TEST REPORT

| | |
|---|---|
| Report No: | TW2308036-03E |
| Applicant: | Eastern Times Technology Co.,Ltd |
| Product: | REDRAGON WIRELESS 75% GASKET MECHANICAL KEYBOARD |
| Model No: | K673WB-RGB-PRO, K673BW-RGB-PRO, ET-8986, K673CPG-RGB-PRO |
| Trademark: | REDRAGON |
| Test Standards: | ETSI EN301 489-1 v 2.2.3 (2019-11)<br>ETSI EN301 489-3 v 2.3.2 (2023-01)<br>ETSI EN301 489-17 v 3.2.4 (2020-09) |
| Test Result: | The EMC testing has been performed on the submitted samples and found in compliance with council Radio Equipment Directive (RED) 2014/53/EU |

Approved By

Terry Tang

EMC Manager

Dated: August 30, 2023

**Results appearing herein relate only to the sample tested**
**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**


## SHENZHEN TIMEWAY TESTING LABORATORIES.

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (+86 755)8344 8688 Fax (+86 755)8344 2996 Email:info@timeway-lab.com

## Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

**CNAS-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

**FCC-Registration No.: 744189**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

**Industry Canada (IC) —Registration No.:5205A**

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

**A2LA (Certification Number:5013.01)**

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

**CAB identifier: CN0033**

## Table of Contents

# 1. General Information

### 1.1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The TIMEWAY Lab does not assume Responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the TIMEWAY Lab.

## 1.2 Testing Laboratory

**SHENZHEN TIMEWAY TESTING LABORATORIES.**

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel: +86 755 83448688 Fax: +86 755 83442996

Internet: www.timeway-lab.com

Site on File With the Federal Communications and Commission – United States

Registration Number: 744189

For 3m Anechoic Chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A

For 3m Anechoic Chamber

## 1.3 Details of Applicant

Name: Eastern Times Technology Co.,Ltd

Address: Building D, Nan An Industrial Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China.

## 1.4 Application Details

Date of Receipt of Application: August 02, 2023

Date of Receipt of Test Item: August 02, 2023

Date of Test: August 02, 2023 ~ August 30, 2023

## 1.5 Test Item

Manufacturer: Eastern Times Technology Co.,Ltd
Address: Building D, Nan An Industrial Area, Youganpu Village, Fenggang Town, Dongguan City, Guangdong, China.
Trademark: REDRAGON
Model No.: K673WB-RGB-PRO
Additional Model: K673BW-RGB-PRO, ET-8986, K673CPG-RGB-PRO
Description: REDRAGON WIRELESS 75% GASKET MECHANICAL KEYBOARD

## Additional Information

Frequency: 2403MHz-2480MHz for Keyboard/dongle Part
Channel Number: 16
Channel List (unit: MHz): 2403, 2424, 2441, 2461, 2414, 2435, 2450, 2470, 2409, 2429, 2455, 2475, 2419, 2445, 2465, 2480
Modulation Type: GFSK

Frequency 2: 2402MHz-2480MHz for Keyboard Bluetooth mode
Channel Separation: 1MHz for Bluetooth
Modulation Type: GFSK (Bluetooth)

Antenna Designation: PCB antenna with maximum gain -7.30dBi for keyboard part and 1.66dBi for USB dongle part
Rating: DC5V hosted from PC for USB dongle part; DC5V, 825mA or DC3.7V, 325mA for Keyboard Part
Battery: DC3.7V, 3000mAh Li-ion battery or keyboard part (Li-ion battery)
Operation Distance: N/A
Resolution: N/A
Extreme Temp. Tolerance: -20℃ to 55℃

**Note: Classification according to CEPT/ERC Recommendation 70-03 & ETSI EN301 489-3 v 2.3.2 (2023-01) and ETSI EN301 489-17 v 3.2.4 (2020-09)**

## 1.6 Equipment Classification

| Equipment Category: 3 |
|---|

## 1.7 List of Ports

| Port | Description | Classification[1] | Maximum cable Length | Cable Type |
|---|---|---|---|---|
| N/A | | | | |

Note [1]prots shall be classified as ac power, dc power or signal/control port.
[2]Maximum cable length corresponding to the appropriate ports shall be classified as ≤3m or >3m.

## 1.8 Ancillary and Peripheral Devices

| Description | Designation | Serial No. | Manufacturer |
|---|---|---|---|
| N/A | | | |

**List of Peripheral Devices Used for Testing**

| Description | Designation | Serial No. | Manufacturer |
|---|---|---|---|
| N/A | | | |

Note: An Equipment (apparatus) used in connection with a receiver or transmitter is considered as an ancillary Equipment (apparatus) if:

a. The equipment is intended for use in conjunction with a receiver or transmitter to provide additional operational and/or control features to the radio equipment. (e.g. to extend control to another position or location); and

b. The equipment cannot be used on a stand alone basis to provide user functions independently of a receiver or transmitter; and

c. The receiver or transmitter to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

## 1.9 Test Standards

| **ETSI EN 301 489-1 v 2.2.3 (2019-11)** |
|---|
| Electromagnetic Compatibility (EMC) standard for radio equipment and services; |
| Part 1: Common technical requirements |
| Harmonised Standard for ElectroMagnetic Compatibility |
| **ETSI EN 301 489-3 v 2.3.2 (2023-01)** |
| ElectroMagnetic Compatibility (EMC) standard for radio equipment and services |
| Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; |
| Harmonised Standard for ElectroMagnetic Compatibility |
| **ETSI EN301 489-17 v 3.2.4 (2020-09)** |

| ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; |
|---|
| Part 17: Specific conditions for Broadband Data Transmission Systems; |
| Harmonised Standard for ElectroMagnetic Compatibility |

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

### 1.10 Test or Witness Test Engineering

Test By: Andy Xing

Printing Name: Andy Xing

## 2. Technical Test

### 2.1 Summary of Test Results

| No deviations from the technical specification(s) were ascertained in the course of the tests Performed | |
|---|---|
| Final Verdict:<br>(Only "Passed" if all Measurements are "Passed") | **Pass** |

### 2.2 Test Report

**Emission (EMI)**

| EMI Phenomenon | Port | Requirement | | EUT Setup | Result | Applicability |
|---|---|---|---|---|---|---|
| | | Standard | Basic Standard | | | |
| Conducted Interference Voltage | AC Mains | ETSI EN 301489-1: 2019-11 Clause 8.4 | EN 55032:2015 +A11:2020 +A1:2020 | Refer to Section 4 | Complies | Applicable |
| Radiated Interference Field Strength 30~6000MHz | Enclosure | ETSI EN 301 489-1: 2019-11 Clause 8.2 | EN 55032:2015 +A11:2020 +A1:2020 | Refer to Section 4 | Complies | Applicable |
| Harmonic Current Emissions | AC Mains Input Port | ETSI EN 301 489-1: 2019-11 Clause 8.5 | EN IEC 61000-3-2: 2019+A1:2021 | Refer to Section 4 | Complies | Not Applicable |
| Flicker & Voltage Fluctuation | AC Mains Input Port | ETSI EN 301 489-1: 2019-11 Clause 8.6 | EN 61000-3-3: 2013+A2:2021 +AC:2022-01 | Refer to Section 4 | Complies | Not Applicable |

**Immunity (EMS)**

| EM3 Phenomenon | Port | Requirement | | EUT Setup | Result | Applicability |
|---|---|---|---|---|---|---|
| | | Standard | Basic Standard | | | |
| Electronic Discharge (ESD) | Enclosure | ETSI EN 301 489-1: 2019-11 Clause 9.3 | EN 61000-4-2: 2009 | Refer to Section 4 | Complies | Applicable |
| RF-Electro-Magnetic Field (80-6000MHz) | Enclosure | ETSI EN 301 489-1: 2019-11 Clause 9.2 | EN IEC 61000-4-3:2020 | Refer to Section 4 | Complies | Applicable |
| Fast Transients, Burst | Power Line AC/DC | ETSI EN 301 489-1: 2019-11 Clause 9.4 | EN 61000-4-4: 2012 | Refer to Section 4 | Complies | Applicable |
| Surge | Power Line (1 phase) | ETSI EN 301 489-1: 2019-11 Clause 9.8 | EN 61000-4-5: 2014 | Refer to Section 4 | Complies | Applicable |
| Transients & Surge Vehicular Environment | Power Line (Car Charge) | ETSI EN 301 489-1: 2019-11 Clause 9.6 | ISO 7637-1/2 | Refer to Section 4 | Complies | Not Applicable |
| RF Common Mode (0.15-80MHz) | Power Line AC/DC signal Lines | ETSI EN 301 489-1: 2019-11 Clause 9.5 | EN 61000-4-6: 2014 | Refer to Section 4 | Complies | Applicable |
| Vol. Dips, Interruptions& Fluctuations (AC Power) | Input& Output AC Ports only | ETSI EN 301 489-1: 2019-11 Clause 9.7 | EN IEC 61000-4-11: 2020 | Refer to Section 4 | Complies | Applicable |

**N/A=Not Applicable**

-Performance criteria A for immunity tests with phenomena of a continuous nature;

Communication between the Tx and Rx or other BT device in the front of pings should not drop during the test.

-Performance criteria B for immunity tests with phenomena of a transient nature;

N/A

-Performance criteria C for immunity tests with power interruptions exceeding a certain time.

N/A

**Note: For details see subclause 6.1 ETSI EN 301 489-3**

**2.3 Measurement Uncertainty**

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

| Test Item | Uncertainty |
|---|---|
| Conducted Emissions | 3.6dB |
| Radiated Emissions | 4.7dB (Below 1GHz); 5.0dB (above 1GHz) |
| Harmonic Current Emission | 1.2% |
| Voltage Fluctuations and Flicker | 1.5% |
| Electrostatic Discharge | The waveform of voltage: 1.6%; Time: 3.1% |
| RF Electromagnetic Field | 3.1dB |
| Electrical Fast Transients | The waveform of voltage: 1.5%; Time: 2.9% |
| Surge | The waveform of voltage: 1.5%; Time: 2.9% |
| RF Common Mode | 3.9dB |
| Voltage Dips and Interruptions | The waveform of voltage: 1.5%; Time: 2.9% |

## Clause 8.2 Emission Test – Radiated Emission

This test assesses that ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

## According to EMC basic standard (EN 55032)

Measurement according to EMC basic standard, The test results correspond to the 3m Semi-Anechoic Chamber results.

