



## Appendix B

### RF Test Data for 2.4G (Conducted Measurement)

**Product Name: MA-1 MINI SPEAKER**

**Test Model: MA-1**

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23.5° C   |
| Relative Humidity: | 52.2%     |
| ATM Pressure:      | 100.0 kPa |
| Test Engineer:     | Wunder Wu |
| Supervised by:     | Li huan   |

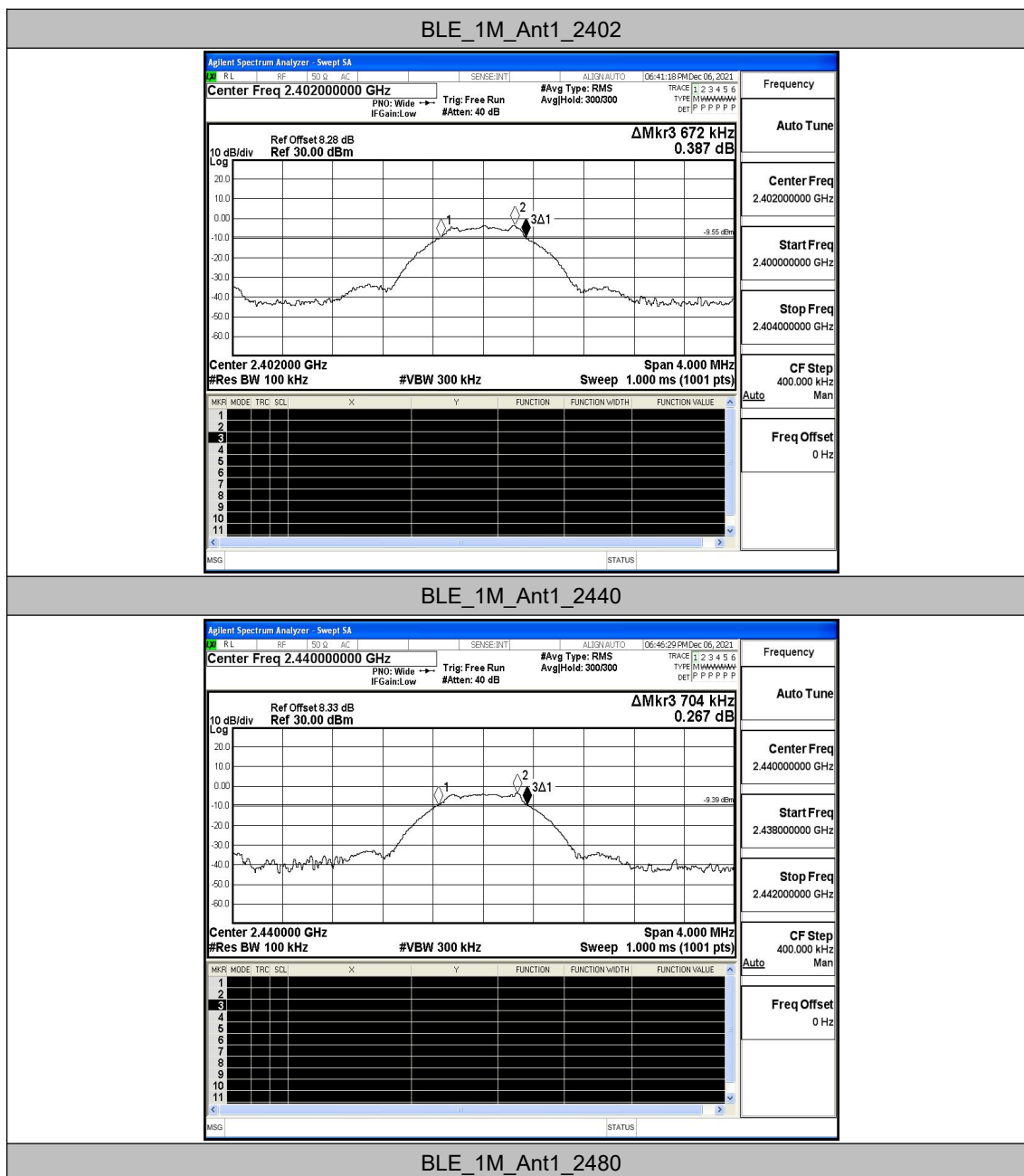


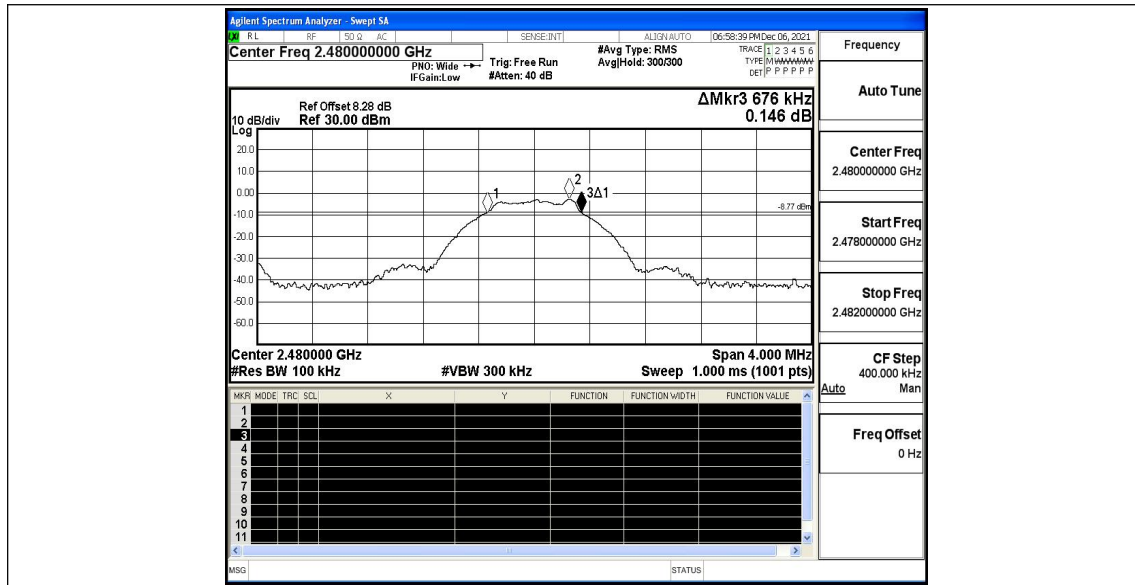
## B.1 6dB Bandwidth

### Test Result

| TestMode | Antenna | Channel | DTS BW [MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|---------|--------------|----------|----------|------------|---------|
| BLE_1M   | Ant1    | 2402    | 0.672        | 2401.664 | 2402.336 | ≥0.5       | PASS    |
|          |         | 2440    | 0.704        | 2439.644 | 2440.348 | ≥0.5       | PASS    |
|          |         | 2480    | 0.676        | 2479.660 | 2480.336 | ≥0.5       | PASS    |

