

## Vertical

## Radiated Emission Measurement

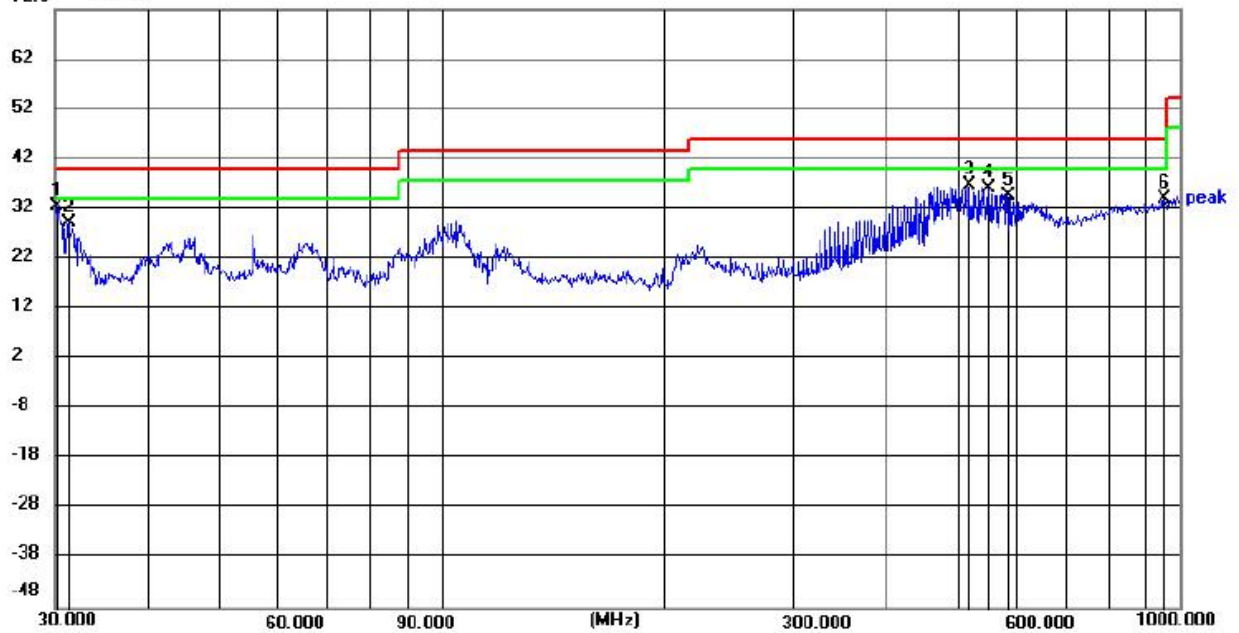
File :RF

Data :#946

Date: 2021/08/17

Time: 21:04:02

72.0 dBuV/m



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|-------------|----------------|-----|--------|
| 1   | 30.1054         | 20.03          | 12.59         | 32.62          | 40.00          | 7.38        | peak     | 100         | 291            | P   |        |
| 2   | 31.2893         | 16.49          | 12.75         | 29.24          | 40.00          | 10.76       | peak     | 100         | 264            | P   |        |
| 3   | 515.4374        | 17.13          | 19.66         | 36.79          | 46.00          | 9.21        | peak     | 100         | 291            | P   |        |
| 4   | 550.9480        | 15.72          | 20.32         | 36.04          | 46.00          | 9.96        | peak     | 100         | 260            | P   |        |
| 5   | 582.7425        | 13.35          | 21.25         | 34.60          | 46.00          | 11.40       | peak     | 100         | 268            | P   |        |
| 6   | 952.0937        | 6.75           | 27.16         | 33.91          | 46.00          | 12.09       | peak     | 100         | 98             | P   |        |

