

# TEST REPORT

**Testing laboratory:**

**SK Tech Co., Ltd.**

88, Geulgaetul-ro, 81beon-gil,  
Wabu-eup, Namyangju-si,  
Gyeonggi-do, Korea

TEL: +82-31-576-2204

FAX: +82-31-576-2205

**Test Report Number: SKT-RET-200004**

**Date of issue: December 14, 2020**

**Applicant:**

**LINE Friends Corporation**

5F, 98, Hannam-daero, Yongsan-gu, Seoul, Korea

**Manufacturer:**

**Shenzhen Zhiyu Innovation Electronic Technology Co.,Ltd**

7th Floor, Building A, Lilan Technology Park, West Section of High-tech Park,  
Jiazitang Community, Gongming Street, Shenzhen, Guangdong, China

**Product:**

WIRELESS CHARGER

**Model:**

**BT21 WIRELESS CHARGER**

**FCC ID:**

2AQTS-LINEBT21WC

**Project number:**

SKTEU20-1269

**EUT received:**

November 11, 2020

**Applied standards:**

**Title 47 CFR Chapter I - Subchapter I §1.1310**

**KDB 680106 D01 Exposure Wireless Charging Apps v03**

**Remarks to the standards:** None

The above equipment has been tested by SK Tech Co., Ltd., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product or system, which was tested.



Wonsik Ham / **Testing Engineer**



Jongsoo Yoon / **Technical Manager**

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### Revision History of Report

| Rev. | Revisions     | Effect page | Approved by  | Date         |
|------|---------------|-------------|--------------|--------------|
| -    | Initial issue | All         | Jongsoo Yoon | Dec 14, 2020 |



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## 1 General information

### 1.1. Testing laboratory

All of the measurements described in this report were performed at SK Tech Co., Ltd

Site I: 88, Geulgaetul-ro 81beon-gil, Wabu-eup, Namyangju-si, Gyeonggi-do, Korea

Site II: 124-8, Geulgaetul-ro, Wabu-eup, Namyangju-si, Gyeonggi-do, Korea

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-4. The sites comply with the Normalized Site Attenuation requirements given in ANSI C63.4, and site VSWR requirements specified in CISPR 16-1-4. The measuring apparatus and ancillary equipment conform to CISPR 16-1 series.

### 1.2. Accreditations

The laboratory has been also notified to FCC by RRA as a Conformity Assessment Body, and designated to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification under Parts 15 and 18 of the FCC Rules.

Designation No. KR0007

### 1.3. List of test and measurement instruments

| Description                    | Model               | Manufacturer | Serial No. | Use                                 |
|--------------------------------|---------------------|--------------|------------|-------------------------------------|
| B-Field Probe                  | 100 cm <sup>2</sup> | Narda        | M-0594     | <input checked="" type="checkbox"/> |
| Exposure Level Meter           | ELT-400             | Narda        | M-0594     | <input checked="" type="checkbox"/> |
| Isotropic electric field probe | HI-6105             | ETS-LINDGREN | 00205916   | <input checked="" type="checkbox"/> |
| LASER DATA INTERFACE           | HI-6113             | ETS-LINDGREN | 00204638   | <input checked="" type="checkbox"/> |

### 1.4. Test date and environmental conditions

| Test suites         | Test date<br>(YYYY.MM.DD) | Ambient<br>temperature<br>(°C) | Relative<br>humidity<br>(%) | Atmospheric<br>pressure<br>(kPa) |
|---------------------|---------------------------|--------------------------------|-----------------------------|----------------------------------|
| Exposure evaluation | 2020.12.01                | 23.7                           | 44.6                        | -                                |



## 2 Description of equipment under test (EUT)

Product: WIRELESS CHARGER  
Model: BT21 WIRELESS CHARGER  
Serial number: None (prototype)

### Model differences:

| Model name            | Difference                                            | Tested (checked)                    |
|-----------------------|-------------------------------------------------------|-------------------------------------|
| BT21 WIRELESS CHARGER | fully tested model that was provided by the applicant | <input checked="" type="checkbox"/> |

### Technical data:

|                           |                                             |
|---------------------------|---------------------------------------------|
| Power source              | DC 5 V or DC 9 V                            |
| Local Oscillator or X-Tal | None                                        |
| Transmit Frequency        | 110 kHz – 205 kHz                           |
| Antenna Type              | Integral loop coil antenna                  |
| Type of Modulation        | None                                        |
| Exposure category         | General population/uncontrolled environment |
| Device Type               | Mobile Device                               |

