

## **FCC Appendix RF Test Data for BLE**

**FCC ID** : 2BW5X-DK-9000

**Company** : Shenzhen Derk IoT Technology Co., Ltd

**EUT** : Passport Reader

**Model Number** : DK-9000

**Report No.** : CTA26061101001

**Reviewed By** : Eric Wang

## Appendix A: DTS Bandwidth

### Test Result

| TestMode | Antenna | Freq(MHz) | DTS BW<br>[MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|-----------|-----------------|----------|----------|------------|---------|
| BLE_1M   | Ant1    | 2402      | 0.632           | 2401.696 | 2402.328 | 0.5        | PASS    |
|          |         | 2440      | 0.636           | 2439.700 | 2440.336 | 0.5        | PASS    |
|          |         | 2480      | 0.632           | 2479.696 | 2480.328 | 0.5        | PASS    |

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.402000000 GHz

Ref Offset 0.3 dB  
Ref 30.00 dBm

Trig: Free Run  
#Atten: 40 dB

#Avg Type: RMS  
AvgHold: 100/100

Span 4.000 MHz  
Sweep 1.000 ms (1001 pts)

ΔMkr3 632 kHz  
0.297 dB

10 dB/div  
Log

Center 2.402000 GHz  
#Res BW 100 kHz  
#VBW 300 kHz

| MKR | MODE | TRIG | SCL   | X            | Y          | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|------|-------|--------------|------------|----------|----------------|----------------|
| 1   | N    | 1    | f     | 2.401696 GHz | -9.676 dBm |          |                |                |
| 2   | N    | 1    | f     | 2.402000 GHz | -9.726 dBm |          |                |                |
| 3   | Δ    | 1    | f (Δ) | 632 kHz (Δ)  | 0.297 dB   |          |                |                |

Frequency

Auto Tune

Center Freq  
2.402000000 GHz

Start Freq  
2.400000000 GHz

Stop Freq  
2.404000000 GHz

CF Step  
400.000 kHz  
Man

Freq Offset  
0 Hz

BLE\_1M\_Ant1\_2402

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.440000000 GHz

Ref Offset 0.3 dB  
Ref 30.00 dBm

Trig: Free Run  
#Atten: 40 dB

#Avg Type: RMS  
AvgHold: 100/100

Span 4.000 MHz  
Sweep 1.000 ms (1001 pts)

ΔMkr3 636 kHz  
-0.370 dB

10 dB/div  
Log

Center 2.440000 GHz  
#Res BW 100 kHz  
#VBW 300 kHz

| MKR | MODE | TRIG | SCL   | X            | Y          | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|------|-------|--------------|------------|----------|----------------|----------------|
| 1   | N    | 1    | f     | 2.439700 GHz | -9.316 dBm |          |                |                |
| 2   | N    | 1    | f     | 2.440028 GHz | -9.804 dBm |          |                |                |
| 3   | Δ    | 1    | f (Δ) | 636 kHz (Δ)  | -0.370 dB  |          |                |                |

Frequency

Auto Tune

Center Freq  
2.440000000 GHz

Start Freq  
2.438000000 GHz

Stop Freq  
2.442000000 GHz

CF Step  
400.000 kHz  
Man

Freq Offset  
0 Hz

BLE\_1M\_Ant1\_2440

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.440000000 GHz

Ref Offset 0.3 dB  
Ref 30.00 dBm

Trig: Free Run  
#Atten: 40 dB

#Avg Type: RMS  
AvgHold: 100/100

Span 4.000 MHz  
Sweep 1.000 ms (1001 pts)

ΔMkr3 636 kHz  
-0.370 dB

10 dB/div  
Log

Center 2.440000 GHz  
#Res BW 100 kHz  
#VBW 300 kHz

| MKR | MODE | TRIG | SCL   | X            | Y          | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|------|-------|--------------|------------|----------|----------------|----------------|
| 1   | N    | 1    | f     | 2.439700 GHz | -9.316 dBm |          |                |                |
| 2   | N    | 1    | f     | 2.440028 GHz | -9.804 dBm |          |                |                |
| 3   | Δ    | 1    | f (Δ) | 636 kHz (Δ)  | -0.370 dB  |          |                |                |

