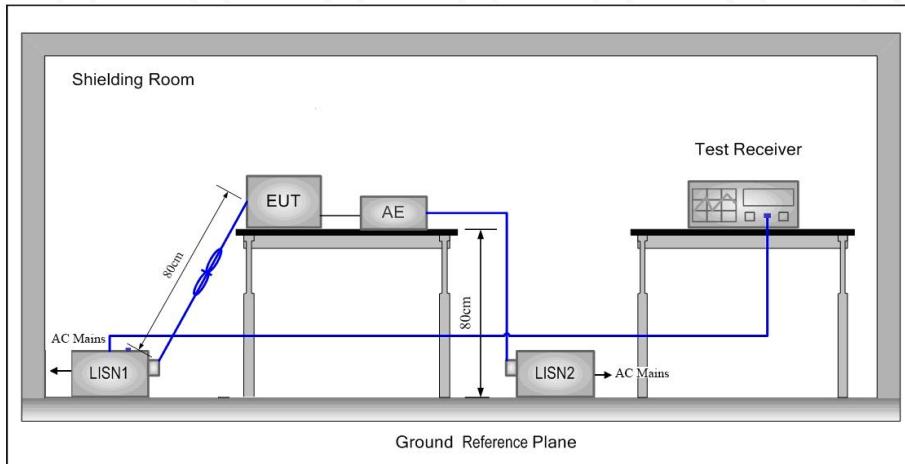


### 3.10 AC Power Line Conducted Emissions

|  |   |           |              |
|--|---|-----------|--------------|
| Test Requirement:                                | 47 CFR Part 15C Section 15.207  |           |              |
| Test Method:                                     | ANSI C63.10: 2013   |           |              |
| Test Frequency Range:                            | 150kHz to 30MHz   |           |              |
| Limit:   | Frequency range (MHz)   |           | Limit (dBuV) |
|  |   |           | Quasi-peak   |
|  | 0.15-0.5  | 66 to 56* | 56 to 46*    |
|  | 0.5-5   | 56        | 46           |
|  | 5-30  | 60        | 50           |
| * Decreases with the logarithm of the frequency. |   |           |              |
| Test Procedure:                                  | <p>1) The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a <math>50\Omega/50\mu\text{H} + 5\Omega</math> linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</p> <p>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,</p> <p>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 2013 on conducted measurement.</p> |           |              |
| Test Setup:                                      |   |           |              |

|                        |  |
|------------------------|--|
| Exploratory Test Mode: | Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. |
|------------------------|--|



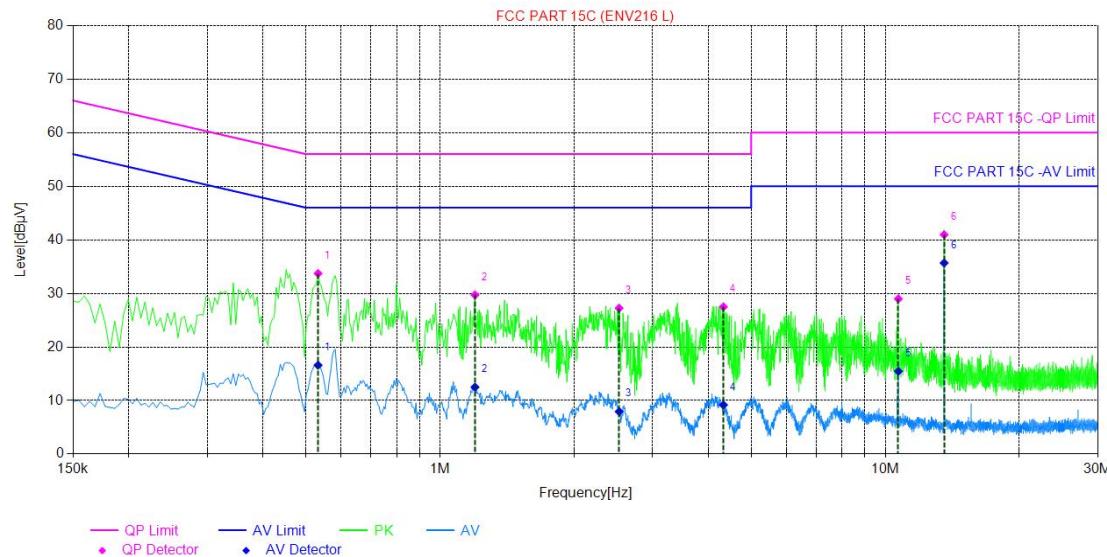
|                   |   |
|-------------------|---|
|                   | Charge + Transmitting mode.                       |
| Final Test Mode:  | Through Pre-scan, find the the worst case of GFSK |
| Instruments Used: | Refer to section 2.9 for details                  |
| Test Results:     | Pass  |

### Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

#### Live Line:

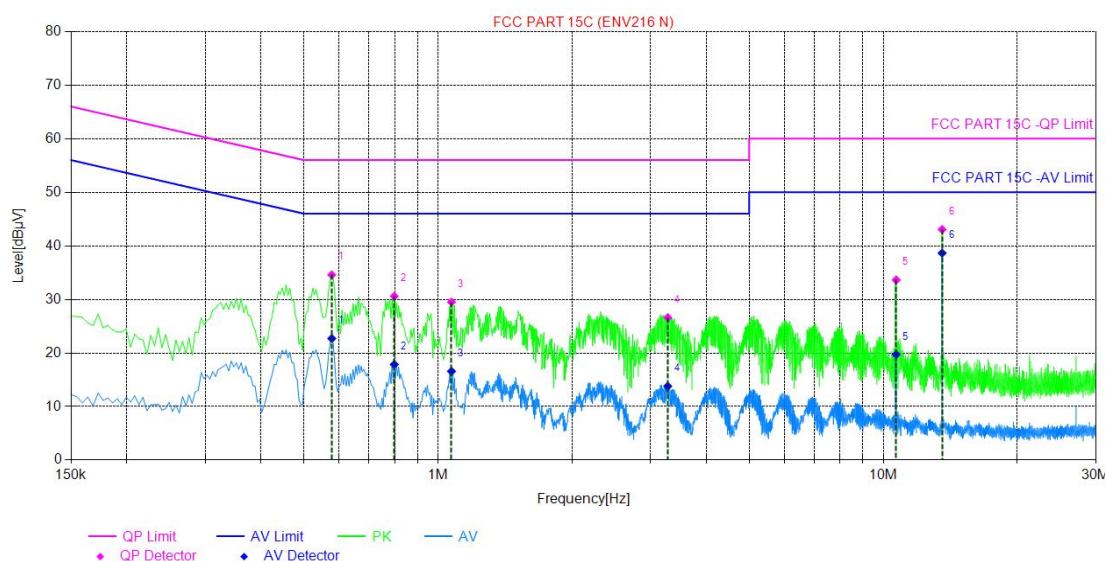


### Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | Verdict |
|-----|-------------|-------------|-----------------|-----------------|----------------|-----------------|-----------------|----------------|---------|
| 1   | 0.5325      | 9.86        | 33.71           | 56.00           | 22.29          | 16.59           | 46.00           | 29.41          | PASS    |
| 2   | 1.1985      | 9.72        | 29.71           | 56.00           | 26.29          | 12.50           | 46.00           | 33.50          | PASS    |
| 3   | 2.526       | 9.74        | 27.23           | 56.00           | 28.77          | 7.94            | 46.00           | 38.06          | PASS    |
| 4   | 4.3305      | 9.77        | 27.48           | 56.00           | 28.52          | 9.18            | 46.00           | 36.82          | PASS    |
| 5   | 10.7025     | 9.88        | 28.98           | 60.00           | 31.02          | 15.47           | 50.00           | 34.53          | PASS    |
| 6   | 13.56       | 9.95        | 40.95           | 60.00           | 19.05          | 35.68           | 50.00           | 14.32          | PASS    |



Neutral Line:



### Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Value [dB $\mu$ V] | QP Limit [dB $\mu$ V] | QP Margin [dB] | AV Value [dB $\mu$ V] | AV Limit [dB $\mu$ V] | AV Margin [dB] | Verdict |
|-----|-------------|-------------|-----------------------|-----------------------|----------------|-----------------------|-----------------------|----------------|---------|
| 1   | 0.5775      | 9.77        | 34.58                 | 56.00                 | 21.42          | 22.70                 | 46.00                 | 23.30          | PASS    |
| 2   | 0.798       | 9.80        | 30.58                 | 56.00                 | 25.42          | 17.86                 | 46.00                 | 28.14          | PASS    |
| 3   | 1.0725      | 9.69        | 29.50                 | 56.00                 | 26.50          | 16.58                 | 46.00                 | 29.42          | PASS    |
| 4   | 3.282       | 9.90        | 26.60                 | 56.00                 | 29.40          | 13.79                 | 46.00                 | 32.21          | PASS    |
| 5   | 10.6935     | 9.82        | 33.63                 | 60.00                 | 26.37          | 19.71                 | 50.00                 | 30.29          | PASS    |
| 6   | 13.56       | 9.90        | 43.05                 | 60.00                 | 16.95          | 38.64                 | 50.00                 | 11.36          | PASS    |

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including LISN Factor and the Cable Factor etc.), The basic equation is as follows:  
Result Level= Reading Level + Correct Factor(including LISN Factor, Cable Factor etc)



## 4 Appendix

### Appendix A: Duty Cycle

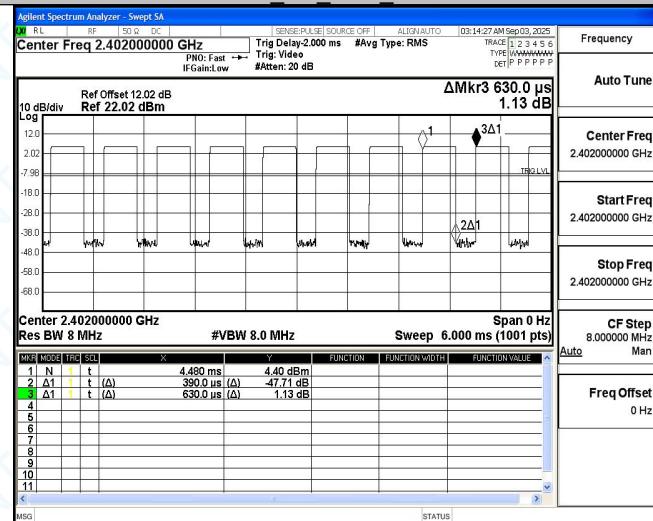
#### Test Result

| TestMode | Antenna | Freq(MHz) | ON Time [ms] | Period [ms] | X      | DC [%] | xFactor | Limit | Verdict |
|----------|---------|-----------|--------------|-------------|--------|--------|---------|-------|---------|
| BLE_1M   | Ant1    | 2402      | 0.39         | 0.63        | 0.6190 | 61.90  | 2.08    | ---   | ---     |
|          |         | 2440      | 0.38         | 0.62        | 0.6129 | 61.29  | 2.13    | ---   | ---     |
|          |         | 2480      | 0.39         | 0.63        | 0.6190 | 61.90  | 2.08    | ---   | ---     |
| BLE_2M   | Ant1    | 2402      | 0.24         | 0.62        | 0.3871 | 38.71  | 4.12    | ---   | ---     |
|          |         | 2440      | 0.24         | 0.63        | 0.3810 | 38.10  | 4.19    | ---   | ---     |
|          |         | 2480      | 0.24         | 0.62        | 0.3871 | 38.71  | 4.12    | ---   | ---     |



