

## Appendix: Bluetooth LE

Contents

Appendix A: DTS Bandwidth ..... 3

    Test Result ..... 3

    Test Graphs ..... 4

Appendix B: Occupied Channel Bandwidth ..... 7

    Test Result ..... 7

    Test Graphs ..... 8

Appendix C: Maximum conducted output power ..... 11

    Test Result Peak ..... 11

    Test Graphs Peak ..... 12

Appendix D: Maximum power spectral density ..... 15

    Test Result ..... 15

    Test Graphs ..... 16

Appendix E: Band edge measurements ..... 19

    Test Result ..... 19

    Test Graphs ..... 20

Appendix F: Conducted Spurious Emission ..... 22

    Test Result ..... 22

    Test Graphs ..... 23

Appendix G: Duty Cycle ..... 32

    Test Result ..... 32

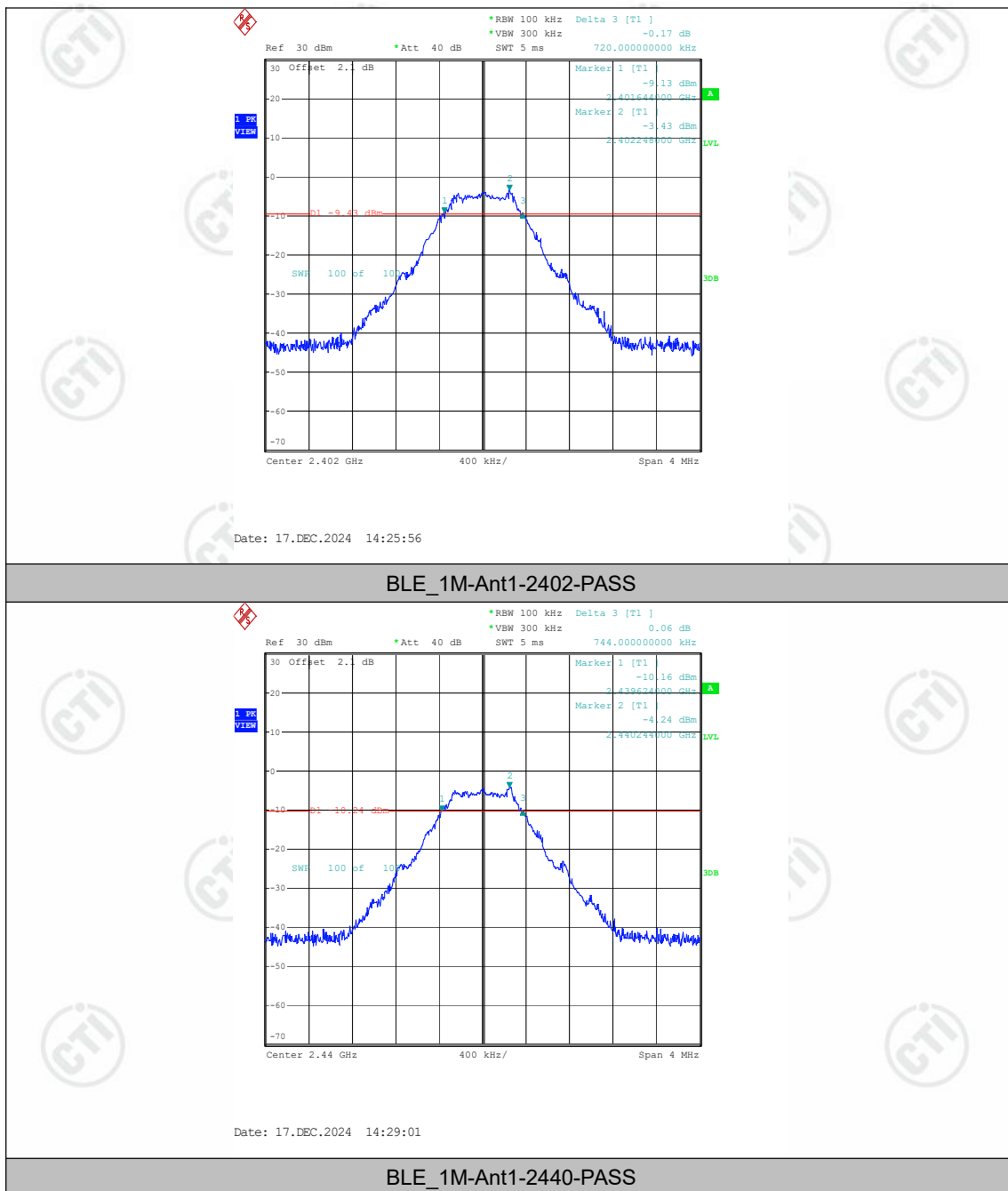
    Test Graphs ..... 33

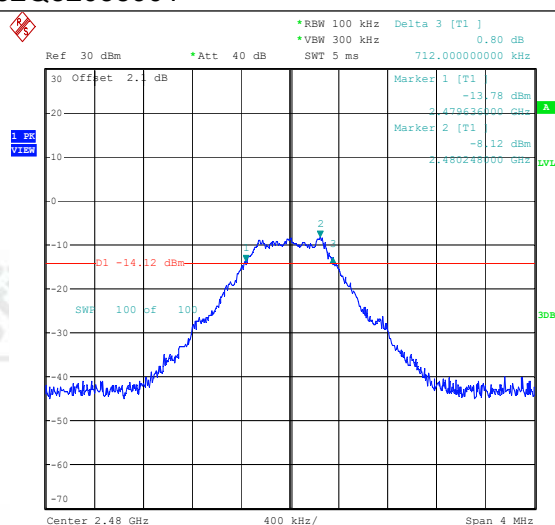
Appendix A: DTS Bandwidth

Test Result

| TestMode | Antenna | Frequency[MHz] | DTS BW [MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | Verdict |
|----------|---------|----------------|--------------|---------|---------|------------|---------|
| BLE_1M   | Ant1    | 2402           | 0.72         | 2401.64 | 2402.36 | 0.5        | PASS    |
| BLE_1M   | Ant1    | 2440           | 0.74         | 2439.62 | 2440.37 | 0.5        | PASS    |
| BLE_1M   | Ant1    | 2480           | 0.71         | 2479.64 | 2480.35 | 0.5        | PASS    |
| BLE_2M   | Ant1    | 2402           | 1.23         | 2401.36 | 2402.59 | 0.5        | PASS    |
| BLE_2M   | Ant1    | 2440           | 1.23         | 2439.36 | 2440.59 | 0.5        | PASS    |
| BLE_2M   | Ant1    | 2480           | 1.23         | 2479.36 | 2480.58 | 0.5        | PASS    |