### Test Graphs





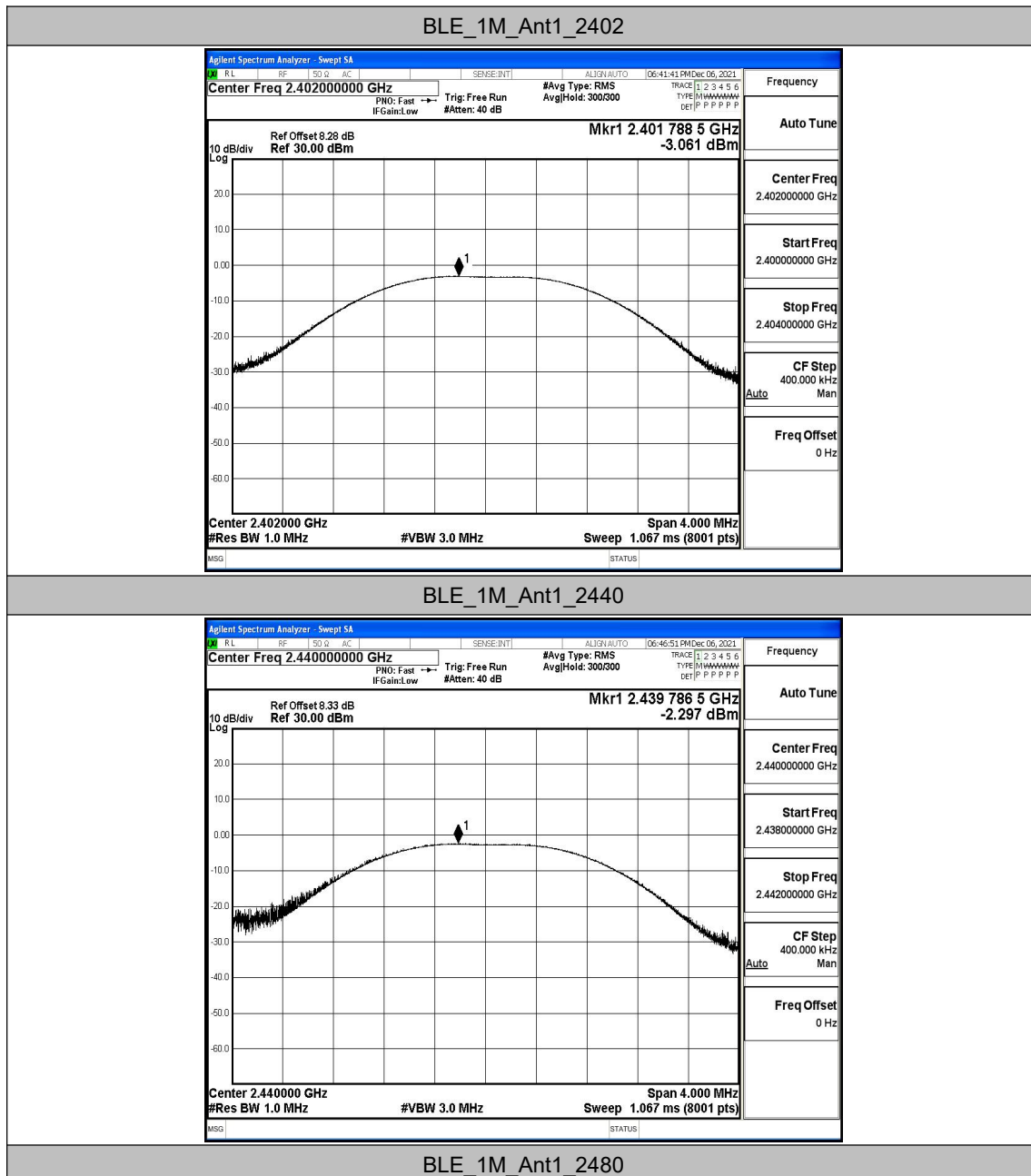


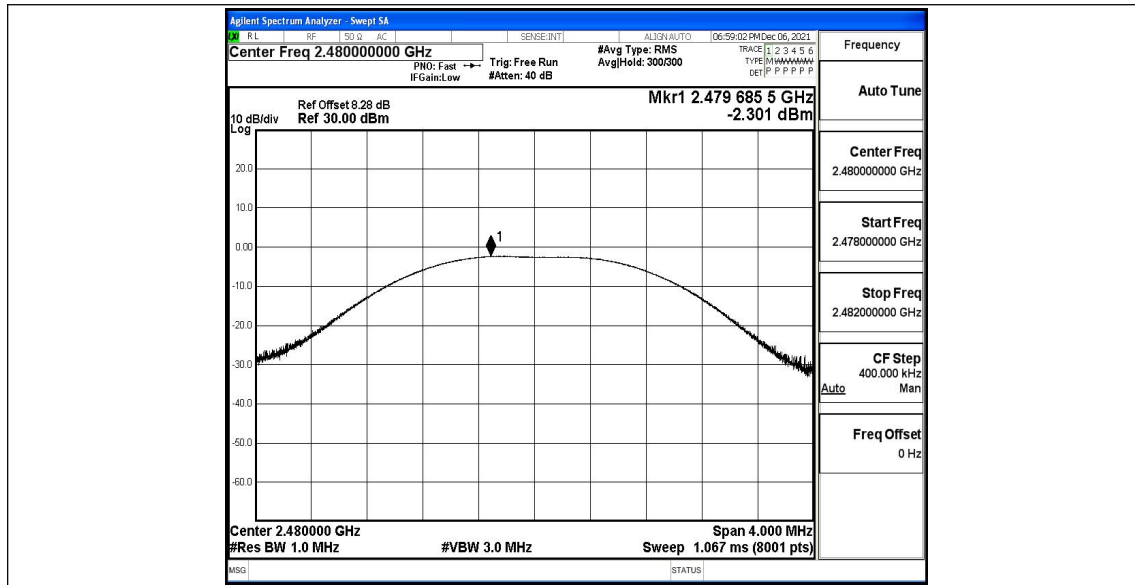
## B.2 Maximum conducted output power

### Test Result

| TestMode | Antenna | Channel | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|---------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402    | -3.06       | ≤30        | PASS    |
|          |         | 2440    | -2.3        | ≤30        | PASS    |
|          |         | 2480    | -2.3        | ≤30        | PASS    |

