

## Appendix A

### RF Test Data for BLE (Conducted Measurement)

Product Name: Smart Plug

Test Model: US-ZH-B151-W1

#### Environmental Conditions

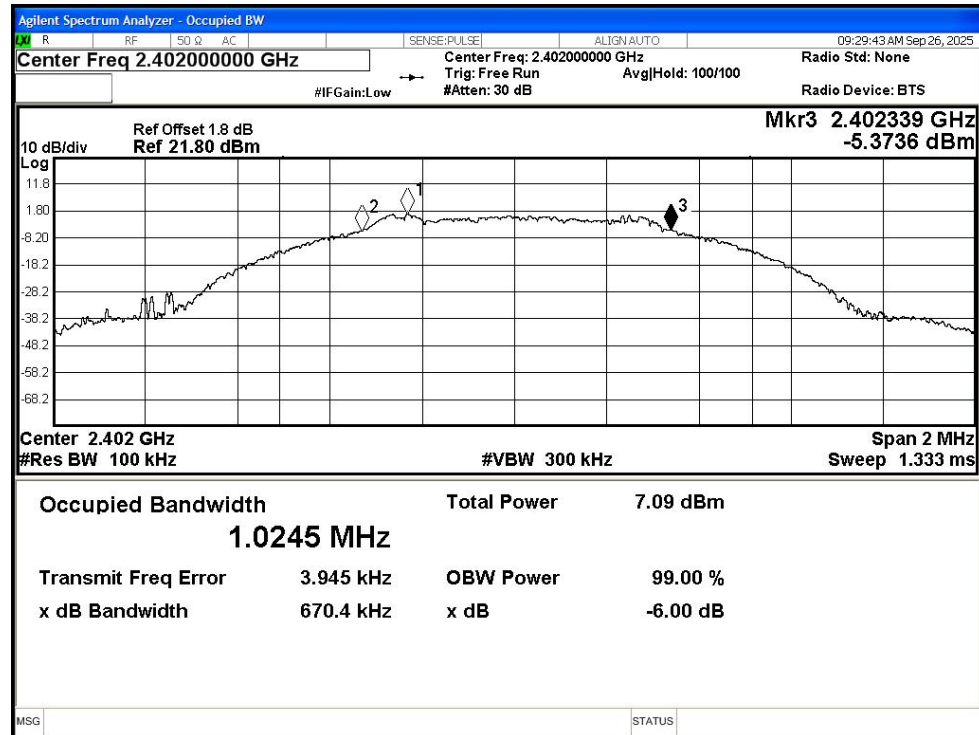
|                    |             |
|--------------------|-------------|
| Temperature:       | 23.5° C     |
| Relative Humidity: | 52.2%       |
| ATM Pressure:      | 100.0 kPa   |
| Test Engineer:     | Suichao Lai |
| Supervised by:     | Yan Chen    |

## A.1 -6dB Bandwidth

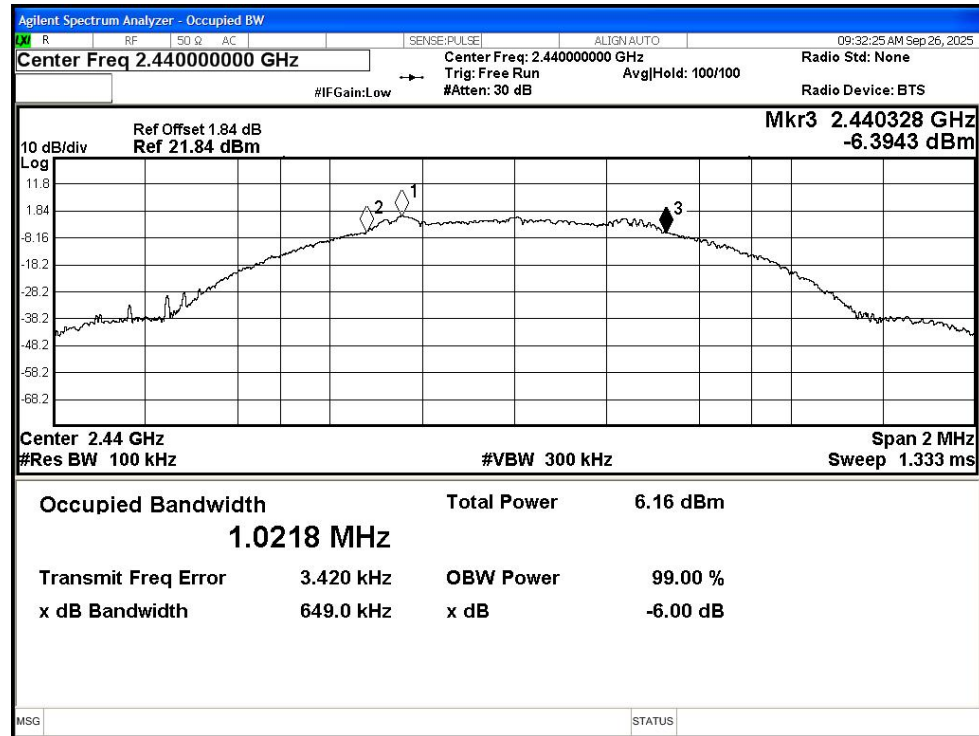
| Condition | Mode   | Frequency (MHz) | Antenna | -6 dB Bandwidth (MHz) | Limit -6 dB Bandwidth (MHz) | Verdict |
|-----------|--------|-----------------|---------|-----------------------|-----------------------------|---------|
| NVNT      | BLE 1M | 2402            | Ant1    | 0.67                  | $\geq 0.5$                  | Pass    |
| NVNT      | BLE 1M | 2440            | Ant1    | 0.649                 | $\geq 0.5$                  | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 0.665                 | $\geq 0.5$                  | Pass    |