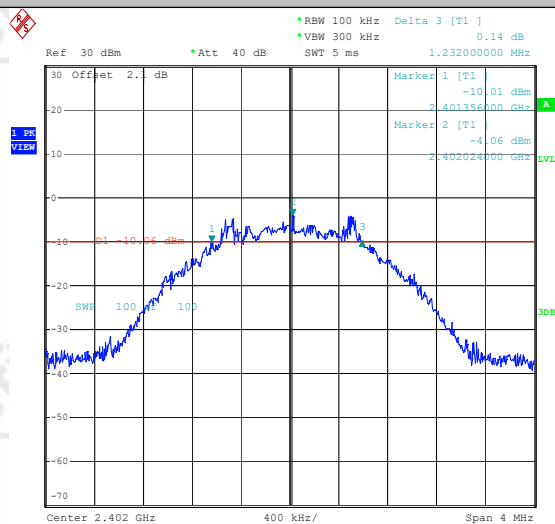
## Test Graphs





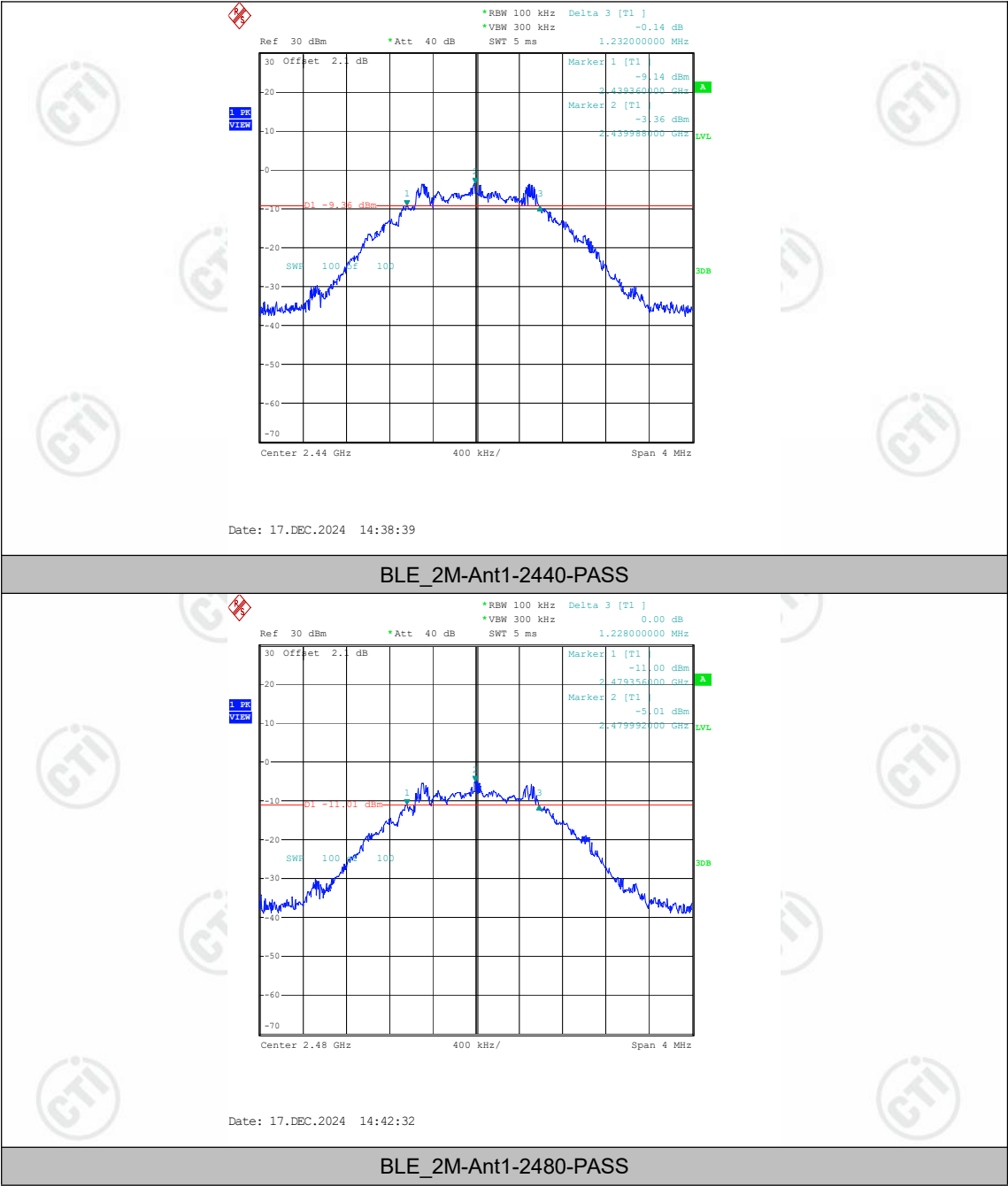
Date: 17.DEC.2024 14:32:00

## BLE\_1M-Ant1-2480-PASS



Date: 17.DEC.2024 14:35:10

## BLE 2M-Ant1-2402-PASS

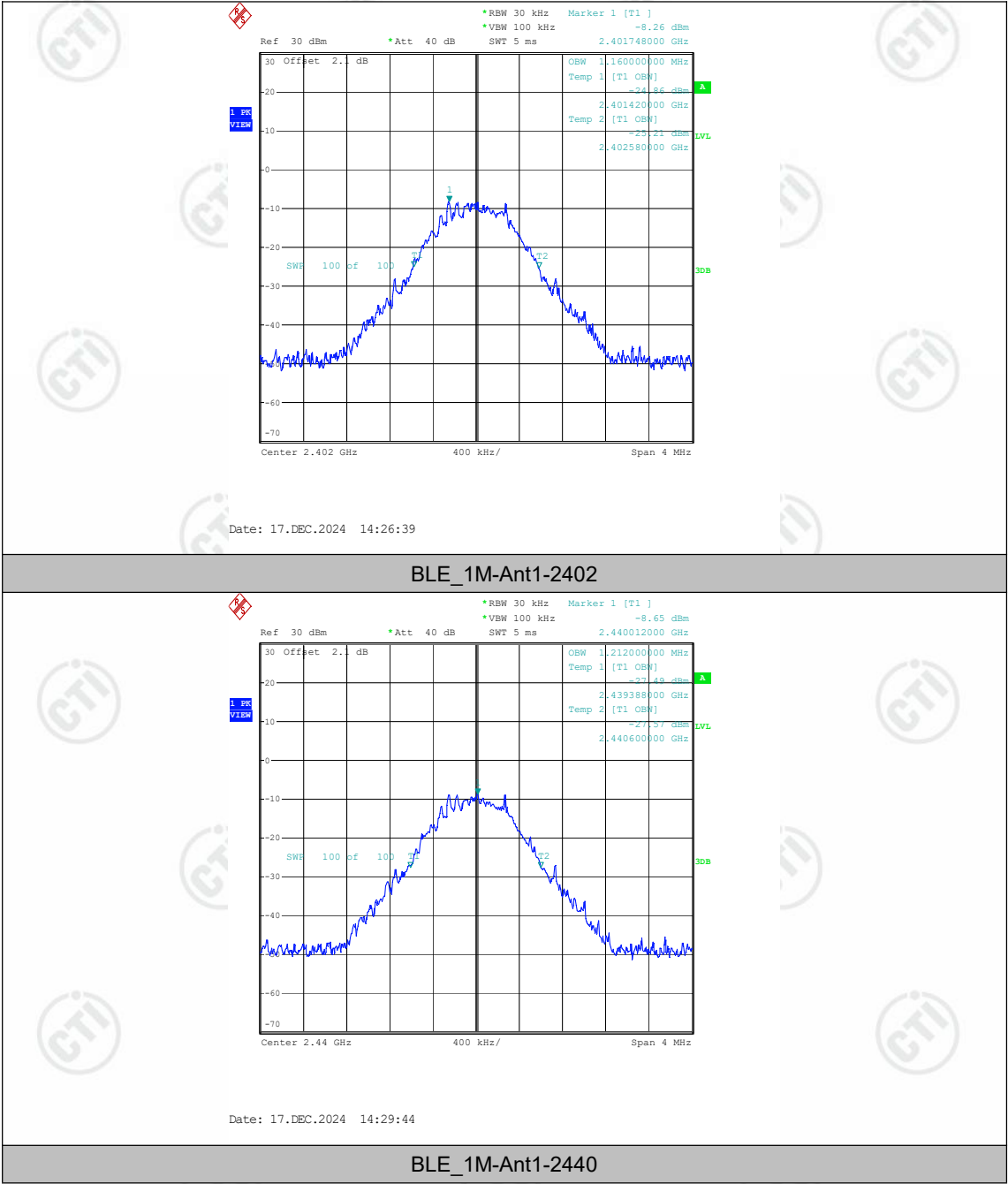


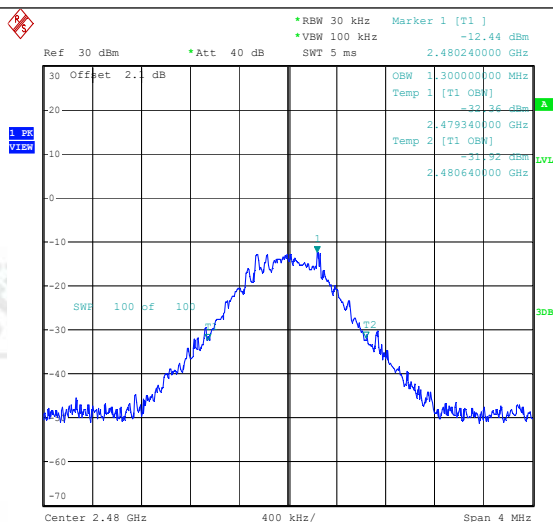
Appendix B: Occupied Channel Bandwidth

Test Result

| Test Mode | Antenna | Frequency[MHz] | OCB [MHz] | FL[MHz] | FH[MHz] | Limit[MHz] | Verdict |
|-----------|---------|----------------|-----------|---------|---------|------------|---------|
| BLE_1M    | Ant1    | 2402           | 1.160     | 2401.42 | 2402.58 | ---        | ---     |
| BLE_1M    | Ant1    | 2440           | 1.213     | 2439.39 | 2440.60 | ---        | ---     |
| BLE_1M    | Ant1    | 2480           | 1.300     | 2479.34 | 2480.64 | ---        | ---     |
| BLE_2M    | Ant1    | 2402           | 2.116     | 2400.95 | 2403.07 | ---        | ---     |
| BLE_2M    | Ant1    | 2440           | 2.116     | 2438.96 | 2441.07 | ---        | ---     |
| BLE_2M    | Ant1    | 2480           | 2.128     | 2478.95 | 2481.08 | ---        | ---     |

