

TEST REPORT

Product Name : Wireless Charger
Model Number : USB2028AC, USB1518, USB1528AC,
USB1528C, USB2028C
FCC ID : GX7-USB2028AC

Prepared for : Hubbell Incorporated(Delaware) Wiring Device Kellems
Division

Address : 40 Waterview Drive Shelton, CT 06484, USA

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Report Number : EDG2406200140E00202R
Date(s) of Tests : Jun 20, 2024 to Jul 28, 2024
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TABLE OF CONTENT

| Test Report Description | Page |
|--|------|
| 1. TEST REPORT DESCRIPTION | 3 |
| 2. EUT Specification | 5 |
| 3. SUMMARY OF TEST RESULT | 6 |
| 4. Description of Test Facility | 7 |
| 5. MEASURING DEVICE AND TEST EQUIPMENT | 8 |
| 5.1. FOR MPE MEASUREMENT | 8 |
| 6. RF EXPOSURE | 9 |
| 6.1. MEASURING STANDARD | 9 |
| 6.2. REQUIMENTS | 9 |
| 6.3. TEST CONFIGURATION | 11 |
| 6.4. LIMITS | 12 |
| 6.5. MEASURING RESULTS | 13 |
| 7. PHOTOGRAPHS OF TEST SETUP | 15 |

1. TEST REPORT DESCRIPTION

Applicant : Hubbell Incorporated(Delaware) Wiring Device Kellems Division
Address : 40 Waterview Drive Shelton, CT 06484, USA
Manufacturer : Dongguan Hubbell Electrical Products Co .Ltd.
Address : Xicheng Industrial zone Heng Li Town, Dongguan City Guangdong Province, PRC
Factory : Dongguan Hubbell Electrical Products Co .Ltd.
Address : Xicheng Industrial zone Heng Li Town, Dongguan City Guangdong Province, PRC
EUT : Wireless Charger
Model Name : USB2028AC, USB1518, USB1528AC, USB1528C, USB2028C
Trademark : HUBBELL

Measurement Procedure Used:

| APPLICABLE STANDARDS | |
|---|-------------|
| STANDARD | TEST RESULT |
| FCC Part 1(1.1310) and Part 2(2.1091) 680106 D01 RF Exposure Wireless Charging App v04 | PASS |

The above equipment was tested by DONGGUAN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in FCC Part 1(1.1310) and Part 2(2.1091)
680106 D01 RF Exposure Wireless Charging App v04 by the sample EUT tested as described in this report is in compliance with of FCC Rules

The test results of this report relate only to the tested sample identified in this report.

Date of Test :

Jun 20, 2024 to Jul 28, 2024

Prepared by :

Warren Deng

Warren Deng /Editor

Tim Dong

Reviewer :

Tim Dong /Supervisor



Approve & Authorized Signer :

Sam Lv / Manager

Modified History

| Version | Report No. | Revision Date | Summary |
|---------|----------------------|---------------|-----------------|
| | EDG2406200140E00202R | / | Original Report |
| | | | |
| | | | |



2. EUT SPECIFICATION

| Characteristics | Description |
|-------------------------------|--|
| Product Name | Wireless Charger |
| Model number | USB2028AC, USB1518, USB1528AC, USB1528C, USB2028C Only the model USB2028AC was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for the above models, with only difference on USB receptacle. |
| Power Supply | AC 120V/60Hz |
| Operating Frequency Range | 111-205KHz |
| Modulation Technique | FSK |
| Wireless Output Power | 7.5W MAX. |
| WPT device placement mode: | direct contact with or docked onto the WPT source |
| Maximum coupling surface: | less than or equal to 400 cm ² |
| The total leakage (Electric): | 6.84 v/m |
| The total leakage (Magnetic): | 0.2014 a/m |
| Antenna Type | Induction Coil antenna |
| Device category | <input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____ |
| Exposure classification | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²) |
| Antenna diversity | <input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity |
| Evaluation applied | <input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation |

3. SUMMARY OF TEST RESULT

| EMISSION | | |
|--|--|---------|
| Description of Test Item | Standard & Limits | Results |
| MPE | FCC Part 1(1.1310) and Part 2(2.1091) 680106 D01 RF Exposure Wireless Charging App v04 | Pass |
| Note: N/A is an abbreviation for Not Applicable. | | |



4. DESCRIPTION OF TEST FACILITY

Site Description

EMC Lab.

