# 12. TIME OF OCCUPANCY (DWELL TIME)

## 12.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.
2. RBW shall be≤channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:
   (Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

## 12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

## 12.3. MEASUREMENT EQUIPMENT USED

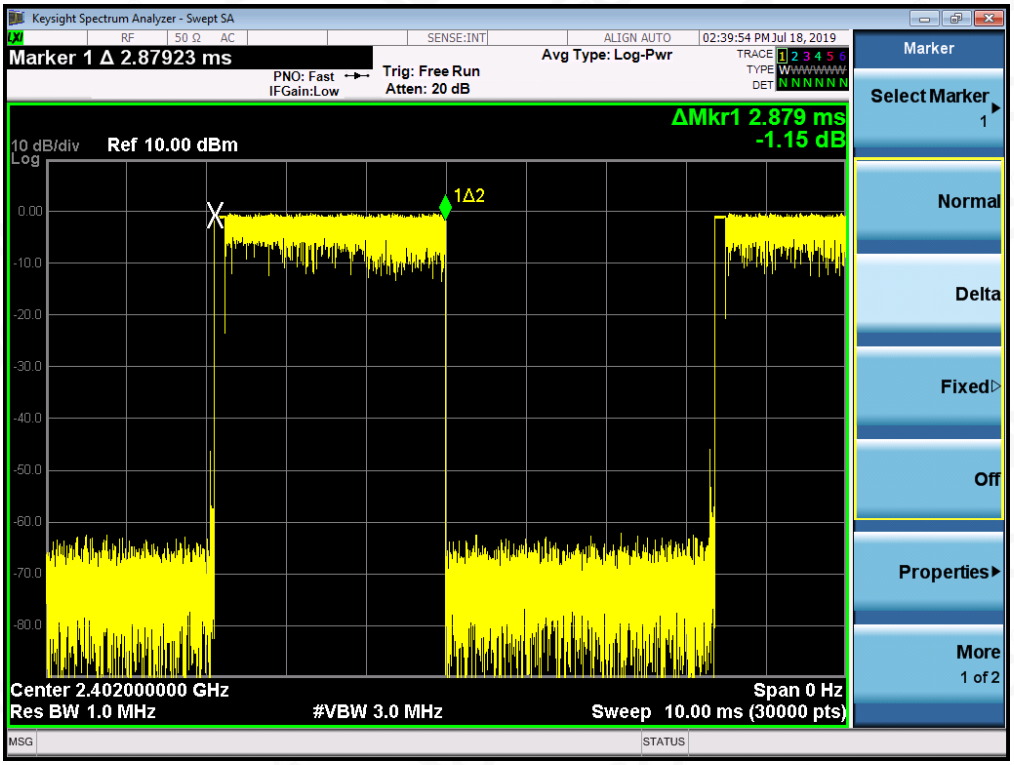
The same as described in section 6

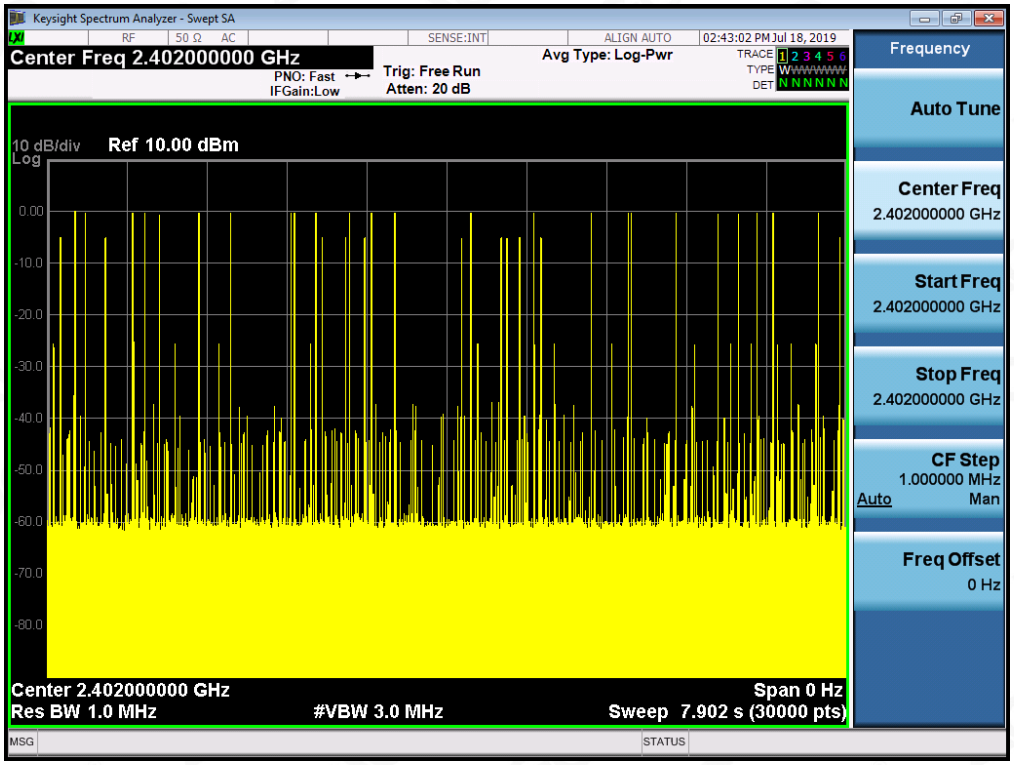
## 12.4. LIMITS AND MEASUREMENT RESULT

| Channel | Time of Pulse for DH5 (ms) | Number of hops in the period specified in the requirements | Sweep Time (ms) | Limit (ms) |
|---|---|---|---|---|
| Low | 2.879 | 24*4 | 276.38 | 400 |
| Middle | 2.871 | 27*4 | 310.07 | 400 |
| High | 2.873 | 25*4 | 287.30 | 400 |

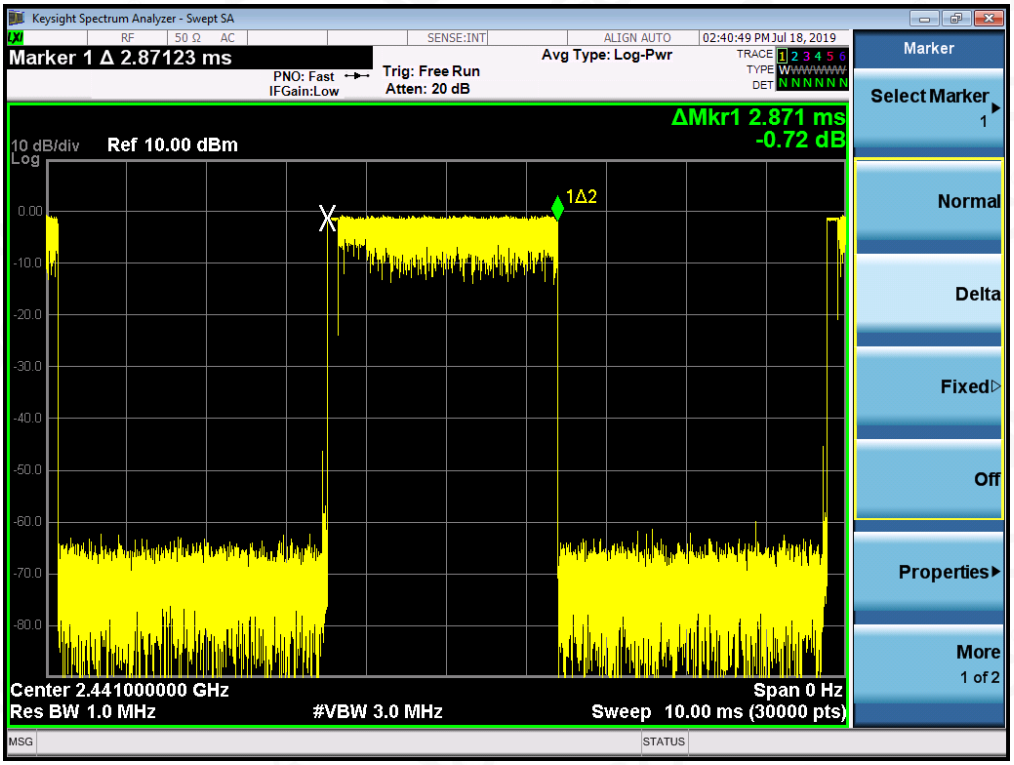
Note: The $\pi$ /4-DQPSK modulation is the worst case and recorded in the report.