### Test Graphs





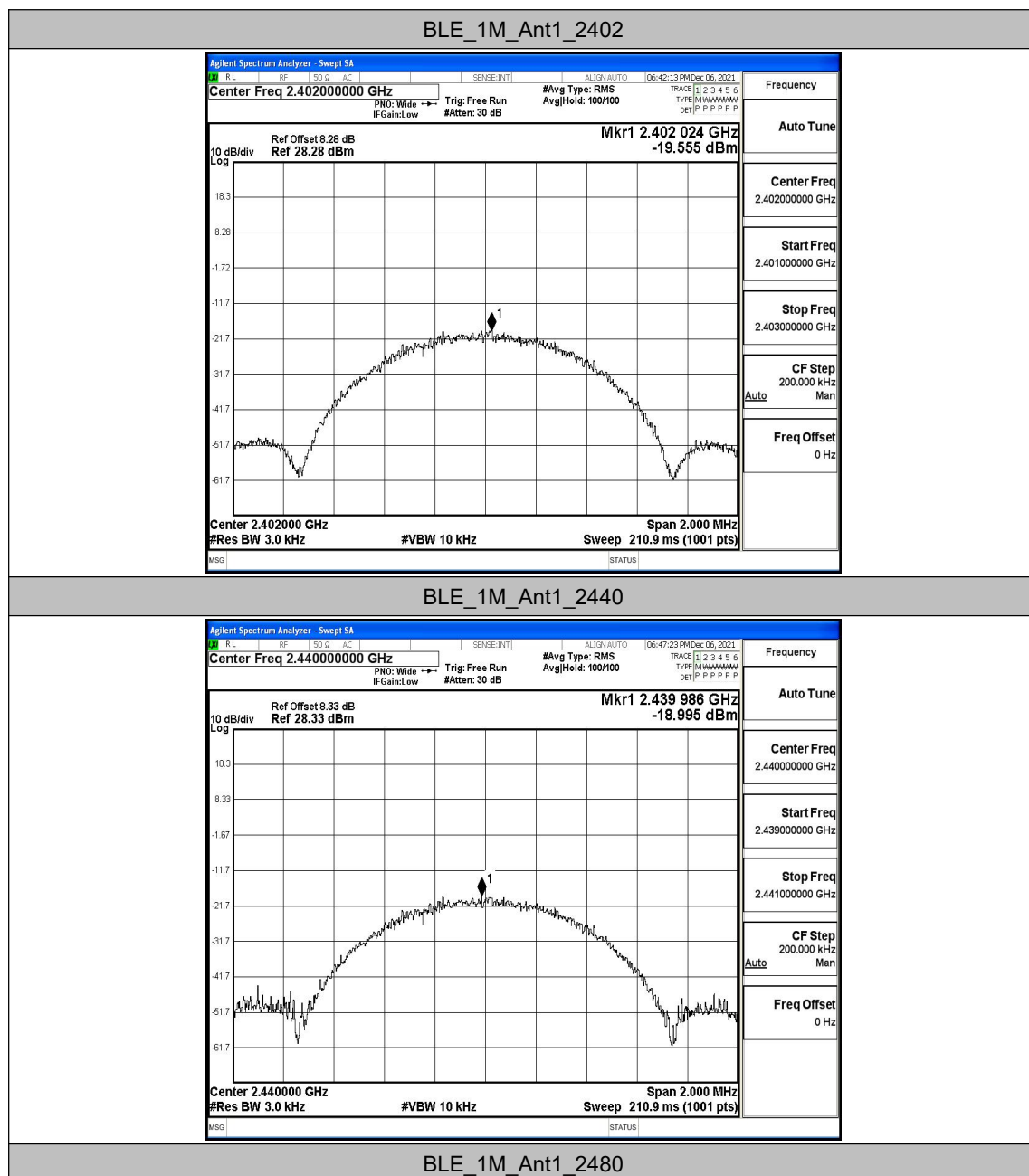


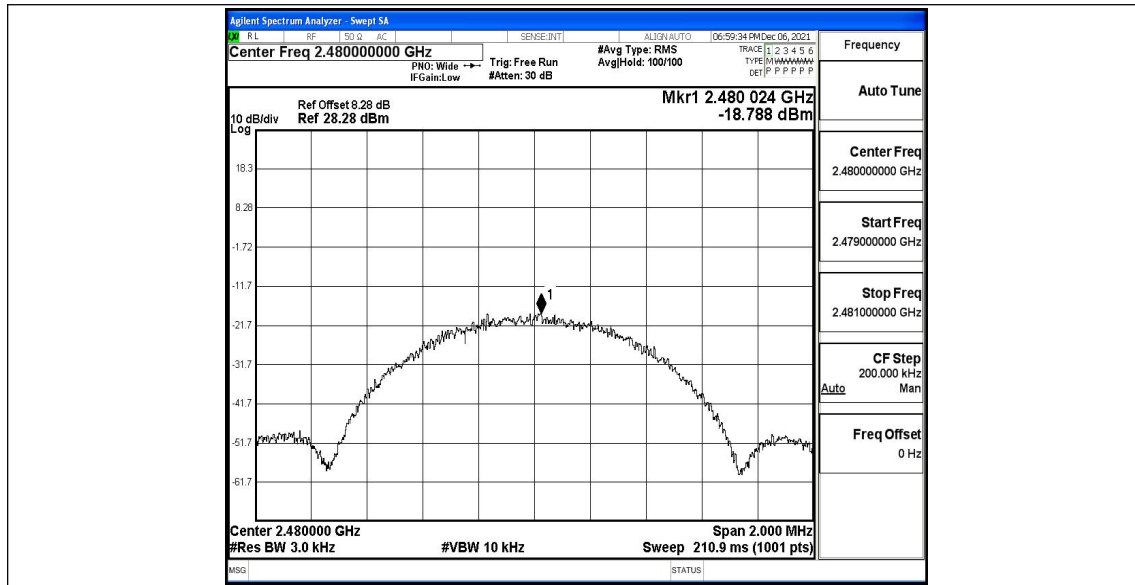
## B.3 Maximum power spectral density

### Test Result

| TestMode | Antenna | Channel | Result[dBm/3-100kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|---------|----------------------|-----------------|---------|
| BLE_1M   | Ant1    | 2402    | -19.56               | ≤8              | PASS    |
|          |         | 2440    | -19                  | ≤8              | PASS    |