: **Accredited by CNAS**

The Laboratory has been assessed and proved to be in compliance with
CNAS/CL01:2018

The Certificate Registration Number is L3150

Accredited by FCC

Designation Number: CN1300

Test Firm Registration Number: 945551

Accredited by A2LA

The Certificate Registration Number is 4321.02

Accredited by Industry Canada

The Certificate Registration Number is CN0113

Name of Firm

: EMTEK(DONGGUAN) CO., LTD.

Site Location

: -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and
Development Base, No.9, Xincheng Avenue, Songshanhu High-technology
Industrial Development Zone, Dongguan, Guangdong, China

5. MEASURING DEVICE AND TEST EQUIPMENT

5.1. For MPE Measurement

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|-------------------------------------|---|--------------|-----------|------------|------------|---------------|
| <input checked="" type="checkbox"/> | Probe(100cm ²) | Narda | ELT-400 | C-0012 | 2024/04/28 | 1 Year |
| <input checked="" type="checkbox"/> | E-Field Probe(100kHz-3GHz) | Narda | EF0391 | 2304/03 | 2024/04/28 | 1 Year |
| <input checked="" type="checkbox"/> | Broadband Field Meter | Narda | NBM-550 | 232421 | 2024/04/28 | 1 Year |
| <input checked="" type="checkbox"/> | Electric and Magnetic Field Analyzer (1Hz-400kHz) | Narda | EHP-50F | 2404/03 | 2024/04/28 | 1 Year |

6. RF EXPOSURE

6.1. Measuring Standard

FCC Part 1(1.1310) and Part 2(2.1091)
680106 D01 RF Exposure Wireless Charging App v04

6.2. Requirments

FCC Part 1(1.1310) and Part 2(2.1091)

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- o Fixed Installations: fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.
- o Mobile Devices: a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.
- o Portable Devices: a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR §2.1093). The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/ Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

Occupational/Controlled Exposure: In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

General Population/Uncontrolled Exposure: The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

680106 D01 RF Exposure Wireless Charging App v04

Mobile Device and Portable Device Configurations

Wireless power transfer devices must comply with RF exposure requirements for all design configurations in which they can operate. At a minimum, RF exposure must be evaluated for the worst-case scenario, typically when the transmitter, while delivering energy to a client device, is operating at maximum output power.

RF exposure compliance for equipment authorization must be determined following the guidance of KDB 447498, which includes consideration of the different test requirements for Mobile Device and Portable Device exposure categories, as defined in §§ 2.1091 and 2.1093 of the Rules.

Sometimes, a device may meet the RF exposure compliance requirements for a specified minimum distance for all but the most unlikely use conditions. For example, some typical desktop applications, such as wireless charging pads connected to household power, operate only when the active coil is covered and coupled with the target, and are characterized by a form factor that would discourage any on-body use because of size and/or weight. Thus, these devices may be considered to meet the § 2.1091-Mobile conditions (“generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source’s radiating structure(s) and [the nearest person]”), and may be tested for compliance according to the applicable procedures for Mobile devices that are less onerous than those for Portable devices. In other analogous cases, still for a Mobile device, RF Exposure compliance may be ensured only for a minimum separation distance that is greater than 20 cm, while use conditions at smaller distances can still be considered unlikely.

For these scenarios, the equipment authorization of the device may be allowed, on a case-by-case basis, only after receiving FCC concurrence. This procedure requires the submittal of a KDB Inquiry selecting “Equipment Compliance Review” (ECR) as the first category, and “Minimum RF Exposure Compliance Distance” as the second category.