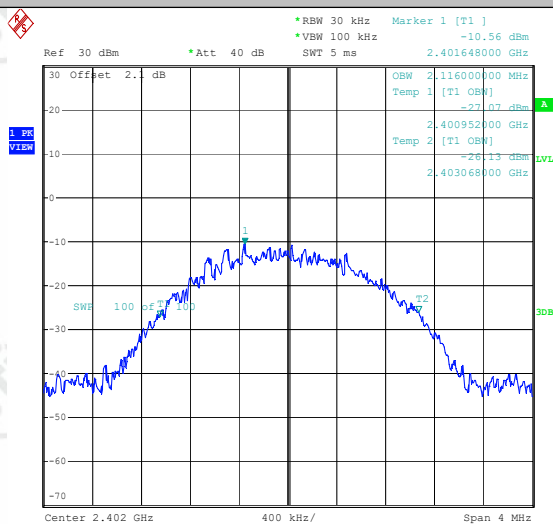
Test Graphs





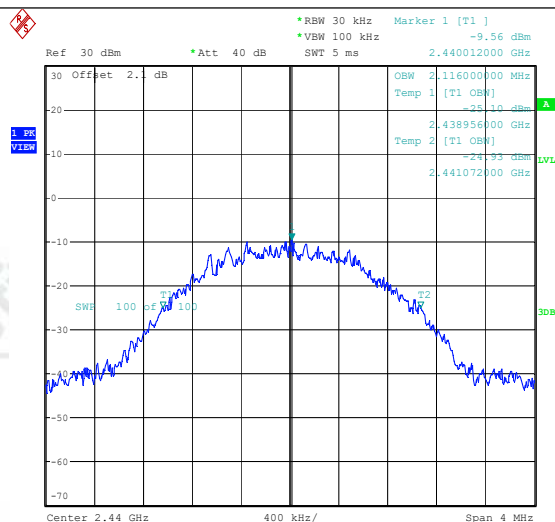
Date: 17.DEC.2024 14:32:43

## BLE\_1M-Ant1-2480



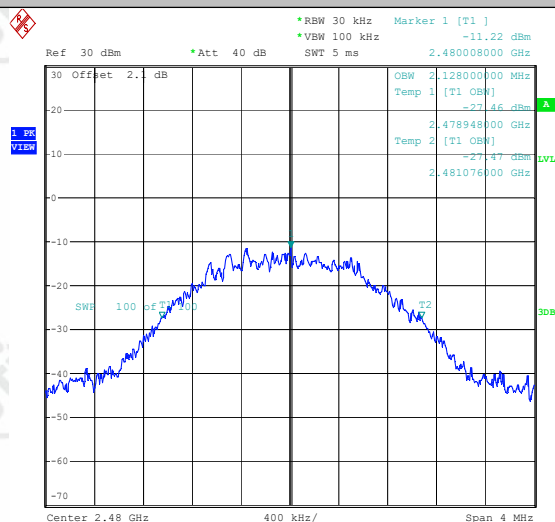
Date: 17.DEC.2024 14:35:52

## BLE\_2M-Ant1-2402



Date: 17.DEC.2024 14:39:22

## BLE\_2M-Ant1-2440



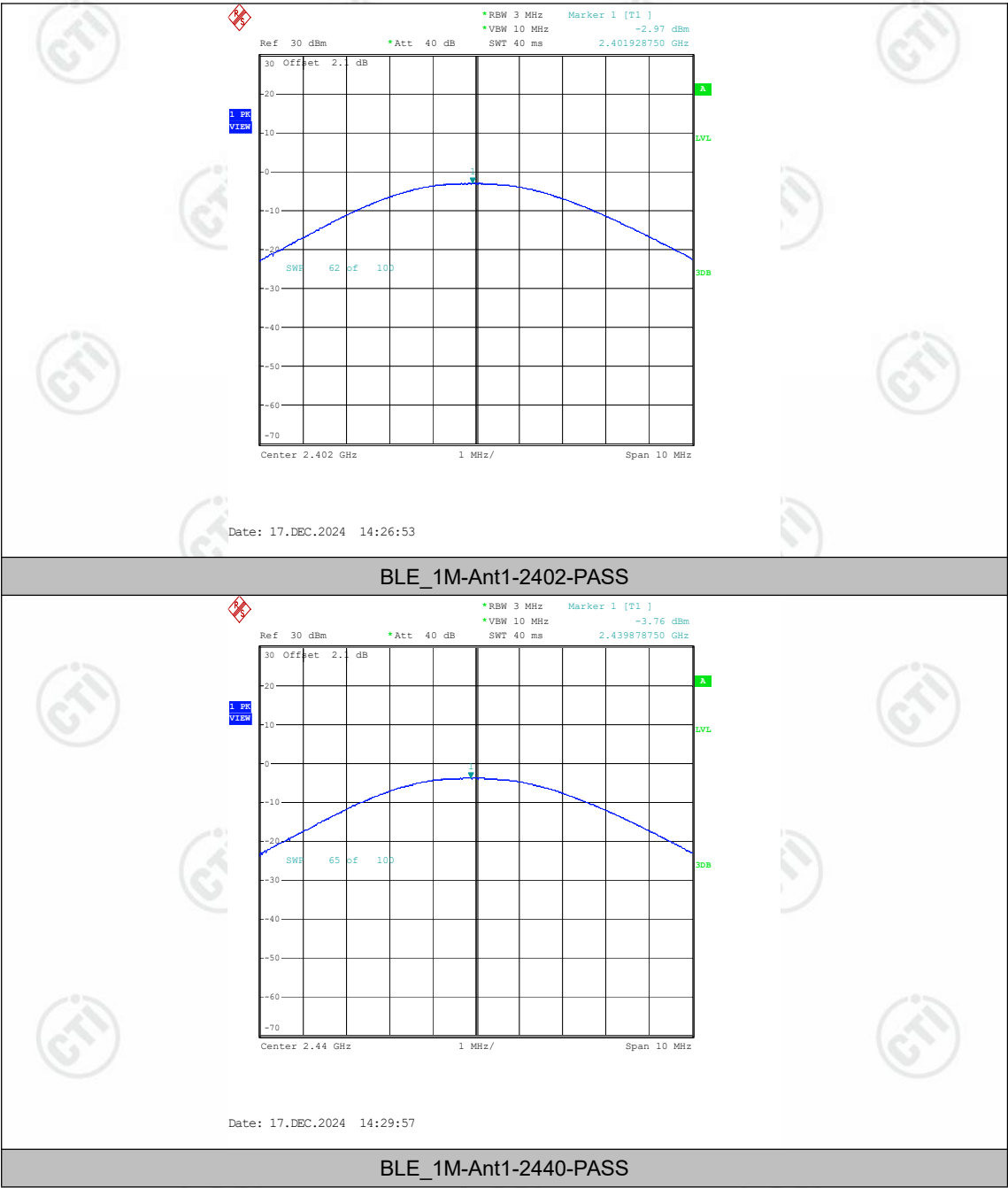
Date: 17.DEC.2024 14:43:14

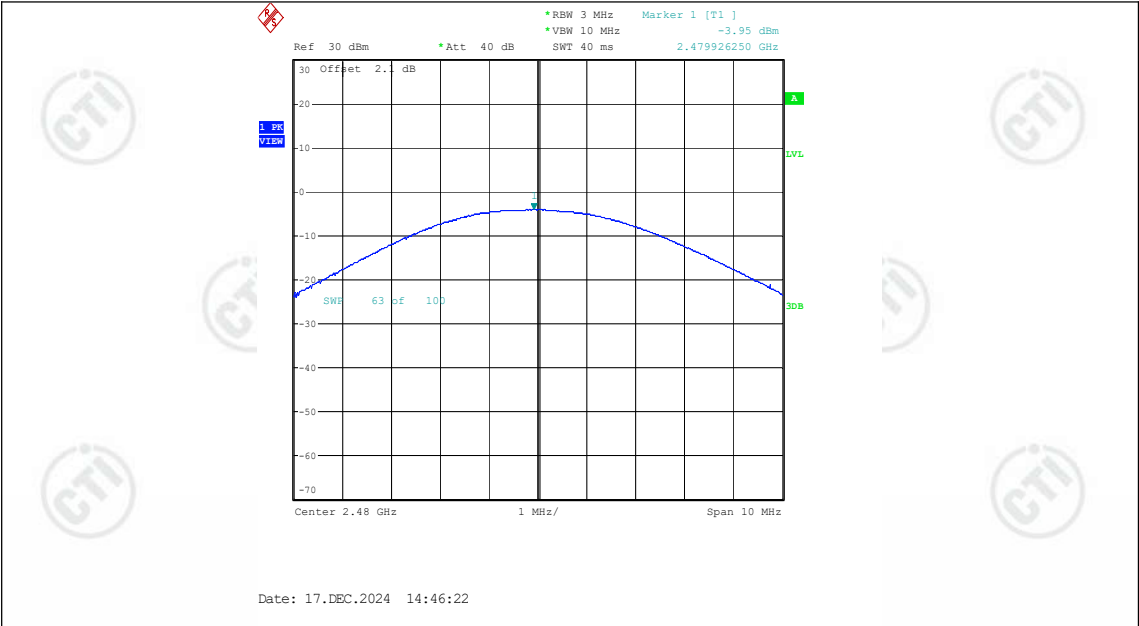
## BLE\_2M-Ant1-2480

**Appendix C: Maximum conducted output power****Test Result Peak**

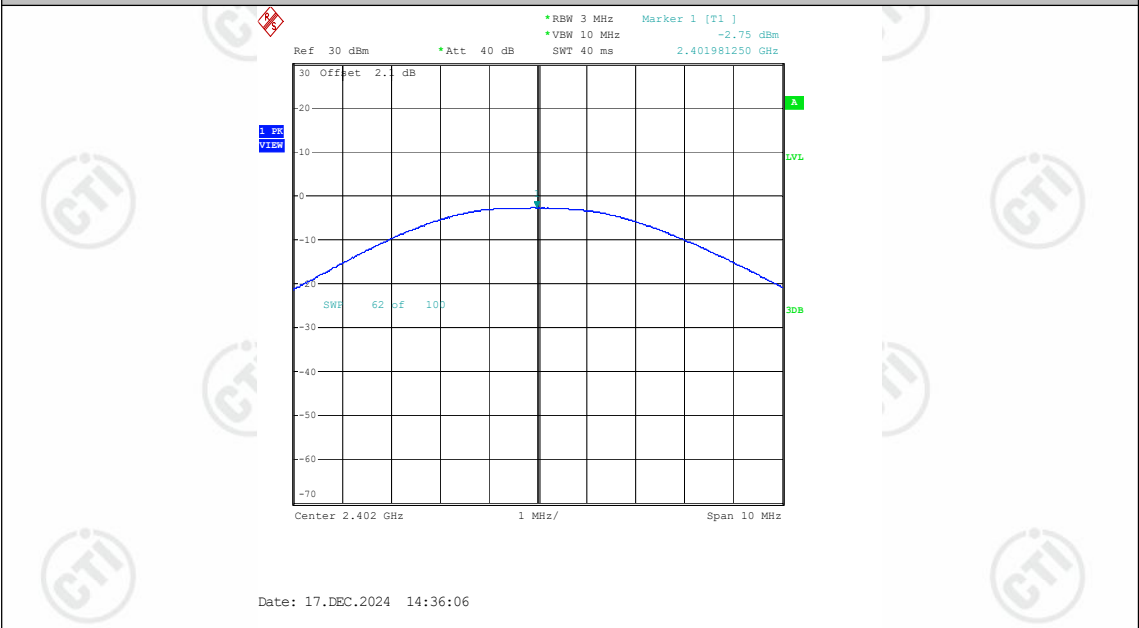
| TestMode | Antenna | Frequency[MHz] | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|----------------|---------------------------|----------------------|---------|
| BLE_1M   | Ant1    | 2402           | -2.97                     | ≤30                  | PASS    |
| BLE_1M   | Ant1    | 2440           | -3.76                     | ≤30                  | PASS    |
| BLE_1M   | Ant1    | 2480           | -3.95                     | ≤30                  | PASS    |
| BLE_2M   | Ant1    | 2402           | -2.75                     | ≤30                  | PASS    |
| BLE_2M   | Ant1    | 2440           | <b>-2.17</b>              | ≤30                  | PASS    |
| BLE_2M   | Ant1    | 2480           | -3.94                     | ≤30                  | PASS    |

Test Graphs Peak





BLE\_1M-Ant1-2480-PASS



BLE\_2M-Ant1-2402-PASS



Ref 30 dBm \* Att 40 dB \* RBW 3 MHz Marker 1 [T1] -3.94 dBm  
 \* VBW 10 MHz  
 SWT 40 ms 2.479983750 GHz

30 Offset 2.1 dB

1. SP  
 VIDM

SWR 64  $\sigma$ f 100

Center 2.48 GHz 1 MHz/ Span 10 MHz

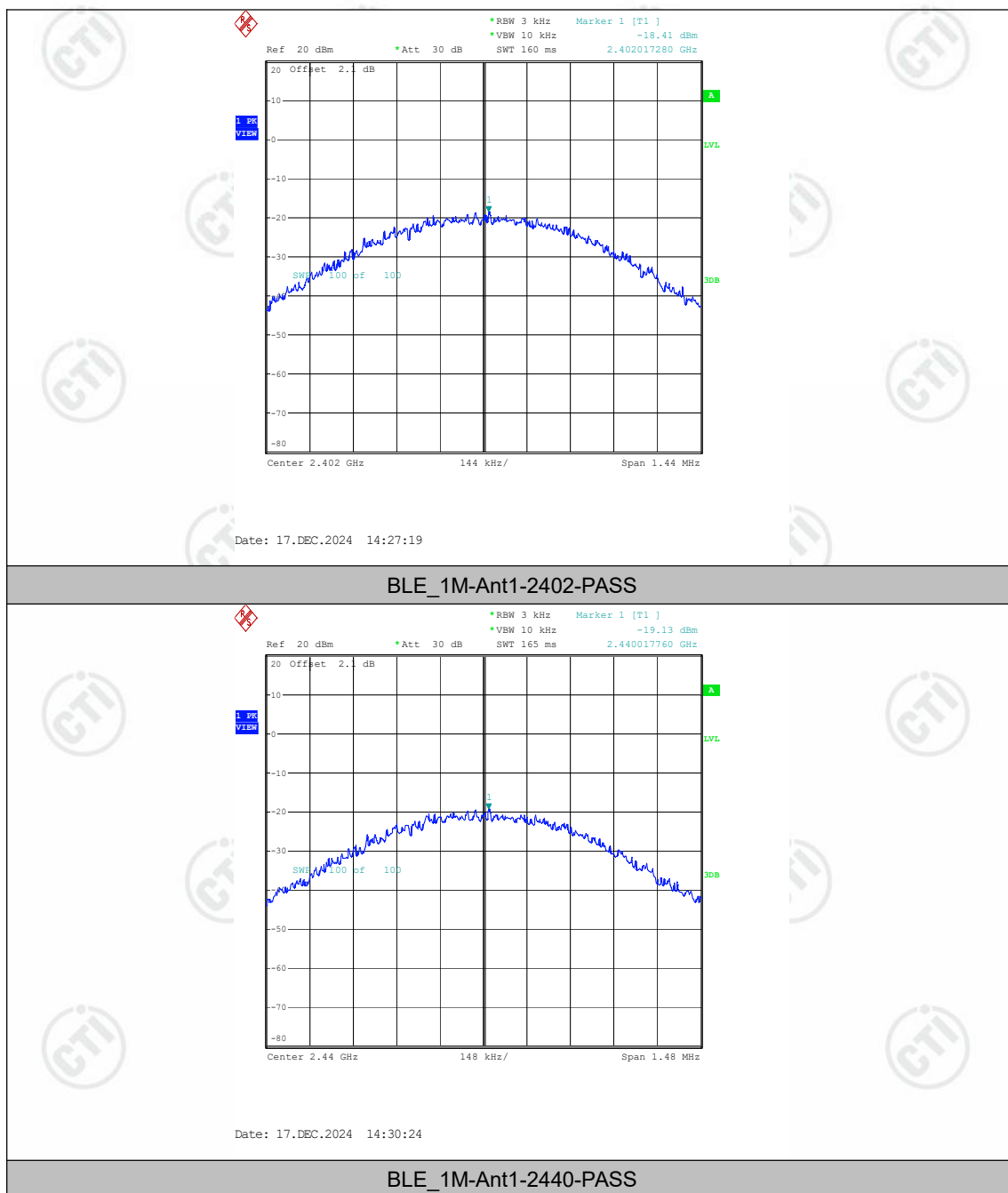
Date: 17.DEC.2024 14:43:28

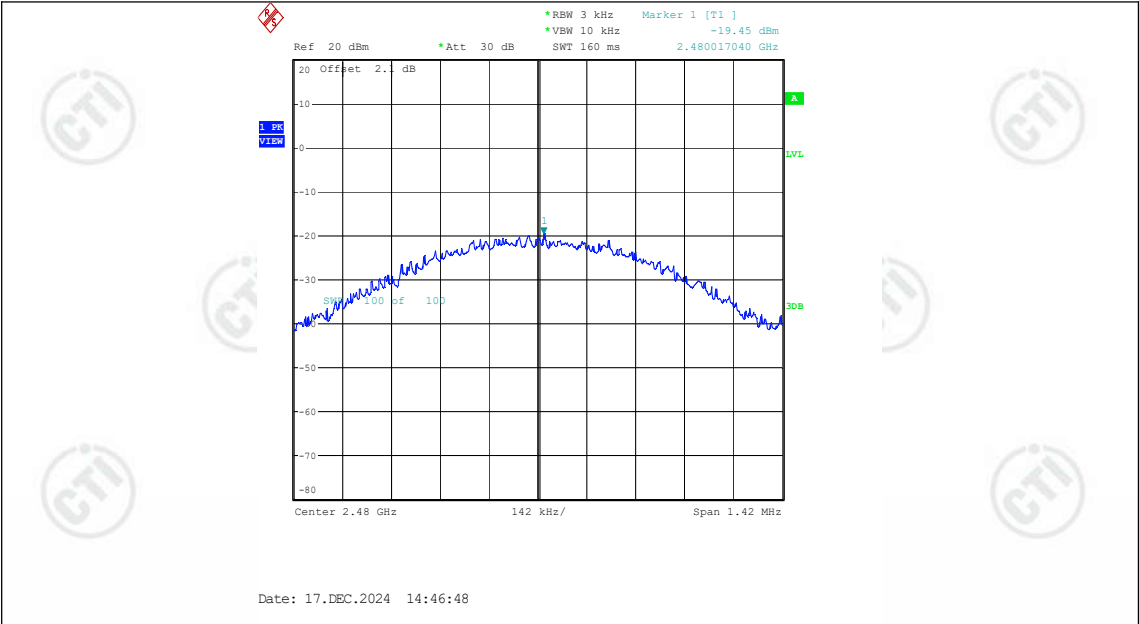
Appendix D: Maximum power spectral density

Test Result

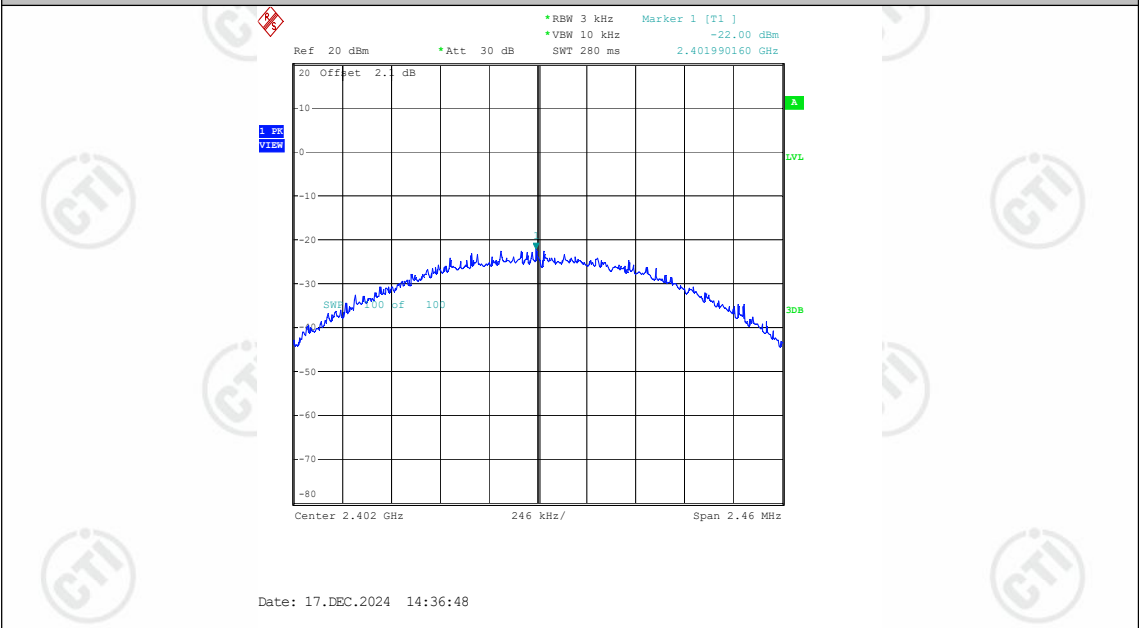
| TestMode | Antenna | Frequency[MHz] | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|----------------|------------------|-----------------|---------|
| BLE_1M   | Ant1    | 2402           | -18.41           | ≤8.00           | PASS    |
| BLE_1M   | Ant1    | 2440           | -19.13           | ≤8.00           | PASS    |
| BLE_1M   | Ant1    | 2480           | -19.45           | ≤8.00           | PASS    |
| BLE_2M   | Ant1    | 2402           | -22.00           | ≤8.00           | PASS    |
| BLE_2M   | Ant1    | 2440           | -21.18           | ≤8.00           | PASS    |
| BLE_2M   | Ant1    | 2480           | -22.92           | ≤8.00           | PASS    |