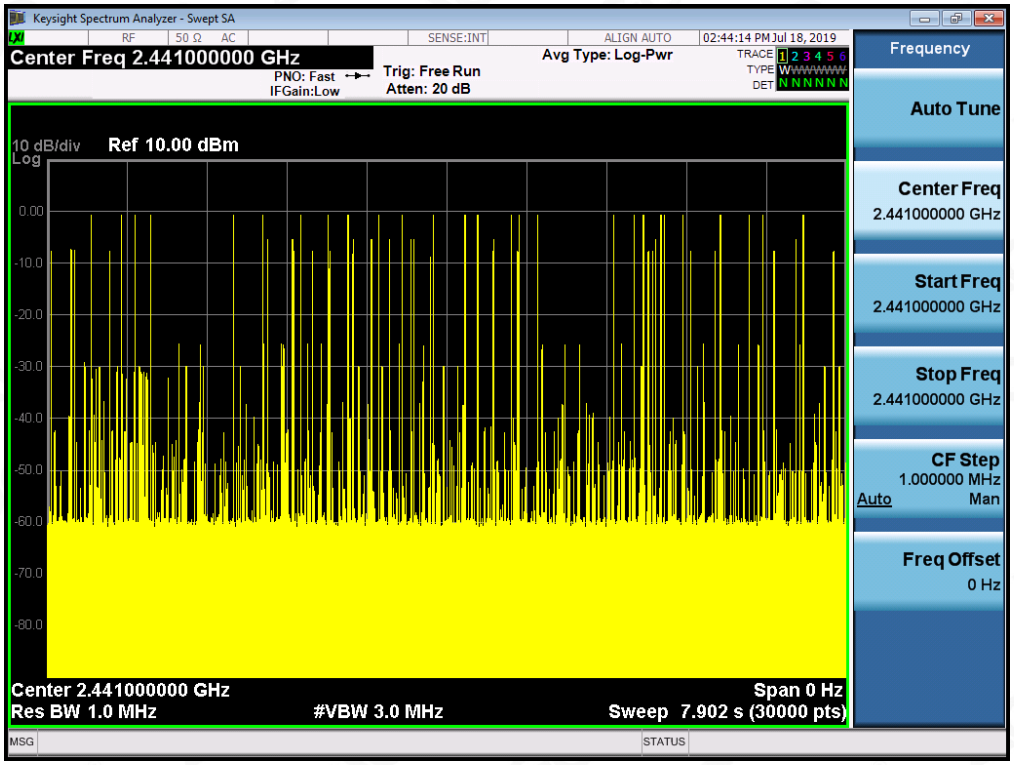
TEST PLOT OF LOW CHANNEL



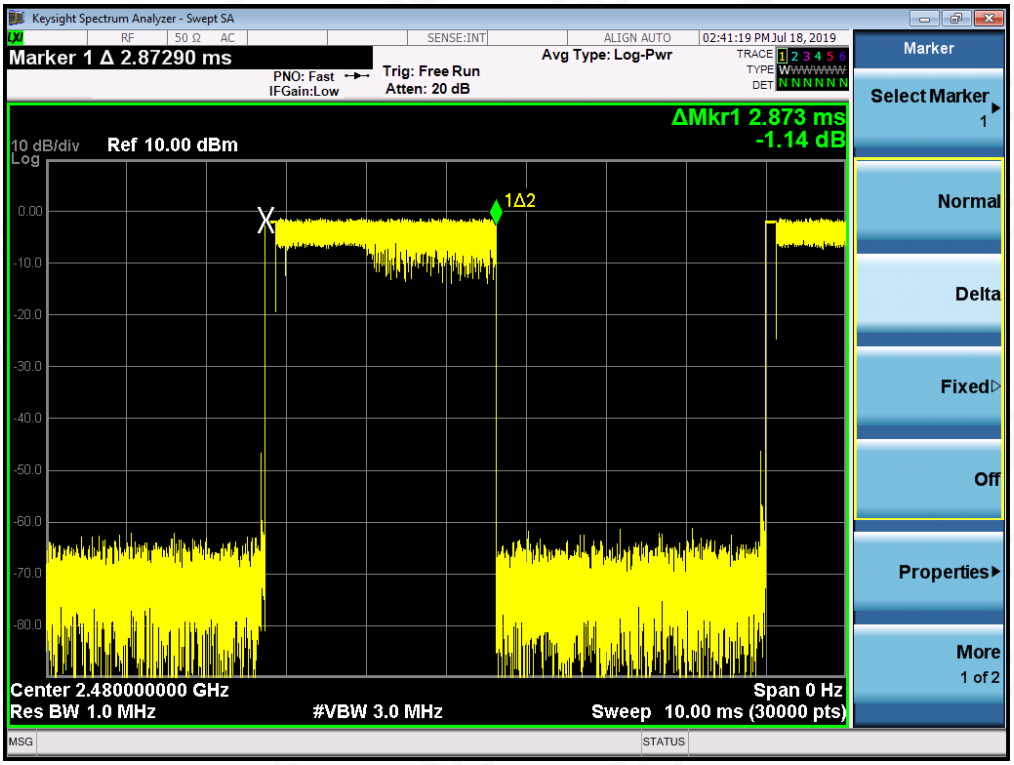



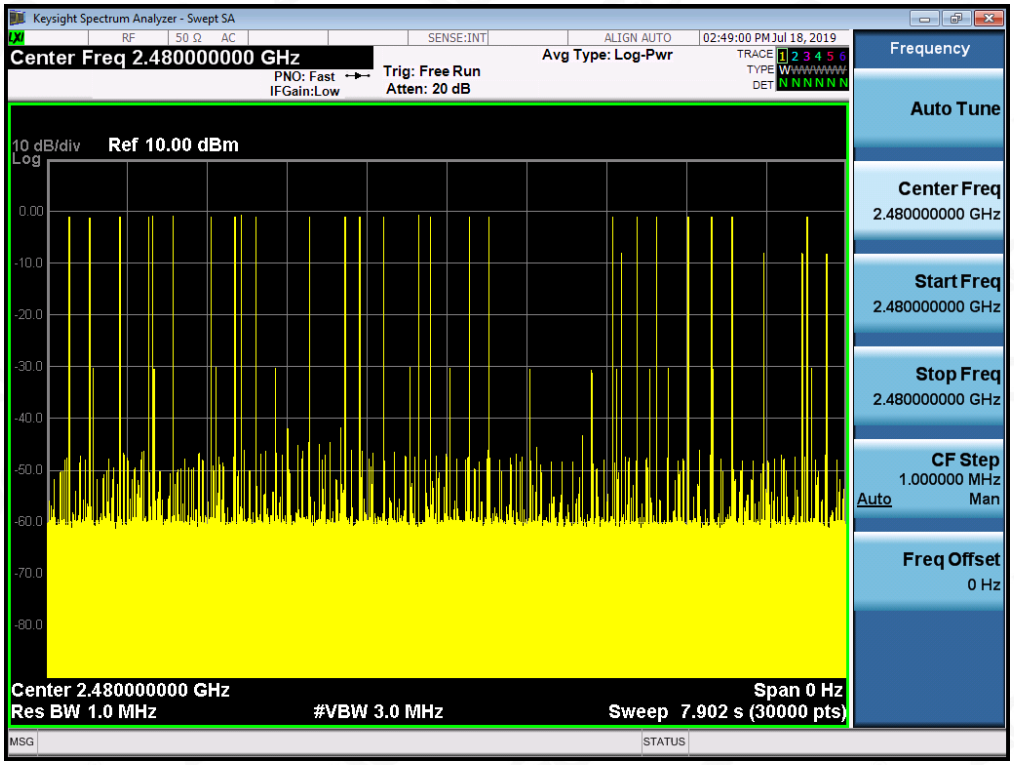
TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL



# 13. FREQUENCY SEPARATION

## 13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW) ≥ RBW.
4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

## 13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

## 13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

## 13.4. LIMITS AND MEASUREMENT RESULT

| CHANNEL | CHANNEL SEPARATION | LIMIT | RESULT |
|---|---|---|---|
| | KHz | KHz | Pass |
| CH01-CH02 | 1001 | >=25 KHz or 2/3 20 dB BW | |

TEST PLOT FOR FREQUENCY SEPARATION

Note: The π /4-DQPSK modulation is the worst case and recorded in the report.