|          |         | 2480    | -18.79               | ≤8              | PASS    |

### Test Graphs





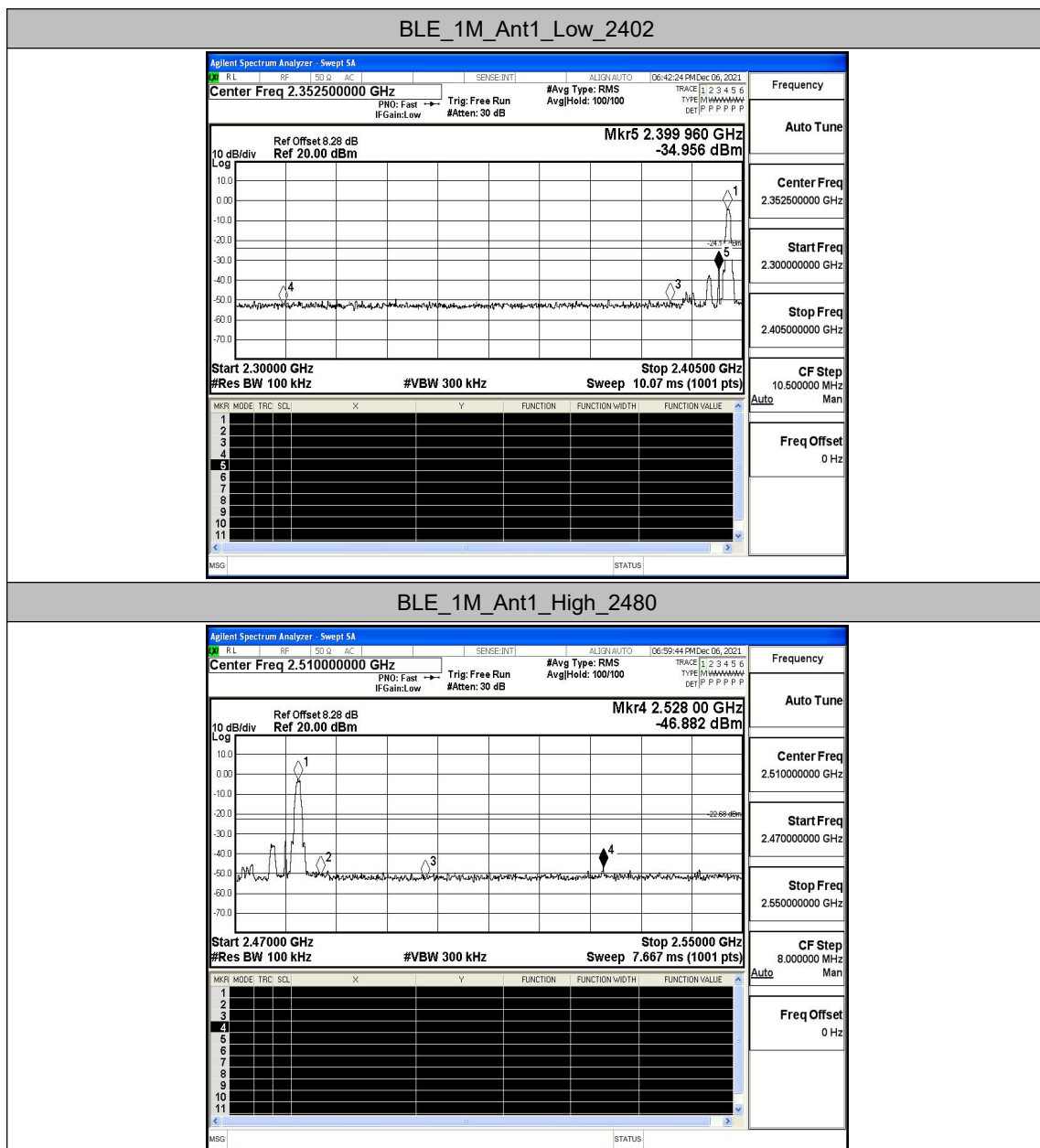


## B.4 Band edge measurements

### Test Result

| TestMode | Antenna | ChName | Channel | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|---------|---------------|-------------|------------|---------|
| BLE_1M   | Ant1    | Low    | 2402    | -4.14         | -34.96      | ≤-24.14    | PASS    |
|          |         | High   | 2480    | -2.68         | -46.88      | ≤-22.68    | PASS    |