Frequency

Auto Tune

Center Freq  
2.440000000 GHz

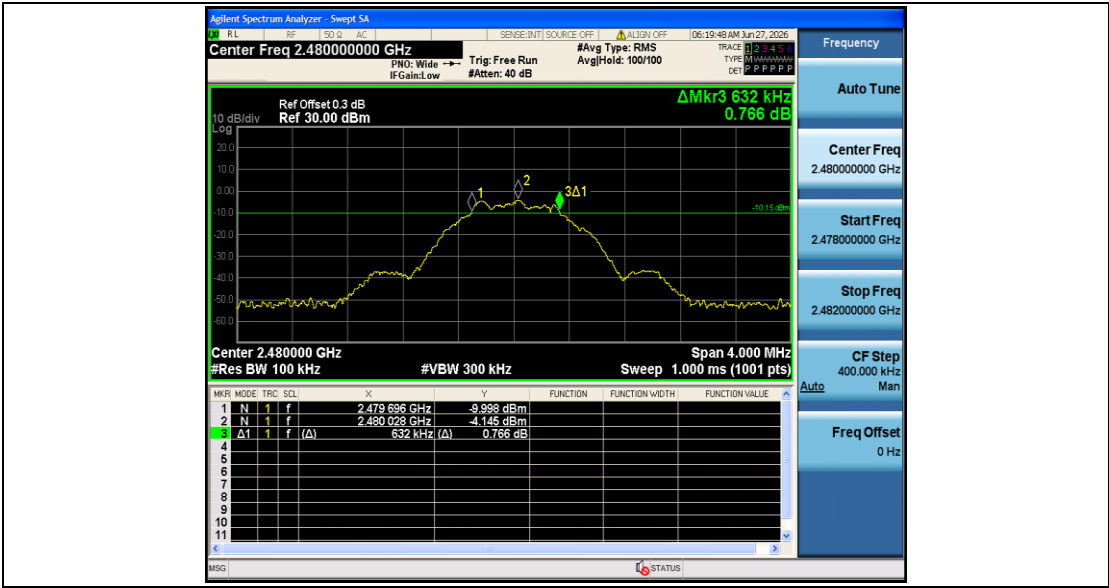
Start Freq  
2.438000000 GHz

Stop Freq  
2.442000000 GHz

CF Step  
400.000 kHz  
Man

Freq Offset  
0 Hz

BLE\_1M\_Ant1\_2480

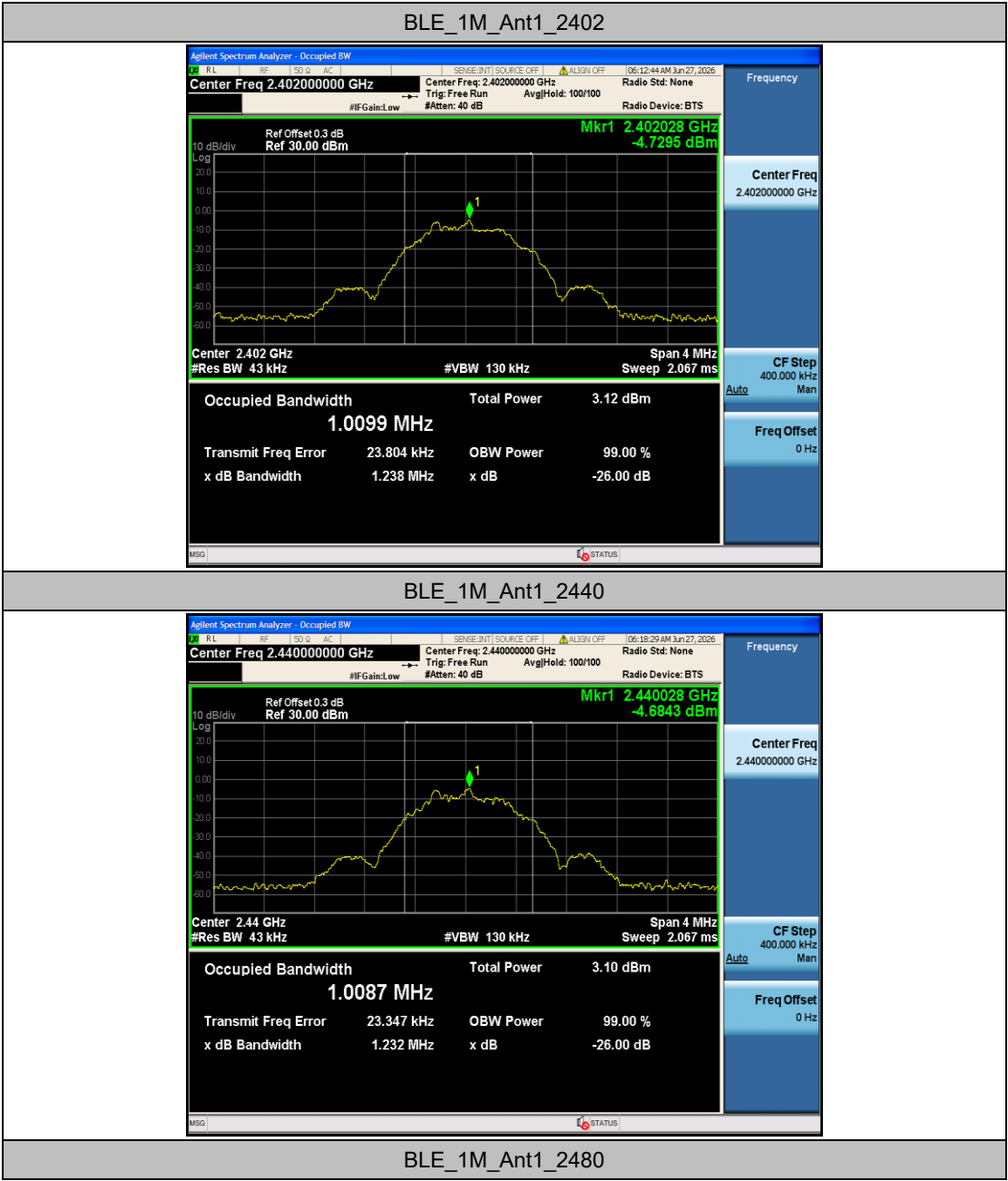


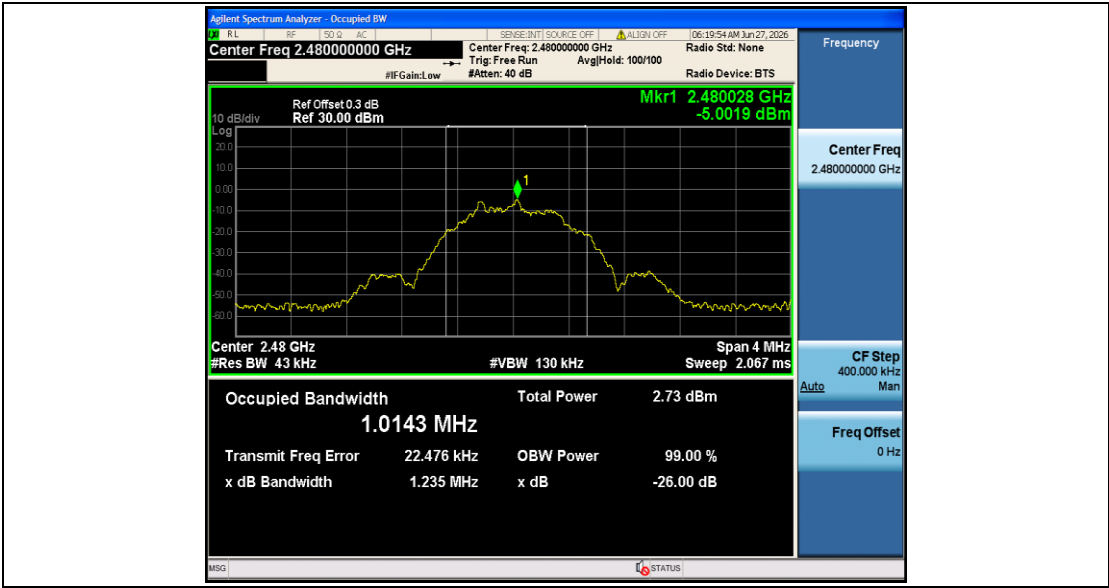
## Appendix B: Occupied Channel Bandwidth