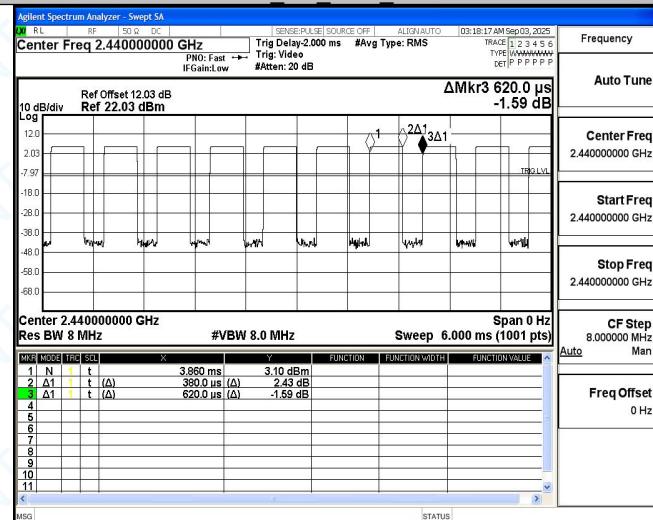
## Test Graphs

## BLE\_1M\_Ant1\_2402



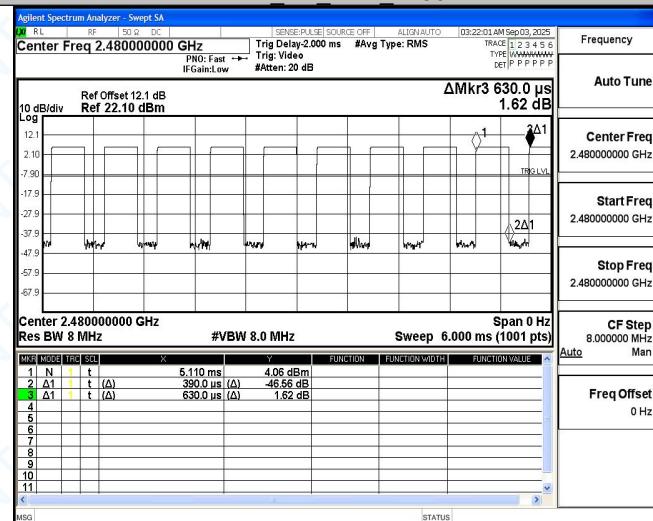
|                 |
|-----------------|
| Frequency       |
| Auto Tune       |
| Center Freq     |
| 2.402000000 GHz |
| Start Freq      |
| 2.402000000 GHz |
| Stop Freq       |
| 2.402000000 GHz |
| CF Step         |
| 8.000000 MHz    |
| Man             |
| Freq Offset     |
| 0 Hz            |

## BLE\_1M\_Ant1\_2440



|                 |
|-----------------|
| Frequency       |
| Auto Tune       |
| Center Freq     |
| 2.440000000 GHz |
| Start Freq      |
| 2.440000000 GHz |
| Stop Freq       |
| 2.440000000 GHz |
| CF Step         |
| 8.000000 MHz    |
| Man             |
| Freq Offset     |
| 0 Hz            |

## BLE\_1M\_Ant1\_2480



|                 |
|-----------------|
| Frequency       |
| Auto Tune       |
| Center Freq     |
| 2.480000000 GHz |
| Start Freq      |
| 2.480000000 GHz |
| Stop Freq       |
| 2.480000000 GHz |
| CF Step         |
| 8.000000 MHz    |
| Man             |
| Freq Offset     |
| 0 Hz            |

