

Appendix A

RF Test Data for BT (Conducted Measurement)

Product Name: Wear Bluetooth Earphones on the Head

Test Model: Quantum Elite

Environmental Conditions

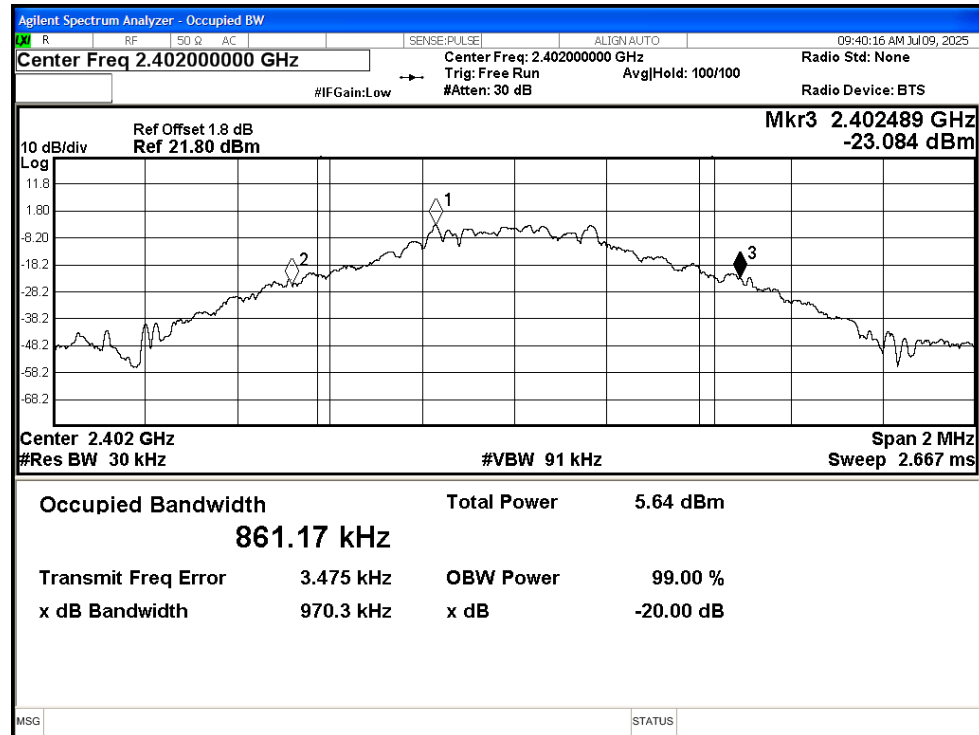
|                    |           |
|--------------------|-----------|
| Temperature:       | 23.8°C    |
| Relative Humidity: | 52.5%     |
| ATM Pressure:      | 100.0 kPa |
| Test Engineer:     | Jerry Chu |
| Supervised by:     | Nick Peng |

## A.1 -20dB Bandwidth

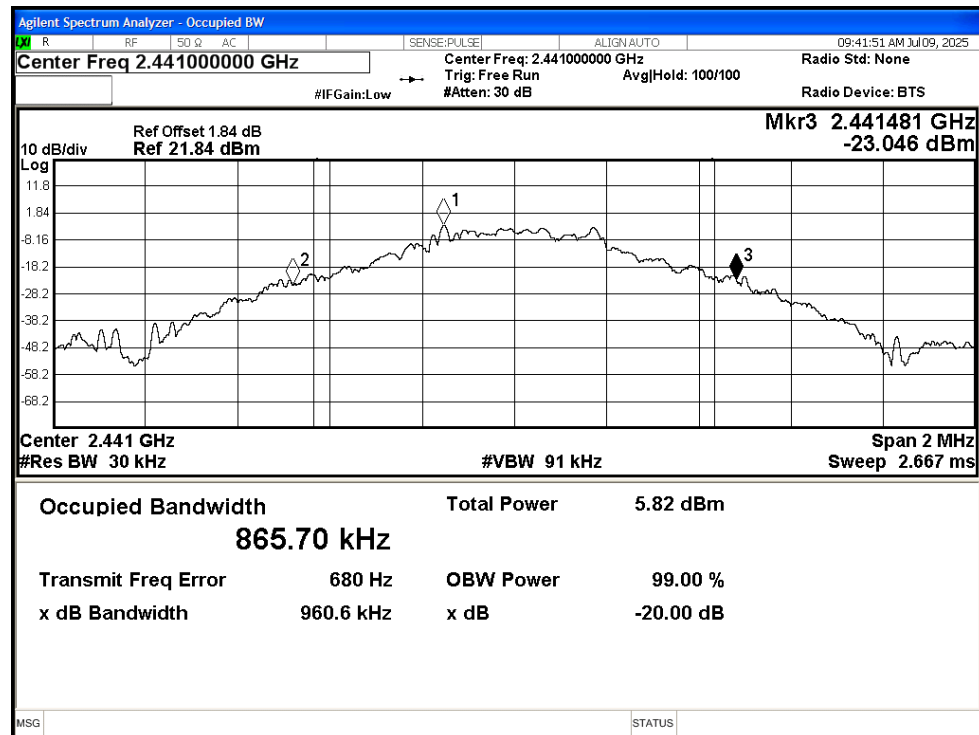
| Condition | Mode  | Frequency (MHz) | Antenna | -20 dB Bandwidth (MHz) | Limit -20 dB Bandwidth (MHz) | Verdict |
|-----------|-------|-----------------|---------|------------------------|------------------------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant     | 0.97                   | N/A                          | Pass    |
| NVNT      | 1-DH5 | 2441            | Ant     | 0.961                  | N/A                          | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | 0.986                  | N/A                          | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | 1.283                  | N/A                          | Pass    |
| NVNT      | 2-DH5 | 2441            | Ant     | 1.316                  | N/A                          | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | 1.285                  | N/A                          | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | 1.287                  | N/A                          | Pass    |
| NVNT      | 3-DH5 | 2441            | Ant     | 1.3                    | N/A                          | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | 1.291                  | N/A                          | Pass    |

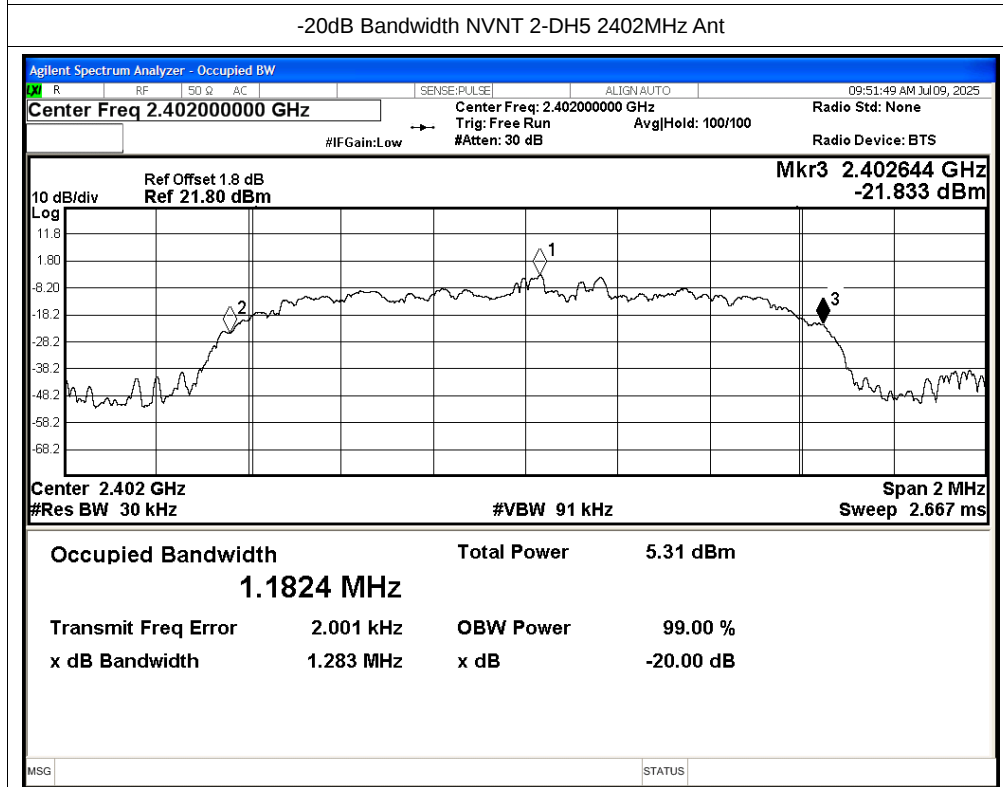
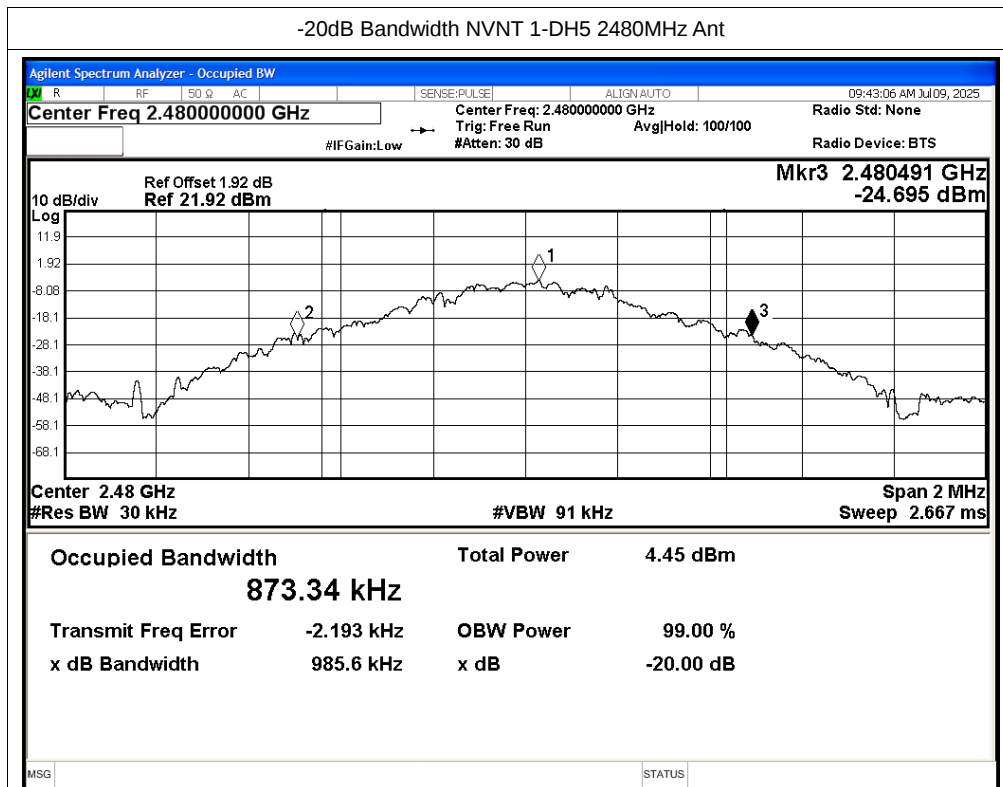
## Test Graphs

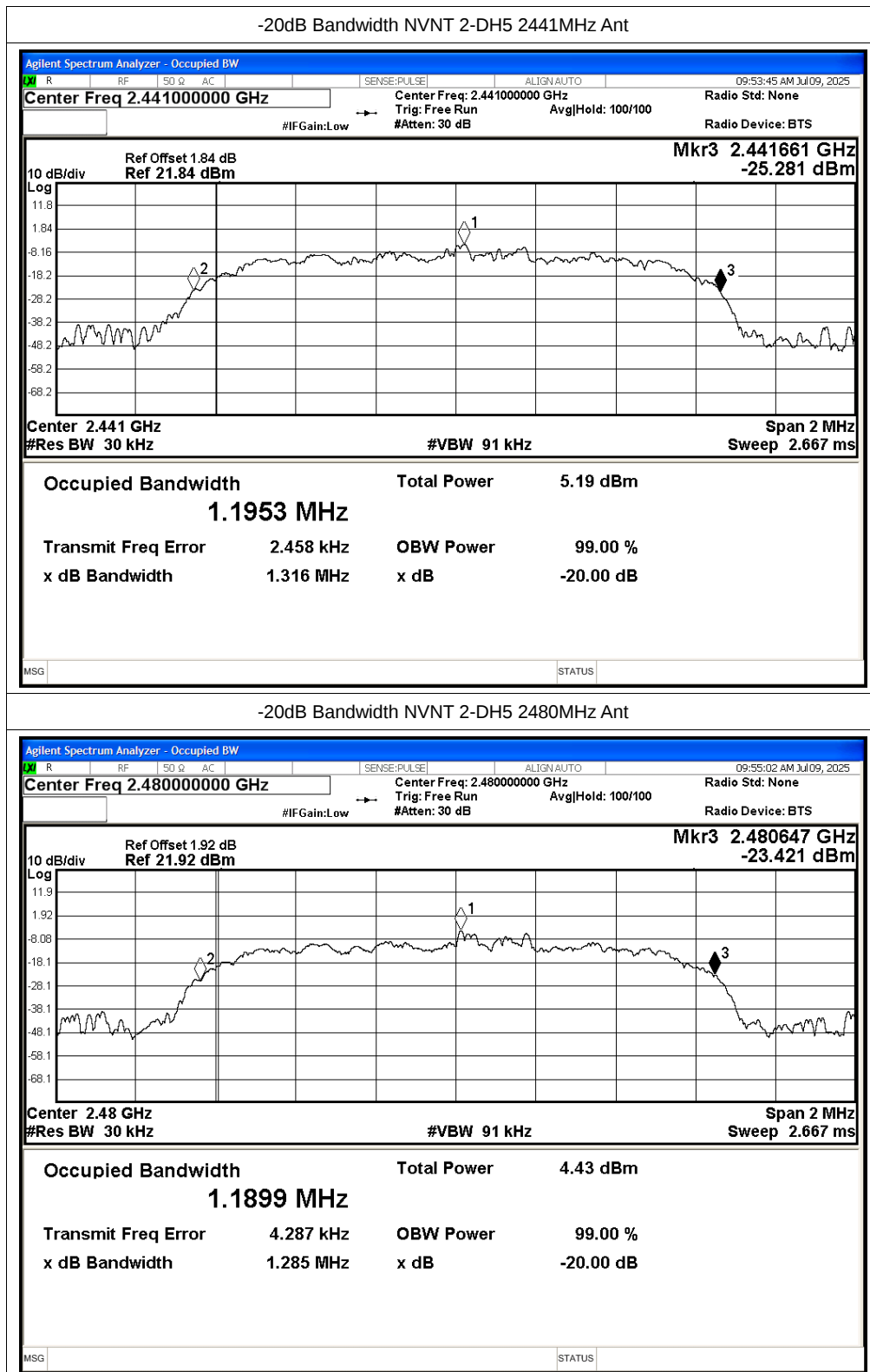
-20dB Bandwidth NVNT 1-DH5 2402MHz Ant

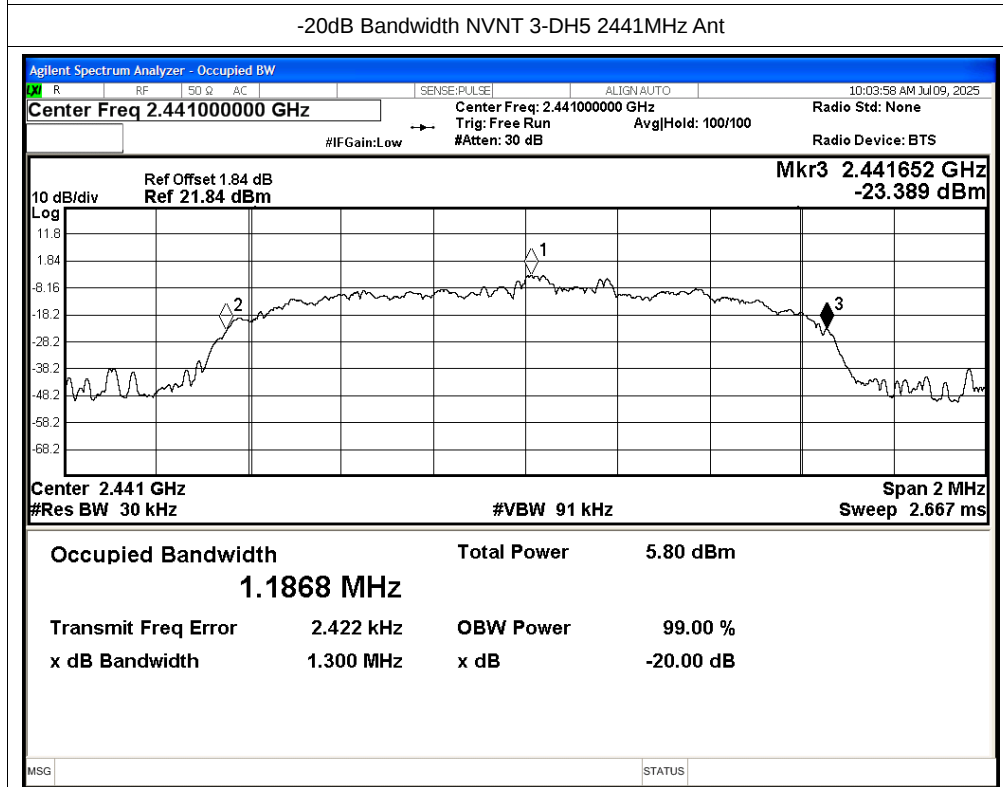
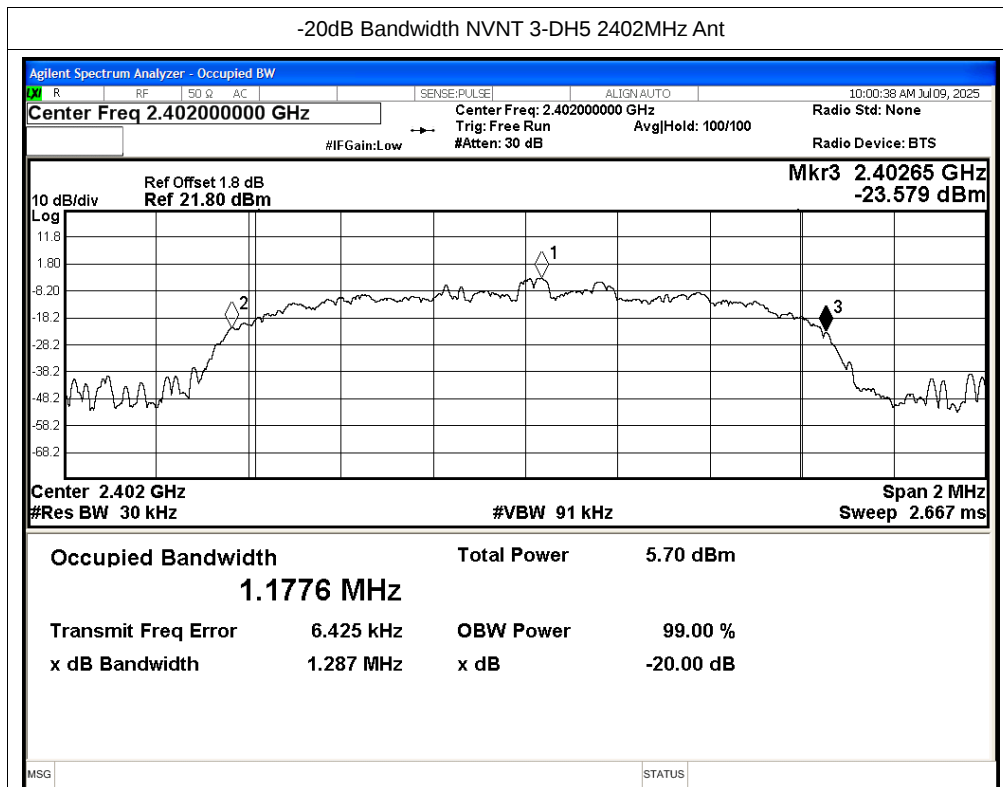


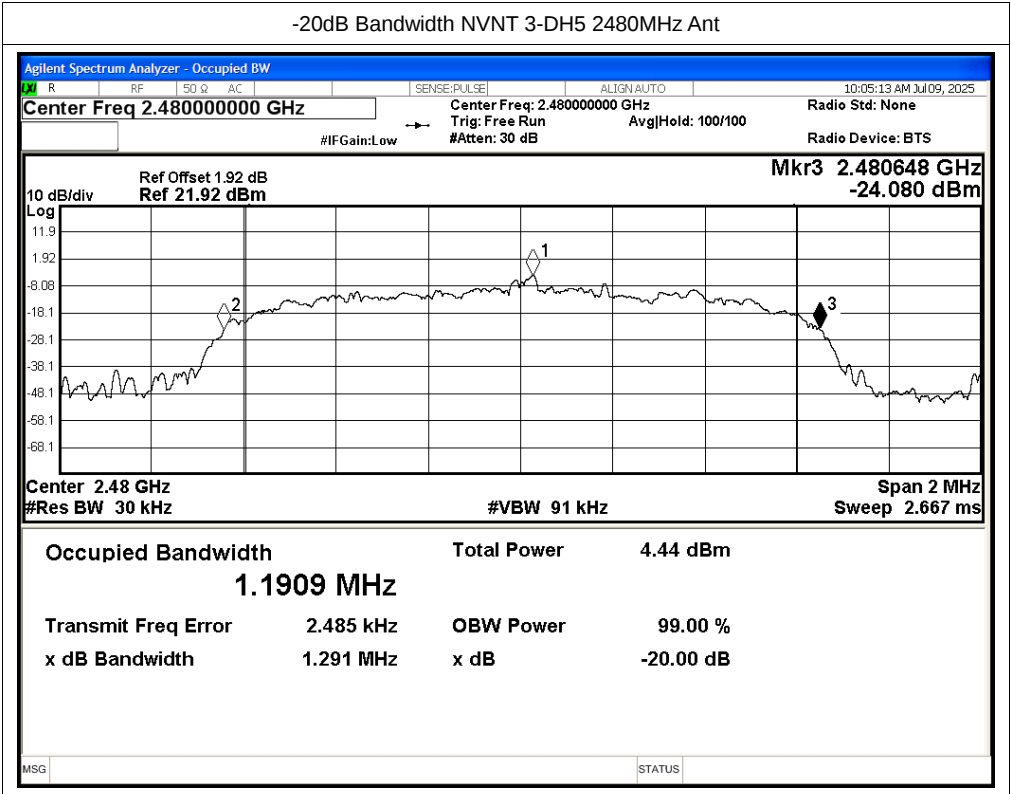
-20dB Bandwidth NVNT 1-DH5 2441MHz Ant









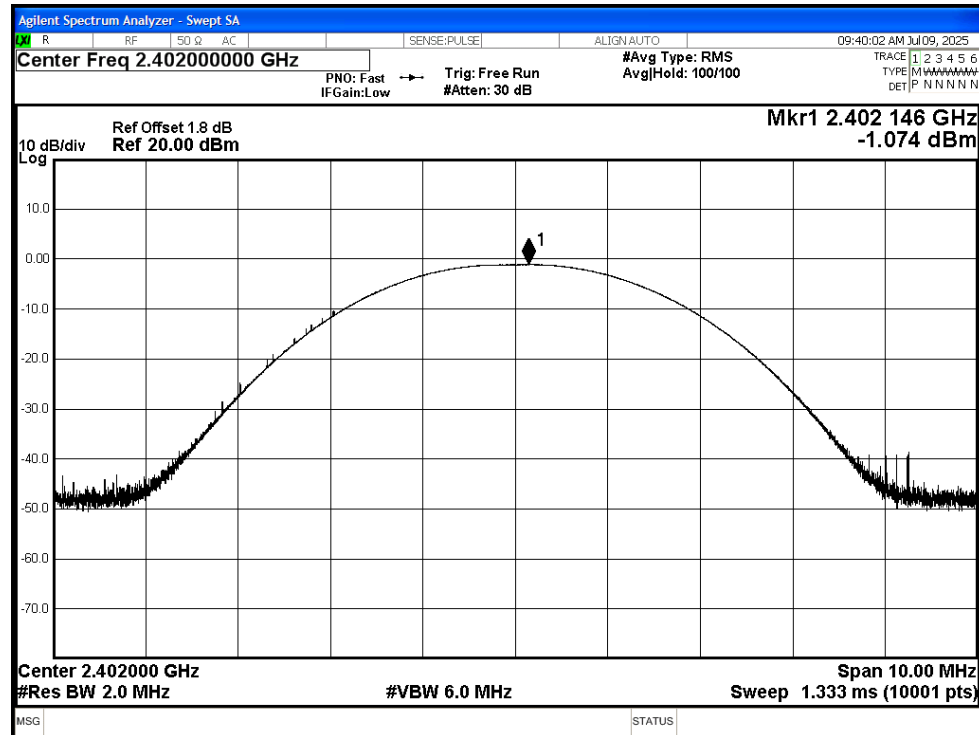


## A.2 Maximum Peak Conducted Output Power

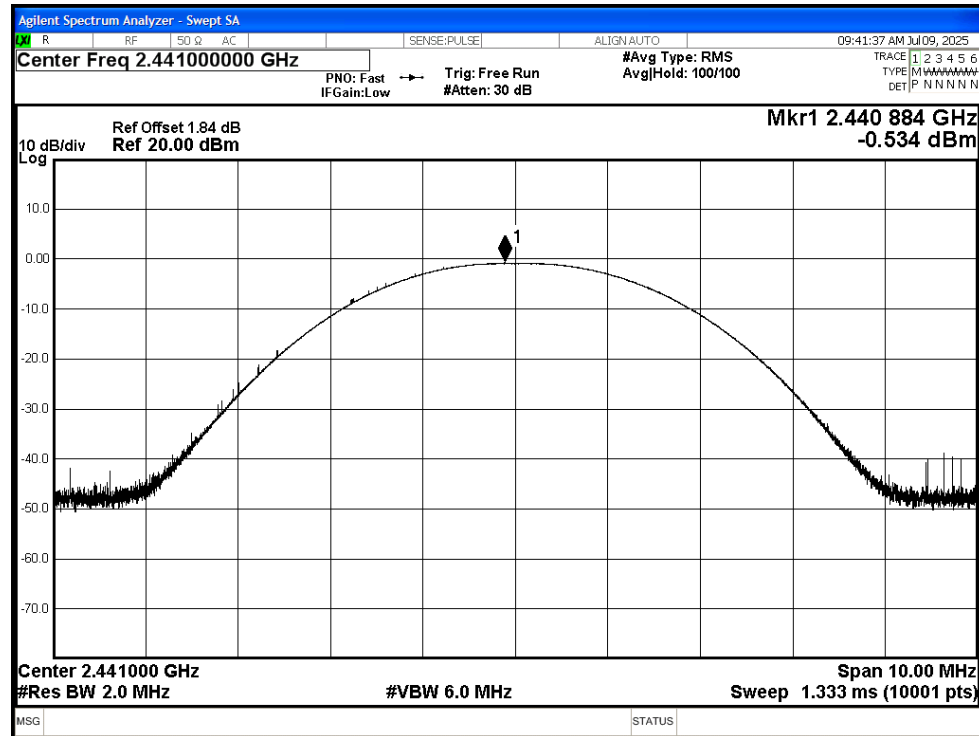
| Condition | Mode  | Frequency (MHz) | Antenna | Conducted Power (dBm) | Limit (dBm) | Verdict |
|-----------|-------|-----------------|---------|-----------------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant     | -1.07                 | 21          | Pass    |
| NVNT      | 1-DH5 | 2441            | Ant     | -0.53                 | 21          | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | -1.68                 | 21          | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | 0.84                  | 21          | Pass    |
| NVNT      | 2-DH5 | 2441            | Ant     | 1.2                   | 21          | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | 0.07                  | 21          | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | 1.32                  | 21          | Pass    |
| NVNT      | 3-DH5 | 2441            | Ant     | 1.62                  | 21          | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | 0.47                  | 21          | Pass    |