### Test Result

| TestMode | Antenna | Freq(MHz) | OCB [MHz] | FL[MHz]   | FH[MHz]   | Limit[MHz] | Verdict |
|----------|---------|-----------|-----------|-----------|-----------|------------|---------|
| BLE_1M   | Ant1    | 2402      | 1.0099    | 2401.5189 | 2402.5288 | ---        | ---     |
|          |         | 2440      | 1.0087    | 2439.5190 | 2440.5277 | ---        | ---     |
|          |         | 2480      | 1.0143    | 2479.5153 | 2480.5296 | ---        | ---     |

Test Graphs





## Appendix C: Maximum conducted output power

### Test Result Peak

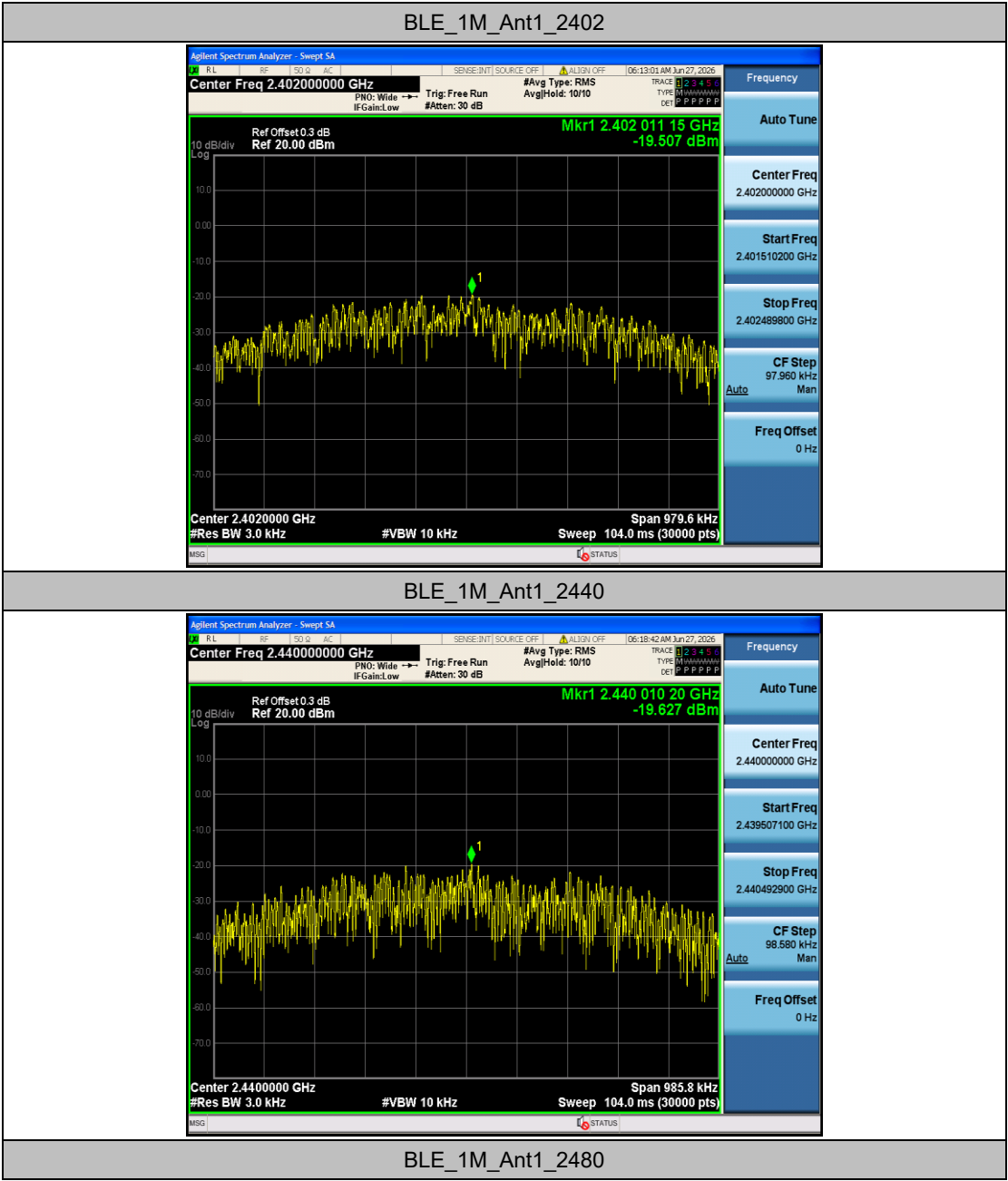
| TestMode | Antenna | Freq(MHz) | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|-----------|---------------------------|----------------------|---------|
| BLE_1M   | Ant1    | 2402      | -3.63                     | ≤30                  | PASS    |
|          |         | 2440      | -3.49                     | ≤30                  | PASS    |
|          |         | 2480      | -3.79                     | ≤30                  | PASS    |

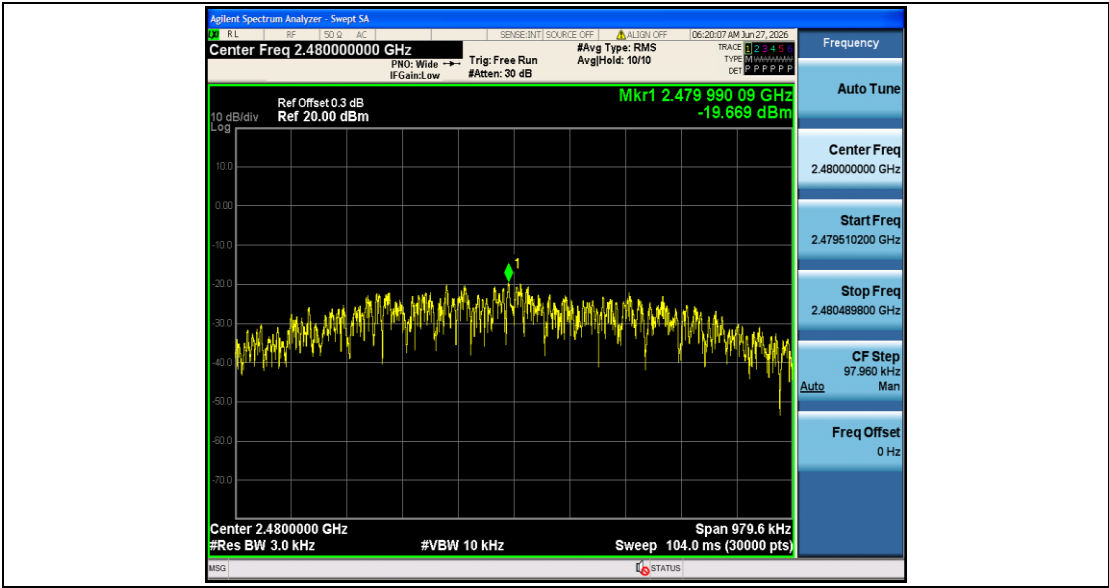
## Appendix D: Maximum power spectral density

