

## RF Exposure Evaluation

### 1 Measuring Standard

KDB680106 D01 RF Exposure Wireless Charging App v03r01;  
TCB Workshop, October 2018, 5.2 RF Exposure Procedures

### 2 Requirements

According to the item 5 of KDB680106 D01 RF Exposure Wireless Charging App v03r01:

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

Yes

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

Yes

(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.

Yes

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

Yes

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

No

(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

### Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

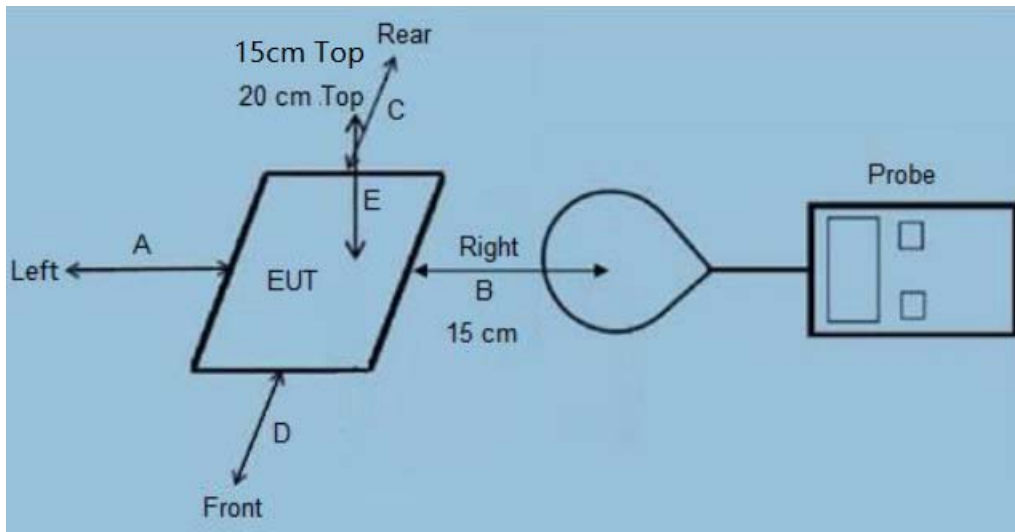
Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz)                                          | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposures</b>        |                               |                               |                                     |                          |
| 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                        |
| 300-1500                                                       | /                             | /                             | f/300                               | 6                        |
| 1500-100,000                                                   | /                             | /                             | 5                                   | 6                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</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                       |