## Test Graphs

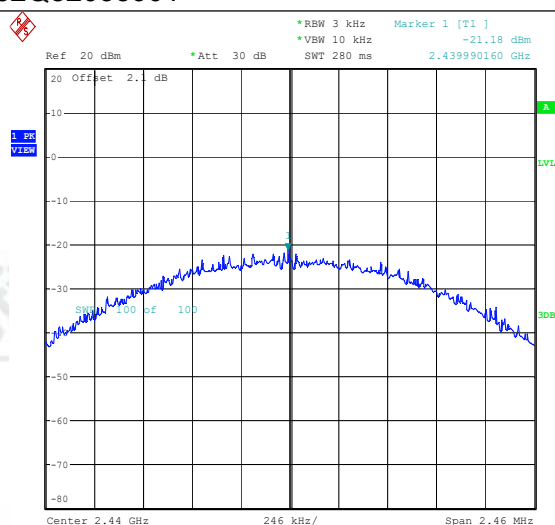




BLE\_1M-Ant1-2480-PASS

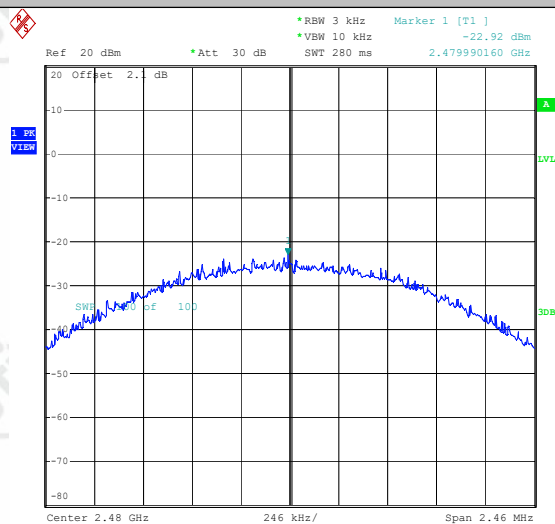


BLE\_2M-Ant1-2402-PASS



Date: 17.DEC.2024 14:40:17

## BLE 2M-Ant1-2440-PASS



Date: 17.DEC.2024 14:44:10

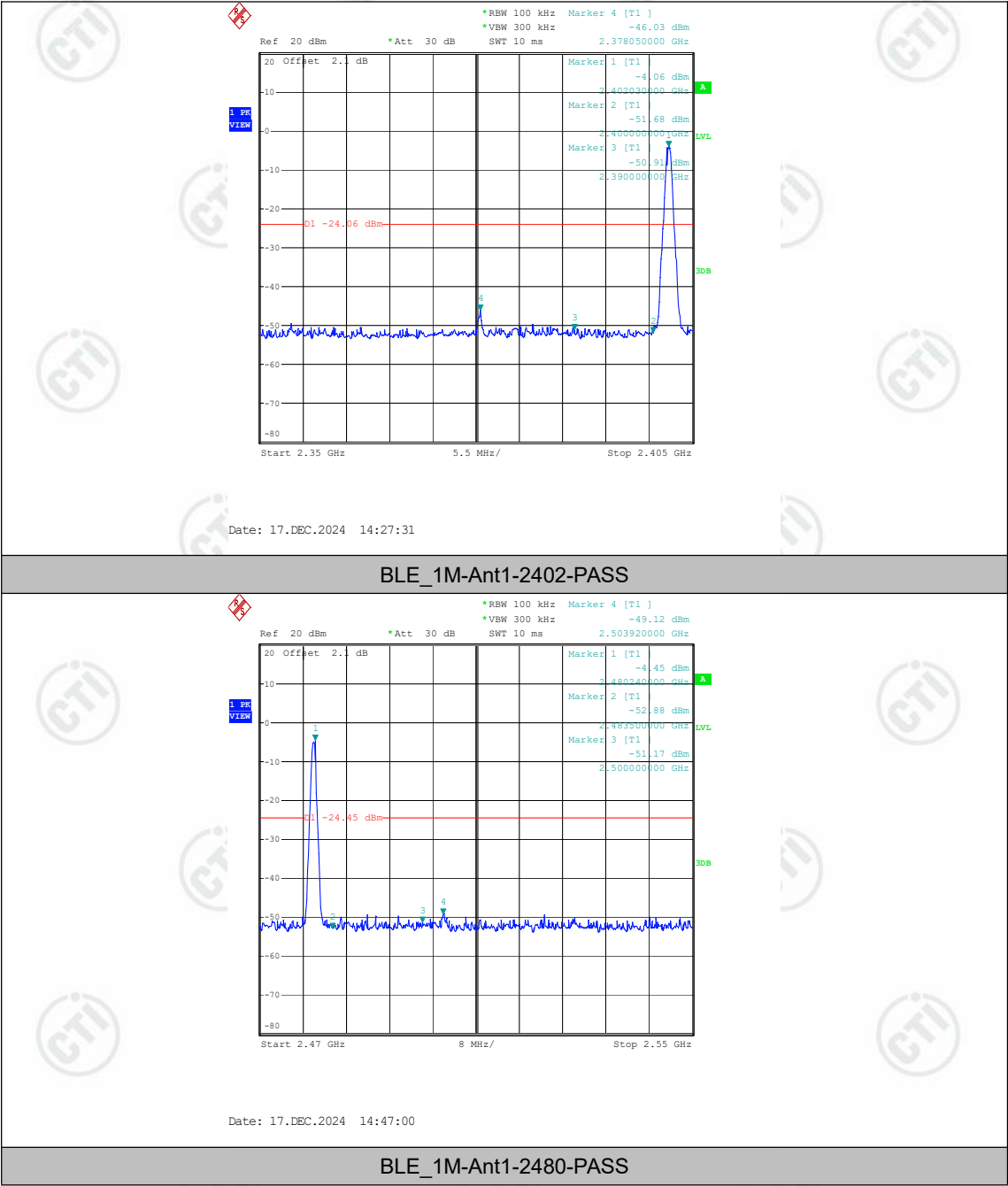
## BLE\_2M-Ant1-2480-PASS

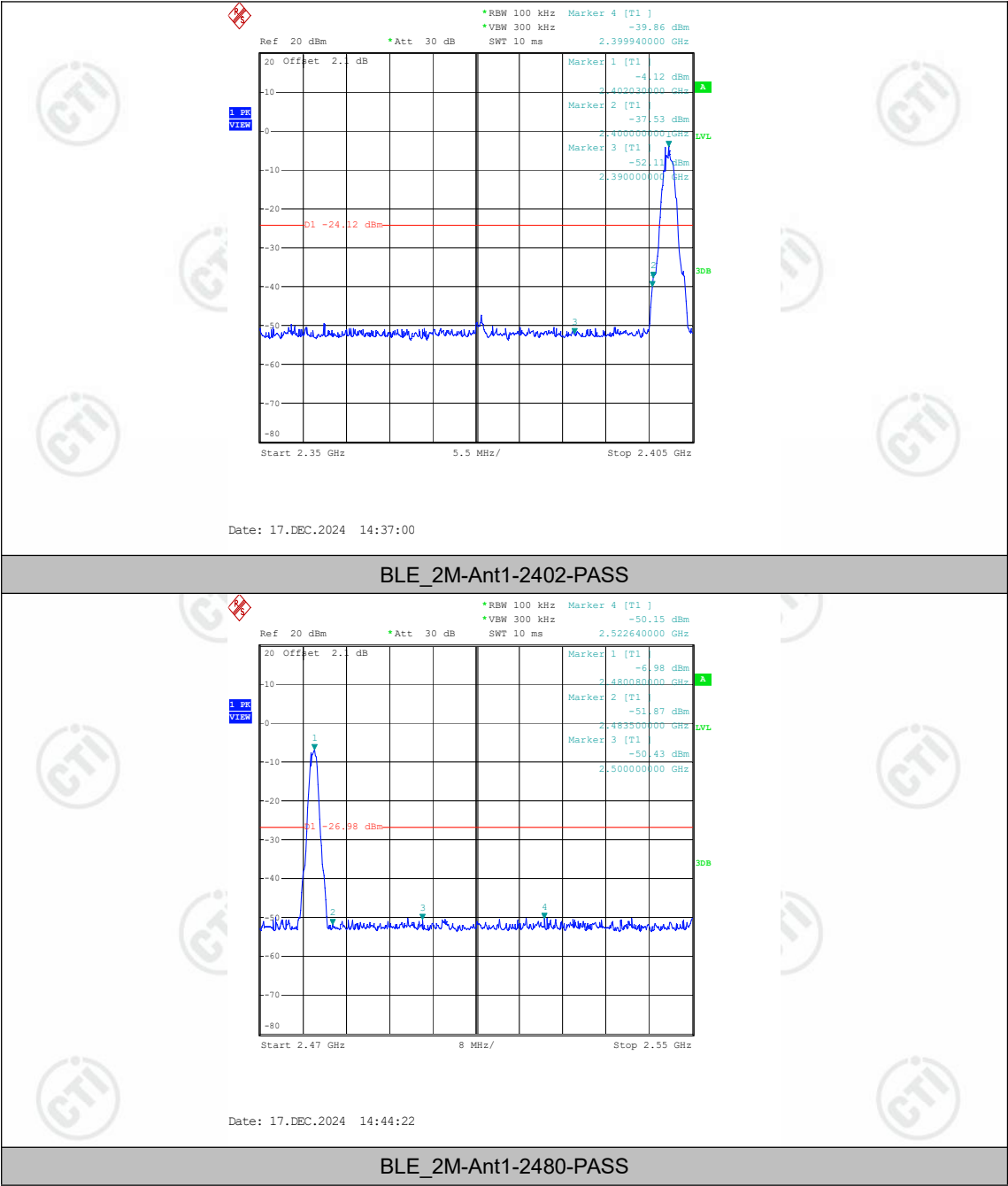
Appendix E: Band edge measurements

Test Result

| TestMode | Antenna | ChName | Frequency[MHz] | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|----------------|---------------|-------------|------------|---------|
| BLE_1M   | Ant1    | Low    | 2402           | -4.06         | -46.03      | ≤-24.06    | PASS    |
| BLE_1M   | Ant1    | High   | 2480           | -4.45         | -49.12      | ≤-24.45    | PASS    |
| BLE_2M   | Ant1    | Low    | 2402           | -4.12         | -39.86      | ≤-24.12    | PASS    |
| BLE_2M   | Ant1    | High   | 2480           | -6.98         | -50.15      | ≤-26.98    | PASS    |

