



Appendix A

RF Test Data for BT LE (Conducted Measurement)

Product Name: Asset Tracking Anchor  
Test Model: VLVDFA1R

Environmental Conditions

|                    |            |
|--------------------|------------|
| Temperature:       | 23.8°C     |
| Relative Humidity: | 52.1%      |
| ATM Pressure:      | 100.0 kPa  |
| Test Engineer:     | Can Kun    |
| Supervised by:     | Paddi Chen |





### A.1 DTS Bandwidth

#### Test Result

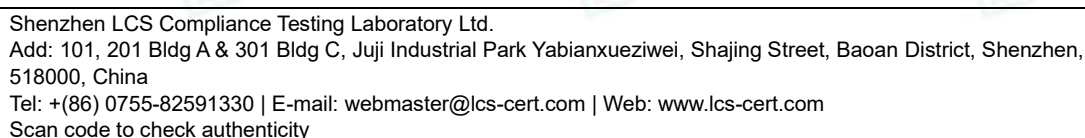
| TestMode | Antenna | Freq(MHz) | DTS BW [MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|-----------|--------------|----------|----------|------------|---------|
| BLE_1M   | Ant1    | 2402      | 0.696        | 2401.796 | 2402.492 | 0.5        | PASS    |
|          |         | 2440      | 0.704        | 2439.792 | 2440.496 | 0.5        | PASS    |
|          |         | 2480      | 0.704        | 2479.796 | 2480.500 | 0.5        | PASS    |

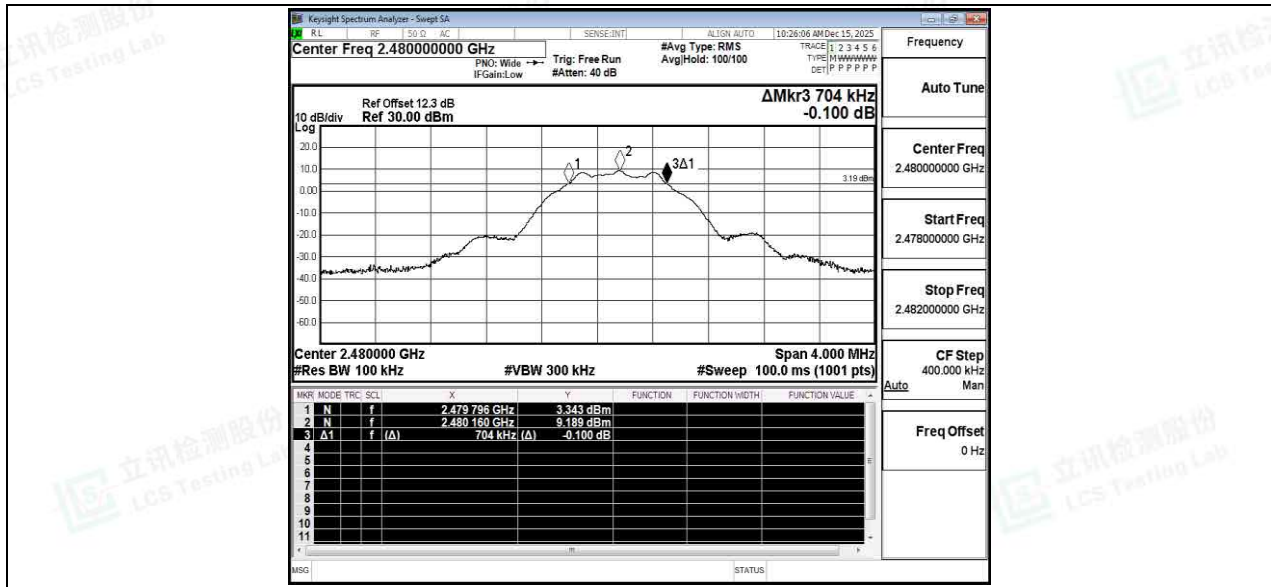
Note :offset=System attenuation +cabal loss





## BLE 1M Ant1 2402







## Test Result

| TestMode | Antenna | Freq(MHz) | DTS BW<br>[MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|-----------|-----------------|----------|----------|------------|---------|
| BLE_1M   | Ant2    | 2402      | 0.692           | 2401.796 | 2402.488 | 0.5        | PASS    |
|          |         | 2440      | 0.700           | 2439.800 | 2440.500 | 0.5        | PASS    |
|          |         | 2480      | 0.688           | 2479.808 | 2480.496 | 0.5        | PASS    |

Note :offset=System attenuation +cabal loss

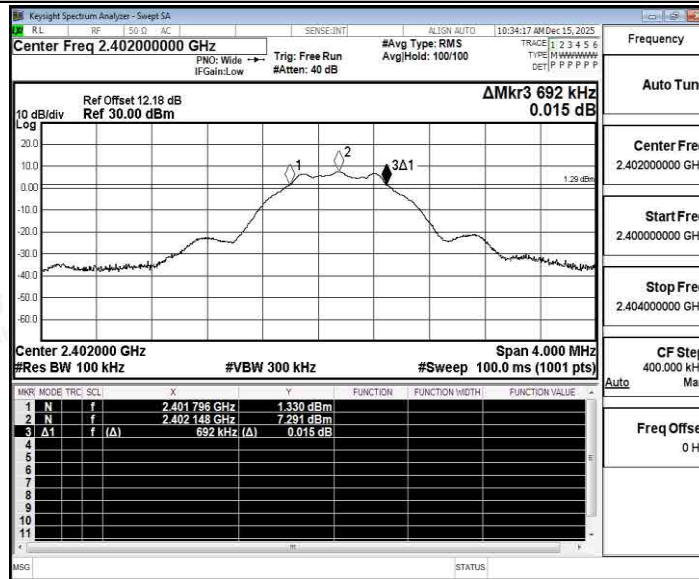


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518000, China  
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com  
Scan code to check authenticity

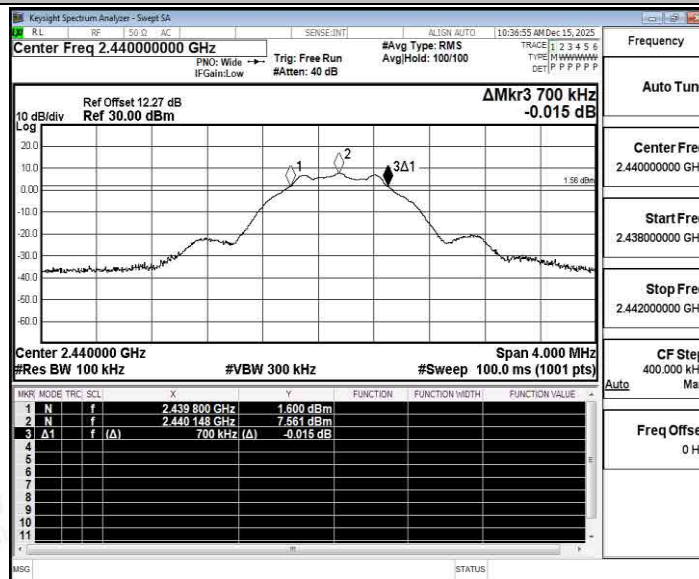


## Test Graphs

BLE\_1M\_Ant2\_2402

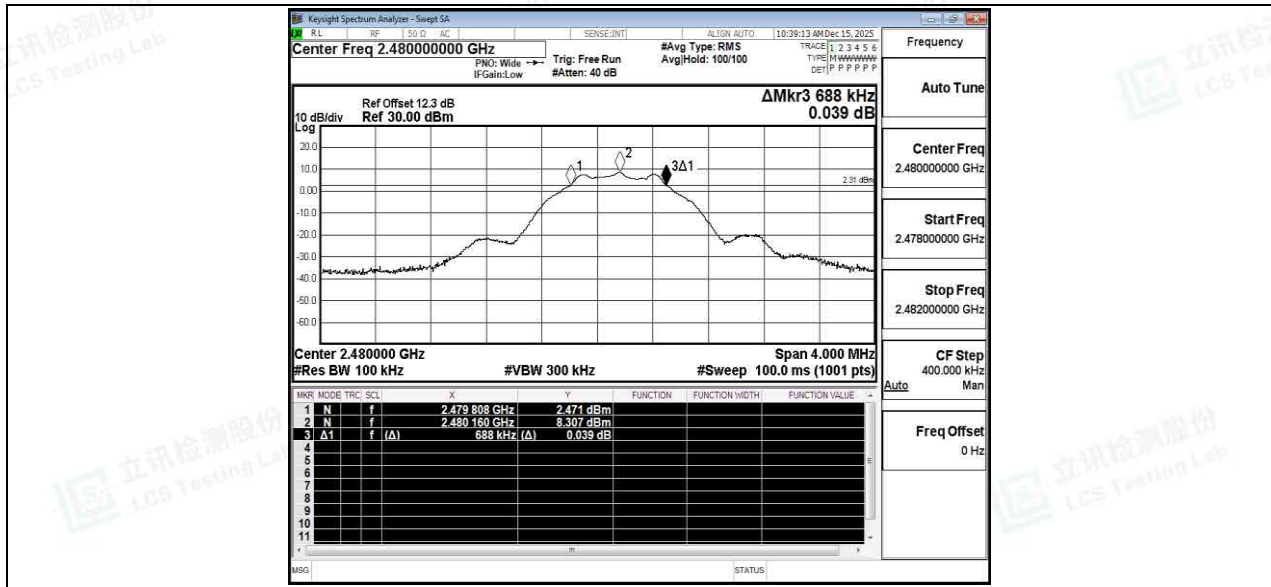


BLE\_1M\_Ant2\_2440



BLE\_1M\_Ant2\_2480







## A.2 Maximum Peak Conducted Output Power

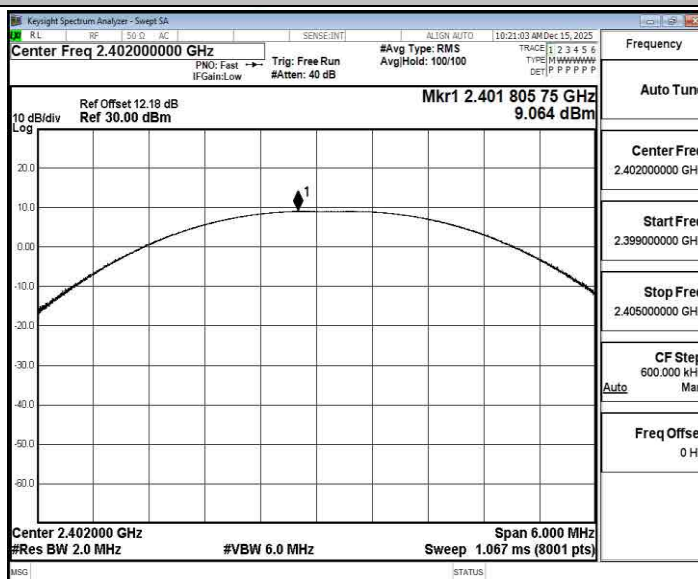
### Test Result Peak

| TestMode | Antenna | Freq(MHz) | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|-----------|---------------------------|----------------------|---------|
| BLE_1M   | Ant1    | 2402      | 9.06                      | ≤30                  | PASS    |
|          |         | 2440      | 9.43                      | ≤30                  | PASS    |
|          |         | 2480      | 9.41                      | ≤30                  | PASS    |