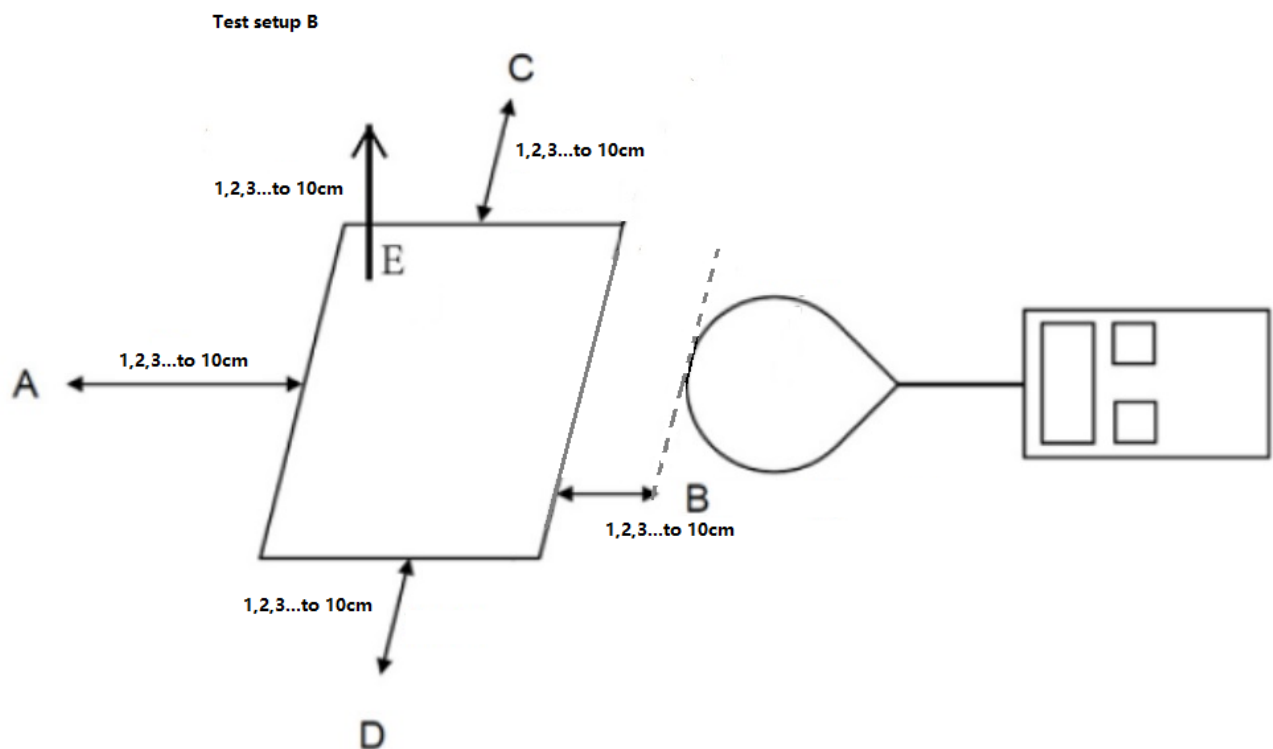
F=frequency in MHz  
\*=Plane-wave equivalent power density  
RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in Table 1 of 1.1310 (use the 300kHz limits for 150kHz: 614V/m, 1.63A/m).

### 3TestSetup

A:



B:



### 4TestProcedure

- 1) The RF exposure test was performed in anechoic chamber;
- 2) The measurement probe was placed at test distance (15 cm from edges, 20 cm and 15cm from top) Which is between the edge of the charger and the geometric center of probe, for test setup A;
- 3) In addition to what is described in KDB 680106 D01, please measure and provide magnetic and electrical field strength at a distance 10cm to 1cm at 1cm iteration, i.e. at a distance of 10cm, 9cm, 8cm, ..... 1cm. Which is between the edge of the charger and the edge of probe, for test setup B;
- 4) The highest emission level was recorded and compared with limit as soon as measurement of each

points (A,B, C,D, E) were completed;

5) The EUT was measured according to the dictates of KDB680106 D01v03r01; TCB Workshop, October 2018, 5.2 RF Exposure Procedures

Remark: The EUT's test position A, B,C, D and E is valid for the E and H field measurements.

#### 5TestInstruments list

| Test Equipment  | Manufacturer | Model No. | SN.    | Cal.Date<br>(mm-dd-yy) | Cal.Duedate<br>(mm-dd-yy) |
|-----------------|--------------|-----------|--------|------------------------|---------------------------|
| E&H-Field Probe | NARDA        | ELT-400   | C-0371 | Mar. 8, 2021           | Mar. 7, 2022              |
| E&H-Field Meter | NARDA        | ELT-400   | N-0925 | Mar. 8, 2021           | Mar. 7, 2022              |