### Test Result

| TestMode | Antenna | Freq(MHz) | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|-----------|------------------|-----------------|---------|
| BLE_1M   | Ant1    | 2402      | -19.51           | ≤8.00           | PASS    |
|          |         | 2440      | -19.63           | ≤8.00           | PASS    |
|          |         | 2480      | -19.67           | ≤8.00           | PASS    |

Test Graphs



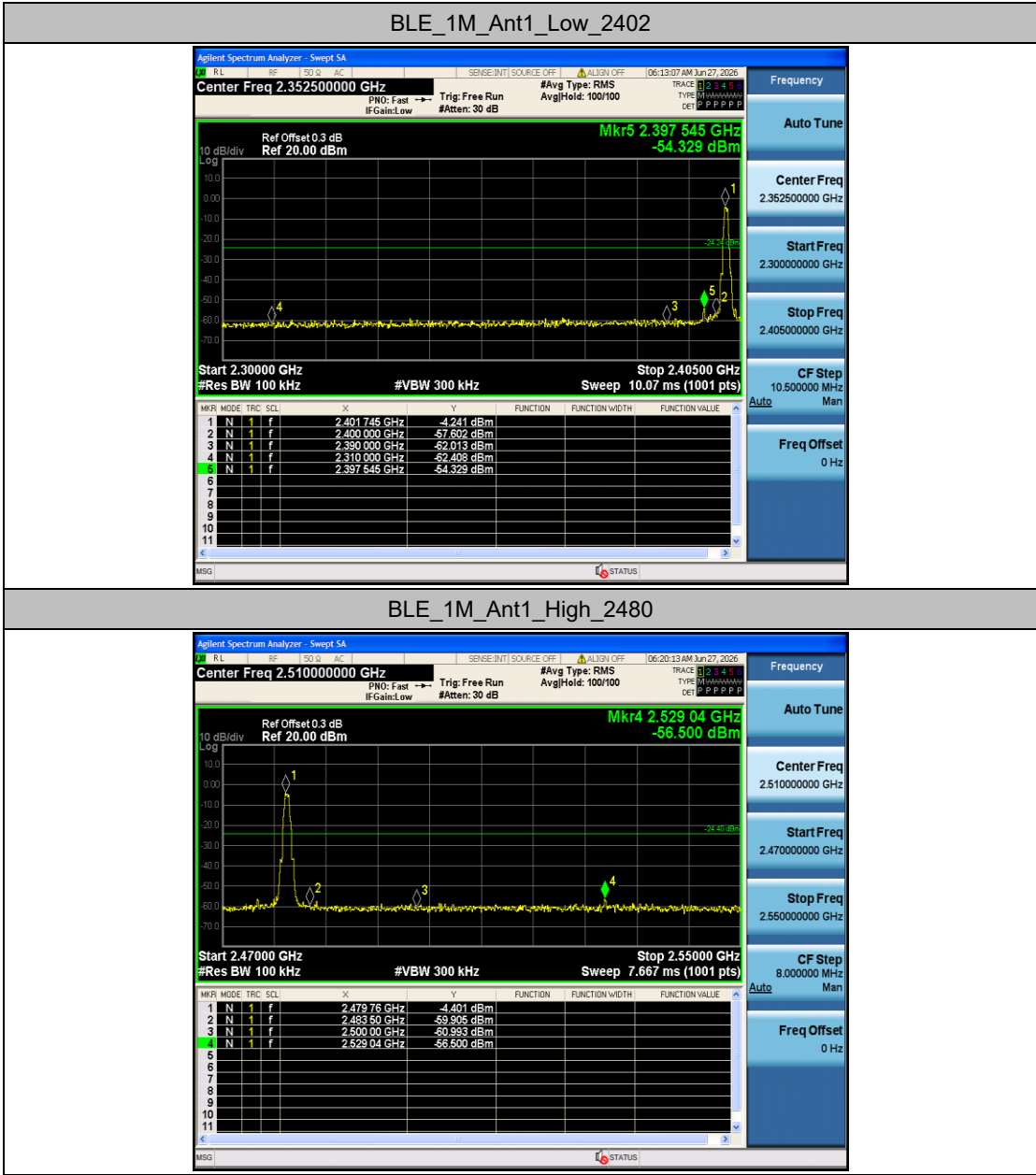


## Appendix E: Band edge measurements

### Test Result

| TestMode | Antenna | Channel | Freq(MHz) | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|---------|-----------|---------------|-------------|------------|---------|
| BLE_1M   | Ant1    | Low     | 2402      | -4.24         | -54.33      | ≤-24.24    | PASS    |
|          |         | High    | 2480      | -4.40         | -56.5       | ≤-24.4     | PASS    |