### Test Graphs





## Test Result

| TestMode | Antenna | Channel | FreqRange<br>[MHz] | RefLevel<br>[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|---------|--------------------|-------------------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402    | Reference          | -4.18             | -4.18       | ---        | PASS    |
|          |         |         | 30~1000            | -4.18             | -60.95      | ≤-24.18    | PASS    |
|          |         |         | 1000~26500         | -4.18             | -46.26      | ≤-24.18    | PASS    |
|          |         | 2440    | Reference          | -3.62             | -3.62       | ---        | PASS    |
|          |         |         | 30~1000            | -3.62             | -61.13      | ≤-23.62    | PASS    |
|          |         |         | 1000~26500         | -3.62             | -46         | ≤-23.62    | PASS    |
|          |         | 2480    | Reference          | -2.99             | -2.99       | ---        | PASS    |
|          |         |         | 30~1000            | -2.99             | -33.61      | ≤-22.99    | PASS    |
|          |         |         | 1000~26500         | -2.99             | -44.59      | ≤-22.99    | PASS    |

**BLE\_1M\_Ant1\_2402\_0~Reference**

**Agilent Spectrum Analyzer - Swept SA**

RL RF SD Q AC SENSE:INT ALIGN: AUTO 06:43:44 PM Dec 06, 2021

**Center Freq 2.402000000 GHz** PNO: Wide → Trig: Free Run #Avg Type: RMS #Avg Hold: 100/100 TRACE [1] 2 3 4 5 6 TYPE: HAWAIIAN DEF: P P P P P

Ref Offset 8.28 dB Ref 28.28 dBm Mkr1 2.402 030 GHz -4.180 dBm

10 dB/div Log

18.3 8.28 -1.72 -11.7 -21.7 -31.7 -41.7 -51.7 -61.7

Center 2.402000 GHz Span 3.000 MHz  
#Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)