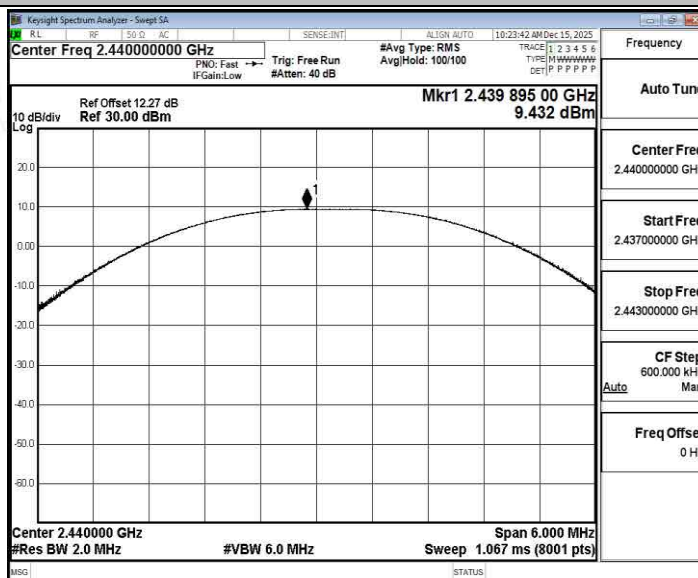
Note :offset=System attenuation +cabal loss

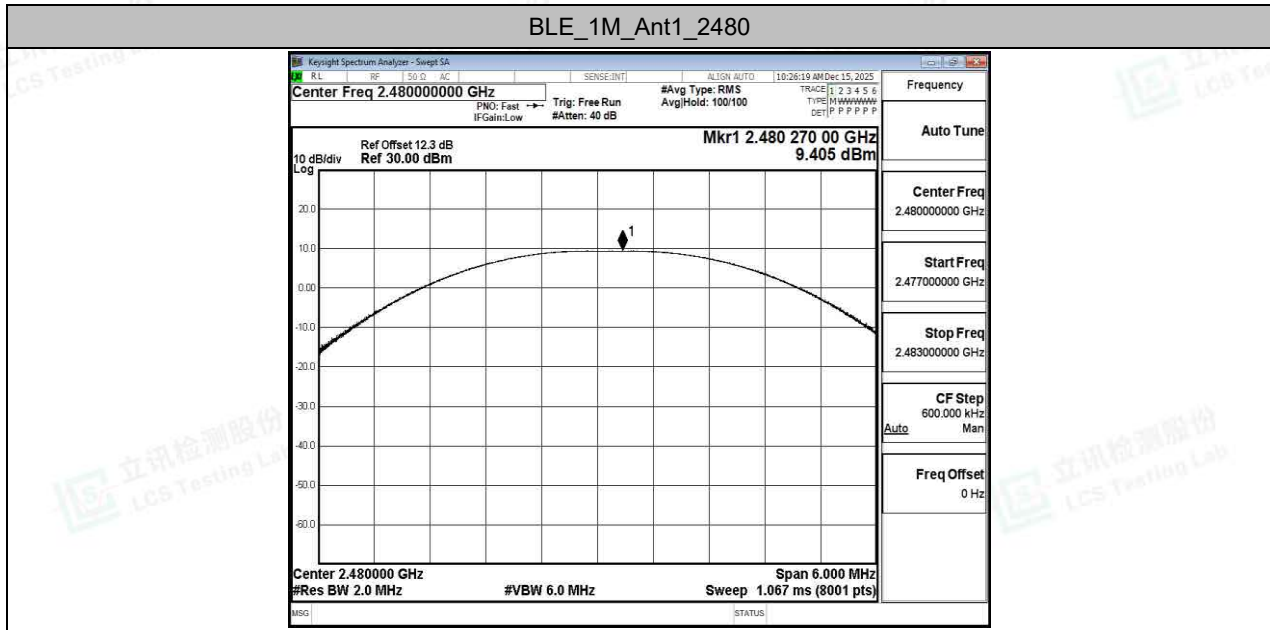
### Test Graphs Peak

BLE\_1M\_Ant1\_2402



BLE\_1M\_Ant1\_2440







Test Result Peak

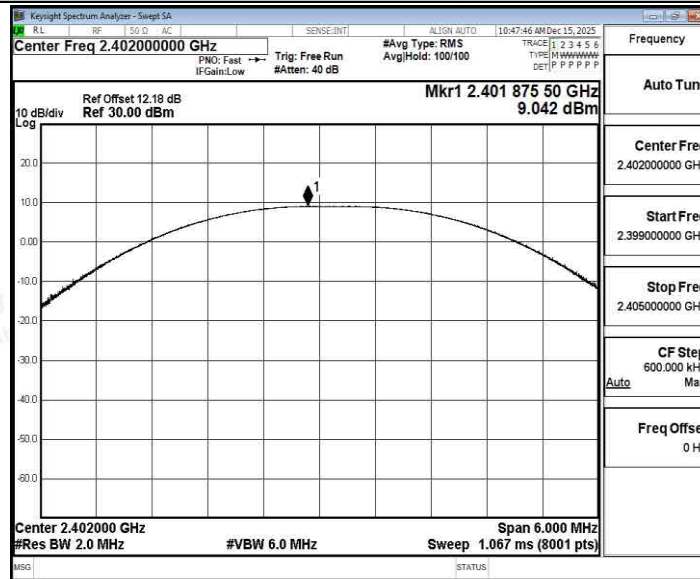
| TestMode | Antenna | Freq(MHz) | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|-----------|---------------------------|----------------------|---------|
| BLE_1M   | Ant2    | 2402      | 9.04                      | ≤30                  | PASS    |
|          |         | 2440      | 9.37                      | ≤30                  | PASS    |
|          |         | 2480      | 9.44                      | ≤30                  | PASS    |

Note :offset=System attenuation +cabal loss

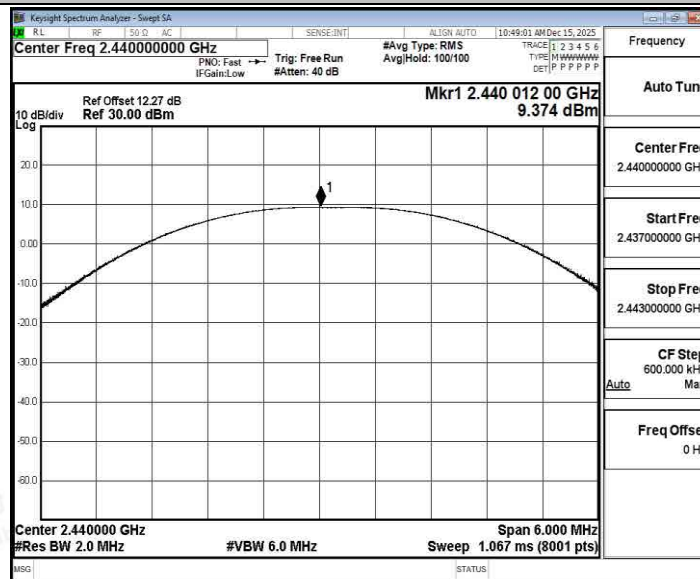


## Test Graphs Peak

BLE\_1M\_Ant2\_2402

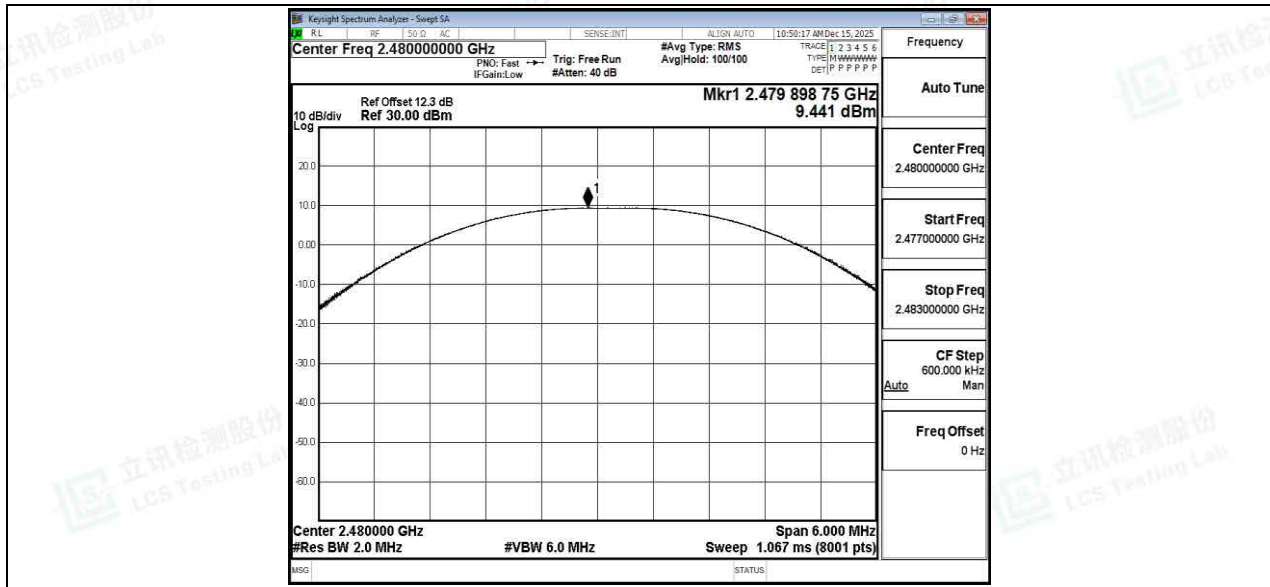


BLE\_1M\_Ant2\_2440



BLE\_1M\_Ant2\_2480







### A.3 Maximum power spectral density

#### Test Result

| TestMode | Antenna | Freq(MHz) | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|-----------|------------------|-----------------|---------|
| BLE_1M   | Ant1    | 2402      | -6.60            | ≤8.00           | PASS    |
|          |         | 2440      | -6.26            | ≤8.00           | PASS    |
|          |         | 2480      | -6.28            | ≤8.00           | PASS    |

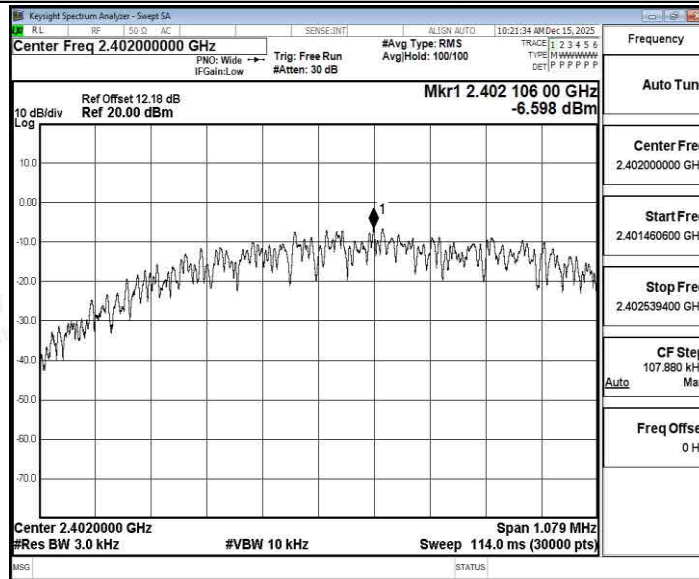
Note :offset=System attenuation +cabal loss



