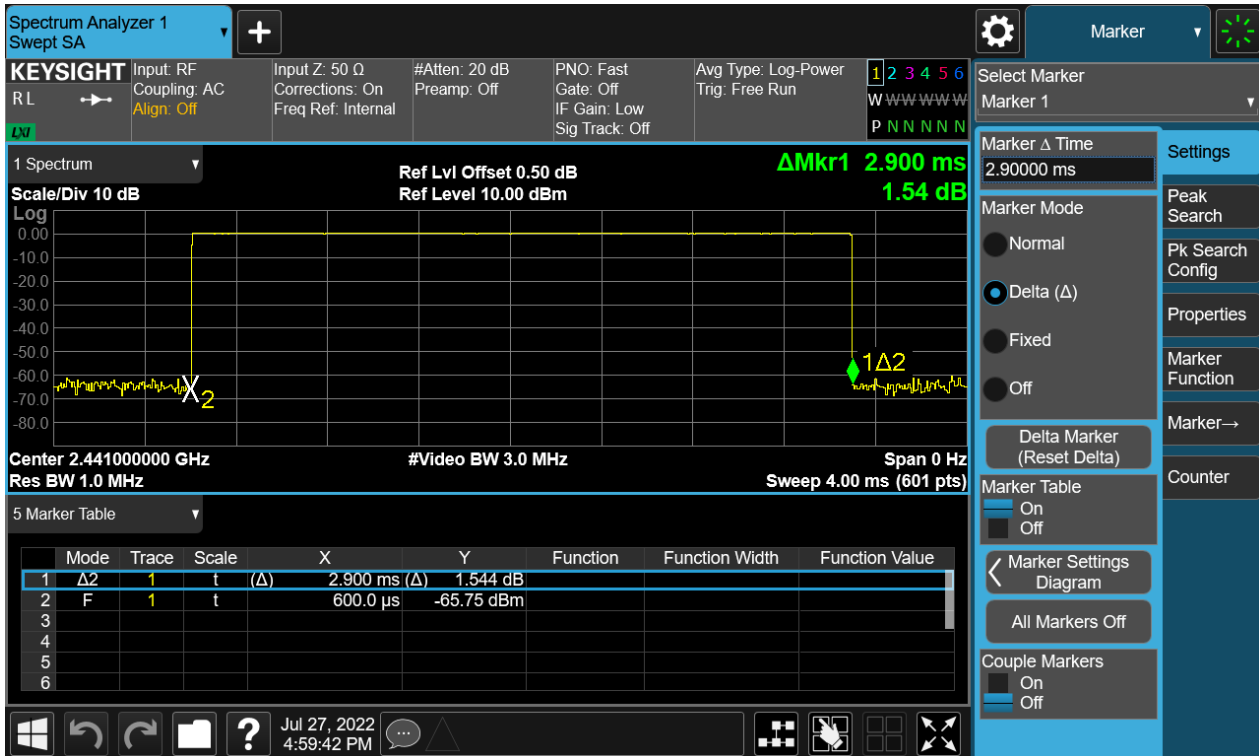
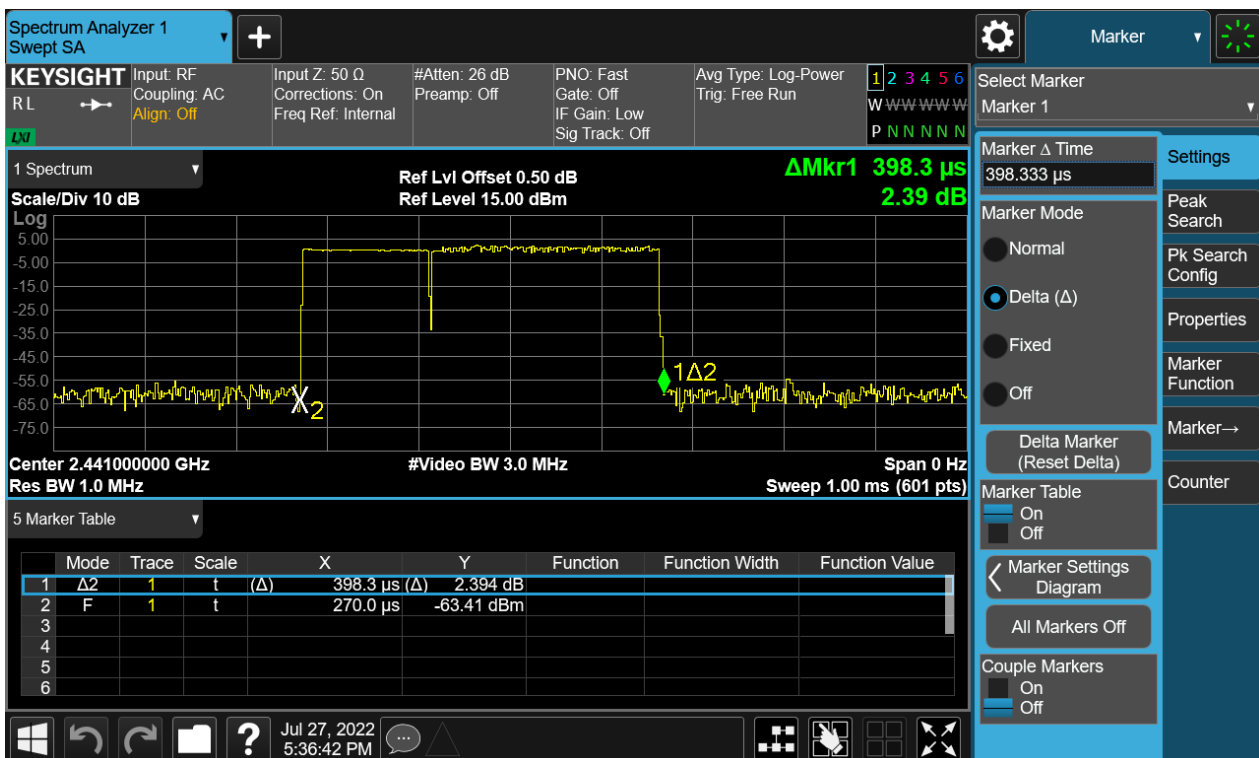