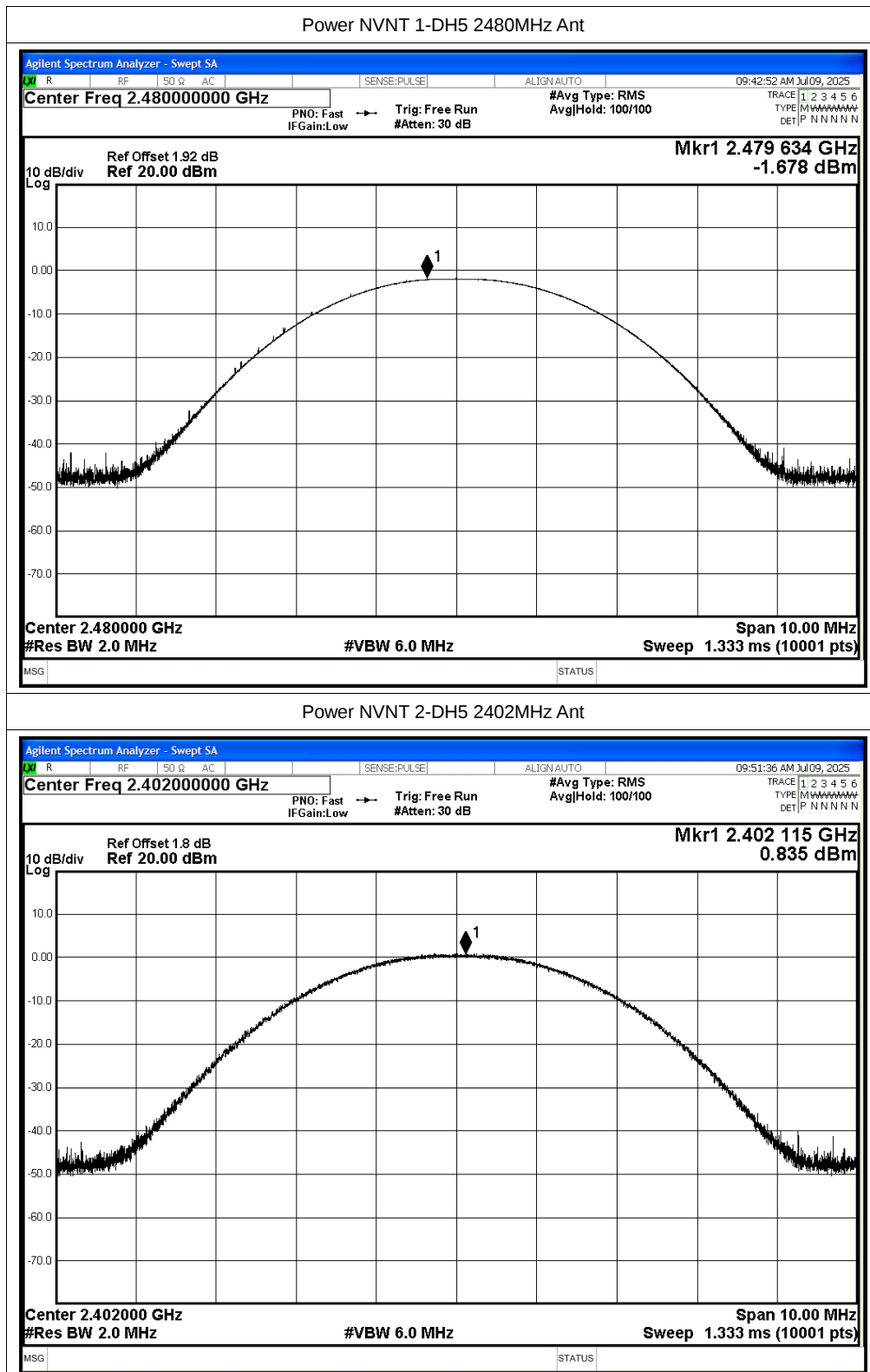
## Test Graphs

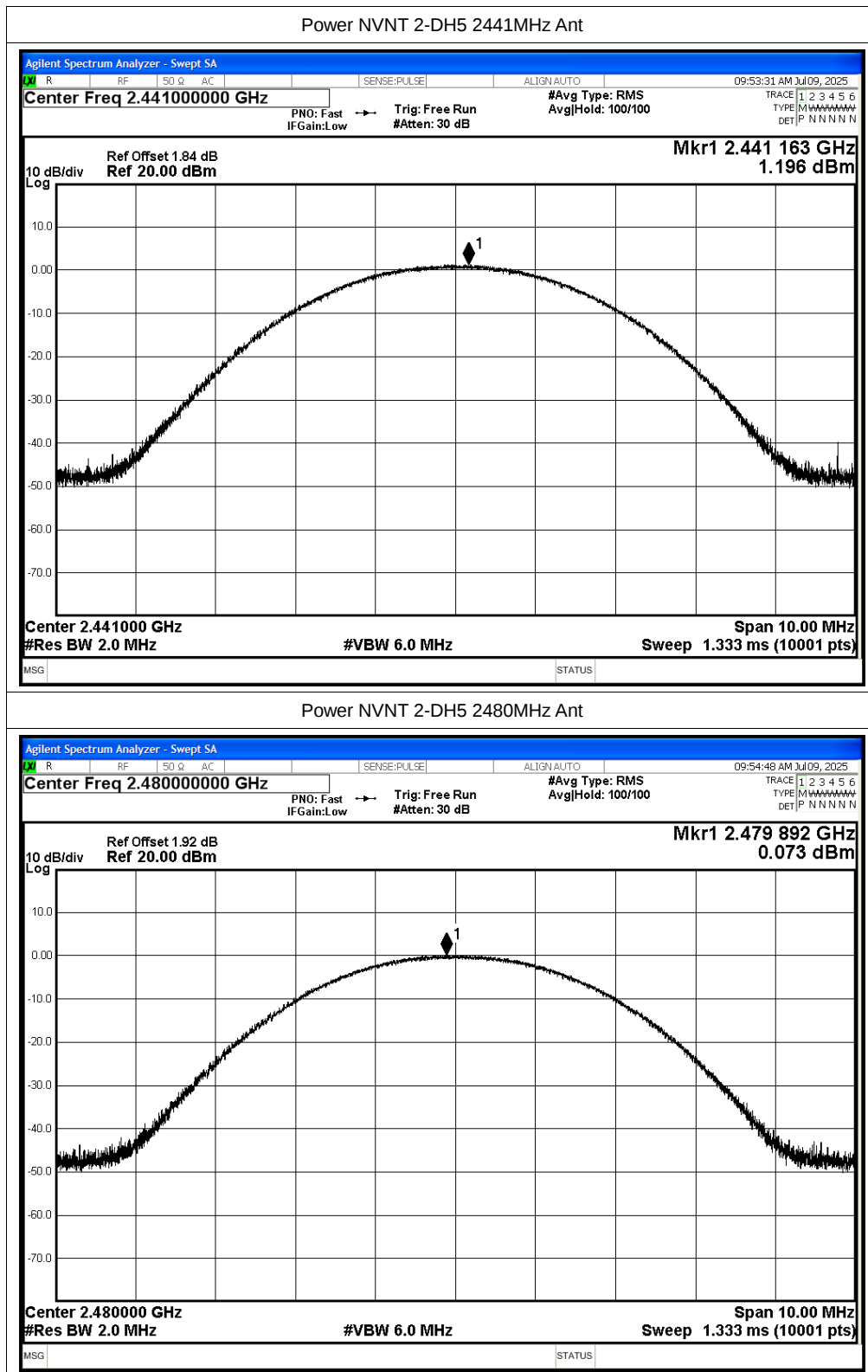
## Power NVNT 1-DH5 2402MHz Ant

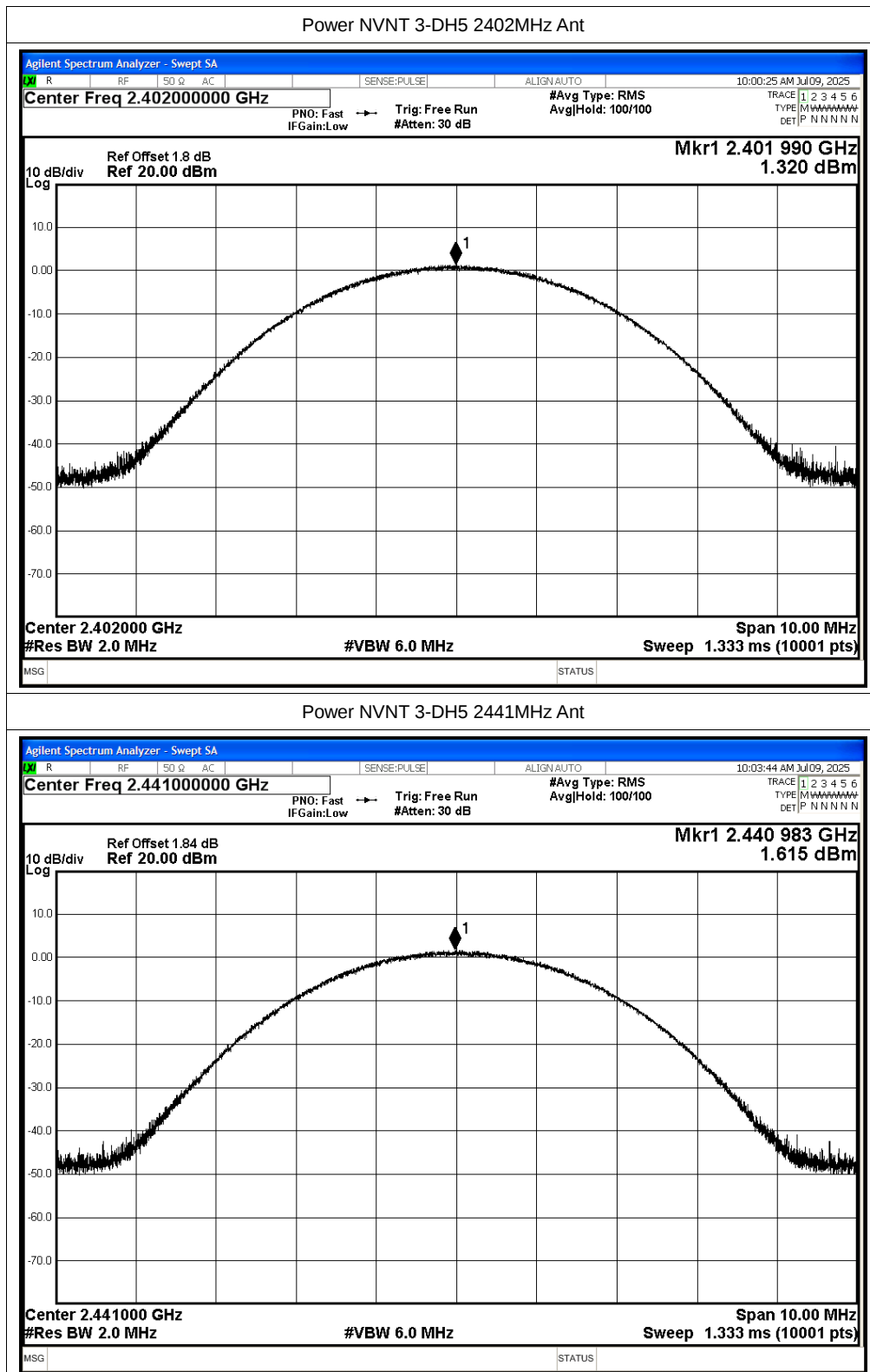


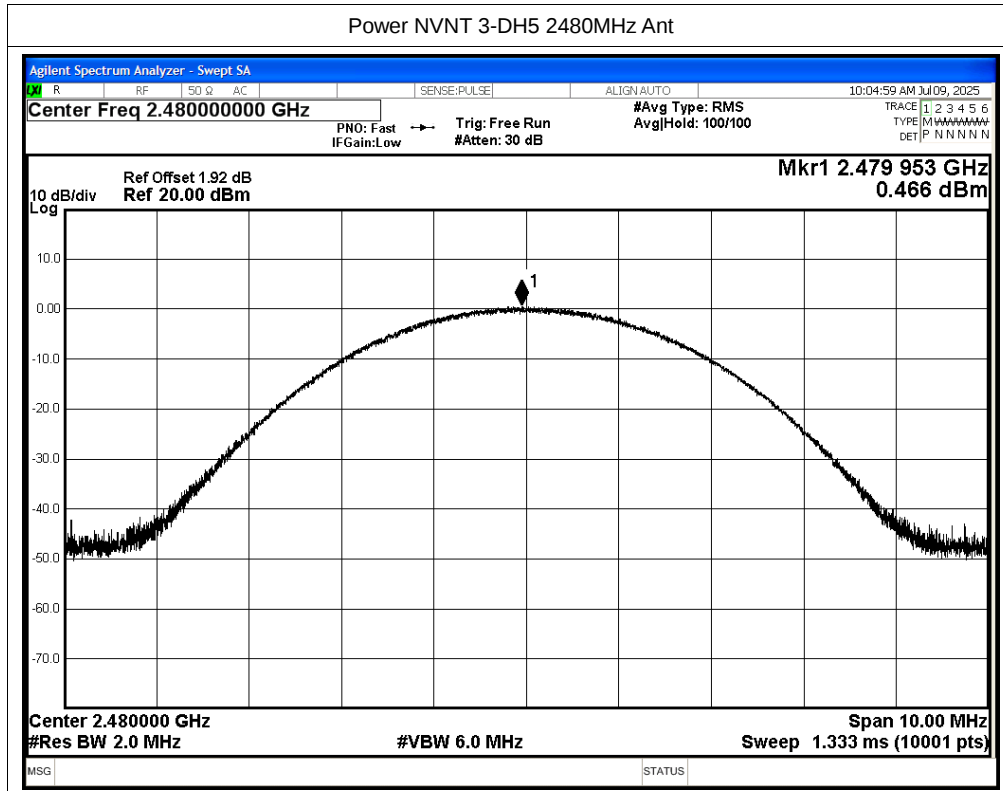
## Power NVNT 1-DH5 2441MHz Ant





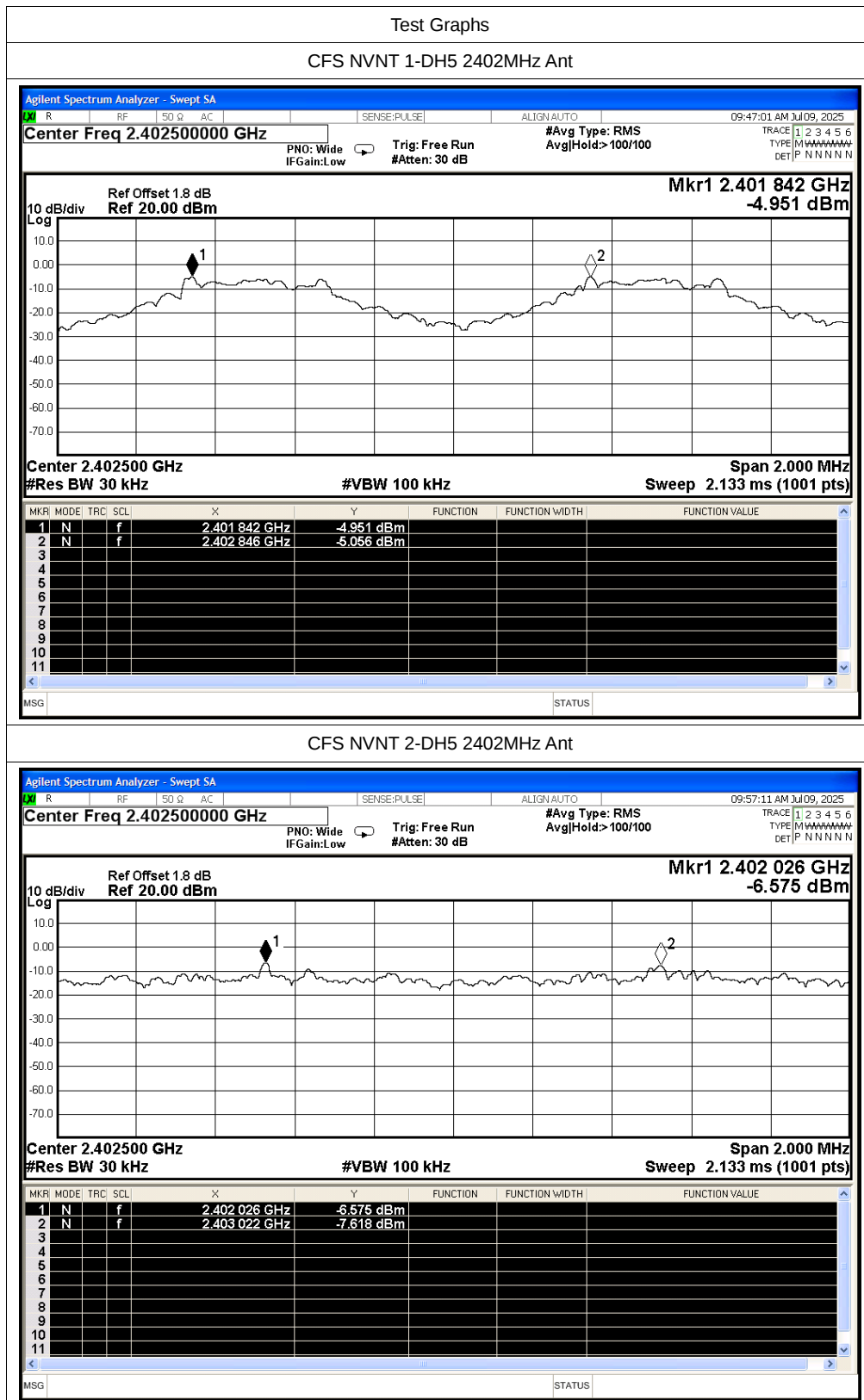


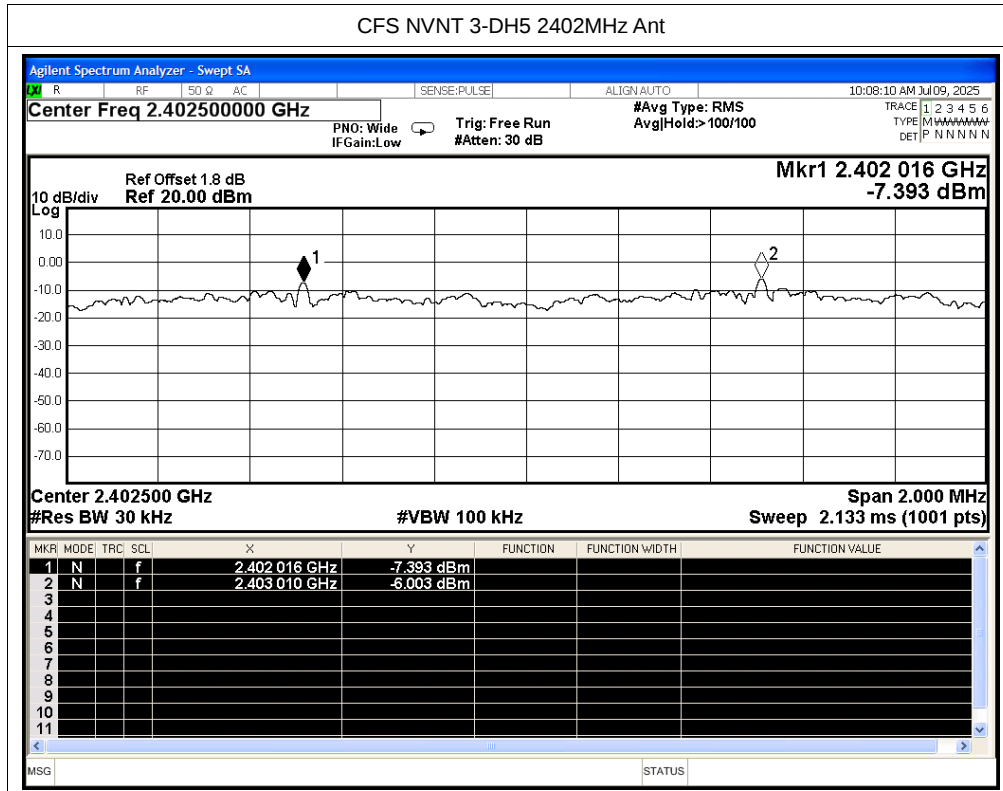




## A.3 Carrier Frequencies Separation

| Condition | Mode  | Antenna | Hopping Freq1 (MHz) | Hopping Freq2 (MHz) | HFS (MHz) | Limit (MHz) | Verdict |
|-----------|-------|---------|---------------------|---------------------|-----------|-------------|---------|
| NVNT      | 1-DH5 | Ant     | 2401.842            | 2402.846            | 1.004     | 0.657       | Pass    |
| NVNT      | 2-DH5 | Ant     | 2402.026            | 2403.022            | 0.996     | 0.877       | Pass    |
| NVNT      | 3-DH5 | Ant     | 2402.016            | 2403.01             | 0.994     | 0.867       | Pass    |



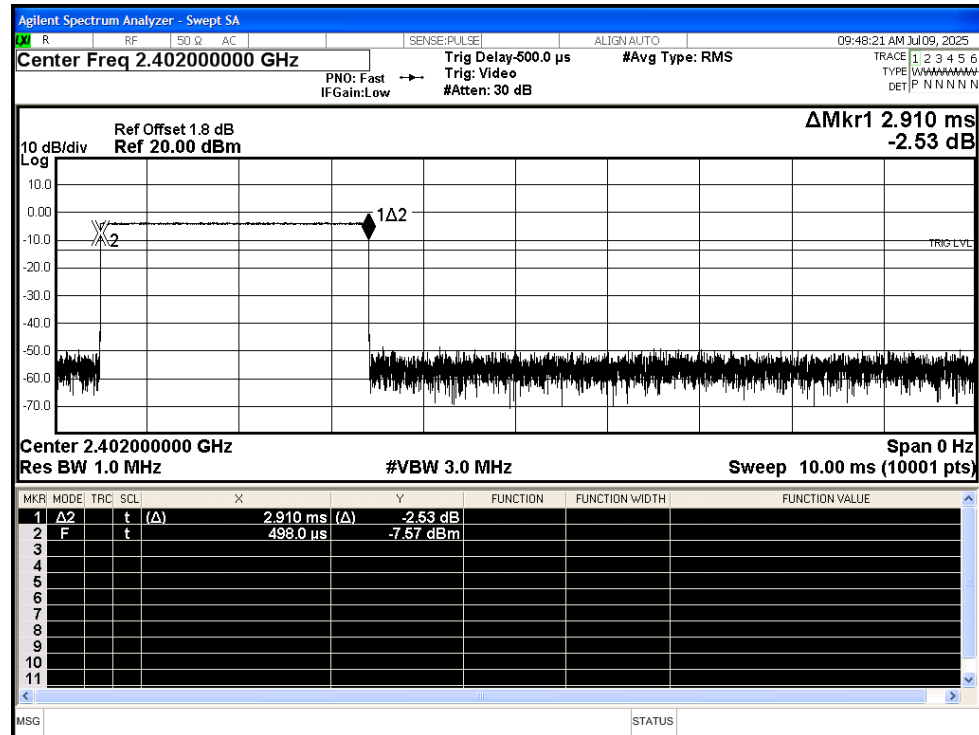


## A.4 Dwell Time

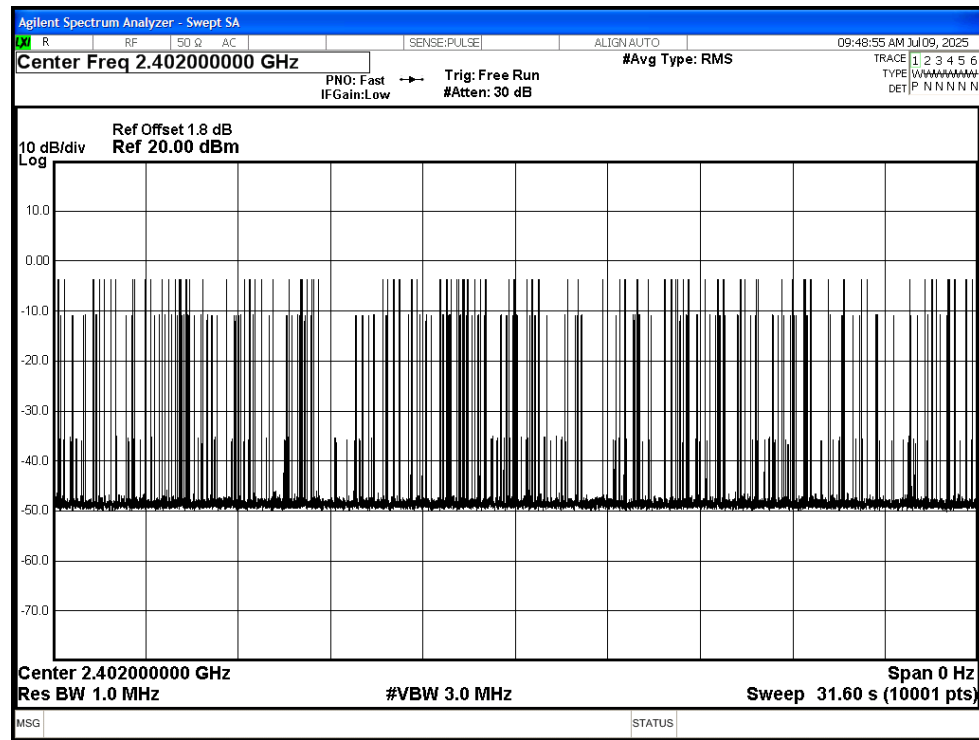
| Condition | Mode  | Frequency<br>(MHz) | Antenna | Pulse Time<br>(ms) | Total Dwell<br>Time (ms) | Burst<br>Count | Period Time<br>(ms) | Limit<br>(ms) | Verdict |
|-----------|-------|--------------------|---------|--------------------|--------------------------|----------------|---------------------|---------------|---------|
| NVNT      | 1-DH5 | 2402               | Ant     | 2.91               | 328.83                   | 113            | 31600               | 400           | Pass    |
| NVNT      | 2-DH5 | 2402               | Ant     | 2.898              | 318.78                   | 110            | 31600               | 400           | Pass    |
| NVNT      | 3-DH5 | 2402               | Ant     | 2.897              | 304.185                  | 105            | 31600               | 400           | Pass    |