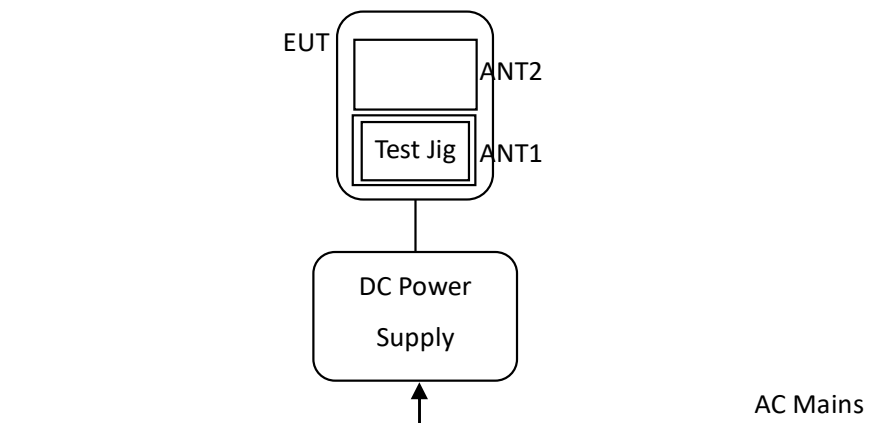
| I/O port | Type       | Q'ty | Remark |
|----------|------------|------|--------|
| DC input | USB Type C | 1    |        |

Modification of EUT during the compliance testing: none

### 3 Test and measurement conditions

#### 3.1. Operating modes

The EUT was operated from DC Power Supply (5 V or 9 V). The measurements were taken while the Test Jig was placed on the pad of EUT.



#### 3.2. Description of support units (accessory equipment)

The following support units or accessories were used to form a representative test configuration during the tests.

| # | Equipment       | Manufacturer | Model No. | Serial No.  |
|---|-----------------|--------------|-----------|-------------|
| 1 | DC Power Supply | HP           | 6633A     | 2838A-01000 |
| 2 | Test Jig        | N/A          | N/A       | N/A         |

#### 3.3. Interconnection and I/O cables

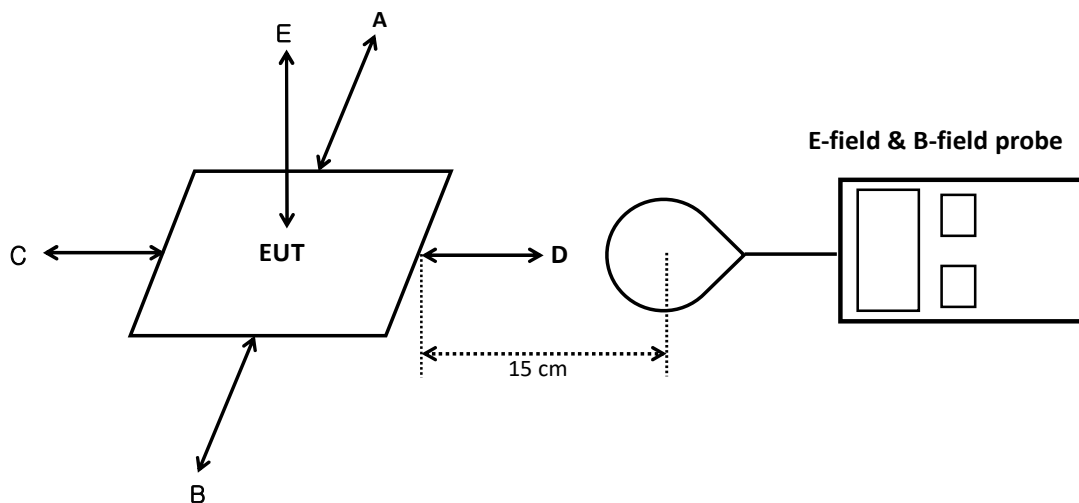
The following support units or accessories were used to form a representative test configuration during the tests.

| No. | Start           |          | End             |           | Cable      |                |
|-----|-----------------|----------|-----------------|-----------|------------|----------------|
|     | Name            | I/O port | Name            | I/O port  | length (m) | shielded (Y/N) |
| 1   | EUT             | DC Input | DC Power Supply | DC Output | 2.0        | N              |
| 2   | EUT             | -        | Test Jig        | -         | -          | -              |
| 3   | DC Power Supply | AC Input | AC Mains        | AC Mains  | 1.0        | N              |

**Note:** 1) All the equipment was placed in the worst-case configuration to maximize the emission during the test.  
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

### 3.4. Measurement set-up (arrangement of EUT)

The drawing of the test configuration was shown below, and the photographs of the test setup were attached.



### 3.5. Measurement distances

The measurement probe was placed at test distance 15 cm.

### 3.6. Measurement Uncertainty ( $U$ )

|                         |                                                      |
|-------------------------|------------------------------------------------------|
| Measurement uncertainty | $\pm 3.0$ dB (confidence level about 95 %, $k = 2$ ) |
|-------------------------|------------------------------------------------------|



## 4 Exposure evaluation

### 4.1. Exposure limits

According to FCC KDB 680106 D01 Paragraph 3 RF Exposure Requirements clause 3 (c) For devices designed for typical desktop applications, such a wireless charging pads, RF exposure evaluation should be conducted assuming a user separation distance of 15 cm. E and H field strength measurements or numerical modeling may be used to demonstrate compliance. Measurements should be made from all sides and the top of the primary/client pair, with the 15 cm measured from the center of the probe(s) to the edge of the device. Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m. A KDB inquiry is required to determine the applicable exposure limits below 100 kHz.