Figure 40: Time of Occupancy, 2441MHz,  $\pi/4$ -DQPSK DH1





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Figure 41: Time of Occupancy, 2441MHz,  $\pi/4$ -DQPSK DH3

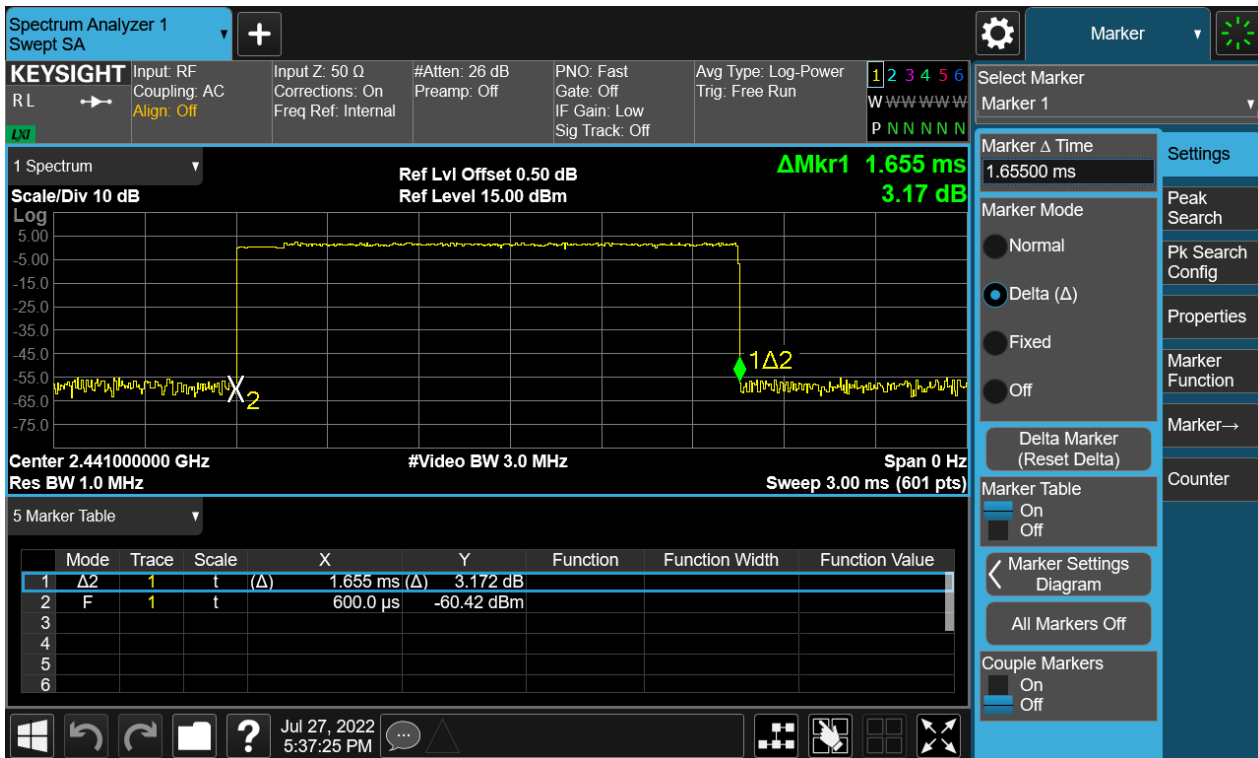
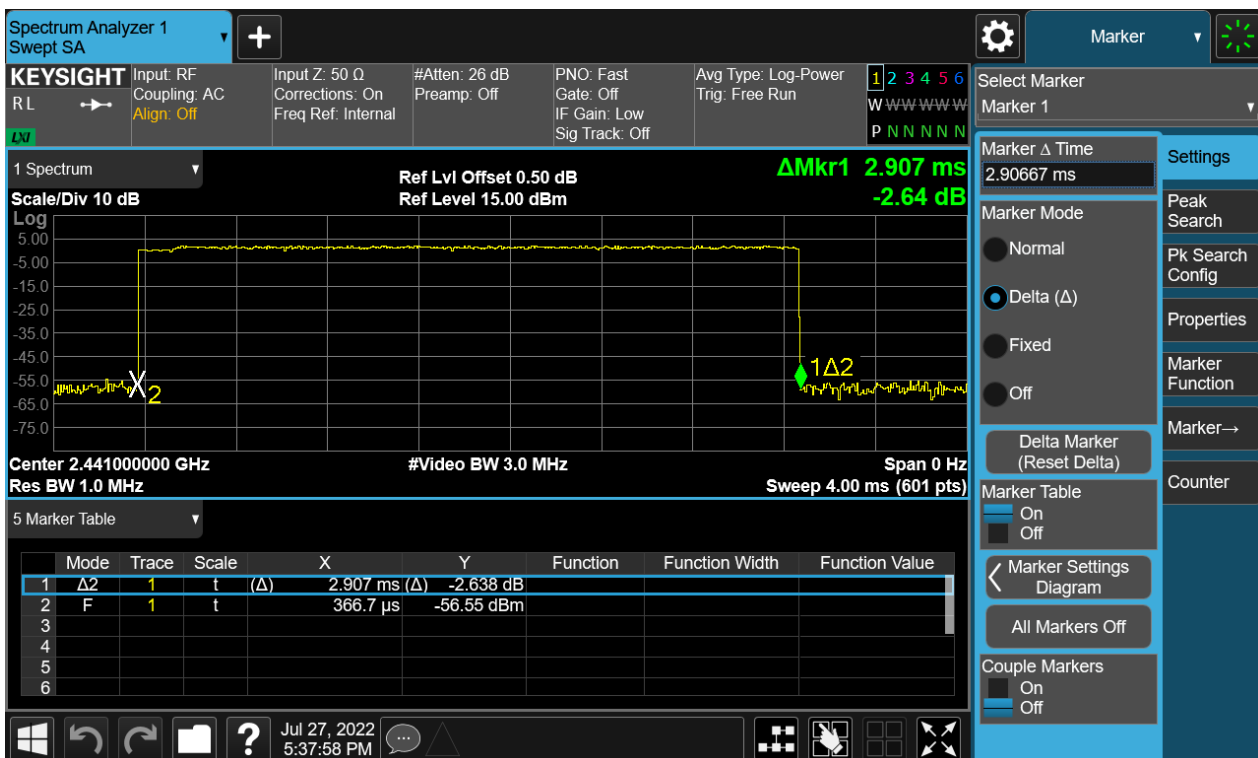
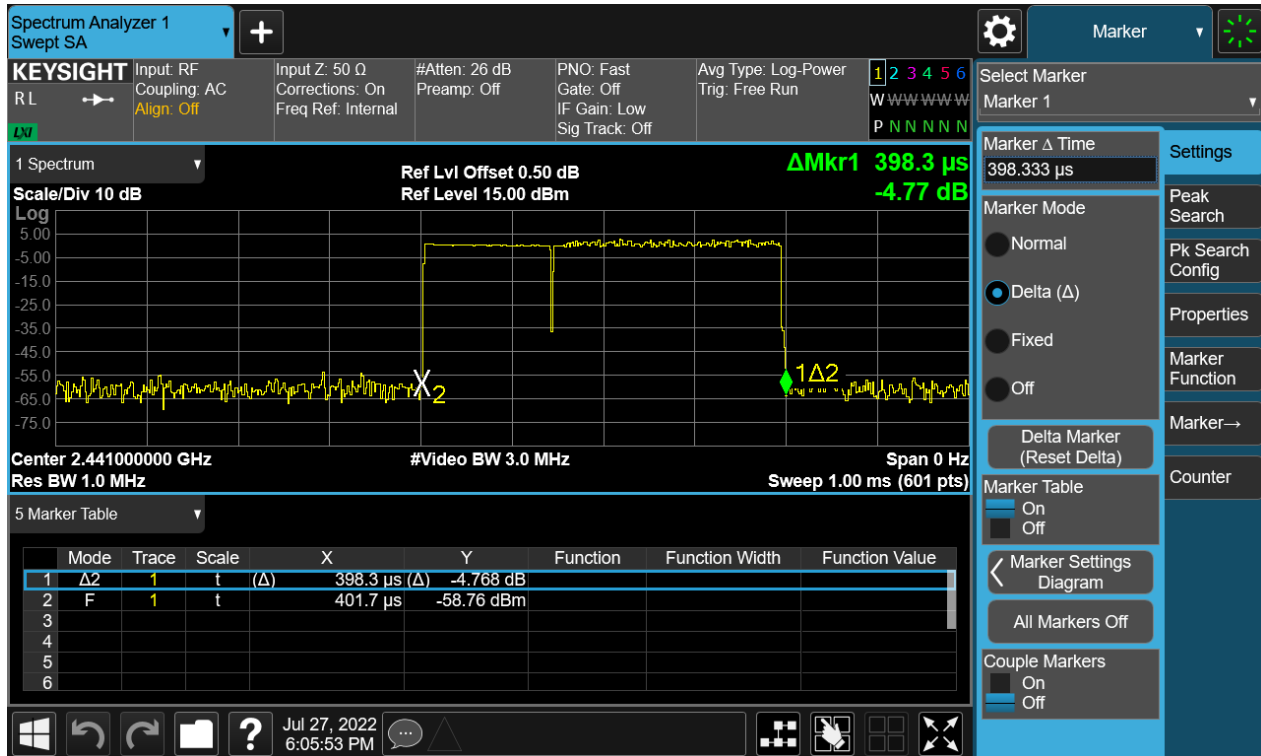