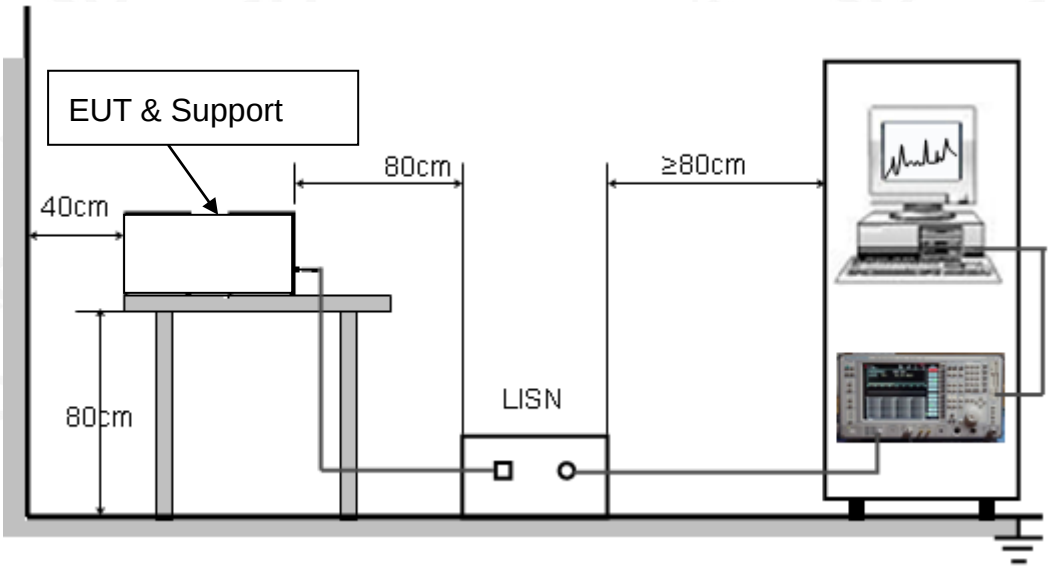
# 14. FCC LINE CONDUCTED EMISSION TEST

## 14.1. LIMITS OF LINE CONDUCTED EMISSION TEST

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Q.P.( dBuV) | Average( dBuV) |
| 150kHz~500kHz | 66-56 | 56-46 |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

Note:
1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## 14.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



### 14.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

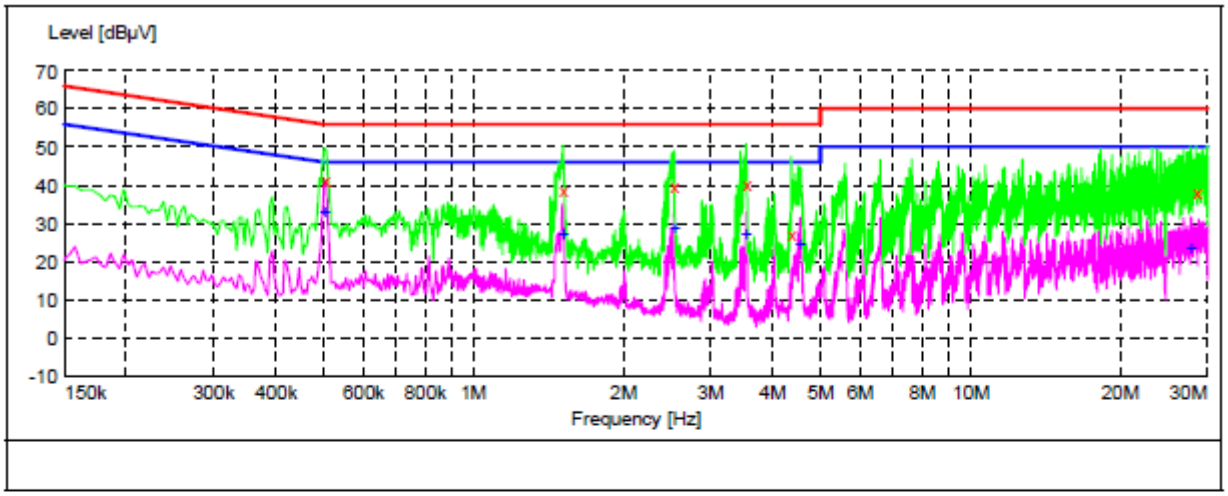
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

### 14.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

## 14.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



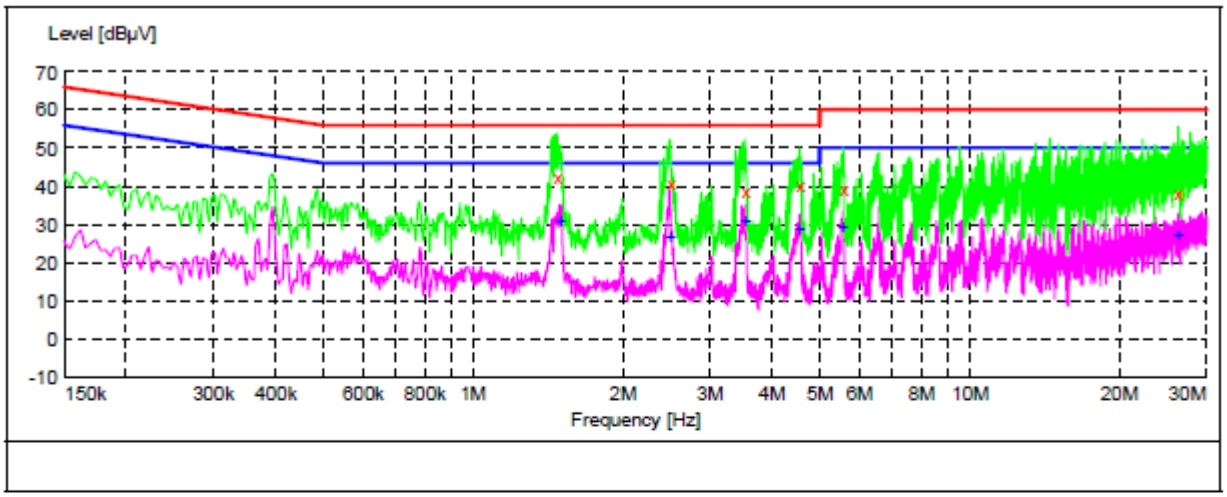

***MEASUREMENT RESULT: "TEST_fin"***

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.502000 | 41.20 | 11.2 | 56 | 14.8 | QP | L1 | FLO |
| 1.514000 | 38.50 | 11.5 | 56 | 17.5 | QP | L1 | FLO |
| 2.534000 | 40.00 | 11.5 | 56 | 16.0 | QP | L1 | FLO |
| 3.538000 | 40.20 | 11.6 | 56 | 15.8 | QP | L1 | FLO |
| 4.366000 | 27.20 | 11.6 | 56 | 28.8 | QP | L1 | FLO |
| 28.478000 | 38.40 | 12.8 | 60 | 21.6 | QP | L1 | FLO |

***MEASUREMENT RESULT: "TEST_fin2"***

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.502000 | 32.80 | 11.2 | 46 | 13.2 | AV | L1 | FLO |
| 1.514000 | 27.40 | 11.5 | 46 | 18.6 | AV | L1 | FLO |
| 2.534000 | 29.00 | 11.5 | 46 | 17.0 | AV | L1 | FLO |
| 3.542000 | 27.40 | 11.6 | 46 | 18.6 | AV | L1 | FLO |
| 4.558000 | 24.70 | 11.6 | 46 | 21.3 | AV | L1 | FLO |
| 27.810000 | 23.80 | 12.8 | 50 | 26.2 | AV | L1 | FLO |

Line Conducted Emission Test Line 2-N




***MEASUREMENT RESULT: "TEST_fin"***

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 1.474000 | 42.30 | 11.5 | 56 | 13.7 | QP | N | FLO |
| 2.494000 | 40.80 | 11.5 | 56 | 15.2 | QP | N | FLO |
| 3.534000 | 38.60 | 11.6 | 56 | 17.4 | QP | N | FLO |
| 4.550000 | 40.30 | 11.6 | 56 | 15.7 | QP | N | FLO |
| 5.554000 | 39.30 | 11.7 | 60 | 20.7 | QP | N | FLO |
| 26.246000 | 38.40 | 12.7 | 60 | 21.6 | QP | N | FLO |