MSG STATUS

**Frequency**

Auto Tune

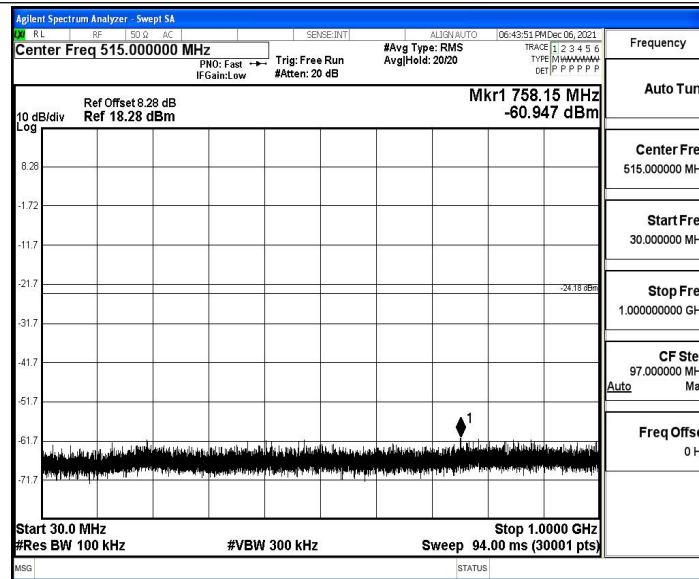
Center Freq  
2.402000000 GHz

Start Freq  
2.400500000 GHz

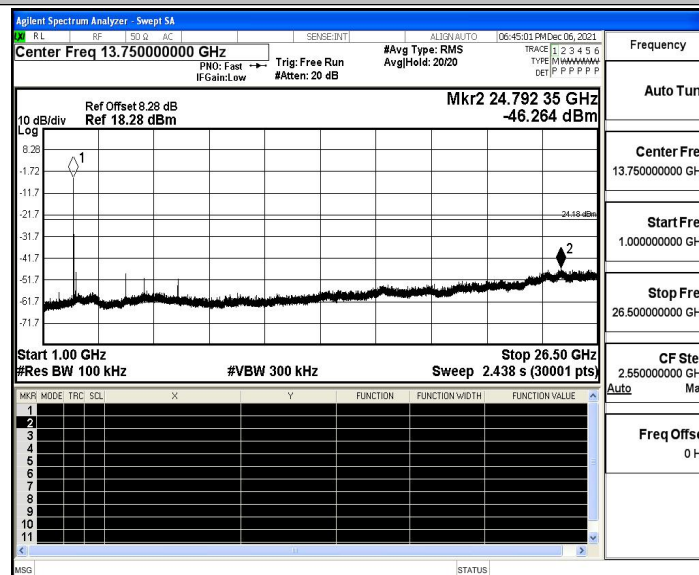
Stop Freq  
2.403500000 GHz

CF Step  
300.000 kHz  
Auto Man

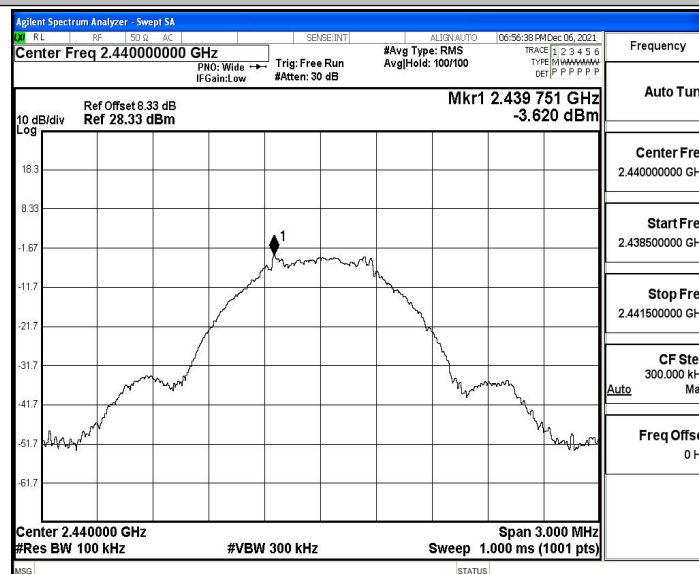
Freq Offset  
0 Hz



BLE\_1M\_Ant1\_2402\_1000~26500

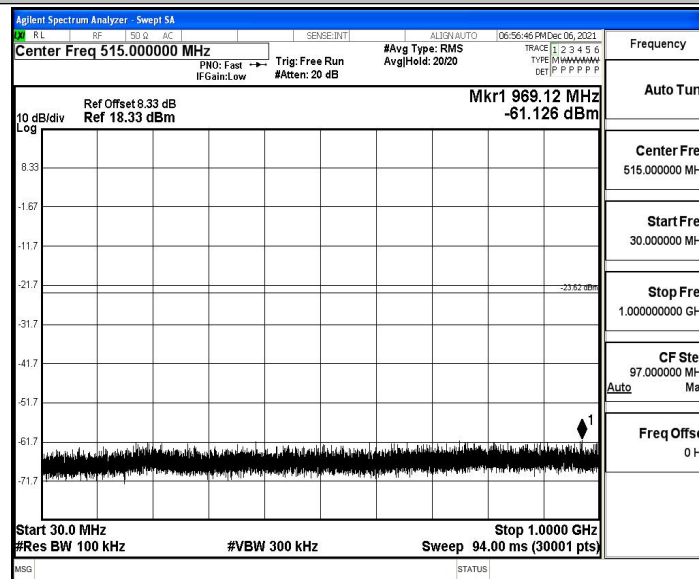


BLE\_1M\_Ant1\_2440\_0~Reference

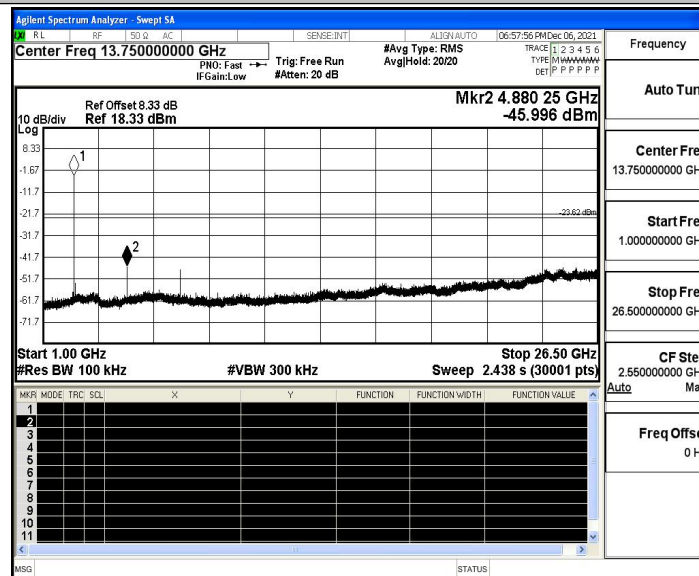




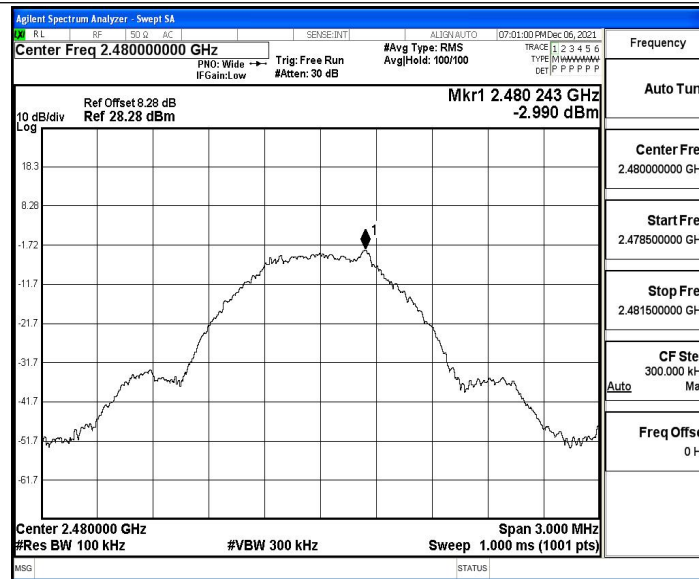
## BLE\_1M\_Ant1\_2440\_30~1000



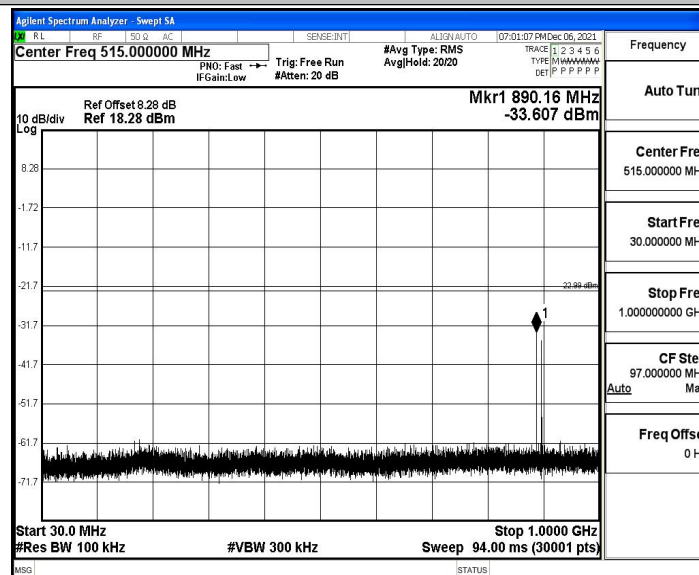
## BLE\_1M\_Ant1\_2440\_1000~26500



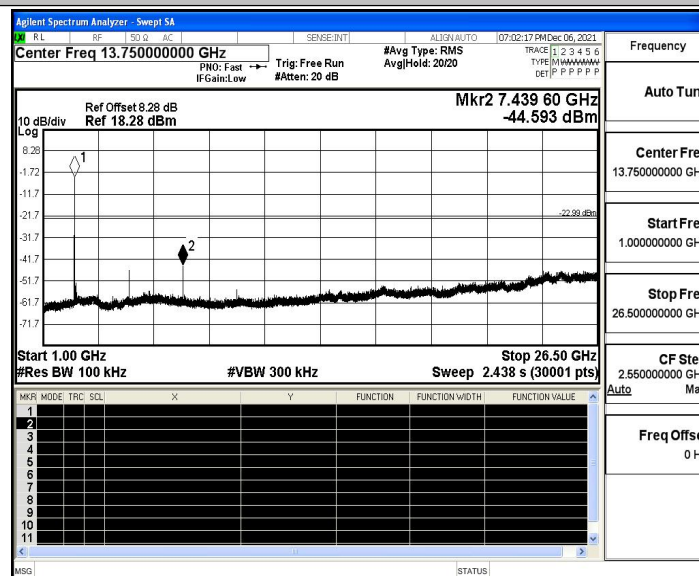
## BLE\_1M\_Ant1\_2480\_0~Reference



BLE\_1M\_Ant1\_2480\_30~1000