The EUT and it simulators are placed on a turntable which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission, all of The interface cables must be manipulated according to EN55032: 2015 on radiated measurement.

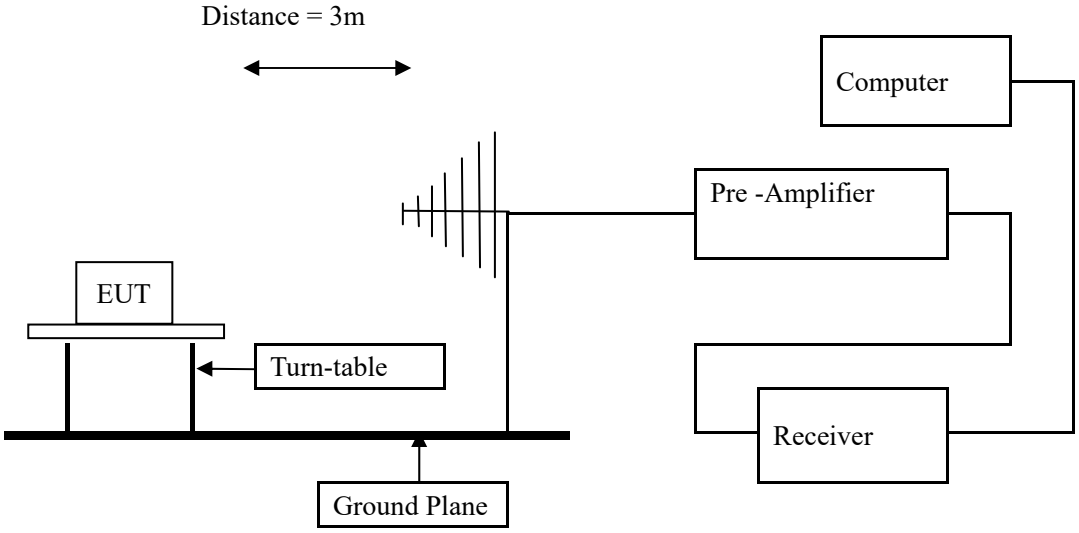
Radiated emissions were invested over the frequency range from 30MHz to 1 GHz using a receiver bandwidth of 120kHz.

Radiated emissions were invested over the frequency range from 30MHz to 6 GHz

Radiated Emission was performed at an antenna to EUT distance of 3 meters.

**Radiated Emission Test**

**Block diagram of Test setup**




Power line conducted Emission Limit

| Frequency Range (MHz) | Distance (m) | Quasi-Peak limits (dB μ V/m) |
|---|---|---|
| 30-230 | 10/3 | 30.0/40.0 |
| 230-1000 | 10/3 | 37.0/47.0 |
| 1000-3000 | 3 | 50 （AV）/70（PK） |
| 3000-6000 | 3 | 54 （AV）/74（PK） |

Note: The lower limit shall apply at the transition frequencies

Test result

Please refer to following table

**A: Radiated Disturbance (30MHz----1000MHz)**

**EUT Operating Environment**

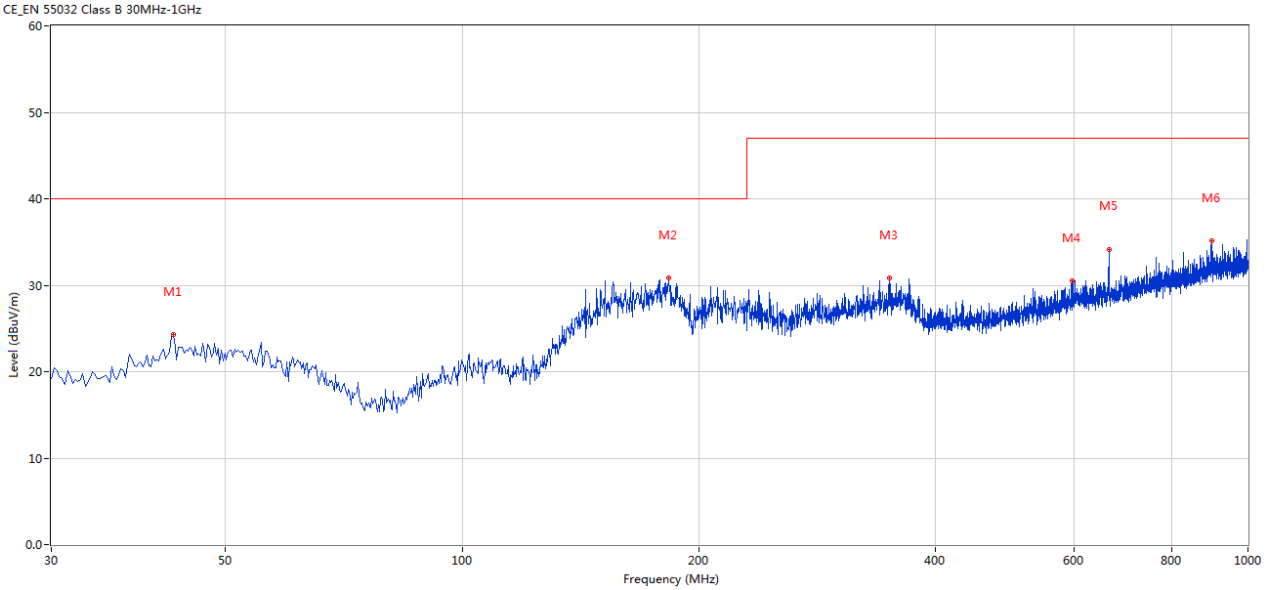
Temperature: 25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Bluetooth Mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Margin (dB) | Detector | Table (Degree) | Height (cm) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 42.849 | 24.28 | -11.52 | 40.0 | 15.72 | Peak | 157.00 | 100 | Horizontal | Pass |
| 2 | 182.979 | 30.81 | -14.94 | 40.0 | 9.19 | Peak | 265.00 | 100 | Horizontal | Pass |
| 3 | 349.293 | 30.79 | -9.41 | 47.0 | 16.21 | Peak | 359.00 | 100 | Horizontal | Pass |
| 4 | 596.581 | 30.45 | -5.13 | 47.0 | 16.55 | Peak | 305.00 | 100 | Horizontal | Pass |
| 5 | 666.403 | 34.17 | -4.50 | 47.0 | 12.83 | Peak | 255.00 | 100 | Horizontal | Pass |
| 6 | 899.145 | 35.16 | -1.81 | 47.0 | 11.84 | Peak | 253.00 | 100 | Horizontal | Pass |

**B: Radiated Disturbance (30MHz----1000MHz)**

**EUT Operating Environment**

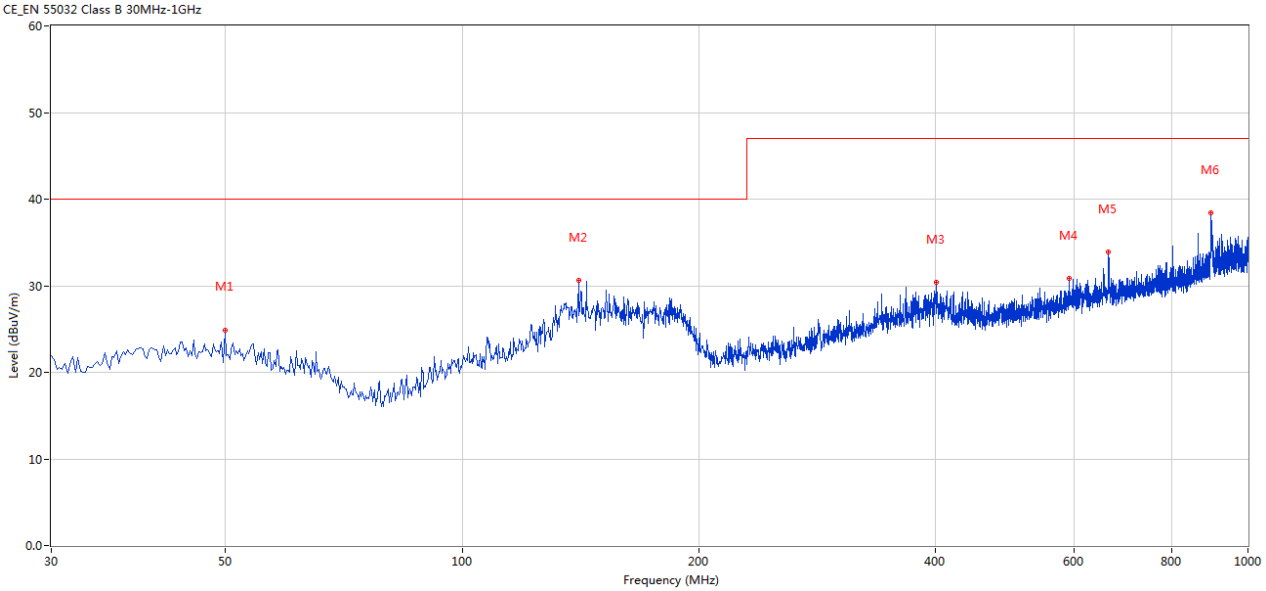
Temperature:25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Bluetooth Mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Margin (dB) | Detector | Table (Degree) | Height (cm) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 49.880 | 24.91 | -11.36 | 40.0 | 15.09 | Peak | 161.00 | 100 | Vertical | Pass |
| 2 | 140.552 | 30.63 | -17.24 | 40.0 | 9.37 | Peak | 235.00 | 100 | Vertical | Pass |
| 3 | 401.660 | 30.39 | -8.60 | 47.0 | 16.61 | Peak | 322.00 | 100 | Vertical | Pass |
| 4 | 591.975 | 30.85 | -5.16 | 47.0 | 16.15 | Peak | 161.00 | 100 | Vertical | Pass |
| 5 | 663.494 | 33.93 | -4.45 | 47.0 | 13.07 | Peak | 343.00 | 100 | Vertical | Pass |
| 6 | 897.448 | 38.40 | -1.76 | 47.0 | 8.60 | Peak | 320.00 | 100 | Vertical | Pass |