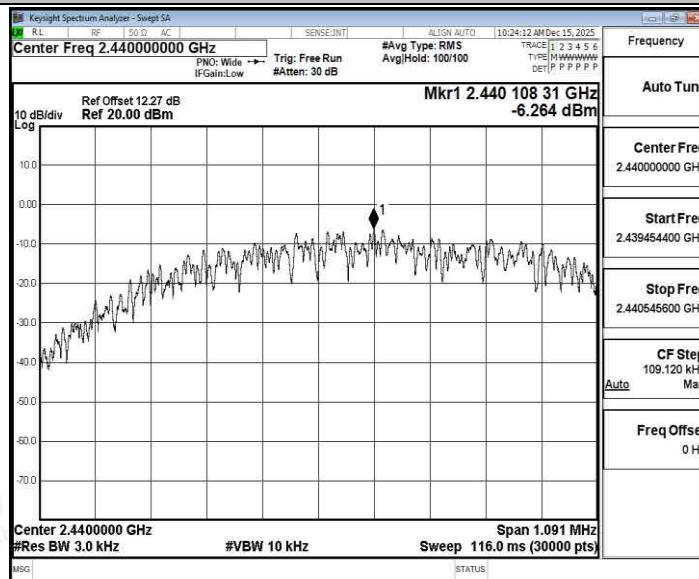


## Test Graphs

BLE\_1M\_Ant1\_2402

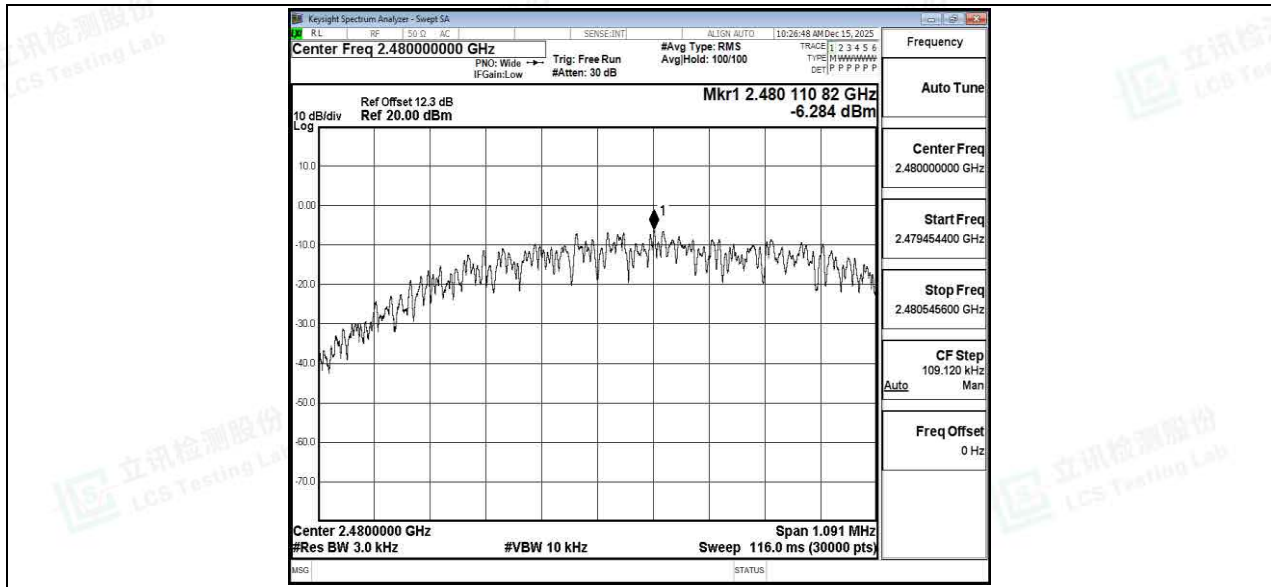


BLE\_1M\_Ant1\_2440



BLE\_1M\_Ant1\_2480







Test Result

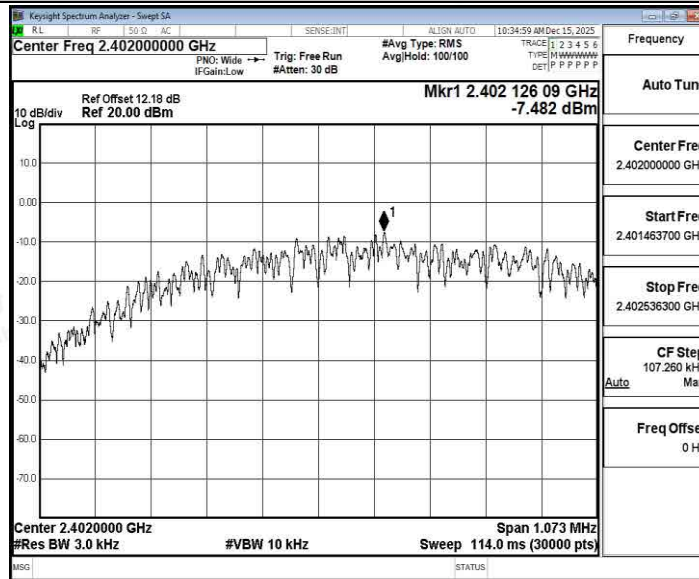
| TestMode | Antenna | Freq(MHz) | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|-----------|------------------|-----------------|---------|
| BLE_1M   | Ant2    | 2402      | -7.48            | ≤8.00           | PASS    |
|          |         | 2440      | -7.47            | ≤8.00           | PASS    |
|          |         | 2480      | -6.98            | ≤8.00           | PASS    |

Note :offset=System attenuation +cabal loss

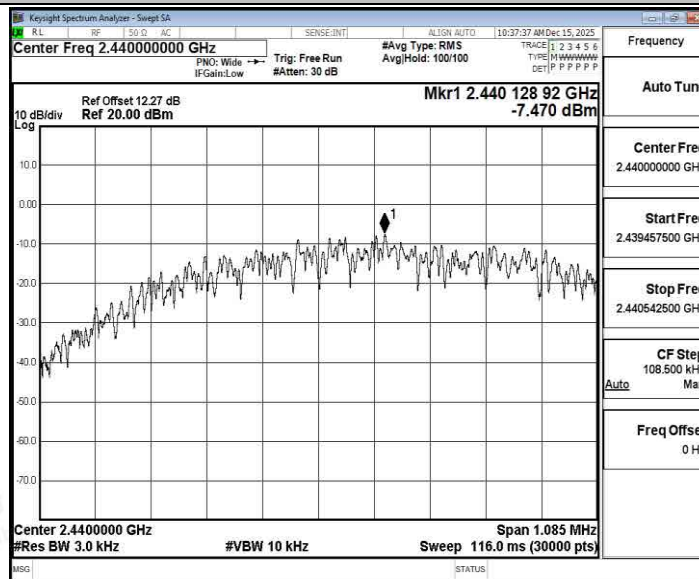


## Test Graphs

BLE\_1M\_Ant2\_2402

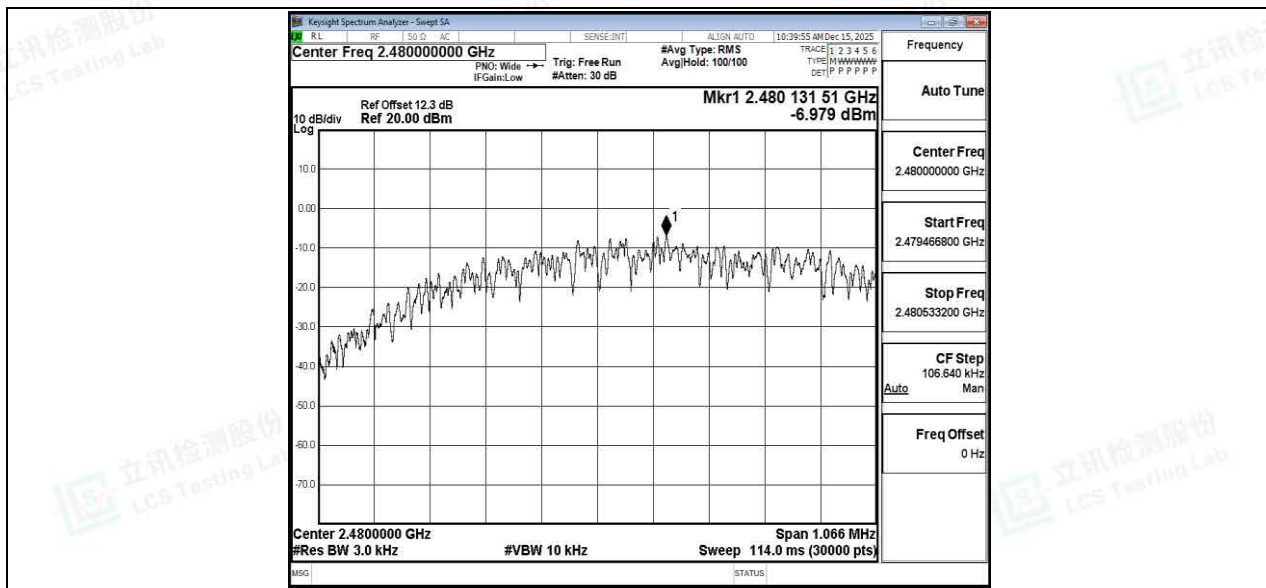


BLE\_1M\_Ant2\_2440



BLE\_1M\_Ant2\_2480







### A.4 Band edge measurements

#### Test Result

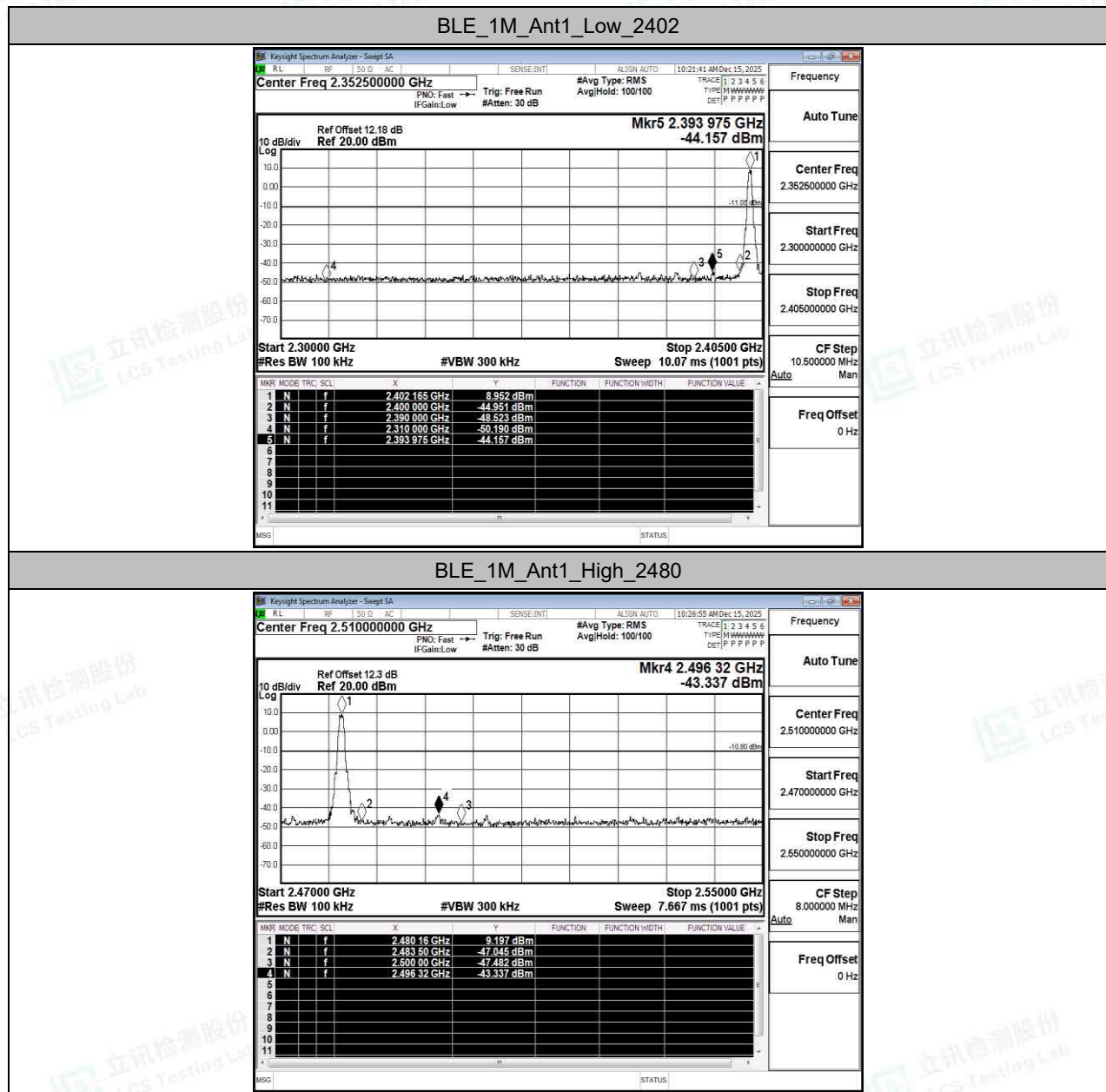
| TestMode | Antenna | ChName | Freq(MHz) | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|-----------|---------------|-------------|------------|---------|
| BLE_1M   | Ant1    | Low    | 2402      | 8.95          | -44.16      | ≤-11.05    | PASS    |
|          |         | High   | 2480      | 9.20          | -43.34      | ≤-10.8     | PASS    |