The ECR KDB inquiry shall explain why the stated minimum distance for RF exposure compliance was chosen, and justify why non-compliant use conditions (such as a person getting closer than the distance chosen for testing, and for a long enough time) are highly unlikely to occur. If these statements are deemed acceptable, then authorization may be granted, with the provision that the information about these specific conditions is clearly reported both in the grant comments (for certified devices) and in the user’s manual/instructions available to consumers, as discussed in further detail in KDB 951290-D01.

6.3. Test configuration

- 1) Accordingly, for § 2.1091-Mobile devices, the MPE limits between 100 kHz to 300 kHz are to be considered the same as those at 300 kHz in Table 1 of § 1.1310, that is, 614 V/m and 1.63 A/m, for the electric field and magnetic field, respectively. For § 2.1093-Portable devices below 4 MHz and down to 100 kHz, the MPE limits in § 1.1310 (with the 300 kHz limit applicable all the way down to 100 kHz) can be used for the purpose of equipment authorization in lieu of SAR evaluations.
- 2) Furthermore, consistent with FCC' s equipment authorization RF exposure guidance, any device (both portable and mobile) operating at frequencies below 100 kHz is considered compliant for the purpose of equipment authorization when the external (unperturbed) temporal peak field strengths do not exceed the following reference levels:
83 V/m for the electric field strength (E)
and
90 A/m for the magnetic field strength (H).
These data may be provided through measurements and/or numerical simulations, and for all the positions in space relevant for any possible body exposure.
- 3) For all the cases mentioned above, E and H measurements should be made from all sides of the transmitter, along all the principal axes defined with respect to the orientation of the transmitting element (e.g., coil or antenna). When clearly demonstrated, symmetry considerations may be used to reduce the amount of testing. Furthermore, for “low-frequency” loop/coil emitting structures that lead to dominant H-field near-field emissions (i.e., with E/H ratio less than 1/10 of the 377-ohm free space wave impedance, typically frequencies less than 1 MHz), only H-field1 measurements are sufficient for demonstrating MPE limit compliance.
- 4) It should be also noted that if numerical modeling is used to support compliance data for certification, the application is subject to PAG, related to the NUMSIM item in the PAG list of KDB Publication 388624-D02.

6.4. Limits

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm ²) | Averaging time (minutes) |
|-----------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
|-----------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|

(i) Limits for Occupational/Controlled Exposure

| | | | | |
|---------------|--------|--------|------------------------|----|
| 0.3–3.0 | 614 | 1.63 | *(100) | ≤6 |
| 3.0–30 | 1842/f | 4.89/f | *(900/f ²) | <6 |
| 30–300 | 61.4 | 0.163 | 1.0 | <6 |
| 300–1,500 | | | f/300 | <6 |
| 1,500–100,000 | | | 5 | <6 |

(ii) Limits for General Population/Uncontrolled Exposure

| | | | | |
|---------------|-------|--------|------------------------|-----|
| 0.3–1.34 | 614 | 1.63 | *(100) | <30 |
| 1.34–30 | 824/f | 2.19/f | *(180/f ²) | <30 |
| 30–300 | 27.5 | 0.073 | 0.2 | <30 |
| 300–1,500 | | | f/1500 | <30 |
| 1,500–100,000 | | | 1.0 | <30 |

f = frequency in MHz. * = Plane-wave equivalent power density.