BLE\_1M\_Ant1\_2480\_1000~26500



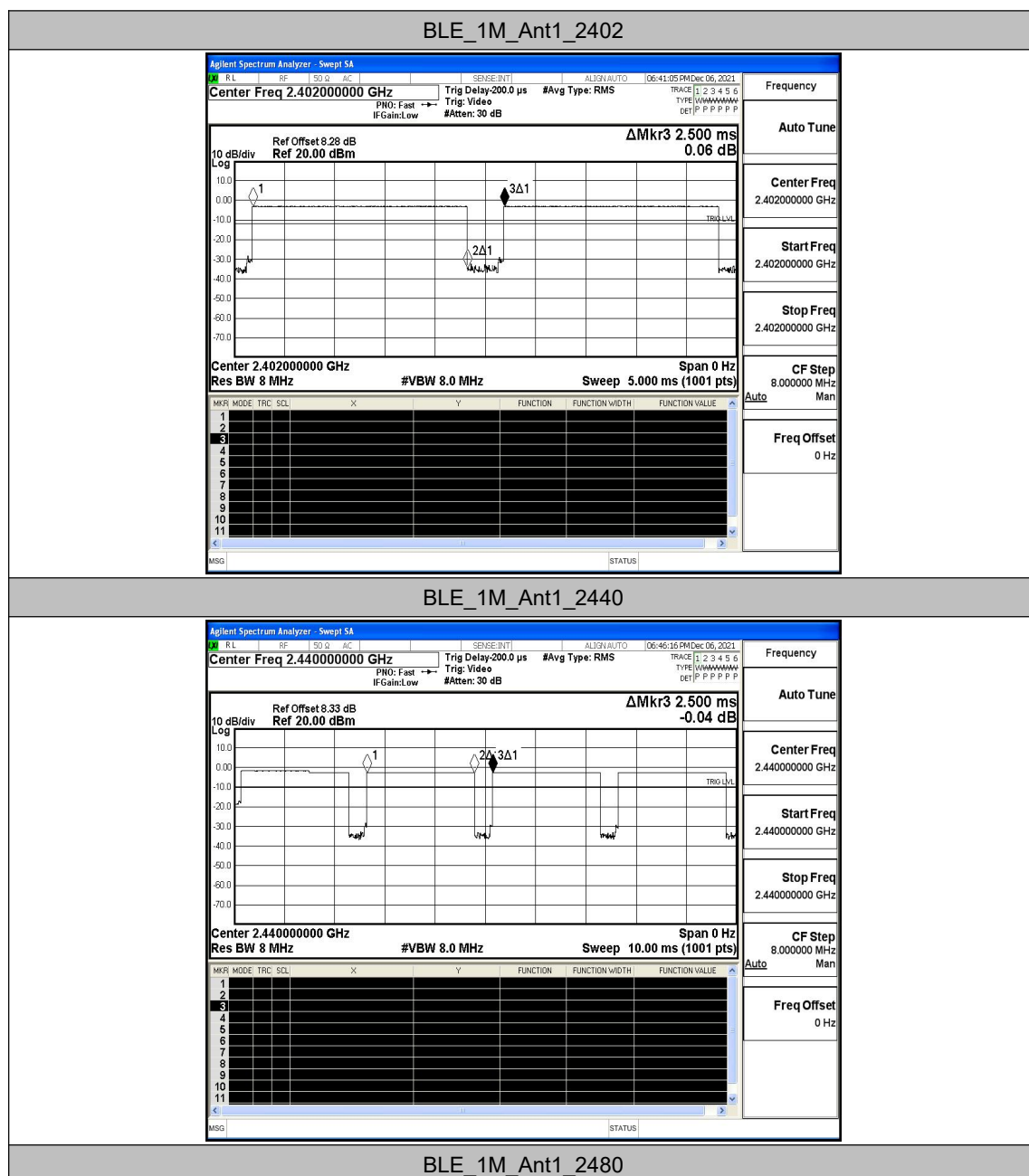


## B.6 Duty Cycle

### Test Result

| TestMode | Antenna | Channel | ON Time<br>[ms] | Period<br>[ms] | X      | DC<br>[%] | xFactor | Limit | Verdict |
|----------|---------|---------|-----------------|----------------|--------|-----------|---------|-------|---------|
| BLE_1M   | Ant1    | 2402    | 2.13            | 2.50           | 0.8520 | 85.20     | 0.70    | ---   | PASS    |
|          |         | 2440    | 2.13            | 2.50           | 0.8520 | 85.20     | 0.70    | ---   | PASS    |
|          |         | 2480    | 2.13            | 2.50           | 0.8520 | 85.20     | 0.70    | ---   | PASS    |