# Test Graphs

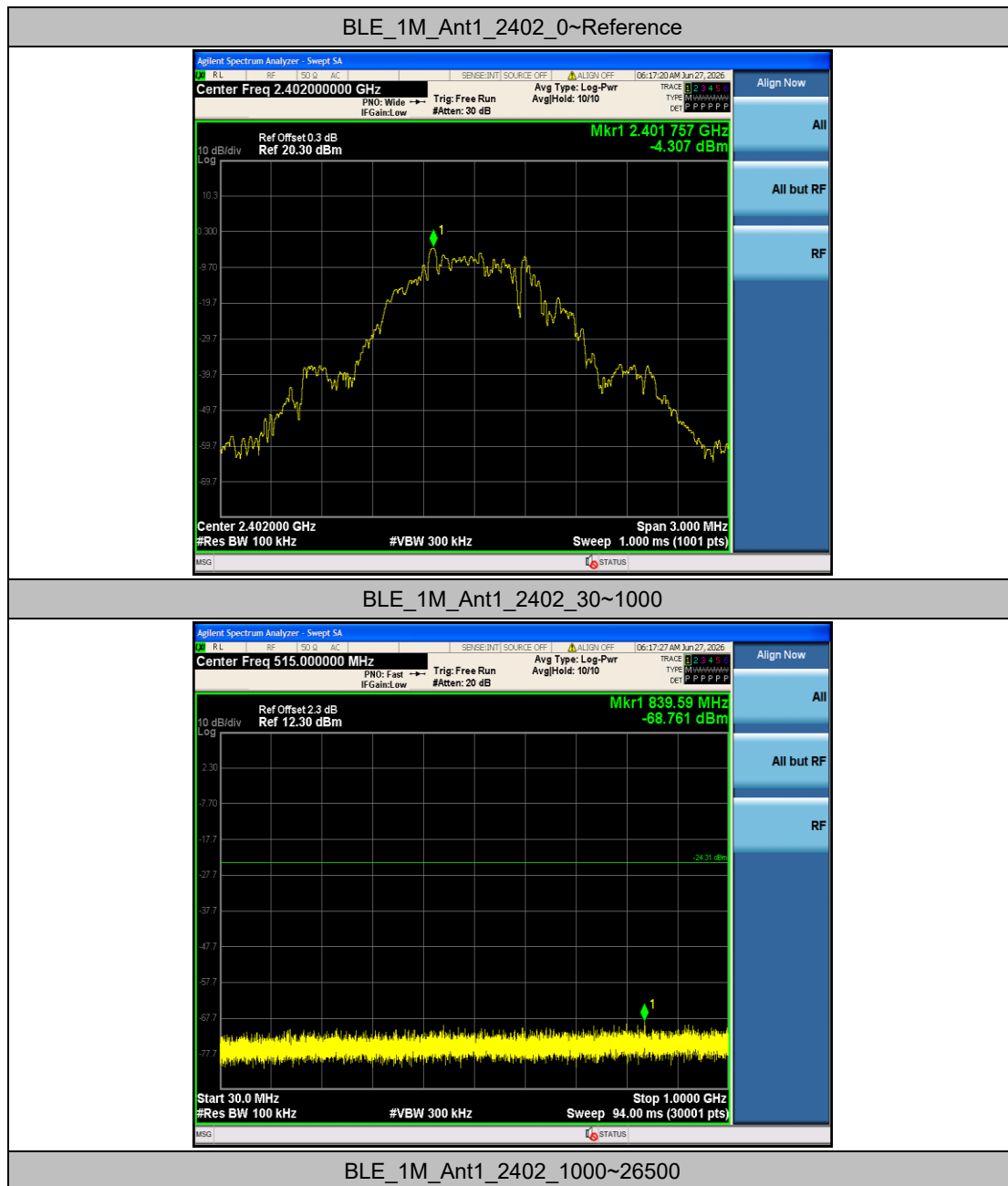


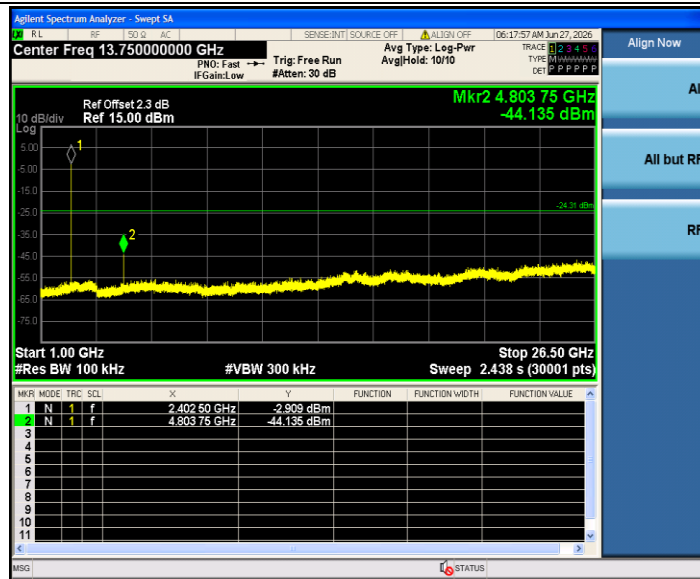
## Appendix F: Conducted Spurious Emission

### Test Result

| TestMode | Antenna | Freq(MHz) | FreqRange [MHz] | RefLevel [dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|-----------|-----------------|----------------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402      | Reference       | -4.31          | -4.31       | ---        | PASS    |
|          |         |           | 30~1000         | -4.31          | -68.76      | ≤-24.31    | PASS    |
|          |         |           | 1000~26500      | -4.31          | -44.14      | ≤-24.31    | PASS    |
|          |         | 2440      | Reference       | -5.00          | -5.00       | ---        | PASS    |
|          |         |           | 30~1000         | -5.00          | -68.39      | ≤-25       | PASS    |
|          |         |           | 1000~26500      | -5.00          | -44.4       | ≤-25       | PASS    |
|          |         | 2480      | Reference       | -5.78          | -5.78       | ---        | PASS    |
|          |         |           | 30~1000         | -5.78          | -69.04      | ≤-25.78    | PASS    |
|          |         |           | 1000~26500      | -5.78          | -45.45      | ≤-25.78    | PASS    |