Figure 42: Time of Occupancy, 2441MHz,  $\pi/4$ -DQPSK DH5

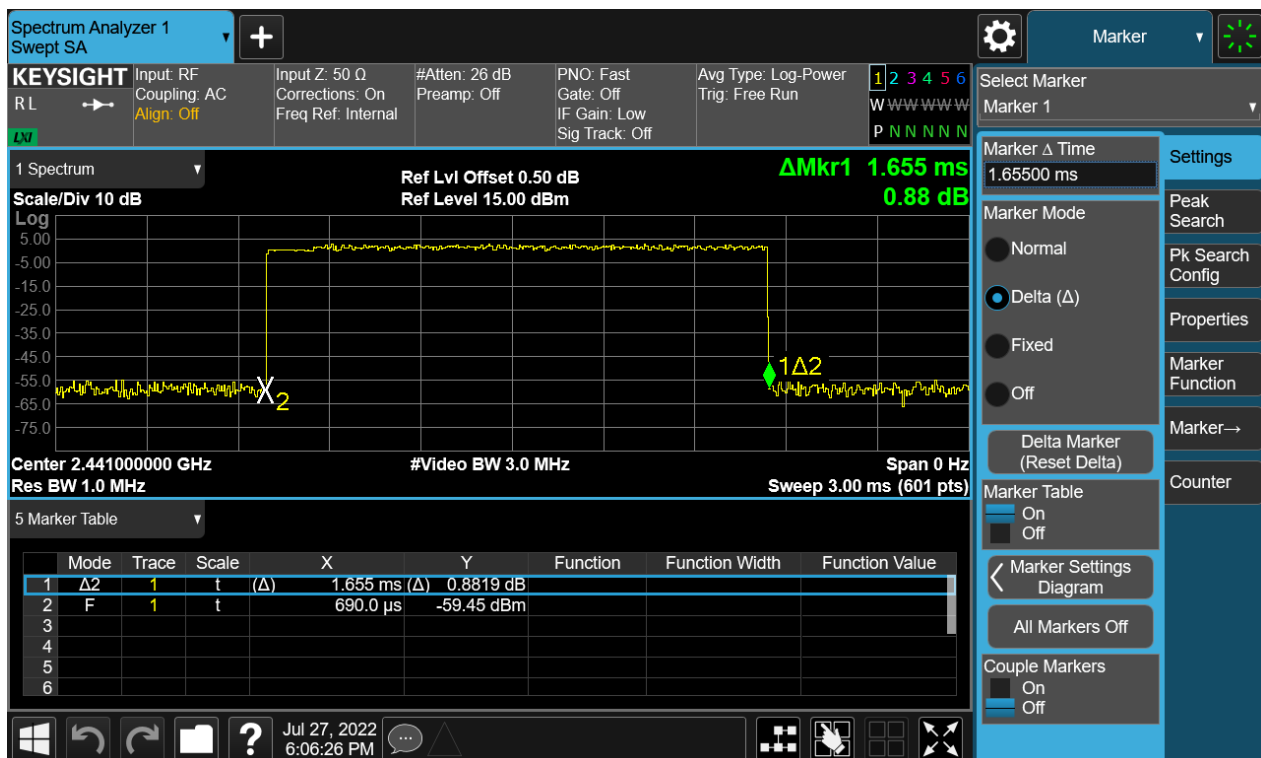


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**Figure 43: Time of Occupancy, 2441MHz, 8-DPSK DH1**



