

RF EXPOSURE

1. Test Configuration

For devices designed for typical desktop applications, such as 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.

2. Limit

Table 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) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) 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 |
| (B) 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 | 30 |

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

Per the guidance of KDB 680106, the E-field and H-field limits shown in the table above are extended down to 100kHz.

3. Equipment Approval Considerations

(1) Power transfer frequency is less than 1 MHz.

-The power transfer frequency is set from 110 kHz to 205 kHz. Therefore the frequency specification is satisfied with the device.

(2) Output power from each primary coil is less than or equal to 15 watts.

-it is that supports up to 10 W

(3) 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 DUT(Device Under Test) includes only one coil in transmitter.

(4) Client device is placed directly in contact with the transmitter.

-When the client device is placed directly in contact with transmitter, then charging is able to start.

(5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).

-Yes

(6) 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 (refer to 4page)

4. Test Methods

4.1 Measurement procedure

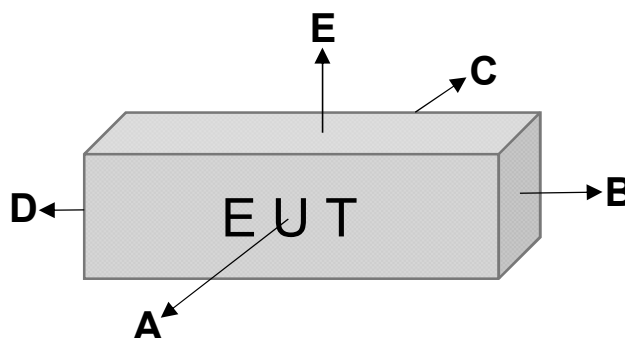
1. The RF exposure test was performed at the turn table of anechoic chamber.

2. The edge of the charger(EUT) and center of the field probe should be located at specified distance(15 cm, 20 cm).

3. Maximum value of E-field and H-field were measured for the five side each at the specified distance and recorded them on the following Test Result table. Five sides are [A]Front, [B]Left, [C]Rear, [D]Right, and [E]Top. Please see below diagram.

4. The EUT was implemented by the dictates of KDB 680106D01v03 accordingly.

4.2 Test diagram



4.3 Test mode

In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

| EUT Voltage | Cal.Date |
|-------------------|-------------------------------|
| 5 V Charging Mode | Battery less than 1% charged |
| | Battery less than 50% charged |
| | Battery 100% fully charged |
| 9 V Charging Mode | Battery less than 1% charged |
| | Battery less than 50% charged |
| | Battery 100% fully charged |

4.4. Test Result

Comply (measurement data : refer to below)

- 5 V Charging Mode (Battery less than 1% charged)

E-field Measurements (Distance : 15 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.83 | 0.80 | 0.81 | 0.85 | 0.94 | 614.00 |

E-field Measurements (Distance : 20 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.81 | 307.00 |

H-field Measurements (Distance : 15 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.016 | 0.018 | 0.018 | 0.022 | 0.025 | 1.63 |

H-field Measurements (Distance : 20 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.022 | 0.82 |

- 5 V Charging Mode (Battery less than 50% charged)

E-field Measurements (Distance : 15 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.85 | 0.80 | 0.82 | 0.84 | 1.00 | 614.00 |

E-field Measurements (Distance : 20 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.82 | 307.00 |

H-field Measurements (Distance : 15 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.017 | 0.019 | 0.018 | 0.022 | 0.025 | 1.63 |

H-field Measurements (Distance : 20 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.022 | 0.82 |

- 5 V Charging Mode (Battery 100% fully charged)

E-field Measurements (Distance : 15 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.82 | 0.81 | 0.83 | 0.85 | 0.99 | 614.00 |

E-field Measurements (Distance : 20 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.81 | 307.00 |

H-field Measurements (Distance : 15 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.018 | 0.021 | 0.020 | 0.021 | 0.024 | 1.63 |

H-field Measurements (Distance : 20 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.022 | 0.82 |

- 9 V Charging Mode (Battery less than 1% charged)

E-field Measurements (Distance : 15 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.87 | 0.82 | 0.85 | 0.83 | 1.01 | 614.00 |

E-field Measurements (Distance : 20 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.84 | 307.00 |

H-field Measurements (Distance : 15 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.018 | 0.018 | 0.021 | 0.018 | 0.024 | 1.63 |

H-field Measurements (Distance : 20 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.023 | 0.82 |

- 9 V Charging Mode (Battery less than 50% charged)

E-field Measurements (Distance : 15 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.86 | 0.83 | 0.82 | 0.85 | 1.01 | 614.00 |

E-field Measurements (Distance : 20 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.84 | 307.00 |

H-field Measurements (Distance : 15 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.017 | 0.019 | 0.018 | 0.022 | 0.025 | 1.63 |

H-field Measurements (Distance : 20 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.022 | 0.82 |

- 9 V Charging Mode (Battery 100% fully charged)

E-field Measurements (Distance : 15 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.85 | 0.82 | 0.83 | 0.84 | 1.02 | 614.00 |

E-field Measurements (Distance : 20 cm)

| Front [A] (V/m) | Left [B] (V/m) | Rear [C] (V/m) | Right [D] (V/m) | Top [E] (V/m) | Limit (V/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.86 | 307.00 |

H-field Measurements (Distance : 15 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| 0.018 | 0.021 | 0.020 | 0.022 | 0.024 | 1.63 |

H-field Measurements (Distance : 20 cm)

| Front [A] (A/m) | Left [B] (A/m) | Rear [C] (A/m) | Right [D] (A/m) | Top [E] (A/m) | Limit (A/m) |
|-----------------------|----------------------|----------------------|-----------------------|---------------------|----------------|
| | | | | 0.022 | 0.82 |

5 Test Equipment

| Type | Manufacturer | Model | Cal.Date | Next.Cal.Date | S/N |
|------------------------------------|--------------|-----------|----------|---------------|-----------|
| Magnetic Field HiTester | Hioki | FT3470-50 | 18.08.31 | 19.08.31 | 171129500 |
| Isotropic Electric Field Probe | ETS-Lindgren | HI-6105 | 18.06.17 | 19.06.17 | 161805 |
| Isotropic Electric Field Interface | ETS-Lindgren | HI-6113 | - | - | 161970 |