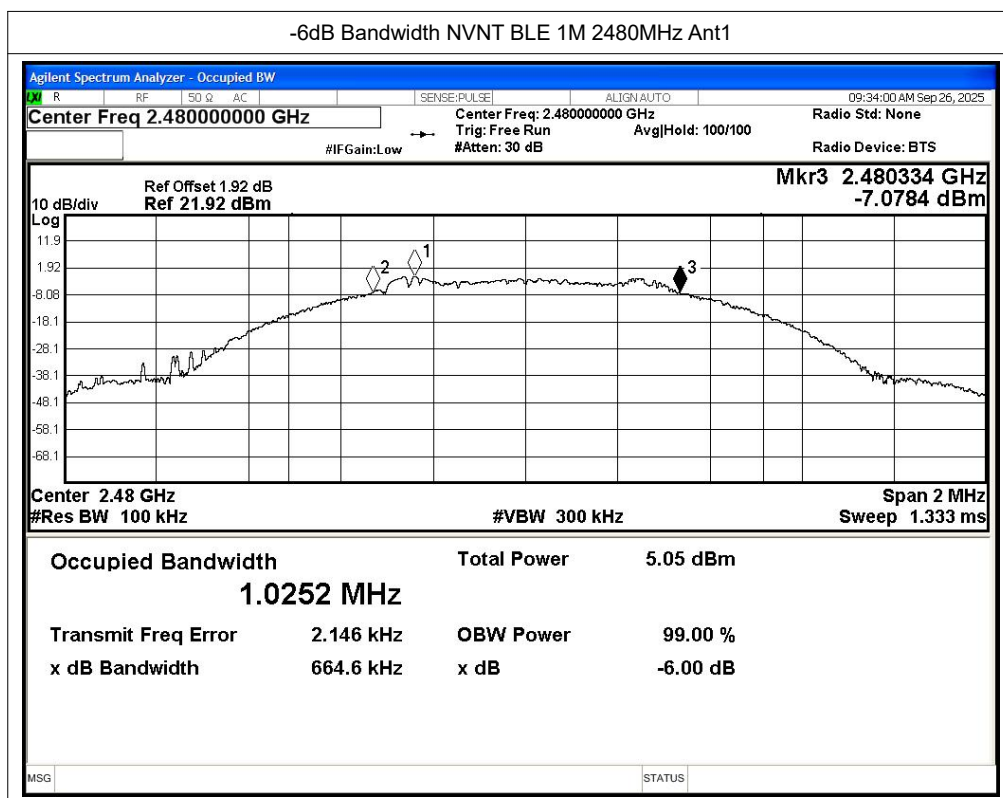
## Test Graphs

-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2440MHz Ant1



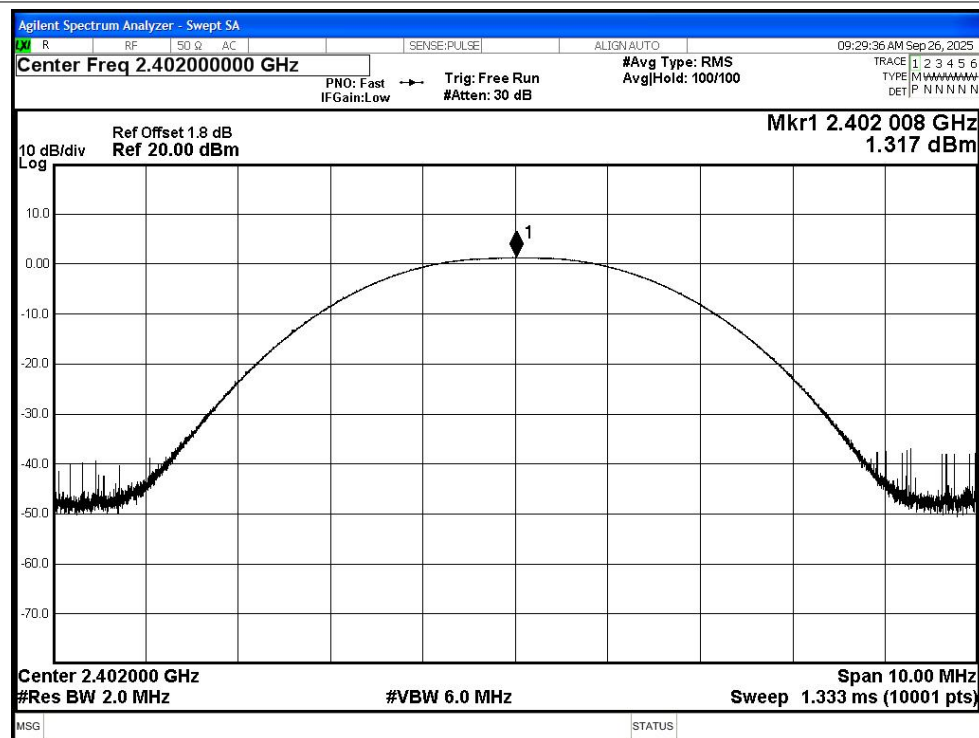


## A.2 Maximum Peak Conducted Output Power

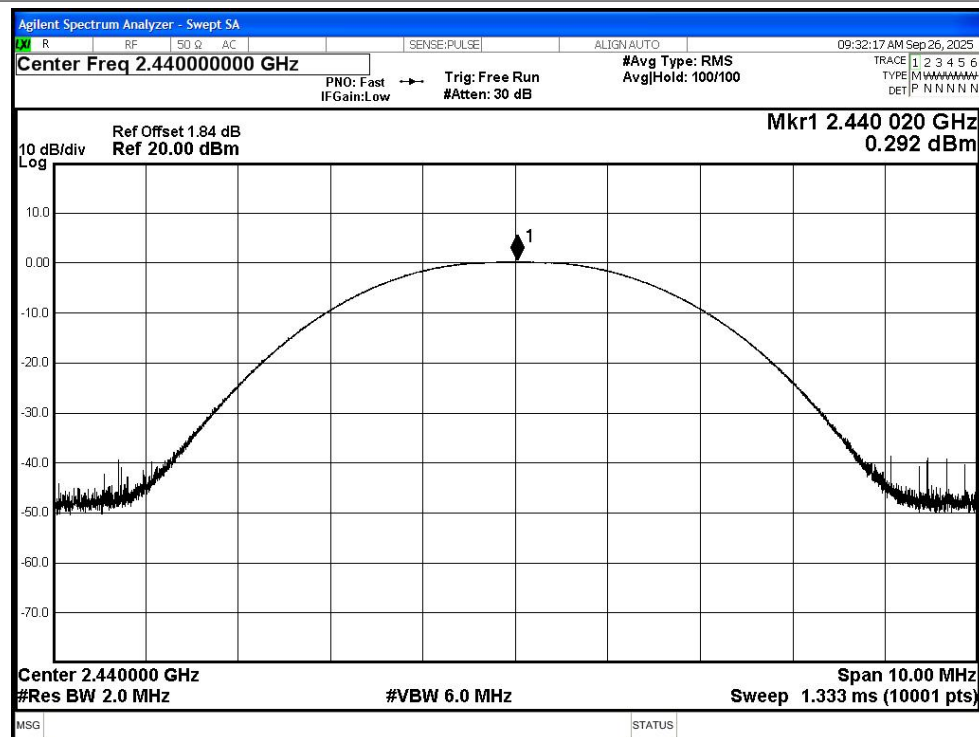
| Condition | Mode   | Frequency (MHz) | Antenna | Total Power (dBm) | Limit (dBm) | Verdict |
|-----------|--------|-----------------|---------|-------------------|-------------|---------|
| NVNT      | BLE 1M | 2402            | Ant1    | 1.32              | 30          | Pass    |
| NVNT      | BLE 1M | 2440            | Ant1    | 0.29              | 30          | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | -0.64             | 30          | Pass    |