**For 1GHz to 25GHz****BLE 1M Mode (above 1GHz)**

| Frequency(MHz): |                         |    | 2402           |             | Polarity:        |                       |                   | HORIZONTAL         |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4804.00         | 47.00                   | PK | 74.00          | 27.00       | 42.49            | 33.49                 | 6.91              | 35.89              | 4.51                     |
| 4804.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 5762.00         | 45.37                   | PK | 74.00          | 28.63       | 38.16            | 34.38                 | 7.10              | 34.27              | 7.21                     |
| 5762.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 7206.00         | 44.21                   | PK | 74.00          | 29.79       | 33.11            | 36.95                 | 9.18              | 35.03              | 11.10                    |
| 7206.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2402           |             | Polarity:        |                       |                   | VERTICAL           |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4804.00         | 47.35                   | PK | 74.00          | 26.65       | 42.84            | 33.49                 | 6.91              | 35.89              | 4.51                     |
| 4804.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 5469.00         | 45.02                   | PK | 74.00          | 28.98       | 37.46            | 34.69                 | 7.23              | 34.36              | 7.56                     |
| 5469.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 7206.00         | 44.13                   | PK | 74.00          | 29.87       | 33.03            | 36.95                 | 9.18              | 35.03              | 11.10                    |
| 7206.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2440           |             | Polarity:        |                       |                   | HORIZONTAL         |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4880.00         | 47.32                   | PK | 74.00          | 26.68       | 41.07            | 33.60                 | 6.95              | 34.30              | 6.25                     |
| 4880.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 5154.00         | 46.02                   | PK | 74.00          | 27.98       | 38.39            | 34.57                 | 7.16              | 34.10              | 7.63                     |
| 5154.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 7320.00         | 43.66                   | PK | 74.00          | 30.34       | 31.97            | 37.46                 | 9.23              | 35.00              | 11.69                    |
| 7320.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2440           |             | Polarity:        |                       |                   | VERTICAL           |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4880.00         | 48.33                   | PK | 74.00          | 25.67       | 42.08            | 33.60                 | 6.95              | 34.30              | 6.25                     |
| 4880.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 5899.00         | 45.12                   | PK | 74.00          | 28.88       | 37.48            | 34.58                 | 7.16              | 34.10              | 7.64                     |
| 5899.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 7320.00         | 44.95                   | PK | 74.00          | 29.05       | 33.26            | 37.46                 | 9.23              | 35.00              | 11.69                    |
| 7320.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2480           |             | Polarity:        |                       |                   | HORIZONTAL         |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4960.00         | 47.38                   | PK | 74.00          | 26.62       | 42.46            | 33.84                 | 7.00              | 35.92              | 4.92                     |
| 4960.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 5158.00         | 44.96                   | PK | 74.00          | 29.04       | 37.42            | 34.67                 | 7.22              | 34.35              | 7.54                     |
| 5158.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 7440.00         | 43.85                   | PK | 74.00          | 30.15       | 31.90            | 37.64                 | 9.28              | 34.97              | 11.95                    |
| 7440.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2480           |             | Polarity:        |                       |                   | VERTICAL           |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4960.00         | 47.36                   | PK | 74.00          | 26.64       | 42.44            | 33.84                 | 7.00              | 35.92              | 4.92                     |
| 4960.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 6521.00         | 45.02                   | PK | 74.00          | 28.98       | 37.83            | 34.36                 | 7.10              | 34.27              | 7.19                     |
| 6521.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 7440.00         | 43.68                   | PK | 74.00          | 30.32       | 31.73            | 37.64                 | 9.28              | 34.97              | 11.95                    |
| 7440.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |

## REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. Other emissions are attenuated 20dB below the limits, so it does not recorded in report.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