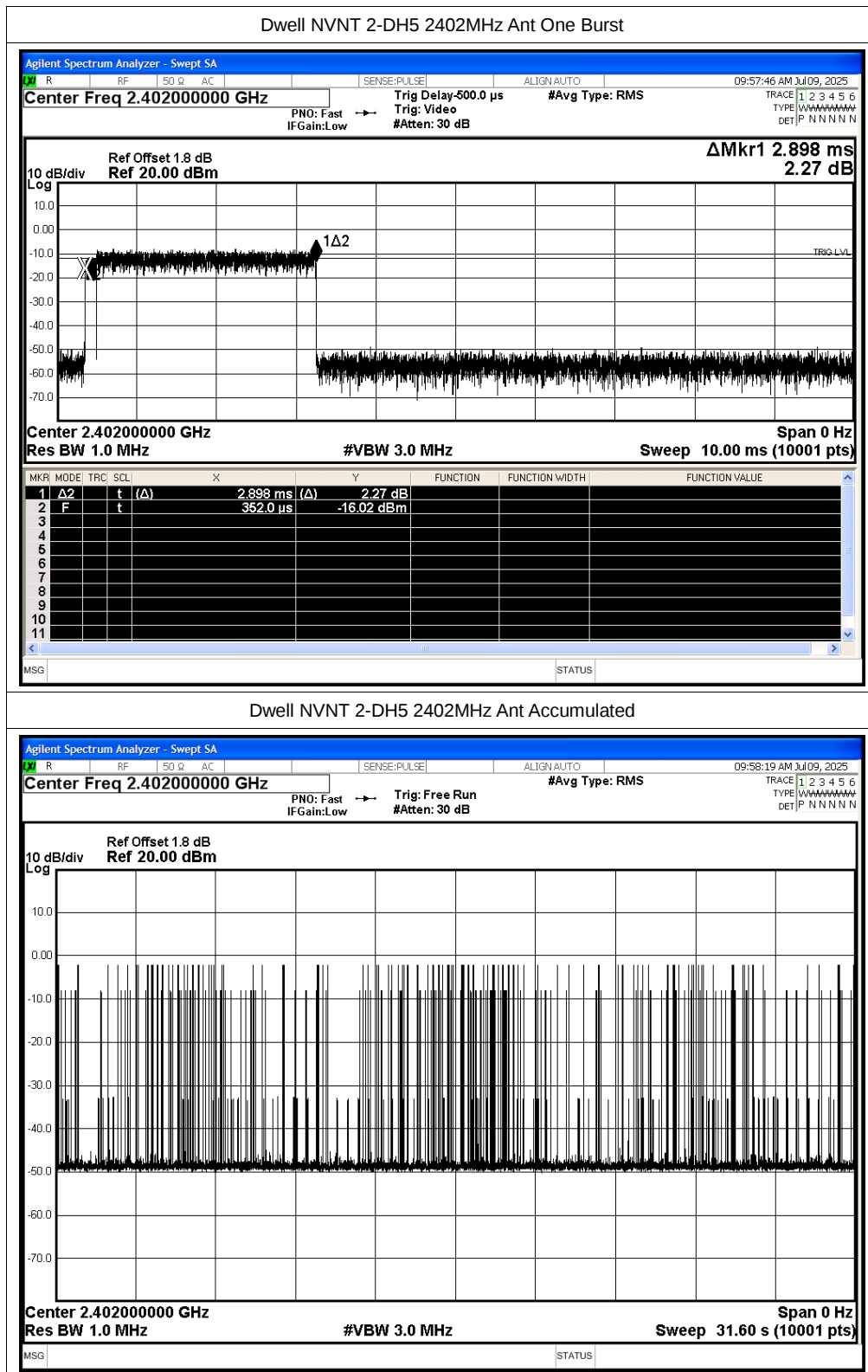
## Test Graphs

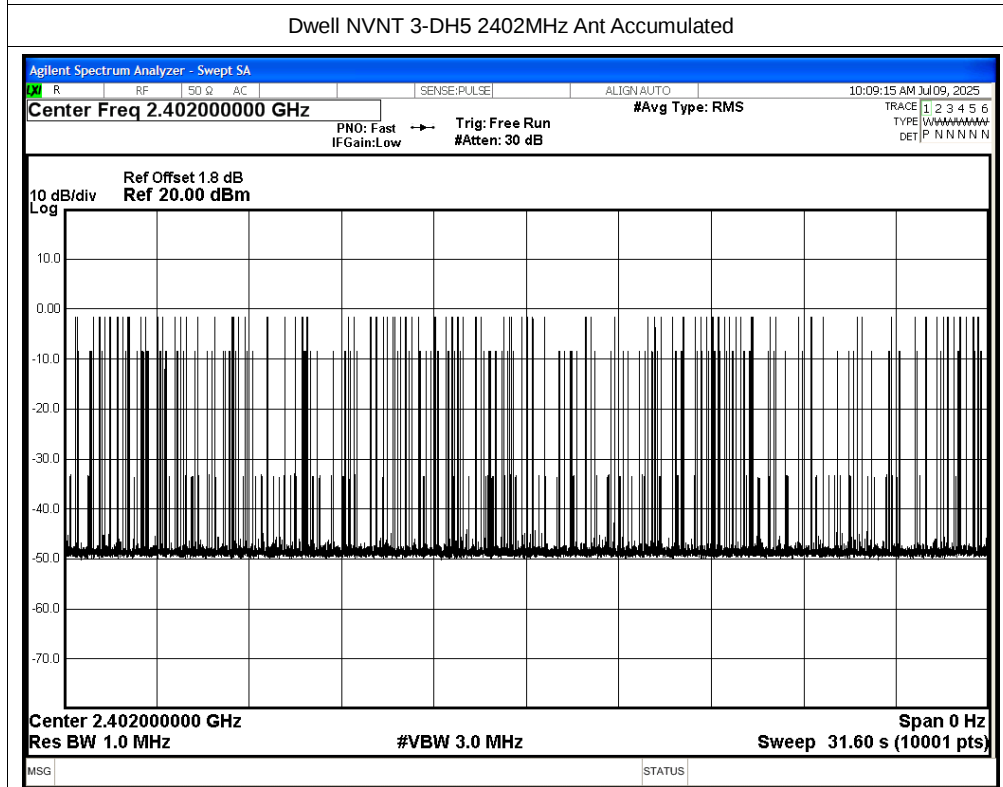
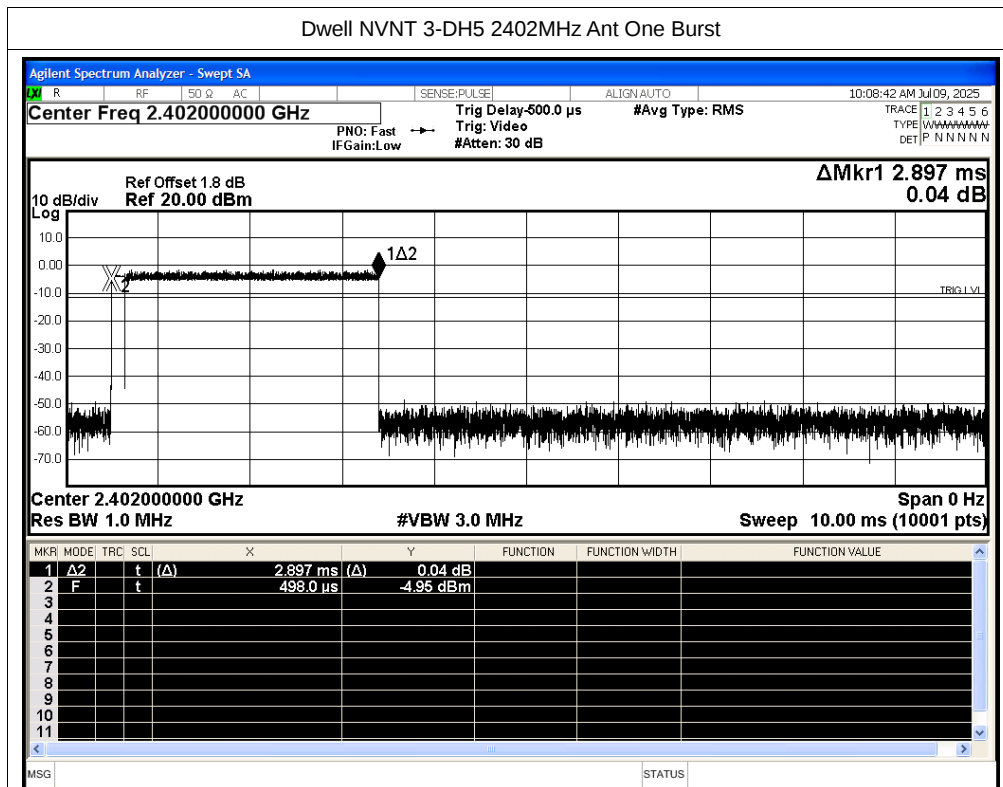
## Dwell NVNT 1-DH5 2402MHz Ant One Burst



## Dwell NVNT 1-DH5 2402MHz Ant Accumulated





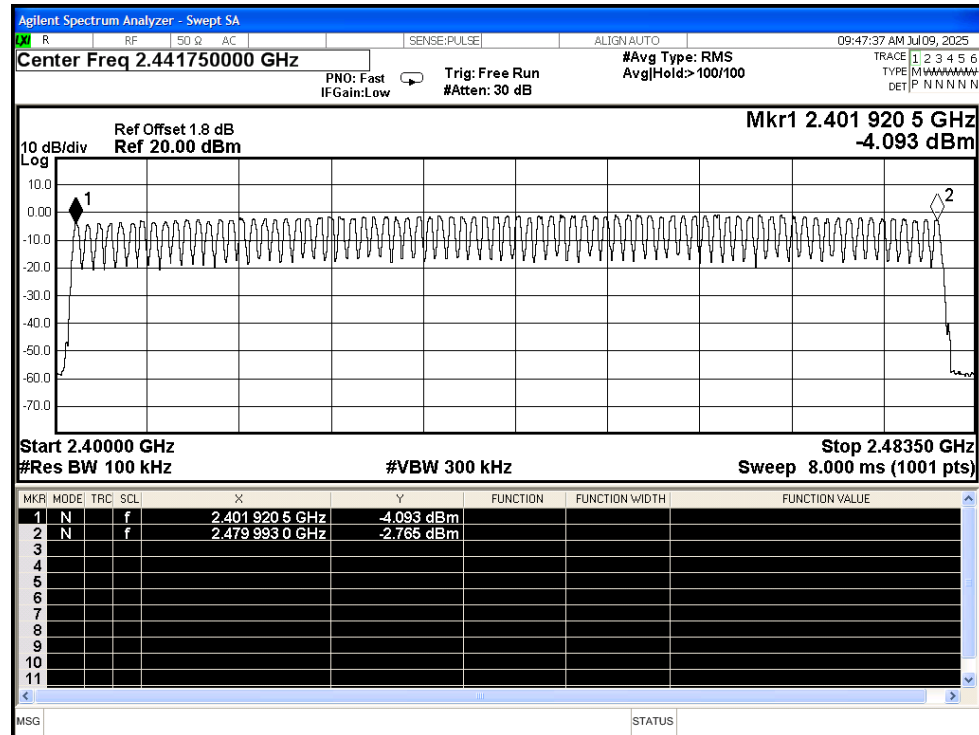


## A.5 Number of Hopping Channel

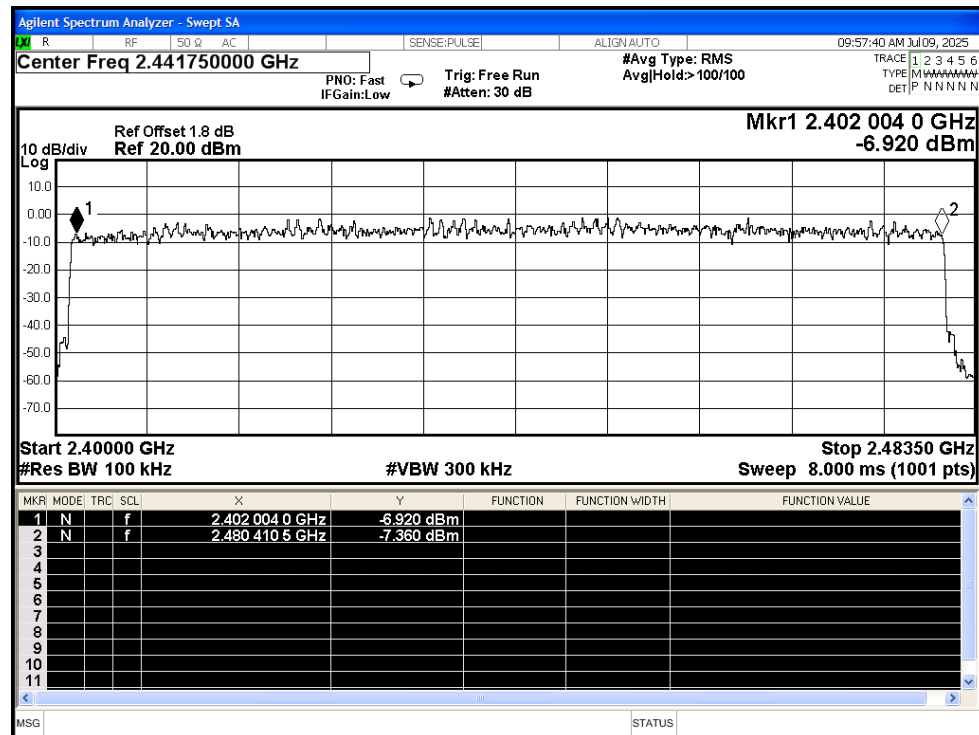
| Condition | Mode  | Antenna | Hopping Number | Limit | Verdict |
|-----------|-------|---------|----------------|-------|---------|
| NVNT      | 1-DH5 | Ant     | 79             | 15    | Pass    |
| NVNT      | 2-DH5 | Ant     | 79             | 15    | Pass    |
| NVNT      | 3-DH5 | Ant     | 79             | 15    | Pass    |

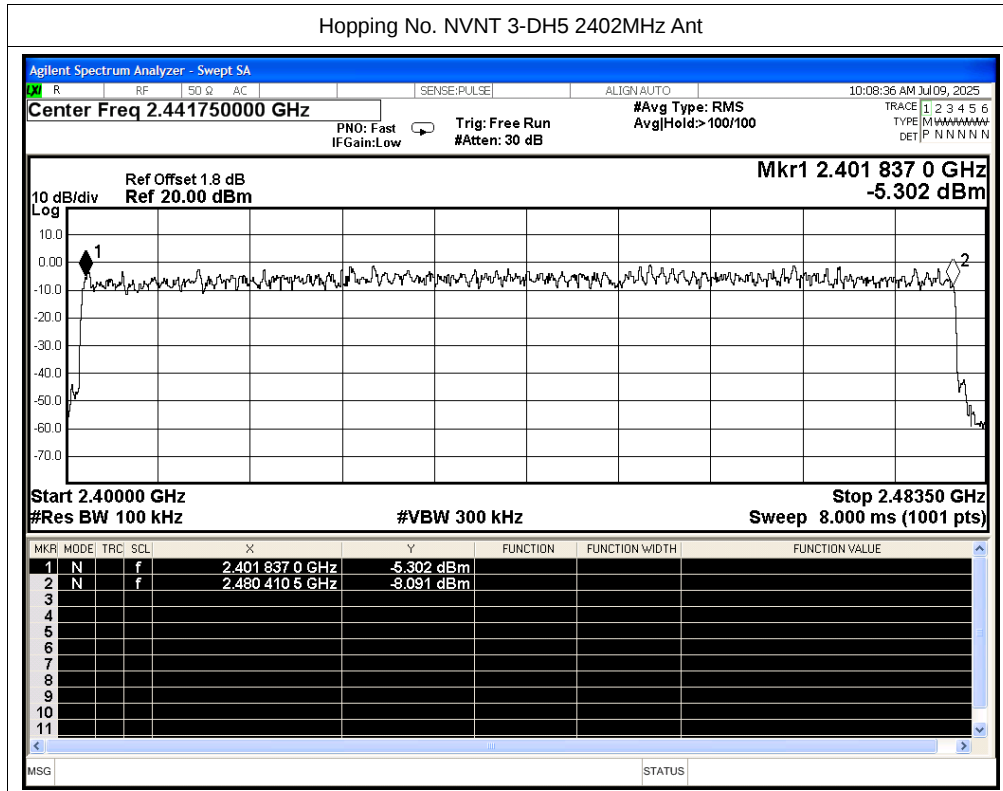
## Test Graphs

Hopping No. NVNT 1-DH5 2402MHz Ant



Hopping No. NVNT 2-DH5 2402MHz Ant



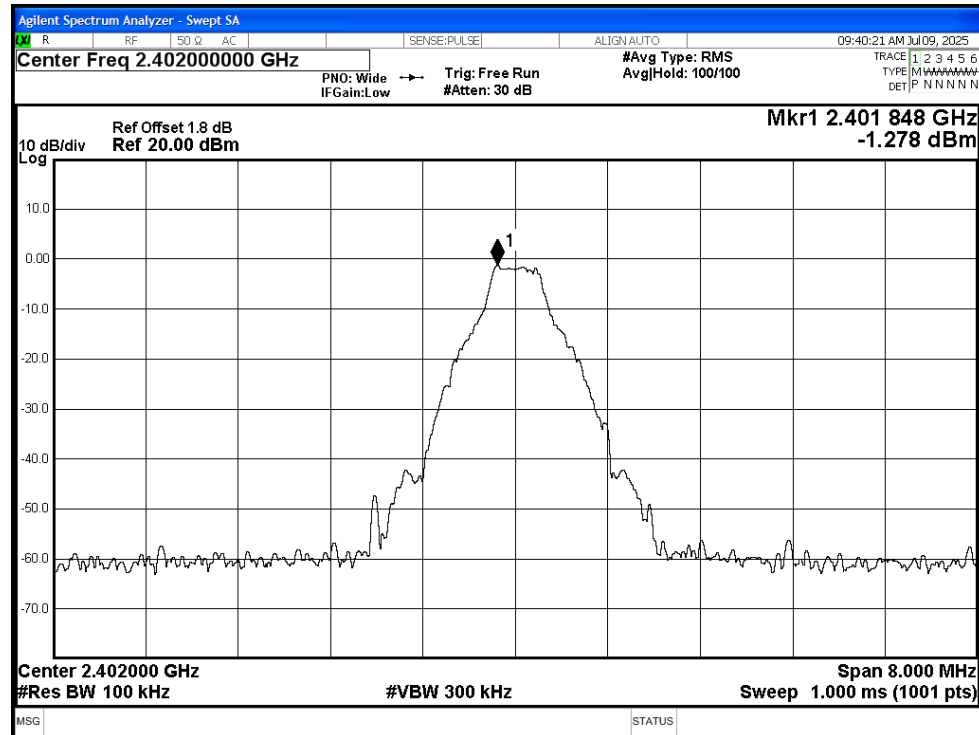


## A.6 Band Edge

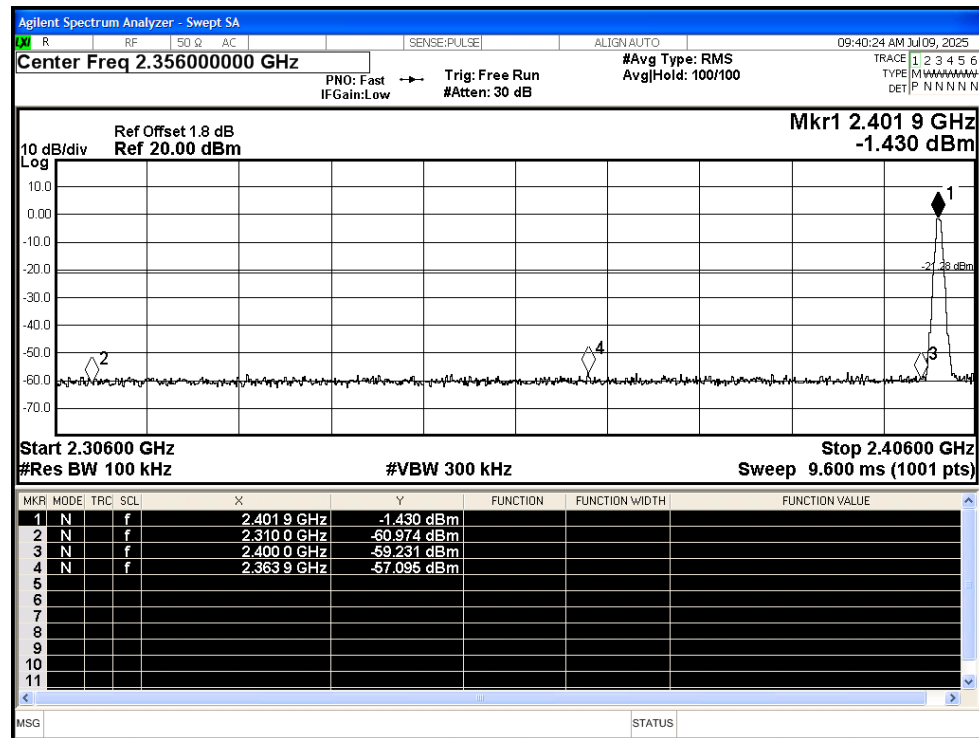
| Condition | Mode  | Frequency (MHz) | Antenna | Hopping Mode | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|-------|-----------------|---------|--------------|-----------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | -55.82          | -20         | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | -55.92          | -20         | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | -51.65          | -20         | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | -55.19          | -20         | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | -52.02          | -20         | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | -52.67          | -20         | Pass    |

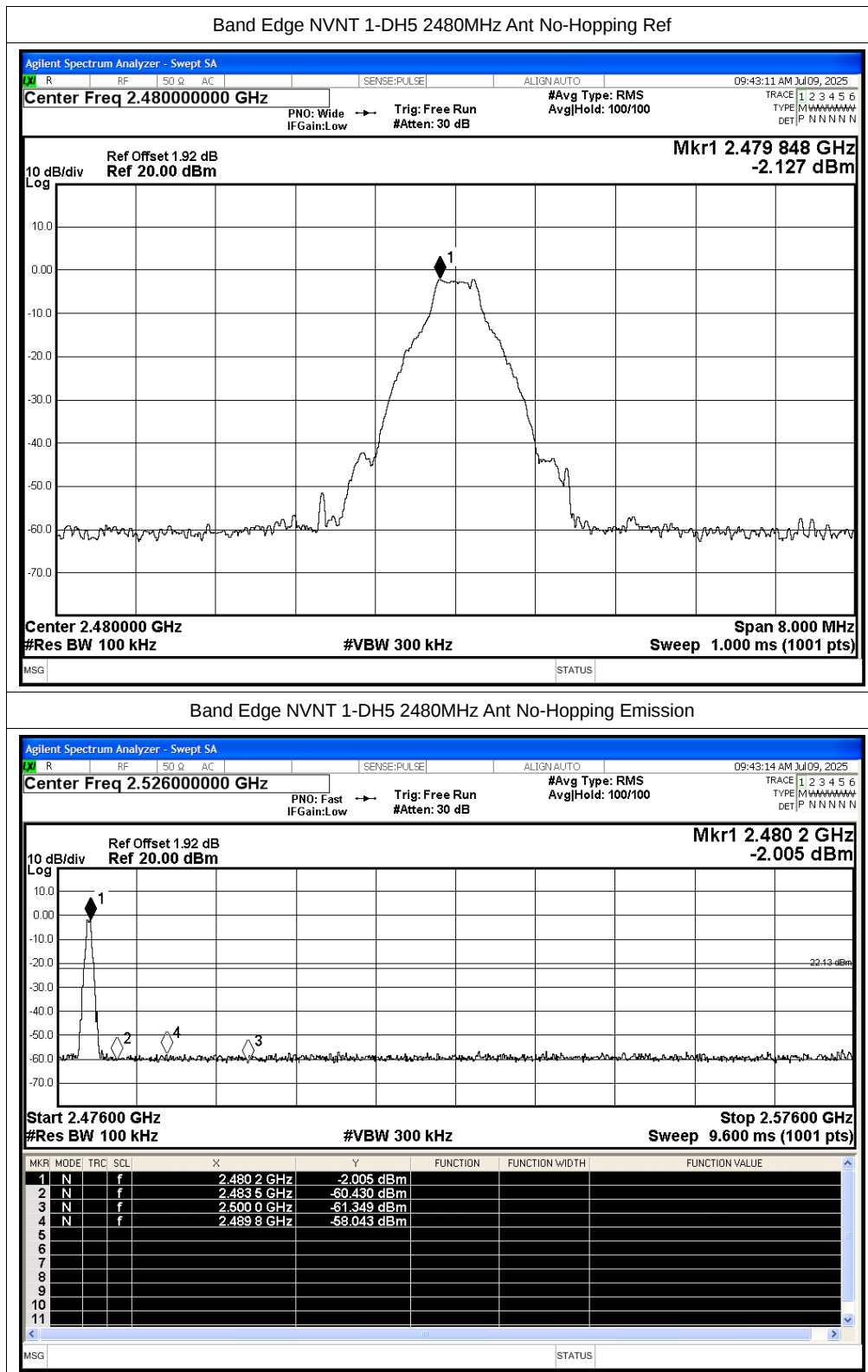
## Test Graphs

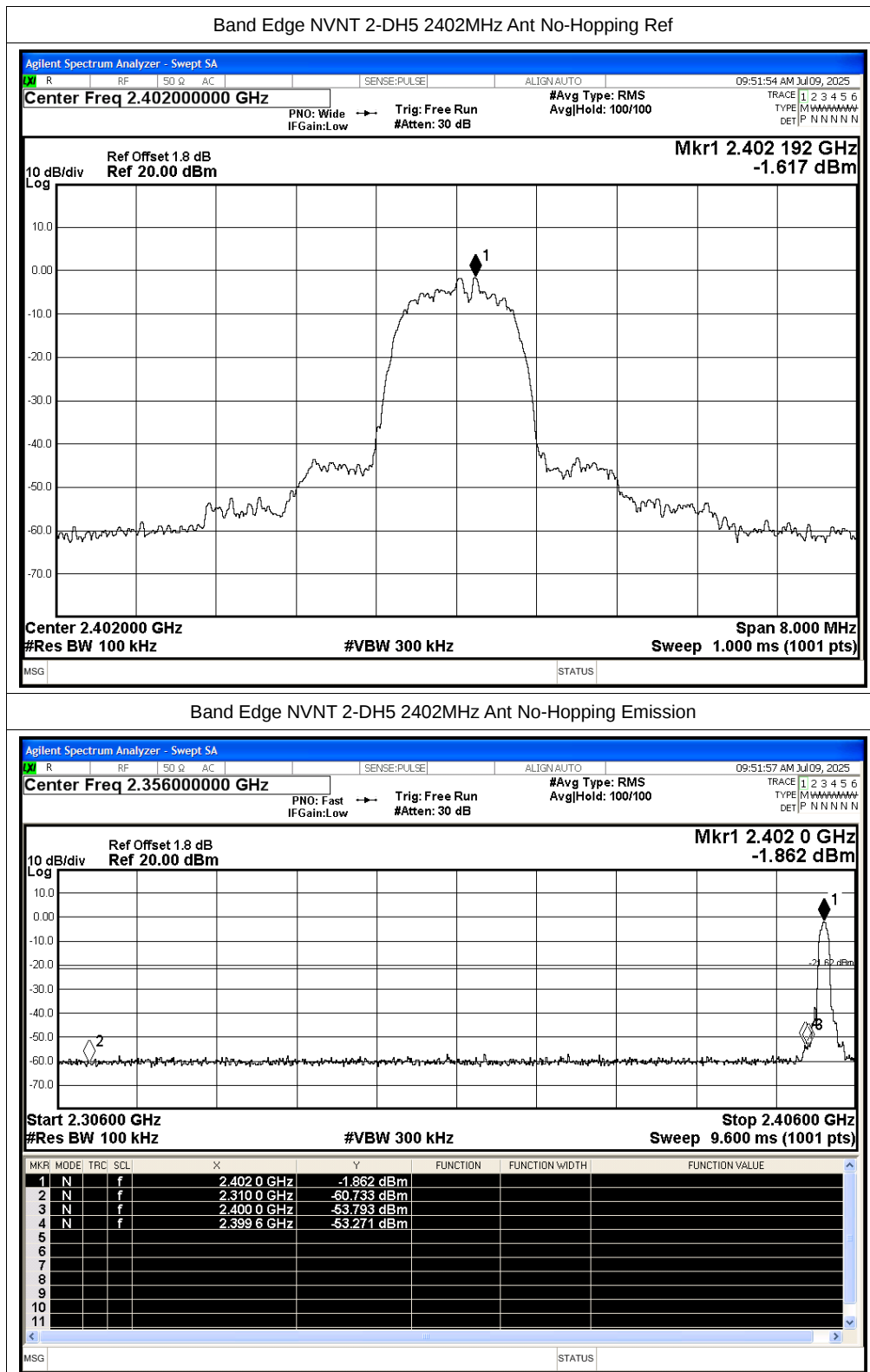
## Band Edge NVNT 1-DH5 2402MHz Ant No-Hopping Ref