***MEASUREMENT RESULT: "TEST_fin2"***

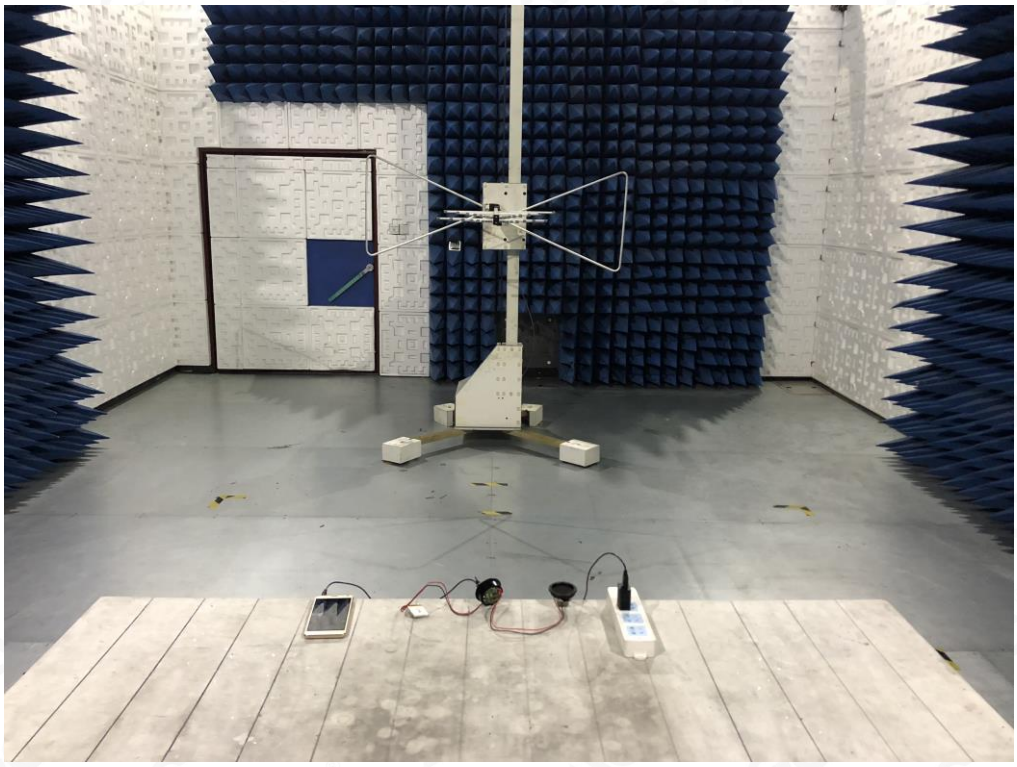
| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 1.498000 | 31.10 | 11.5 | 46 | 14.9 | AV | N | FLO |
| 2.494000 | 26.70 | 11.5 | 46 | 19.3 | AV | N | FLO |
| 3.538000 | 30.80 | 11.6 | 46 | 15.2 | AV | N | FLO |
| 4.554000 | 28.90 | 11.6 | 46 | 17.1 | AV | N | FLO |
| 5.558000 | 29.10 | 11.7 | 50 | 20.9 | AV | N | FLO |
| 26.286000 | 27.30 | 12.7 | 50 | 22.7 | AV | N | FLO |