#### 6TestResult

##### Test Result for Test setup A:

**Note: Internal battery power +wireless charger(5W)mode**

##### E-Filed Strength at (15 cm from edges A, B, C, D, 20 cm and 15cm from top E) surrounding the EUT(V/m)

| Charging Load<br>Worse case | Test<br>Position<br>A(V/m) | Test<br>Position<br>B(V/m) | Test<br>Position<br>C(V/m) | Test<br>Position<br>D(V/m) | Test<br>Position<br>E(V/m)<br>20cm | Test<br>Position<br>E(V/m)<br>15cm | Limits<br>(V/m) |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------------------------------------|------------------------------------|-----------------|
| <5%                         | 1.55                       | 1.67                       | 1.69                       | 1.73                       | 1.50                               | 1.66                               | 83              |
| 50%                         | 1.36                       | 1.48                       | 1.52                       | 1.66                       | 1.31                               | 1.42                               | 83              |
| >90 %                       | 1.24                       | 1.35                       | 1.47                       | 1.58                       | 1.33                               | 1.38                               | 83              |

##### H-Filed Strength at (15 cm from edges A, B, C, D, 20 cm and 15cm from top E) surrounding the EUT(A/m)

| Charging Load<br>Worse case | Test<br>Position<br>A(A/m) | Test<br>Position<br>B(A/m) | Test<br>Position<br>C(A/m) | Test<br>Position<br>D(A/m) | Test<br>Position<br>E(A/m)20cm | Test<br>Position<br>E(A/m)15cm | Limits<br>(A/m) |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------------------------------|--------------------------------|-----------------|
| <5%                         | 0.207                      | 0.186                      | 0.191                      | 0.197                      | 0.183                          | 0.186                          | 90              |
| 50%                         | 0.190                      | 0.185                      | 0.193                      | 0.181                      | 0.186                          | 0.196                          | 90              |
| >90 %                       | 0.194                      | 0.177                      | 0.189                      | 0.183                      | 0.171                          | 0.175                          | 90              |

**Note: AC power in +wireless charger(5W)mode**

##### E-Filed Strength at(15 cm from edges A, B, C, D, 20 cm and 15cm from top E)surrounding the EUT(V/m)

| Charging Load<br>Worse case | Test<br>Position<br>A(V/m) | Test<br>Position<br>B(V/m) | Test<br>Position<br>C(V/m) | Test<br>Position<br>D(V/m) | Test<br>Position<br>E(V/m)<br>20cm | Test<br>Position<br>E(V/m)<br>15cm | Limits<br>(V/m) |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------------------------------------|------------------------------------|-----------------|
| <5%                         | 1.53                       | 1.65                       | 1.72                       | 1.82                       | 1.55                               | 1.65                               | 614             |
| 50%                         | 1.34                       | 1.49                       | 1.66                       | 1.53                       | 1.32                               | 1.48                               | 614             |
| >90 %                       | 1.22                       | 1.32                       | 1.44                       | 1.55                       | 1.34                               | 1.45                               | 614             |

**H-Filed Strength at(15 cm from edges A, B, C, D, 20 cm and 15cm from top E) surrounding the EUT(A/m)**

| Charging Load<br>Worse case | Test<br>Position<br>A(A/m) | Test<br>Position<br>B(A/m) | Test<br>Position<br>C(A/m) | Test<br>Position<br>D(A/m) | Test<br>Position<br>E(A/m)<br>20cm | Test<br>Position<br>E(A/m)<br>15cm | Limits<br>(A/m) |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------------------------------------|------------------------------------|-----------------|
| <5%                         | 0.205                      | 0.185                      | 0.194                      | 0.185                      | 0.185                              | 0.195                              | 1.63            |
| 50%                         | 0.192                      | 0.184                      | 0.195                      | 0.175                      | 0.175                              | 0.188                              | 1.63            |
| >90 %                       | 0.195                      | 0.173                      | 0.175                      | 0.155                      | 0.166                              | 0.175                              | 1.63            |