Note :offset=System attenuation +cabal loss





## Test Graphs





## Test Result

| TestMode | Antenna | ChName | Freq(MHz) | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|-----------|---------------|-------------|------------|---------|
| BLE_1M   | Ant2    | Low    | 2402      | 7.51          | -43.01      | ≤-12.49    | PASS    |
|          |         | High   | 2480      | 7.74          | -42.13      | ≤-12.26    | PASS    |

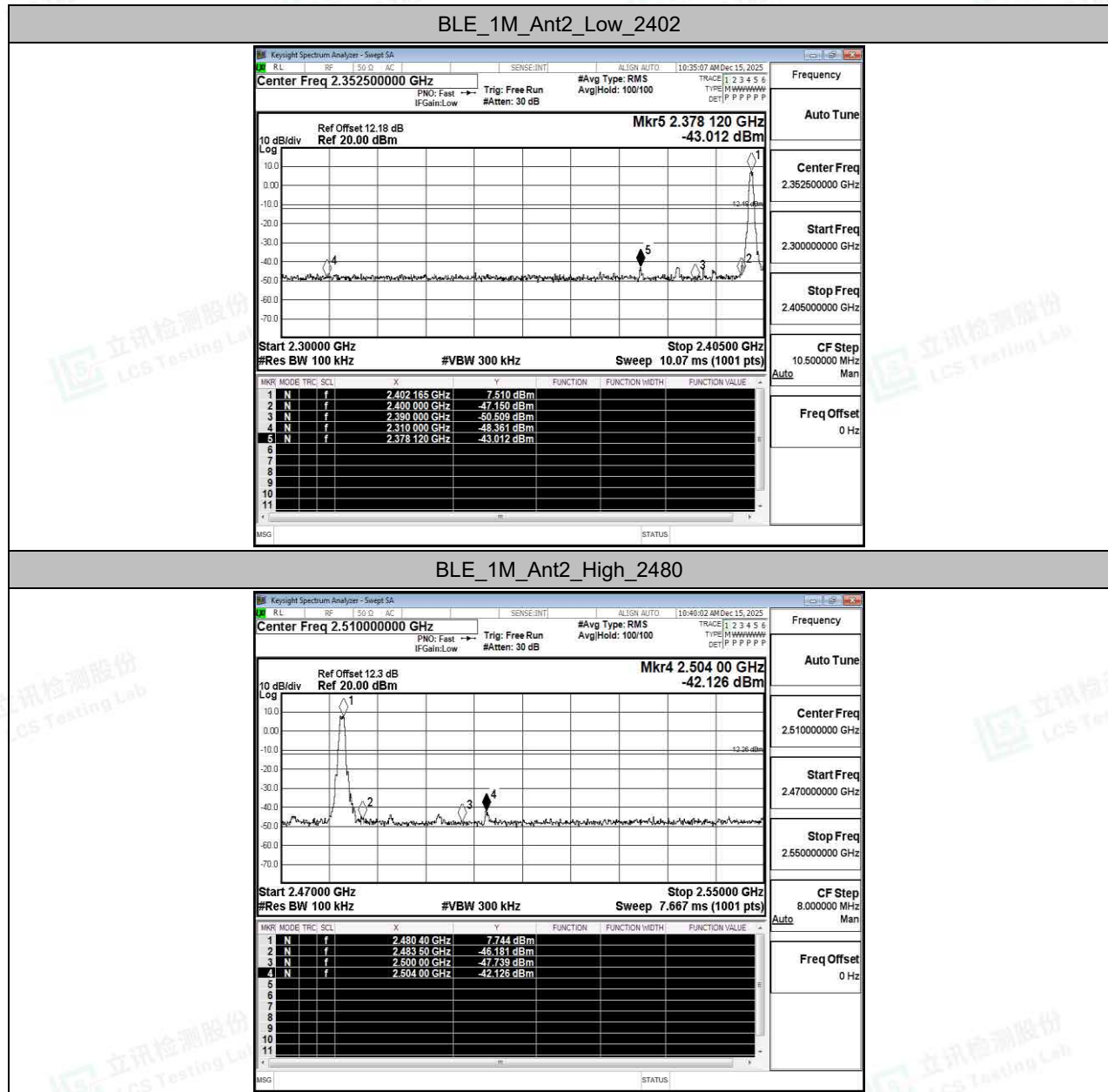
Note :offset=System attenuation +cabal loss



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## Test Graphs





## A.5 Conducted Spurious Emission

### Test Result

| TestMode | Antenna | Freq(MHz) | FreqRange [MHz] | RefLevel [dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|-----------|-----------------|----------------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402      | Reference       | 8.91           | 8.91        | ---        | PASS    |
|          |         |           | 30~1000         | 8.91           | -55.4       | ≤-11.09    | PASS    |
|          |         |           | 1000~26500      | 8.91           | -12.24      | ≤-11.09    | PASS    |
|          |         | 2440      | Reference       | 9.11           | 9.11        | ---        | PASS    |
|          |         |           | 30~1000         | 9.11           | -55.88      | ≤-10.89    | PASS    |
|          |         |           | 1000~26500      | 9.11           | -14.52      | ≤-10.89    | PASS    |
|          |         | 2480      | Reference       | 9.15           | 9.15        | ---        | PASS    |
|          |         |           | 30~1000         | 9.15           | -55.42      | ≤-10.85    | PASS    |
|          |         |           | 1000~26500      | 9.15           | -11.46      | ≤-10.85    | PASS    |

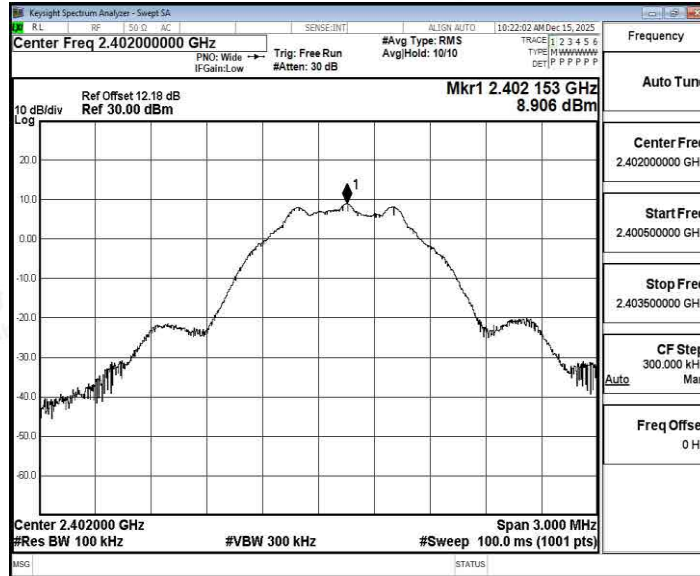
Note :offset=System attenuation +cabal loss