**C: Radiated Disturbance (1000MHz----6000MHz) --- Horizontal**

**EUT Operating Environment**

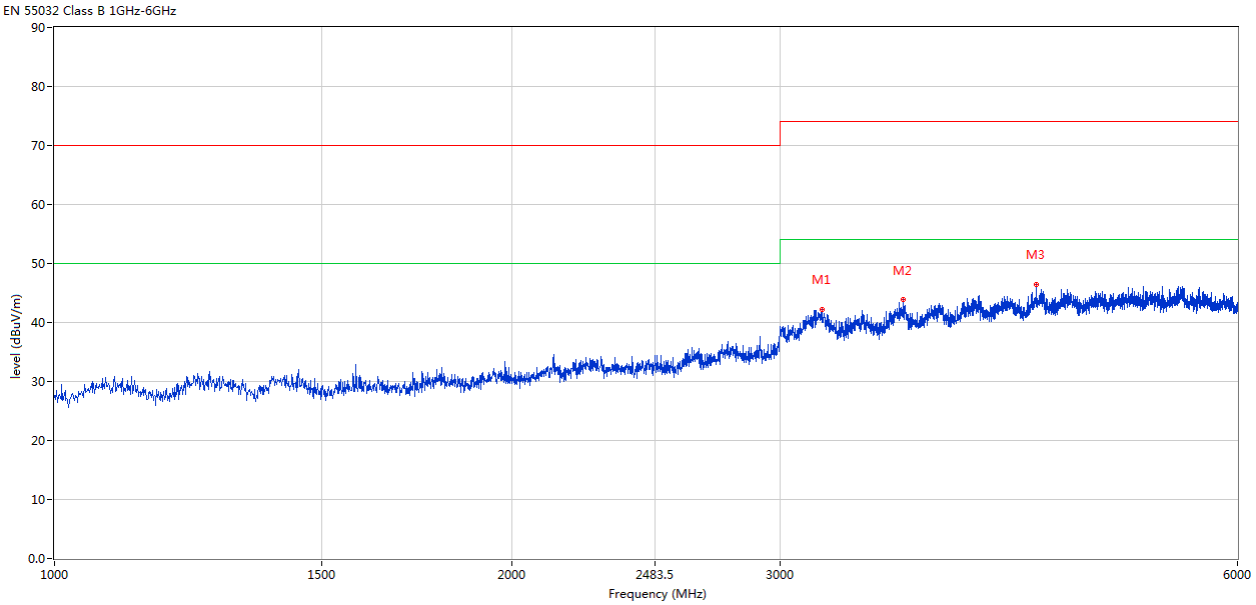
Temperature: 25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Bluetooth Mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3197.500 | 42.27 | -1.98 | 74.0 | -31.73 | Peak | 15.00 | 100 | Horizontal | Pass |
| 2 | 3617.500 | 43.89 | -0.53 | 74.0 | -30.11 | Peak | 9.00 | 100 | Horizontal | Pass |
| 3 | 4423.750 | 46.50 | 2.05 | 74.0 | -27.50 | Peak | 3.00 | 100 | Horizontal | Pass |

**D: Radiated Disturbance (1000MHz----6000MHz) --- Vertical**

**EUT Operating Environment**

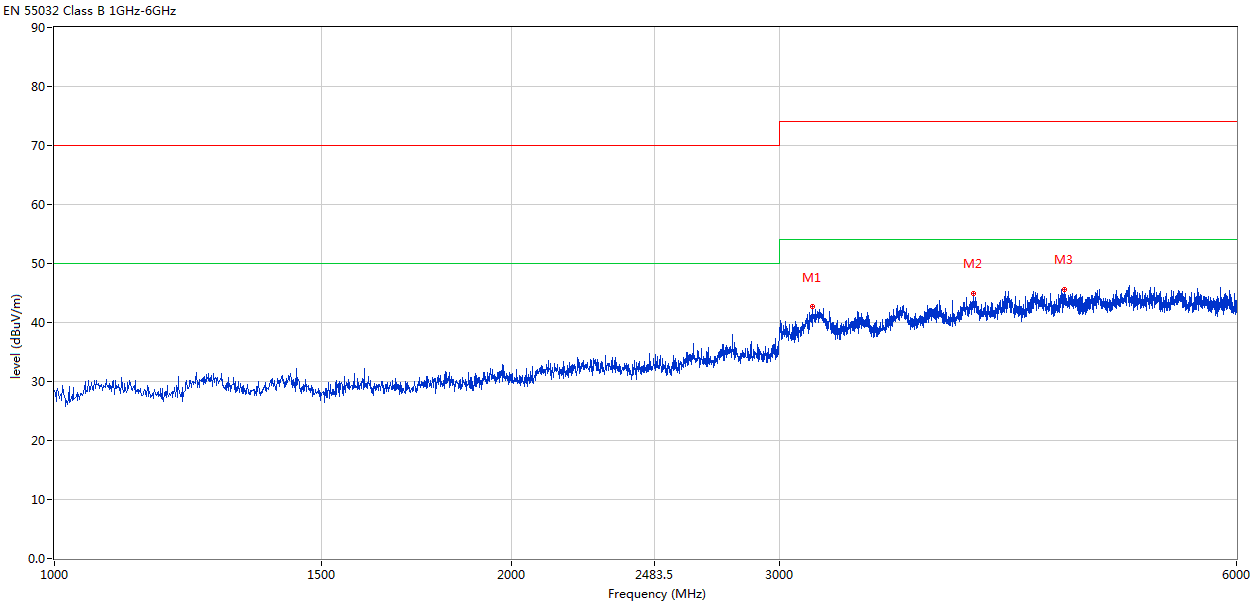
Temperature:25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Bluetooth Mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3156.250 | 42.65 | -2.07 | 74.0 | -31.35 | Peak | 12.00 | 100 | Vertical | Pass |
| 2 | 4030.000 | 44.94 | 1.26 | 74.0 | -29.06 | Peak | 11.00 | 100 | Vertical | Pass |
| 3 | 4620.000 | 45.68 | 2.63 | 74.0 | -28.32 | Peak | 15.00 | 100 | Vertical | Pass |

**E: Radiated Disturbance (30MHz----1000MHz)**

**EUT Operating Environment**

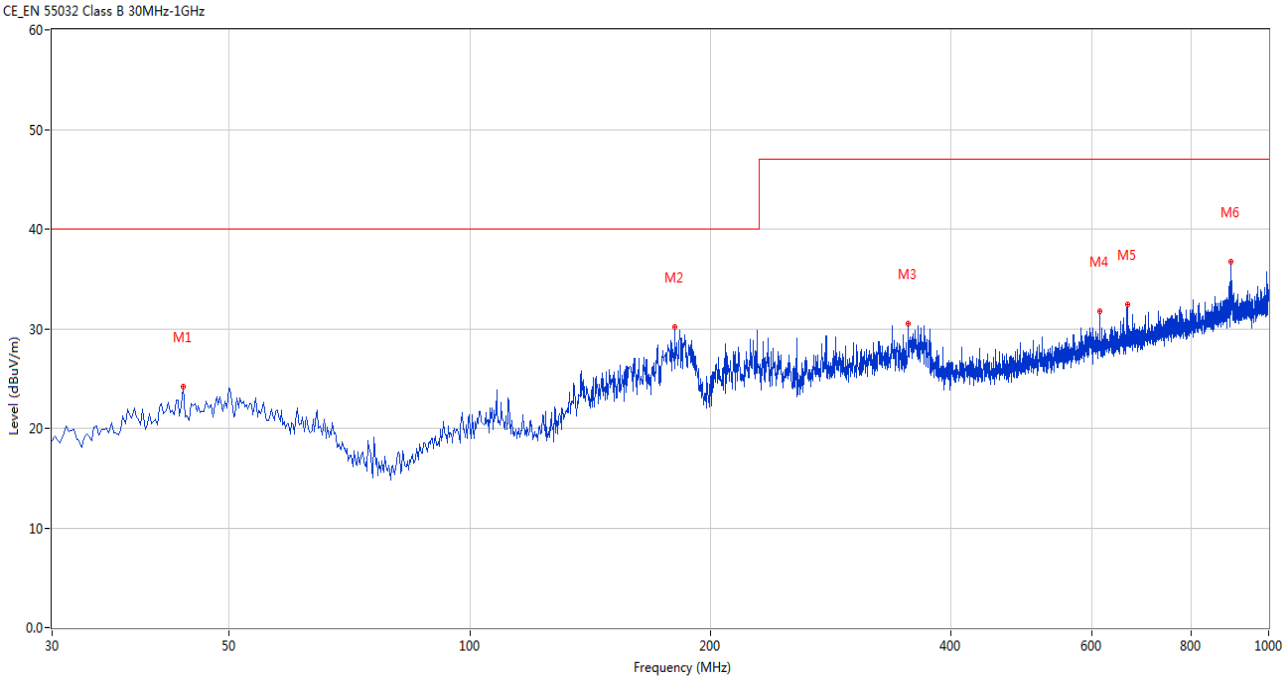
Temperature: 25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: 2.4G Mode (Keyboard communication with dongle)**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Margin (dB) | Detector | Table (Degree) | Height (cm) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 43.819 | 24.13 | -11.48 | 40.0 | 15.87 | Peak | 284.00 | 100 | Horizontal | Pass |
| 2 | 180.555 | 30.18 | -15.23 | 40.0 | 9.82 | Peak | 262.00 | 100 | Horizontal | Pass |
| 3 | 354.141 | 30.52 | -9.45 | 47.0 | 16.48 | Peak | 358.00 | 100 | Horizontal | Pass |
| 4 | 615.249 | 31.70 | -5.12 | 47.0 | 15.30 | Peak | 249.00 | 100 | Horizontal | Pass |
| 5 | 665.191 | 32.41 | -4.44 | 47.0 | 14.59 | Peak | 272.00 | 100 | Horizontal | Pass |
| 6 | 895.751 | 36.73 | -1.78 | 47.0 | 10.27 | Peak | 13.00 | 100 | Horizontal | Pass |
| 7 | 93.519 | 19.34 | -14.41 | 40.0 | 20.66 | Peak | 196.00 | 100 | Horizontal | Pass |