**Test Result for Test setup B:**

**Note:** internal battery power +wireless charger(5W)mode

**<5% ,50% ,>90% load battery mode all have been tested ,only worse case Max load (<5%mode) is reported.**

**E-Filed Strength at (distance 10cm to 1cm at 1cm iteration, i.e. at a distance of 10cm, 9cm, 8cm, ..... 1cm, Which is between the edge of the charger and the edge of probe,) surrounding the EUT(V/m)**

| Test distance<br>(cm) | Test<br>Position<br>A(V/m) | Test<br>Position<br>B(V/m) | Test<br>Position<br>C(V/m) | Test<br>Position<br>D(V/m) | Test<br>Position<br>E(V/m) | Limits<br>(V/m) |
|-----------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----------------|
| <b>1</b>              | 2.15                       | 2.30                       | 2.32                       | 2.44                       | 2.12                       | 83              |
| <b>2</b>              | 2.11                       | 2.22                       | 2.22                       | 2.33                       | 1.98                       | 83              |
| <b>3</b>              | 1.98                       | 2.12                       | 2.01                       | 2.01                       | 1.96                       | 83              |
| <b>4</b>              | 1.95                       | 1.98                       | 1.98                       | 1.99                       | 1.95                       | 83              |
| <b>5</b>              | 1.85                       | 1.76                       | 1.95                       | 1.92                       | 1.92                       | 83              |
| <b>6</b>              | 1.83                       | 1.75                       | 1.85                       | 1.88                       | 1.87                       | 83              |
| <b>7</b>              | 1.76                       | 1.72                       | 1.72                       | 1.87                       | 1.85                       | 83              |
| <b>8</b>              | 1.73                       | 1.68                       | 1.66                       | 1.85                       | 1.82                       | 83              |
| <b>9</b>              | 1.66                       | 1.66                       | 1.64                       | 1.75                       | 1.74                       | 83              |
| <b>10</b>             | 1.63                       | 1.65                       | 1.62                       | 1.72                       | 1.65                       | 83              |

**H-Filed Strength at (distance 10cm to 1cm at 1cm iteration, i.e. at a distance of 10cm, 9cm, 8cm, ..... 1cm, Which is between the edge of the charger and the edge probe,)surrounding the EUT(A/m)**

| Test distance (cm) | Test Position A(A/m) | Test Position B(A/m) | Test Position C(A/m) | Test Position D(A/m) | Test Position E(A/m) | Limits (A/m) |
|--------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--------------|
| 1                  | 0.299                | 0.285                | 0.275                | 0.266                | 0.285                | 90           |
| 2                  | 0.288                | 0.256                | 0.253                | 0.258                | 0.277                | 90           |
| 3                  | 0.277                | 0.253                | 0.251                | 0.248                | 0.272                | 90           |
| 4                  | 0.266                | 0.252                | 0.248                | 0.234                | 0.266                | 90           |
| 5                  | 0.248                | 0.243                | 0.243                | 0.232                | 0.263                | 90           |
| 6                  | 0.238                | 0.235                | 0.234                | 0.228                | 0.258                | 90           |
| 7                  | 0.235                | 0.232                | 0.225                | 0.226                | 0.245                | 90           |
| 8                  | 0.227                | 0.225                | 0.215                | 0.224                | 0.236                | 90           |
| 9                  | 0.215                | 0.205                | 0.206                | 0.215                | 0.228                | 90           |
| 10                 | 0.207                | 0.204                | 0.202                | 0.208                | 0.218                | 90           |

Note:Description of Support Units

| Equipment    | Model No. | Serial No.   | FCC ID | Trade Name |
|--------------|-----------|--------------|--------|------------|
| Mobile Phone | MQ6M2CH/A | C7DV86Y3JC6F | /      | IPHONE     |

## 7. Facilities and Accreditations

### 7.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of SHENZHEN TONGCE TESTING LAB has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

### 7.2. Location

Shenzhen Tongce Testing Lab

Address: TCT Testing Industrial Park, Fuqiao 5th Industrial Zone, Fuhai Street,

Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China

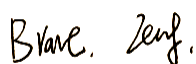
TEL: +86-755-27673339

### 7.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %

$\pm 0.8\text{dB}$  (H-Field)