**Figure 44: Time of Occupancy, 2441MHz, 8-DPSK DH3**



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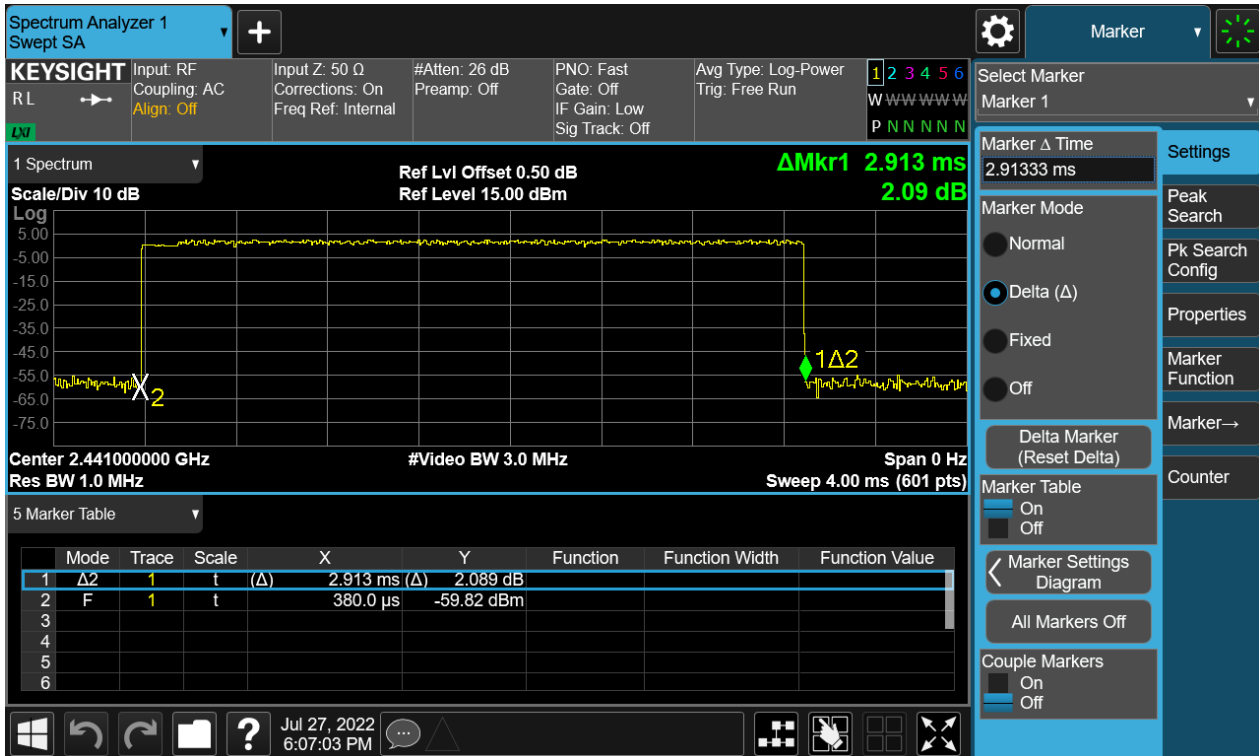
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Figure 45: Time of Occupancy, 2441MHz, 8-DPSK DH5



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## 4.2 Mains Emissions

### 4.2.1 Conducted Emission on AC Mains

RESULT:

**PASS**

Test standard : FCC Part 15.207(a)

Requirement : ANSI C63.10-2013, Clause 6.2

Kind of test site : Shielded room

#### Test setup

Input Voltage : AC 120V 60Hz

Operation Mode : A.1.a

Earthing : Connected to GND

Ambient temperature : 23.6°C

Relative humidity : 57%

For details refer to following test plot.