**Results of Band Edges Test (Radiated)****BLE 1M Mode**

| Frequency(MHz): |                         |    | 2402           |             | Polarity:        |                       |                   | HORIZONTAL         |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2402.00         | 102.23                  | PK | --             | --          | 68.84            | 28.78                 | 4.61              | 0.00               | 33.39                    |
| 2402.00         | 86.35                   | AV | --             | --          | 52.96            | 28.78                 | 4.61              | 0.00               | 33.39                    |
| 2378.00         | 44.36                   | PK | 74.00          | 29.64       | 11.28            | 28.52                 | 4.56              | 0.00               | 33.08                    |
| 2378.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 2390.00         | 45.12                   | PK | 74.00          | 28.88       | 11.80            | 28.72                 | 4.60              | 0.00               | 33.32                    |
| 2390.00         | --                      | AV | 54.00          | --          | --               | --                    | --                | --                 | --                       |
| 2400.00         | 46.25                   | PK | --             | --          | 12.86            | 28.78                 | 4.61              | 0.00               | 33.39                    |
| 2400.00         | --                      | AV | --             | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2402           |             | Polarity:        |                       |                   | VERTICAL           |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2402.00         | 101.05                  | PK | --             | --          | 67.66            | 28.78                 | 4.61              | 0                  | 33.39                    |
| 2402.00         | 87.46                   | AV | --             | --          | 54.07            | 28.78                 | 4.61              | 0                  | 33.39                    |
| 2369.00         | 44.15                   | PK | 74             | 29.85       | 11.07            | 28.52                 | 4.56              | 0                  | 33.08                    |
| 2369.00         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |
| 2390.00         | 45.21                   | PK | 74             | 28.79       | 11.89            | 28.72                 | 4.60              | 0                  | 33.32                    |
| 2390.00         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |
| 2400.00         | 46.98                   | PK | --             | --          | 13.59            | 28.78                 | 4.61              | 0                  | 33.39                    |
| 2400.00         | --                      | AV | --             | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2480           |             | Polarity:        |                       |                   | HORIZONTAL         |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2480.00         | 101.23                  | PK | --             | --          | 67.61            | 28.92                 | 4.70              | 0.00               | 33.62                    |
| 2480.00         | 90.26                   | AV | --             | --          | 56.64            | 28.92                 | 4.70              | 0.00               | 33.62                    |
| 2483.50         | 47.03                   | PK | 74             | 26.97       | 13.4             | 28.93                 | 4.70              | 0.00               | 33.63                    |
| 2483.50         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |
| 2492.00         | 45.38                   | PK | 74             | 28.62       | 11.72            | 28.95                 | 4.71              | 0.00               | 33.66                    |
| 2492.00         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |
| 2500.00         | 44.62                   | PK | 74             | 29.38       | 10.94            | 28.96                 | 4.72              | 0.00               | 33.68                    |
| 2500.00         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |

| Frequency(MHz): |                         |    | 2480           |             | Polarity:        |                       |                   | VERTICAL           |                          |
|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2480.00         | 99.35                   | PK | --             | --          | 65.73            | 28.92                 | 4.70              | 0.00               | 33.62                    |
| 2480.00         | 84.02                   | AV | --             | --          | 50.4             | 28.92                 | 4.70              | 0.00               | 33.62                    |
| 2483.50         | 47.36                   | PK | 74             | 26.64       | 13.73            | 28.93                 | 4.70              | 0.00               | 33.63                    |
| 2483.50         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |
| 2496.00         | 44.98                   | PK | 74             | 29.02       | 11.32            | 28.95                 | 4.71              | 0.00               | 33.66                    |
| 2496.00         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |
| 2500.00         | 43.28                   | PK | 74             | 30.72       | 9.6              | 28.96                 | 4.72              | 0.00               | 33.68                    |
| 2500.00         | --                      | AV | 54             | --          | --               | --                    | --                | --                 | --                       |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor
3. Margin value = Limit value - Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. Other emissions are attenuated 20dB below the limits, so it does not recorded in report.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.

### 3.3. Maximum Conducted Output Power

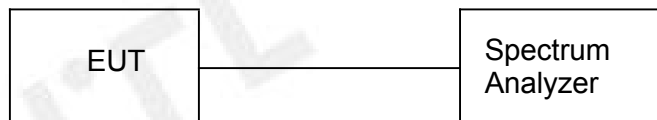
#### Limit

The Maximum Peak Output Power Measurement is 30dBm.

#### Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

#### Test Configuration



#### Test Results

Raw data reference to Section 2 from Appendix.