$\pm 0.8\text{dB}$  (E-Field)



Test Engineer:

Brave Zeng



Reviewer:

Beryl Zhao

Test date:

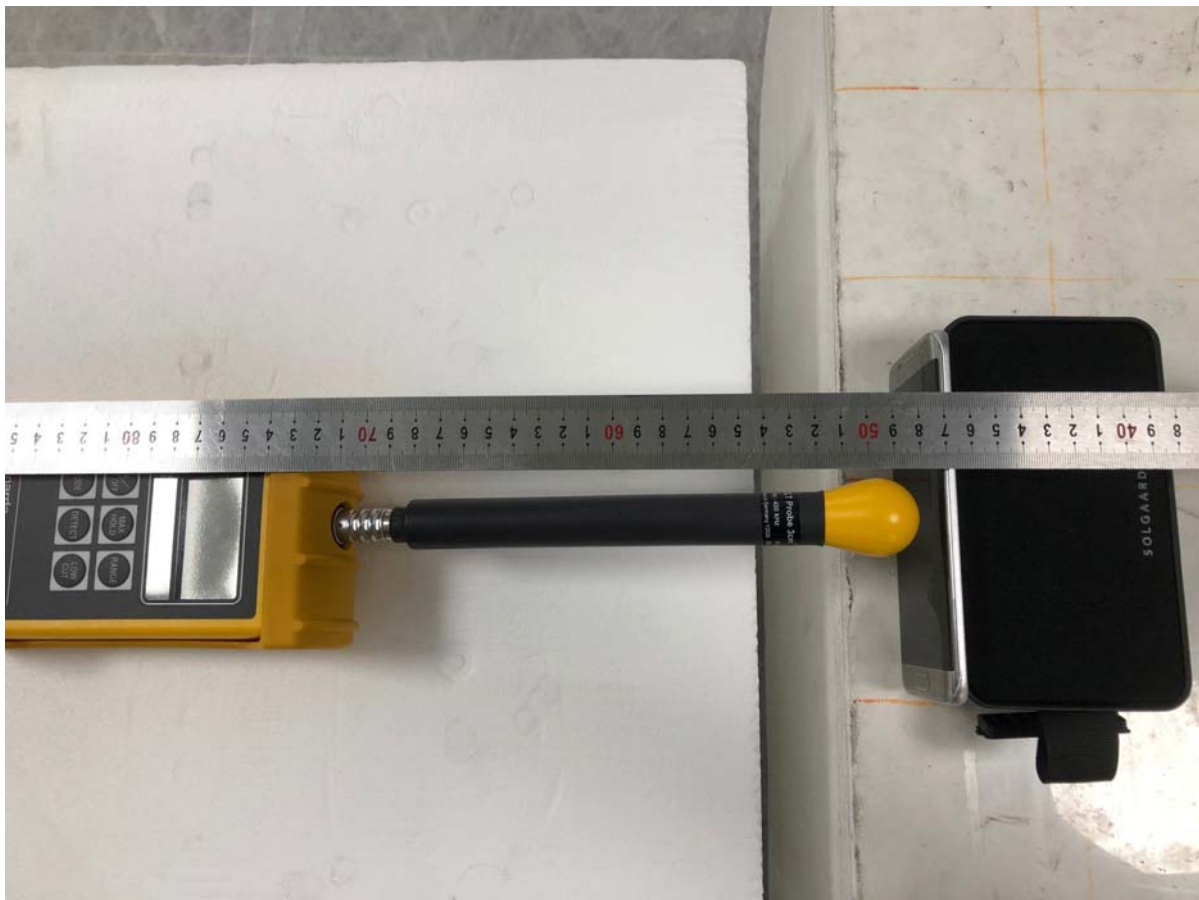
Apr. 13, 2021

Review date:

Apr. 14, 2021

## 7 Test Set-up Photo

E position setup B :



E position setup A :