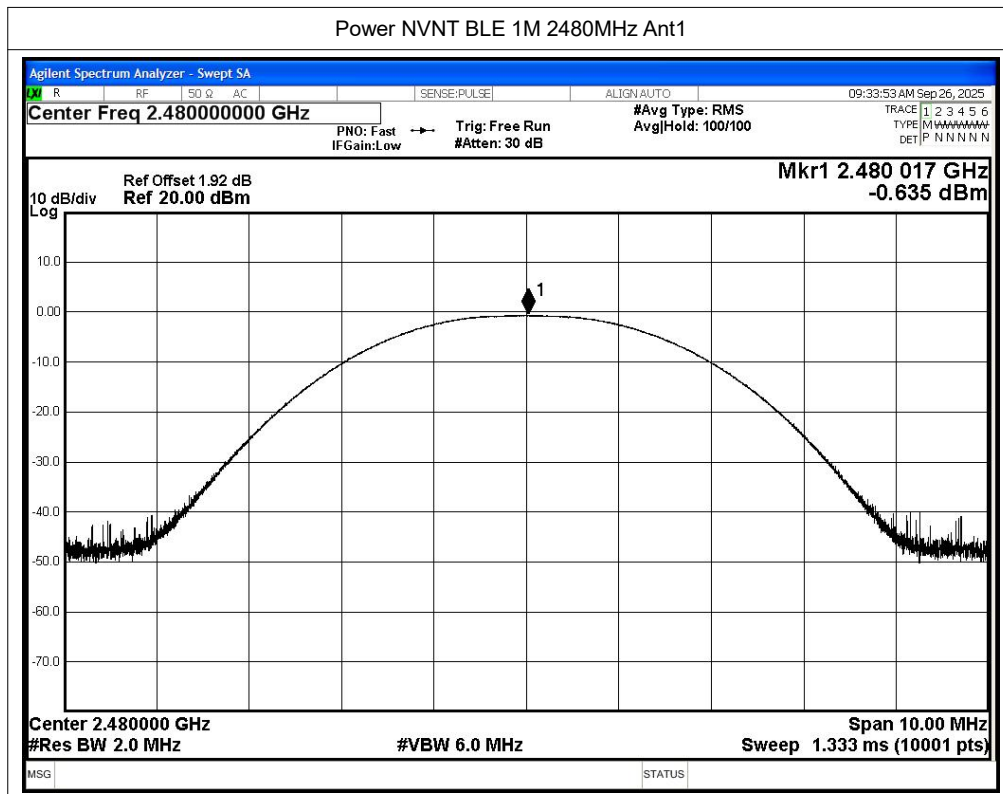
## Test Graphs

Power NVNT BLE 1M 2402MHz Ant1



Power NVNT BLE 1M 2440MHz Ant1





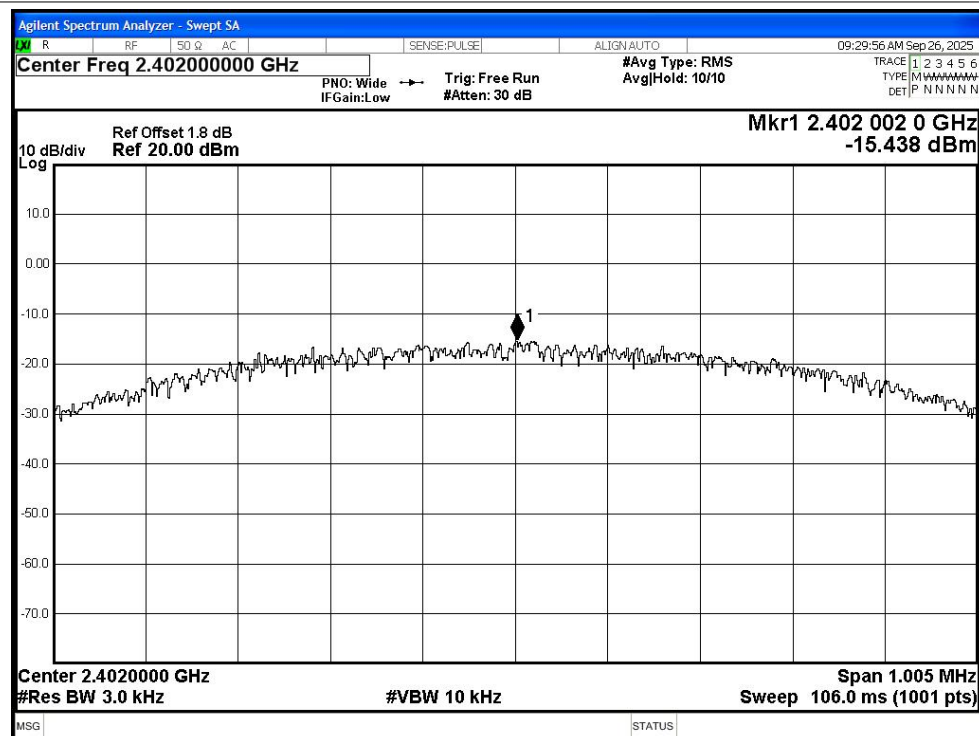
### A.3 Maximum Power Spectral Density Level

| Condition | Mode   | Frequency (MHz) | Antenna | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Verdict |
|-----------|--------|-----------------|---------|----------------------|------------------|---------|
| NVNT      | BLE 1M | 2402            | Ant1    | -15.44               | 8                | Pass    |
| NVNT      | BLE 1M | 2440            | Ant1    | -16.24               | 8                | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | -17.29               | 8                | Pass    |