### 3.4. Power Spectral Density

#### Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW  $\geq 3$  kHz.
3. Set the VBW  $\geq 3 \times$  RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

#### Test Configuration



#### Test Results

Raw data reference to Section 3 from Appendix.

### 3.5. 6dB Bandwidth

#### Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

#### Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

#### Test Configuration



#### Test Results

Raw data reference to Section 1 from Appendix.

### 3.6. Out-of-band Emissions

#### Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

#### Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, band edge and out-of-band emissions.

#### Test Configuration



#### Test Results

Raw data reference to Section 4 from Appendix.

### 3.7. Antenna Requirement

#### Standard Applicable

**For intentional device, according to FCC 47 CFR Section 15.203:**

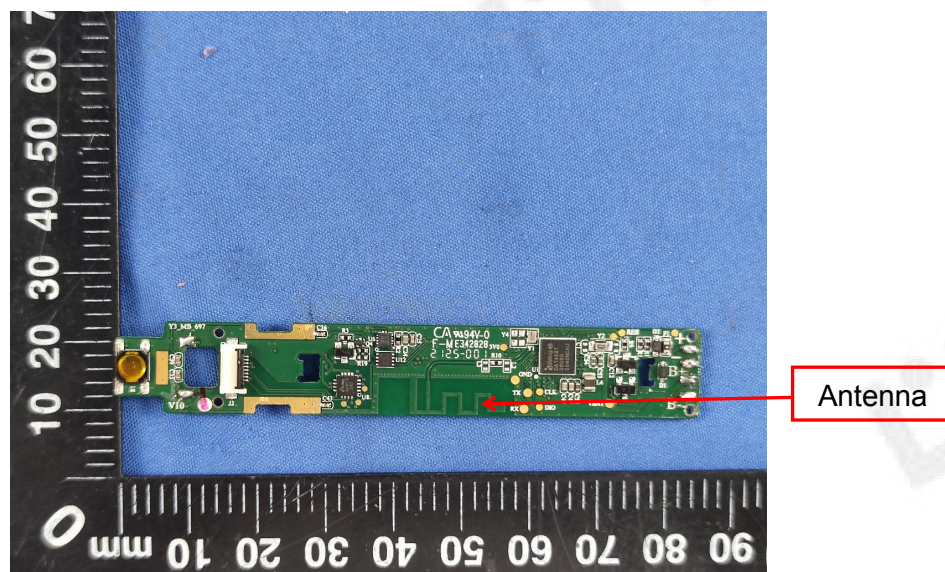
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

**FCC CFR Title 47 Part 15 Subpart C Section 15.247(b) (4) :**

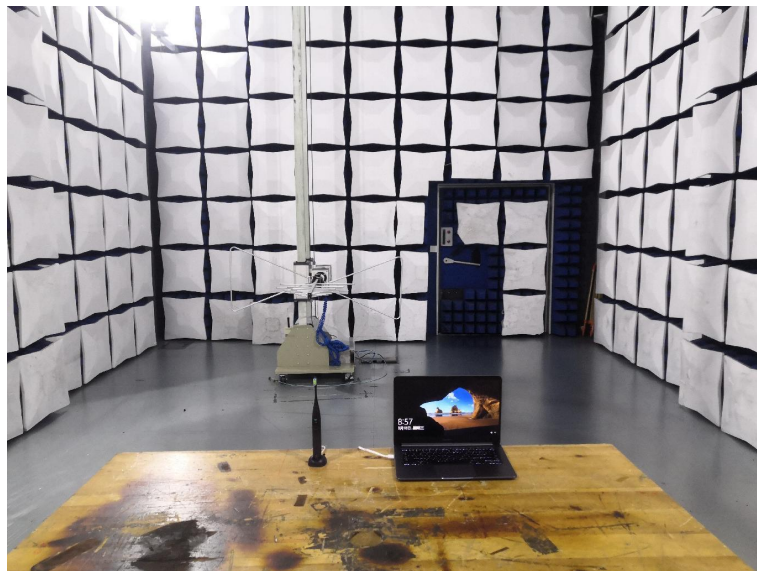
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### Test Result:

The maximum gain of antenna was -0.53dBi.