**F: Radiated Disturbance (30MHz----1000MHz)**

**EUT Operating Environment**

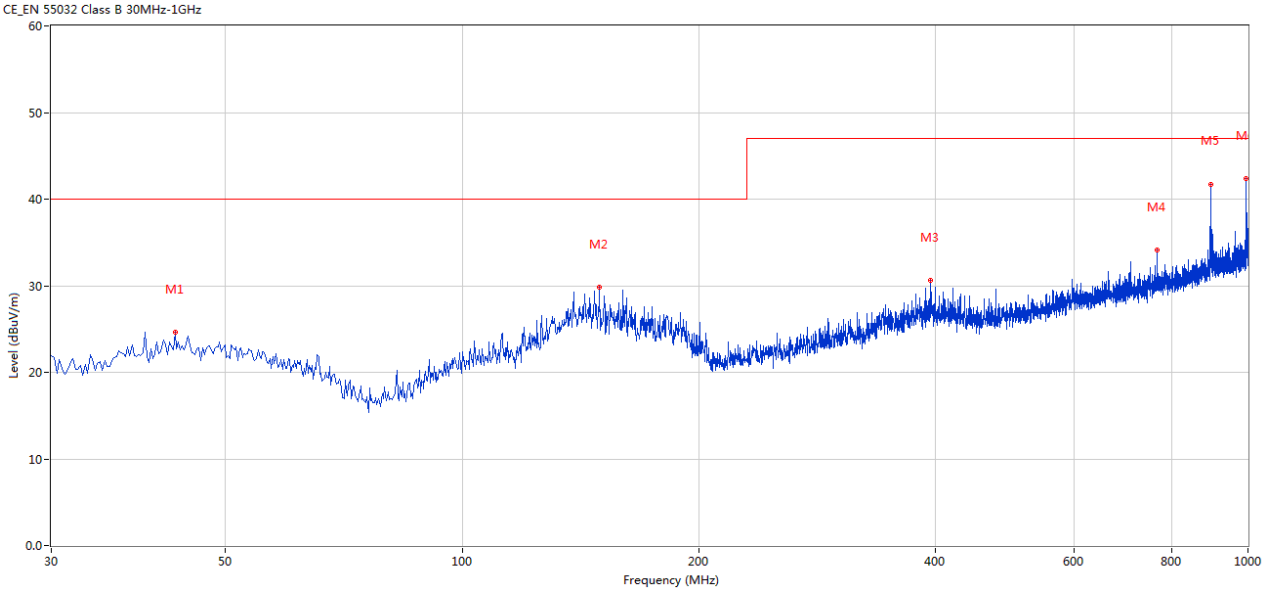
Temperature:25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: 2.4G Mode (Keyboard communication with dongle)**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Margin (dB) | Detector | Table (Degree) | Height (cm) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 43.092 | 24.64 | -11.50 | 40.0 | 15.36 | Peak | 265.00 | 100 | Vertical | Pass |
| 2 | 149.523 | 29.79 | -17.07 | 40.0 | 10.21 | Peak | 242.00 | 100 | Vertical | Pass |
| 3 | 394.871 | 30.61 | -8.75 | 47.0 | 16.39 | Peak | 319.00 | 100 | Vertical | Pass |
| 4 | 765.804 | 34.17 | -3.23 | 47.0 | 12.83 | Peak | 297.00 | 100 | Vertical | Pass |
| 5 | 895.994 | 41.65 | -1.76 | 47.0 | 5.35 | Peak | 333.00 | 100 | Vertical | Pass |
| 6 | 995.394 | 42.38 | -1.26 | 47.0 | 4.62 | Peak | 341.00 | 100 | Vertical | Pass |

**G: Radiated Disturbance (1000MHz----6000MHz) --- Horizontal**

**EUT Operating Environment**

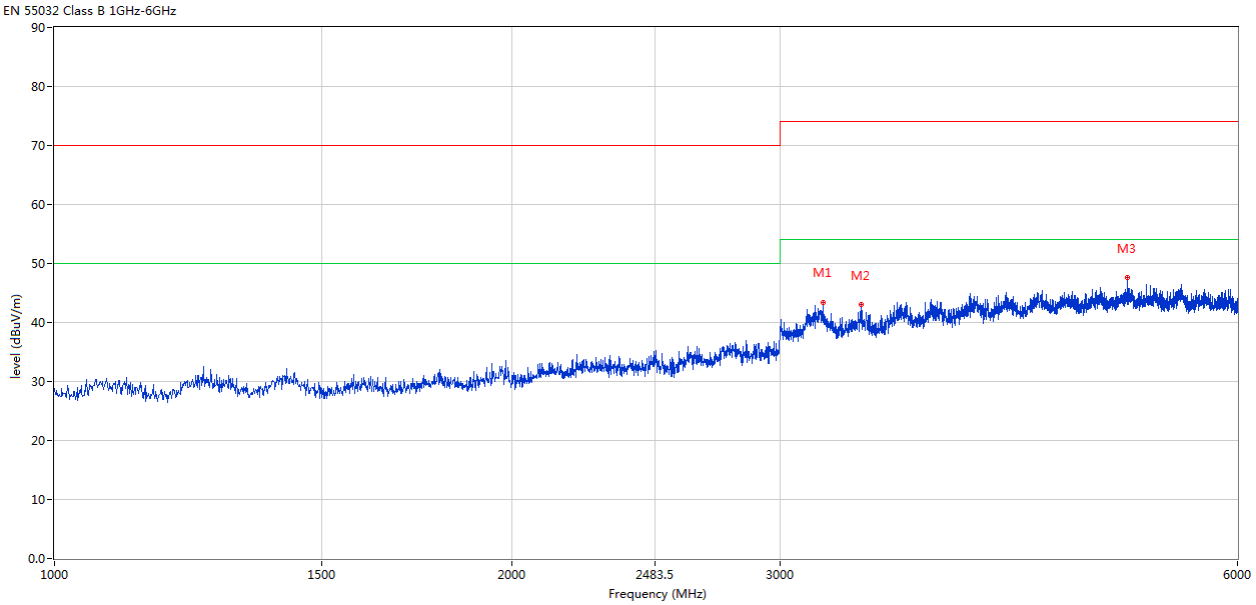
Temperature: 25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: 2.4G Mode (Keyboard communication with dongle)**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3201.250 | 43.41 | -1.97 | 74.0 | -30.59 | Peak | 3.00 | 100 | Horizontal | Pass |
| 2 | 3395.000 | 43.00 | -1.81 | 74.0 | -31.00 | Peak | 9.00 | 100 | Horizontal | Pass |
| 3 | 5077.500 | 47.58 | 3.73 | 74.0 | -26.42 | Peak | 11.00 | 100 | Horizontal | Pass |

**H: Radiated Disturbance (1000MHz----6000MHz) --- Vertical**

**EUT Operating Environment**

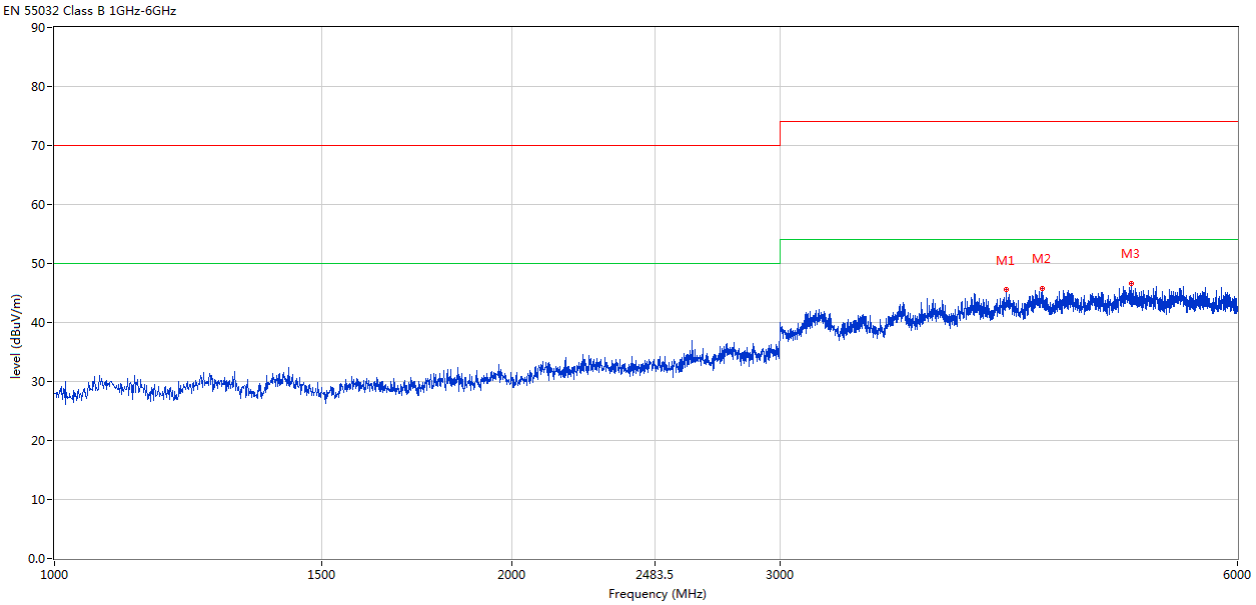
Temperature:25℃ Humidity: 55%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: 2.4G Mode (Keyboard communication with dongle)**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4228.750 | 45.54 | 1.67 | 74.0 | -28.46 | Peak | 6.00 | 100 | Vertical | Pass |
| 2 | 4463.750 | 45.80 | 2.13 | 74.0 | -28.20 | Peak | 11.00 | 100 | Vertical | Pass |
| 3 | 5112.500 | 46.66 | 3.79 | 74.0 | -27.34 | Peak | 5.00 | 100 | Vertical | Pass |

**Clause 8.4 AC Line Conducted Emissions**

According to EMC Basic Standard (EN 55032 Class-B)

1. For the table top EUT the distance to the reference ground plane (wall) should be 40 cm.
2. AC input line plugged into LISN.