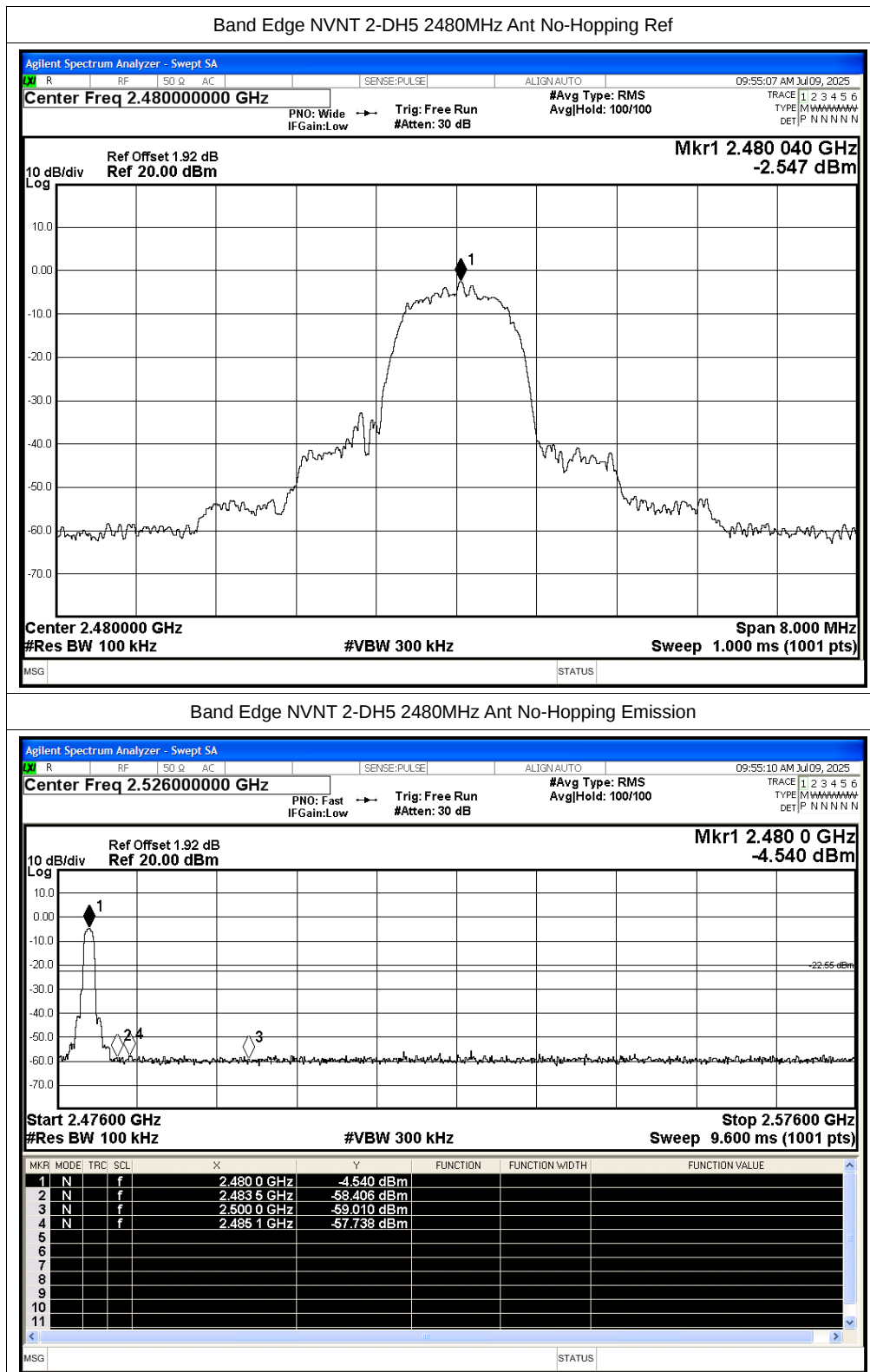


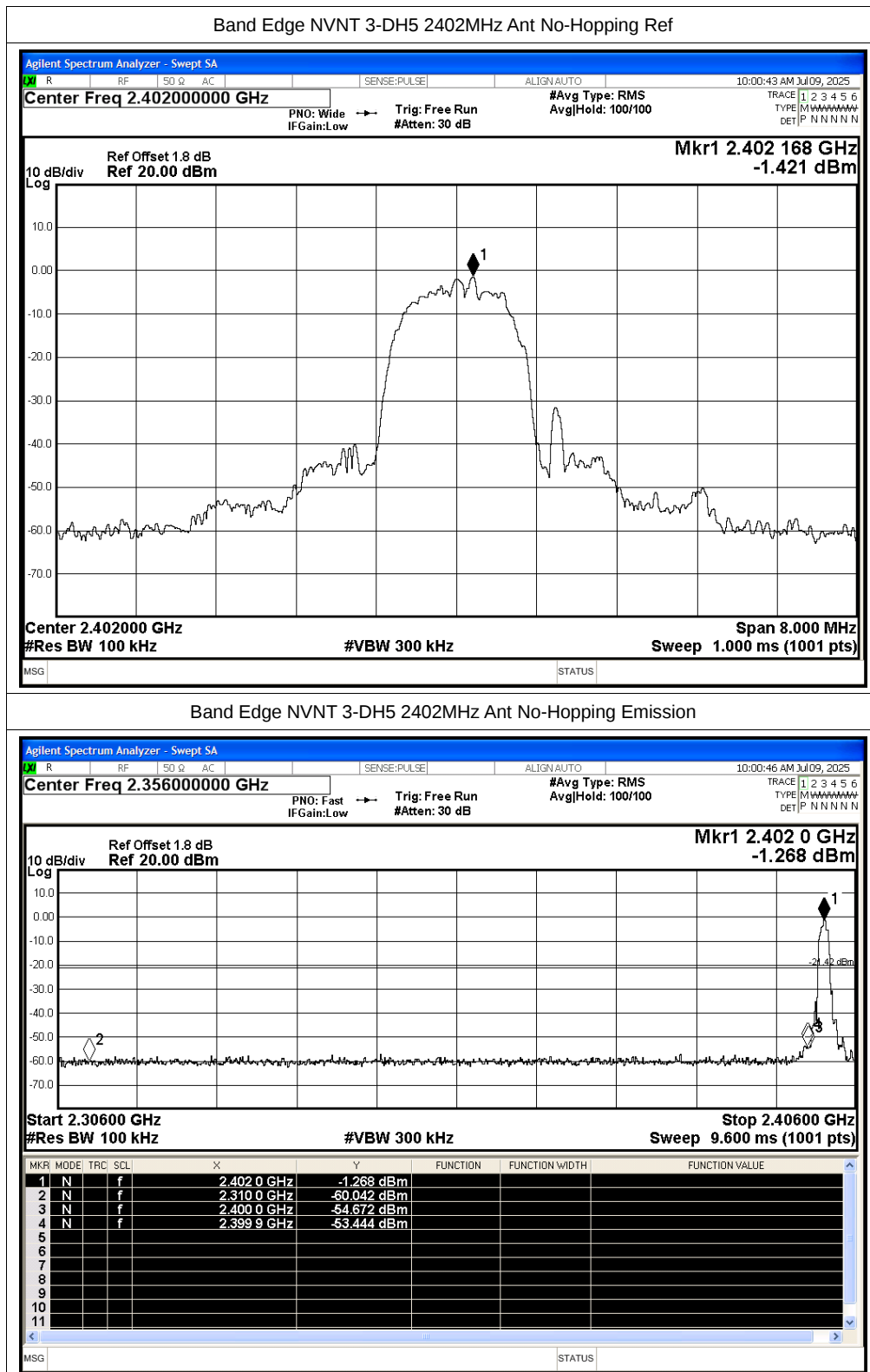
## Band Edge NVNT 1-DH5 2402MHz Ant No-Hopping Emission

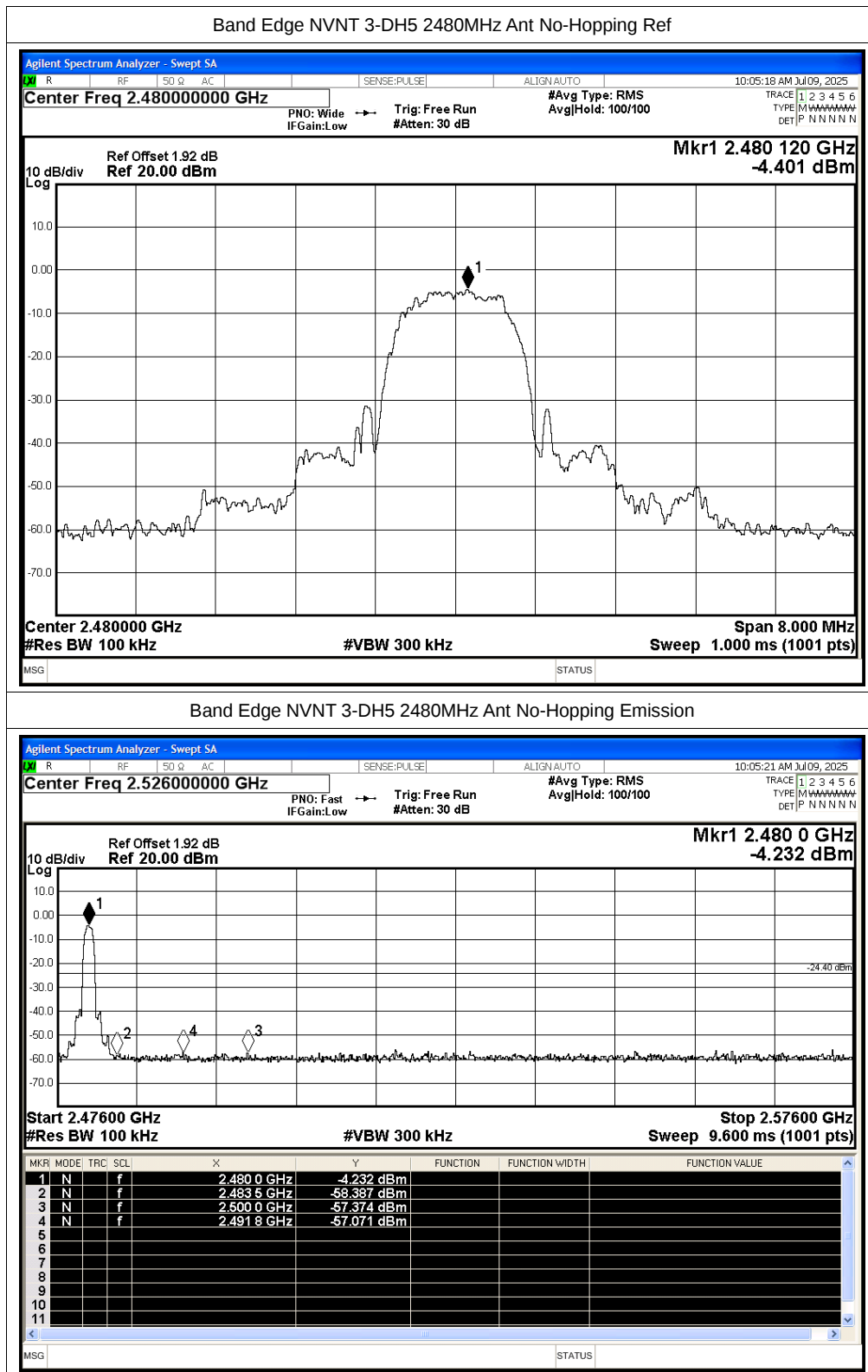










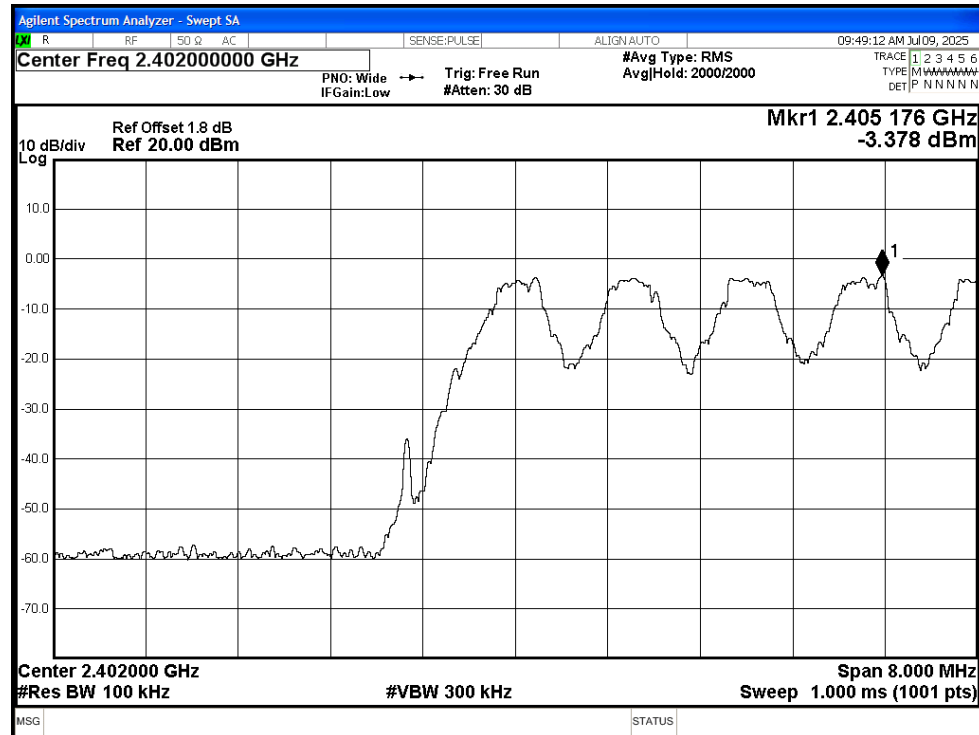


**(Hopping)**

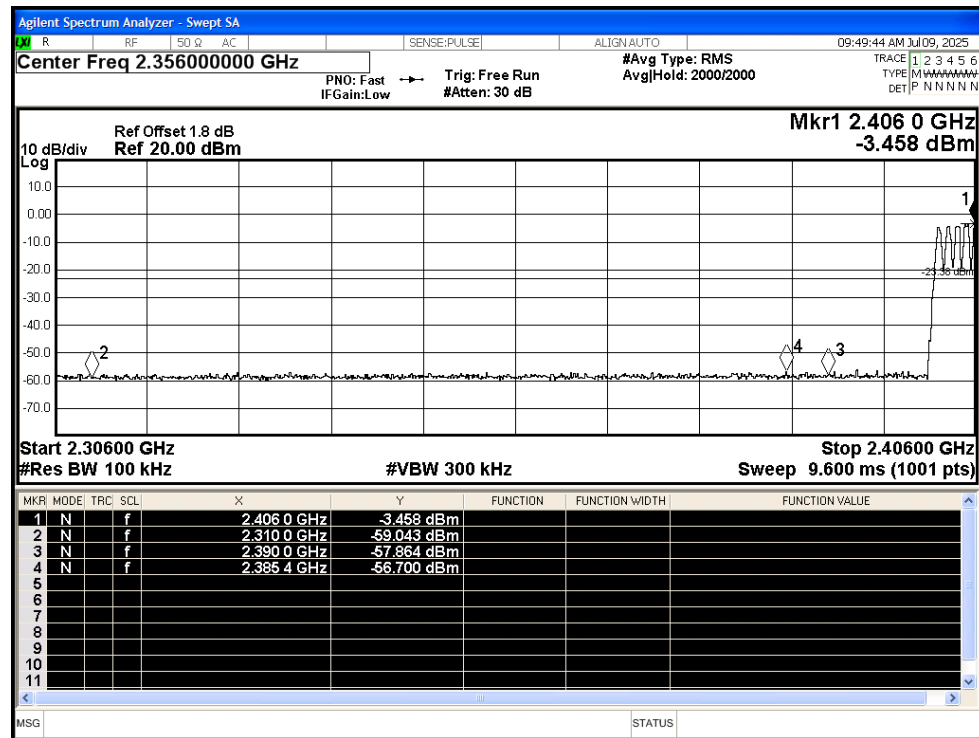
| Condition | Mode  | Frequency (MHz) | Antenna | Hopping Mode | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|-------|-----------------|---------|--------------|-----------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant     | Hopping      | -53.32          | -20         | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | Hopping      | -54.25          | -20         | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | Hopping      | -52.88          | -20         | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | Hopping      | -53.4           | -20         | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | Hopping      | -50.13          | -20         | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | Hopping      | -53.35          | -20         | Pass    |

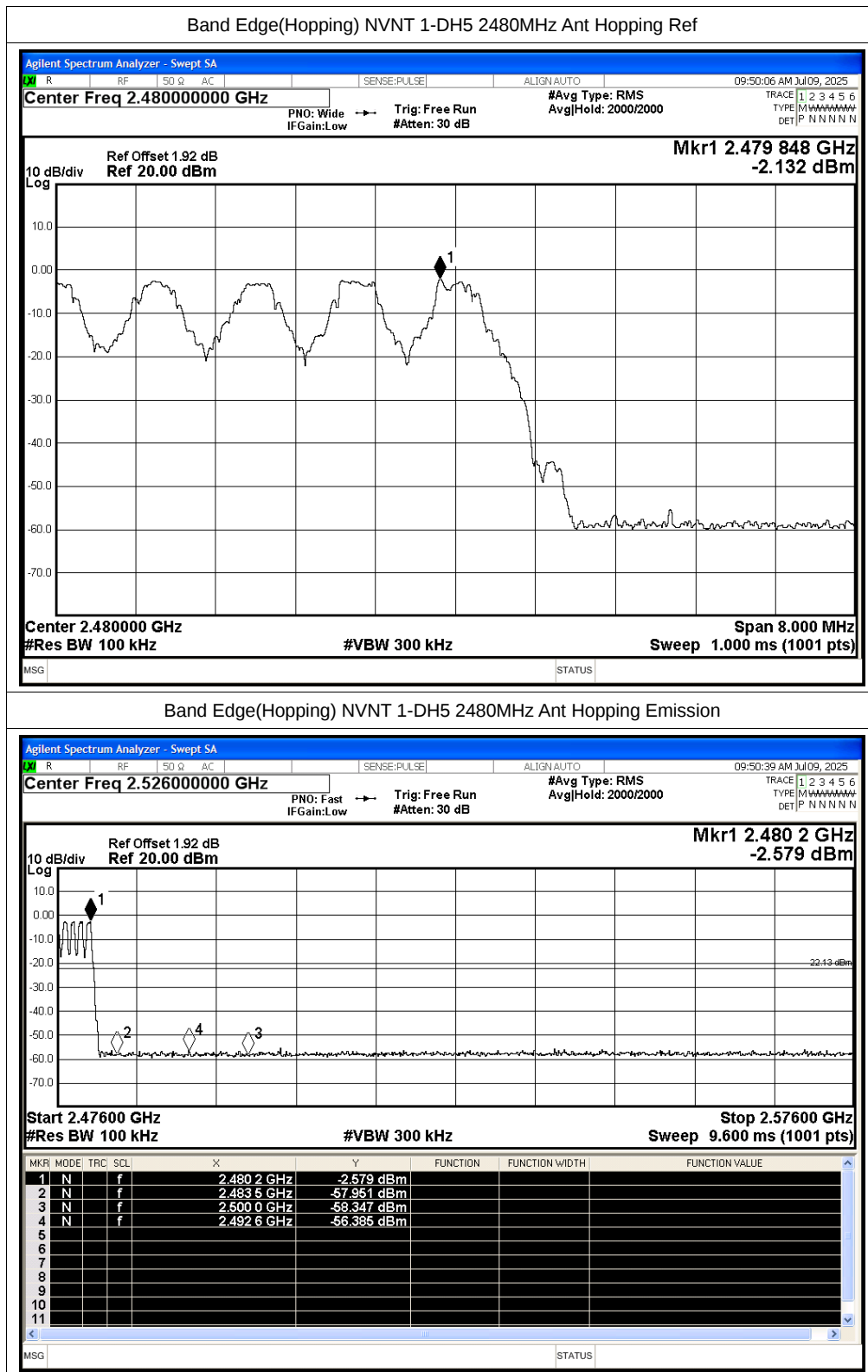
## Test Graphs

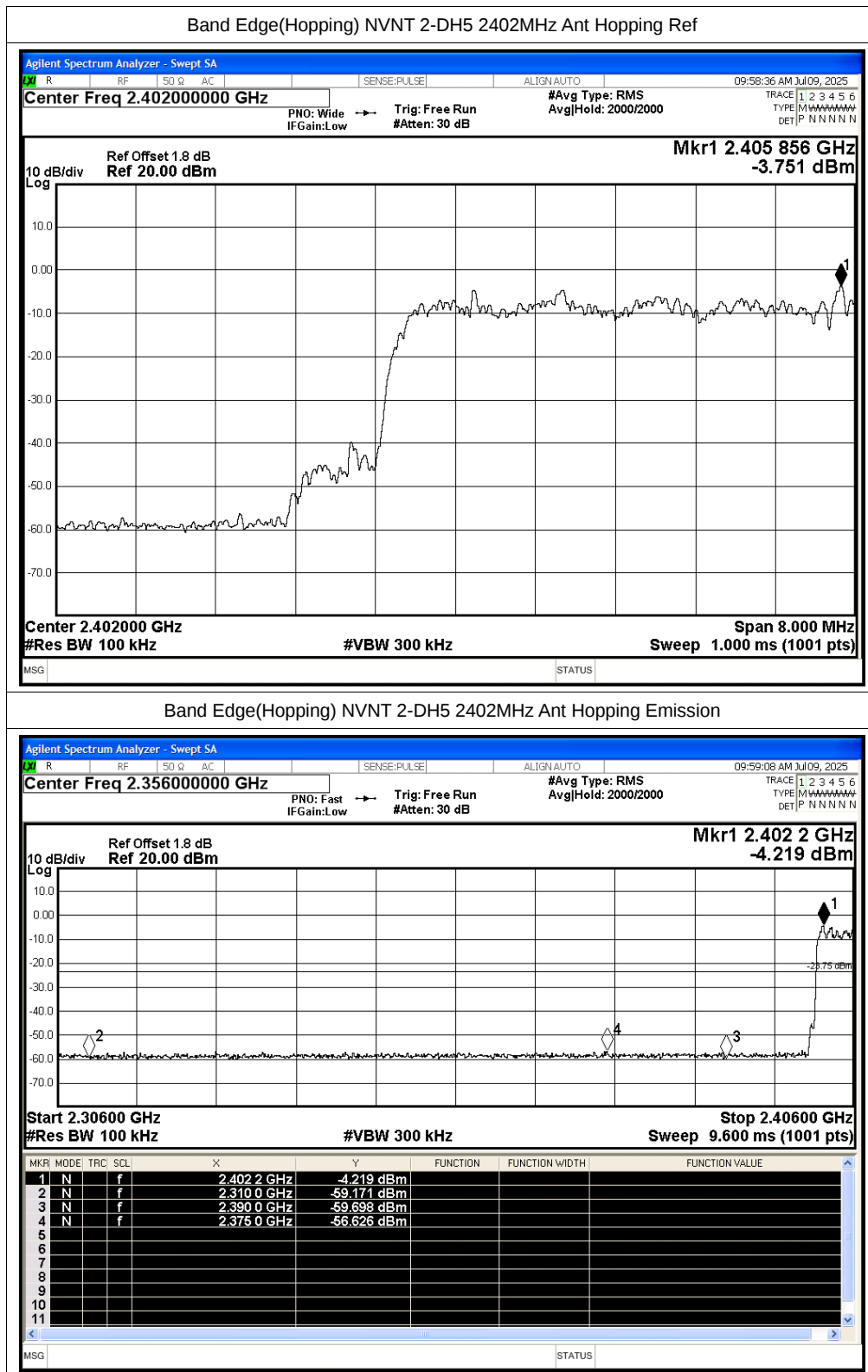
## Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant Hopping Ref