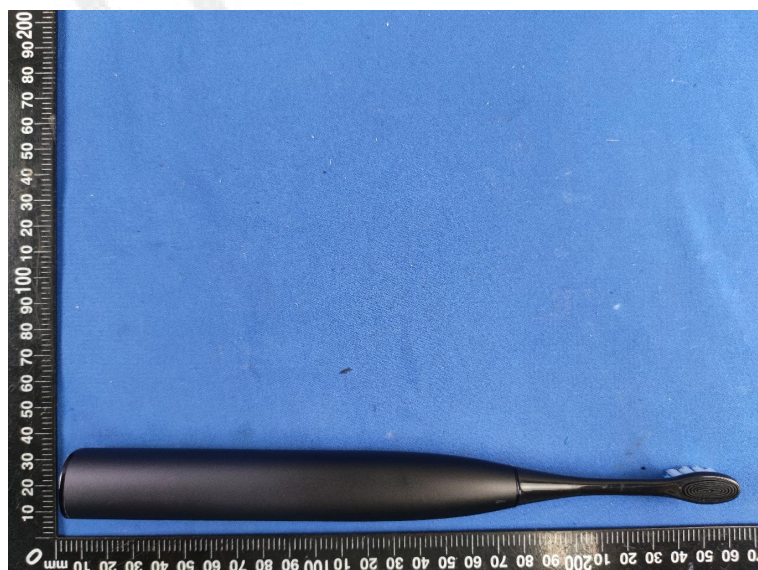
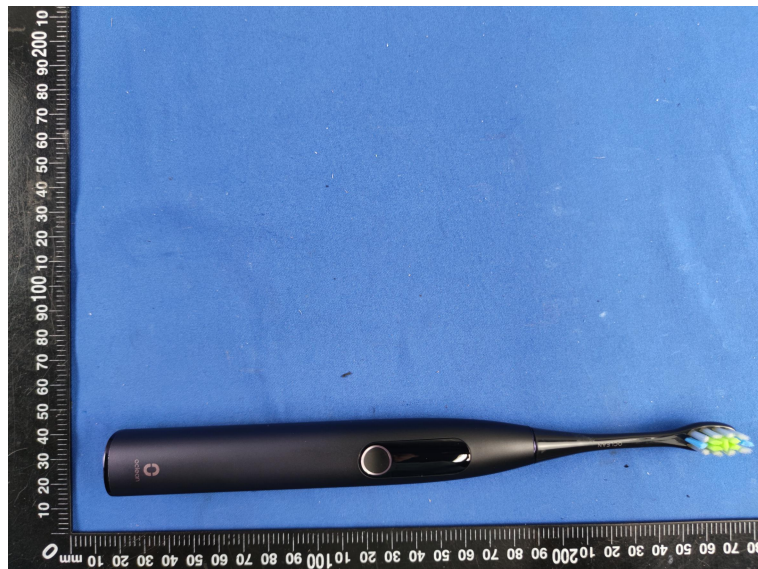