## Test Graphs

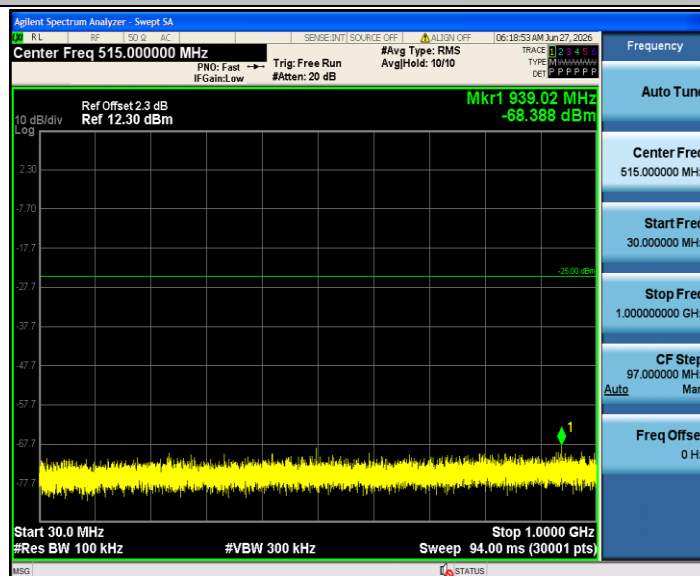




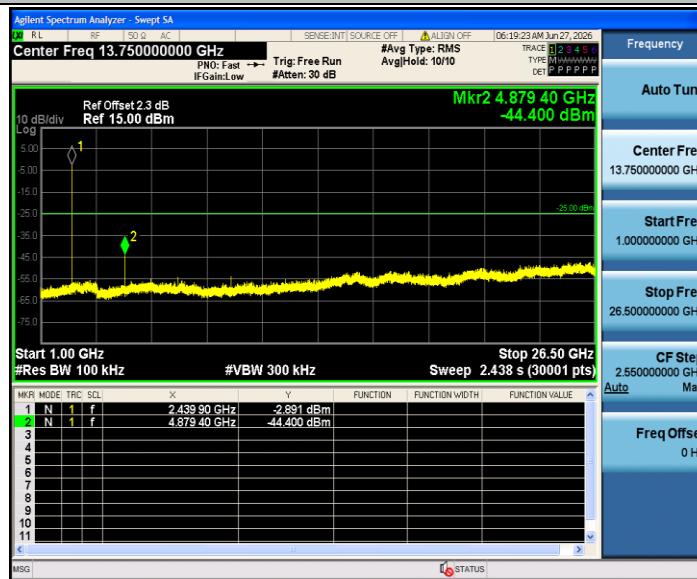
BLE\_1M\_Ant1\_2440\_0~Reference



BLE\_1M\_Ant1\_2440\_30~1000



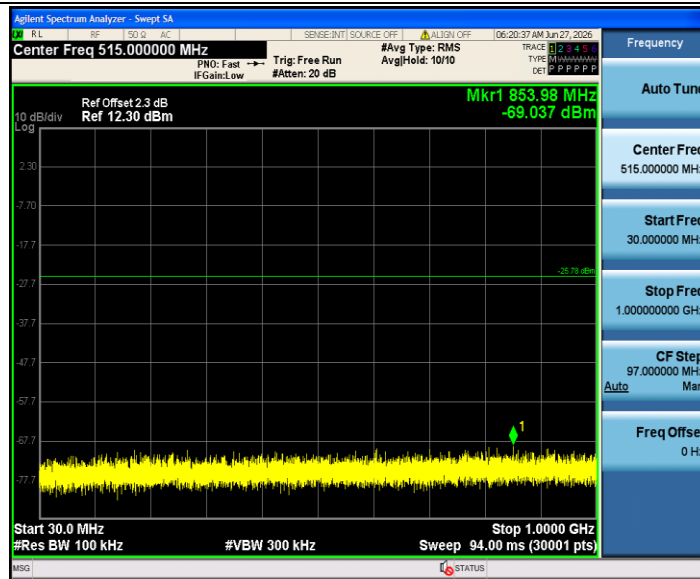
# BLE\_1M\_Ant1\_2440\_1000~26500



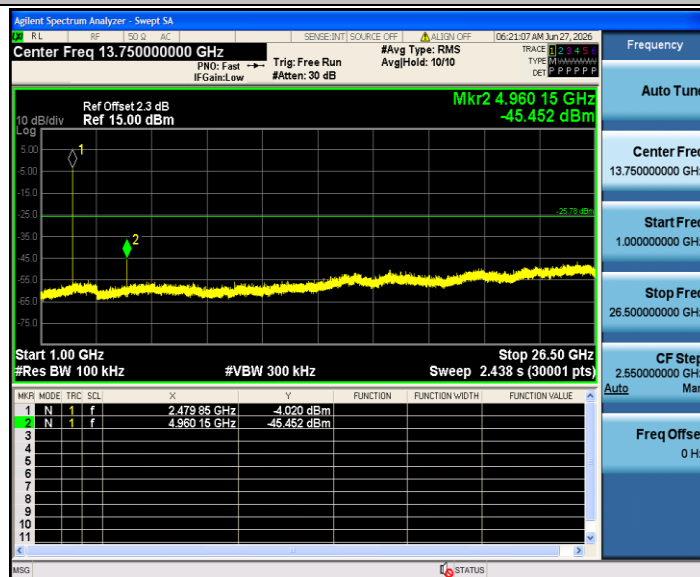
# BLE\_1M\_Ant1\_2480\_0~Reference



# BLE\_1M\_Ant1\_2480\_30~1000



BLE\_1M\_Ant1\_2480\_1000~26500



## Appendix G: Duty Cycle

### Test Result

| TestMode | Antenna | Freq(MHz) | ON Time<br>[ms] | Period<br>[ms] | X      | DC<br>[%] | xFactor | Limit | Verdict |
|----------|---------|-----------|-----------------|----------------|--------|-----------|---------|-------|---------|
| BLE_1M   | Ant1    | 2402      | 0.41            | 0.62           | 0.6613 | 66.13     | 1.80    | ---   | ---     |
|          |         | 2440      | 0.41            | 0.62           | 0.6613 | 66.13     | 1.80    | ---   | ---     |
|          |         | 2480      | 0.41            | 0.62           | 0.6613 | 66.13     | 1.80    | ---   | ---     |

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.402000000 GHz

Trig Delay: 2.000 ms

Trig: Video

#Avg Type: RMS

Ref Offset 0.3 dB

Ref 20.30 dBm

PN0: Fast

IF Gain: Low

#Atten: 30 dB

ΔMkr3 620.0 μs

-32.57 dB

2Δ1

3Δ1

Center 2.402000000 GHz

Res BW 8 MHz

#VBW 8.0 MHz

Sweep 1.000 ms (1001 pts)

Span 0 Hz

CF Step 8.000000 MHz

Man

Freq Offset 0 Hz

| MKR | MODE | TRIG | SQL | X   | Y        | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|------|-----|-----|----------|----------|----------------|----------------|
| 1   | N    | 1    | t   |     | 120.0 μs |          |                | -15.11 dBm     |
| 2   | Δ1   | 1    | t   | (Δ) | 410.0 μs | (Δ)      |                | -19.31 dB      |
| 3   | Δ1   | 1    | t   | (Δ) | 620.0 μs | (Δ)      |                | -32.57 dB      |