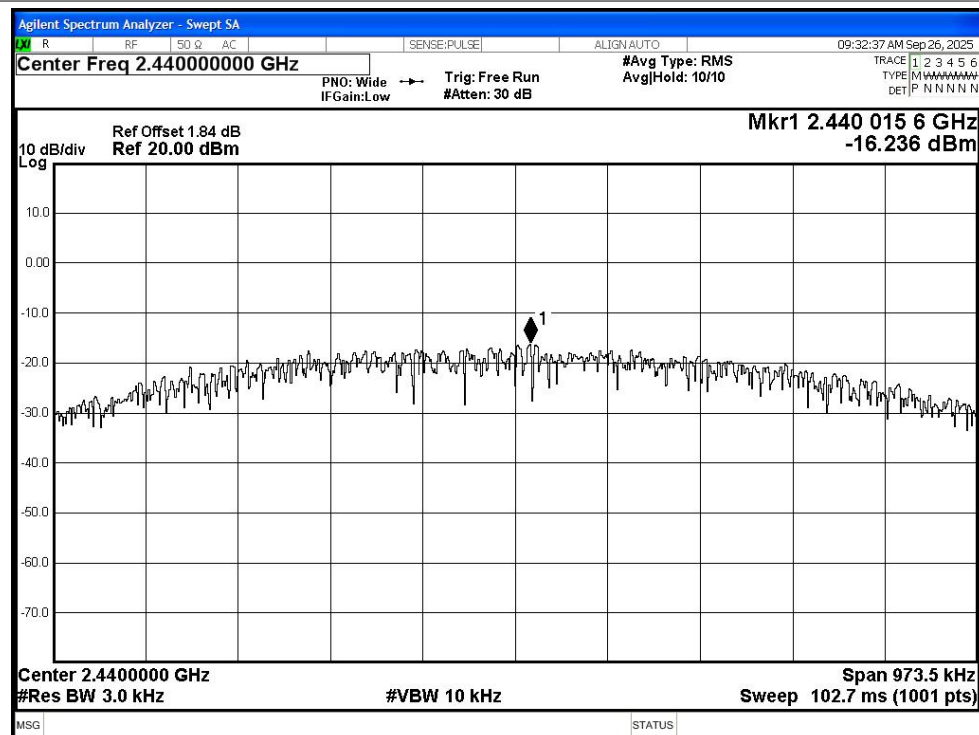


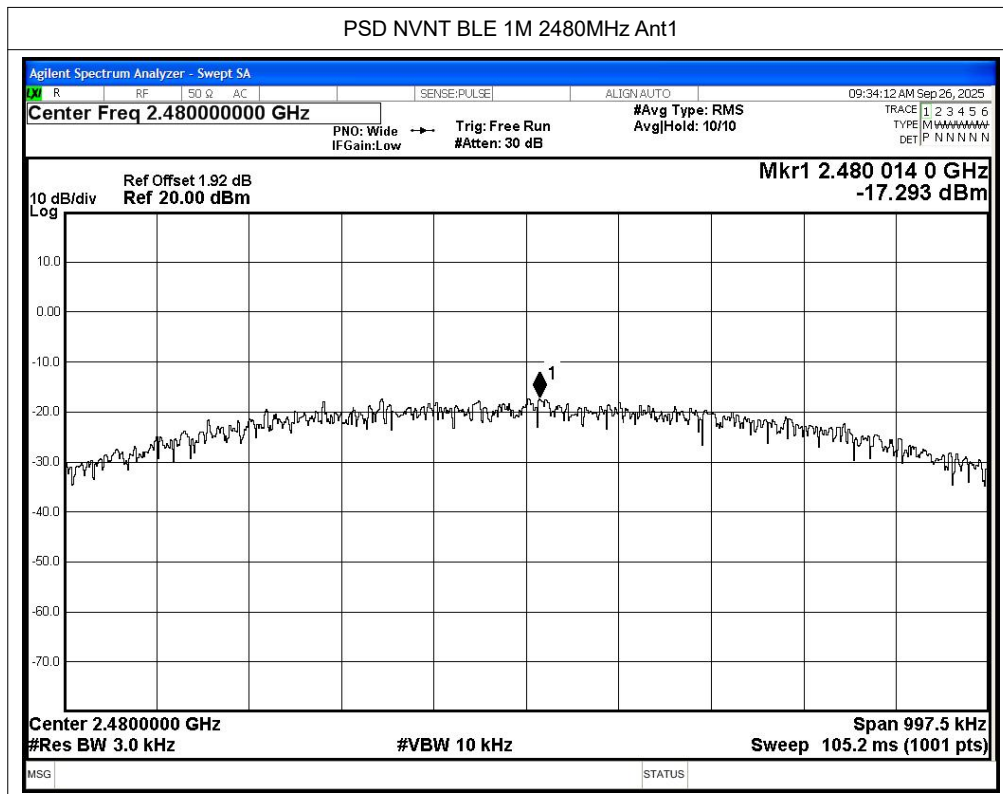
## Test Graphs

PSD NVNT BLE 1M 2402MHz Ant1



PSD NVNT BLE 1M 2440MHz Ant1



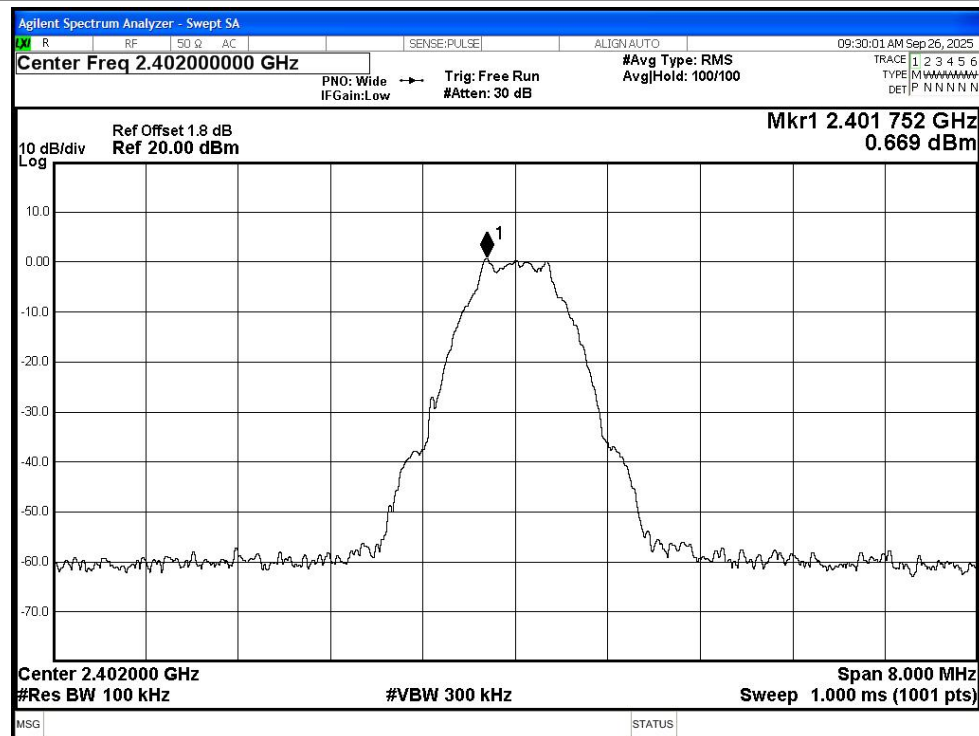


## A.4 Band Edge

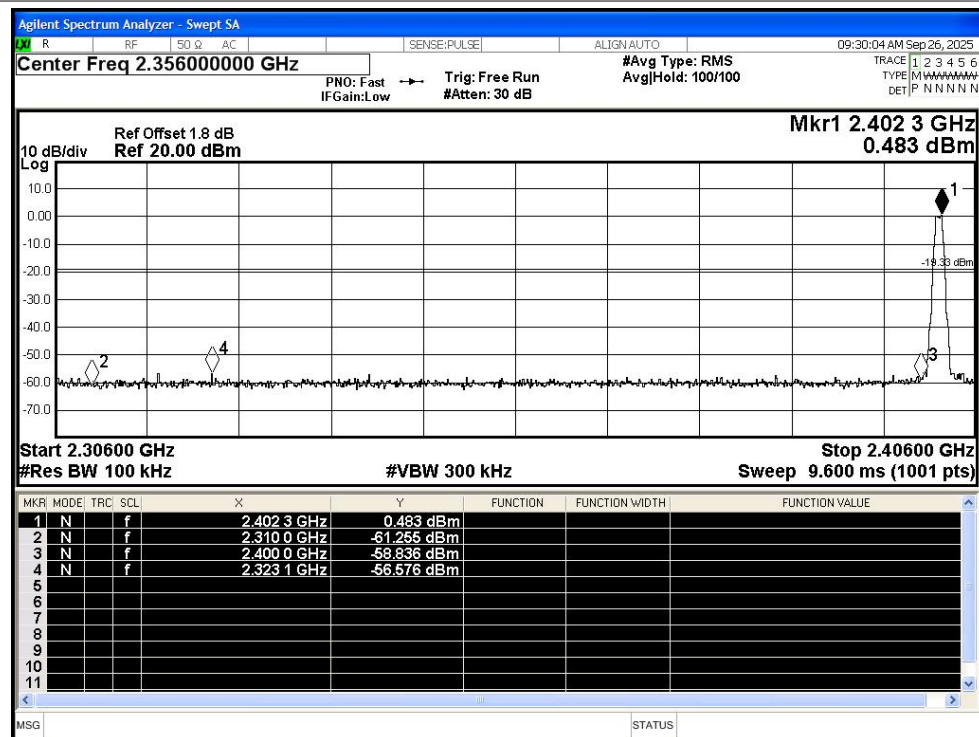
| Condition | Mode   | Frequency (MHz) | Antenna | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|--------|-----------------|---------|-----------------|-------------|---------|
| NVNT      | BLE 1M | 2402            | Ant1    | -57.25          | -20         | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | -56.19          | -20         | Pass    |