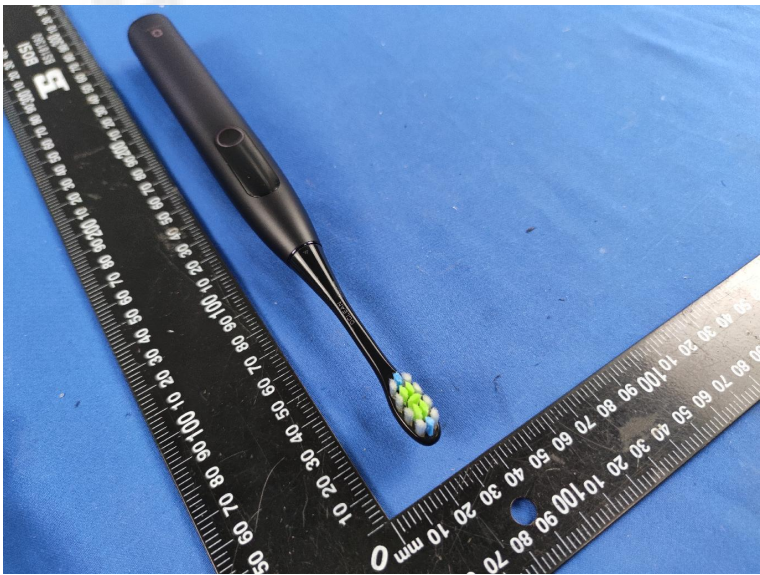
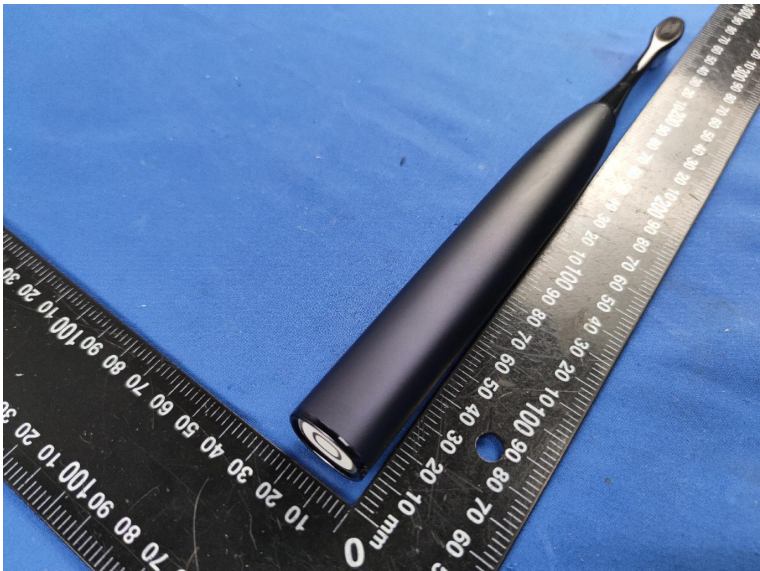
#### 4. Test Setup Photos of the EUT

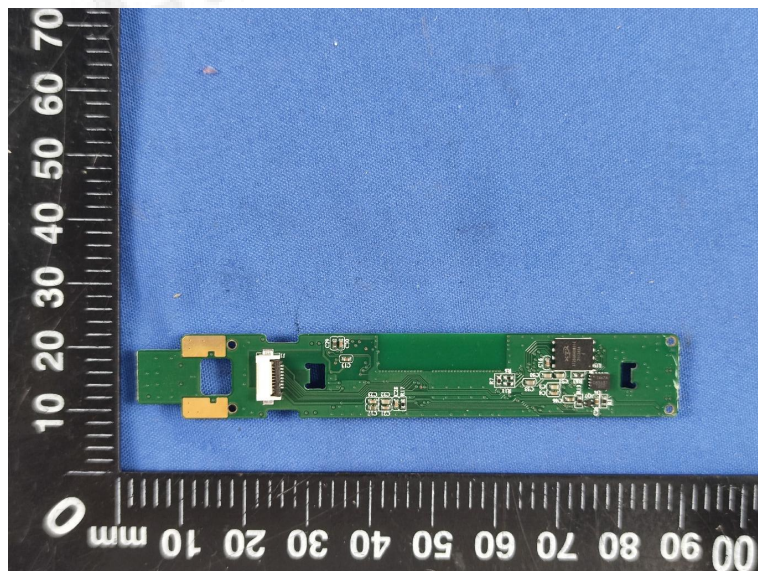
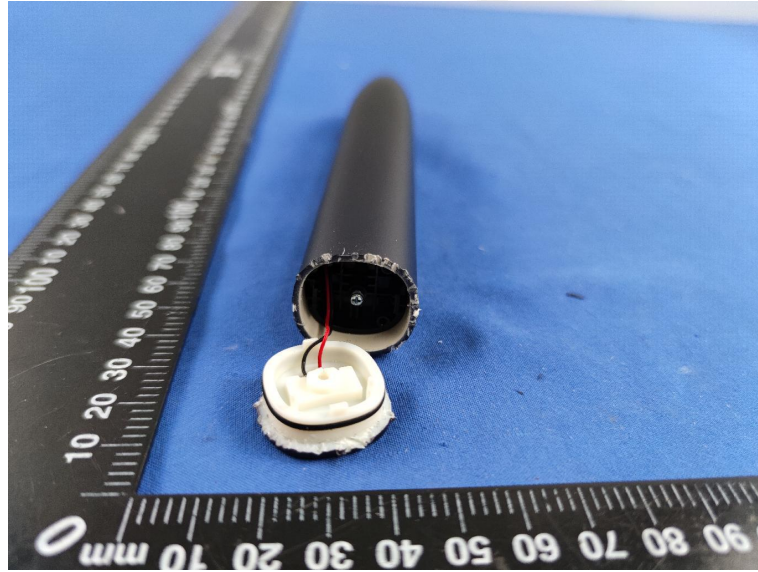