EUT Operating Mode

USB Dongle part under normal operation/ Keyboard under charging mode

Results

| Power Line (L, N) | EUT Operating mode or operating mode no. | Detector (Peak, AV, QP) | Additional (scan-) Information (e.g. Pre-test Fast scan, Maxhold, Final measurement.) | Result (Passed / Failed) |
|---|---|---|---|---|
| L=>GND | USB Dongle part under normal operation/ Keyboard under charging mode | QP & AV | -- | Pass |
| N=>GND | | QP & AV | -- | Pass |

The frequency spectrum from 0.15MHz to 30MHz was investigated. All readings are quasi -peak values with a resolution bandwidth of 9 kHz

Temperature: 25℃

Humidity: 53% RH

**A:** **Conducted Emission on Live Terminal (150kHz to 30MHz)**

**EUT Operating Environment**

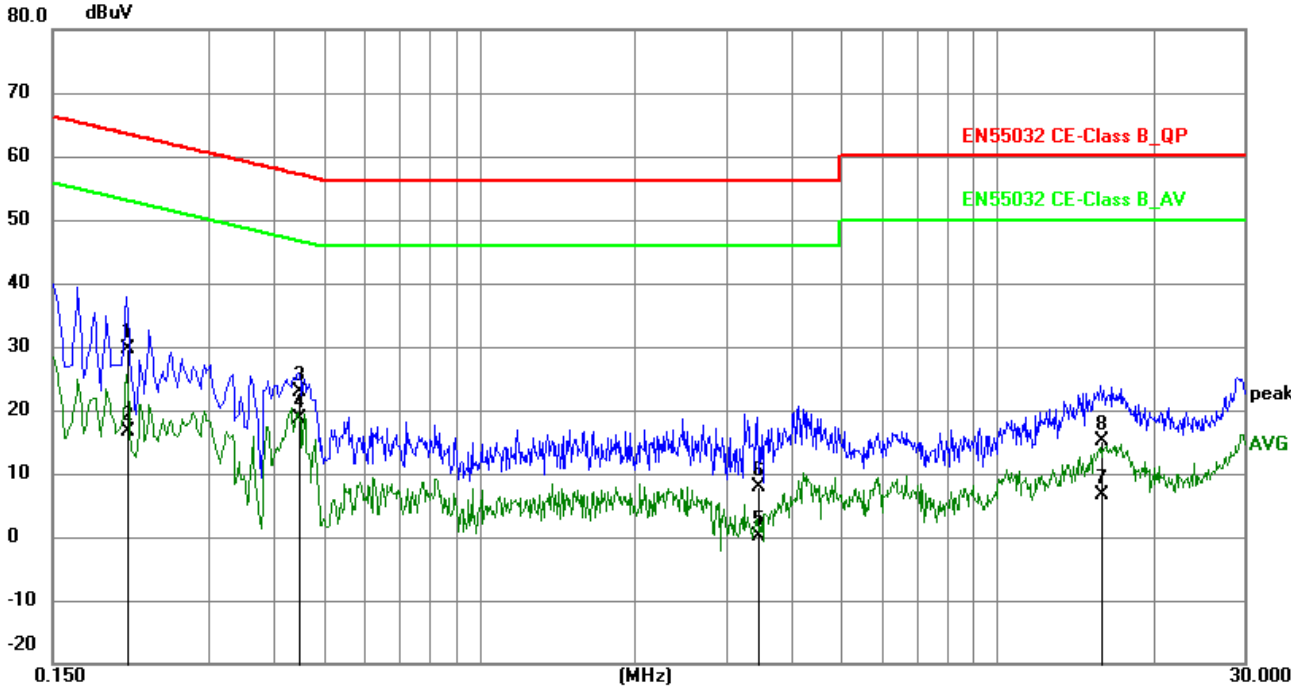
Temperature: 25℃ Humidity: 75%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Dongle under Normal operation mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.2090 | 19.81 | 9.75 | 29.56 | 63.24 | -33.68 | QP | P |
| 2 | 0.2090 | 6.99 | 9.75 | 16.74 | 53.24 | -36.50 | AVG | P |
| 3 | 0.4470 | 13.16 | 9.77 | 22.93 | 56.93 | -34.00 | QP | P |
| 4 | 0.4480 | 8.89 | 9.77 | 18.66 | 46.91 | -28.25 | AVG | P |
| 5 | 3.4520 | -9.64 | 9.86 | 0.22 | 46.00 | -45.78 | AVG | P |
| 6 | 3.4700 | -1.91 | 9.86 | 7.95 | 56.00 | -48.05 | QP | P |
| 7 | 15.8600 | -3.70 | 10.43 | 6.73 | 50.00 | -43.27 | AVG | P |
| 8 | 15.8620 | 4.79 | 10.43 | 15.22 | 60.00 | -44.78 | QP | P |

**B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)**

**EUT Operating Environment**

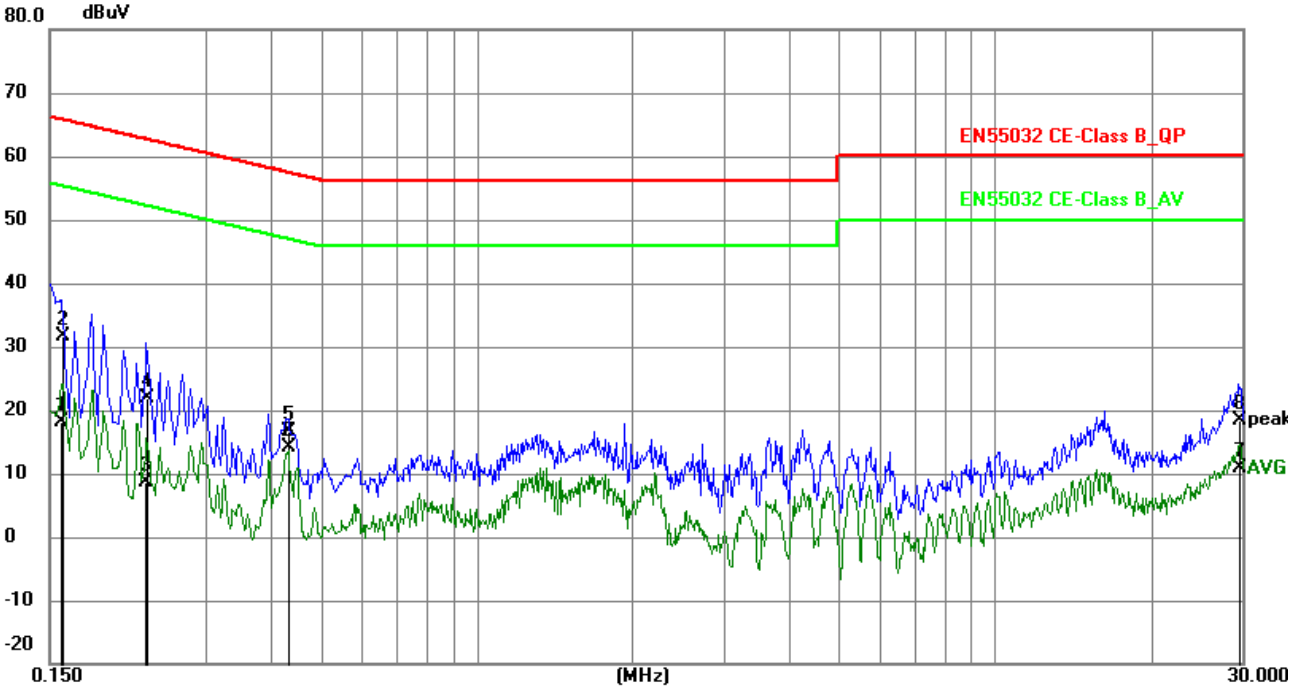
Temperature: 25℃ Humidity: 75%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Dongle under Normal operation mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1580 | 8.45 | 9.78 | 18.23 | 55.57 | -37.34 | AVG | P |
| 2 | 0.1590 | 21.75 | 9.78 | 31.53 | 65.52 | -33.99 | QP | P |
| 3 | 0.2300 | -1.12 | 9.75 | 8.63 | 52.45 | -43.82 | AVG | P |
| 4 | 0.2310 | 12.14 | 9.75 | 21.89 | 62.41 | -40.52 | QP | P |
| 5 | 0.4330 | 6.85 | 9.77 | 16.62 | 57.19 | -40.57 | QP | P |
| 6 | 0.4330 | 4.42 | 9.77 | 14.19 | 47.19 | -33.00 | AVG | P |
| 7 | 29.5790 | -0.51 | 11.27 | 10.76 | 50.00 | -39.24 | AVG | P |
| 8 | 29.5810 | 7.08 | 11.27 | 18.35 | 60.00 | -41.65 | QP | P |

**C: Conducted Emission on Live Terminal (150kHz to 30MHz)**

**EUT Operating Environment**

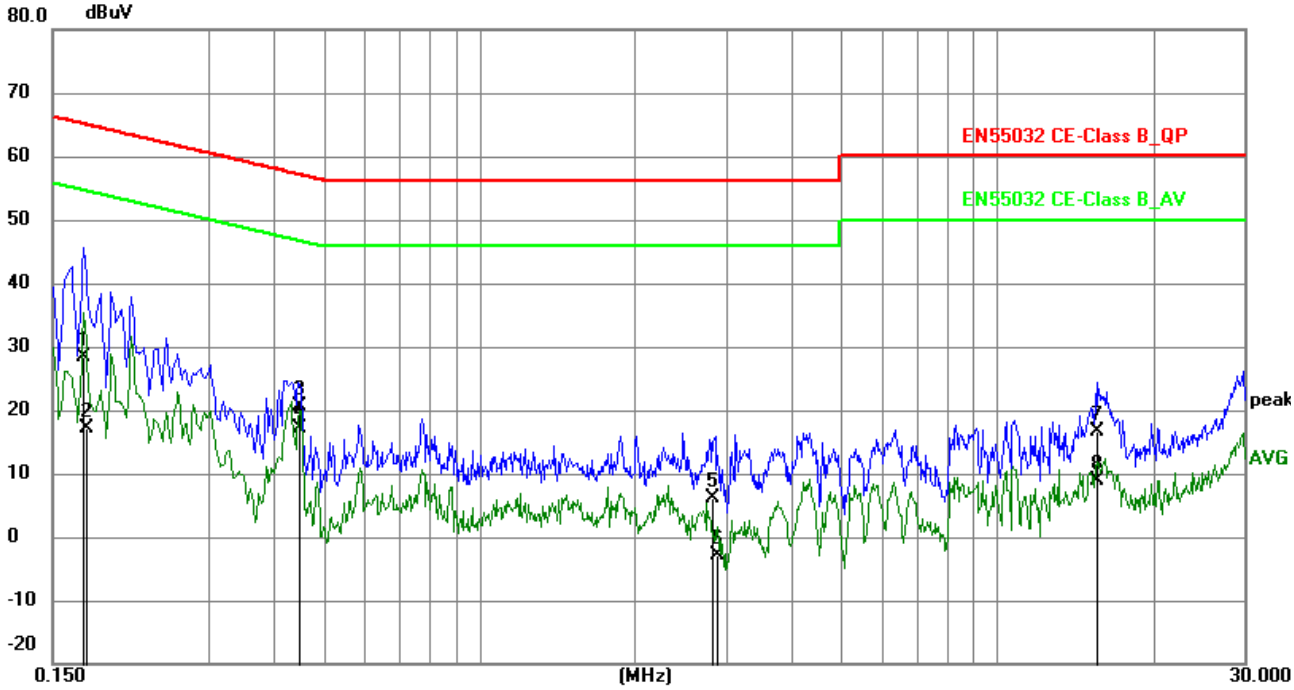
Temperature: 25℃ Humidity: 75%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Keyboard under charging mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1720 | 18.72 | 9.77 | 28.49 | 64.86 | -36.37 | QP | P |
| 2 | 0.1740 | 7.30 | 9.77 | 17.07 | 54.77 | -37.70 | AVG | P |
| 3 | 0.4480 | 10.80 | 9.77 | 20.57 | 56.91 | -36.34 | QP | P |
| 4 | 0.4480 | 7.28 | 9.77 | 17.05 | 46.91 | -29.86 | AVG | P |
| 5 | 2.8210 | -3.73 | 9.84 | 6.11 | 56.00 | -49.89 | QP | P |
| 6 | 2.8770 | -12.60 | 9.84 | -2.76 | 46.00 | -48.76 | AVG | P |
| 7 | 15.6160 | 6.31 | 10.42 | 16.73 | 60.00 | -43.27 | QP | P |
| 8 | 15.6230 | -1.44 | 10.42 | 8.98 | 50.00 | -41.02 | AVG | P |