**RESULT: PASS**

Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

# APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHZ

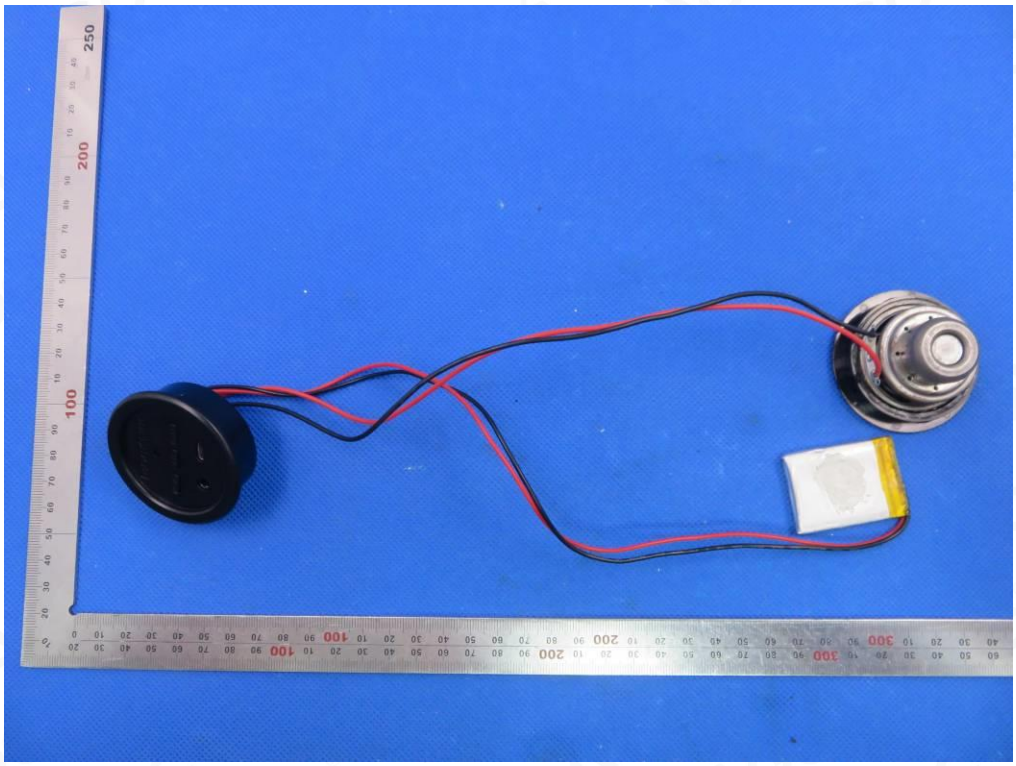


RADIATED EMISSION TEST SETUP ABOVE 1GHZ

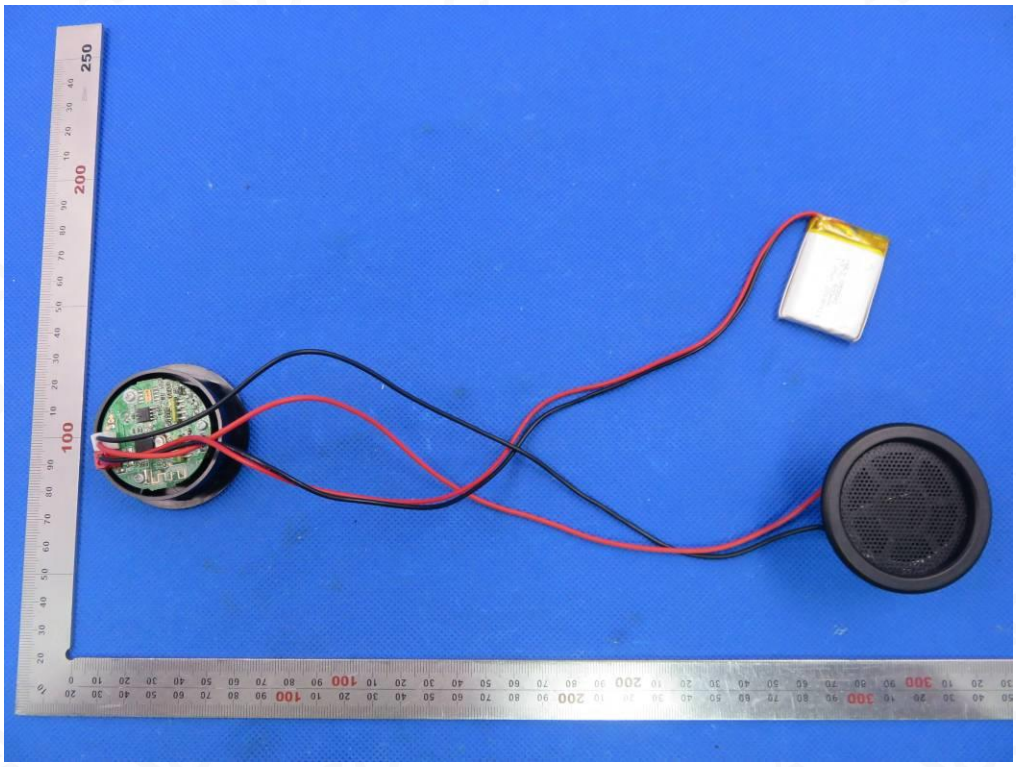
CONDUCTED EMISSION TEST SETUP

# APPENDIX B: PHOTOGRAPHS OF EUT

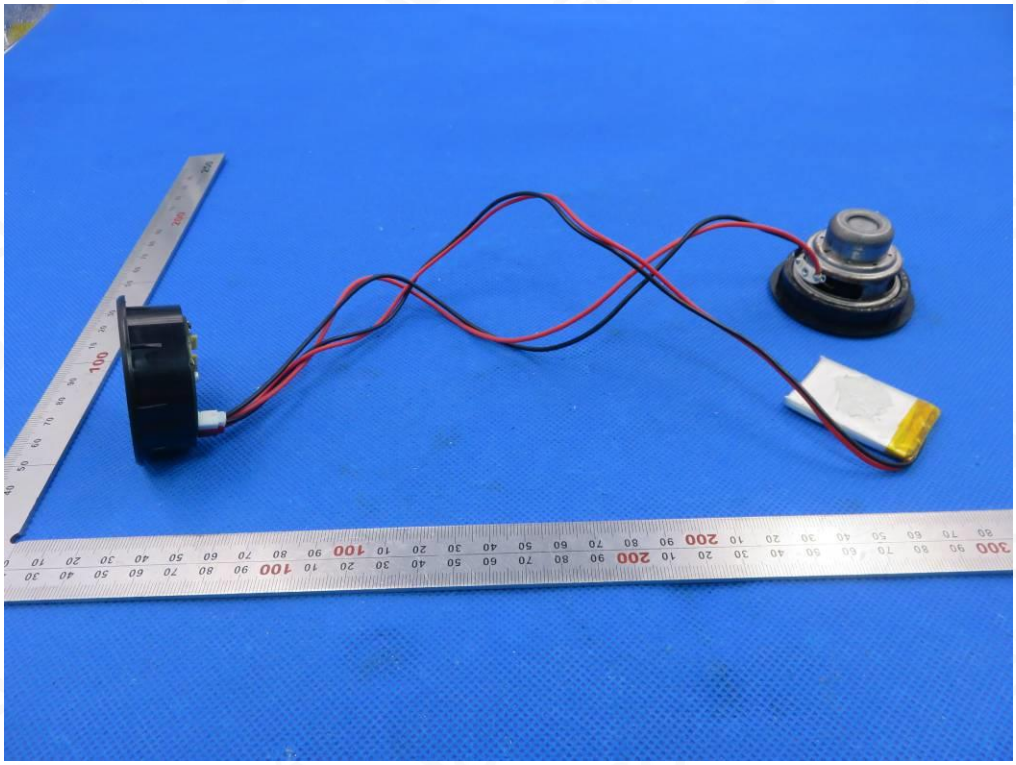
