

TEST REPORT

Testing laboratory:

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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 ²	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 (YYYY.MM.DD)	Ambient temperature (°C)	Relative humidity (%)	Atmospheric pressure (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	

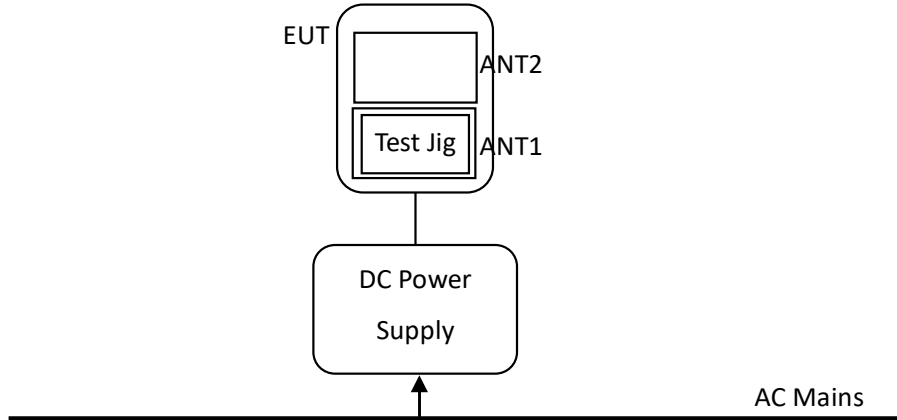
Modification of EUT during the compliance testing: none



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.

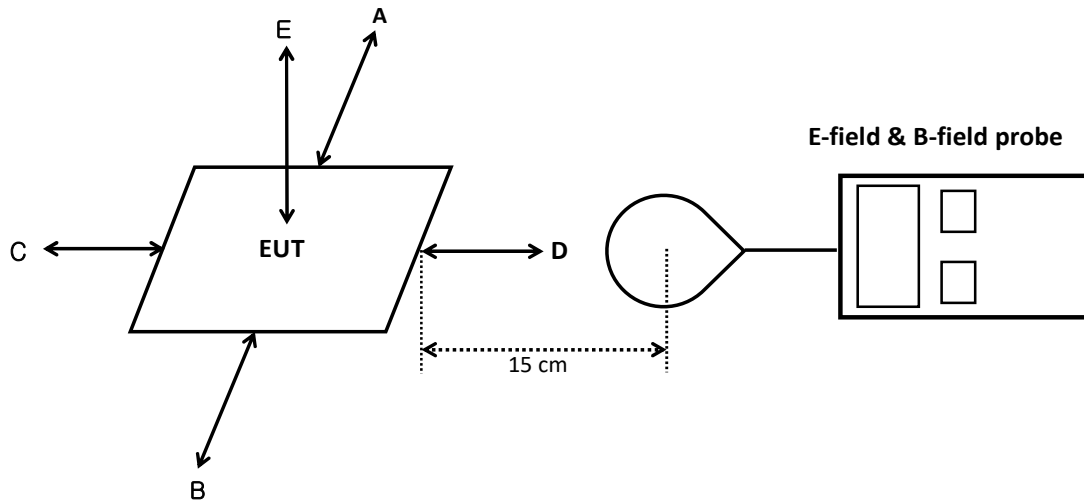
No.	Start		End		Cable	
	Name	I/O port	Name	I/O port	length (m)	shielded (Y/N)
1	EUT	DC Input	DC Power Supply	DC Output	2.0	N
2	EUT	-	Test Jig	-	-	-
3	DC Power Supply	AC Input	AC Mains	AC Mains	1.0	N

- 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	± 3.0 dB (confidence level about 95 %, $k = 2$)
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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 ²)	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 ²	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				
<u>0.3-1.34</u>	<u>614</u>	<u>1.63</u>	*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



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 (kHz)	Position A (A/m)	Position B (A/m)	Position C (A/m)	Position D (A/m)	Position E (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 (kHz)	Position A (A/m)	Position B (A/m)	Position C (A/m)	Position D (A/m)	Position E (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 (kHz)	Position A (V/m)	Position B (A/m)	Position C (V/m)	Position D (V/m)	Position E (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 (kHz)	Position A (V/m)	Position B (A/m)	Position C (V/m)	Position D (V/m)	Position E (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