## BLE\_2M\_Ant1\_2402

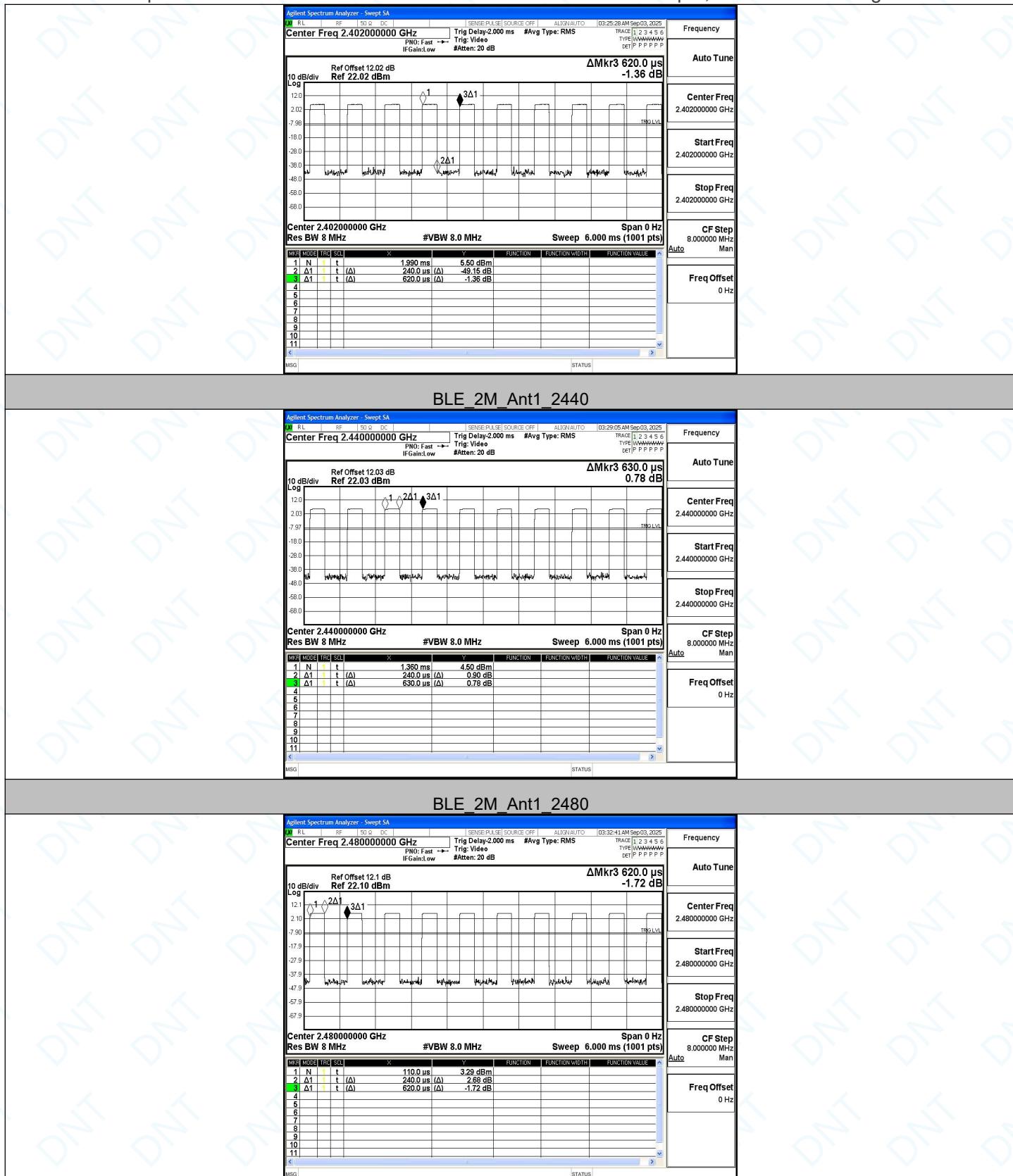
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E-mail: [service@dn-testing.com](mailto:service@dn-testing.com)





## Appendix B: DTS Bandwidth

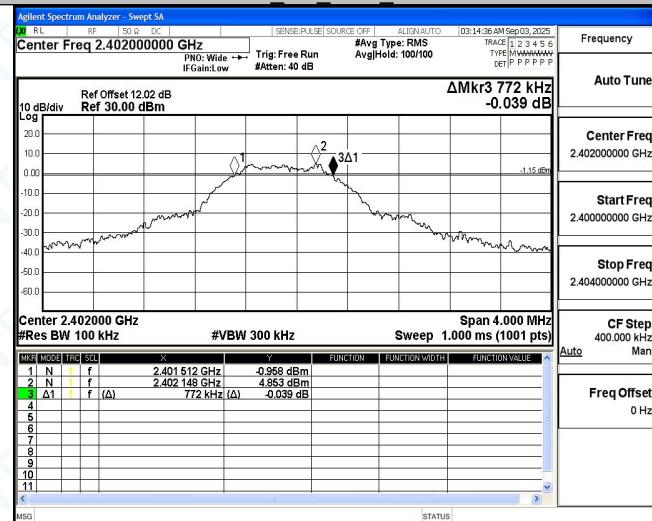
### Test Result

| TestMode | Antenna | Freq(MHz) | DTS BW [MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|-----------|--------------|----------|----------|------------|---------|
| BLE_1M   | Ant1    | 2402      | 0.772        | 2401.512 | 2402.284 | 0.5        | PASS    |
|          |         | 2440      | 0.776        | 2439.508 | 2440.284 | 0.5        | PASS    |
|          |         | 2480      | 0.744        | 2479.528 | 2480.272 | 0.5        | PASS    |
| BLE_2M   | Ant1    | 2402      | 1.184        | 2401.260 | 2402.444 | 0.5        | PASS    |
|          |         | 2440      | 1.244        | 2439.228 | 2440.472 | 0.5        | PASS    |
|          |         | 2480      | 1.216        | 2479.252 | 2480.468 | 0.5        | PASS    |