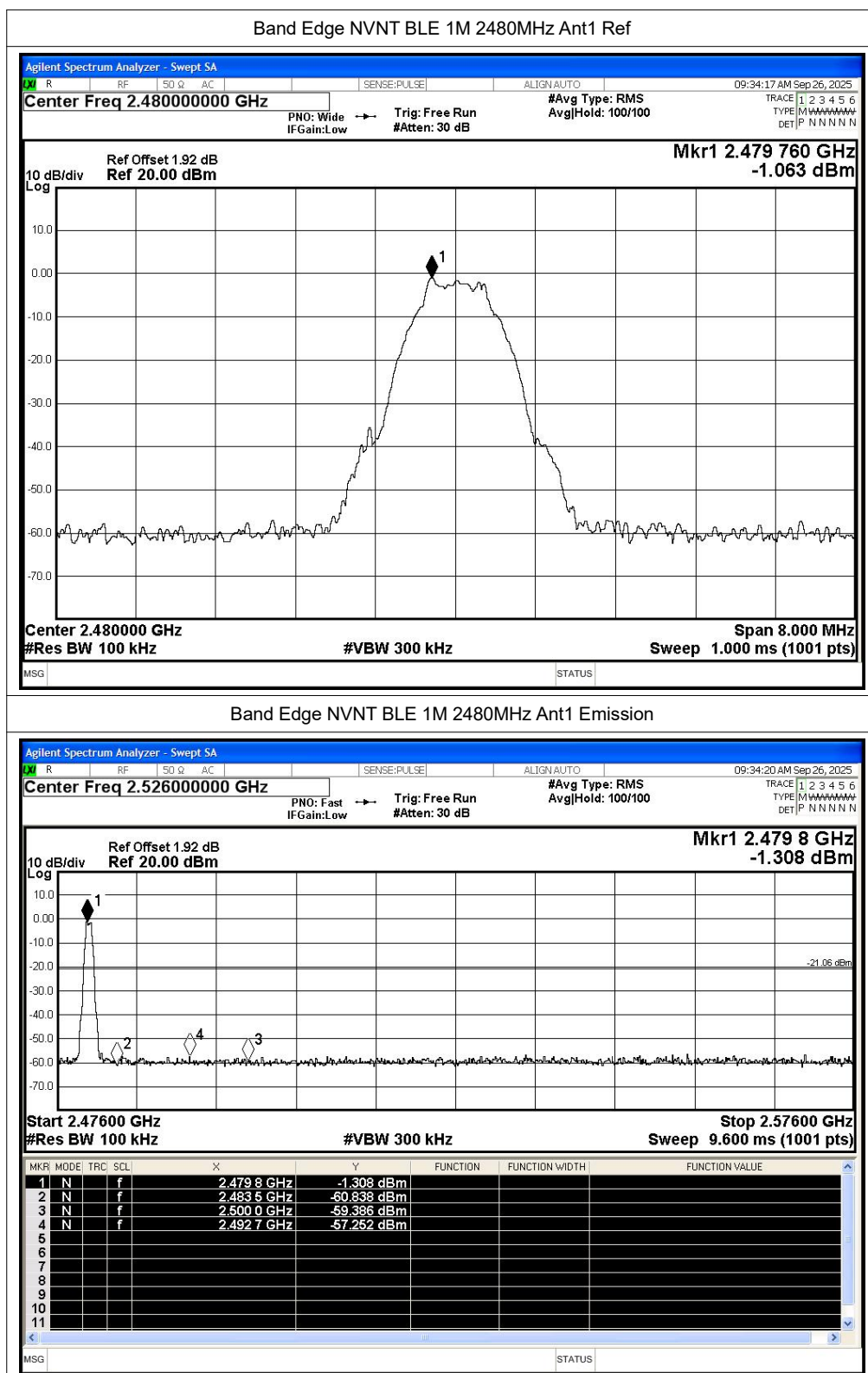
## Test Graphs

## Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



## Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



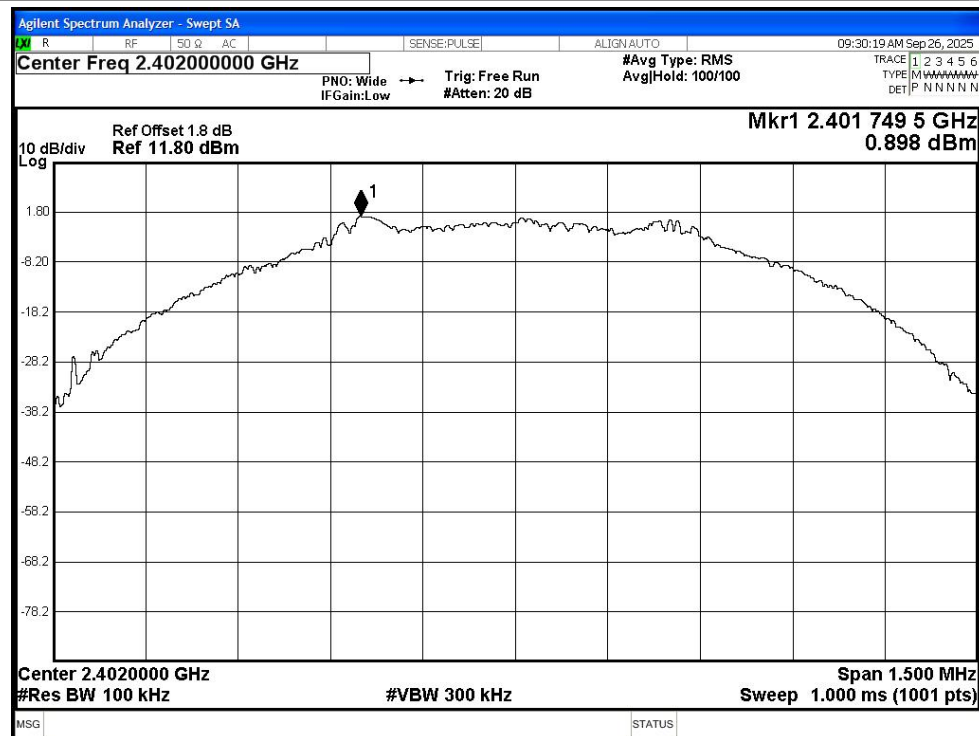


## A.5 Conducted RF Spurious Emission

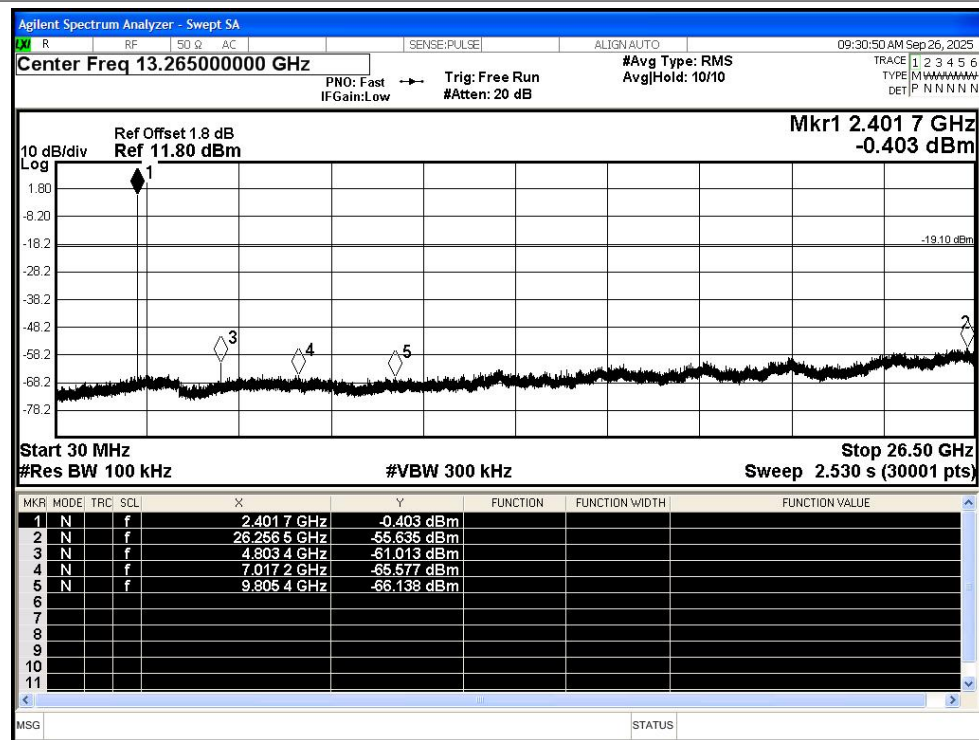
| Condition | Mode   | Frequency (MHz) | Antenna | Max Value (dBc) | Limit (dBc) | Verdict |
|-----------|--------|-----------------|---------|-----------------|-------------|---------|
| NVNT      | BLE 1M | 2402            | Ant1    | -56.53          | -20         | Pass    |
| NVNT      | BLE 1M | 2440            | Ant1    | -55.18          | -20         | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | -54.43          | -20         | Pass    |