TOP VIEW OF EUT



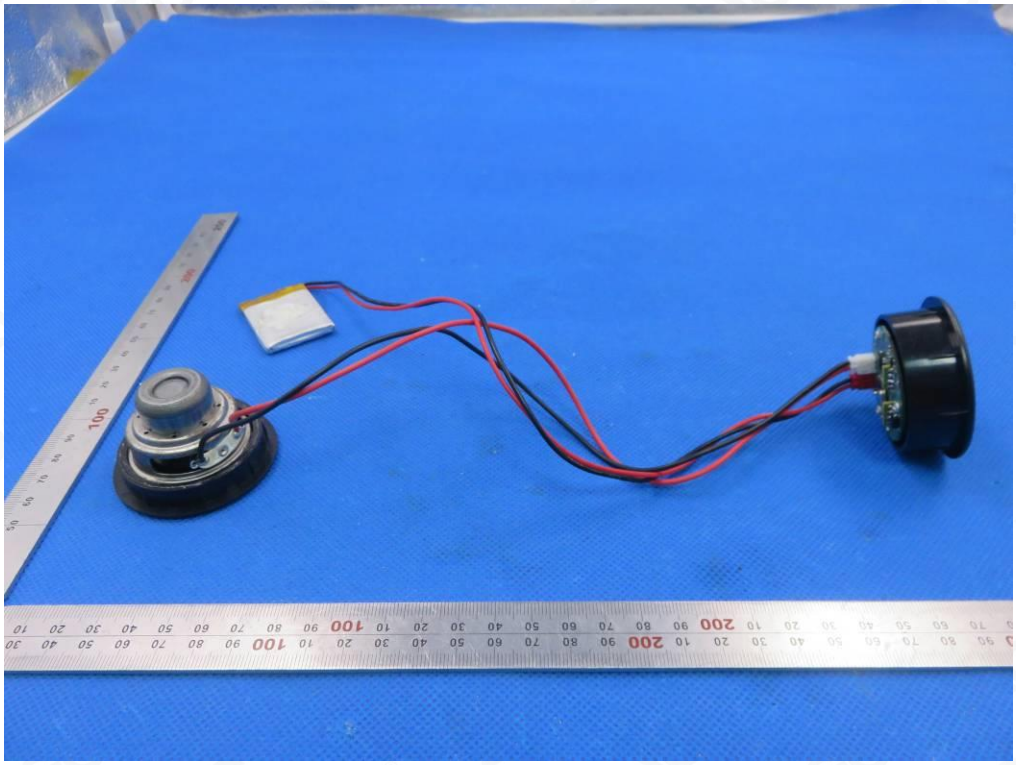
BOTTOM VIEW OF EUT



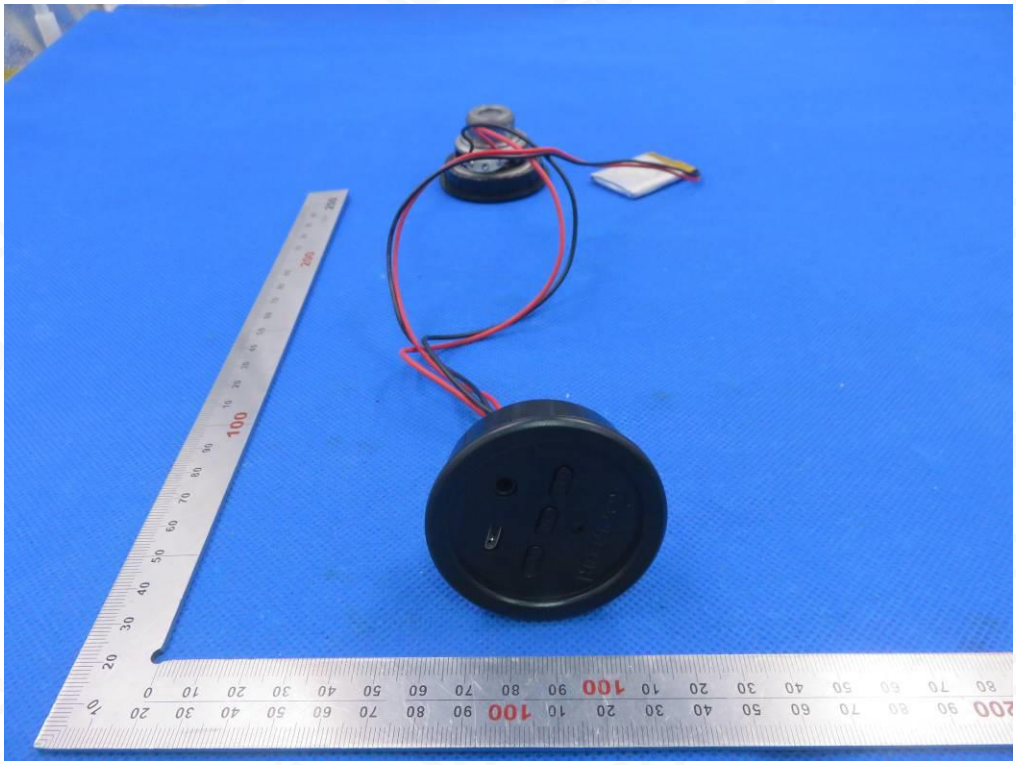
FRONT VIEW OF EUT



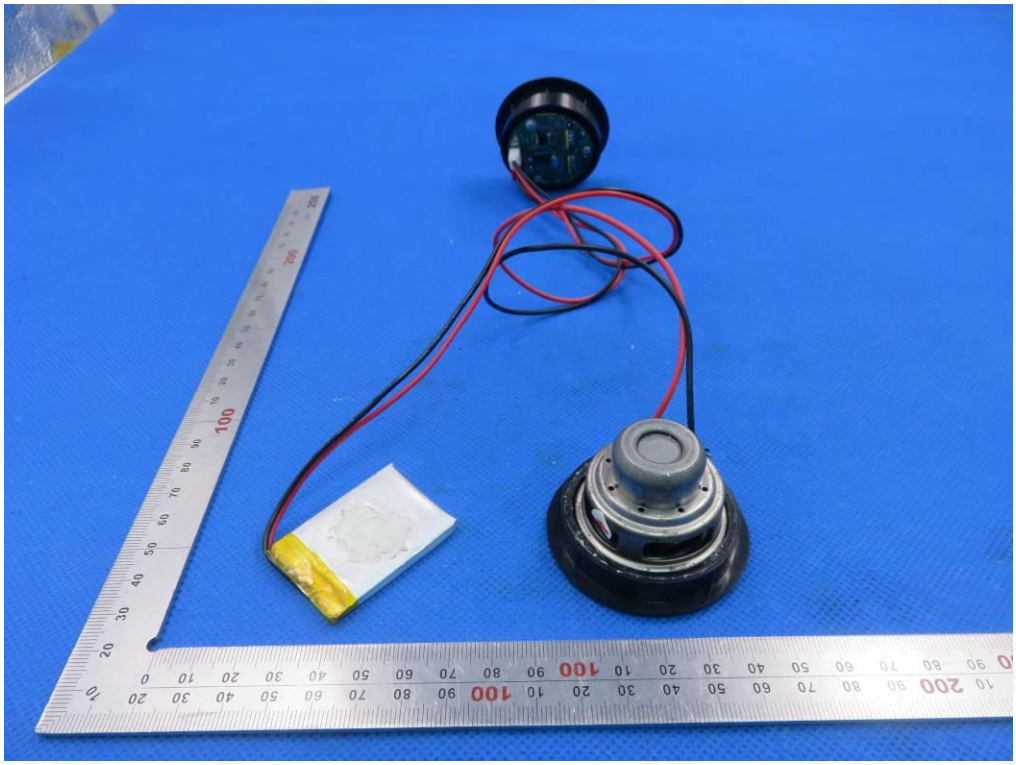
BACK VIEW OF EUT



LEFT VIEW OF EUT

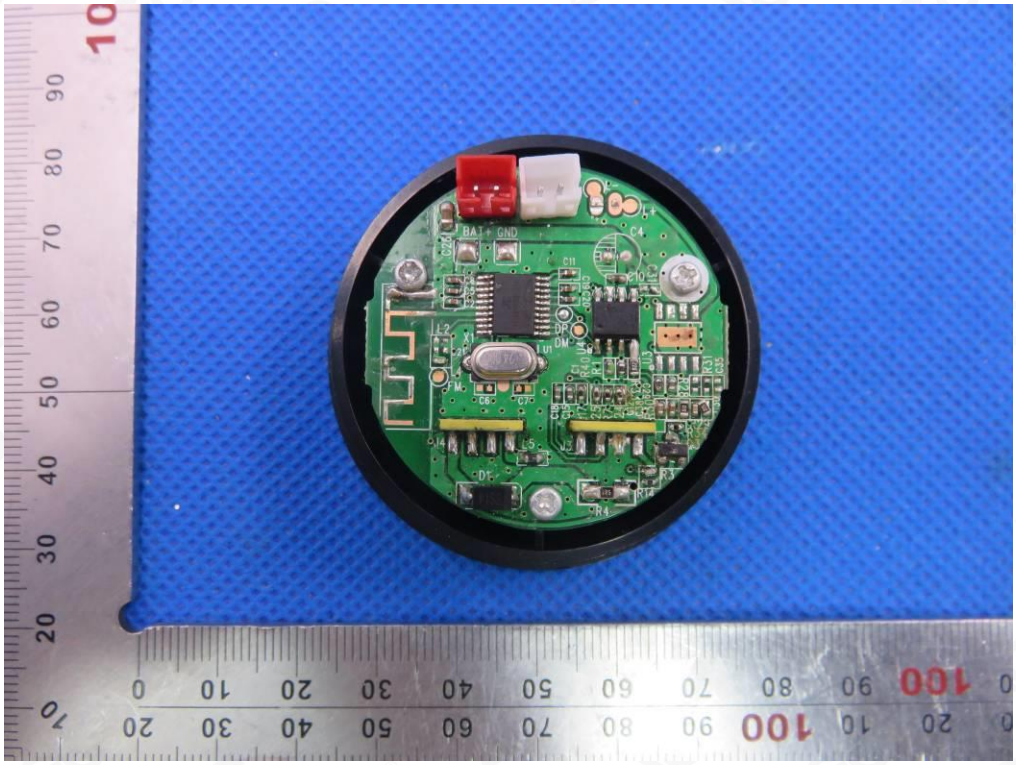


RIGHT VIEW OF EUT



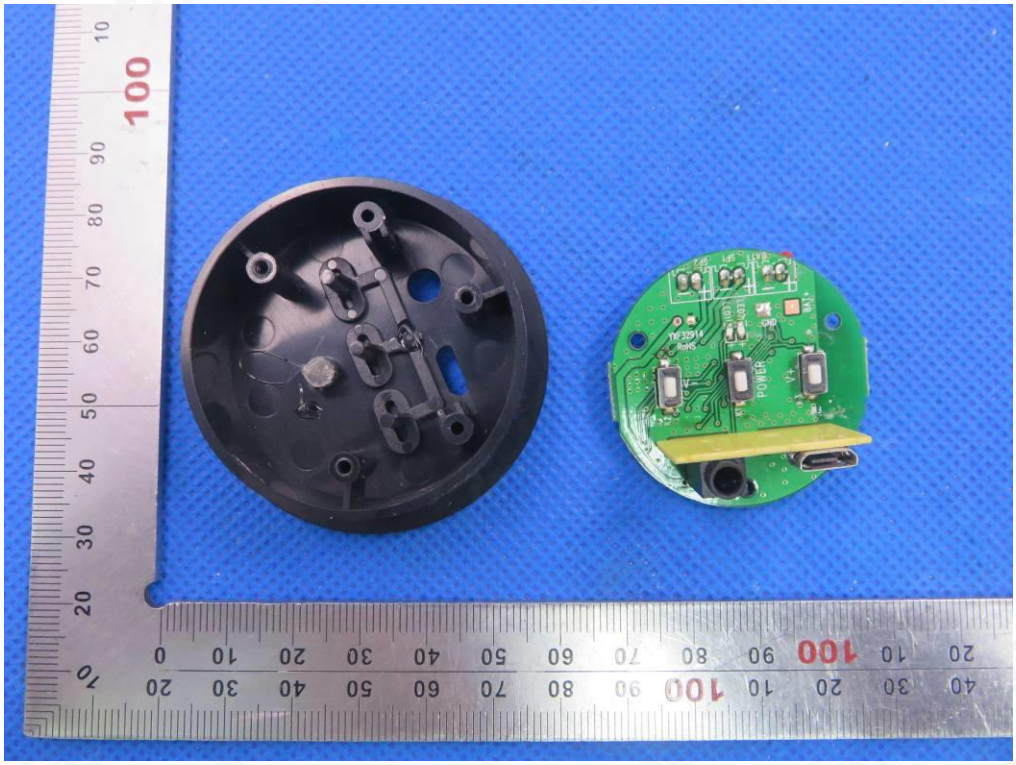
VIEW OF EUT(PORT)