Test Graphs



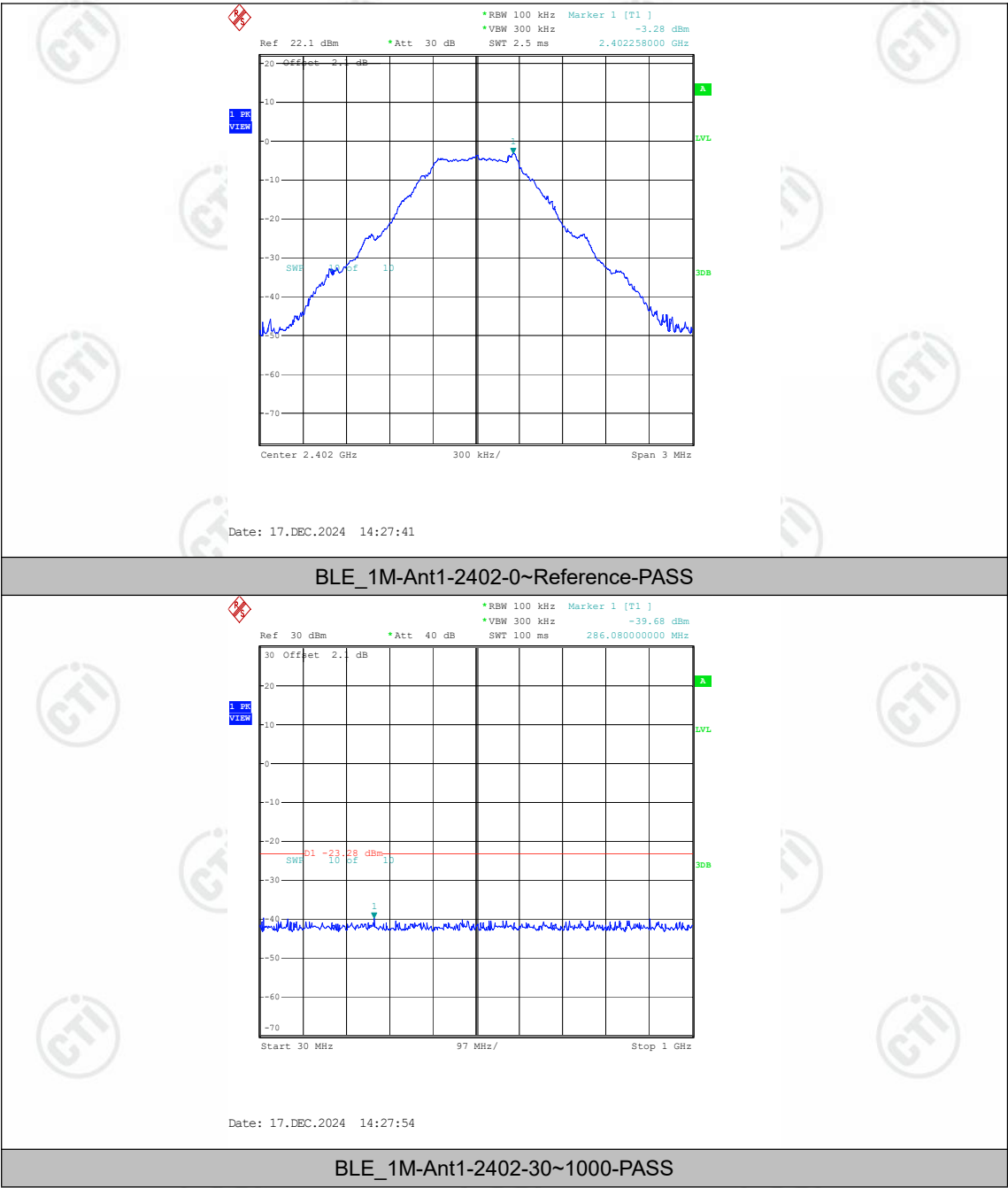


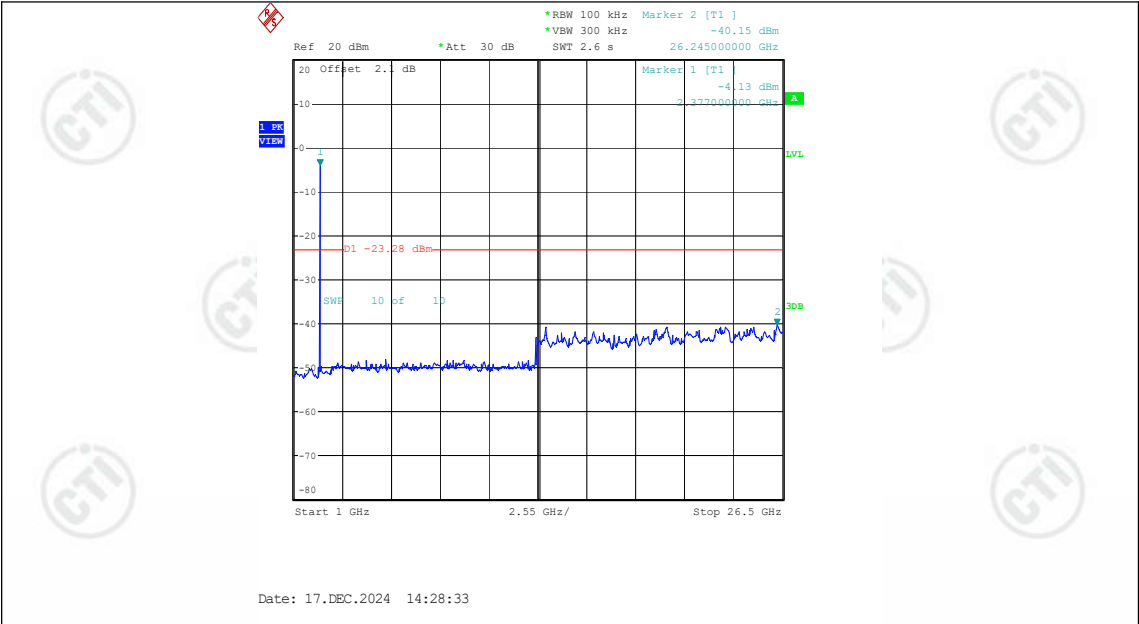
## Appendix F: Conducted Spurious Emission

### Test Result

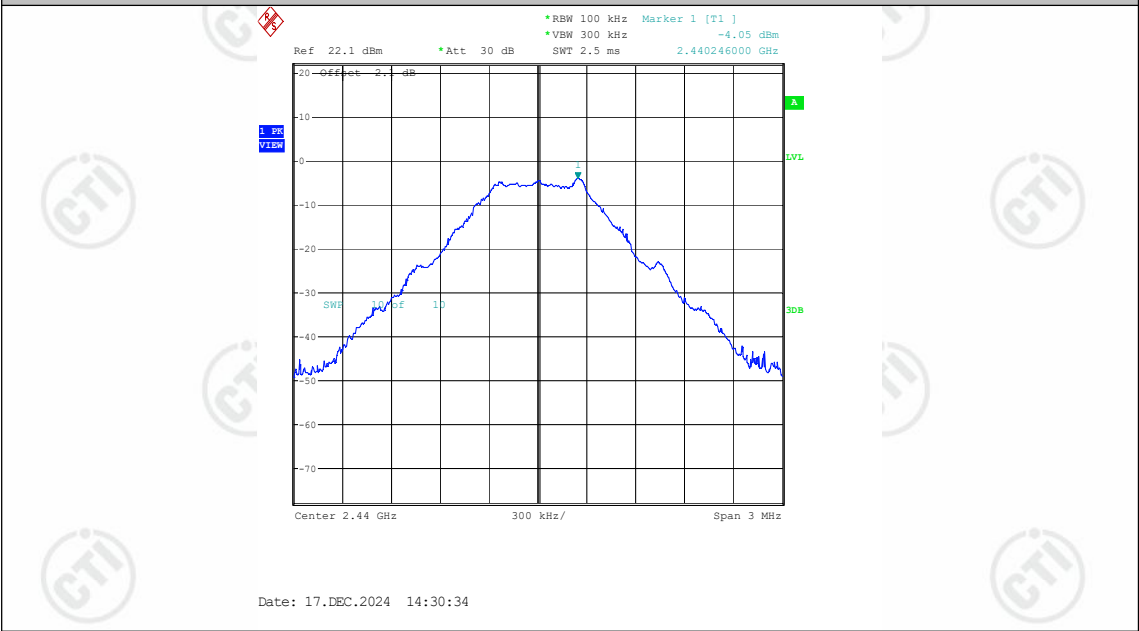
| TestMode | Antenna | Frequency<br>[MHz] | FreqRange<br>[MHz] | RefLevel<br>[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------------------|--------------------|-------------------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402               | 0~Reference        | -3.28             | -3.28       | ---        | PASS    |
| BLE_1M   | Ant1    | 2402               | 30~1000            | -3.28             | -39.68      | ≤-23.28    | PASS    |
| BLE_1M   | Ant1    | 2402               | 1000~26500         | -3.28             | -40.15      | ≤-23.28    | PASS    |
| BLE_1M   | Ant1    | 2440               | 0~Reference        | -4.05             | -4.05       | ---        | PASS    |
| BLE_1M   | Ant1    | 2440               | 30~1000            | -4.05             | -39.48      | ≤-24.05    | PASS    |
| BLE_1M   | Ant1    | 2440               | 1000~26500         | -4.05             | -39.7       | ≤-24.05    | PASS    |
| BLE_1M   | Ant1    | 2480               | 0~Reference        | -4.41             | -4.41       | ---        | PASS    |
| BLE_1M   | Ant1    | 2480               | 30~1000            | -4.41             | -39.65      | ≤-24.41    | PASS    |
| BLE_1M   | Ant1    | 2480               | 1000~26500         | -4.41             | -40.31      | ≤-24.41    | PASS    |
| BLE_2M   | Ant1    | 2402               | 0~Reference        | -3.73             | -3.73       | ---        | PASS    |
| BLE_2M   | Ant1    | 2402               | 30~1000            | -3.73             | -38.86      | ≤-23.73    | PASS    |
| BLE_2M   | Ant1    | 2402               | 1000~26500         | -3.73             | -39.39      | ≤-23.73    | PASS    |
| BLE_2M   | Ant1    | 2440               | 0~Reference        | -3.00             | -3.00       | ---        | PASS    |
| BLE_2M   | Ant1    | 2440               | 30~1000            | -3.00             | -39.39      | ≤-23       | PASS    |
| BLE_2M   | Ant1    | 2440               | 1000~26500         | -3.00             | -39.79      | ≤-23       | PASS    |
| BLE_2M   | Ant1    | 2480               | 0~Reference        | -4.84             | -4.84       | ---        | PASS    |
| BLE_2M   | Ant1    | 2480               | 30~1000            | -4.84             | -39.59      | ≤-24.84    | PASS    |
| BLE_2M   | Ant1    | 2480               | 1000~26500         | -4.84             | -40.02      | ≤-24.84    | PASS    |