BLE\_1M\_Ant1\_2402

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.440000000 GHz

Trig Delay: 2.000 ms

Trig: Video

#Avg Type: RMS

Ref Offset 0.3 dB

Ref 20.30 dBm

PN0: Fast

IF Gain: Low

#Atten: 30 dB

ΔMkr3 620.0 μs

-21.67 dB

2Δ1

3Δ1

Center 2.440000000 GHz

Res BW 8 MHz

#VBW 8.0 MHz

Sweep 1.000 ms (1001 pts)

Span 0 Hz

CF Step 8.000000 MHz

Man

Freq Offset 0 Hz

| MKR | MODE | TRIG | SQL | X   | Y        | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|------|-----|-----|----------|----------|----------------|----------------|
| 1   | N    | 1    | t   |     | 120.0 μs |          |                | -14.96 dBm     |
| 2   | Δ1   | 1    | t   | (Δ) | 410.0 μs | (Δ)      |                | -17.76 dB      |
| 3   | Δ1   | 1    | t   | (Δ) | 620.0 μs | (Δ)      |                | -21.67 dB      |

BLE\_1M\_Ant1\_2440

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.480000000 GHz

Trig Delay: 2.000 ms

Trig: Video

#Avg Type: RMS

Ref Offset 0.3 dB

Ref 20.30 dBm

PN0: Fast

IF Gain: Low

#Atten: 30 dB

ΔMkr3 620.0 μs

-21.67 dB

2Δ1

3Δ1

Center 2.480000000 GHz

Res BW 8 MHz

#VBW 8.0 MHz

Sweep 1.000 ms (1001 pts)

Span 0 Hz

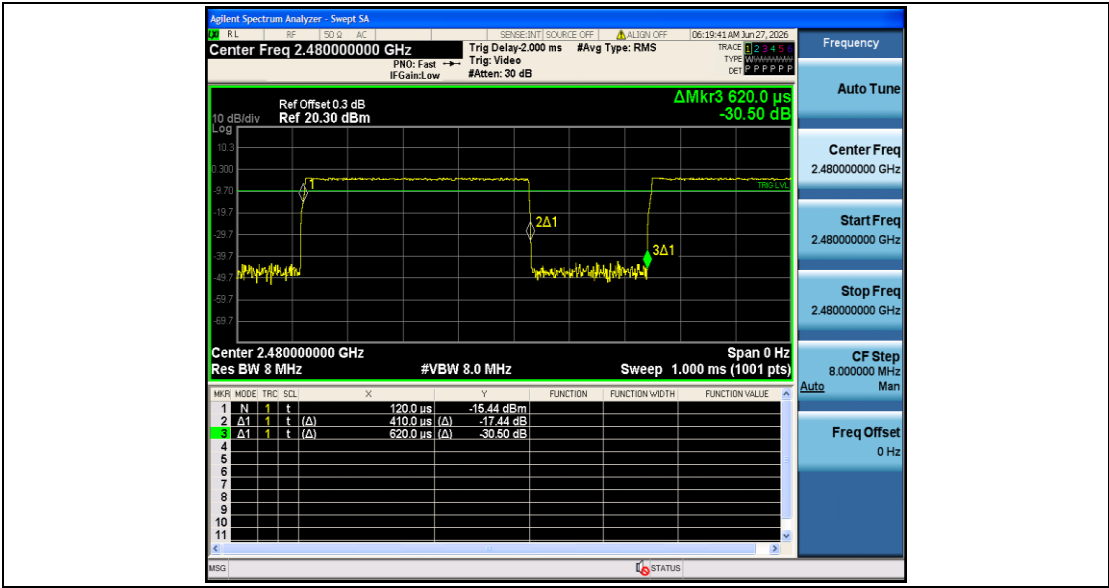
CF Step 8.000000 MHz

Man

Freq Offset 0 Hz

| MKR | MODE | TRIG | SQL | X   | Y        | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|-----|------|------|-----|-----|----------|----------|----------------|----------------|
| 1   | N    | 1    | t   |     | 120.0 μs |          |                | -14.96 dBm     |
| 2   | Δ1   | 1    | t   | (Δ) | 410.0 μs | (Δ)      |                | -17.76 dB      |
| 3   | Δ1   | 1    | t   | (Δ) | 620.0 μs | (Δ)      |                | -21.67 dB      |