OPEN VIEW OF EUT-1

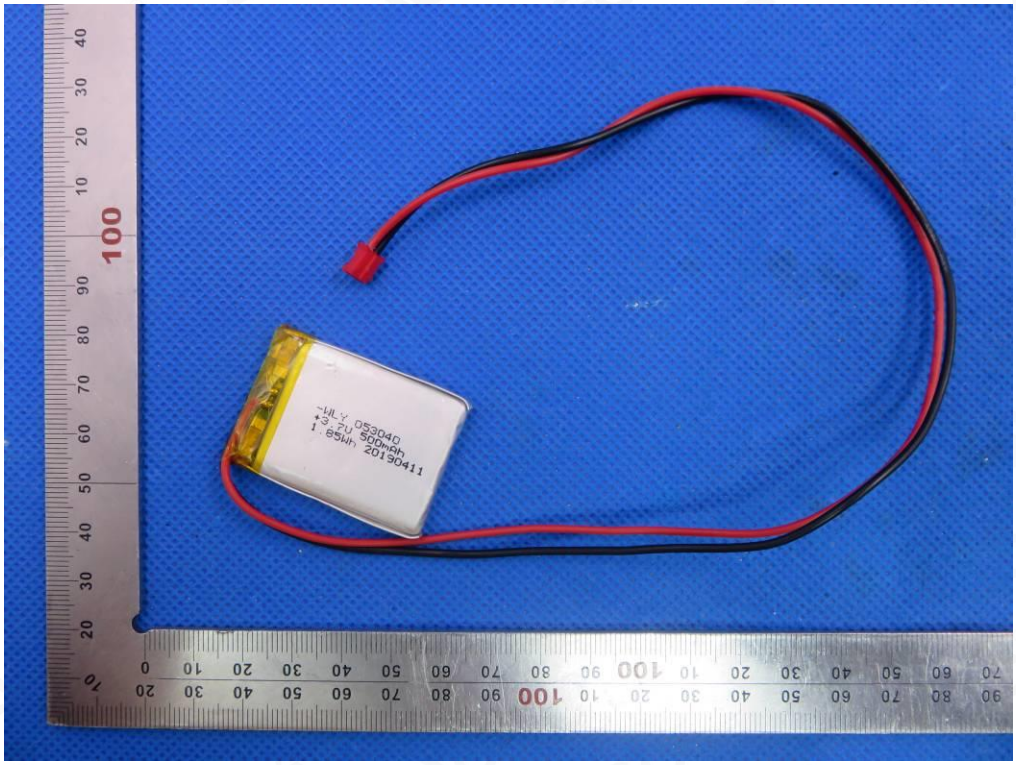


OPEN VIEW OF EUT-2

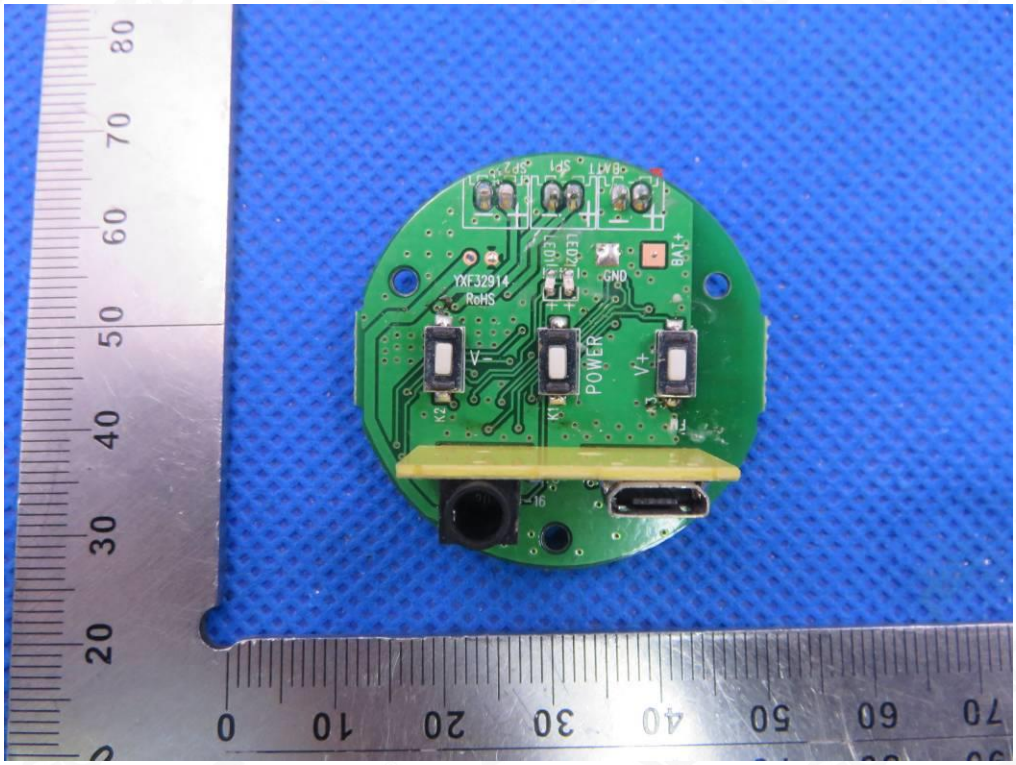
OPEN VIEW OF EUT-3



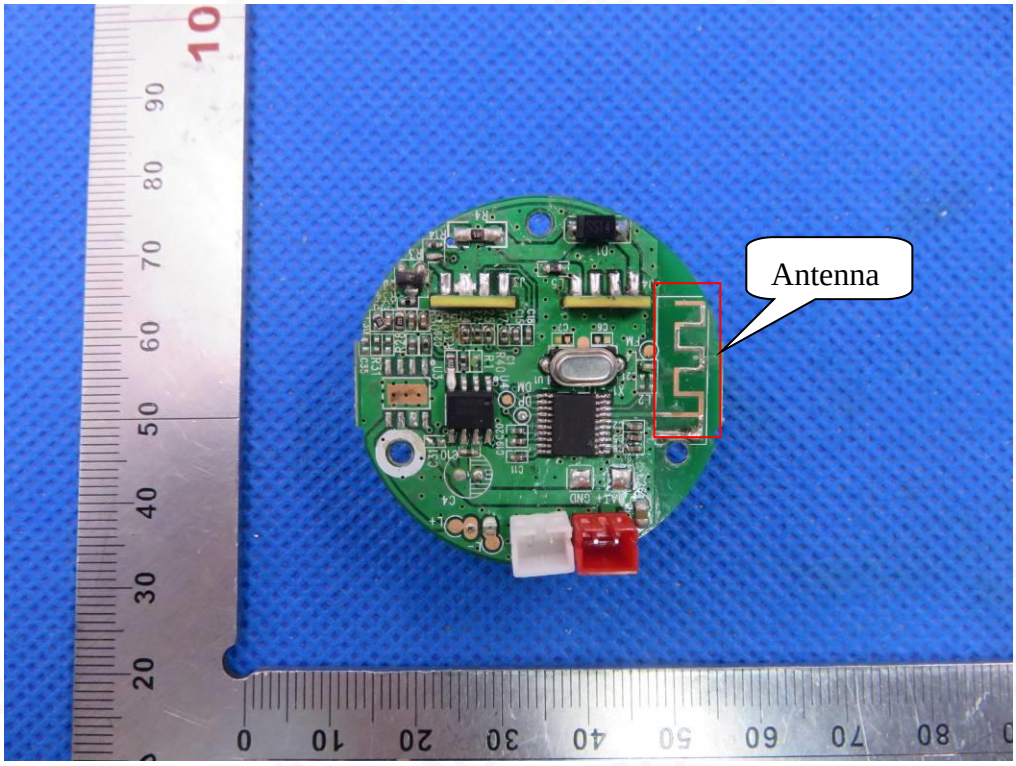
VIEW OF BATTERY



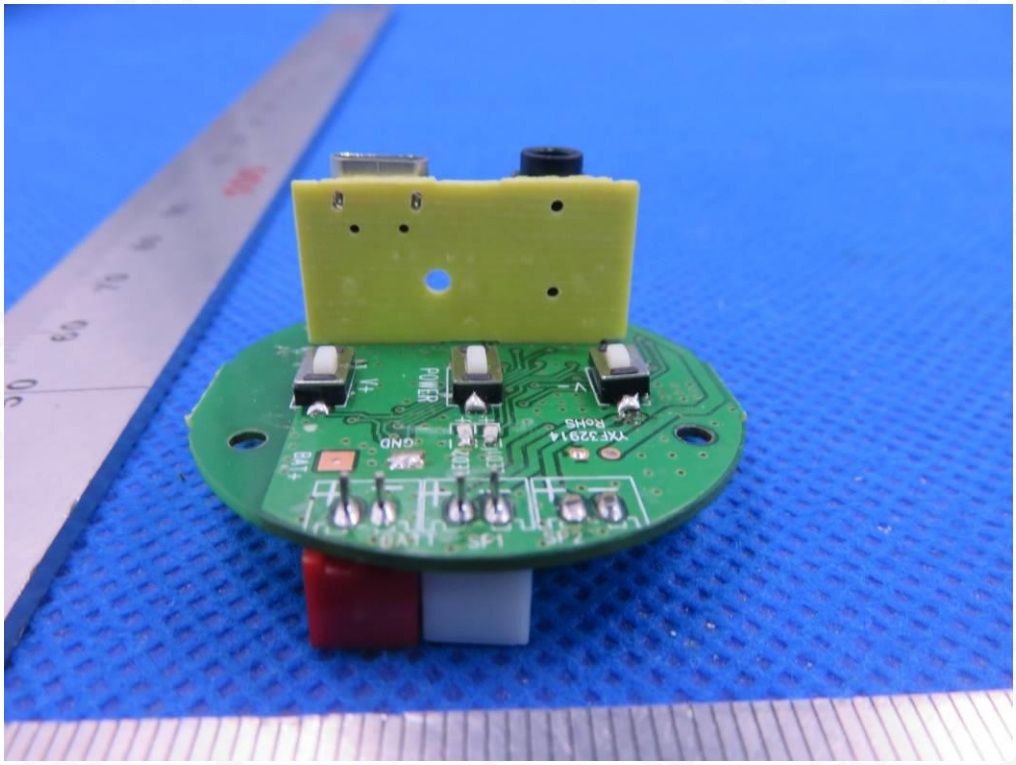
INTERNAL VIEW OF EUT-1