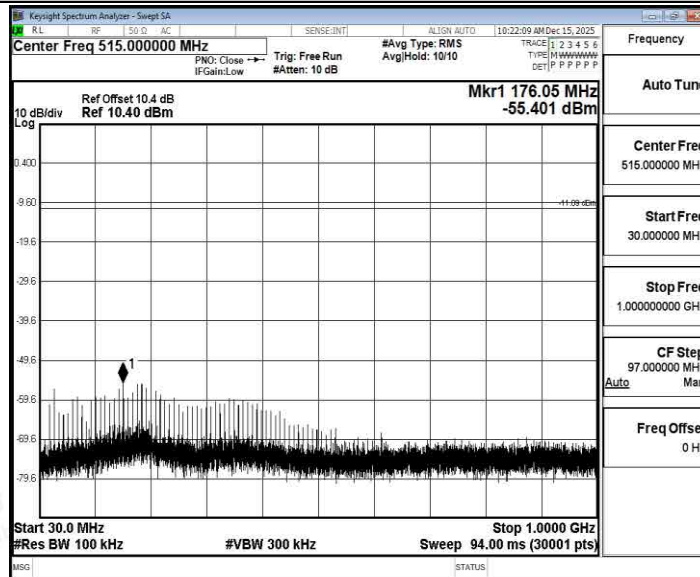


## Test Graphs

BLE\_1M\_Ant1\_2402\_0~Reference

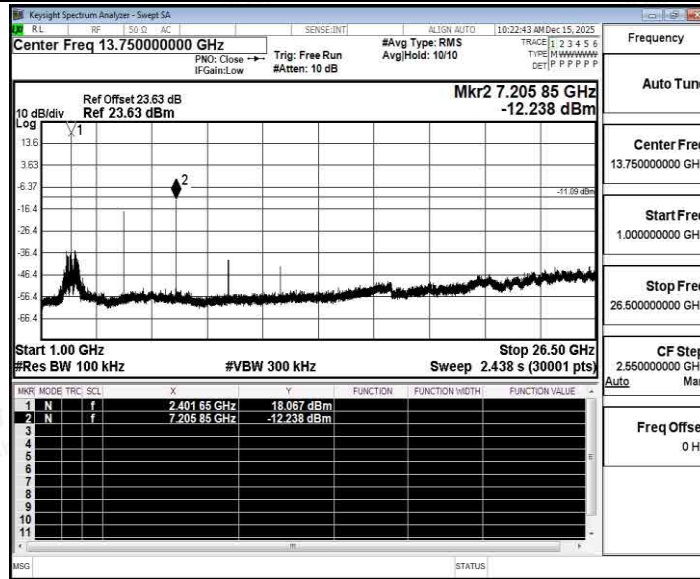


BLE\_1M\_Ant1\_2402\_30~1000

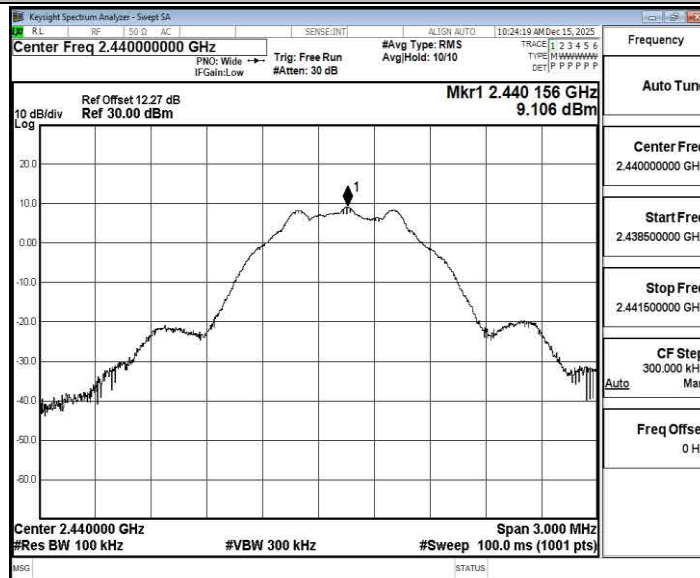


BLE\_1M\_Ant1\_2402\_1000~26500



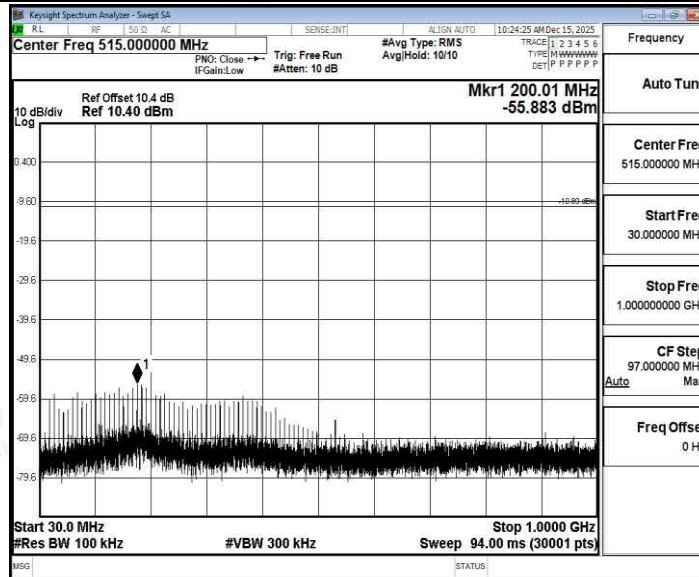


BLE\_1M\_Ant1\_2440\_0~Reference

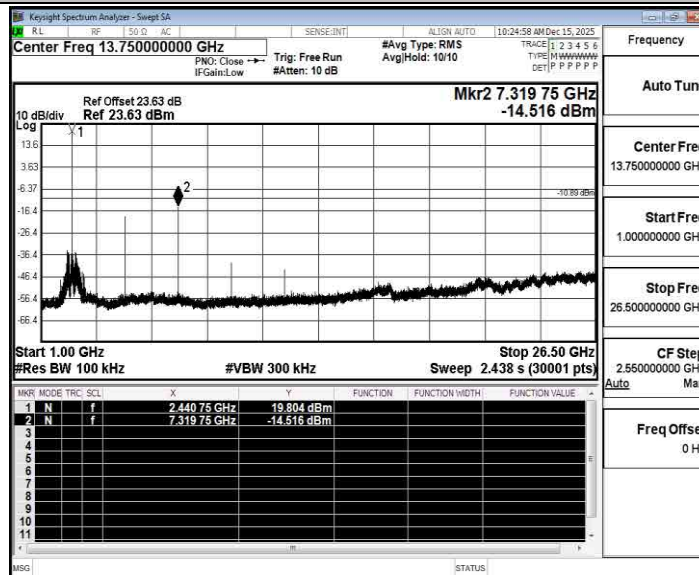


BLE\_1M\_Ant1\_2440\_30~1000



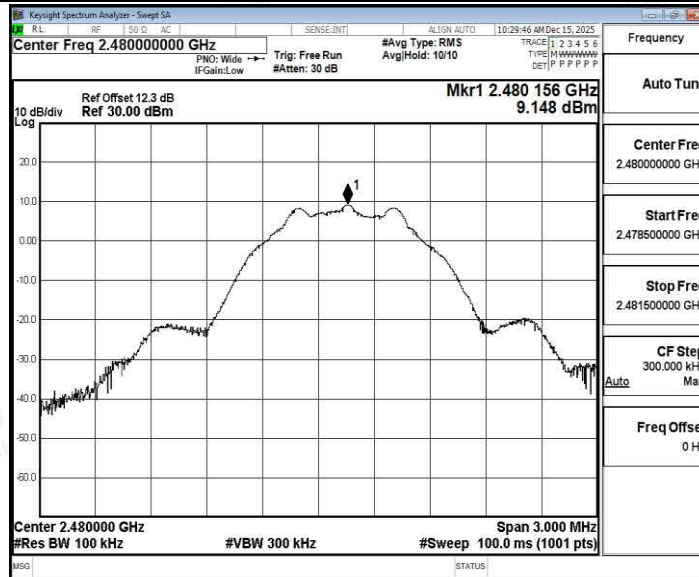


BLE\_1M\_Ant1\_2440\_1000~26500

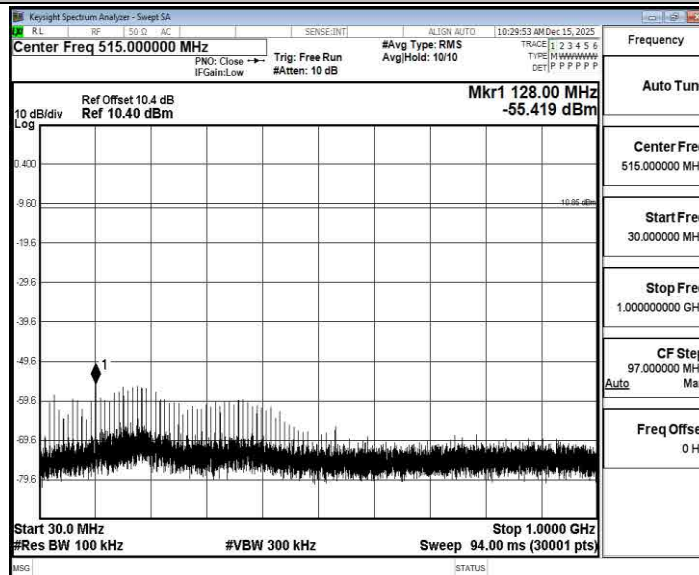


BLE\_1M\_Ant1\_2480\_0~Reference



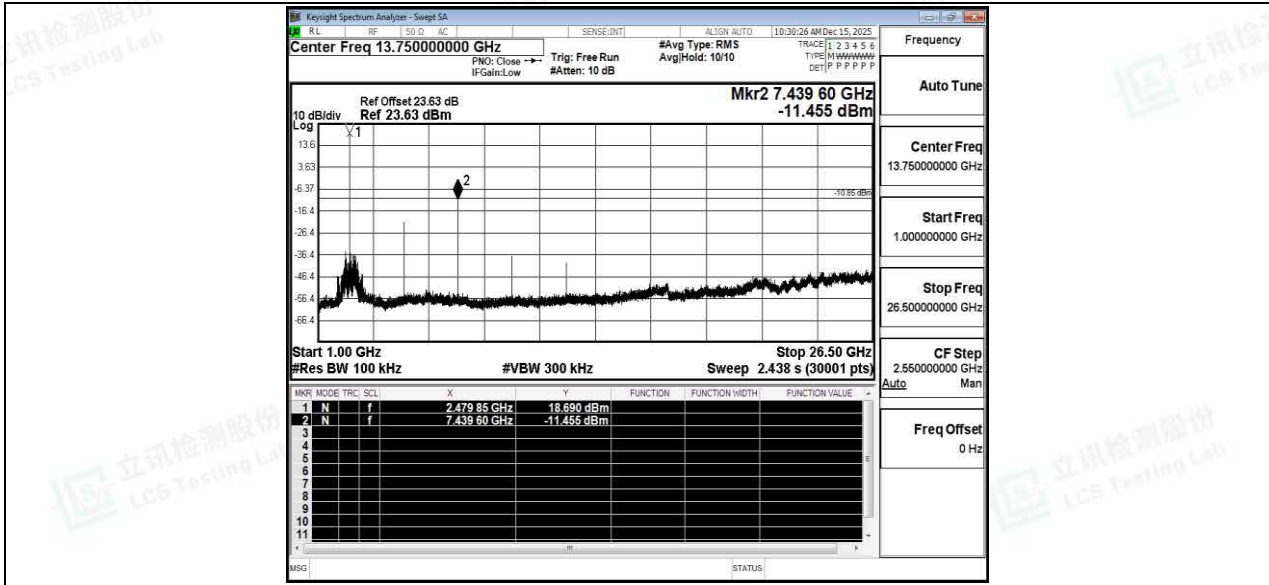


BLE\_1M\_Ant1\_2480\_30~1000



BLE\_1M\_Ant1\_2480\_1000~26500







## Test Result

| TestMode | Antenna | Freq(MHz) | FreqRange [MHz] | RefLevel [dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|-----------|-----------------|----------------|-------------|------------|---------|
| BLE_1M   | Ant2    | 2402      | Reference       | 8.78           | 8.78        | ---        | PASS    |
|          |         |           | 30~1000         | 8.78           | -54.33      | ≤-11.22    | PASS    |
|          |         |           | 1000~26500      | 8.78           | -12.12      | ≤-11.22    | PASS    |
|          |         | 2440      | Reference       | 9.01           | 9.01        | ---        | PASS    |
|          |         |           | 30~1000         | 9.01           | -54.43      | ≤-10.99    | PASS    |
|          |         |           | 1000~26500      | 9.01           | -13.67      | ≤-10.99    | PASS    |
|          |         | 2480      | Reference       | 9.16           | 9.16        | ---        | PASS    |
|          |         |           | 30~1000         | 9.16           | -55.17      | ≤-10.84    | PASS    |
|          |         |           | 1000~26500      | 9.16           | -13.89      | ≤-10.84    | PASS    |

Note :offset=System attenuation +cabal loss

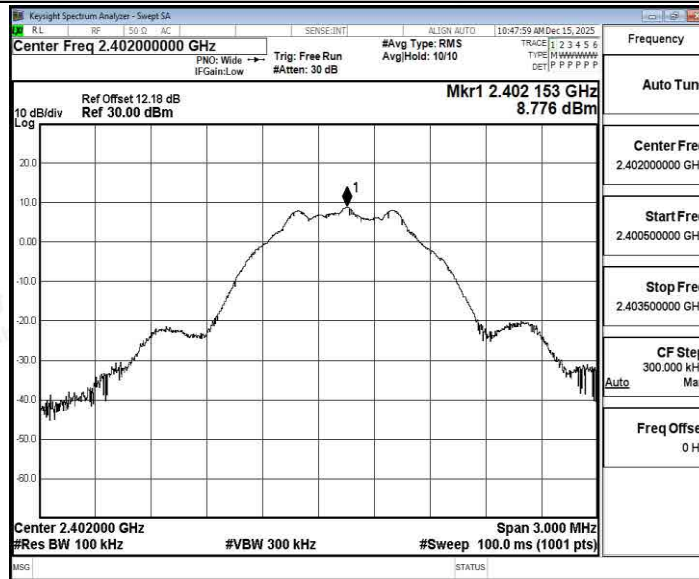


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Scan code to check authenticity