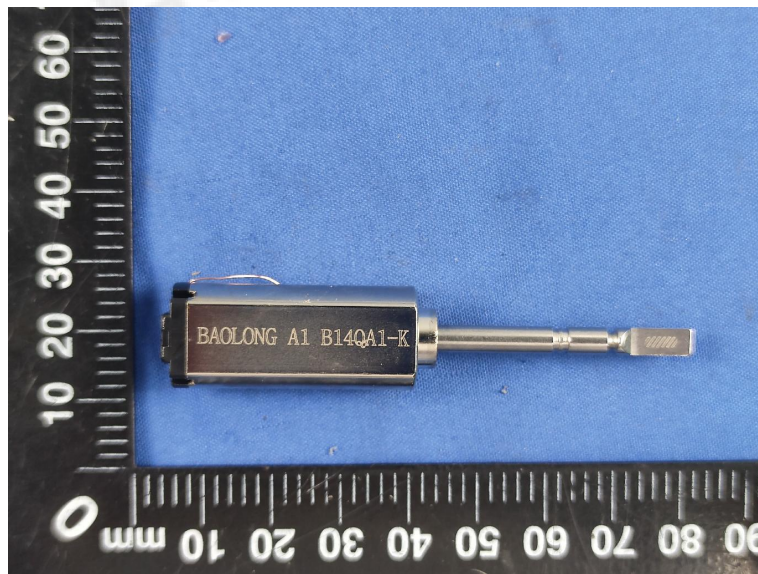
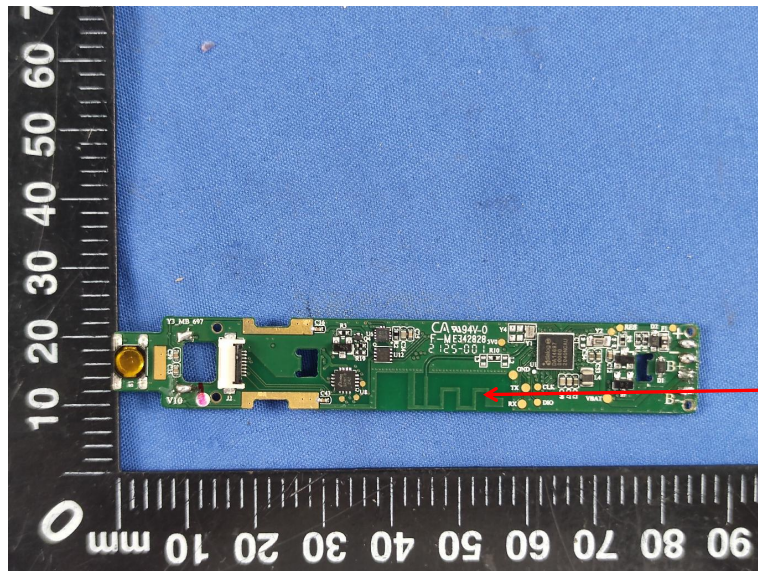
## 5. External and Internal Photos of the EUT

### External Photos of EUT





Internal Photos of EUT



\*\*\*\*\* End of Report \*\*\*\*\*