**D: Conducted Emission on Neutral Terminal (150kHz to 30MHz)**

**EUT Operating Environment**

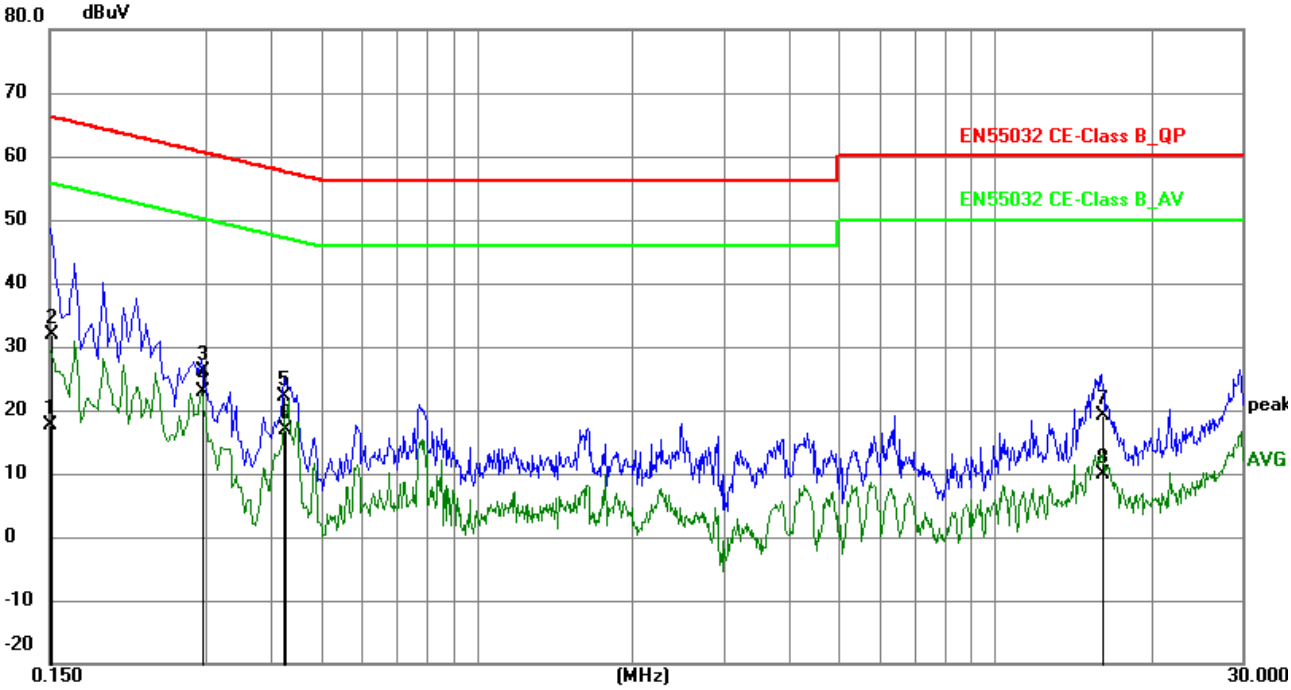
Temperature: 25℃ Humidity: 75%RH Atmospheric Pressure: 101 kPa

**EUT set Condition: Keyboard under charging mode**

**Equipment Level: Class B**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 7.92 | 9.79 | 17.71 | 56.00 | -38.29 | AVG | P |
| 2 | 0.1510 | 22.11 | 9.78 | 31.89 | 65.94 | -34.05 | QP | P |
| 3 | 0.2949 | 16.29 | 9.76 | 26.05 | 60.39 | -34.34 | QP | P |
| 4 | 0.2949 | 13.11 | 9.76 | 22.87 | 50.39 | -27.52 | AVG | P |
| 5 | 0.4240 | 12.48 | 9.76 | 22.24 | 57.37 | -35.13 | QP | P |
| 6 | 0.4260 | 7.15 | 9.76 | 16.91 | 47.33 | -30.42 | AVG | P |
| 7 | 16.1190 | 8.75 | 10.45 | 19.20 | 60.00 | -40.80 | QP | P |
| 8 | 16.1259 | -0.46 | 10.45 | 9.99 | 50.00 | -40.01 | AVG | P |

## Clause 8.5 Harmonic Current Emissions

This test was performed as per EMC Basic Standard EN IEC 61000-3-2:2019+A1:2021

EUT Operating Mode

Normal Operation

Results: **N/A**

| Port | EUT Operating mode or operating mode no. | Result (Passed / Failed) |
|---|---|---|
| AC Input | Normal Operation | N/A |

Please see the following test figure:

| **Table 1 - Limit of Harmonics Current Measurement** | |
|---|---|
| **Limits for Class A equipment** | |
| **Harmonics order (n)** | **Max. permissible harmonics current (A)** |
| Odd harmonics | |
| 3 | 2.3 |
| 5 | 1.14 |
| 7 | 0.77 |
| 9 | 0.40 |
| 11 | 0.33 |
| 13 | 0.21 |
| 15<=n<=39 | 0.15 x 15/n |
| Even harmonics | |
| 2 | 1.08 |
| 4 | 0.43 |
| 6 | 0.30 |
| 8<=n<=40 | 0.23 x 8/n |

Note:

1. For Class A equipment, the harmonics of the input current shall not exceed the absolute values given in table 1.
2. For Class B equipment, the harmonics of the input current shall not exceed the values given in table 1 multiplied by factor of 1, 5.

| **Table 2 - Limit of Harmonics Current Measurement** | |
|---|---|
| **Limits for Class C equipment** | |
| **Harmonics order (n)** | **Max. permissible harmonics current expressed as a percentage of the input current at the fundamental frequency (A)** |

| Odd harmonics only | |
|---|---|
| 2 | 2 |
| 3 | 30× λ * |
| 5 | 10 |
| 7 | 7 |
| 9 | 5 |
| 11<= n<=39 | 3 |

Note: The harmonic current limits of lighting equipment shall not exceed the relative limits given in table 2.

| **Table 3 - Limit of Harmonics Current Measurement** | | |
|---|---|---|
| **Limits for Class D equipment** | | |
| **Harmonics order (n)** | **Maximum permissible harmonic current per watt mA/W** | **Maximum permissible harmonic current A** |
| Odd harmonics only | | |
| 3 | 3.4 | 2.30 |
| 5 | 1.9 | 1.14 |
| 7 | 1.0 | 0.77 |
| 9 | 0.5 | 0.40 |
| 11 | 0.35 | 0.33 |
| 13<=n<=39 | 3.85/n | See table 1 |
| 11<= n<=39 | 3 | |

Note: The harmonic of the input current shall not exceed the values that can be derived form table 3.

**Test Equipment**

Please refer to Section 6 this report.

**Test Procedure**

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

b. The EUT is classified as follows:

Class A Balanced three-phase equipment and all other equipment, except that stated in one of the following classes.

Class B Portable tools.

Class C Lighting equipment, including dimming devices.

Class D Equipment having an input current with “special wave shape” and an active input power, P≤600W

**Note: Due to the input power less than 75W. This test item not applicable.**

## Clause 8.6 Flicker and Voltage Fluctuation

This test was performed as per EMC Basic Standard EN 61000-3-3:2013+A2:2021+AC:2022-01

Environmental conditions: Temperature: 25°C; Humidity: 50%RH

EUT Operating Mode

Normal Operation

Results

| Port | EUT Operating mode or operating mode no. | Result (Passed / Failed) |
|---|---|---|
| AC Input | Normal Operation | **N/A** |

Please refer to the following test figure

**Test Equipment**

Please refer to Section 6 this report.

**Test Procedure**

a.. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

b. During the flick measurement, the measure time shall include that part of whole operation cycle in which t he EUT 10 minutes and the observation period for long- term flicker indicator is 2 hours.

**Note: Tests need not be made on equipment which is unlikely to produce significant voltage fluctuations or flicker.**

## Clause 9.2 Immunity Test – Radiated, RF Electromagnetic Field

**According to EMC Basic Standard (EN 61000-4-3[9])**

USB Dongle part at Operating Mode and Keyboard at Operating Mode
Environmental conditions: Temperature: 25°C; Humidity: 50%RH
Type of Port: Enclosure
Performance Criterion: CT/CR
The distance between the turn-table axis and Tx&Rx-antenna is 3m.
Field strength = 3V/m
Start Frequency = 80MHz Stop Frequency = 6000MHz
Frequency Step = lin 1MHz
Modulation = AM, 400Hz,1kHz, 80%

**Results**

| Frequency (MHz) | Antenna Polarity | Radiation to | Reaction of the EUT During and after test | Result |
|---|---|---|---|---|
| 80-6000 | Horizontal | Front | No reactions recognized | Passed |
| 80-6000 | Vertical | Front | No reactions recognized | Passed |
| 80-6000 | Horizontal | Rear | No reactions recognized | Passed |
| 80-6000 | Vertical | Rear | No reactions recognized | Passed |
| 80-6000 | Horizontal | Left | No reactions recognized | Passed |
| 80-6000 | Vertical | Left | No reactions recognized | Passed |
| 80-6000 | Horizontal | Right | No reactions recognized | Passed |
| 80-6000 | Vertical | Right | No reactions recognized | Passed |

Note: Performance criteria A observed.

**Test Equipment**

Please refer to Section 6 this report.