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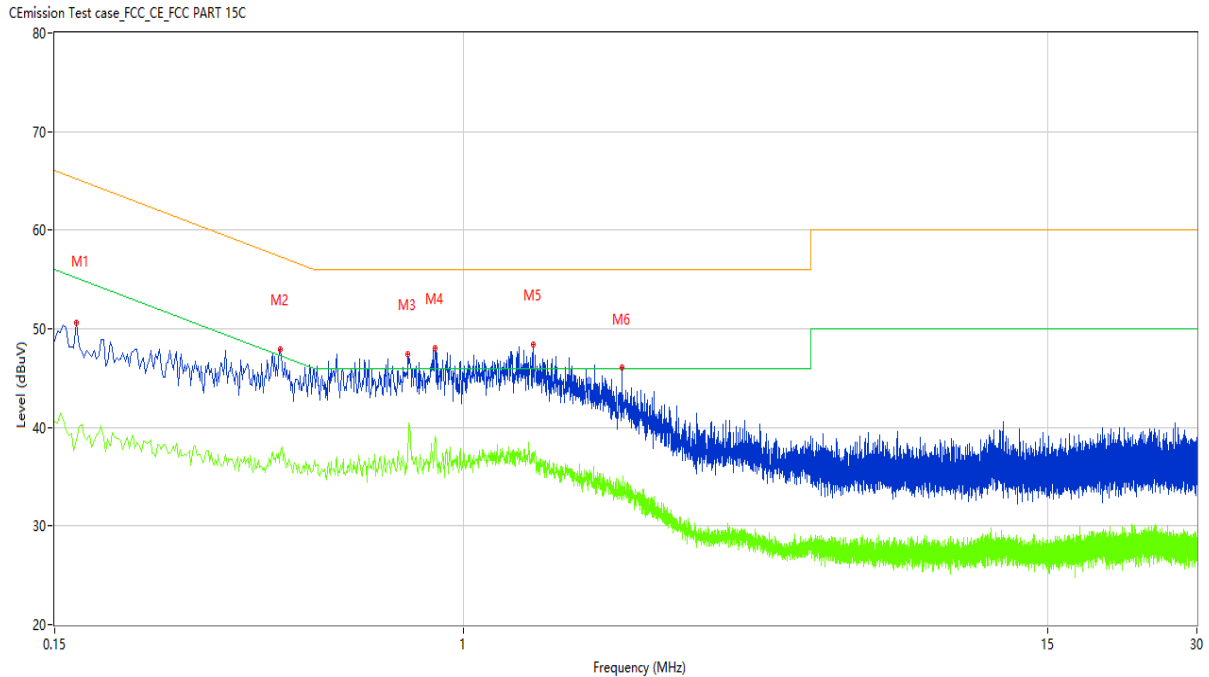
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## Note:

The all configurations were tested respectively, Only the worst mode data of 8DPSK-hopping-DH5 was recorded in the test report.

**Figure 46: Conducted Emission on AC Mains, L Phase**



| No. | Frequency (MHz) | Results (dBuV) | Factor (dB) | Limit (dBuV) | Over Limit (dB) | Detector | Line | Verdict |
|-----|-----------------|----------------|-------------|--------------|-----------------|----------|------|---------|
| 1   | 0.166           | 50.58          | 10.26       | 65.16        | -14.58          | Peak     | L    | Pass    |
| 1*  | 0.166           | 47.02          | 10.26       | 65.16        | -18.14          | QP       | L    | Pass    |
| 1** | 0.166           | 38.76          | 10.26       | 55.16        | -16.40          | AV       | L    | Pass    |
| 2   | 0.428           | 47.89          | 10.25       | 57.29        | -9.40           | Peak     | L    | Pass    |
| 2*  | 0.428           | 42.90          | 10.25       | 57.29        | -14.39          | QP       | L    | Pass    |
| 2** | 0.428           | 37.58          | 10.25       | 47.29        | -9.71           | AV       | L    | Pass    |
| 3   | 0.772           | 47.39          | 10.31       | 56.00        | -8.61           | Peak     | L    | Pass    |
| 3*  | 0.772           | 44.27          | 10.31       | 56.00        | -11.73          | QP       | L    | Pass    |
| 3** | 0.772           | 37.88          | 10.31       | 46.00        | -8.12           | AV       | L    | Pass    |
| 4   | 0.876           | 48.09          | 10.30       | 56.00        | -7.91           | Peak     | L    | Pass    |
| 4*  | 0.876           | 44.14          | 10.30       | 56.00        | -11.86          | QP       | L    | Pass    |
| 4** | 0.876           | 39.05          | 10.30       | 46.00        | -6.95           | AV       | L    | Pass    |
| 5   | 1.380           | 48.38          | 10.18       | 56.00        | -7.62           | Peak     | L    | Pass    |
| 5*  | 1.380           | 44.89          | 10.18       | 56.00        | -11.11          | QP       | L    | Pass    |
| 5** | 1.380           | 36.81          | 10.18       | 46.00        | -9.19           | AV       | L    | Pass    |
| 6   | 2.080           | 46.11          | 10.16       | 56.00        | -9.89           | Peak     | L    | Pass    |
| 6*  | 2.080           | 41.99          | 10.16       | 56.00        | -14.01          | QP       | L    | Pass    |
| 6** | 2.080           | 33.93          | 10.16       | 46.00        | -12.07          | AV       | L    | Pass    |