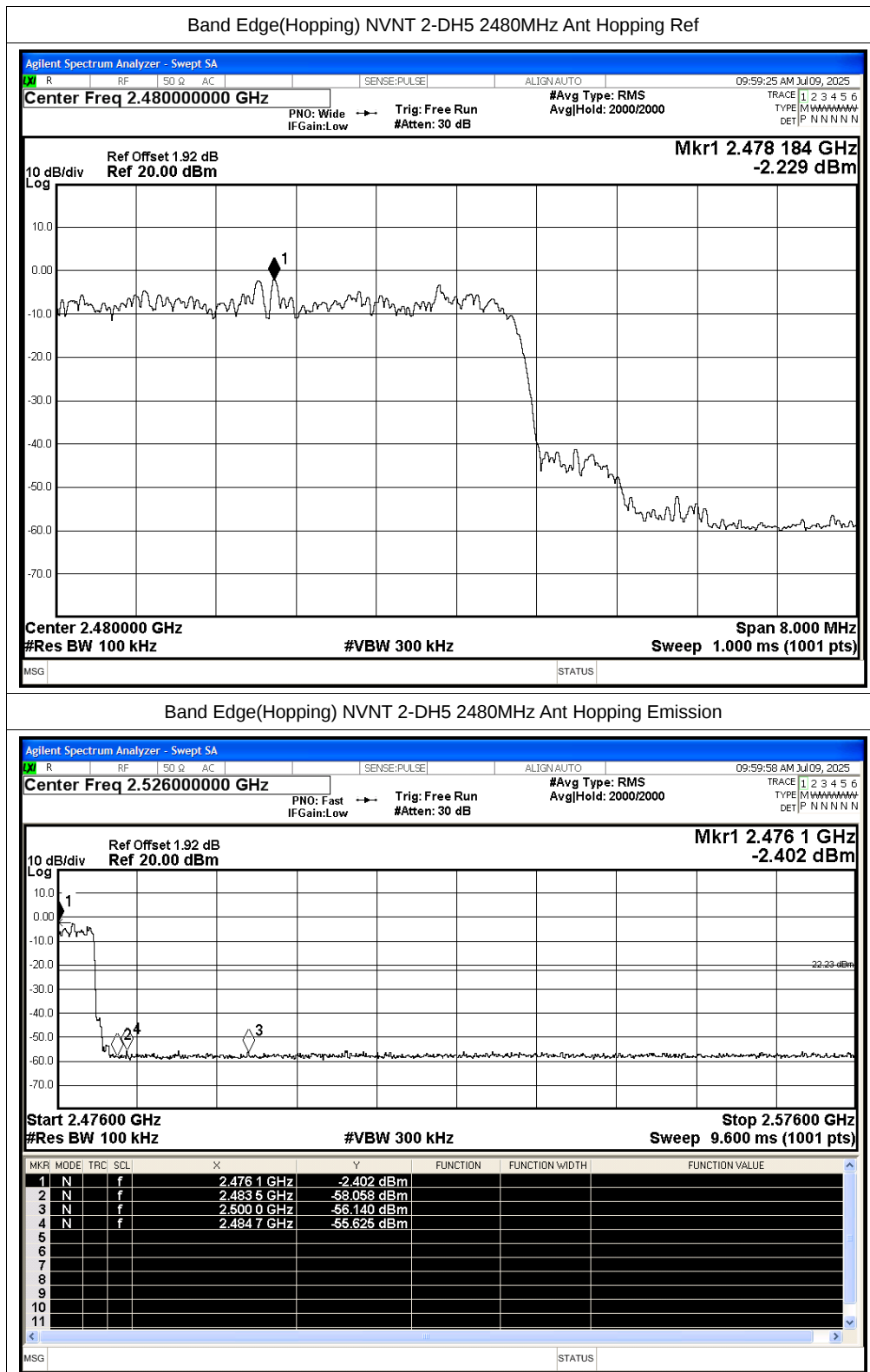


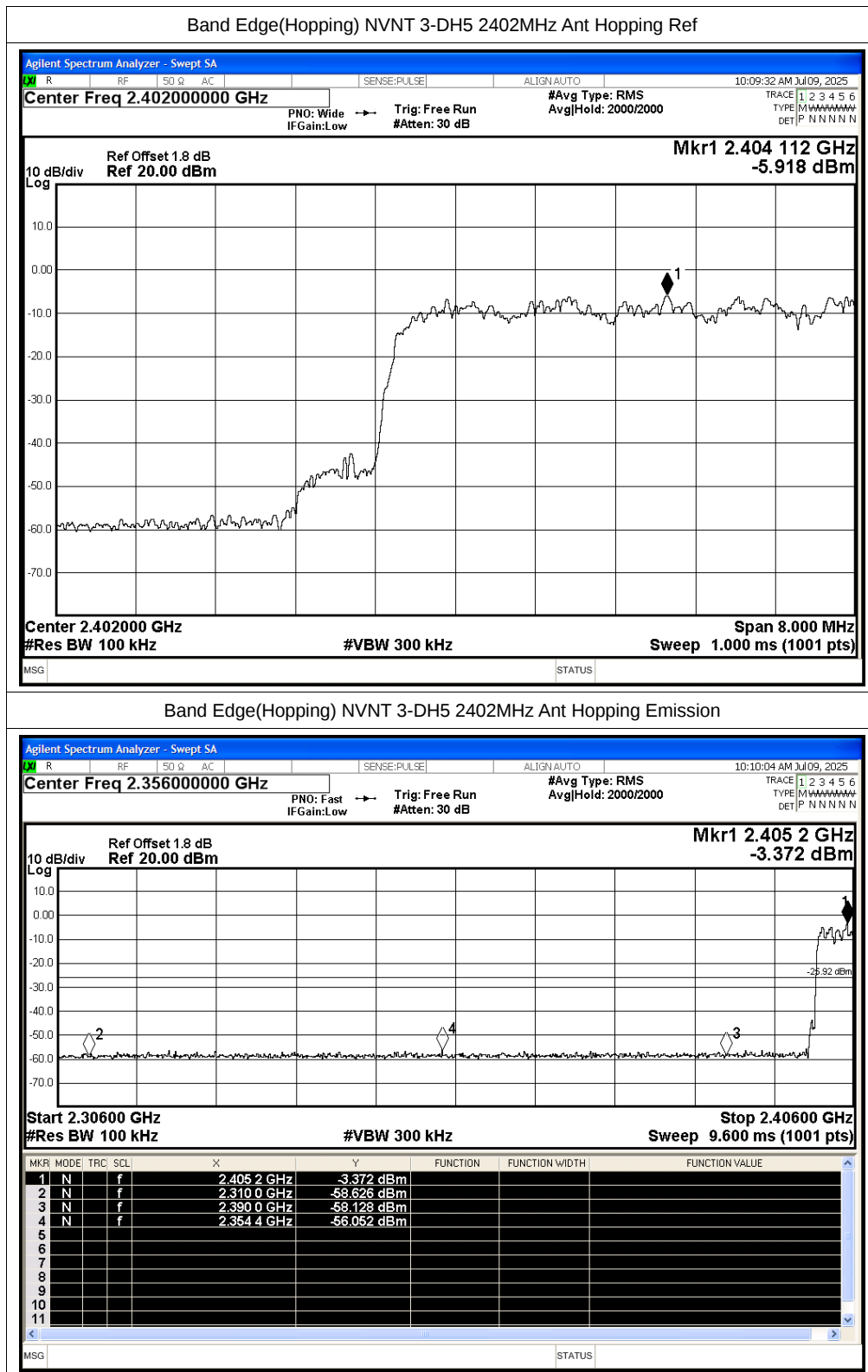
## Band Edge(Hopping) NVNT 1-DH5 2402MHz Ant Hopping Emission

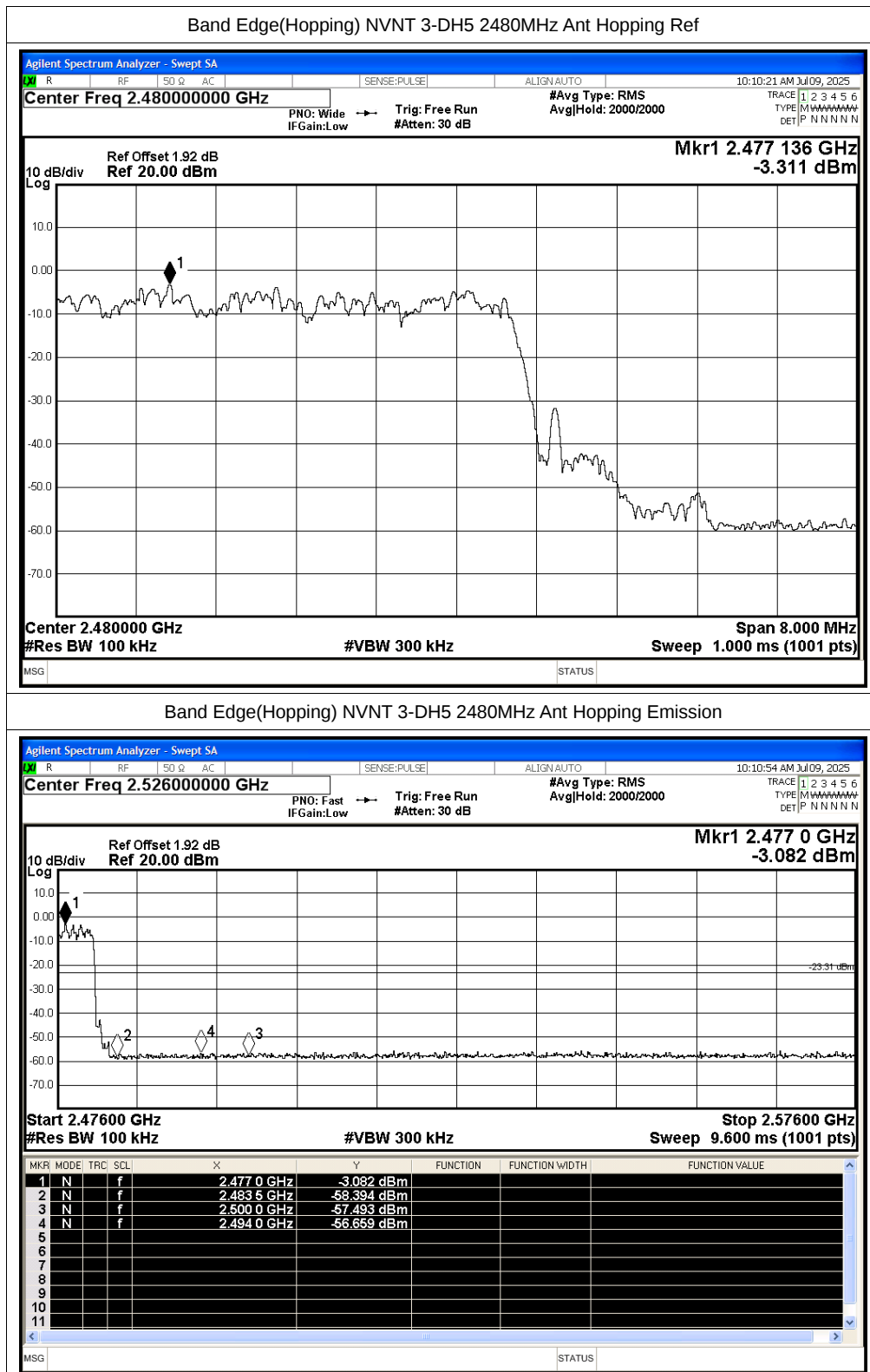










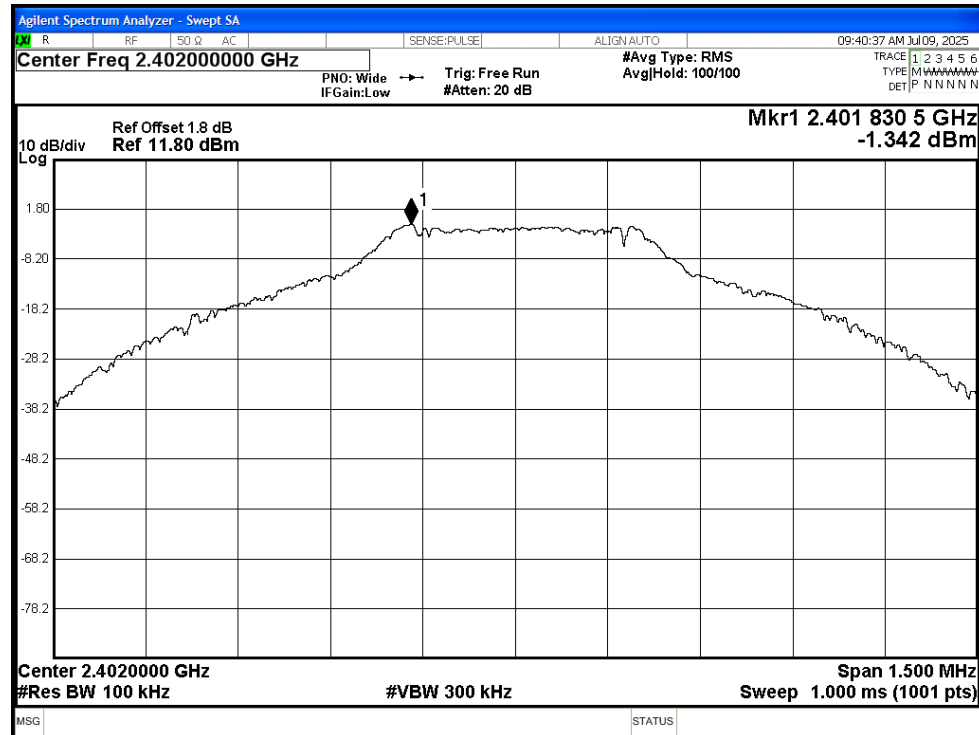


## A.7 Conducted RF Spurious Emission

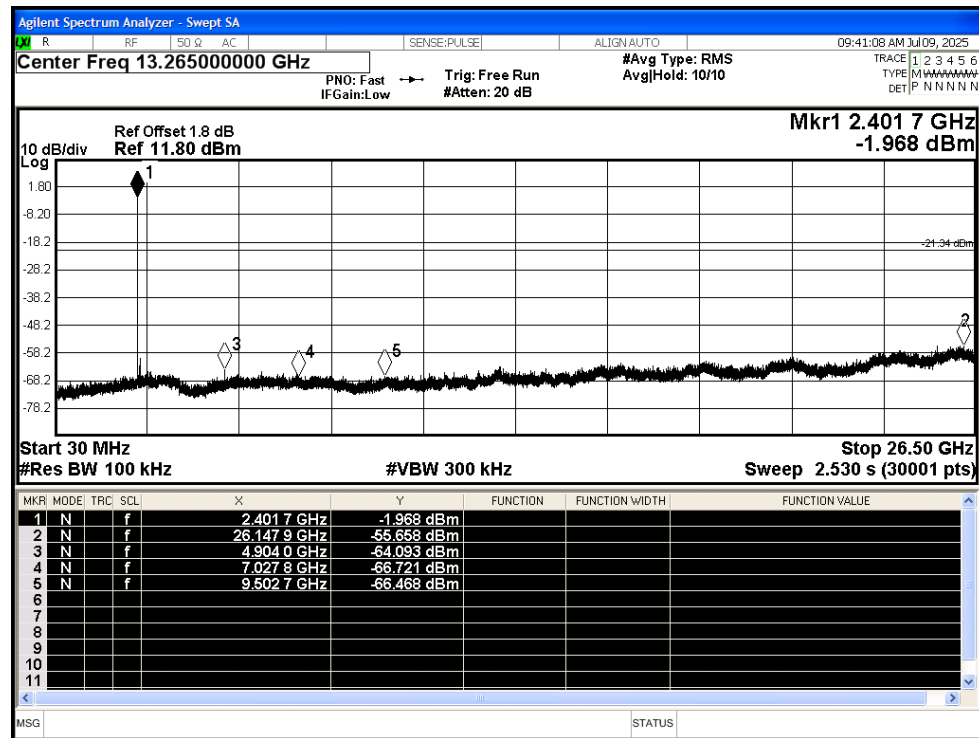
| Condition | Mode  | Frequency (MHz) | Antenna | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|-------|-----------------|---------|-----------------|-------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant     | -54.32          | -20         | Pass    |
| NVNT      | 1-DH5 | 2441            | Ant     | -54.69          | -20         | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | -52.73          | -20         | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | -53.47          | -20         | Pass    |
| NVNT      | 2-DH5 | 2441            | Ant     | -54.42          | -20         | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | -52.6           | -20         | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | -54.58          | -20         | Pass    |
| NVNT      | 3-DH5 | 2441            | Ant     | -53.69          | -20         | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | -52.52          | -20         | Pass    |

## Test Graphs

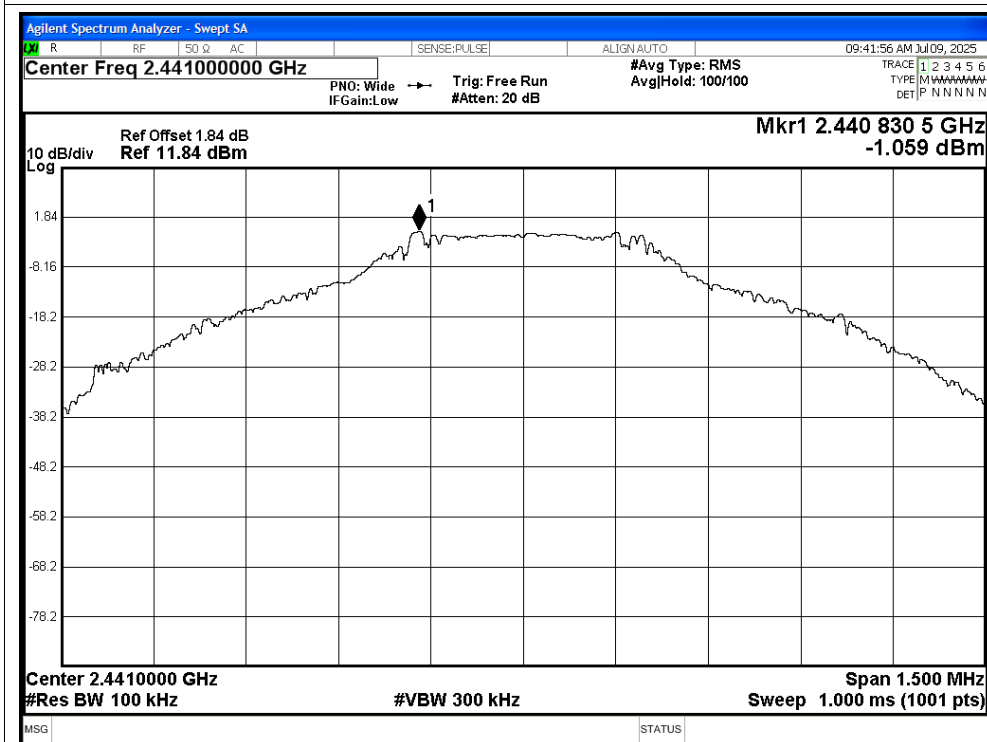
## Tx. Spurious NVNT 1-DH5 2402MHz Ant Ref



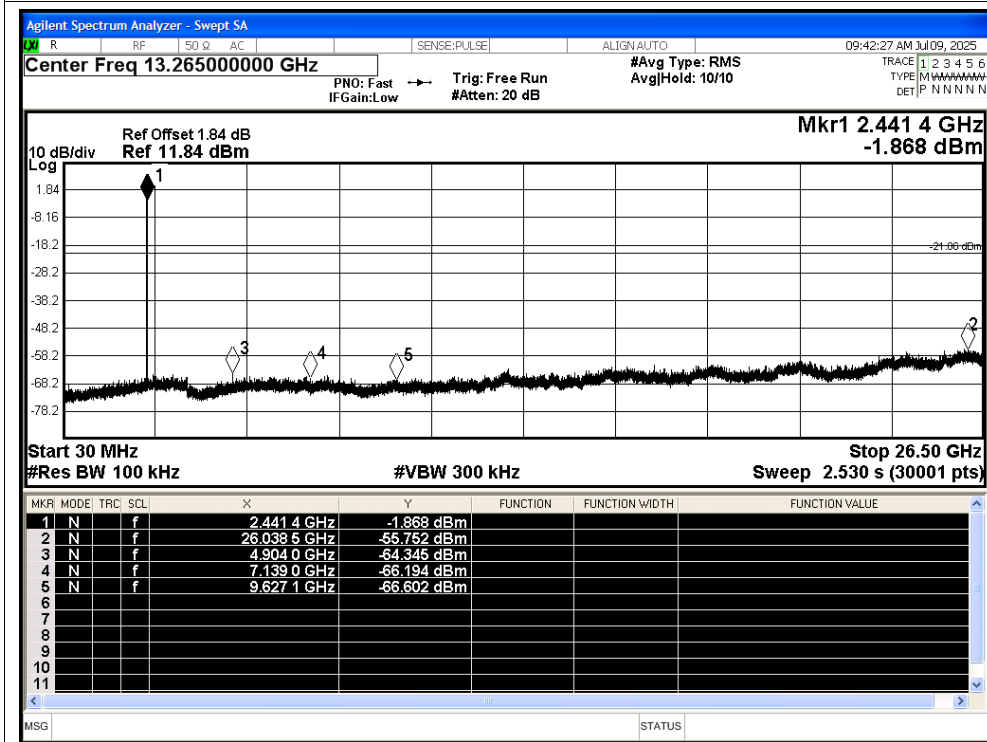
## Tx. Spurious NVNT 1-DH5 2402MHz Ant Emission