BLE\_1M\_Ant1\_2480



## Appendix H: Emissions in Restricted Bands

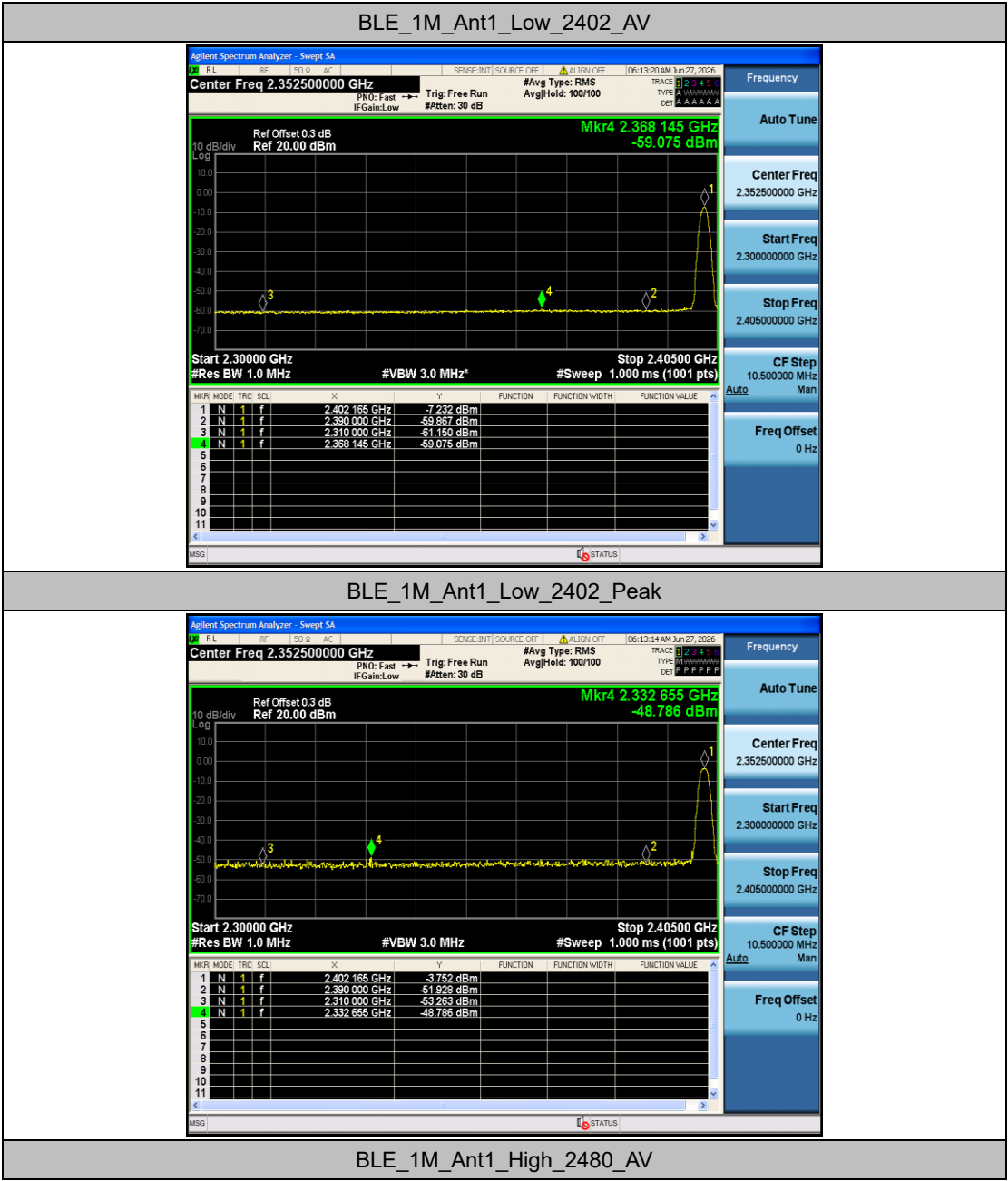
### Test Result

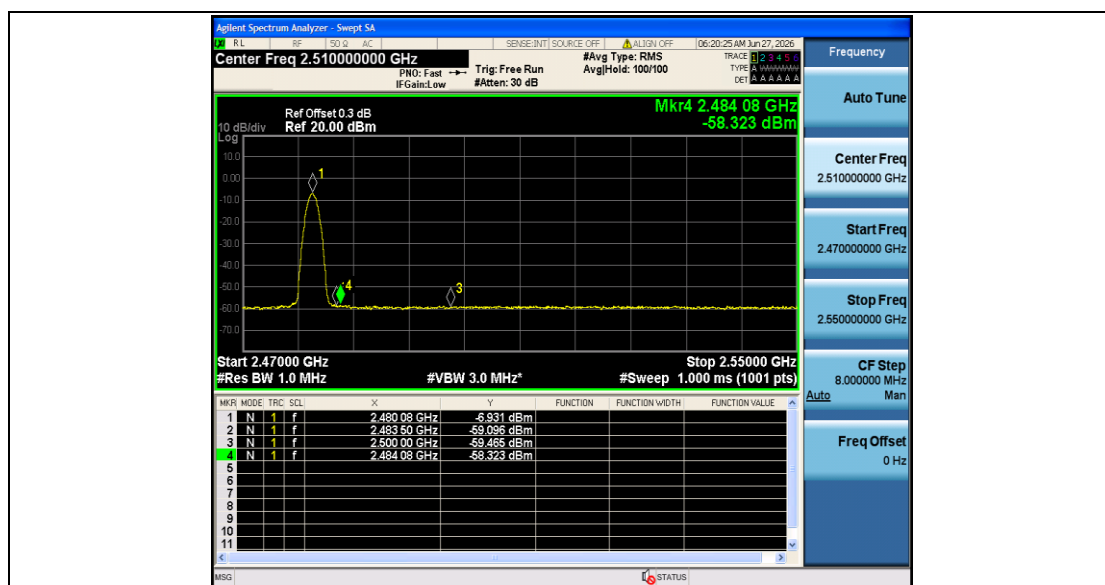
| TestMod<br>e | Antenn<br>a | ChNam<br>e | Freq(MH<br>z) | Detector | Freq<br>[MHz] | Result<br>[dBm] | Gain<br>[dB] | DC<br>Factor<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Verdict |
|--------------|-------------|------------|---------------|----------|---------------|-----------------|--------------|----------------------|--------------------|-------------------|---------|
| BLE_1M       | Ant1        | Low        | 2402          | AV       | 2310.000      | -61.15          | 2.00         | 1.80                 | 37.85              | ≤54               | PASS    |
|              |             |            |               | AV       | 2368.145      | -59.08          | 2.00         | 1.80                 | 39.92              | ≤54               | PASS    |
|              |             |            |               | AV       | 2390.000      | -59.87          | 2.00         | 1.80                 | 39.13              | ≤54               | PASS    |
|              |             |            |               | Peak     | 2310.000      | -53.26          | 2.00         | 0.00                 | 43.94              | ≤74               | PASS    |
|              |             |            |               | Peak     | 2332.655      | -48.79          | 2.00         | 0.00                 | 48.41              | ≤74               | PASS    |
|              |             |            |               | Peak     | 2390.000      | -51.93          | 2.00         | 0.00                 | 45.27              | ≤74               | PASS    |
|              |             | High       | 2480          | AV       | 2483.500      | -59.1           | 2.00         | 1.80                 | 39.90              | ≤54               | PASS    |
|              |             |            |               | AV       | 2484.080      | -58.32          | 2.00         | 1.80                 | 40.68              | ≤54               | PASS    |
|              |             |            |               | AV       | 2500.000      | -59.47          | 2.00         | 1.80                 | 39.53              | ≤54               | PASS    |
|              |             |            |               | Peak     | 2483.500      | -50.81          | 2.00         | 0.00                 | 46.39              | ≤74               | PASS    |
|              |             |            |               | Peak     | 2484.800      | -48.61          | 2.00         | 0.00                 | 48.59              | ≤74               | PASS    |
|              |             |            |               | Peak     | 2500.000      | -50.78          | 2.00         | 0.00                 | 46.42              | ≤74               | PASS    |

Note:

1. 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\_High\_2480\_Peak