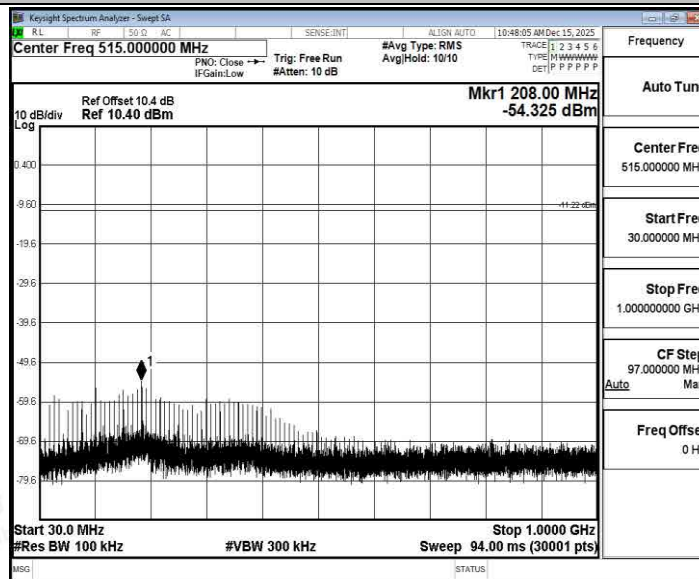


## Test Graphs

BLE\_1M\_Ant2\_2402\_0~Reference

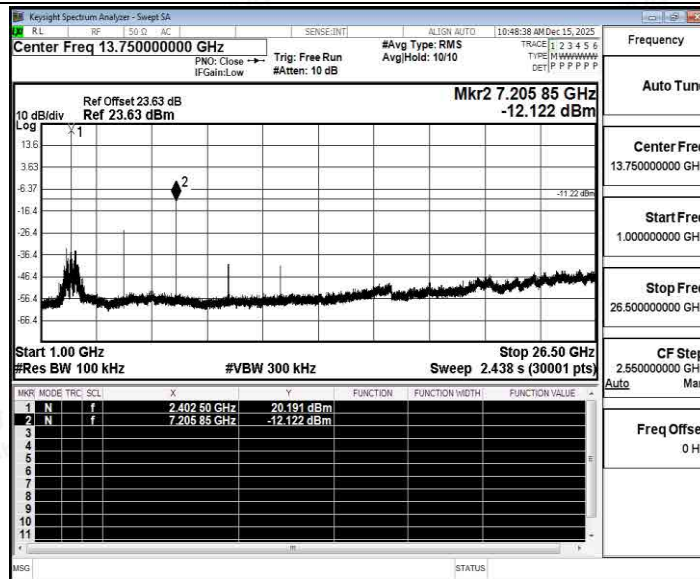


BLE\_1M\_Ant2\_2402\_30~1000

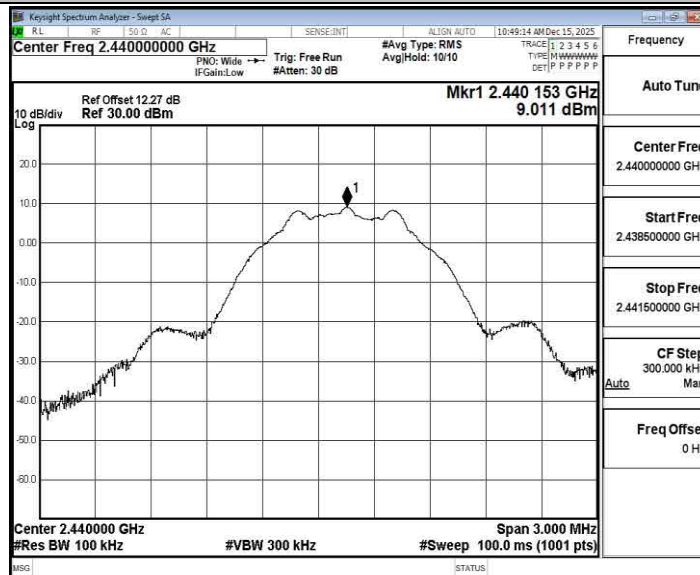


BLE\_1M\_Ant2\_2402\_1000~26500



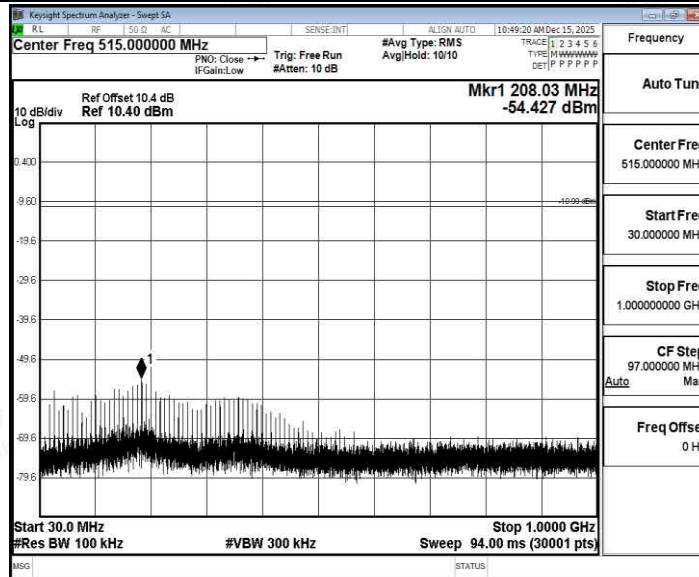


BLE\_1M\_Ant2\_2440\_0~Reference

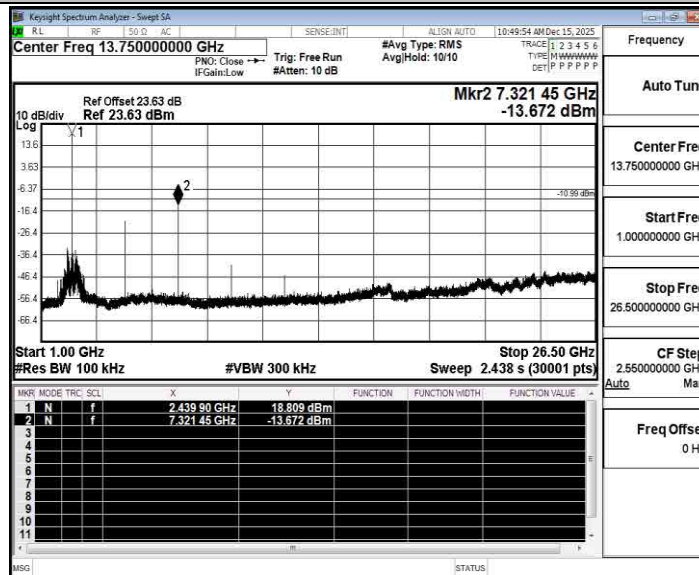


BLE\_1M\_Ant2\_2440\_30~1000



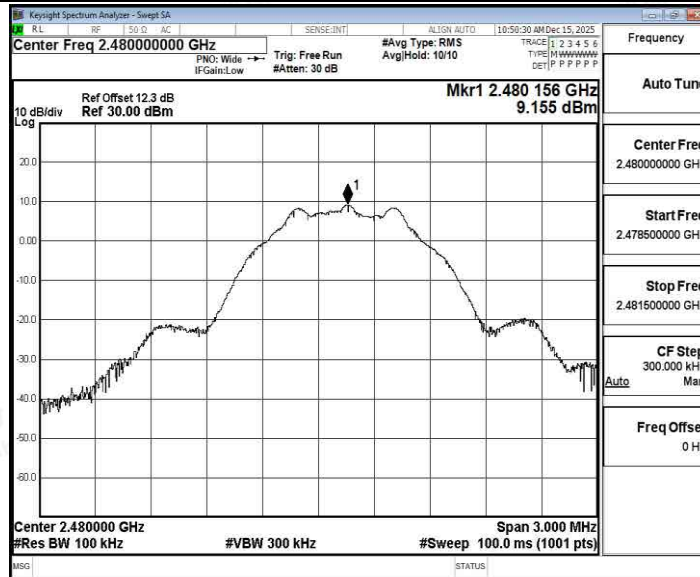


BLE\_1M\_Ant2\_2440\_1000~26500

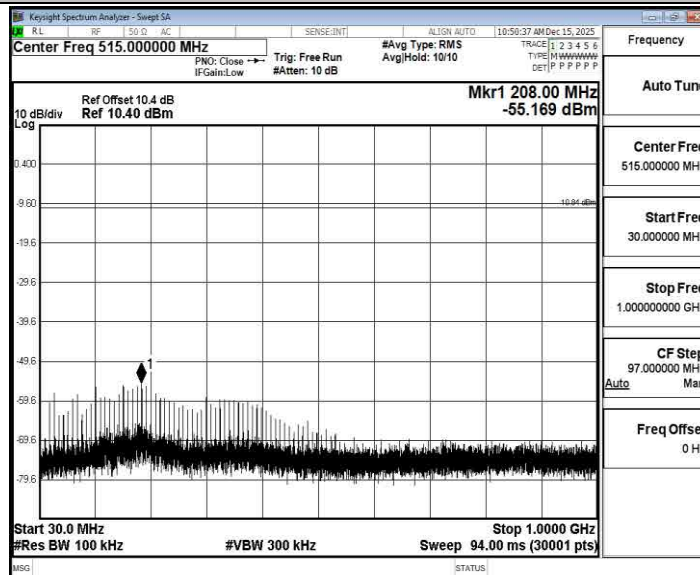


BLE\_1M\_Ant2\_2480\_0~Reference



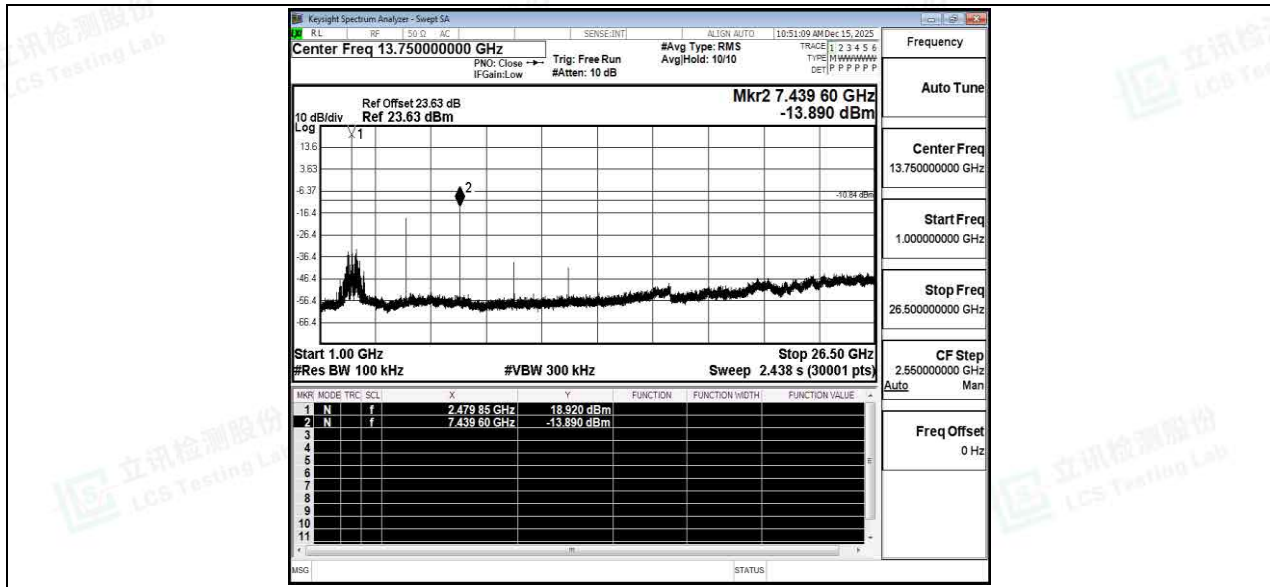


BLE\_1M\_Ant2\_2480\_30~1000



BLE\_1M\_Ant2\_2480\_1000~26500







## A.6 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      | 0.39            | 0.62           | 0.6290 | 62.90     | 2.01    | ---   | ---     |
|          |         | 2440      | 0.39            | 0.62           | 0.6290 | 62.90     | 2.01    | ---   | ---     |
|          |         | 2480      | 0.39            | 0.63           | 0.6190 | 61.90     | 2.08    | ---   | ---     |

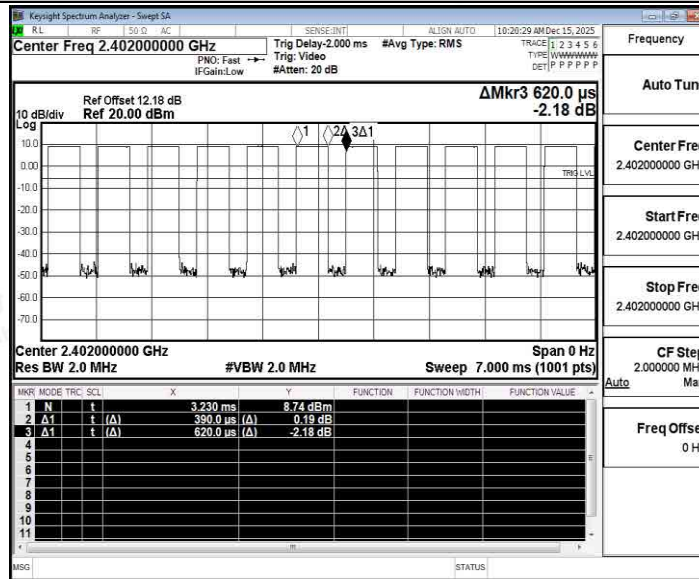
Note :offset=System attenuation +cabal loss