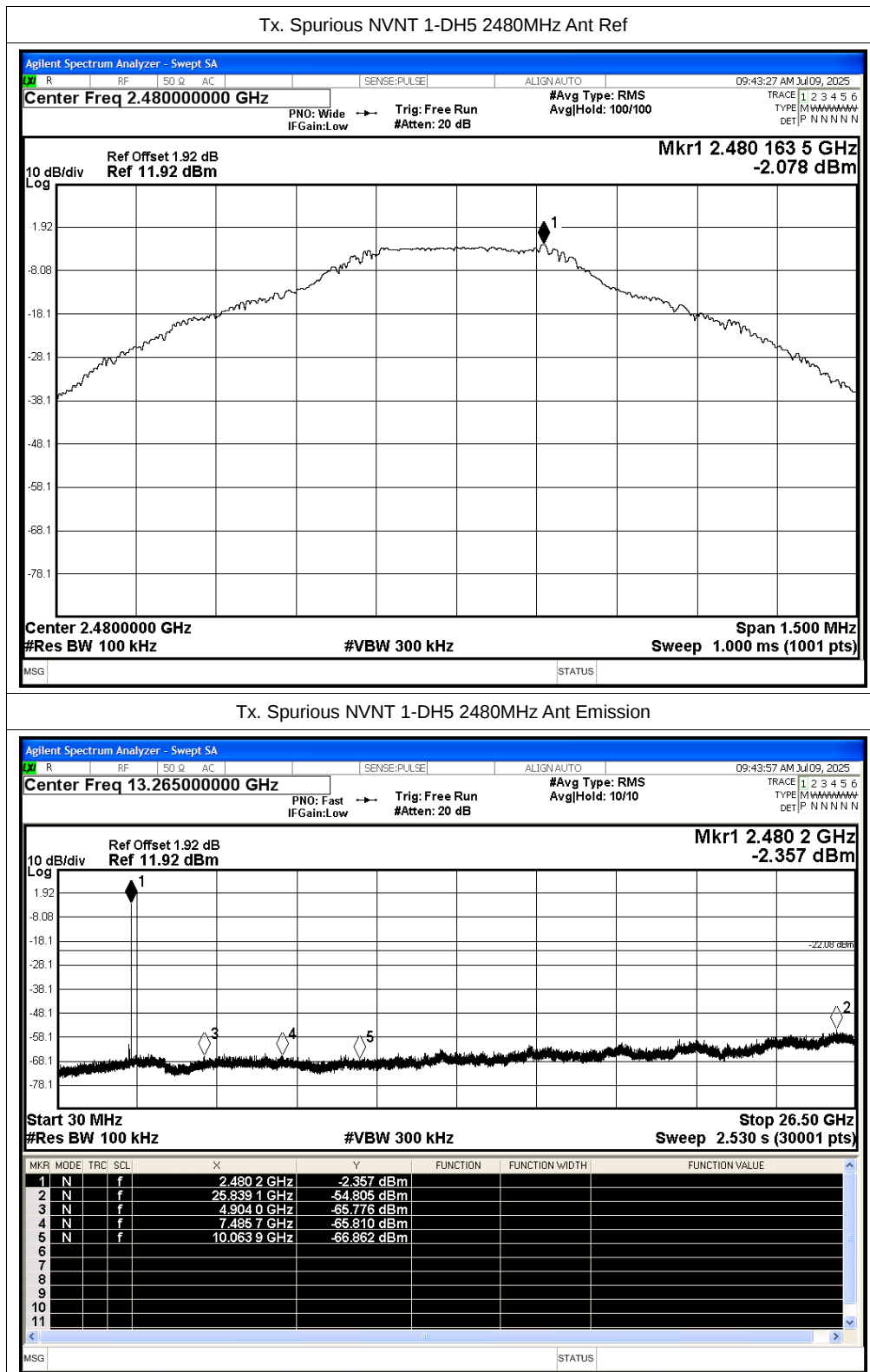


## Tx. Spurious NVNT 1-DH5 2441MHz Ant Ref

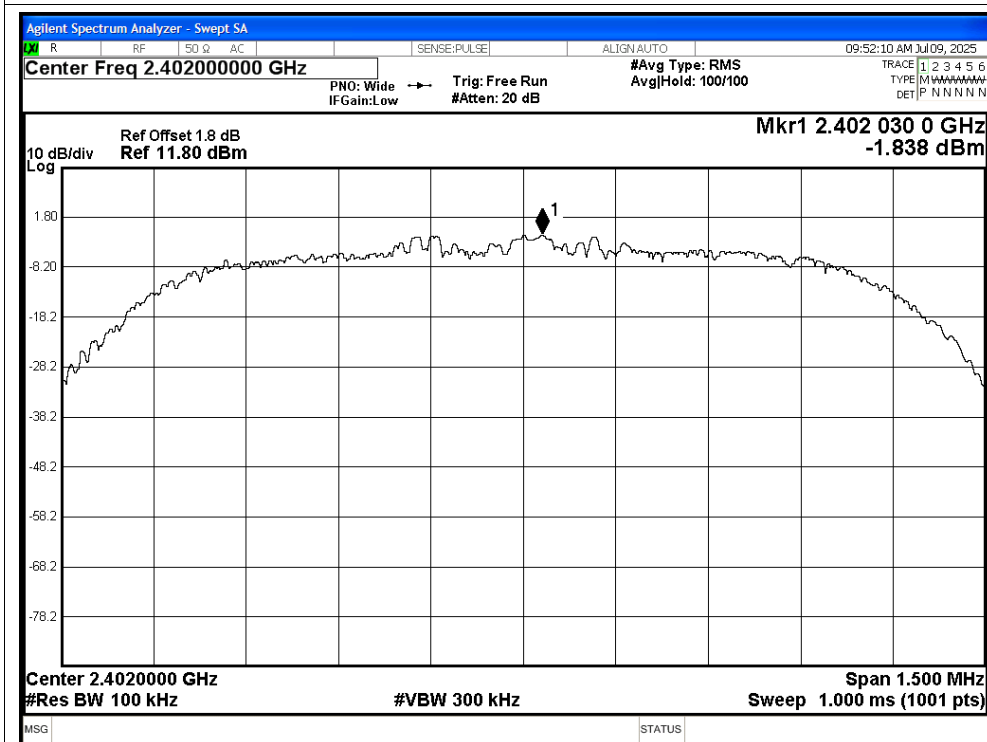


## Tx. Spurious NVNT 1-DH5 2441MHz Ant Emission

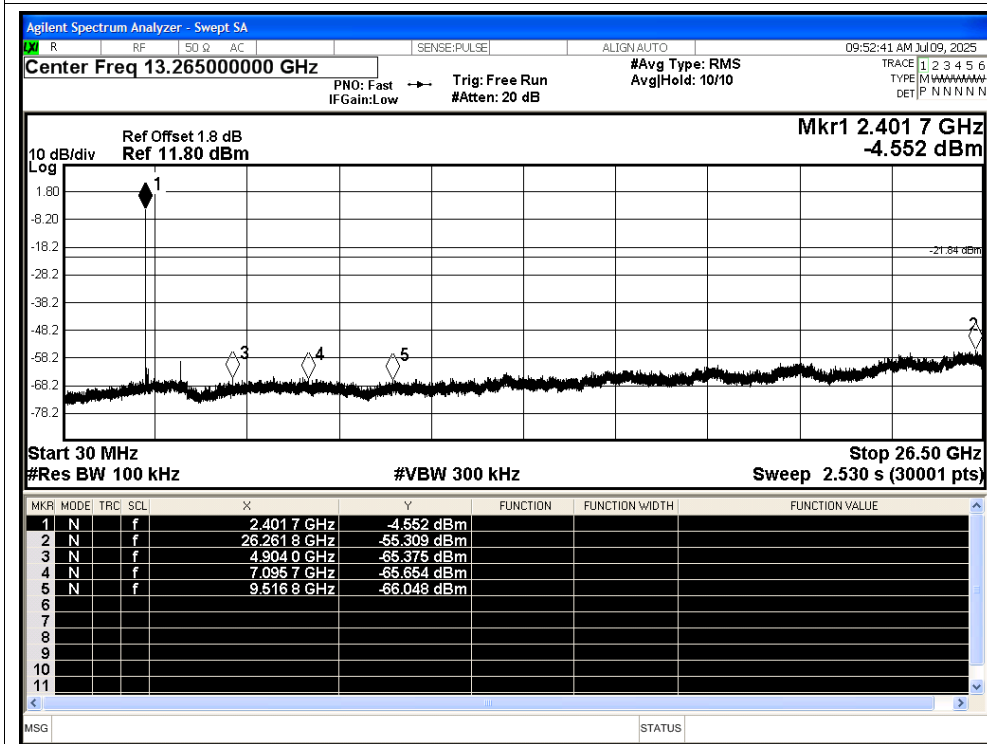




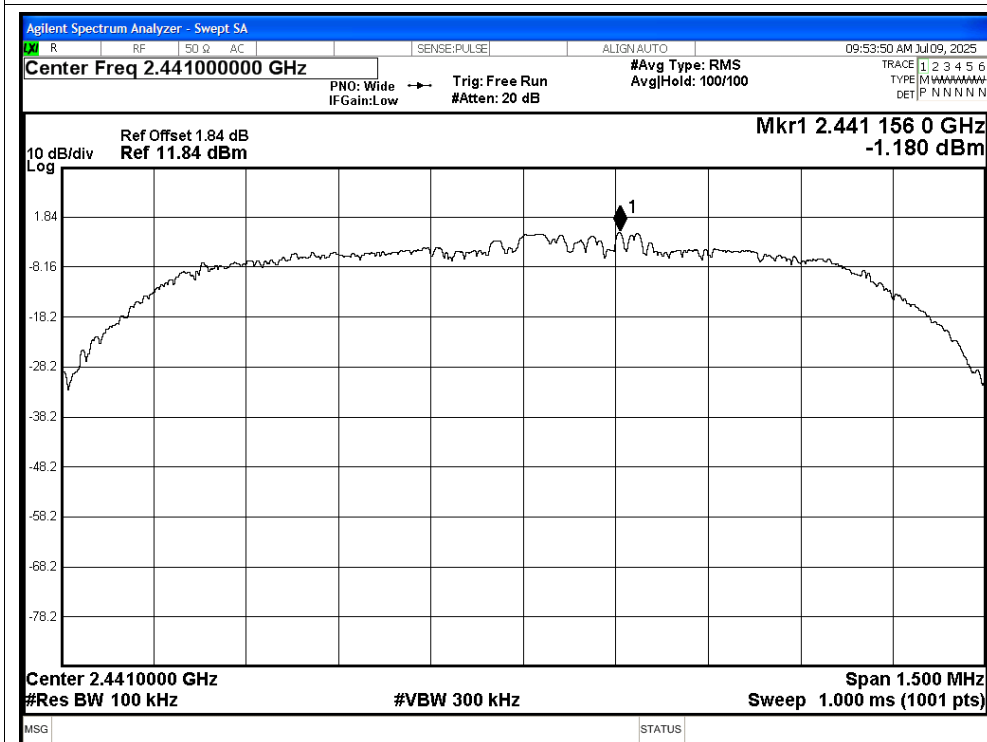
## Tx. Spurious NVNT 2-DH5 2402MHz Ant Ref



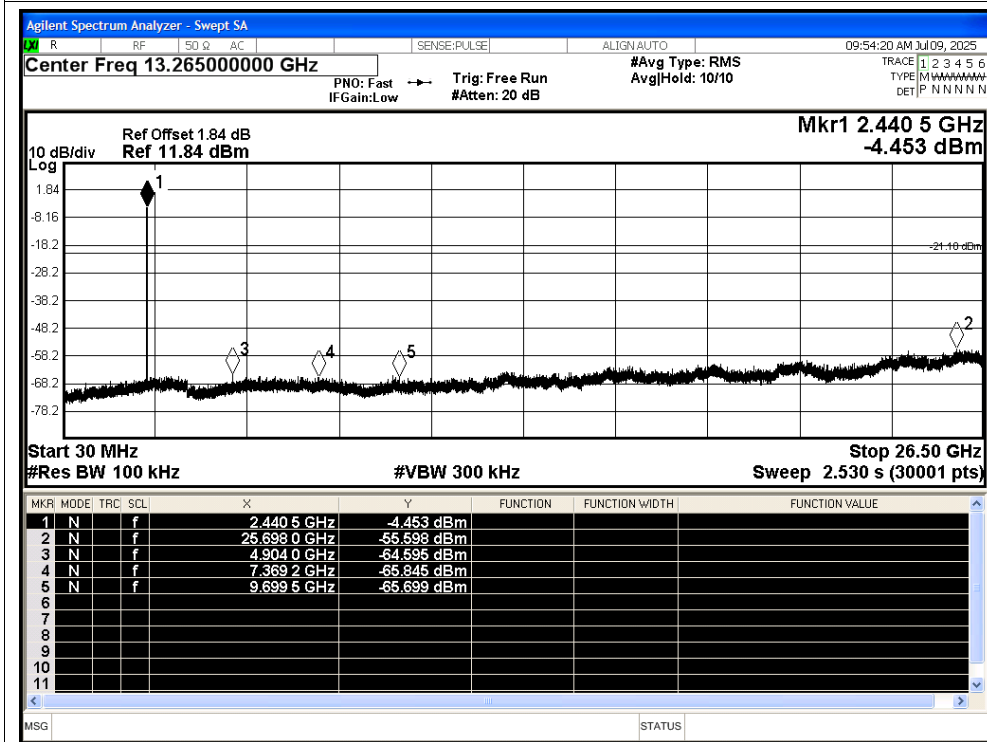
## Tx. Spurious NVNT 2-DH5 2402MHz Ant Emission

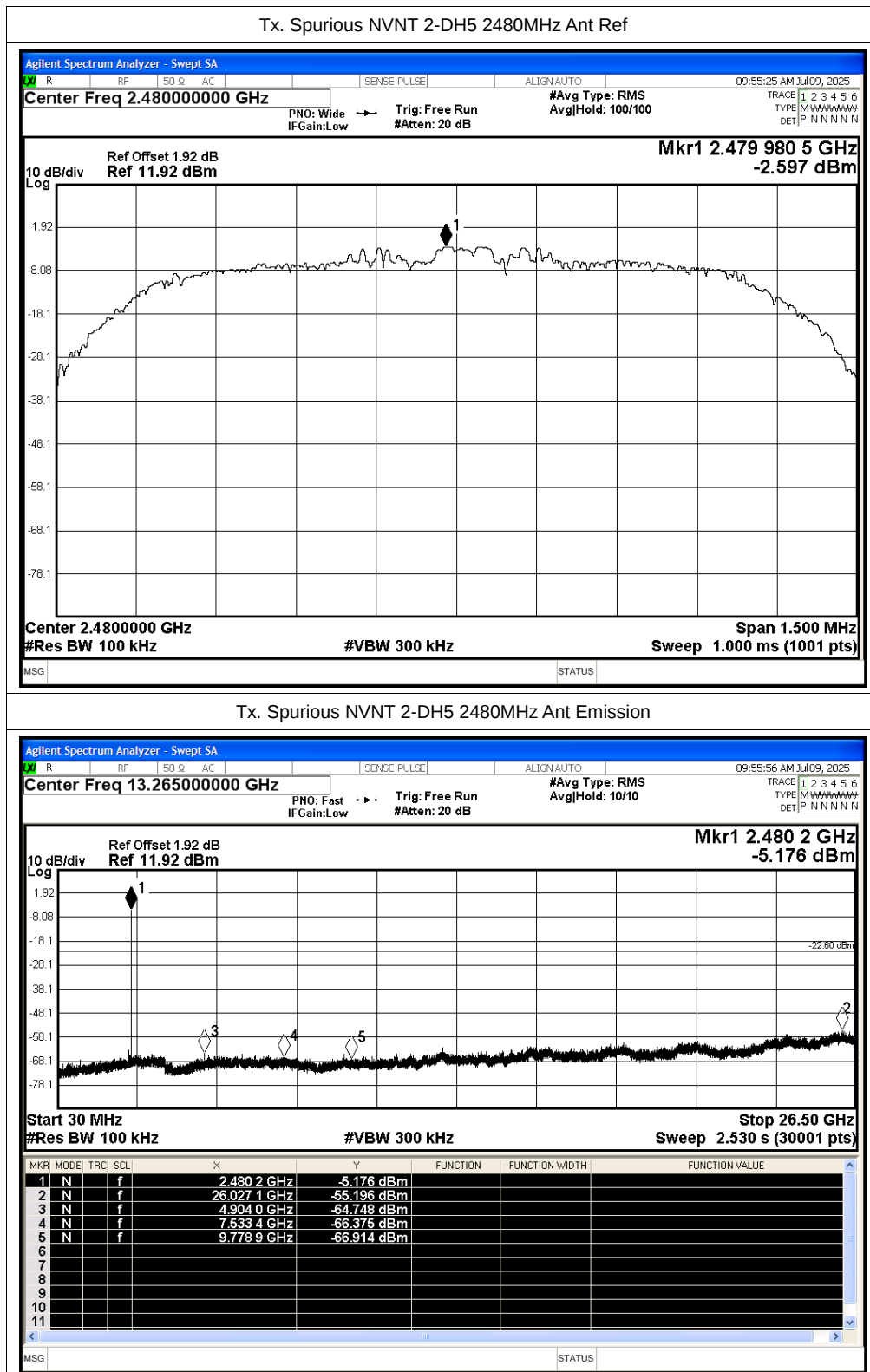


## Tx. Spurious NVNT 2-DH5 2441MHz Ant Ref

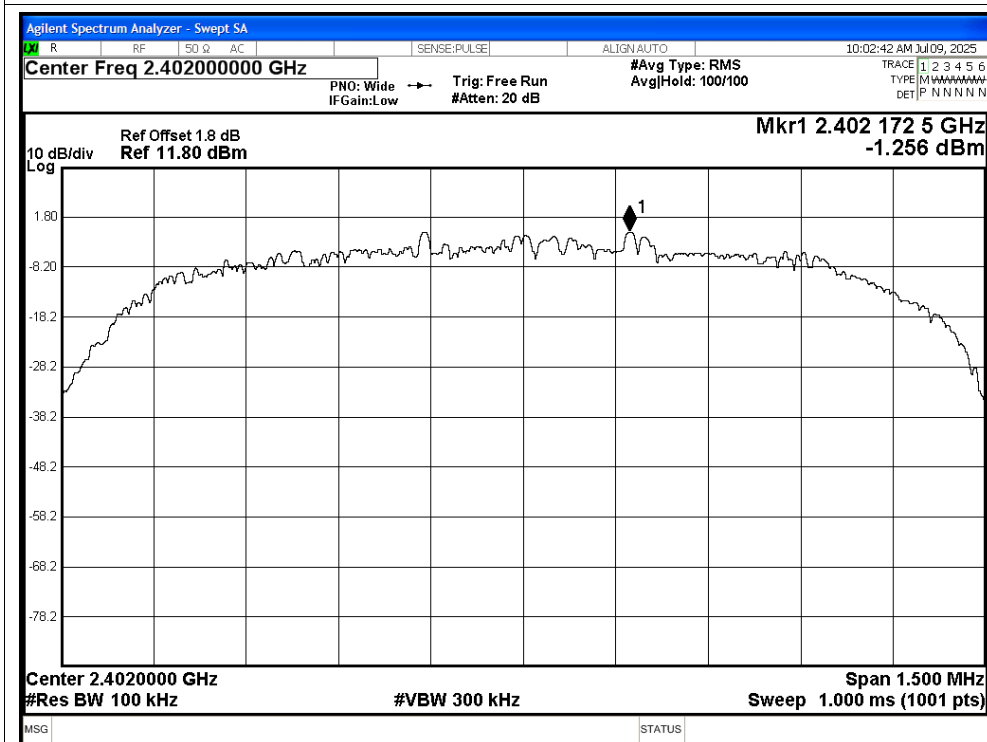


## Tx. Spurious NVNT 2-DH5 2441MHz Ant Emission

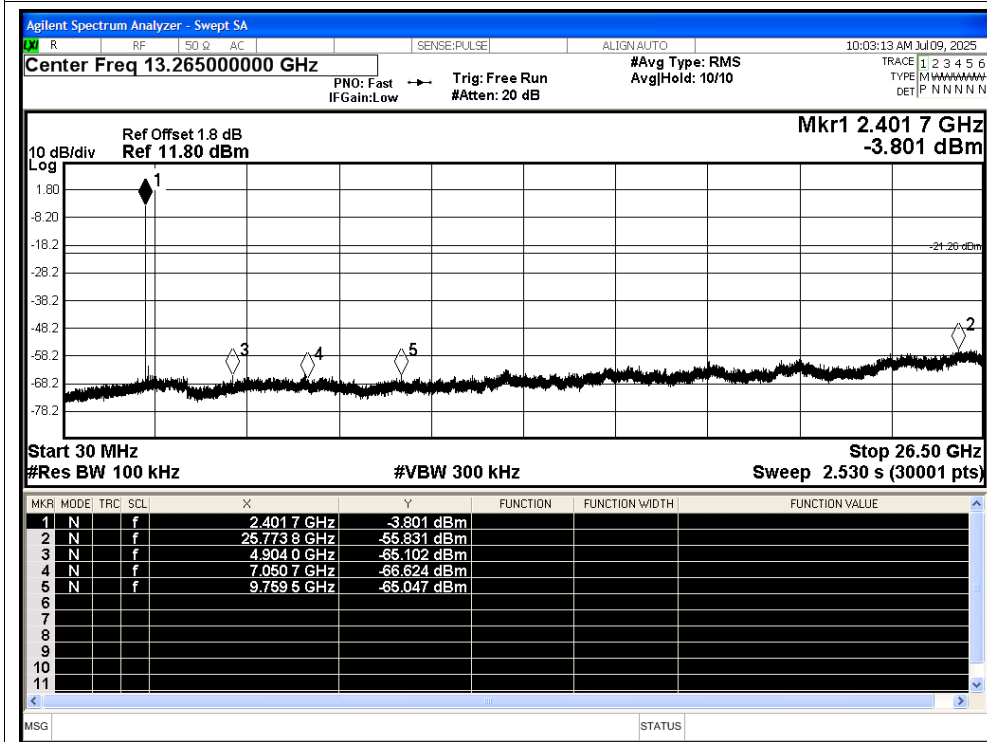




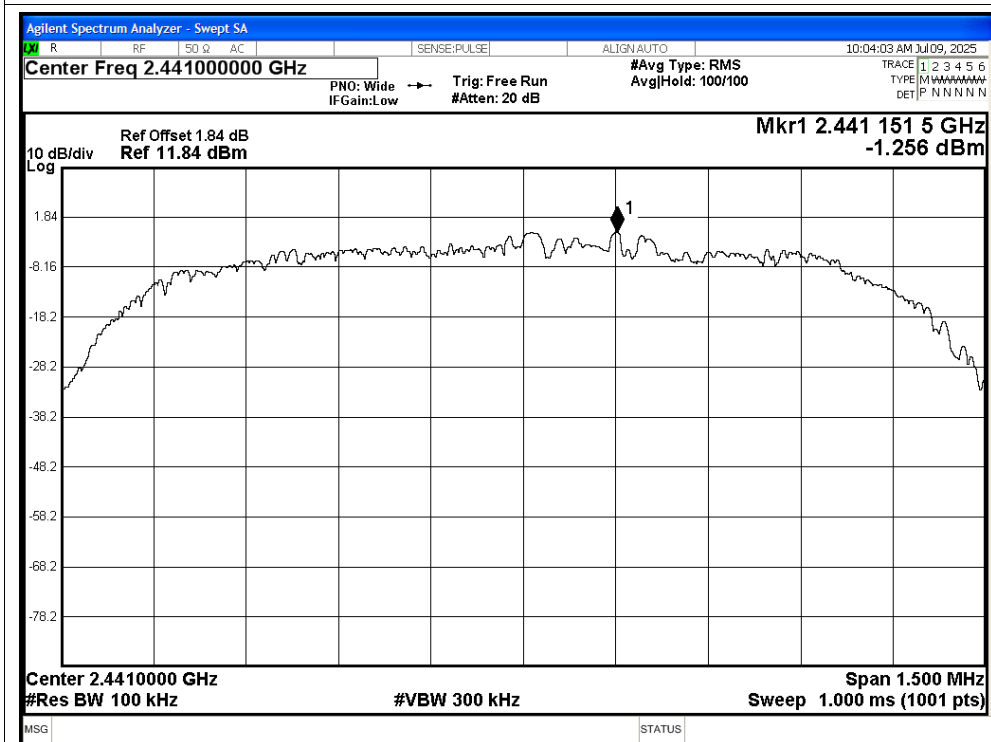
## Tx. Spurious NVNT 3-DH5 2402MHz Ant Ref



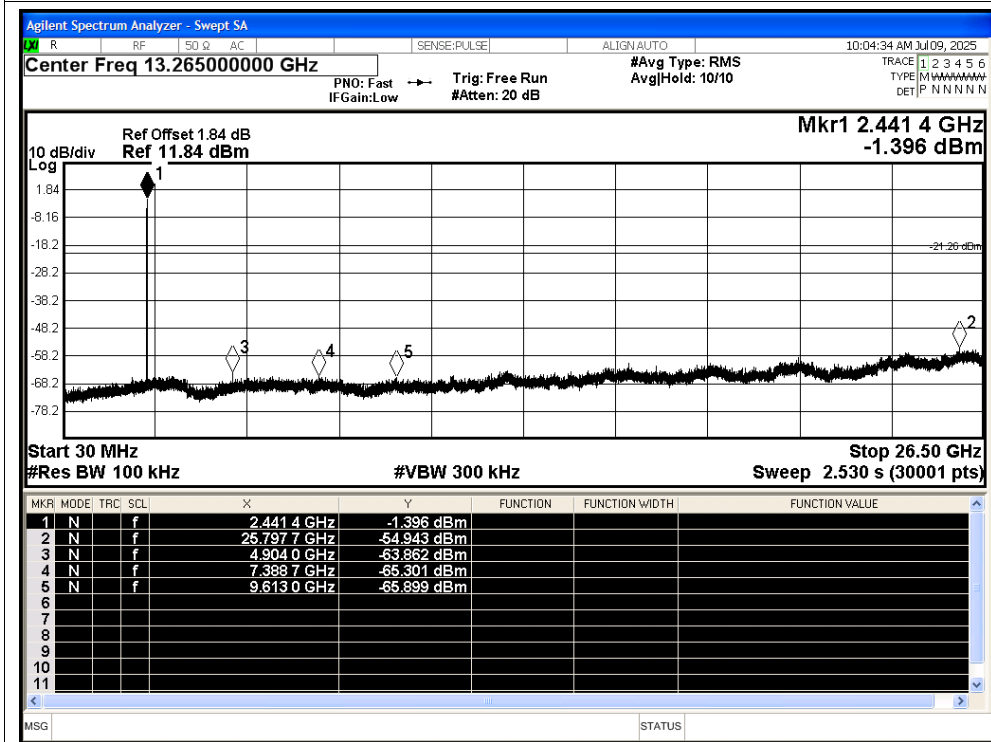
## Tx. Spurious NVNT 3-DH5 2402MHz Ant Emission



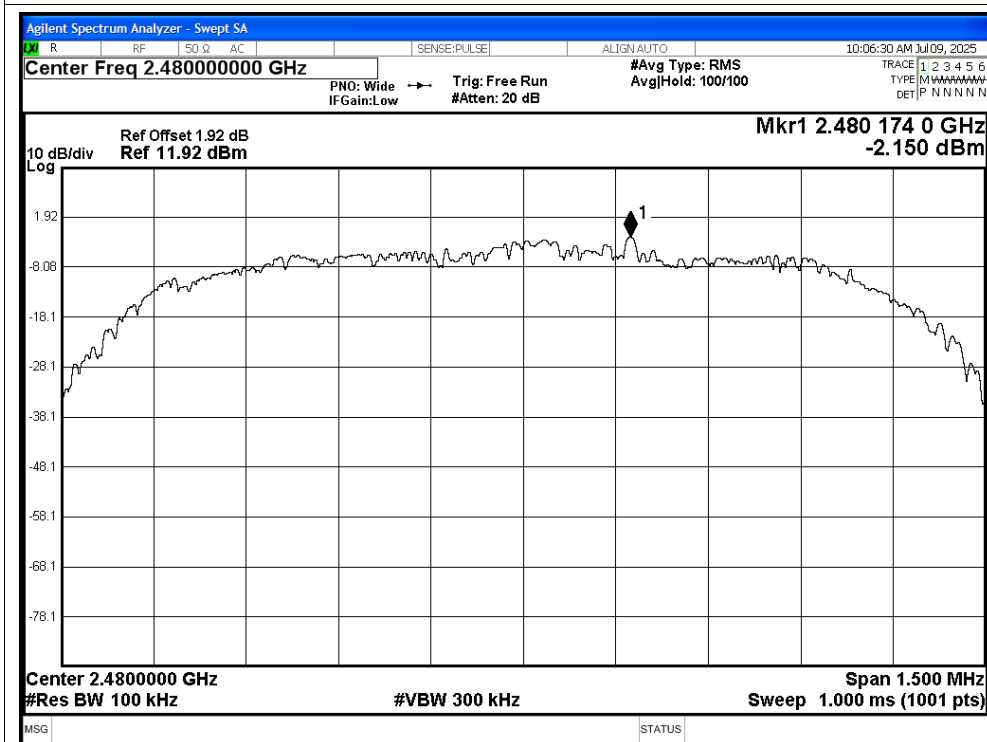
## Tx. Spurious NVNT 3-DH5 2441MHz Ant Ref



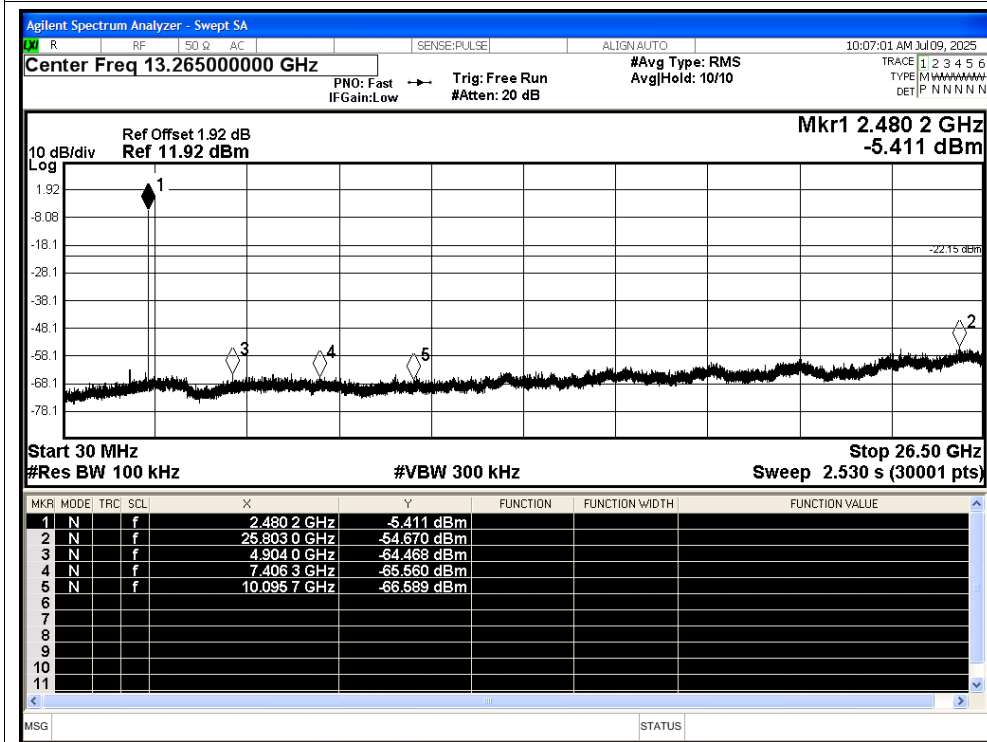
## Tx. Spurious NVNT 3-DH5 2441MHz Ant Emission