### Test Graphs







## B.7 Emissions in Restricted Bands

### Test Result

| TestMode | Antenna | ChName | Channel | Detector | Freq.<br>[MHz] | Result<br>[dBm] | Limit<br>[dBm] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Verdict |
|----------|---------|--------|---------|----------|----------------|-----------------|----------------|--------------------|-------------------|---------|
| BLE_1M   | Ant1    | Low    | 2402    | AV       | 2310.000       | -48.56          | ≤-41.20        | 46.64              | ≤54               | PASS    |
|          |         |        |         | AV       | 2382.215       | -47.97          | ≤-41.20        | 47.23              | ≤54               | PASS    |
|          |         |        |         | AV       | 2390.000       | -48.26          | ≤-41.20        | 46.94              | ≤54               | PASS    |
|          |         |        |         | Peak     | 2310.000       | -41.49          | ≤-21.20        | 53.71              | ≤74               | PASS    |
|          |         |        |         | Peak     | 2389.565       | -37.72          | ≤-21.20        | 57.48              | ≤74               | PASS    |
|          |         |        |         | Peak     | 2390.000       | -42.63          | ≤-21.20        | 52.57              | ≤74               | PASS    |
|          |         | High   | 2480    | AV       | 2483.500       | -45.45          | ≤-41.20        | 49.75              | ≤54               | PASS    |
|          |         |        |         | AV       | 2483.520       | -45.45          | ≤-41.20        | 49.75              | ≤54               | PASS    |
|          |         |        |         | AV       | 2500.000       | -47.64          | ≤-41.20        | 47.56              | ≤54               | PASS    |
|          |         |        |         | Peak     | 2483.500       | -39.06          | ≤-21.20        | 56.14              | ≤74               | PASS    |
|          |         |        |         | Peak     | 2495.200       | -36.45          | ≤-21.20        | 58.75              | ≤74               | PASS    |
|          |         |        |         | Peak     | 2500.000       | -39.4           | ≤-21.20        | 55.80              | ≤74               | PASS    |

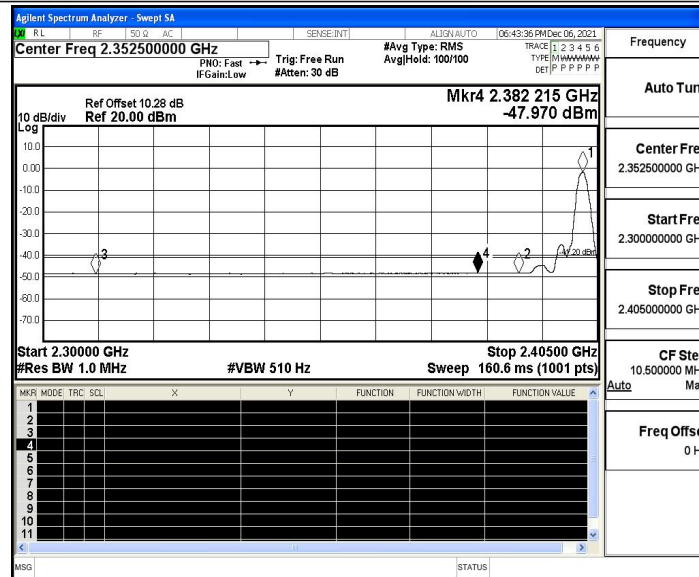
Note:

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

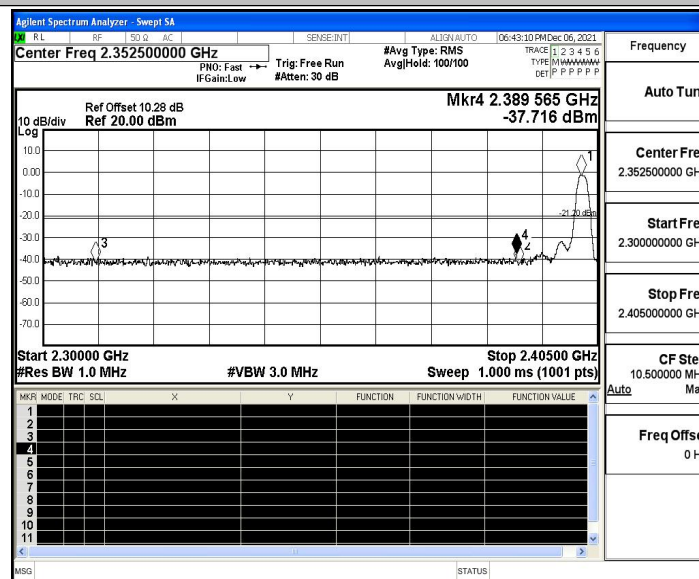


## Test Graphs

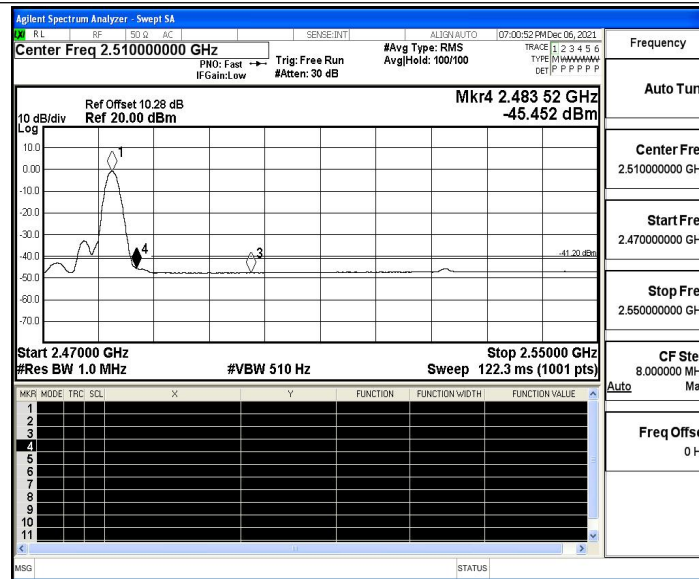
BLE\_1M\_Ant1\_Low\_2402\_AV



BLE\_1M\_Ant1\_Low\_2402\_Peak



BLE\_1M\_Ant1\_High\_2480\_AV



BLE\_1M\_Ant1\_High\_2480\_Peak