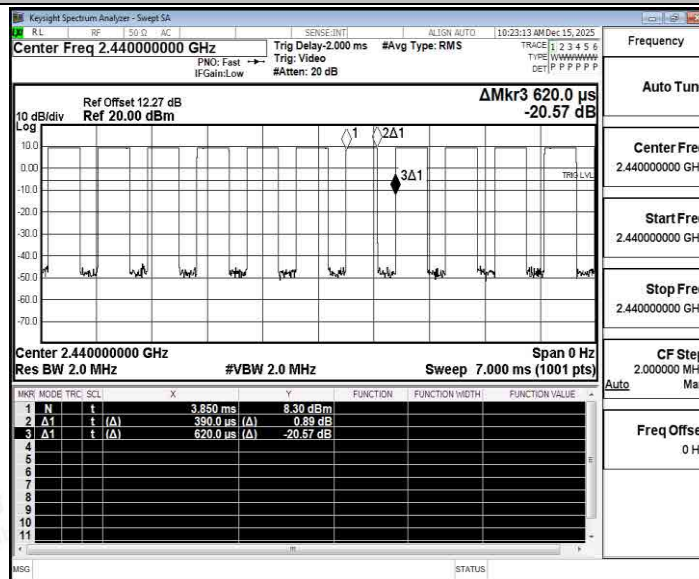


## Test Graphs

BLE\_1M\_Ant1\_2402

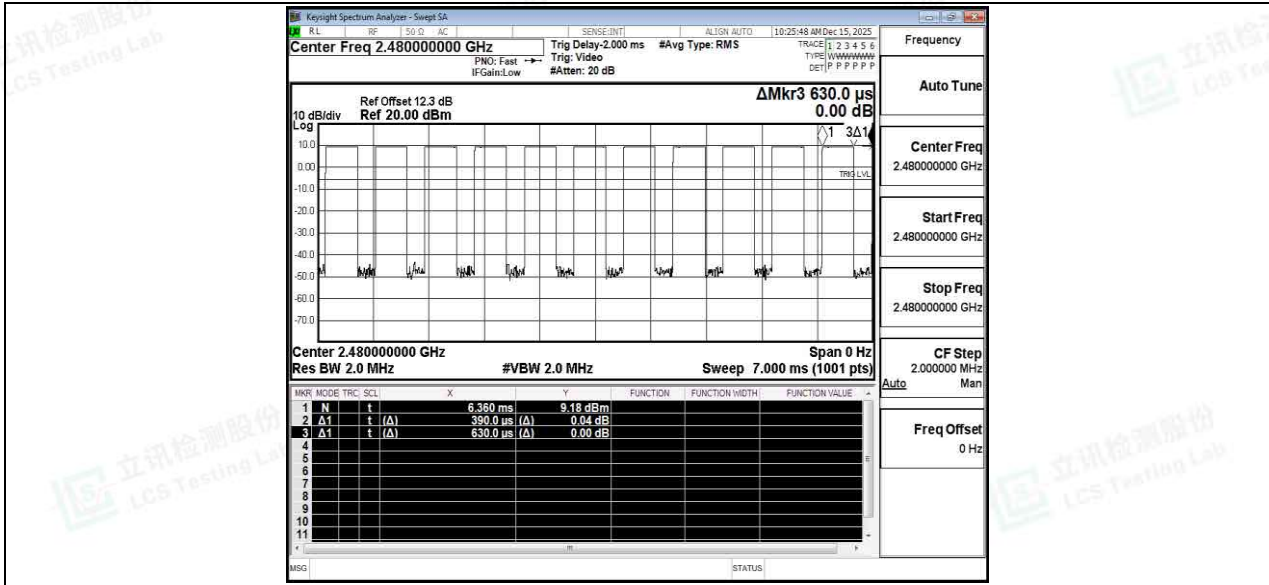


BLE\_1M\_Ant1\_2440



BLE\_1M\_Ant1\_2480







Test Result

| TestMode | Antenna | Freq(MHz) | ON Time<br>[ms] | Period<br>[ms] | X      | DC<br>[%] | xFactor | Limit | Verdict |
|----------|---------|-----------|-----------------|----------------|--------|-----------|---------|-------|---------|
| BLE_1M   | Ant2    | 2402      | 0.39            | 0.62           | 0.6290 | 62.90     | 2.01    | ---   | ---     |
|          |         | 2440      | 0.39            | 0.62           | 0.6290 | 62.90     | 2.01    | ---   | ---     |
|          |         | 2480      | 0.39            | 0.62           | 0.6290 | 62.90     | 2.01    | ---   | ---     |

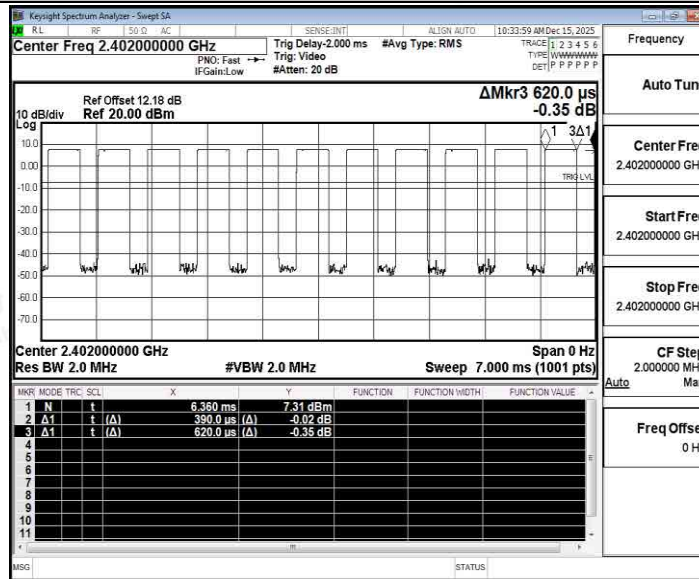
Note :offset=System attenuation +cabal loss



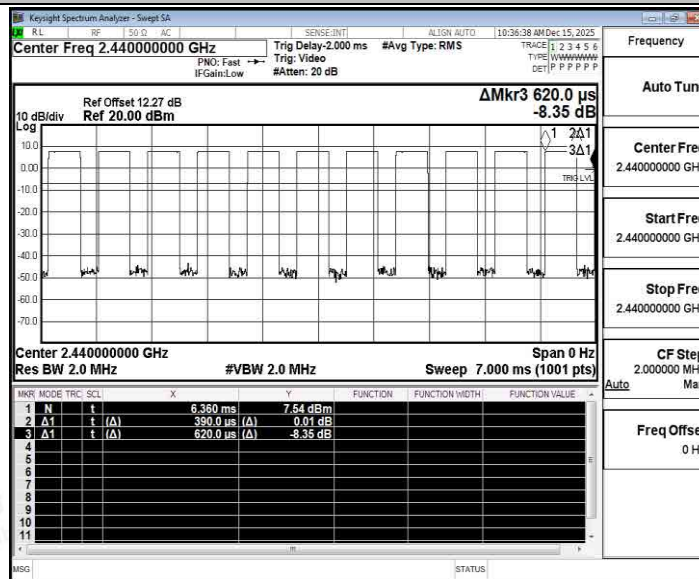


## Test Graphs

BLE\_1M\_Ant2\_2402

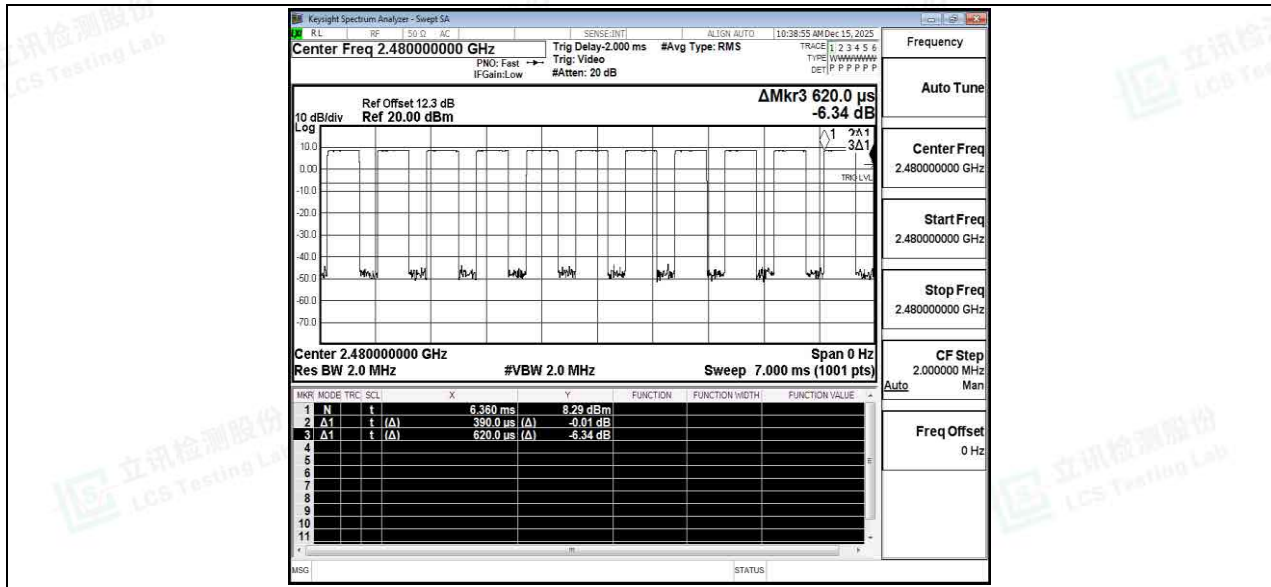


BLE\_1M\_Ant2\_2440



BLE\_1M\_Ant2\_2480







## A.7 Emissions in Restricted Bands

### Test Result

| TestMode | Antenna | ChName | Freq(MHz) | Detector | Freq [MHz] | Result [dBm] | Gain [dBi] | DC Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Verdict |
|----------|---------|--------|-----------|----------|------------|--------------|------------|----------------|-----------------|----------------|---------|
| BLE_1M   | Ant1    | Low    | 2402      | AV       | 2310.000   | -56.87       | 2.00       | 2.01           | 42.34           | ≤54            | PASS    |
|          |         |        |           | AV       | 2386.100   | -48.53       | 2.00       | 2.01           | 50.68           | ≤54            | PASS    |
|          |         |        |           | AV       | 2390.000   | -54.81       | 2.00       | 2.01           | 44.40           | ≤54            | PASS    |
|          |         |        |           | Peak     | 2310.000   | -47.43       | 2.00       | 0.00           | 49.77           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2386.415   | -36.62       | 2.00       | 0.00           | 60.58           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2390.000   | -46.59       | 2.00       | 0.00           | 50.61           | ≤74            | PASS    |
|          |         | High   | 2480      | AV       | 2483.500   | -51.81       | 2.00       | 2.08           | 47.47           | ≤54            | PASS    |
|          |         |        |           | AV       | 2496.080   | -47.74       | 2.00       | 2.08           | 51.54           | ≤54            | PASS    |
|          |         |        |           | AV       | 2500.000   | -56.26       | 2.00       | 2.08           | 43.02           | ≤54            | PASS    |
|          |         |        |           | Peak     | 2483.500   | -43.32       | 2.00       | 0.00           | 53.88           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2484.240   | -36.98       | 2.00       | 0.00           | 60.22           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2500.000   | -39.44       | 2.00       | 0.00           | 57.76           | ≤74            | PASS    |

Note :offset=System attenuation +cabal loss

Note:

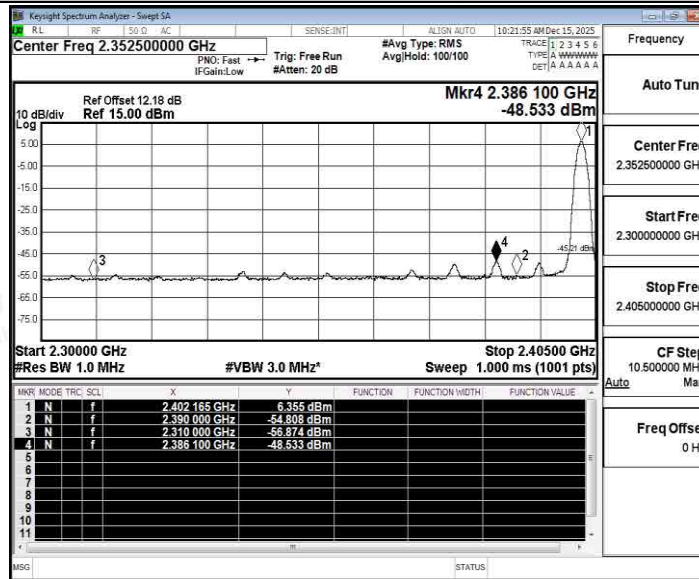
1. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.