## Test Graphs

## BLE\_1M\_Ant1\_2402







## Appendix C: Maximum conducted output power

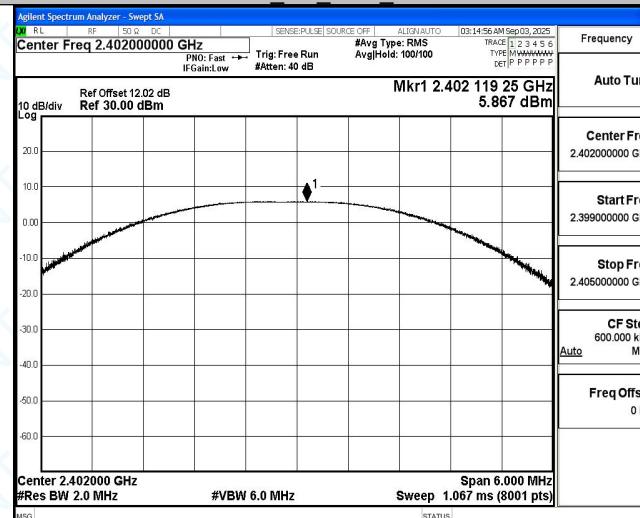
### Test Result

| TestMode | Antenna | Freq(MHz) | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|----------|---------|-----------|---------------------------|----------------------|---------|
| BLE_1M   | Ant1    | 2402      | 5.87                      | ≤30                  | PASS    |
|          |         | 2440      | 5.69                      | ≤30                  | PASS    |
|          |         | 2480      | 6.14                      | ≤30                  | PASS    |
| BLE_2M   | Ant1    | 2402      | 5.89                      | ≤30                  | PASS    |
|          |         | 2440      | 5.64                      | ≤30                  | PASS    |
|          |         | 2480      | 6.16                      | ≤30                  | PASS    |