Test Graphs

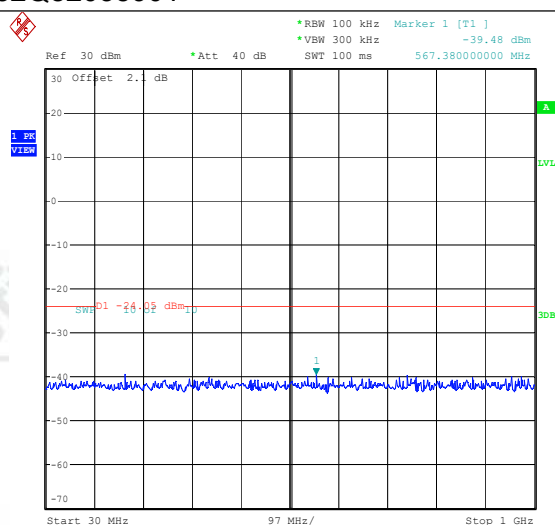




BLE\_1M-Ant1-2402-1000~26500-PASS

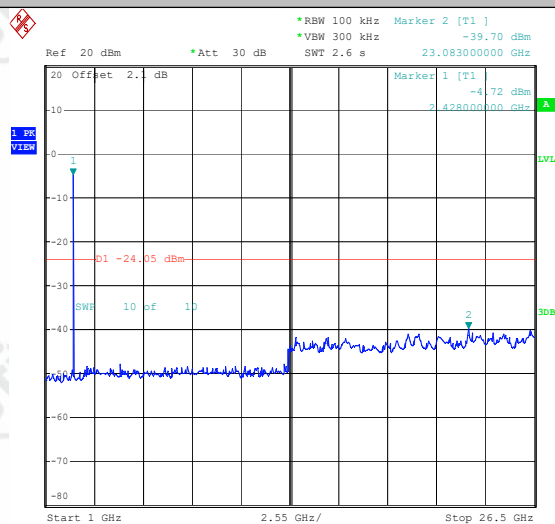


BLE\_1M-Ant1-2440-0~Reference-PASS



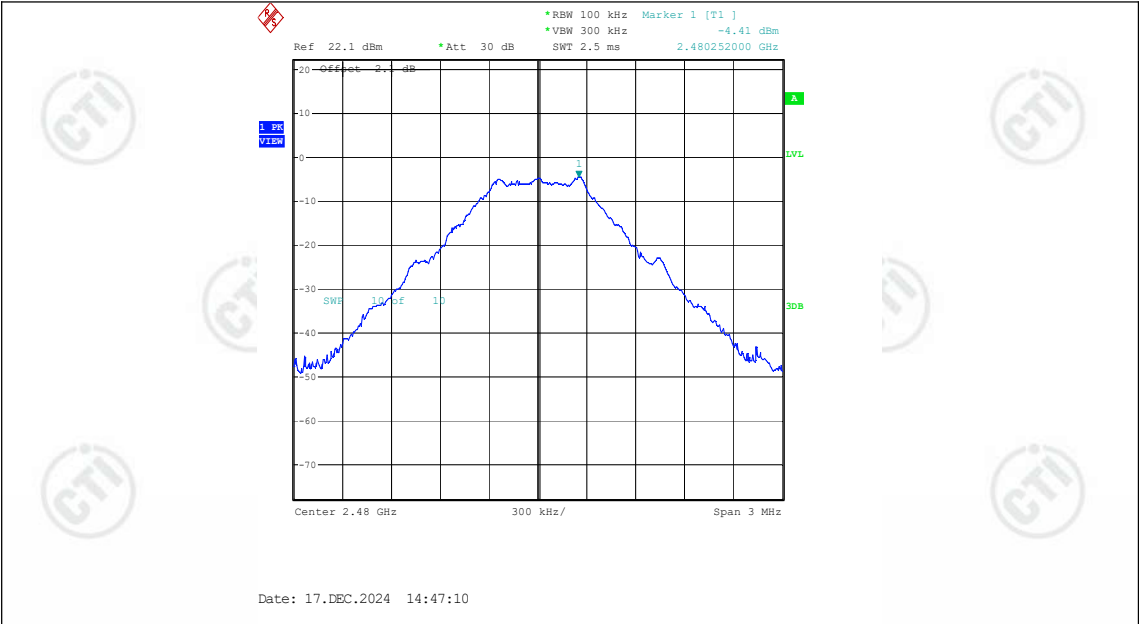
Date: 17.DEC.2024 14:30:47

## BLE\_1M-Ant1-2440-30~1000-PASS

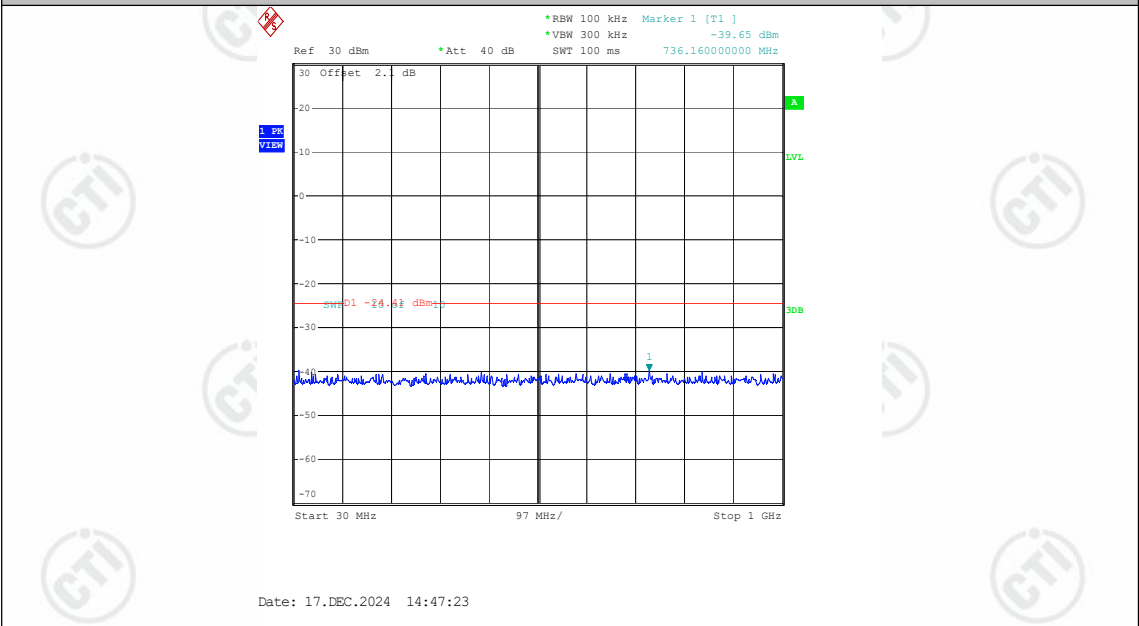


Date: 17.DEC.2024 14:31:26

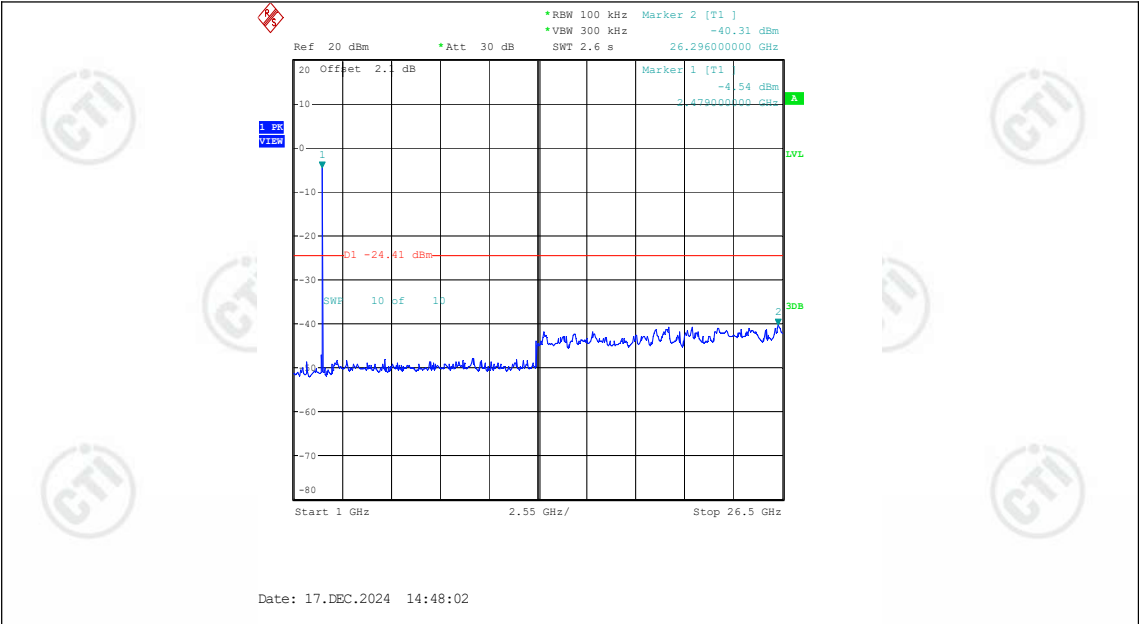
## BLE\_1M-Ant1-2440-1000~26500-PASS



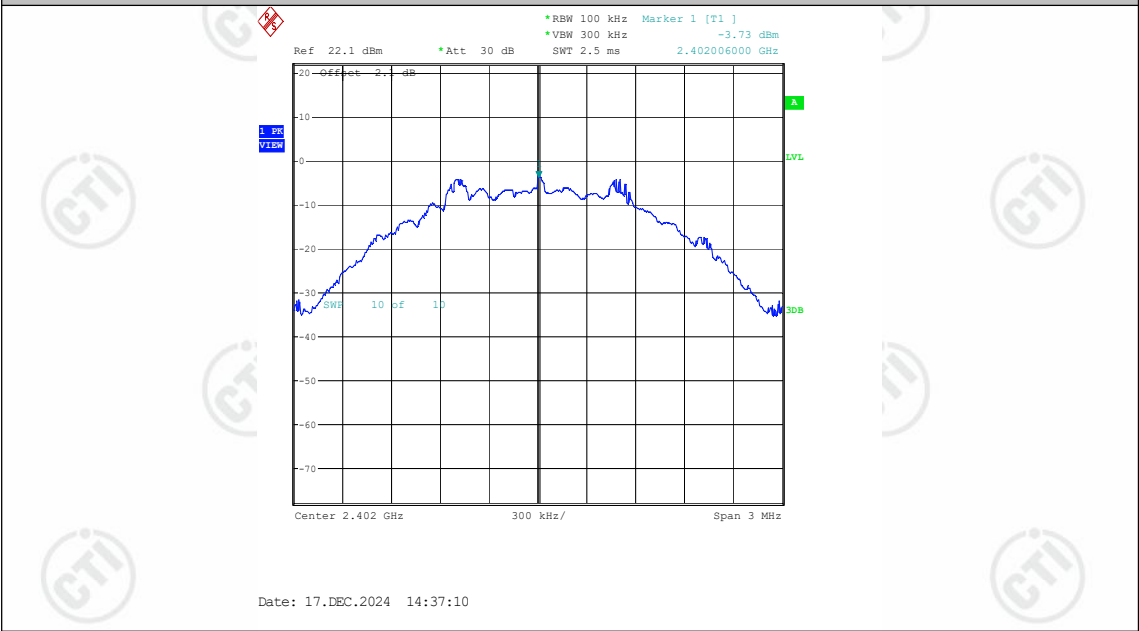
BLE\_1M-Ant1-2480-0~Reference-PASS



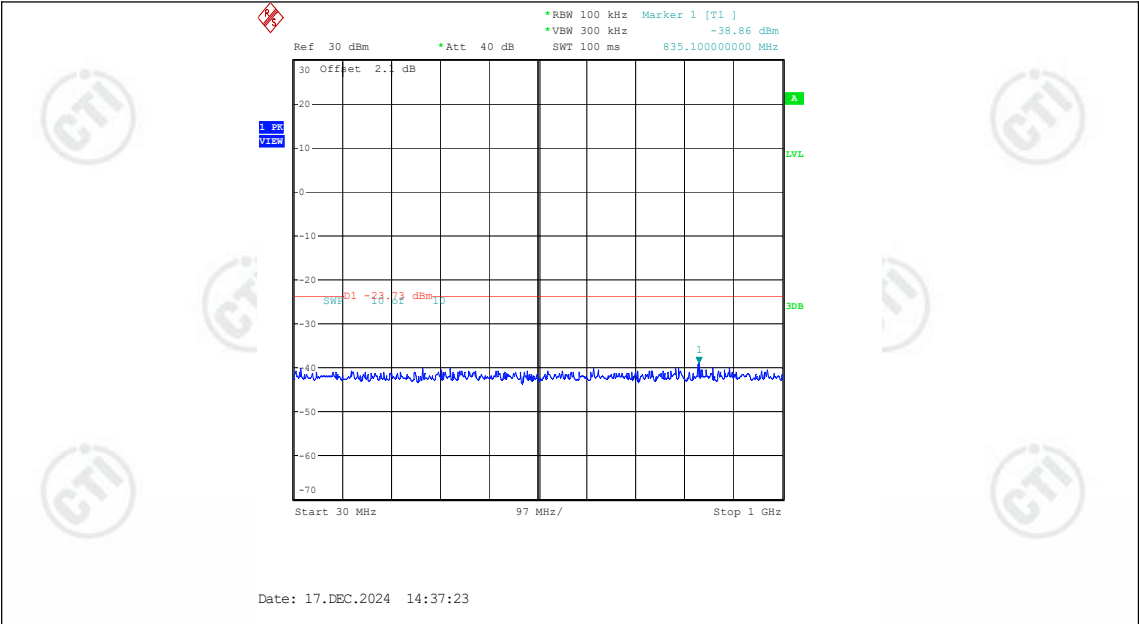
BLE\_1M-Ant1-2480-30~1000-PASS



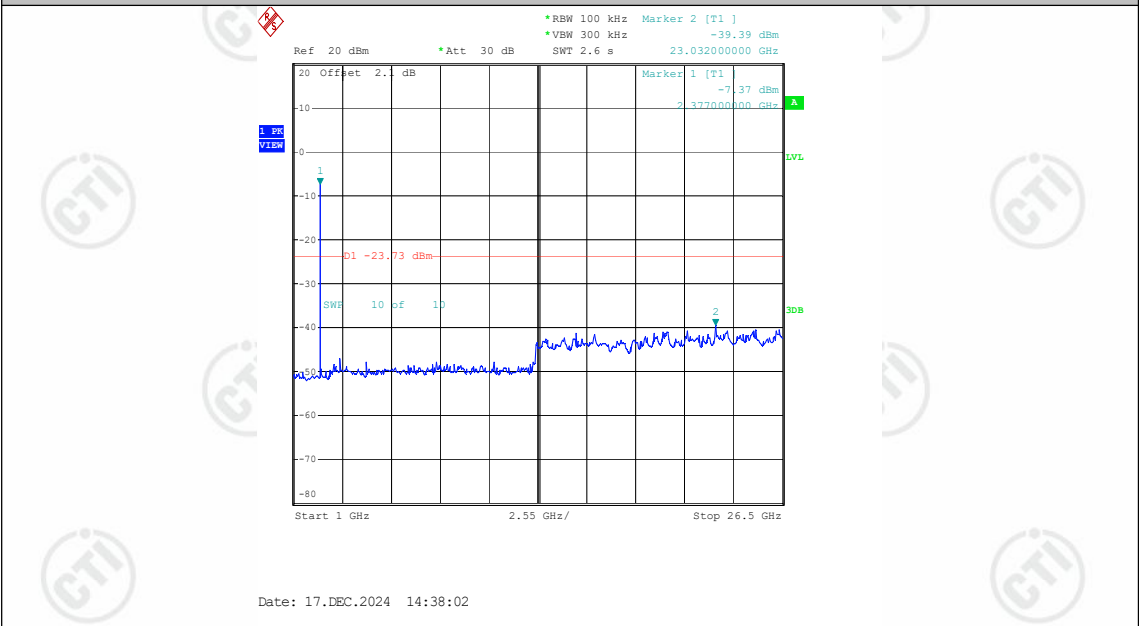
BLE\_1M-Ant1-2480-1000~26500-PASS



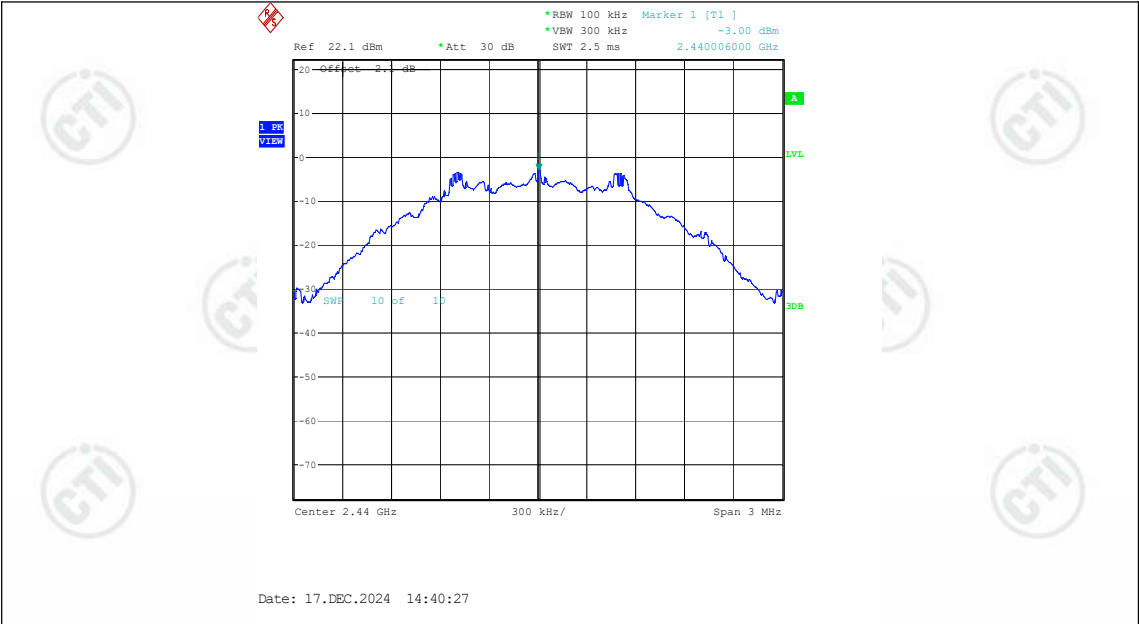
BLE\_2M-Ant1-2402-0~Reference-PASS



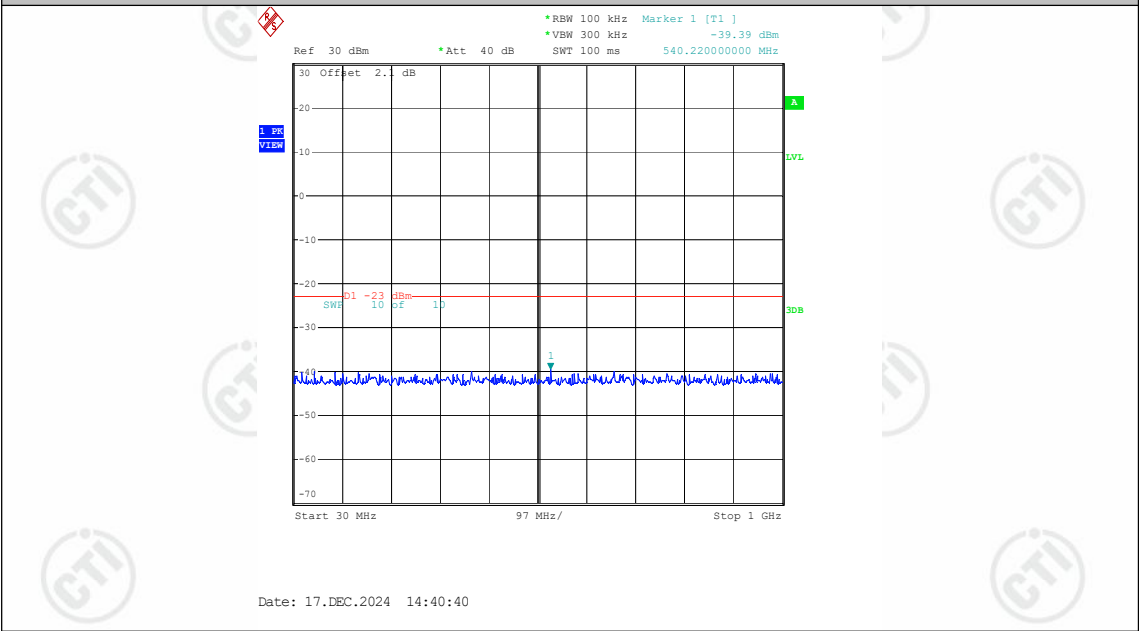
