

## **FCC §1.1310, §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

### **Applicable Standard**

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                                      |                                      |                                          |                                 |
|----------------------------------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------|---------------------------------|
| <b>Frequency Range (MHz)</b>                                   | <b>Electric Field Strength (V/m)</b> | <b>Magnetic Field Strength (A/m)</b> | <b>Power Density (mW/cm<sup>2</sup>)</b> | <b>Averaging Time (minutes)</b> |
| 0.3–1.34                                                       | 614                                  | 1.63                                 | *(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                              |
| 300–1500                                                       | /                                    | /                                    | f/1500                                   | 30                              |
| 1500–100,000                                                   | /                                    | /                                    | 1.0                                      | 30                              |

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

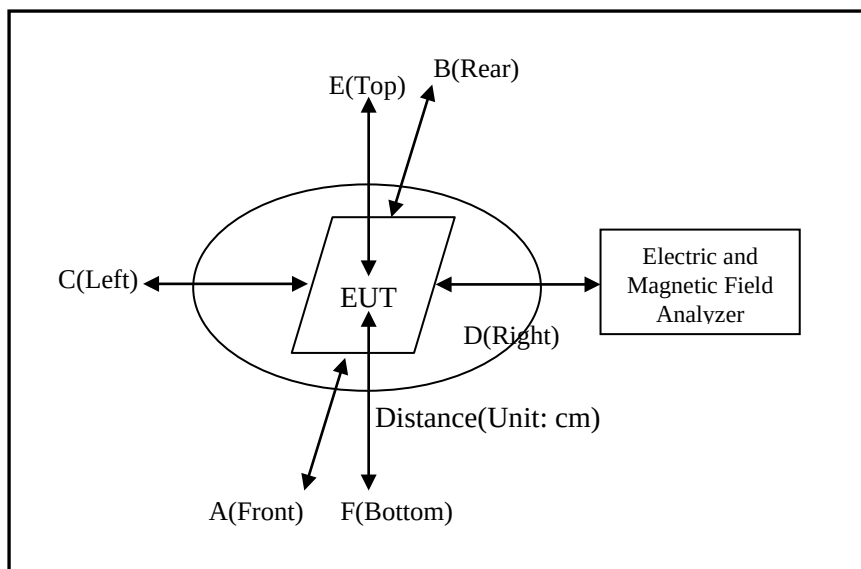
According with KDB 680106 D01 RF Exposure Wireless Charging Apps v03r01 clause 3 c)

- 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.

According to KDB 680106 D01 RF Exposure Wireless Charging App v03r01 clause 5 b)

- (1) Power transfer frequency is less than 1 MHz
- (2) Output power from each primary coil is less than or equal to 15 watts.
- (3) The system may consist of more than one source primary coils, charging one or more clients. If more than one primary coil is present, the coil pairs may be powered on at the same time.
- (4) Client device is placed directly in contact with the transmitter.
- (5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).
- (6) The aggregate H-field strengths anywhere at or beyond 15 cm surrounding the device, and 20 cm away from the surface from all coils that by design can simultaneously transmit, and while those coils are simultaneously energized, are demonstrated to be less than 50% of the applicable MPE limit.

## Block Diagram of Test Setup



Note:

For mobile condition distance: A/B/C/D is 15cm; E is 20cm;

## Test Data

### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 21°C      |
| Relative Humidity: | 45 %      |
| ATM Pressure:      | 101.0 kPa |

*The testing was performed by Fan Yang on 2020-10-28*

**Test mode 1:****H-Field Strength**

| Frequency Range (kHz) | Position A (A/m) | Position B (A/m) | Position C (A/m) | Position D (A/m) | Position E (A/m) | 50% Limit (A/m) | Limit Test (A/m) |
|-----------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 110-205               | 0.207            | 0.206            | 0.211            | 0.213            | 0.231            | 0.815           | 1.63             |

**E-Field Strength**

| Frequency Range (kHz) | Position A (V/m) | Position B (V/m) | Position C (V/m) | Position D (V/m) | Position E (V/m) | 50% Limit (V/m) | Limit Test (V/m) |
|-----------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 110-205               | 1.110            | 1.313            | 1.107            | 1.249            | 2.039            | 307             | 614              |

Note:

For mobile condition distance: A/B/C/D is 15cm; E is 20cm;

**Test mode 2:****H-Field Strength**

| Frequency Range (kHz) | Position A (A/m) | Position B (A/m) | Position C (A/m) | Position D (A/m) | Position E (A/m) | 50% Limit (A/m) | Limit Test (A/m) |
|-----------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 110-205               | 0.213            | 0.211            | 0.218            | 0.224            | 0.269            | 0.815           | 1.63             |

**E-Field Strength**

| Frequency Range (kHz) | Position A (V/m) | Position B (V/m) | Position C (V/m) | Position D (V/m) | Position E (V/m) | 50% Limit (V/m) | Limit Test (V/m) |
|-----------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 110-205               | 1.109            | 1.293            | 1.112            | 1.262            | 2.105            | 307             | 614              |

Note:

For mobile condition distance: A/B/C/D is 15cm; E is 20cm;

**Test mode 3:****H-Field Strength**

| Frequency Range (kHz) | Position A (A/m) | Position B (A/m) | Position C (A/m) | Position D (A/m) | Position E (A/m) | 50% Limit (A/m) | Limit Test (A/m) |
|-----------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 110-205               | 0.219            | 0.226            | 0.217            | 0.230            | 0.282            | 0.815           | 1.63             |

**E-Field Strength**

| Frequency Range (kHz) | Position A (V/m) | Position B (V/m) | Position C (V/m) | Position D (V/m) | Position E (V/m) | 50% Limit (V/m) | Limit Test (V/m) |
|-----------------------|------------------|------------------|------------------|------------------|------------------|-----------------|------------------|
| 110-205               | 1.126            | 1.391            | 1.131            | 1.308            | 2.160            | 307             | 614              |

Note:

For mobile condition distance: A/B/C/D is 15cm; E is 20cm;

**Result: Compliant**

**Considerations of compliance 680106 D01 RF Exposure Wireless Charging App v03r01 clause 5 b:**

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

Yes, the operation frequency is 110-205 kHz.

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

Yes, the maximum output power of primary coil is 15 Watts.

**(3)** The system may consist of more than one source primary coils, charging one or more clients. If more than one primary coil is present, the coil pairs may be powered on at the same time.

The transfer system includes only single primary coil.

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

Yes, client device is placed directly in contact with the transmitter

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

Yes, mobile exposure conditions only.

**(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, the test result for H and E-field strength less than 50% of the MPE limit.