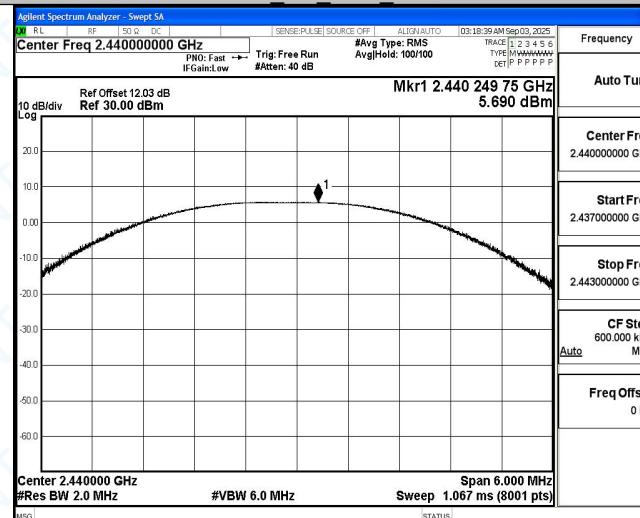


## Test Graphs

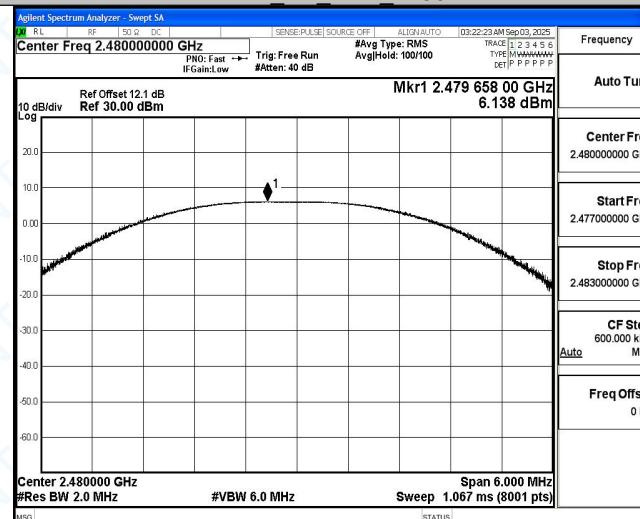
## BLE\_1M\_Ant1\_2402



## BLE\_1M\_Ant1\_2440



## BLE\_1M\_Ant1\_2480



## BLE\_2M\_Ant1\_2402

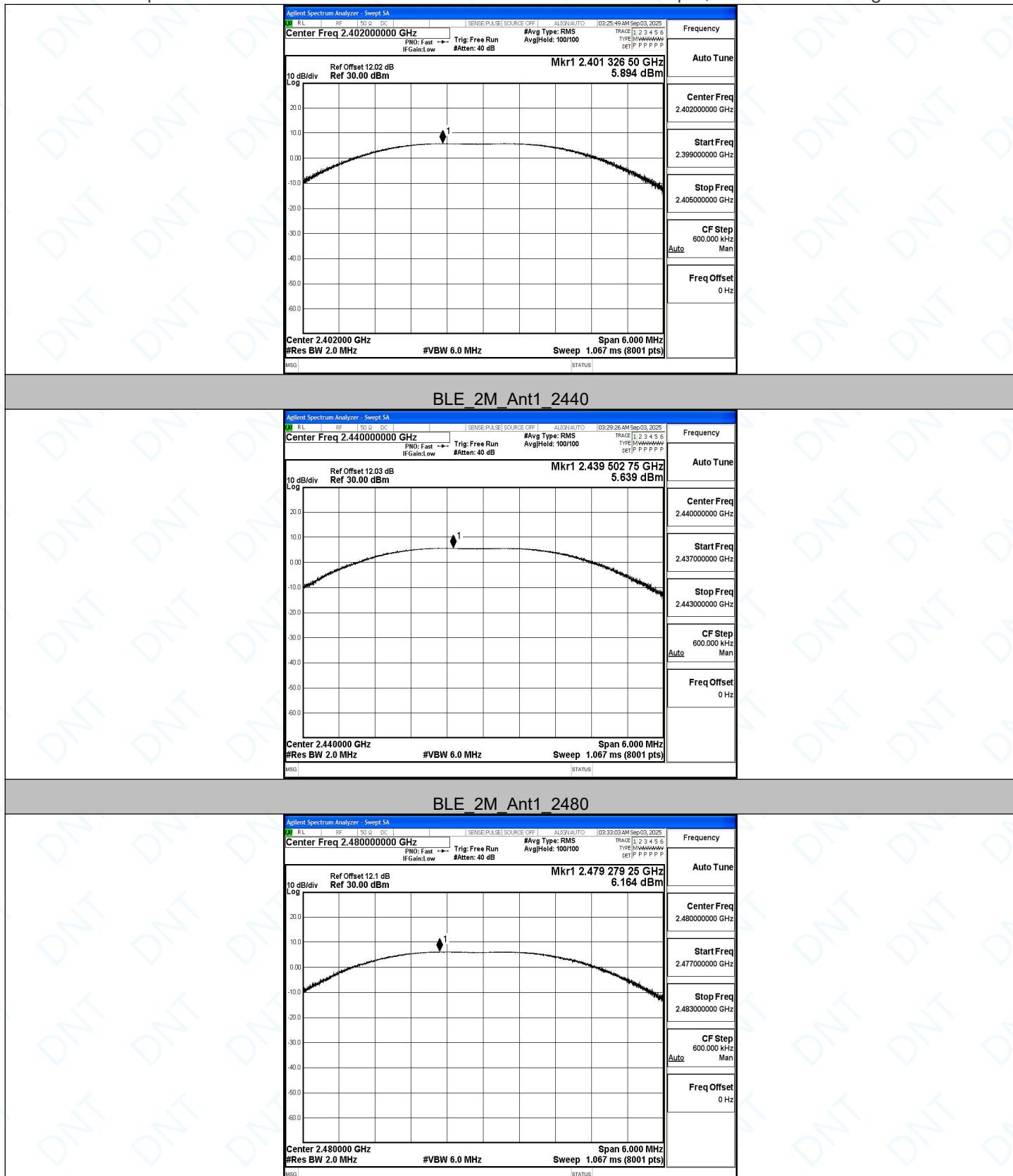
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E-mail: [service@dn-testing.com](mailto:service@dn-testing.com)