## Tx. Spurious NVNT 3-DH5 2480MHz Ant Ref



## Tx. Spurious NVNT 3-DH5 2480MHz Ant Emission

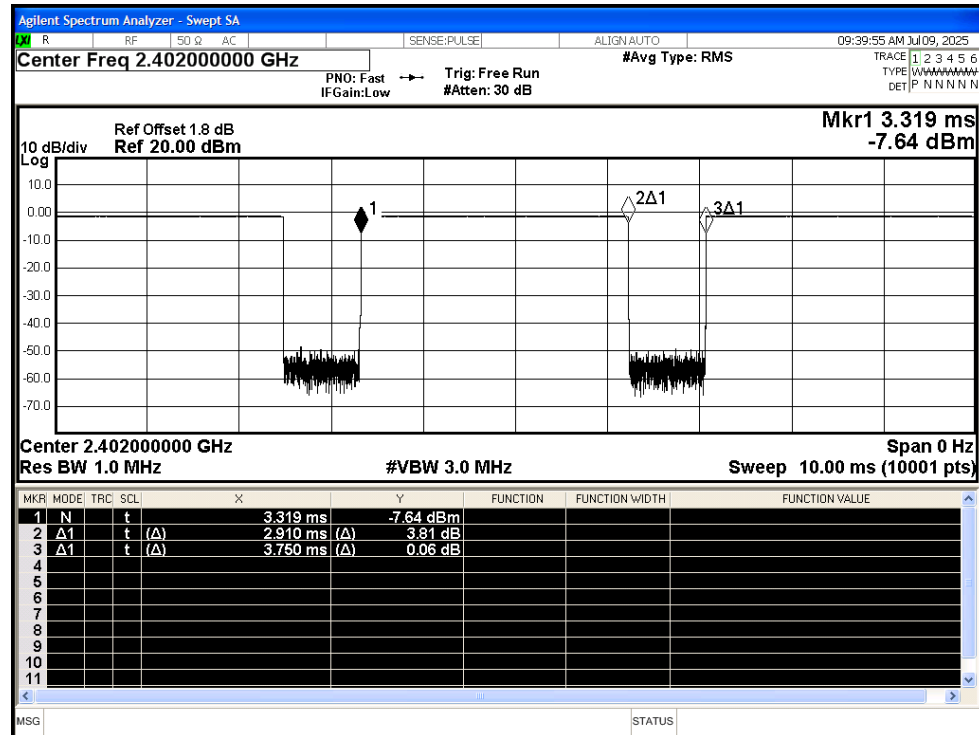


## A.8 Duty Cycle

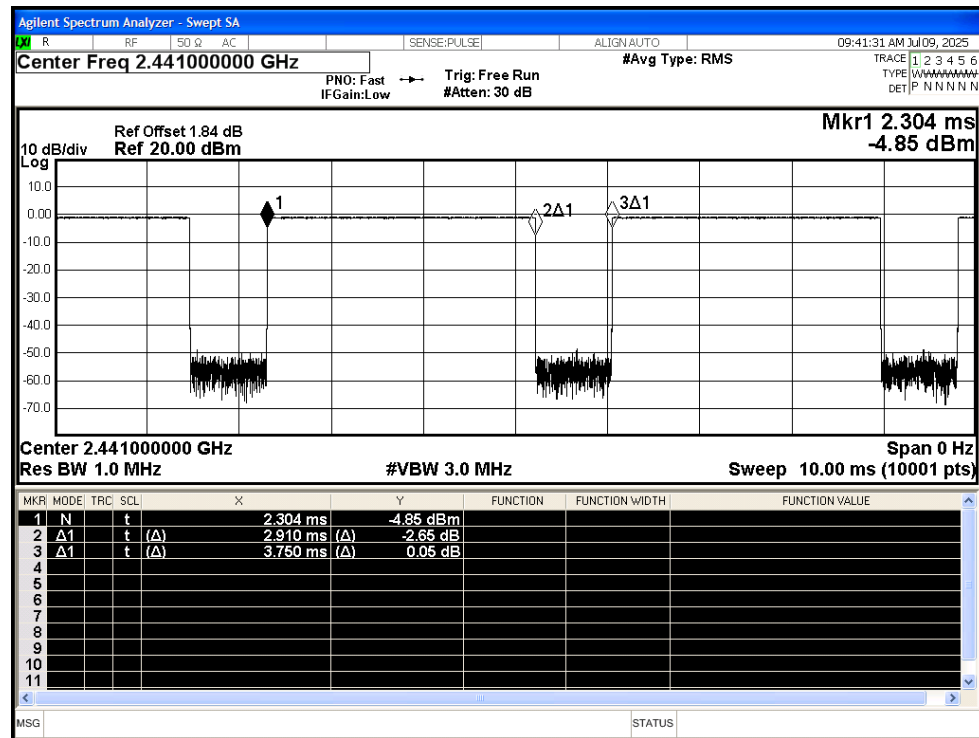
| Condition | Mode  | Frequency (MHz) | Antenna | Duty Cycle (%) | Correction Factor (dB) | 1/T (kHz) |
|-----------|-------|-----------------|---------|----------------|------------------------|-----------|
| NVNT      | 1-DH5 | 2402            | Ant     | 77.6           | 1.1                    | 0.34      |
| NVNT      | 1-DH5 | 2441            | Ant     | 77.6           | 1.1                    | 0.34      |
| NVNT      | 1-DH5 | 2480            | Ant     | 77.6           | 1.1                    | 0.34      |
| NVNT      | 2-DH5 | 2402            | Ant     | 77.33          | 1.12                   | 0.34      |
| NVNT      | 2-DH5 | 2441            | Ant     | 77.33          | 1.12                   | 0.34      |
| NVNT      | 2-DH5 | 2480            | Ant     | 77.33          | 1.12                   | 0.34      |
| NVNT      | 3-DH5 | 2402            | Ant     | 77.28          | 1.12                   | 0.35      |
| NVNT      | 3-DH5 | 2441            | Ant     | 77.28          | 1.12                   | 0.35      |
| NVNT      | 3-DH5 | 2480            | Ant     | 77.28          | 1.12                   | 0.35      |