**Test Procedure**

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with
The calibration plane such that the distance from antenna to the EUT was 3 meters.
Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.
In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

## Clause 9.3 Electrostatic Discharge

**According to EMC basic standard (EN61000-4-2[10])**

USB Dongle part at Operating Mode and Keyboard at Operating Mode

Environmental conditions: Temperature: 24°C; Humidity: 50%RH

Type of Port: Enclosure, Keys, Switch, Type-C Port, USB Port, Gaps, Screws

Performance Criterion: TT/TR

For the table top EUT the distance to the reference ground plane should be 80 cm.

Direct contact discharge on conducting surfaces of EUT

Indirect air discharge on insulating surfaces of EUT

±2kV, ±4kV direct discharge & ±2kV, ±4kV, ±8kV air discharge

**Test Results**

| **Item** | **Contact Discharge to conducted surfaces and to coupling planes** | | **Air Discharge at insulating surfaces** |
|---|---|---|---|
| | **Direct Contact Discharge** | **Indirect Contact Discharge** | |
| **Test Voltage** | **Reaction of EUT / Result** | **Reaction of EUT / Result** | **Reaction of EUT / Result** |
| +2kV | n.r.r Passed | n.r.r Passed | **n.r.r Passed** |
| -2kV | n.r.r Passed | n.r.r Passed | **n.r.r Passed** |
| +4kV | n.r.r Passed | n.r.r Passed | **n.r.r Passed** |
| -4kV | n.r.r Passed | n.r.r Passed | **n.r.r Passed** |
| +8kV | - | - | **n.r.r Passed** |
| -8kV | - | - | **n.r.r Passed** |

Remarks: n.r.r. = no reaction recognized

Performance Criteria A observed and No any function degraded during the tests.

## Clause 9.4 Fast Transients Common Mode

**According to EMC basic standard (EN61000-4-4 [11])**

USB Dongle part Under Operating Mode/ Keyboard under charging mode

Environmental conditions: Temperature: 25°C; Humidity: 51%RH

Type of Port: AC mains power input/output port

Performance Criterion: TT/TR

For the table top EUT the distance to the reference ground plane should be 10 cm.

The test level for ac mains power input ports shall be 1kV open circuit.

**Test Setup**

Burst on Power Line (direct injection)

**Test Results**

| Adjustment on UCS 500 M4: Trigger "AUTO", Burst length: 15ms | | Test Time: | 60s for every voltage and polarity | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 120s for every voltage and polarity | | | | | |
| Testing on power Line (direct injection) | | Reaction of The Test Object During and after Test | | | | | | Result |
| Test Voltage | Repetition Frequency | L1 =>GND (+=>GND) | L2=> GND | L3=> GND | N=> GND | PE=> GND | L1, N, => GND | |
| -0.5kV | 5kHz | n.r.r | N/A | N/A | n.r.r | N/A | n.r.r | **Pass** |
| +0.5kV | 5kHz | n.r.r | N/A | N/A | n.r.r | N/A | n.r.r | **Pass** |
| -1.0kV | 5kHz | n.r.r | N/A | N/A | n.r.r | N/A | n.r.r | **Pass** |
| +1.0kV | 5kHz | n.r.r | N/A | N/A | n.r.r | N/A | n.r.r | **Pass** |

## Clause 9.5 RF Common Mode

**According to EMC basic standard (EN61000-4-6 [10])**

USB Dongle part Under Operating Mode/ Keyboard under charging mode

Environmental conditions: Temperature: 25°C; Humidity: 51%RH

Type of Port: AC mains power input/output port

Performance Criterion: CT/CR

Start Frequency = 150KHz  Stop Frequency = 80MHz

Frequency Step = 50kHz in the range of 150kHz-5MHz

1% increment in the range of 5MHz-80MHz

Modulation = AM, 400Hz, 1kHz, 80%

**Test Setup**

Injection via CDN or BIC clamp

**Test Results**

| Injection On | Injection Via | Reaction of the EUT During and after test | Result |
|---|---|---|---|
| AC input power line | CDN | No reactions recognized | **Pass** |

## Clause 9.7 Voltage Dips

**According to EMC basic standard (EN61000-4-11 [13])**

USB Dongle part Under Operating Mode/ Keyboard under charging mode

Environmental conditions: Temperature: 24°C; Humidity: 49%RH

Type of Port: AC mains power input/output port

Performance Criterion: TT/TR

For the table top EUT the distance to the reference ground plane should be 80 cm.

The test level shall be- a vol. Reduction of the supply vol. 100% for 10ms, 100% for 20ms , 30% for 500ms And 100% for 5000ms

**Test Results**

**Voltage Dip:**

| Test Level % Ut | Reduction | Duration (periods) | Phase Angle | Reaction of EUT during and after Test | Result |
|---|---|---|---|---|---|
| 0 | 100% | 10ms | 0° - 360° | n.r.r- performance criteria A observed | **Pass** |
| 0 | 100% | 20ms | 0° - 360° | n.r.r- performance criteria A observed | **Pass** |
| 70 | 30% | 500ms | 0° - 360° | n.r.r- performance criteria A observed | **Pass** |
| Voltage Interceptions: | | | | | |
| Test Level % Ut | Reduction | Duration (periods) | Phase Angle | Reaction of EUT during and after Test | Result |
| 0 | 100% | 5000ms | 0° - 360° | n.r.r- performance criteria B observed | **Pass** |

## Clause 9.8 Surges Common & Differential Mode (1-phase)

**According to EMC basic standard (EN61000-4-5 [14])**

USB Dongle part Under Operating Mode/ Keyboard under charging mode

Environmental conditions: Temperature: 25°C; Humidity: 50%RH

Type of Port: AC mains power input/output port

Performance Criterion: TT/TR

For the table top EUT the distance to the reference ground plane should be 80 cm.

1KV open circuit for common mode & 0.5kV open circuit for differential mode.

**Test Results**

5 pulses for each polarity and test voltage, alternating and negative/positive, triggered in case of AC- powerline: $0^o$, $45^o$, $90^o$ $180^o$, $270^o$, referred to the line frequency. (L1)

Repetition rate is 1 per min.

| Test Voltage | Reaction of the test object during and after test by trigger angle/pulse no.(coupling on DC-lines =>trigger angle not relevant). | | | | | Result |
|---|---|---|---|---|---|---|
| | $0^o$/pulse no1, 2 | $45^0$/pulse, no.3, 4 | $90^o$/pulse, no. 5, 6 | $180^o$/pulse, no. 7, 8 | $270^o$/pulse, no. 9, 10 | |
| Capacitive coupling on AC line: L1=>N or DC lines lines +=>- (Ri=2 Ω /C =18uF) | | | | | | |
| -0.5kV<br>+0.5kV | No reaction<br>Recognized | No reaction<br>Recognized | No reaction<br>Recognized | No reaction<br>Recognized | No reaction<br>Recognized | **Pass** |
| -1.0kV<br>+1.0kV | No reaction<br>Recognized | No reaction<br>Recognized | No reaction<br>Recognized | No reaction<br>Recognized | No reaction<br>Recognized | **Pass** |
| -2.0kV<br>+2.0kV | N/A | N/A | N/A | N/A | N/A | **N/A** |
| - kV<br>+kV | N/A | N/A | N/A | N/A | N/A | **N/A** |

## 3.0 CE Mark label specification

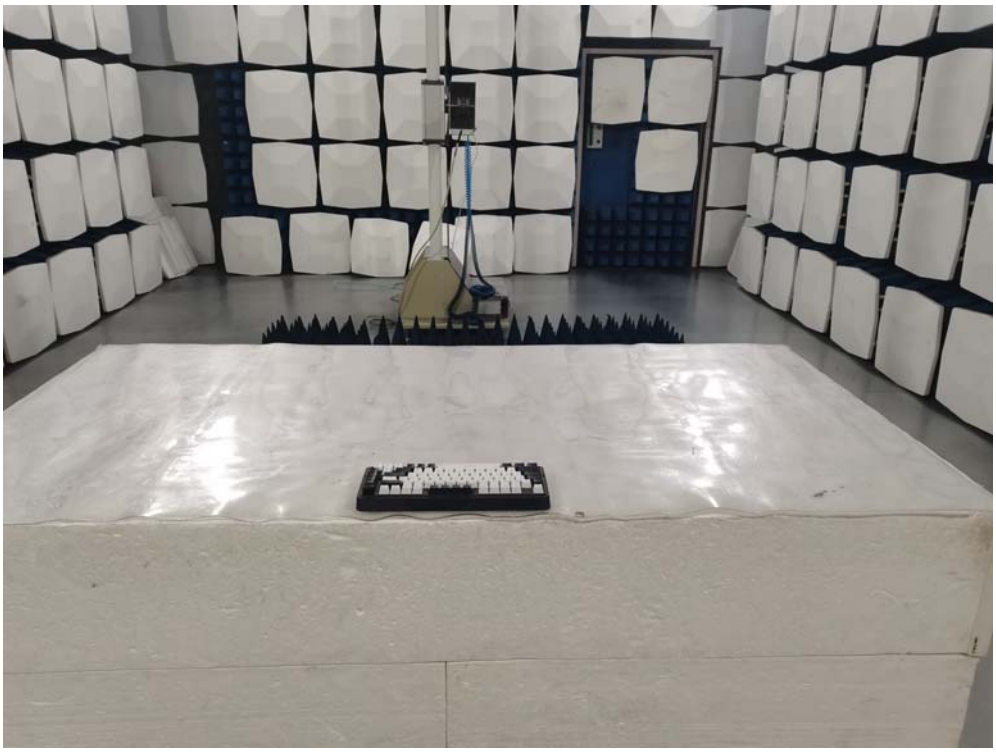
Text of the mark is black or white in color and is left justified. Labels are printed in indelible ink on permanent adhesive backing and shall be affixed at a conspicuous location on the EUT or silk-screened onto the EUT.