BLE\_2M-Ant1-2402-30~1000-PASS



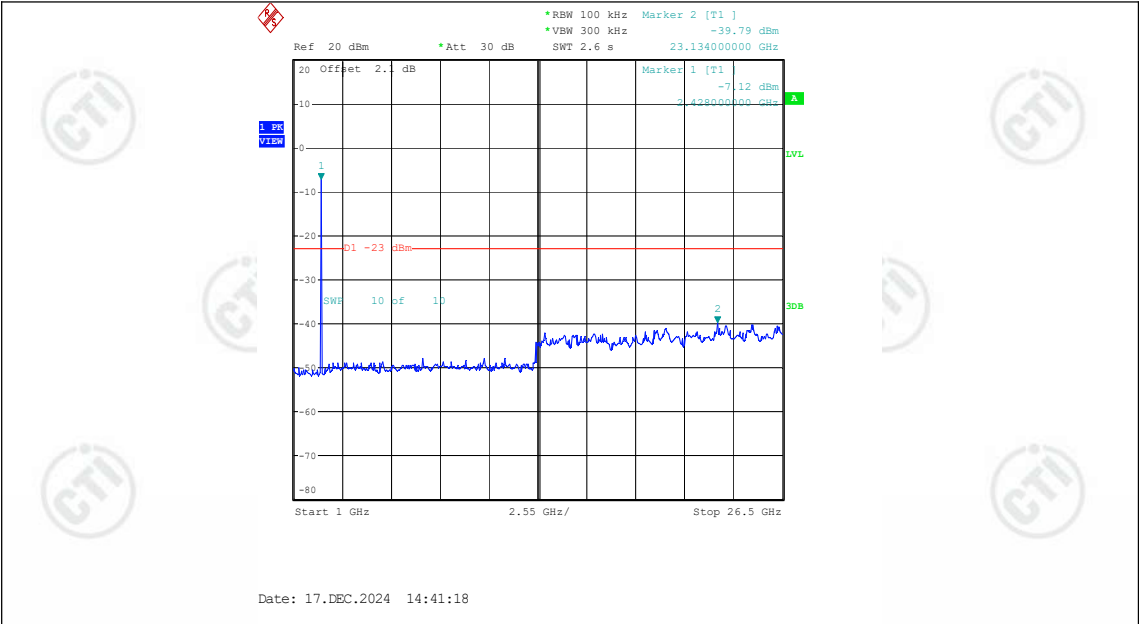
BLE\_2M-Ant1-2402-1000~26500-PASS



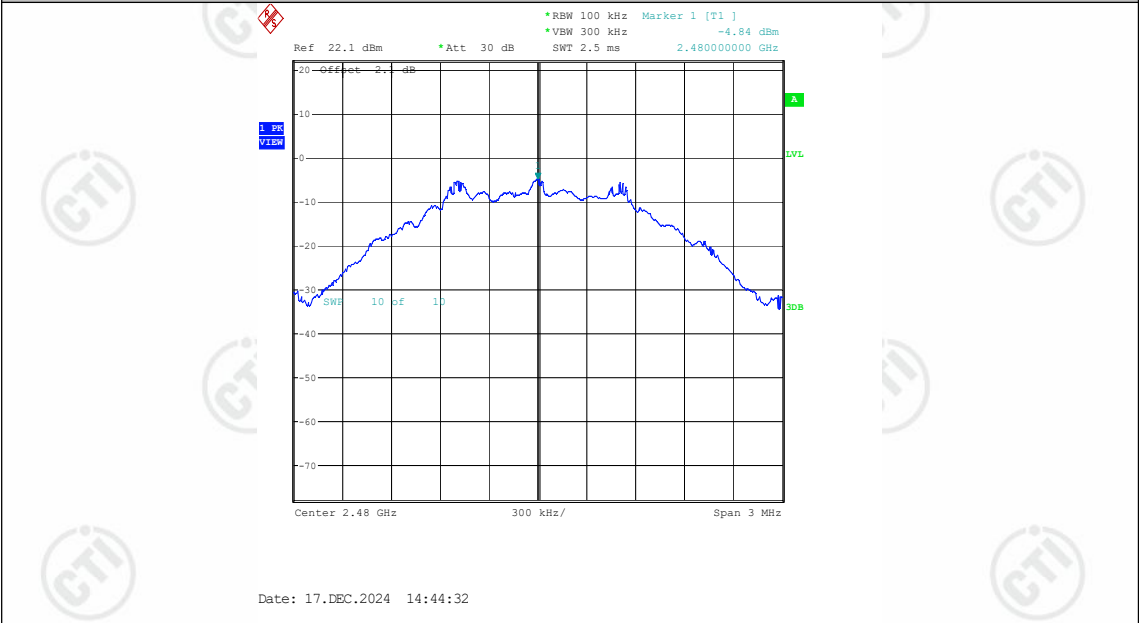
BLE\_2M-Ant1-2440-0~Reference-PASS



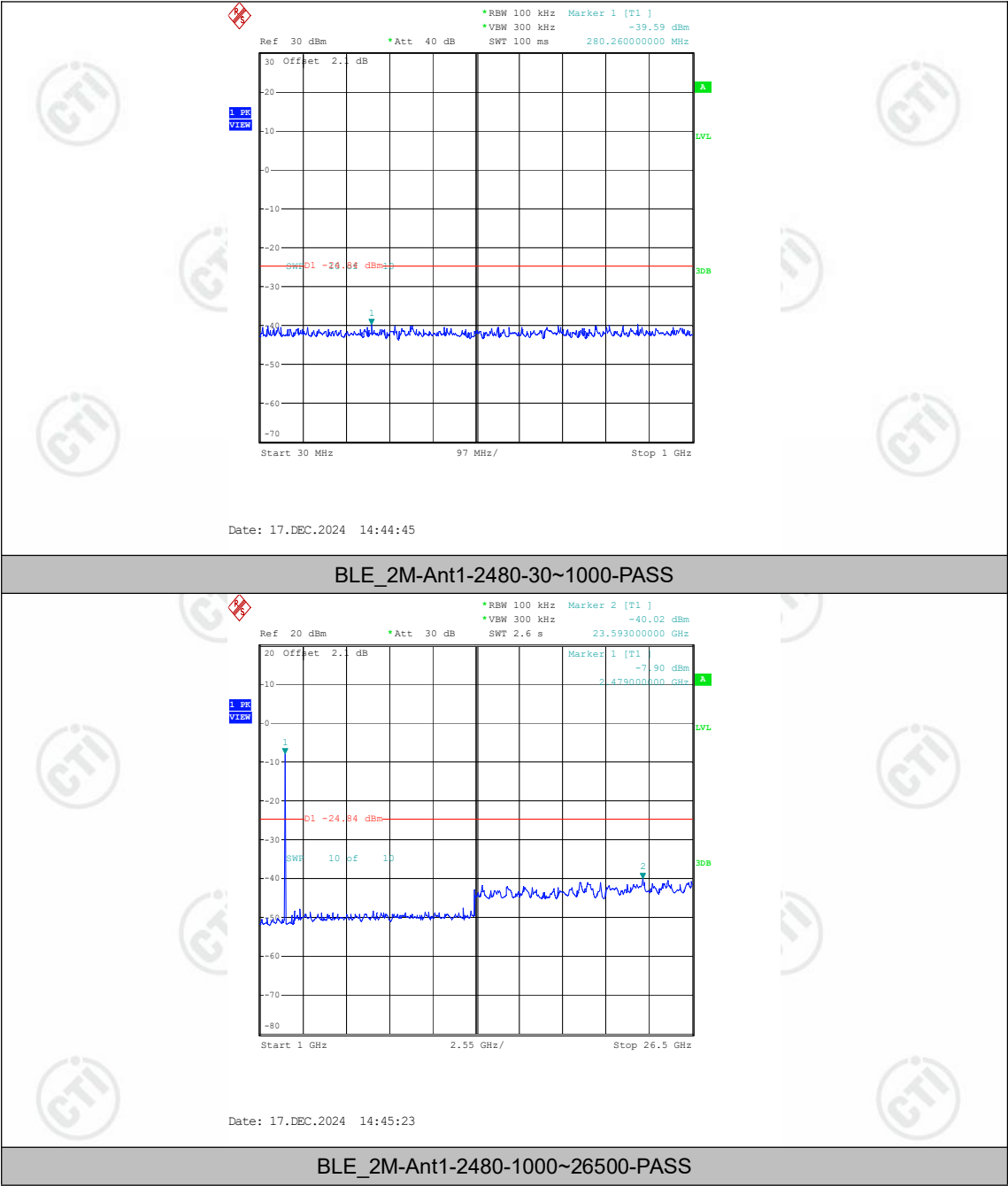
BLE\_2M-Ant1-2440-30~1000-PASS



BLE\_2M-Ant1-2440-1000~26500-PASS



BLE\_2M-Ant1-2480-0~Reference-PASS

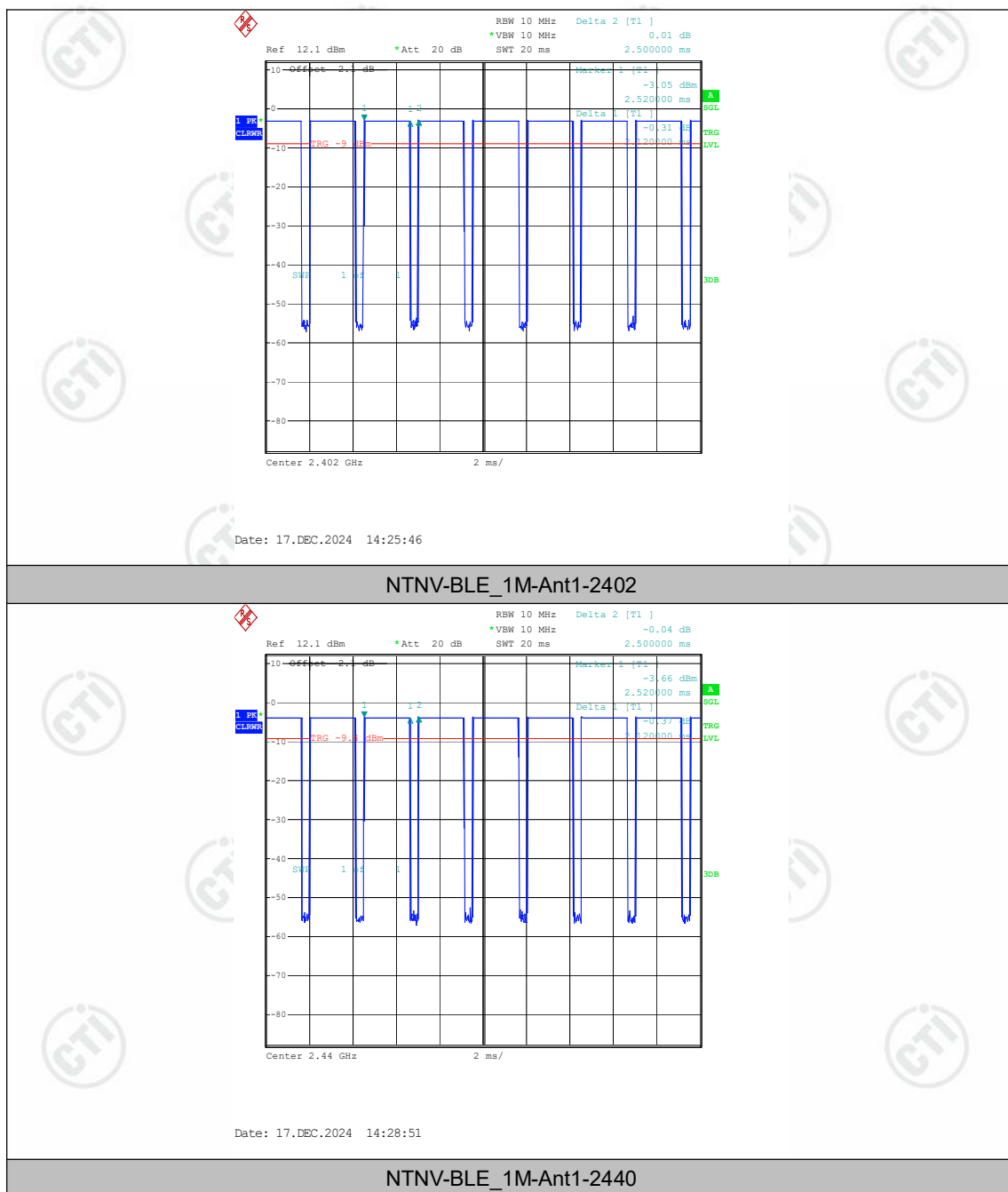


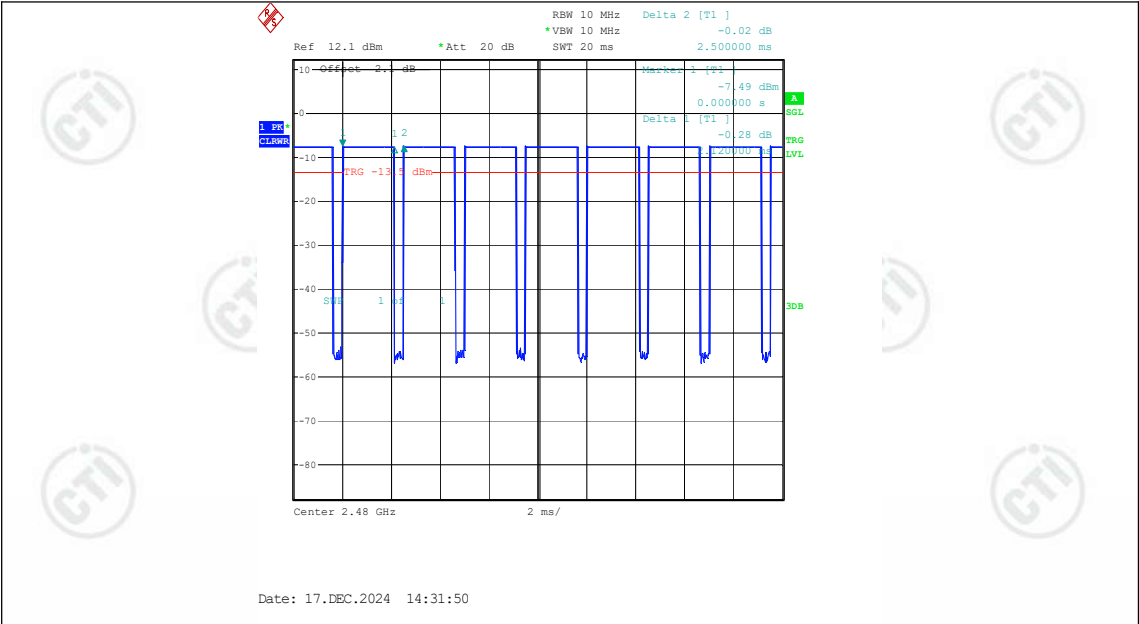
Appendix G: Duty Cycle

Test Result

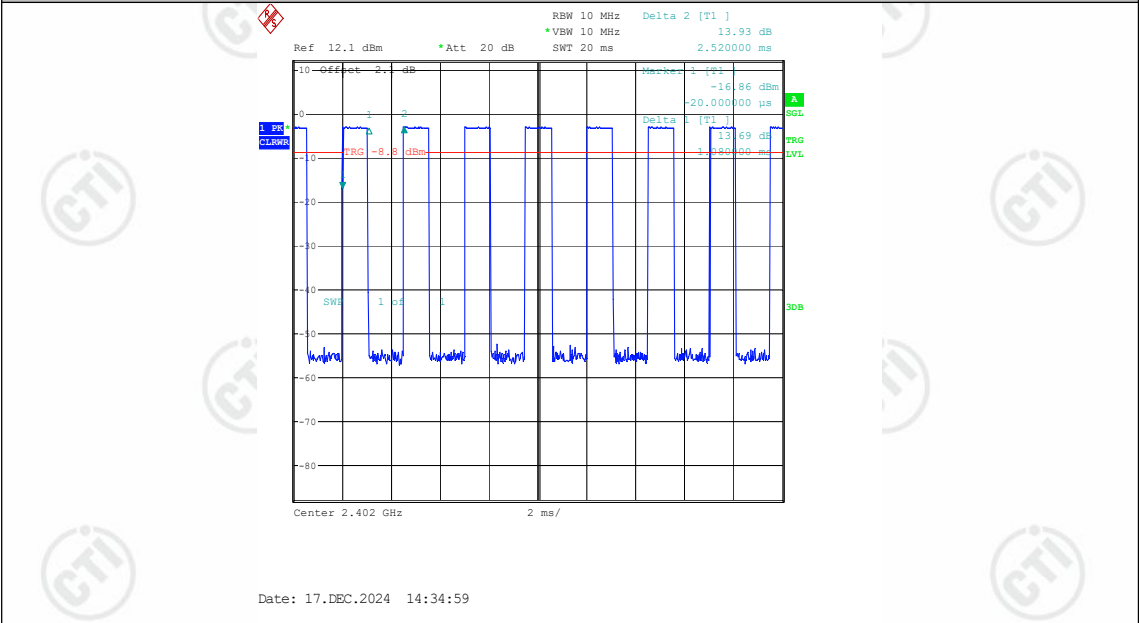
| TestMode | Antenna | Frequency[MHz] | ON Time [ms] | Period [ms] | Duty Cycle [%] | Duty Cycle Factor[dB] |
|----------|---------|----------------|--------------|-------------|----------------|-----------------------|
| BLE_1M   | Ant1    | 2402           | 2.12         | 2.50        | 84.80          | 0.72                  |