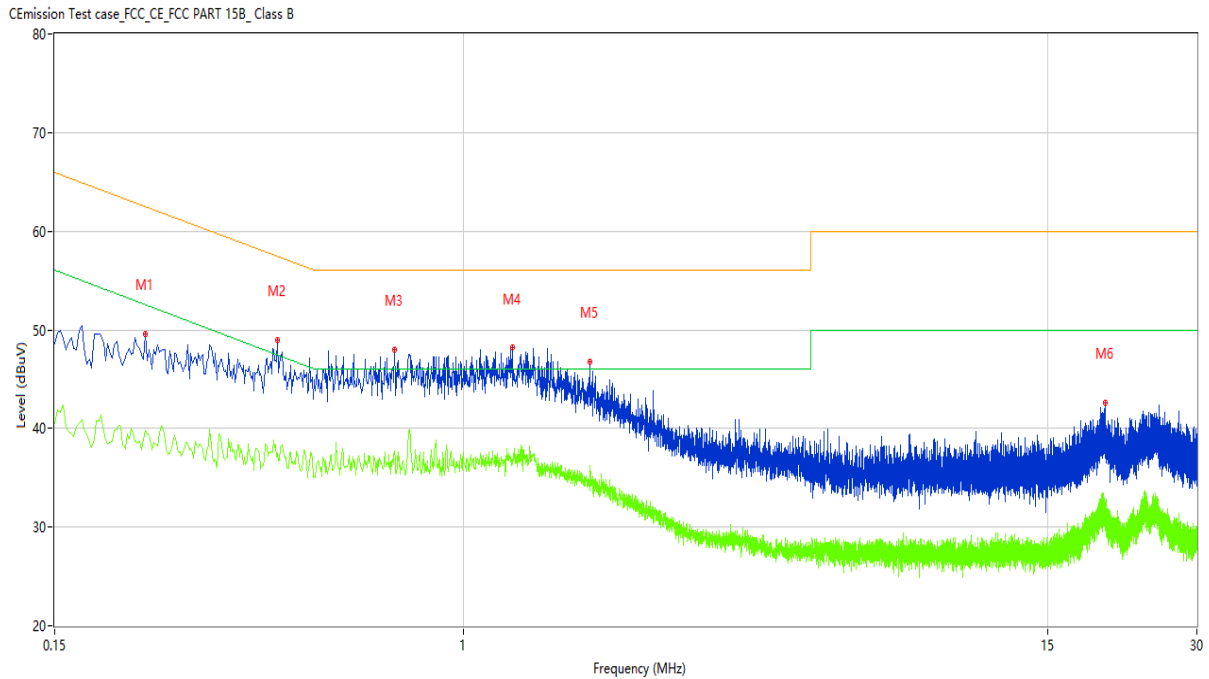
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**Figure 47: Conducted Emission on AC Mains, N Phase**



| No. | Frequency (MHz) | Results (dBuV) | Factor (dB) | Limit (dBuV) | Over Limit (dB) | Detector | Line | Verdict |
|-----|-----------------|----------------|-------------|--------------|-----------------|----------|------|---------|
| 1   | 0.228           | 42.27          | 10.24       | 62.52        | -20.25          | Peak     | N    | Pass    |
| 1*  | 0.228           | 37.66          | 10.24       | 62.52        | -24.86          | QP       | N    | Pass    |
| 1** | 0.228           | 39.85          | 10.24       | 52.52        | -12.67          | AV       | N    | Pass    |
| 2   | 0.422           | 45.33          | 10.25       | 57.41        | -12.08          | Peak     | N    | Pass    |
| 2*  | 0.422           | 41.65          | 10.25       | 57.41        | -15.76          | QP       | N    | Pass    |
| 2** | 0.422           | 37.44          | 10.25       | 47.41        | -9.97           | AV       | N    | Pass    |
| 3   | 0.726           | 38.49          | 10.31       | 56.00        | -17.51          | Peak     | N    | Pass    |
| 3*  | 0.726           | 33.78          | 10.31       | 56.00        | -22.22          | QP       | N    | Pass    |
| 3** | 0.726           | 37.70          | 10.31       | 46.00        | -8.30           | AV       | N    | Pass    |
| 4   | 1.252           | 35.32          | 10.19       | 56.00        | -20.68          | Peak     | N    | Pass    |
| 4*  | 1.252           | 26.57          | 10.19       | 56.00        | -29.43          | QP       | N    | Pass    |
| 4** | 1.252           | 36.84          | 10.19       | 46.00        | -9.16           | AV       | N    | Pass    |
| 5   | 1.796           | 33.25          | 10.17       | 56.00        | -22.75          | Peak     | N    | Pass    |
| 5*  | 1.796           | 26.36          | 10.17       | 56.00        | -29.64          | QP       | N    | Pass    |
| 5** | 1.796           | 35.00          | 10.17       | 46.00        | -11.00          | AV       | N    | Pass    |
| 6   | 19.638          | 37.20          | 10.91       | 60.00        | -22.80          | Peak     | N    | Pass    |
| 6*  | 19.638          | 33.66          | 10.91       | 60.00        | -26.34          | QP       | N    | Pass    |
| 6** | 19.638          | 31.94          | 10.91       | 50.00        | -18.06          | AV       | N    | Pass    |