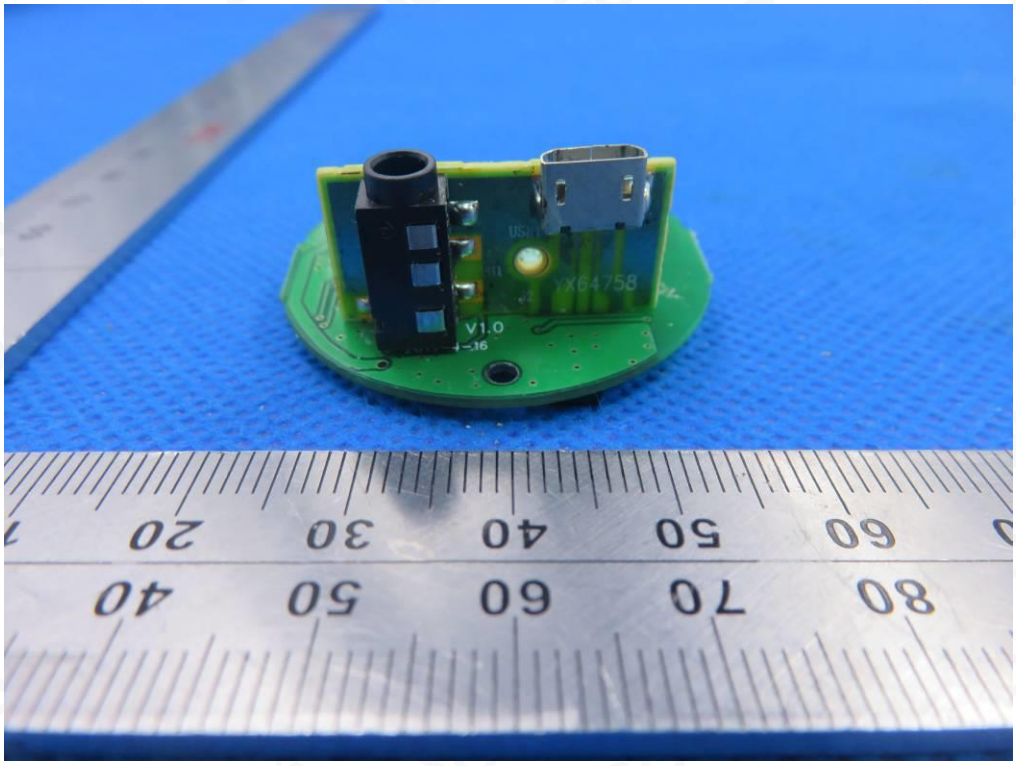
INTERNAL VIEW OF EUT-2



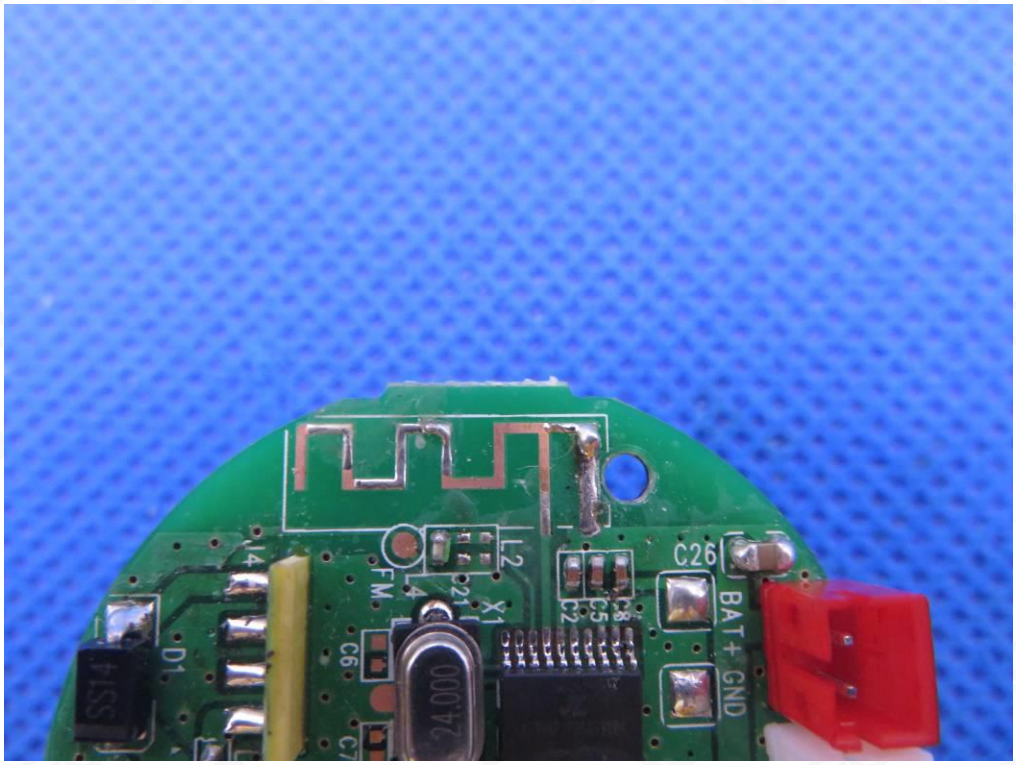

INTERNAL VIEW OF EUT-3



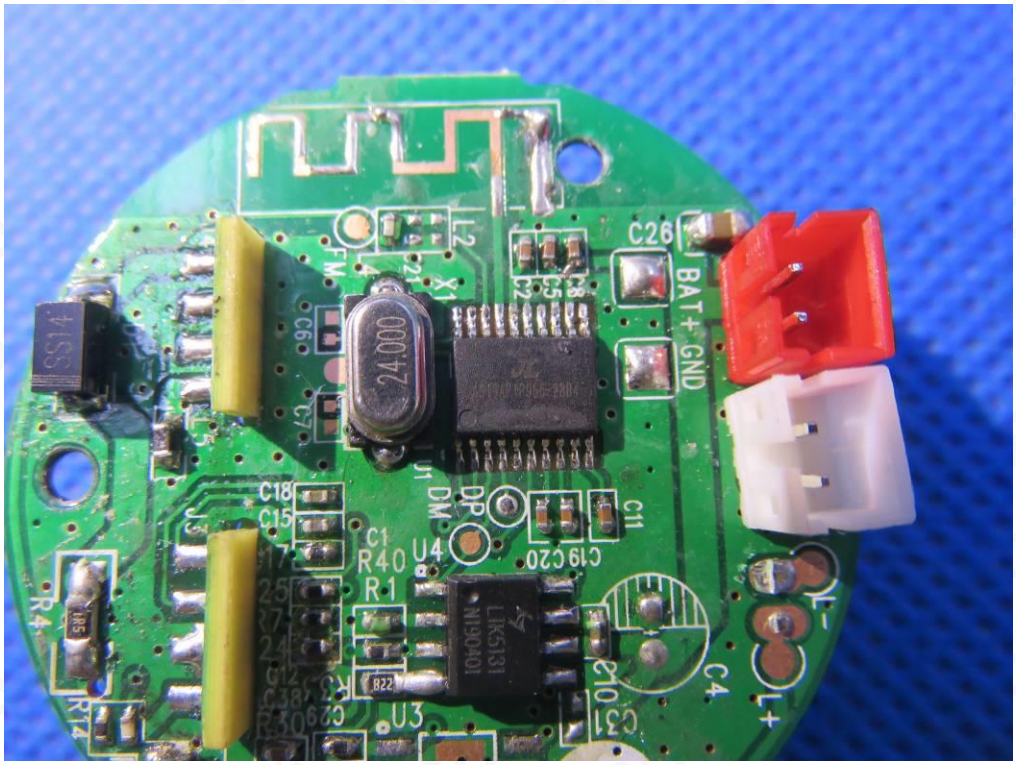
INTERNAL VIEW OF EUT-4




INTERNAL VIEW OF EUT-5



INTERNAL VIEW OF EUT-6




**----END OF REPORT----**