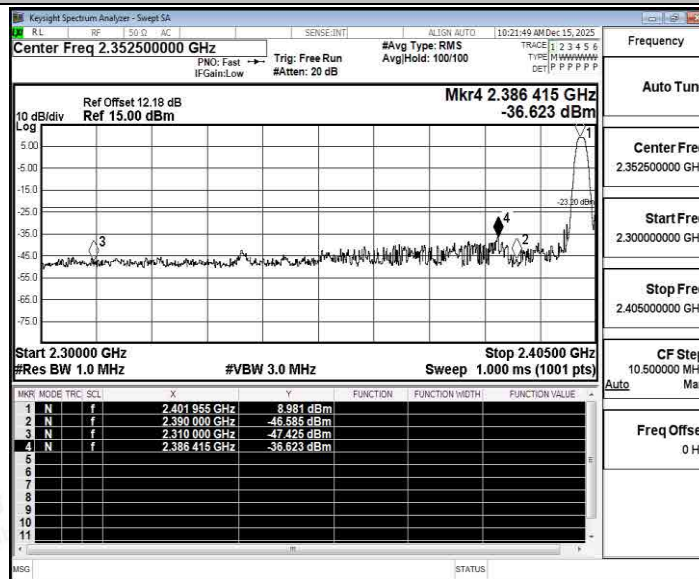


## Test Graphs

BLE\_1M\_Ant1\_Low\_2402\_AV

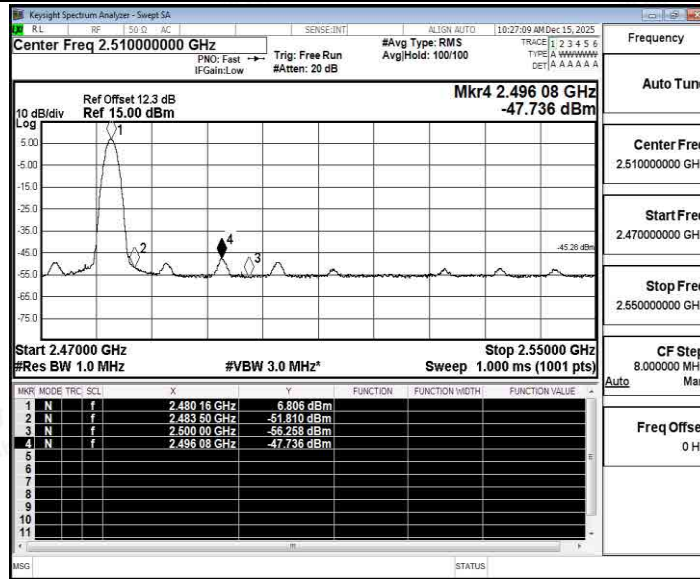


BLE\_1M\_Ant1\_Low\_2402\_Peak

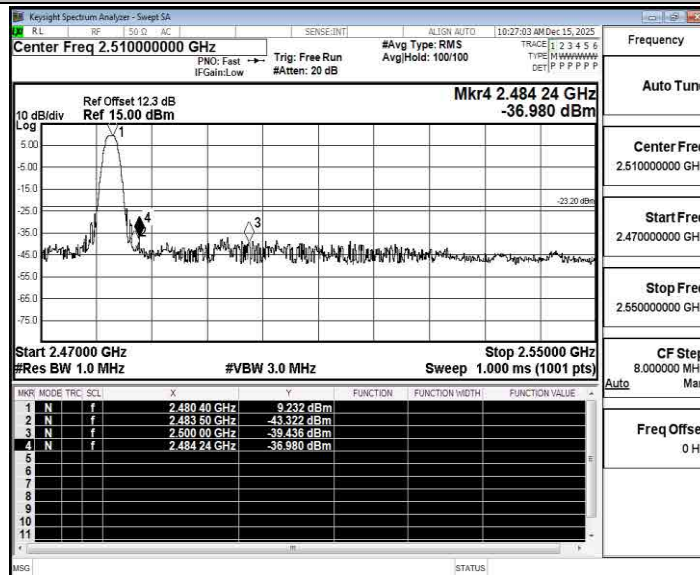


BLE\_1M\_Ant1\_High\_2480\_AV





BLE\_1M\_Ant1\_High\_2480\_Peak



**Test Result**

| TestMode | Antenna | ChName | Freq(MHz) | Detector | Freq [MHz] | Result [dBm] | Gain [dBi] | DC Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Verdict |
|----------|---------|--------|-----------|----------|------------|--------------|------------|----------------|-----------------|----------------|---------|
| BLE_1M   | Ant2    | Low    | 2402      | AV       | 2310.000   | -56.37       | 3.80       | 2.01           | 44.64           | ≤54            | PASS    |
|          |         |        |           | AV       | 2386.205   | -48.81       | 3.80       | 2.01           | 52.20           | ≤54            | PASS    |
|          |         |        |           | AV       | 2390.000   | -56.61       | 3.80       | 2.01           | 44.40           | ≤54            | PASS    |
|          |         |        |           | Peak     | 2310.000   | -48.66       | 3.80       | 0              | 50.34           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2386.100   | -39.6        | 3.80       | 0              | 59.40           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2390.000   | -41.89       | 3.80       | 0              | 57.11           | ≤74            | PASS    |
|          |         | High   | 2480      | AV       | 2483.500   | -52.39       | 3.80       | 2.01           | 48.62           | ≤54            | PASS    |
|          |         |        |           | AV       | 2496.080   | -48.07       | 3.80       | 2.01           | 52.94           | ≤54            | PASS    |
|          |         |        |           | AV       | 2500.000   | -55.25       | 3.80       | 2.01           | 45.76           | ≤54            | PASS    |
|          |         |        |           | Peak     | 2483.500   | -44.04       | 3.80       | 0              | 54.96           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2483.840   | -36.86       | 3.80       | 0              | 62.14           | ≤74            | PASS    |
|          |         |        |           | Peak     | 2500.000   | -42.88       | 3.80       | 0              | 56.12           | ≤74            | PASS    |

Note :offset=System attenuation +cabal loss

Note:

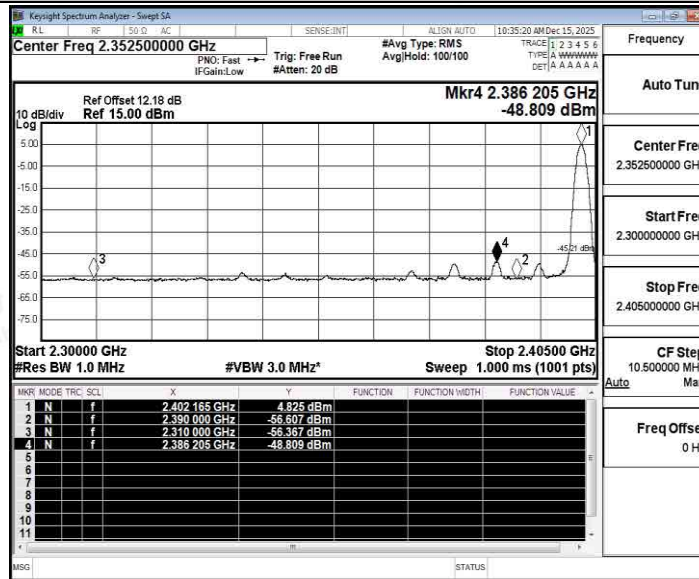
- The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.



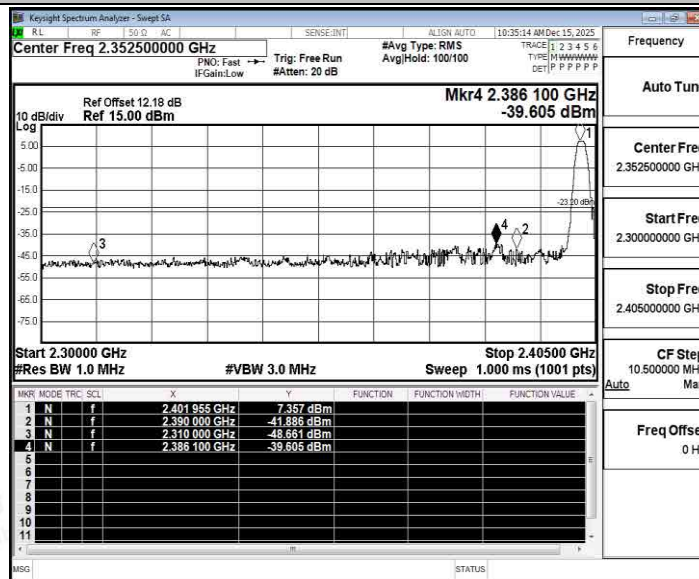


## Test Graphs

BLE\_1M\_Ant2\_Low\_2402\_AV

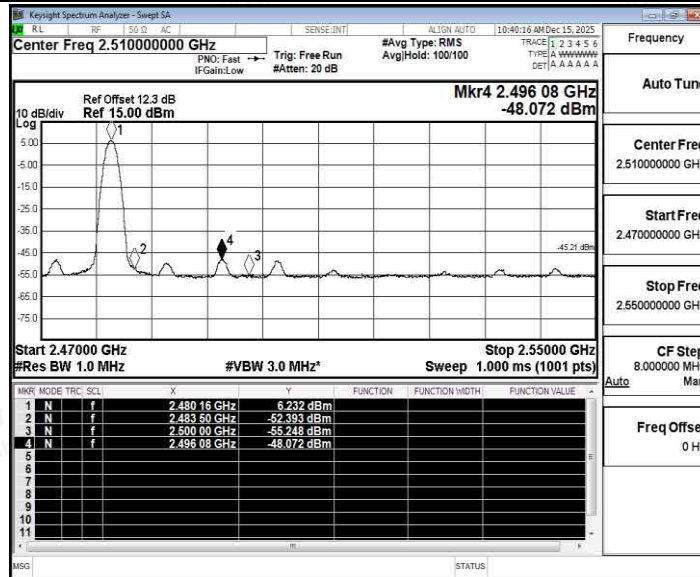


BLE\_1M\_Ant2\_Low\_2402\_Peak



BLE\_1M\_Ant2\_High\_2480\_AV





BLE\_1M\_Ant2\_High\_2480\_Peak