## Test Graphs

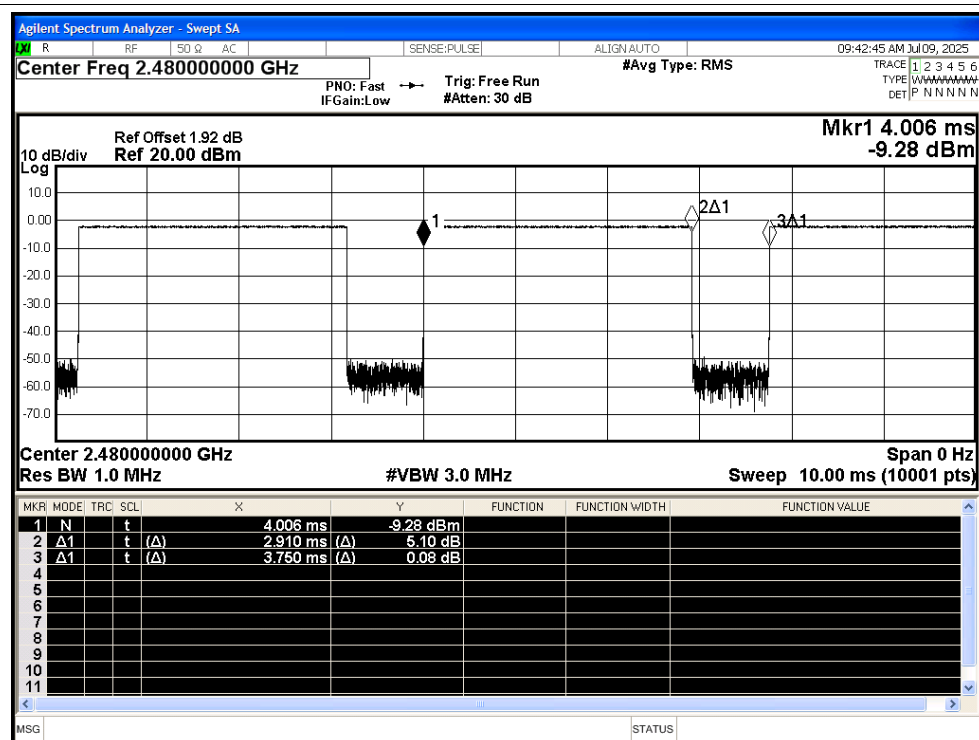
## Duty Cycle NVNT 1-DH5 2402MHz Ant



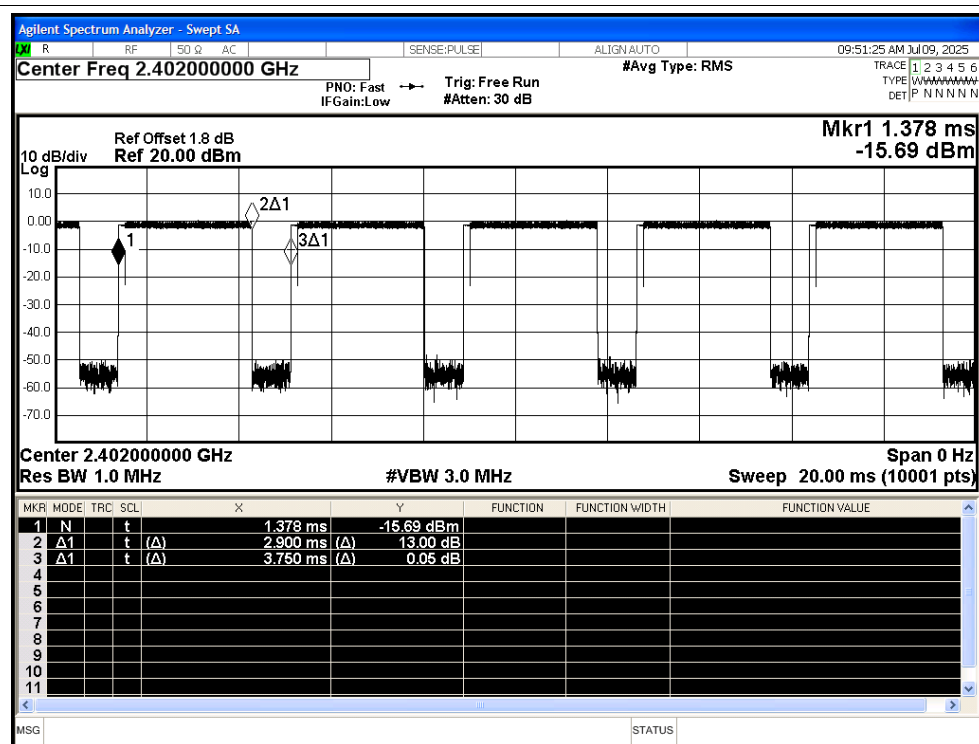
## Duty Cycle NVNT 1-DH5 2441MHz Ant

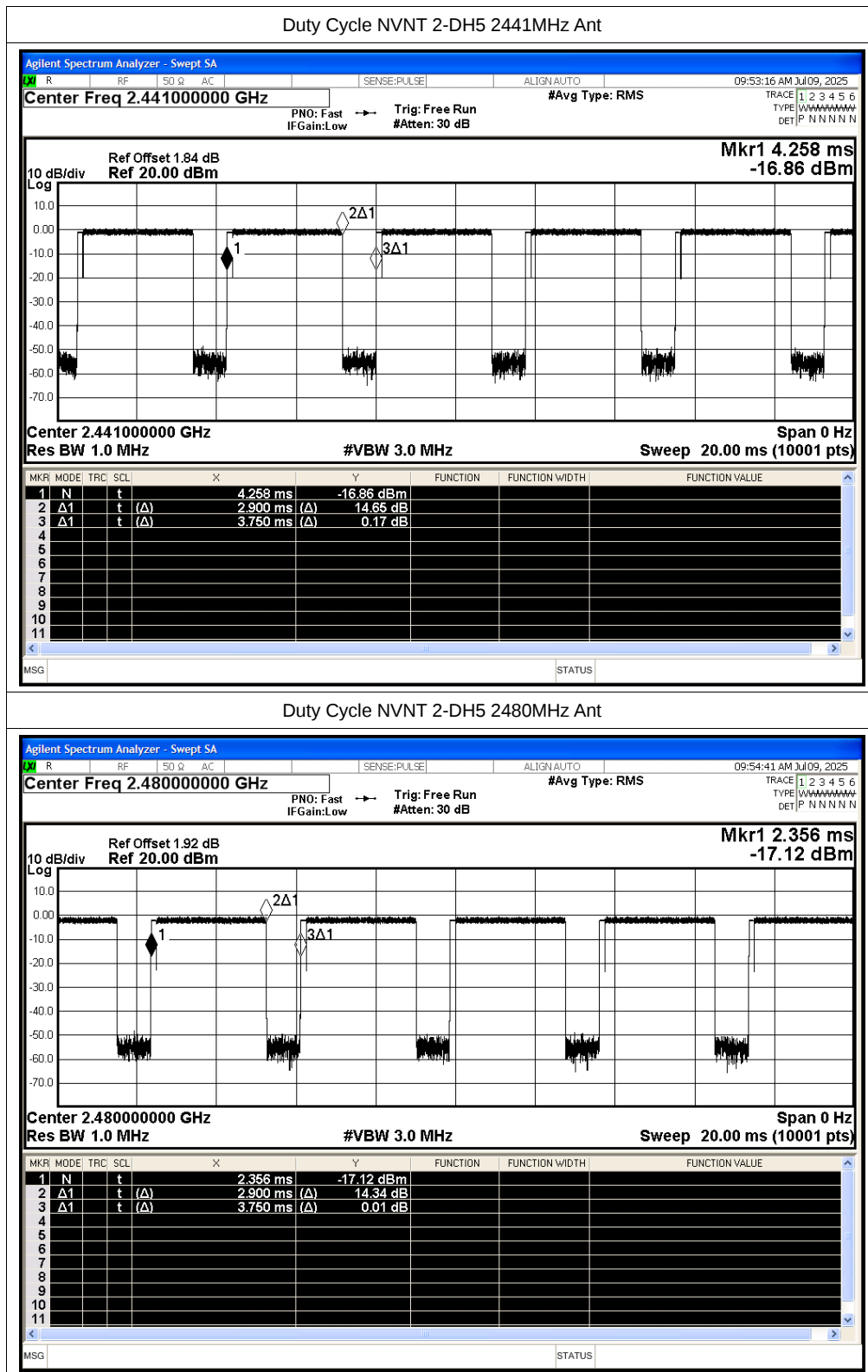


## Duty Cycle NVNT 1-DH5 2480MHz Ant

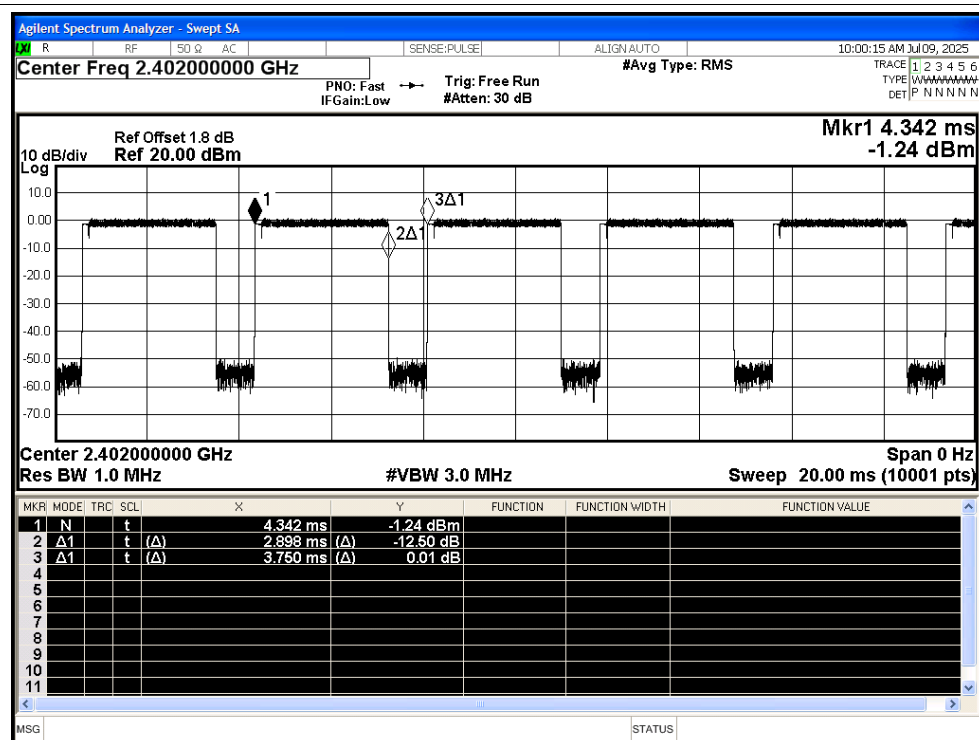


## Duty Cycle NVNT 2-DH5 2402MHz Ant

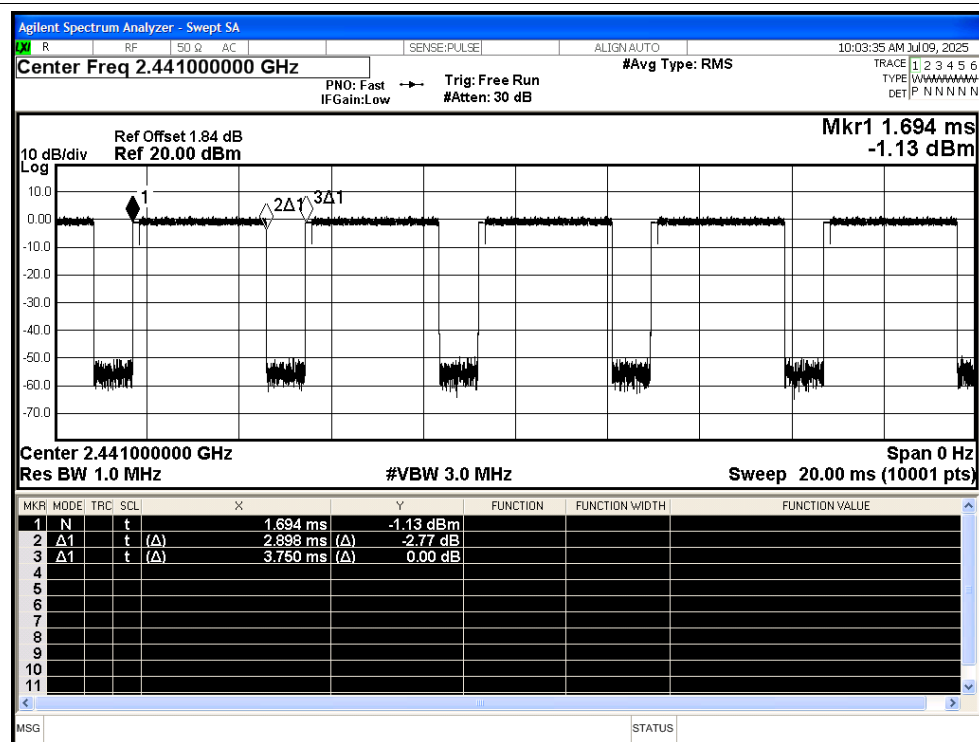


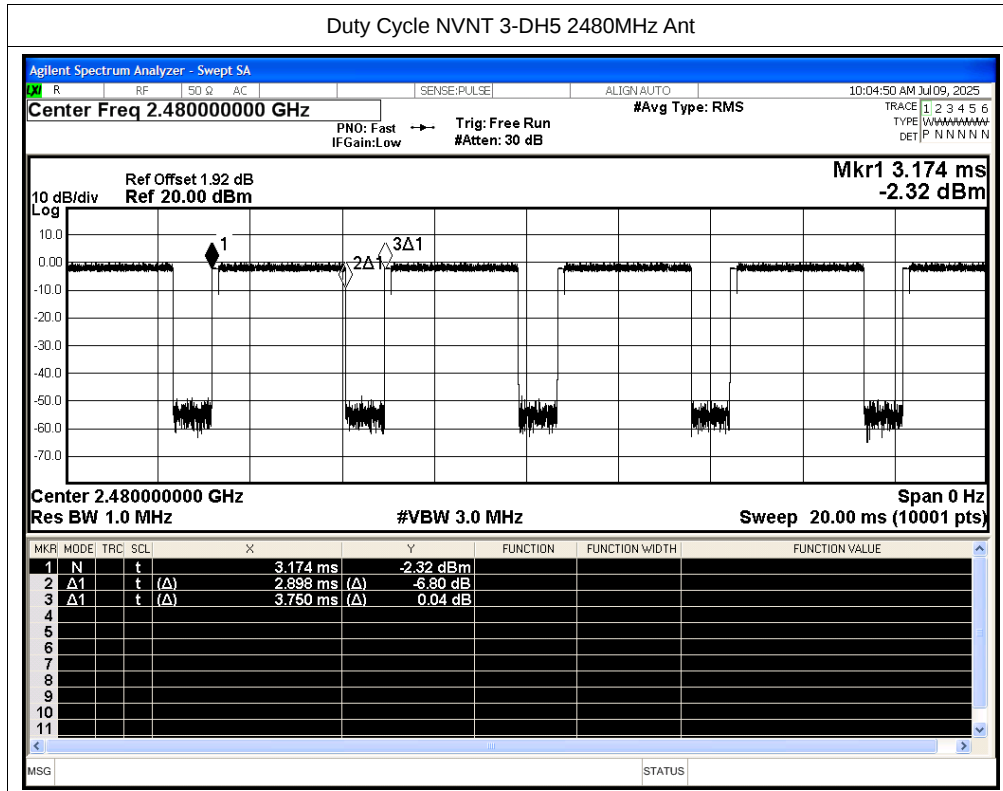


## Duty Cycle NVNT 3-DH5 2402MHz Ant



## Duty Cycle NVNT 3-DH5 2441MHz Ant



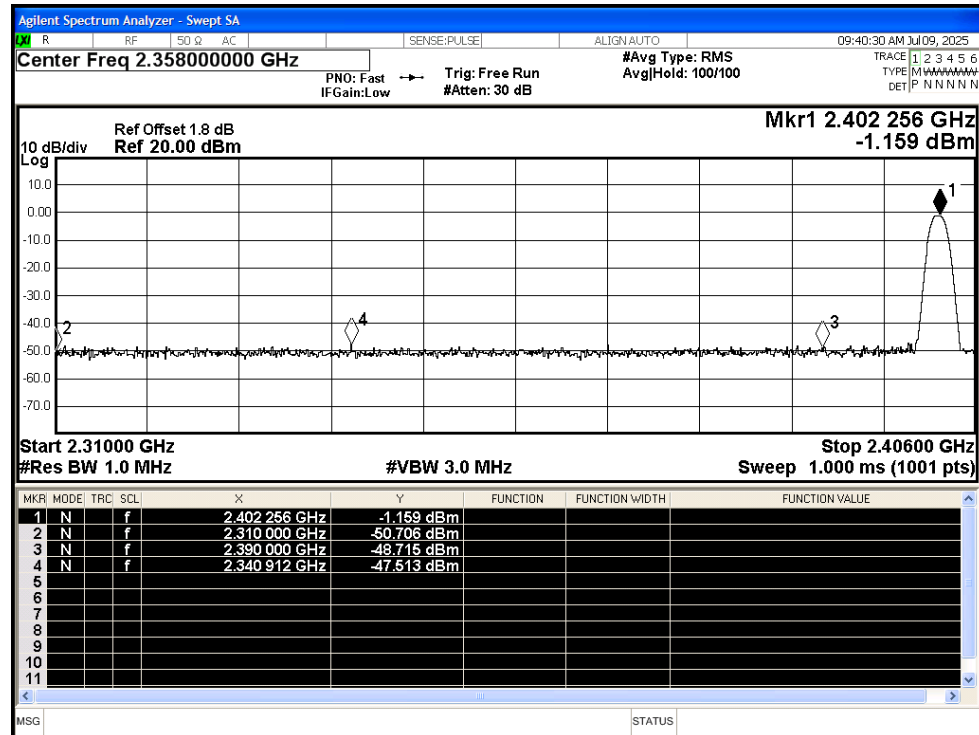


## A.9 Restrict Band

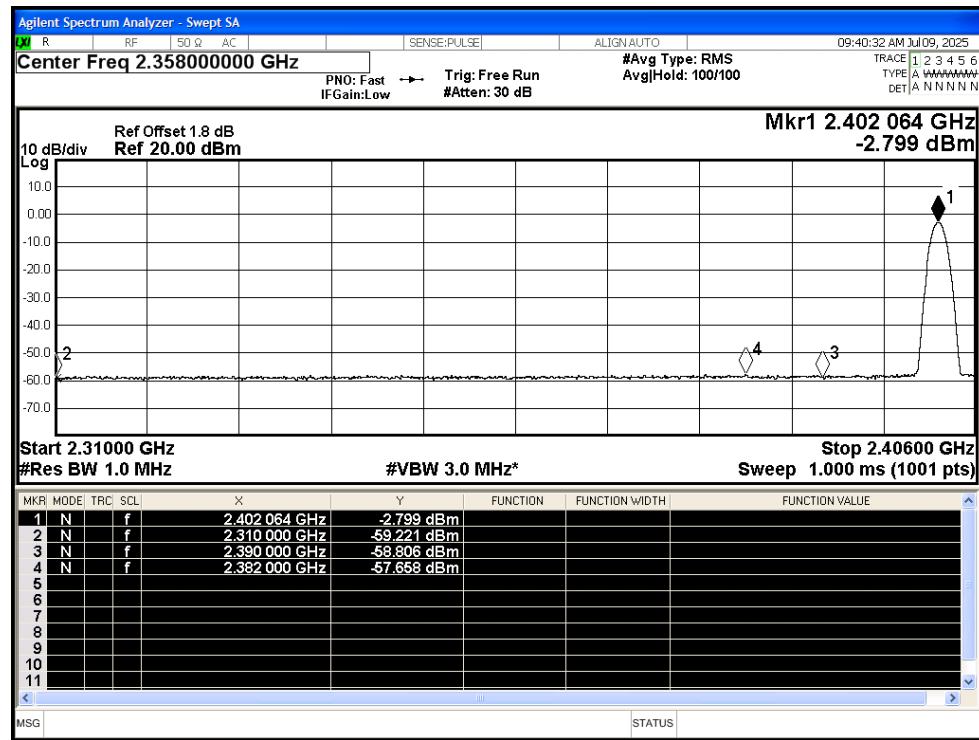
| Condition | Mode  | Frequency (MHz) | Antenna | Hopping Mode | Spur Freq (MHz) | Power (dBm) | Gain (dBi) | Duty Factor (dB) | E (dBUV/m) | Detector | Limit (dBUV/m) | Verdict |
|-----------|-------|-----------------|---------|--------------|-----------------|-------------|------------|------------------|------------|----------|----------------|---------|
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | 2310            | -50.71      | 2          | -                | 46.55      | Peak     | 74             | Pass    |
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | 2310            | -59.22      | 2          | 1.1              | 39.14      | Average  | 54             | Pass    |
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | 2340.912        | -47.51      | 2          | -                | 49.75      | Peak     | 74             | Pass    |
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | 2382            | -57.66      | 2          | 1.1              | 40.7       | Average  | 54             | Pass    |
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | 2390            | -48.72      | 2          | -                | 48.54      | Peak     | 74             | Pass    |
| NVNT      | 1-DH5 | 2402            | Ant     | No-Hopping   | 2390            | -58.81      | 2          | 1.1              | 39.55      | Average  | 54             | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | 2483.5          | -50.33      | 2          | -                | 46.93      | Peak     | 74             | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | 2483.5          | -58.06      | 2          | 1.1              | 40.3       | Average  | 54             | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | 2499.4          | -46.24      | 2          | -                | 51.02      | Peak     | 74             | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | 2484.424        | -57.35      | 2          | 1.1              | 41.01      | Average  | 54             | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | 2500            | -50.62      | 2          | -                | 46.64      | Peak     | 74             | Pass    |
| NVNT      | 1-DH5 | 2480            | Ant     | No-Hopping   | 2500            | -57.76      | 2          | 1.1              | 40.6       | Average  | 54             | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | 2310            | -48.83      | 2          | -                | 48.43      | Peak     | 74             | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | 2310            | -58.74      | 2          | 1.12             | 39.64      | Average  | 54             | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | 2321.04         | -47.02      | 2          | -                | 50.24      | Peak     | 74             | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | 2387.28         | -57.95      | 2          | 1.12             | 40.43      | Average  | 54             | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | 2390            | -51.47      | 2          | -                | 45.79      | Peak     | 74             | Pass    |
| NVNT      | 2-DH5 | 2402            | Ant     | No-Hopping   | 2390            | -58.71      | 2          | 1.12             | 39.67      | Average  | 54             | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | 2483.5          | -50.32      | 2          | -                | 46.94      | Peak     | 74             | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | 2483.5          | -57.28      | 2          | 1.12             | 41.1       | Average  | 54             | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | 2485.672        | -46.37      | 2          | -                | 50.89      | Peak     | 74             | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | 2486.824        | -57.27      | 2          | 1.12             | 41.11      | Average  | 54             | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | 2500            | -51.36      | 2          | -                | 45.9       | Peak     | 74             | Pass    |
| NVNT      | 2-DH5 | 2480            | Ant     | No-Hopping   | 2500            | -58.19      | 2          | 1.12             | 40.19      | Average  | 54             | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | 2310            | -51.31      | 2          | -                | 45.95      | Peak     | 74             | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | 2310            | -59.11      | 2          | 1.12             | 39.27      | Average  | 54             | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | 2382.192        | -47.74      | 2          | -                | 49.52      | Peak     | 74             | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | 2360.4          | -57.86      | 2          | 1.12             | 40.52      | Average  | 54             | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | 2390            | -50.28      | 2          | -                | 46.98      | Peak     | 74             | Pass    |
| NVNT      | 3-DH5 | 2402            | Ant     | No-Hopping   | 2390            | -58.76      | 2          | 1.12             | 39.62      | Average  | 54             | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | 2483.5          | -49.73      | 2          | -                | 47.53      | Peak     | 74             | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | 2483.5          | -57.77      | 2          | 1.12             | 40.61      | Average  | 54             | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | 2485.336        | -45.65      | 2          | -                | 51.61      | Peak     | 74             | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | 2491.432        | -57.07      | 2          | 1.12             | 41.31      | Average  | 54             | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | 2500            | -49.59      | 2          | -                | 47.67      | Peak     | 74             | Pass    |
| NVNT      | 3-DH5 | 2480            | Ant     | No-Hopping   | 2500            | -58.41      | 2          | 1.12             | 39.97      | Average  | 54             | Pass    |

## Test Graphs

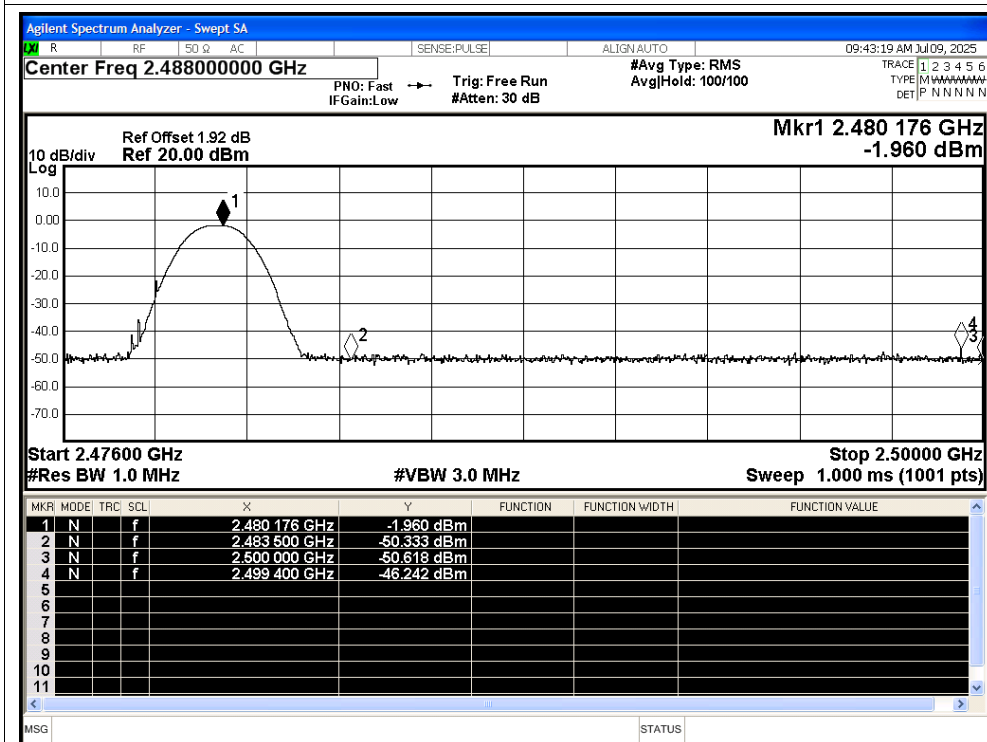
## Restrict Band NVNT 1-DH5 2402MHz Ant No-Hopping Peak



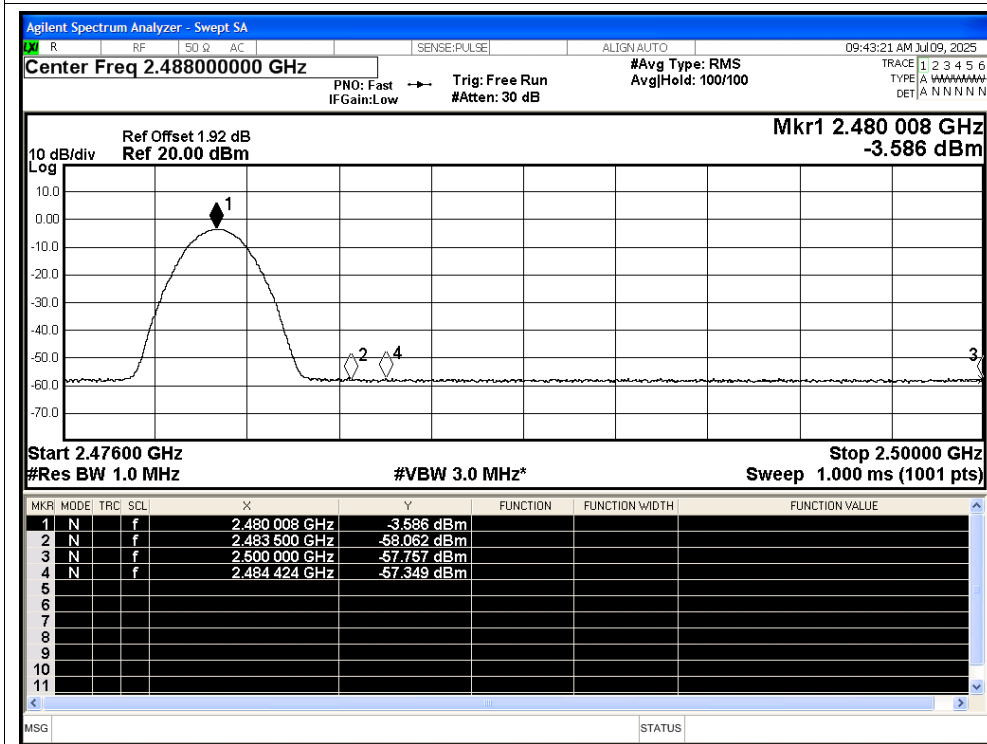
## Restrict Band NVNT 1-DH5 2402MHz Ant No-Hopping Average

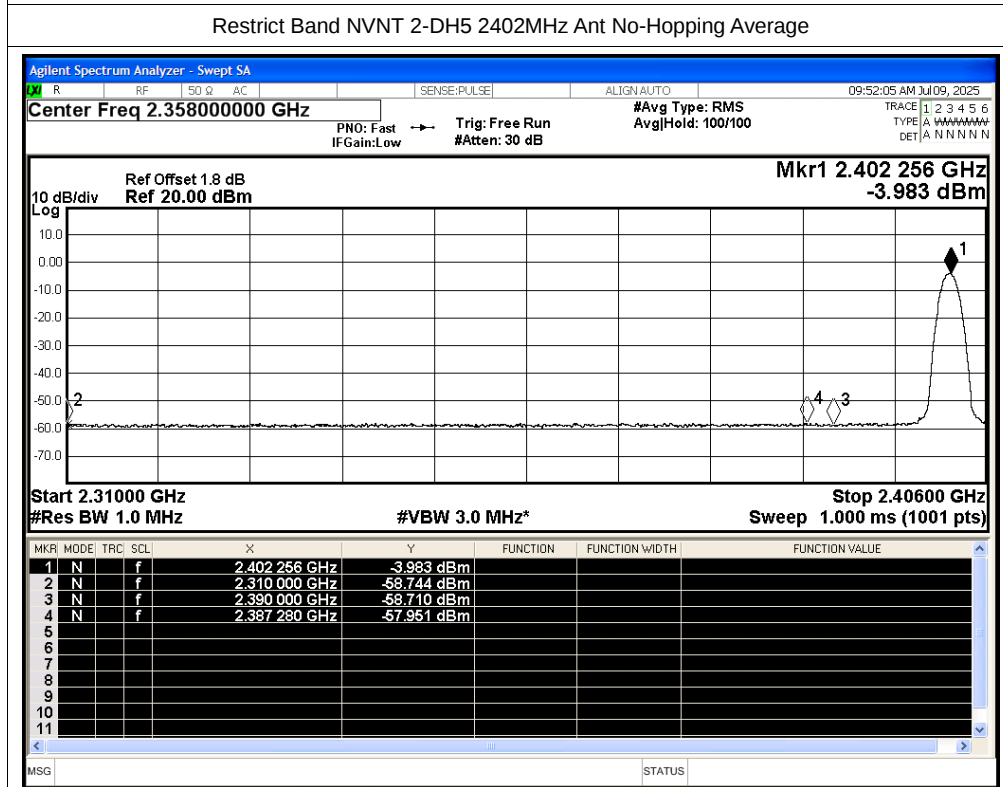
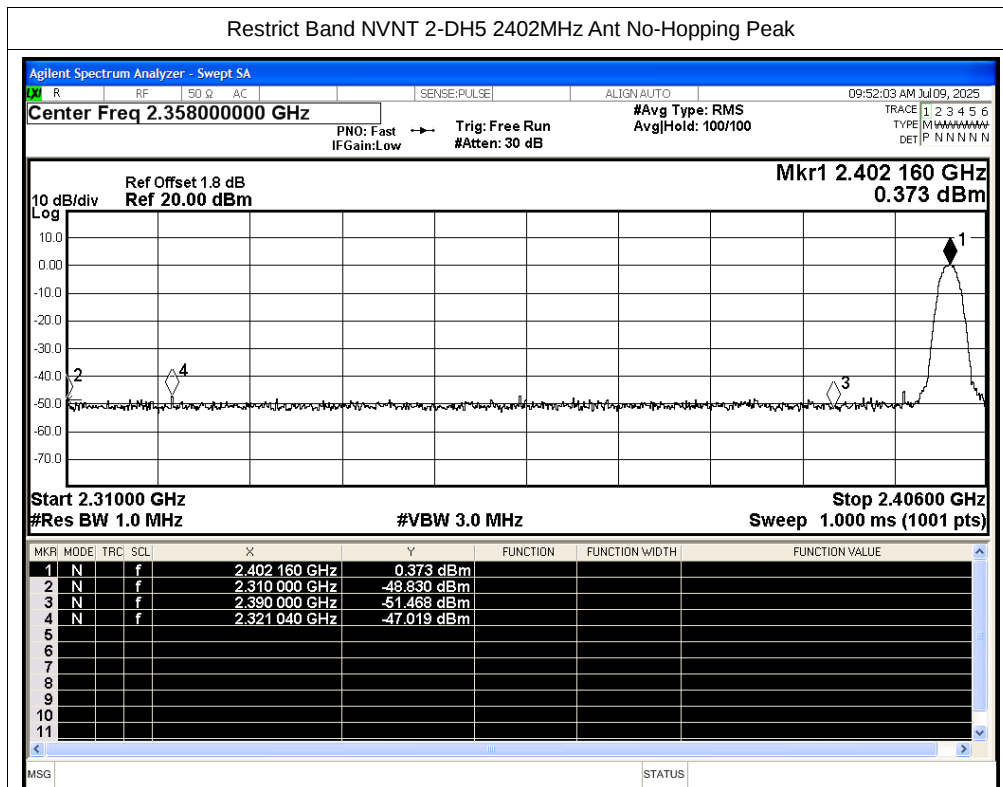


## Restrict Band NVNT 1-DH5 2480MHz Ant No-Hopping Peak

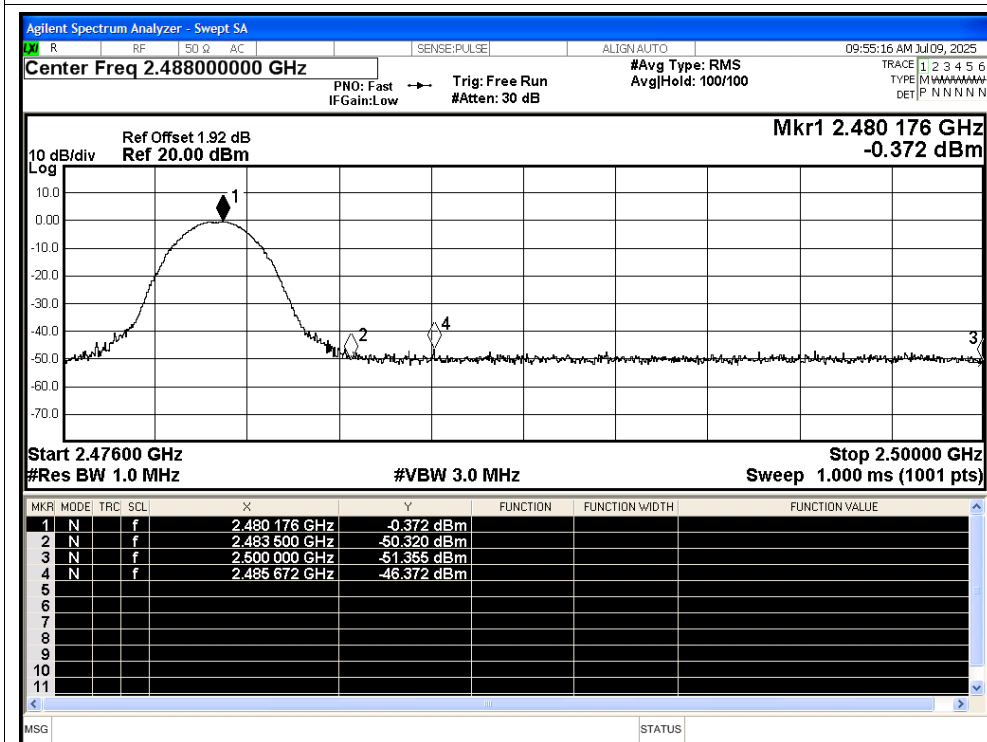


## Restrict Band NVNT 1-DH5 2480MHz Ant No-Hopping Average

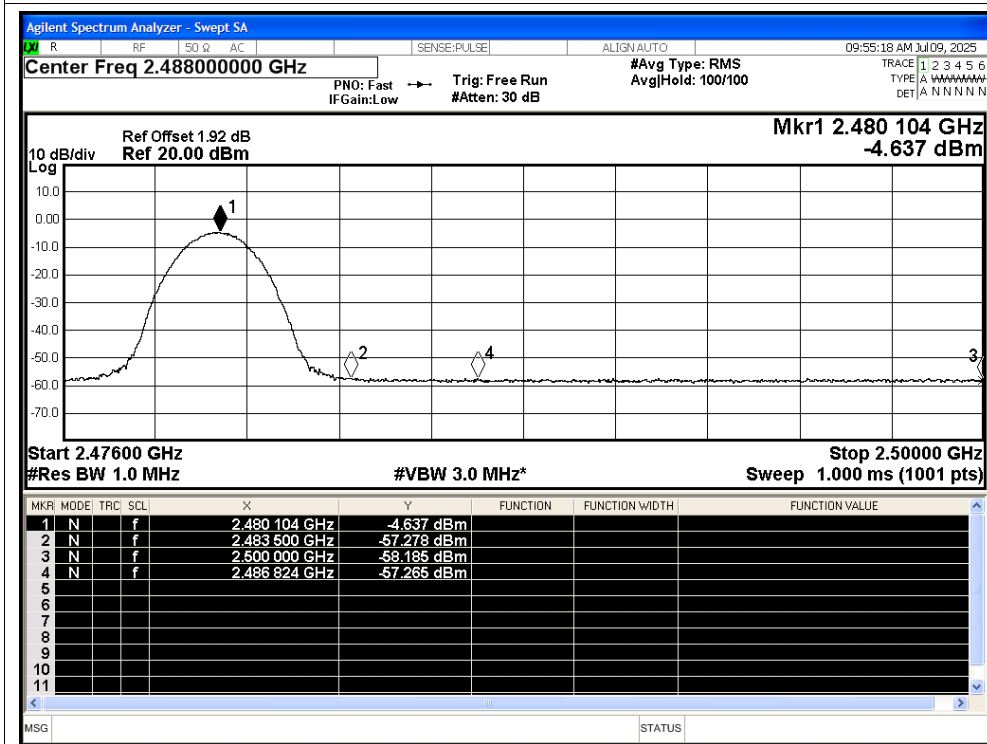


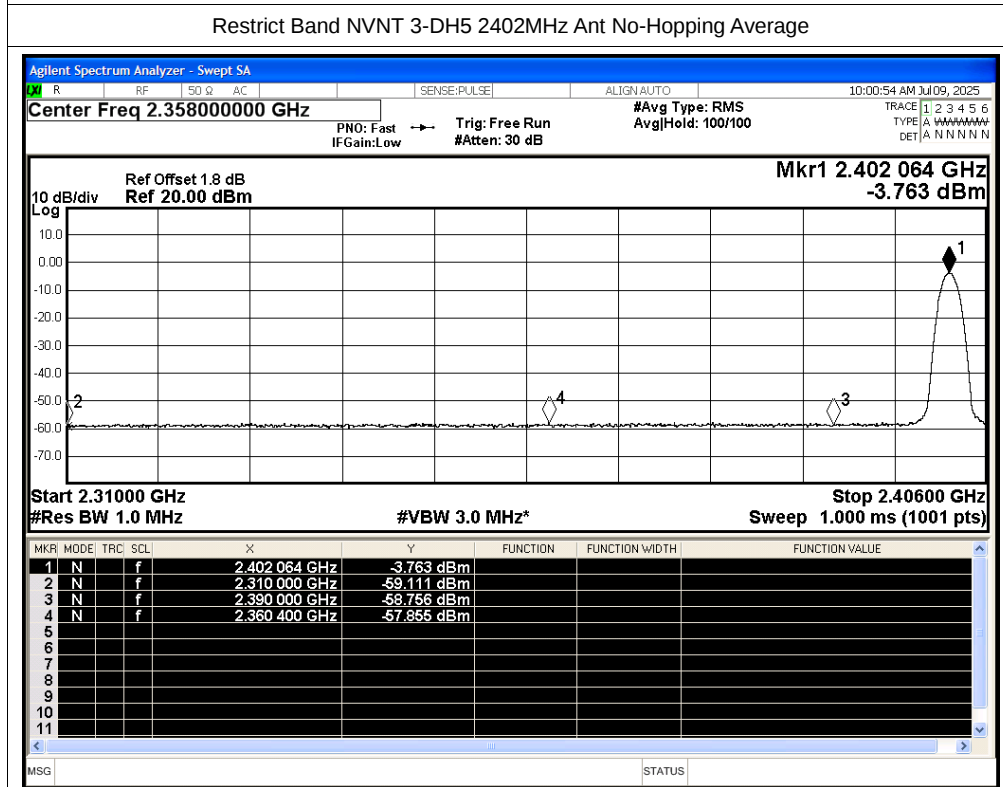
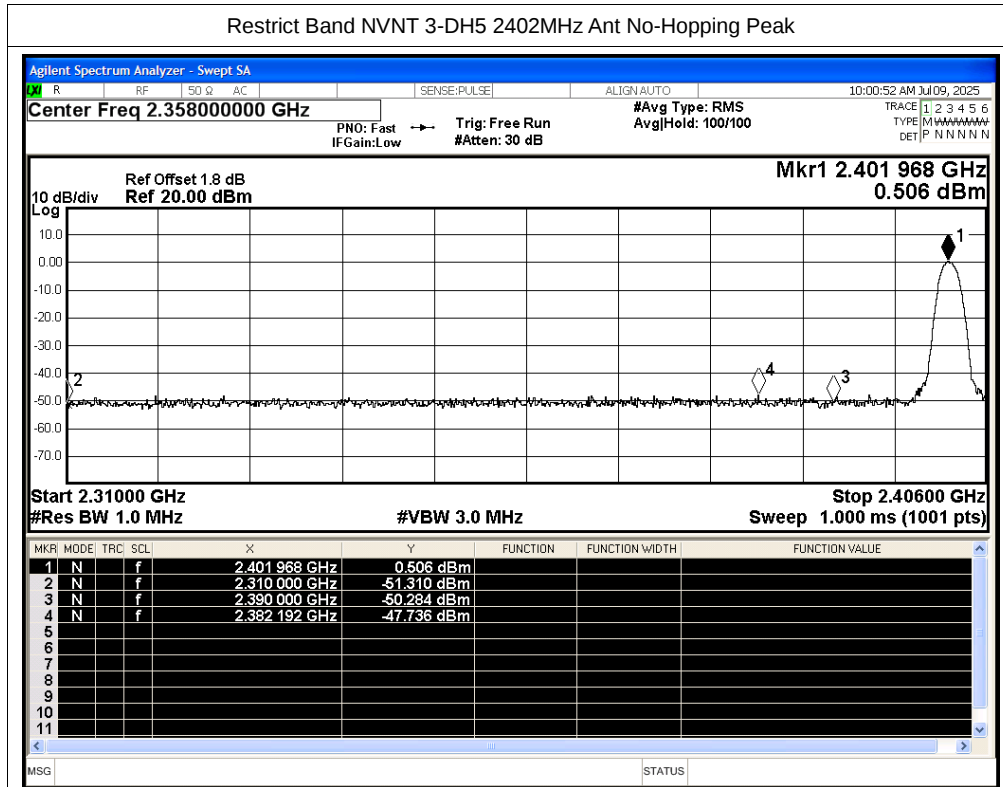


## Restrict Band NVNT 2-DH5 2480MHz Ant No-Hopping Peak

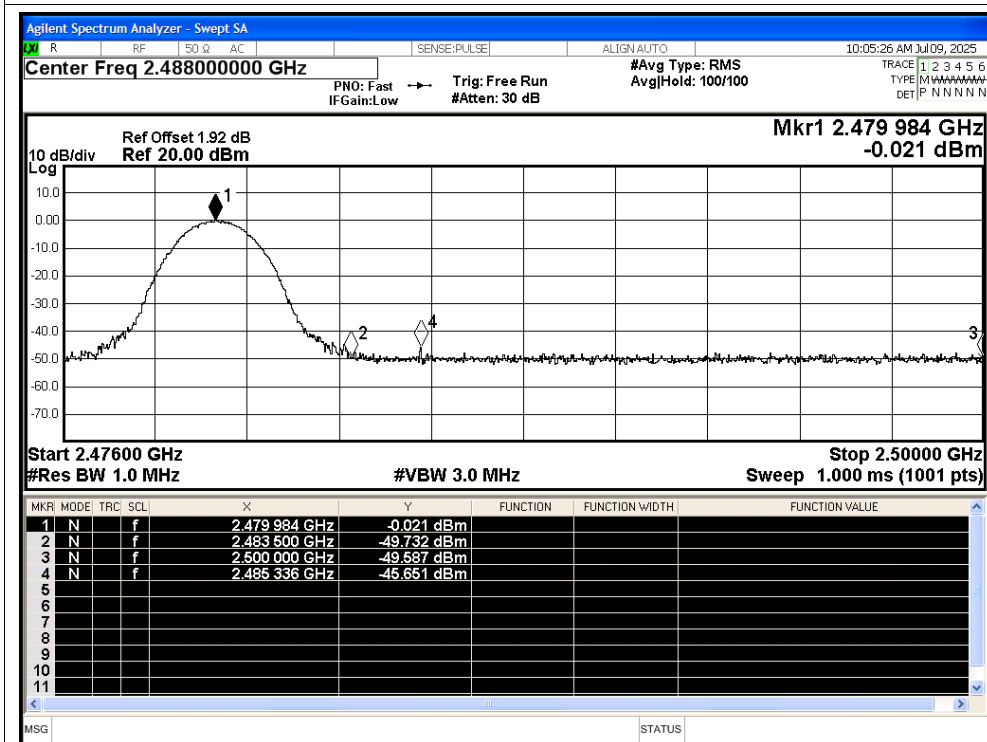


## Restrict Band NVNT 2-DH5 2480MHz Ant No-Hopping Average





## Restrict Band NVNT 3-DH5 2480MHz Ant No-Hopping Peak



## Restrict Band NVNT 3-DH5 2480MHz Ant No-Hopping Average