| BLE_1M   | Ant1    | 2440           | 2.12         | 2.50        | 84.80          | 0.72                  |
| BLE_1M   | Ant1    | 2480           | 2.12         | 2.50        | 84.80          | 0.72                  |
| BLE_2M   | Ant1    | 2402           | 1.08         | 2.52        | 42.86          | 3.68                  |
| BLE_2M   | Ant1    | 2440           | 1.08         | 2.52        | 42.86          | 3.68                  |
| BLE_2M   | Ant1    | 2480           | 1.08         | 2.52        | 42.86          | 3.68                  |

## Test Graphs

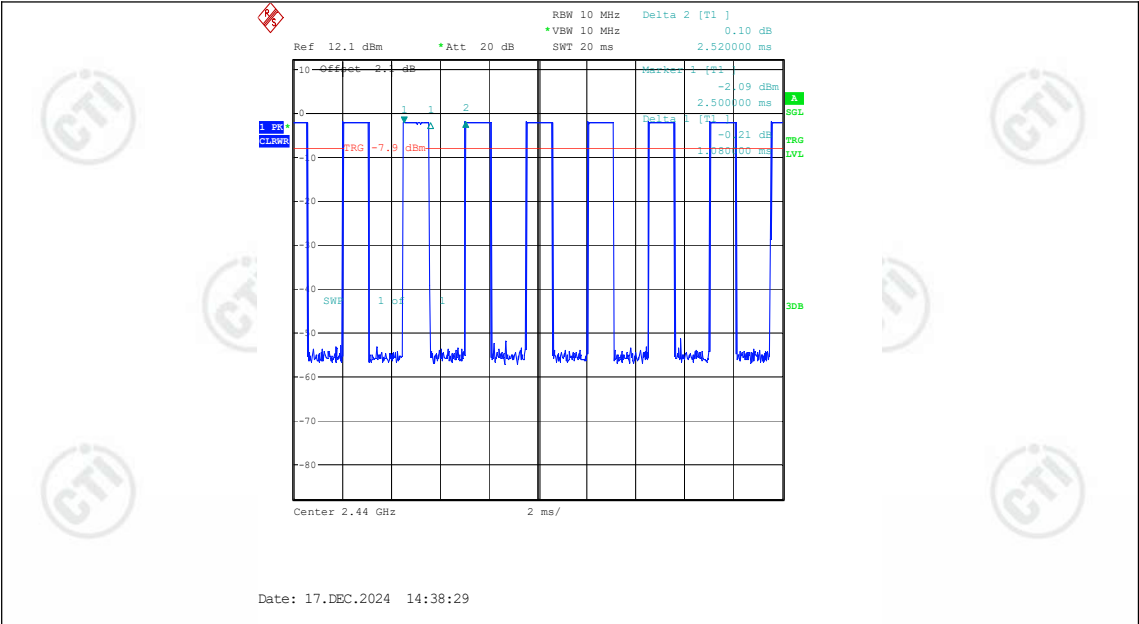




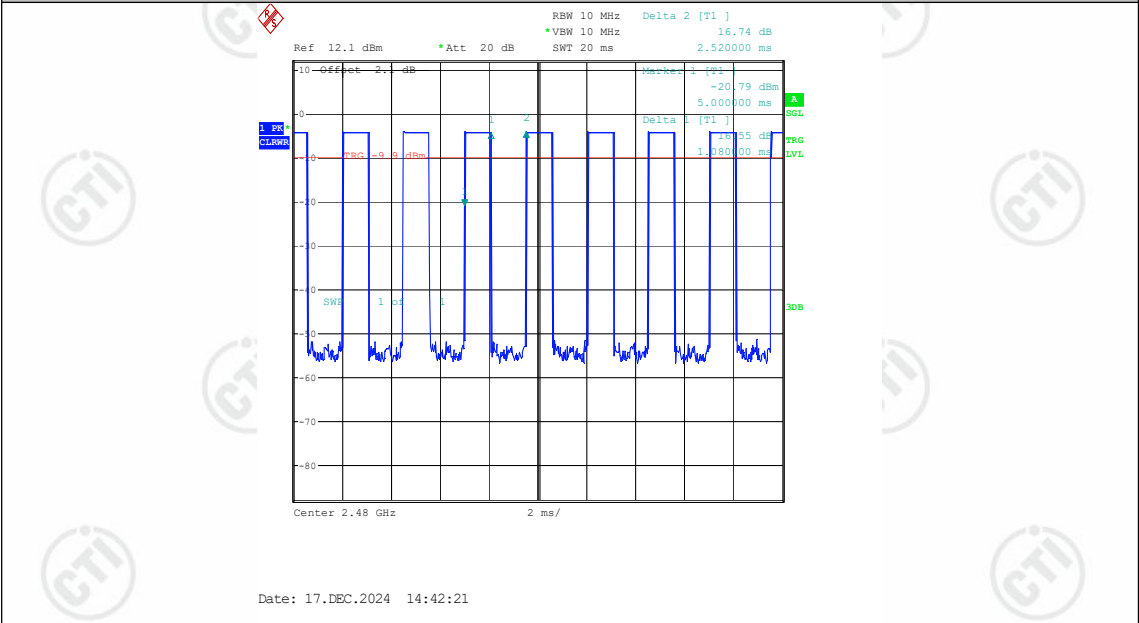
NTNV-BLE\_1M-Ant1-2480



NTNV-BLE\_2M-Ant1-2402



NTNV-BLE\_2M-Ant1-2440



NTNV-BLE\_2M-Ant1-2480

\*\*\*END OF REPORT\*\*\*