- A
1. ON
 2. Wireless 7.5W(100% load)
 3. Wireless 7.5W(50% load)
 3. Wireless 7.5W(10% load)
- Note: The mode 1 is the worst mode

6.5. Measuring Results

Test Mode: Mode A.1(100% Load)

| Electric Field Emissions | | | |
|--------------------------|---------------------|------------|---------------|
| Test Position | Measure Value (V/m) | Limit(V/m) | 50%Limit(V/m) |
| Top | 6.84 | 614 | 307 |
| Left | 6.12 | 614 | 307 |
| Right | 6.33 | 614 | 307 |
| Rear | 6.37 | 614 | 307 |
| Front | 6.29 | 614 | 307 |
| Bottom | 6.47 | 614 | 307 |
| Magnetic Field Emissions | | | |
| Test Position | Measure Value (A/m) | Limit(A/m) | 50%Limit(A/m) |
| Top | 0.2014 | 1.63 | 0.815 |
| Left | 0.1643 | 1.63 | 0.815 |
| Right | 0.1624 | 1.63 | 0.815 |
| Rear | 0.1611 | 1.63 | 0.815 |
| Front | 0.1625 | 1.63 | 0.815 |
| Bottom | 0.1703 | 1.63 | 0.815 |

Test Mode: Mode A.1(50% Load)

| Electric Field Emissions | | | |
|--------------------------|---------------------|------------|---------------|
| Test Position | Measure Value (V/m) | Limit(V/m) | 50%Limit(V/m) |
| Top | 5.41 | 614 | 307 |
| Left | 3.97 | 614 | 307 |
| Right | 4.05 | 614 | 307 |
| Rear | 4.11 | 614 | 307 |
| Front | 4.07 | 614 | 307 |
| Bottom | 4.36 | 614 | 307 |
| Magnetic Field Emissions | | | |
| Test Position | Measure Value (A/m) | Limit(A/m) | 50%Limit(A/m) |
| Top | 0.1021 | 1.63 | 0.815 |
| Left | 0.0934 | 1.63 | 0.815 |
| Right | 0.0921 | 1.63 | 0.815 |
| Rear | 0.0890 | 1.63 | 0.815 |
| Front | 0.0934 | 1.63 | 0.815 |
| Bottom | 0.1011 | 1.63 | 0.815 |

Test Mode: Mode A. 1(10% Load)

| Electric Field Emissions | | | |
|--------------------------|---------------------|------------|---------------|
| Test Position | Measure Value (V/m) | Limit(V/m) | 50%Limit(V/m) |
| Top | 2.27 | 614 | 307 |
| Left | 2.08 | 614 | 307 |
| Right | 2.11 | 614 | 307 |
| Rear | 2.10 | 614 | 307 |
| Front | 2.06 | 614 | 307 |
| Bottom | 2.17 | 614 | 307 |
| Magnetic Field Emissions | | | |
| Test Position | Measure Value (A/m) | Limit(A/m) | 50%Limit(A/m) |
| Top | 0.0779 | 1.63 | 0.815 |
| Left | 0.0631 | 1.63 | 0.815 |
| Right | 0.0620 | 1.63 | 0.815 |
| Rear | 0.0619 | 1.63 | 0.815 |
| Front | 0.0604 | 1.63 | 0.815 |
| Bottom | 0.0754 | 1.63 | 0.815 |

Remark: These measurements shall be taken along the principal axes of the device, with one axis oriented along the direction of the estimated maximum field strength, and for three points per axis. Test results for the worst position (20cm) are reported.

The device meets the mobile RF exposure limit at a 20cm separation distance as specified in §2.1091 of the FCC Rules. The maximum leakage fields at 20 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.

Requirement for KDB Publication 680106 D01

| Condition Requirement | Answers |
|--|---|
| Power transfer frequency is less than 1 MHz. | The power transfer frequency is 111-205KHz. |
| Output power from each primary coil is less than or equal to 15 watts. | ANTOutput power is less than or equal to $7.5W \leq 15W$ |
| Client device is placed directly in contact with the transmitter. | Client device is placed directly in contact with the transmitter. |
| Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion). | Mobile exposure conditions only |
| The aggregate H-field strengths at 20 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit. | Meet the requirements, please refer to the result of Electric Field Emissions and Magnetic Field Emissions. |
| The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils. | The transfer system includes one primary. This product has one coil, the max output power of the coil is 7.5W. |

7. PHOTOGRAPHS OF TEST SETUP



*** End of Report ***