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range (MHz)                               | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|-----------------------------------------------------|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure         |                              |                              |                                     |                         |
| 0.3-3.0                                             | 614                          | 1.63                         | *100                                | 6                       |
| 3.0-30                                              | 1842/f                       | 4.89/f                       | *900/f <sup>2</sup>                 | 6                       |
| 30-300                                              | 61.4                         | 0.163                        | 1.0                                 | 6                       |
| 300-1,500                                           | /                            | /                            | f/300                               | 6                       |
| 1,500-100,000                                       | /                            | /                            | 5                                   | 6                       |
| Limits for General Population/Uncontrolled Exposure |                              |                              |                                     |                         |
| <b><u>0.3-1.34</u></b>                              | <b><u>614</u></b>            | <b><u>1.63</u></b>           | *100                                | 30                      |
| 1.34-30                                             | 824/f                        | 2.19/f                       | *180/f <sup>2</sup>                 | 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



#### 4.2. Equipment Approval Considerations item 5 b) of KDB 680106 D01 v03

The EUT does comply with item 5.2 of KDB 680106 D01v03 as follows table;

| Requirements of KDB 680106 D01                                                                                                                                                                                                           | Yes / No | Description                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power transfer frequency is less than 1 MHz.                                                                                                                                                                                             | Yes      | The device operate in the frequency range 110.0 kHz - 205.0 kHz.                                                                                                                          |
| Output power from each primary coil is less than 15 watts.                                                                                                                                                                               | Yes      | The maximum output power of the primary coil is less than 15 W.                                                                                                                           |
| 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. | Yes      | The transfer system includes multiple primary coils that are able to detect receiver device. Clients are able to detect and allow coupling only between individual pairs of coils.        |
| Client device is placed directly in contact with the transmitter.                                                                                                                                                                        | Yes      | Client device is placed directly in contact with the transmitter.                                                                                                                         |
| Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).                                                                                                                                        | Yes      | Mobile exposure conditions only                                                                                                                                                           |
| The aggregate H-field strengths at 15 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.                                          | Yes      | The EUT H-field strengths at 15 cm surrounding the device and 15 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit. |

In all other cases, unless excluded above, an RF exposure evaluation report must be reviewed and accepted through a KDB or PBA inquiry to enable authorization of the equipment. When evaluation is required to show compliance; for example, using field strength, power density, SAR measurements or computational modeling etc., the specific authorization requirements will be determined based on the results of the RF exposure evaluation.



## 5. Test and measurement results

### 5.1. Measured H-field strength

(Input voltage: DC 5 V, Output power: 7.5 W, Operating frequency: 148 kHz)

| TEST RESULTS                 |                     |                     |                     |                     |                     |       |
|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------|
| Operating Frequency<br>(kHz) | Position A<br>(A/m) | Position B<br>(A/m) | Position C<br>(A/m) | Position D<br>(A/m) | Position E<br>(A/m) | Limit |
|                              |                     |                     |                     |                     |                     | (A/m) |
| 148                          | 0.574               | 0.287               | 0.585               | 0.564               | 0.584               | 1.63  |

(Input voltage: DC 9 V, Output power: 10 W, Operating frequency: 148 kHz)

| TEST RESULTS                 |                     |                     |                     |                     |                     |       |
|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------|
| Operating Frequency<br>(kHz) | Position A<br>(A/m) | Position B<br>(A/m) | Position C<br>(A/m) | Position D<br>(A/m) | Position E<br>(A/m) | Limit |
|                              |                     |                     |                     |                     |                     | (A/m) |
| 148                          | 0.774               | 0.324               | 0.857               | 0.844               | 0.794               | 1.63  |

NOTE: test distance of 15 cm from the edges surrounding the EUT and 15cm from the top surface of the EUT

### 5.2. Measured E-field strength

(Input voltage: DC 5 V, Output power: 7.5 W, Operating frequency: 148 kHz)

| TEST RESULTS                 |                     |                     |                     |                     |                     |       |
|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------|
| Operating Frequency<br>(kHz) | Position A<br>(V/m) | Position B<br>(A/m) | Position C<br>(V/m) | Position D<br>(V/m) | Position E<br>(V/m) | Limit |
|                              |                     |                     |                     |                     |                     | (V/m) |
| 148                          | 2.31                | 1.73                | 2.48                | 2.45                | 2.35                | 614   |

(Input voltage: DC 9 V, Output power: 10 W, Operating frequency: 148 kHz)

| TEST RESULTS                 |                     |                     |                     |                     |                     |       |
|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-------|
| Operating Frequency<br>(kHz) | Position A<br>(V/m) | Position B<br>(A/m) | Position C<br>(V/m) | Position D<br>(V/m) | Position E<br>(V/m) | Limit |
|                              |                     |                     |                     |                     |                     | (V/m) |
| 148                          | 2.72                | 1.96                | 2.91                | 2.90                | 2.76                | 614   |

NOTE: test distance of 15 cm from the edges surrounding the EUT and 15cm from the top surface of the EUT