Mark Location: Rear enclosure

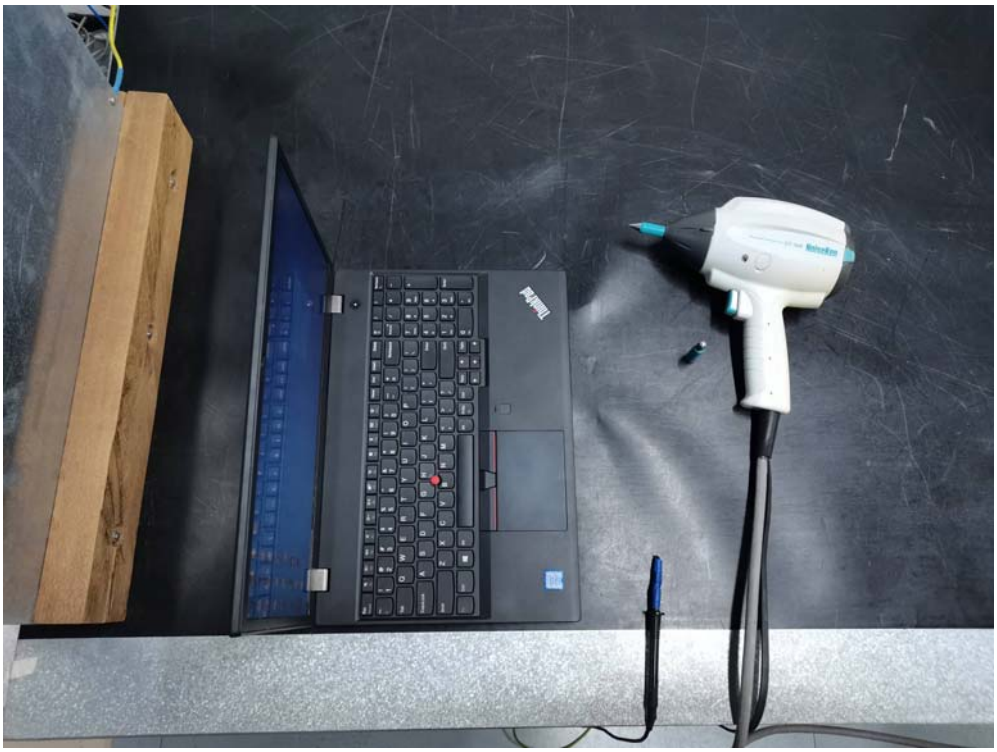
## 4.0 Photographs – Test Setup

### 4.1 Photograph – Conducted Test Setup:

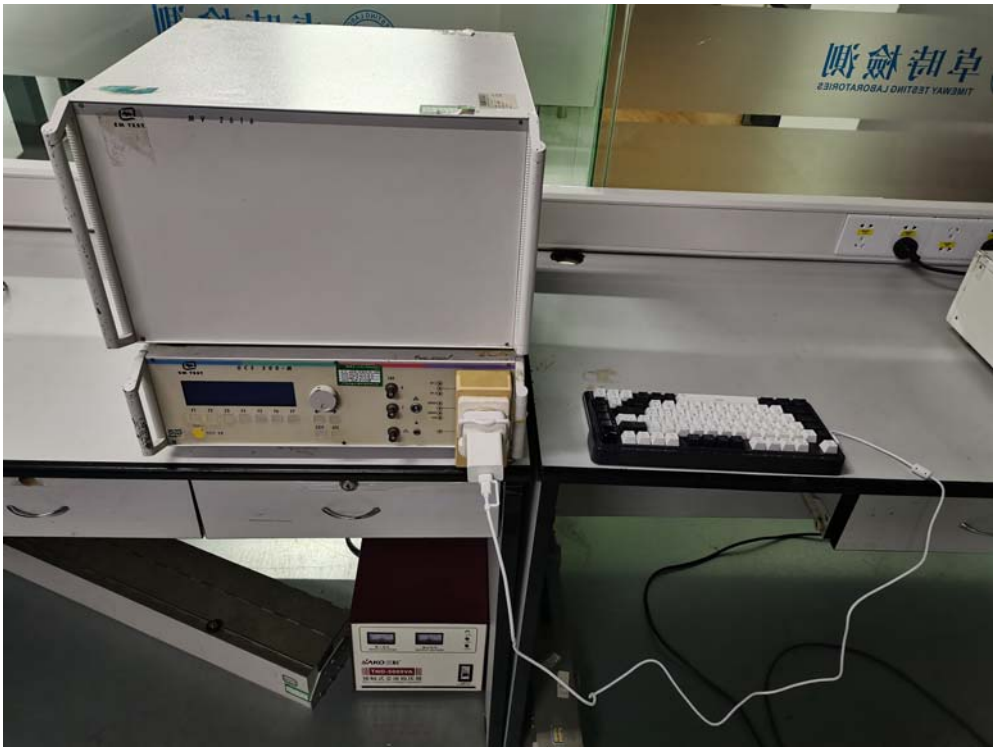
## 4.2 Photograph – Radiated Emission Test Setup:



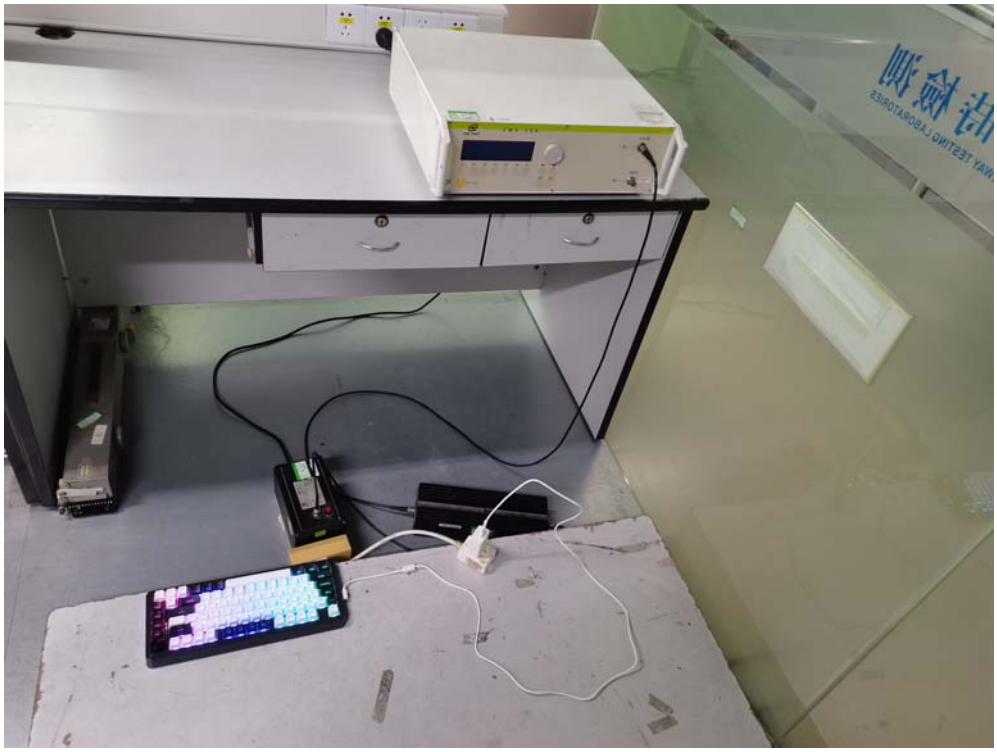
## 4.3 Photograph –ESD Test Setup



### 4.4 Photograph –EFT/B, Surge, Voltage Dips Test Setup



### 4.5 Photograph – CS Test Setup:



## 5.0 Photographs – EUT

Please refer test report TW2308036-01E

## 6.0 List of Measurement Equipment

6.1 Conducted Emission Test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| EMI Test Receiver | ESCS 30 | 834115/006 | RS | 2023.07.14 | 1Year |
| LISN | NNB42 | 00012 | SCHFFNER | 2023.07.14 | 1Year |

6.2 Radiated Disturbance Test

| Name | Model No | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| EMI Test Receiver | ESPI 3 | 100379 | RS | 2023.07.14 | 1Year |
| Spectrum Analyzer | E4407B | MY50441392 | HP/Agilent | 2023.07.14 | 1Year |
| Amplifier | BBV9743 | #218 | HP/Agilent | 2023.07.14 | 1Year |
| Bilog Antenna | VULB9163 | 9163/340 | Schwarebeck | 2022.07.18 | 3Year |
| Horn Antenna | BBHA 9120D | 9120D-631 | RS | 2022.07.18 | 3Year |
| Amplifier | 8449B | 3008A00160 | HP/Agilent | 2023.07.14 | 1Year |

6.3 Harmonic & Flicker Test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| Harmonics Flicker Test System | PACS-1 | 72305 | CI | 2023.07.14 | 1Year |
| 5K VA AC Power Source | 5001iX | 56060 | CI | 2023.07.14 | N/A |

6.4 ESD Test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| ESD Simulator | DITO | 0404-24 | EM TEST | 2023.07.14 | 1Year |

6.5 RF field Strength Susceptibility

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| Signal Generator | SMT03 | 100059 | RS | 2023.07.14 | 1Year |

| | | | | | |
|---|---|---|---|---|---|
| Power Meter | NRVS | --- | RS | 2023.07.14 | 1Year |
| Voltage Probe | URV5-Z2 | 100012 | RS | 2023.07.14 | 1Year |
| Voltage Probe | URV5-Z2 | 100013 | RS | 2023.07.14 | 1Year |
| Power Amplifier | 150W1000 | 300999 | AR | 2023.07.14 | 1Year |
| Power Amplifier | 25S1G4AM1 | 305993 | AR | 2023.07.14 | 1Year |
| Field Probe | CBL6111C | 2576 | Holaday | 2023.07.14 | 1Year |
| Bilog Antenna | MCDC | --- | Chase | 2023.07.14 | 1Year |

6.6 Electrical Fast Transient/Burst (EFT/B) Immunity test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| EFT Generator | UCS 500 M4 | 0304-42 | EM TEST | 2023.07.14 | 1Year |
| Power Source | MV2616 | 0104-14 | EM TEST | 2023.07.14 | 1Year |

6.7 Surge Test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| Ultra Compact Simulator | UCS 500 M4 | 0304-42 | EM TEST | 2023.07.14 | 1Year |
| Power Source | MV2616 | 0104-14 | EM TEST | 2023.07.14 | 1Year |

6.8 Conducted Immunity Test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| Continuous Wave Simulator | CWS 500C | 0407-05 | EM TEST | 2023.07.14 | 1 Year |

6.9 Voltage Dips/Interruption Immunity Test

| Name | Model No. | Serial No. | Manufacturer | Calibration Date | Calibration Cycle |
|---|---|---|---|---|---|
| Ultra Compact Simulator | UCS 500 M4 | 0304-42 | EM TEST | 2023.07.14 | 1 Year |
| Power Source | MV2616 | 0104-14 | EM TEST | 2023.07.14 | 1 Year |

**End of the report**