## Test Graphs

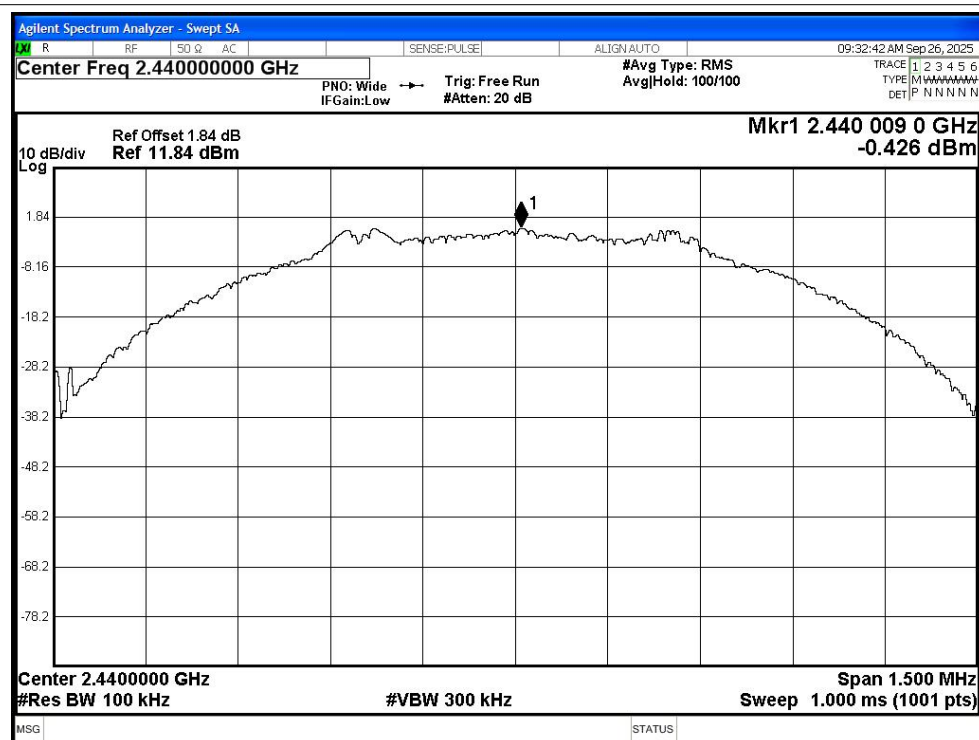
## Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



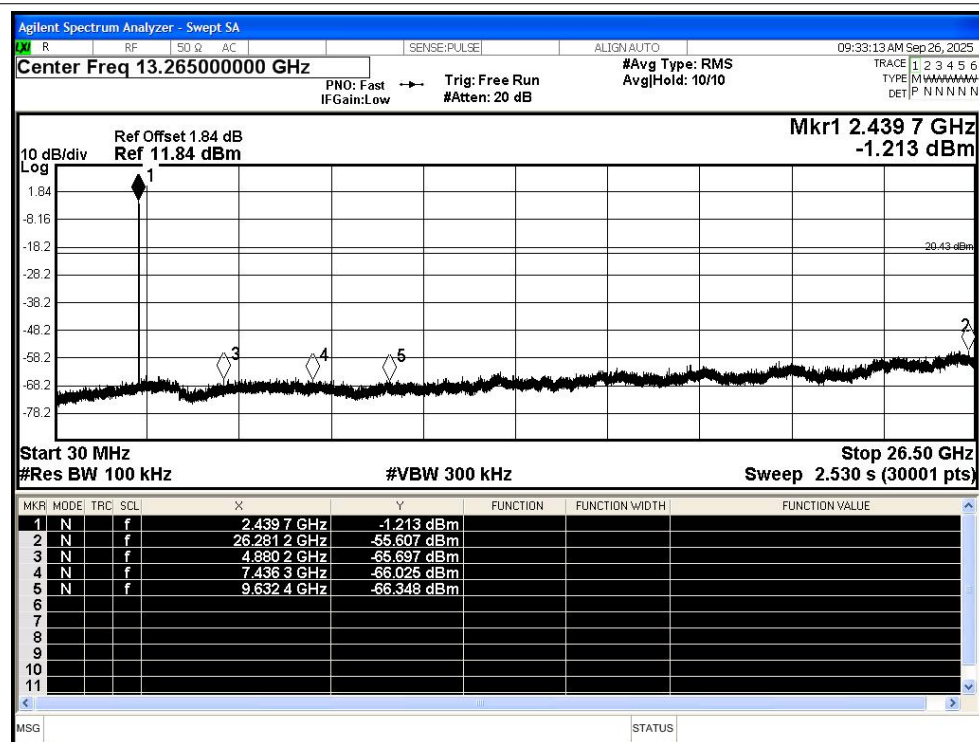
## Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



## Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref

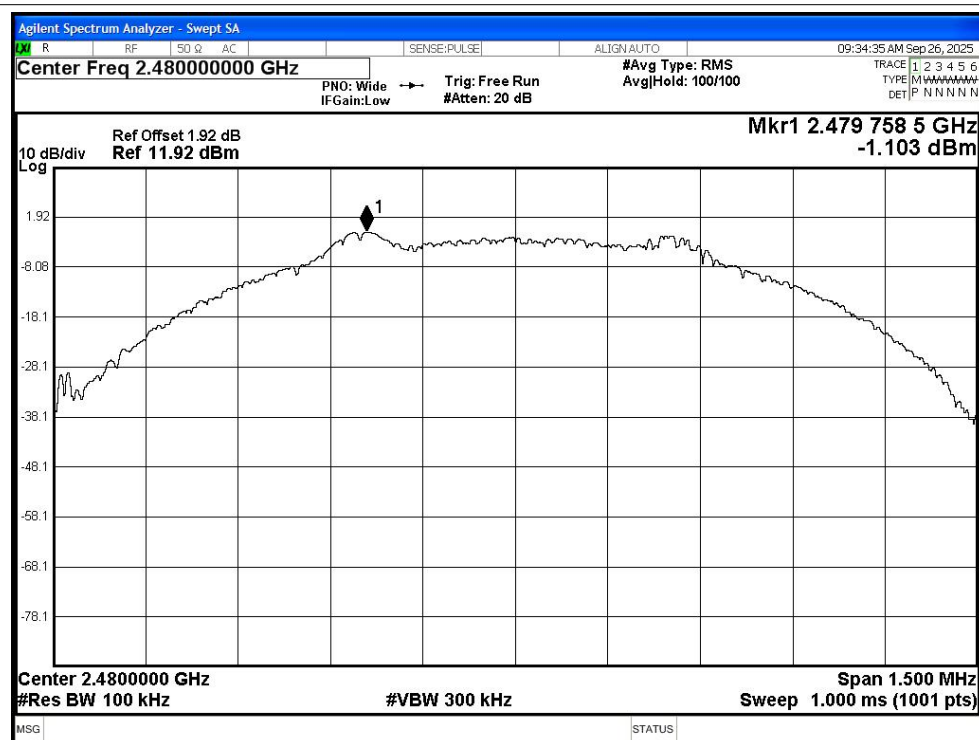


## Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission

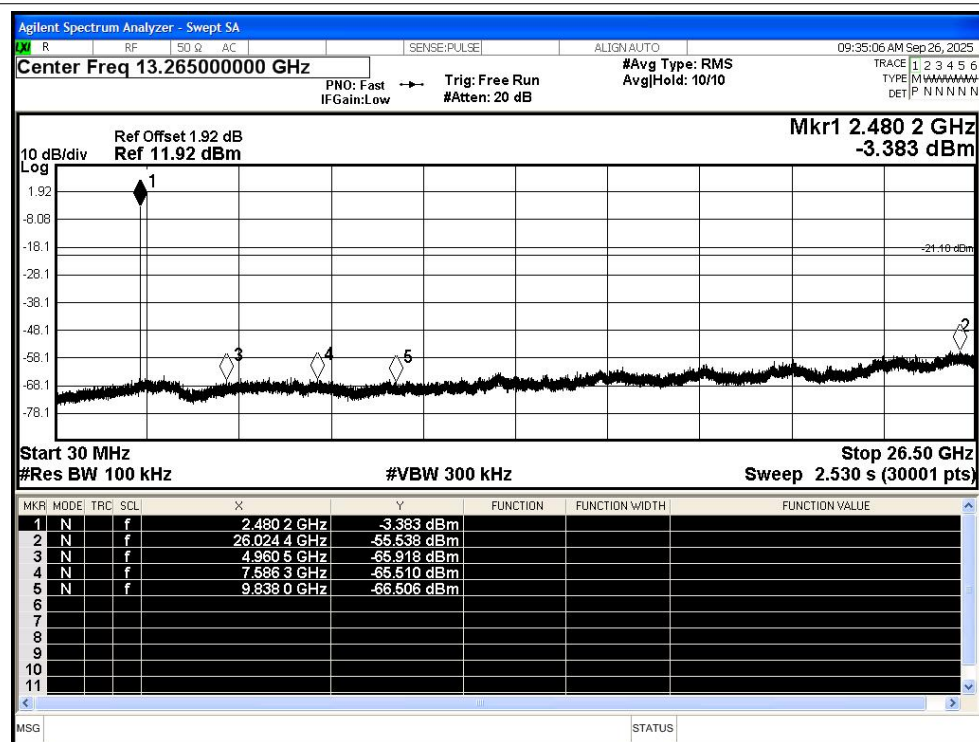




## Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



## Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission

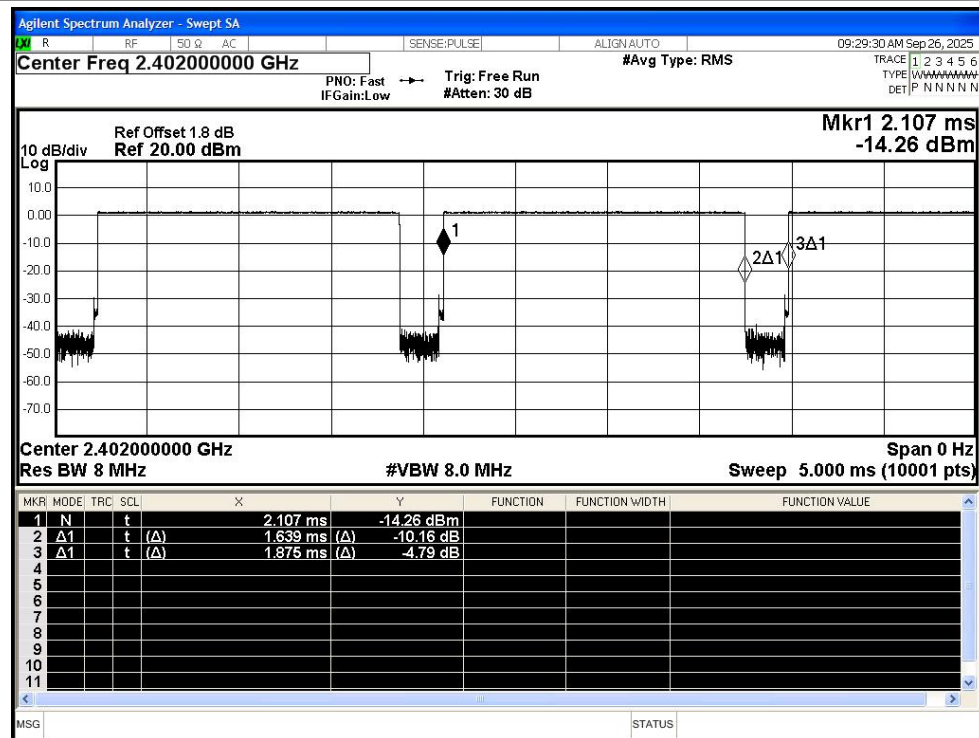


## A.6 Duty Cycle

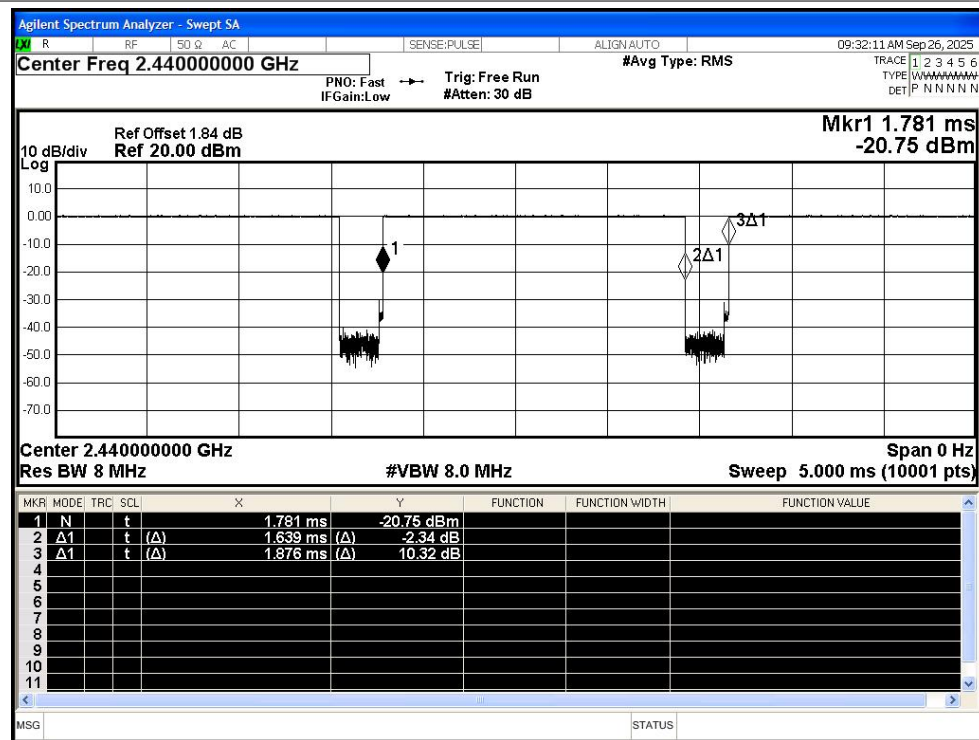
| Condition | Mode   | Frequency (MHz) | Antenna | Duty Cycle (%) | Correction Factor (dB) | 1/T (kHz) |
|-----------|--------|-----------------|---------|----------------|------------------------|-----------|
| NVNT      | BLE 1M | 2402            | Ant1    | 87.41          | 0.58                   | 0.61      |
| NVNT      | BLE 1M | 2440            | Ant1    | 87.39          | 0.59                   | 0.61      |
| NVNT      | BLE 1M | 2480            | Ant1    | 87.39          | 0.59                   | 0.61      |