## Appendix D: Maximum power spectral density

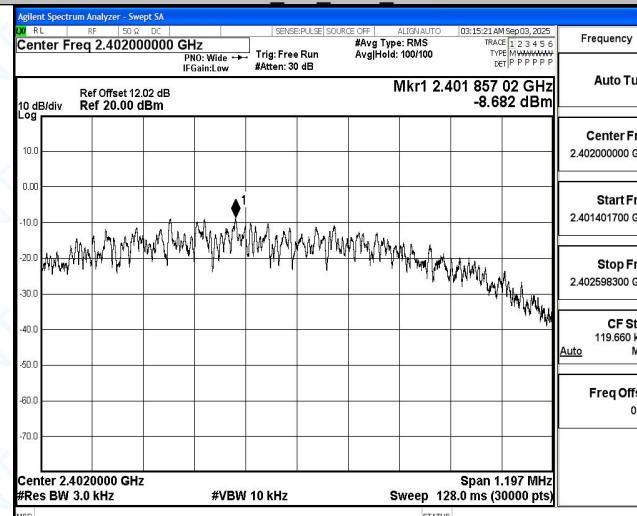
### Test Result

| TestMode | Antenna | Freq(MHz) | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|-----------|------------------|-----------------|---------|
| BLE_1M   | Ant1    | 2402      | -8.68            | ≤8.00           | PASS    |
|          |         | 2440      | -8.40            | ≤8.00           | PASS    |
|          |         | 2480      | -8.04            | ≤8.00           | PASS    |
| BLE_2M   | Ant1    | 2402      | -7.60            | ≤8.00           | PASS    |
|          |         | 2440      | -7.68            | ≤8.00           | PASS    |
|          |         | 2480      | -7.17            | ≤8.00           | PASS    |

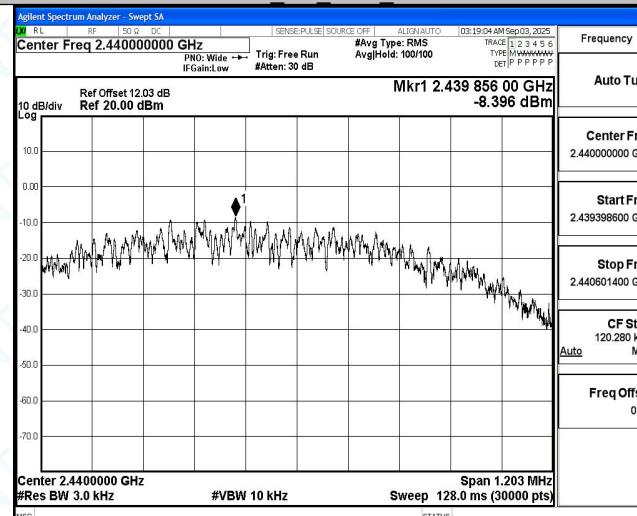


## Test Graphs

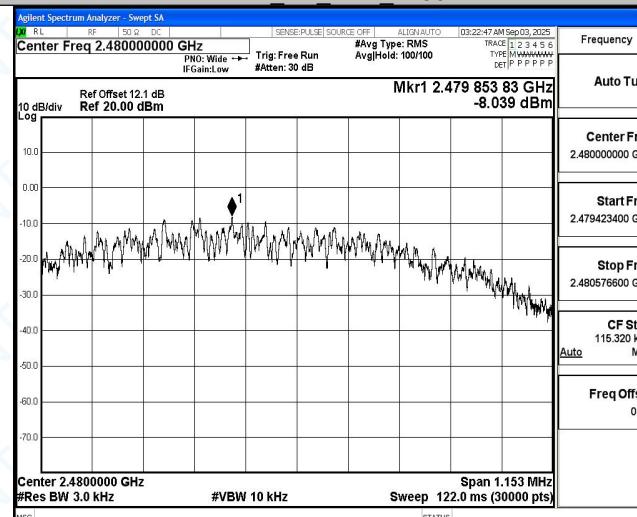
## BLE\_1M\_Ant1\_2402



## BLE\_1M\_Ant1\_2440



## BLE\_1M\_Ant1\_2480



## BLE\_2M\_Ant1\_2402

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