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## 5 Appendixes

### 5.1 Photographs of the Sample



All of the sample



Front of the sample



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Rear of the sample



Left of the sample



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Right of the sample



Top of the sample

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Bottom of the sample

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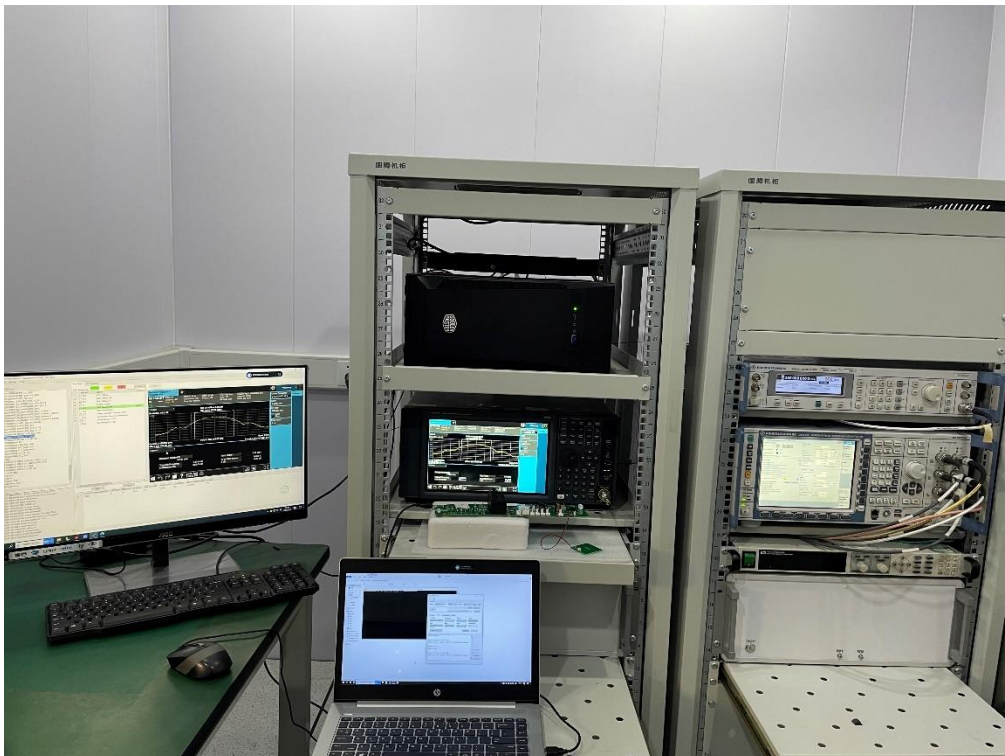
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## 5.2 Set-up for Conducted Emission on AC Mains



## 5.3 Set-up for Conducted RF test at Antenna Port





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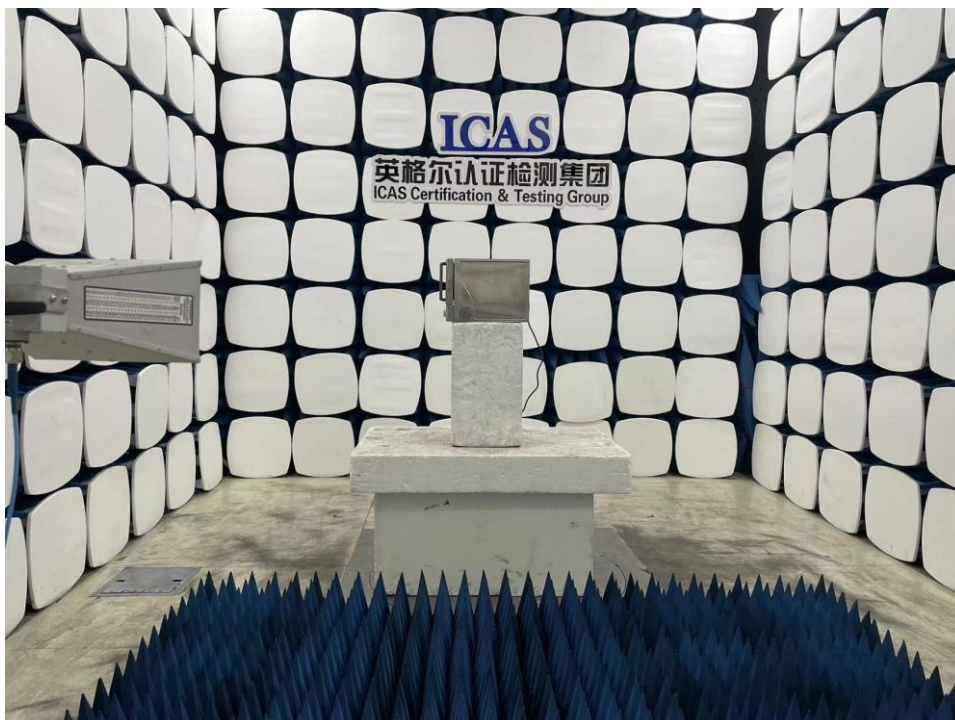
## 5.4 Set-up for Radiated Spurious Emission below 1GHz

30MHz-1GHz



## 5.5 Set-up for Radiated Spurious Emission above 1GHz

1GHz-18GHz



\*\*\*End of the report\*\*\*