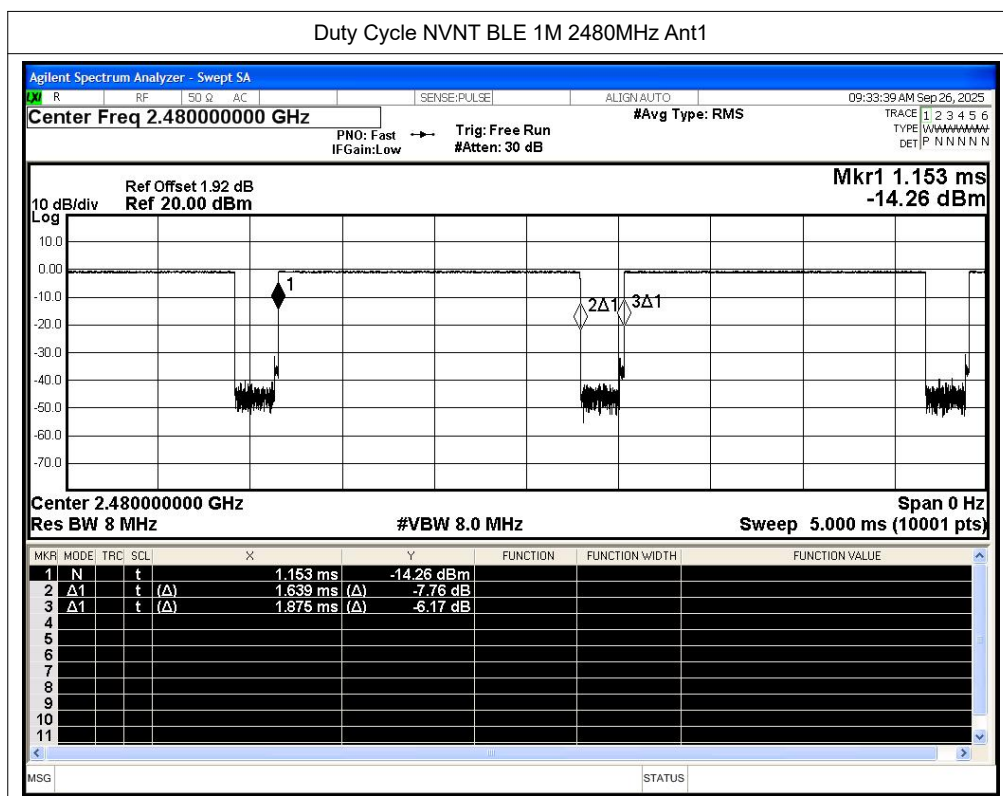
## Test Graphs

## Duty Cycle NVNT BLE 1M 2402MHz Ant1



## Duty Cycle NVNT BLE 1M 2440MHz Ant1



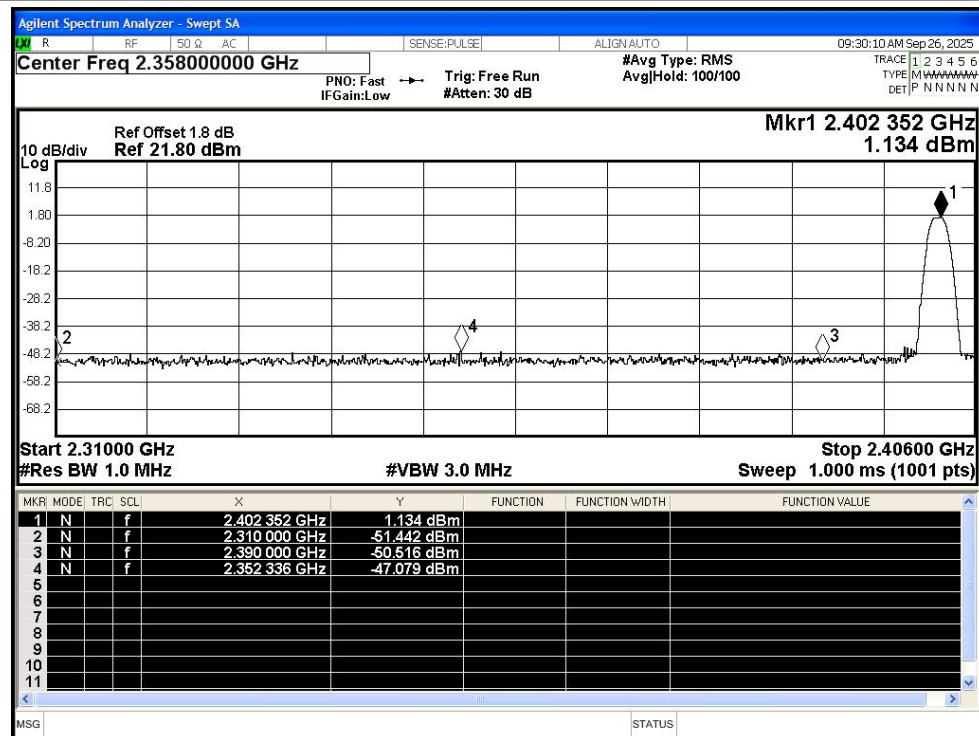


## A.7 Restrict Band

| Condition | Mode   | Frequency (MHz) | Antenna | Spur Freq (MHz) | Power (dBm) | Gain (dBi) | Duty Factor (dB) | E (dBuV/m) | Detector | Limit (dBuV/m) | Verdict |
|-----------|--------|-----------------|---------|-----------------|-------------|------------|------------------|------------|----------|----------------|---------|
| NVNT      | BLE 1M | 2402            | Ant1    | 2310            | -51.44      | 2          | -                | 45.82      | Peak     | 74             | Pass    |
| NVNT      | BLE 1M | 2402            | Ant1    | 2310            | -58.99      | 2          | 0.58             | 38.85      | Average  | 54             | Pass    |
| NVNT      | BLE 1M | 2402            | Ant1    | 2352.336        | -47.08      | 2          | -                | 50.18      | Peak     | 74             | Pass    |
| NVNT      | BLE 1M | 2402            | Ant1    | 2380.08         | -58.33      | 2          | 0.58             | 39.51      | Average  | 54             | Pass    |
| NVNT      | BLE 1M | 2402            | Ant1    | 2390            | -50.52      | 2          | -                | 46.74      | Peak     | 74             | Pass    |
| NVNT      | BLE 1M | 2402            | Ant1    | 2390            | -58.53      | 2          | 0.58             | 39.31      | Average  | 54             | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 2483.5          | -45.56      | 2          | -                | 51.7       | Peak     | 74             | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 2483.5          | -57.9       | 2          | 0.59             | 39.95      | Average  | 54             | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 2483.512        | -45.56      | 2          | -                | 51.7       | Peak     | 74             | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 2483.56         | -57.72      | 2          | 0.59             | 40.13      | Average  | 54             | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 2500            | -50.02      | 2          | -                | 47.24      | Peak     | 74             | Pass    |
| NVNT      | BLE 1M | 2480            | Ant1    | 2500            | -58.19      | 2          | 0.59             | 39.66      | Average  | 54             | Pass    |

## Test Graphs

## Restrict Band NVNT BLE 1M 2402MHz Ant1 Peak



## Restrict Band NVNT BLE 1M 2402MHz Ant1 Average

