RF Exposure Evaluation

1 Measuring Standard

KDB 680106 D01 RF Exposure Wireless Charging App v03;

TCB Workshop, October 2018, 5.2 RF Exposure Procedures

2 Requirements

According to the item 5 of KDB 680106 D01 RF Exposure Wireless Charging App v03:

(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 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

(4) 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

3Limits

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)

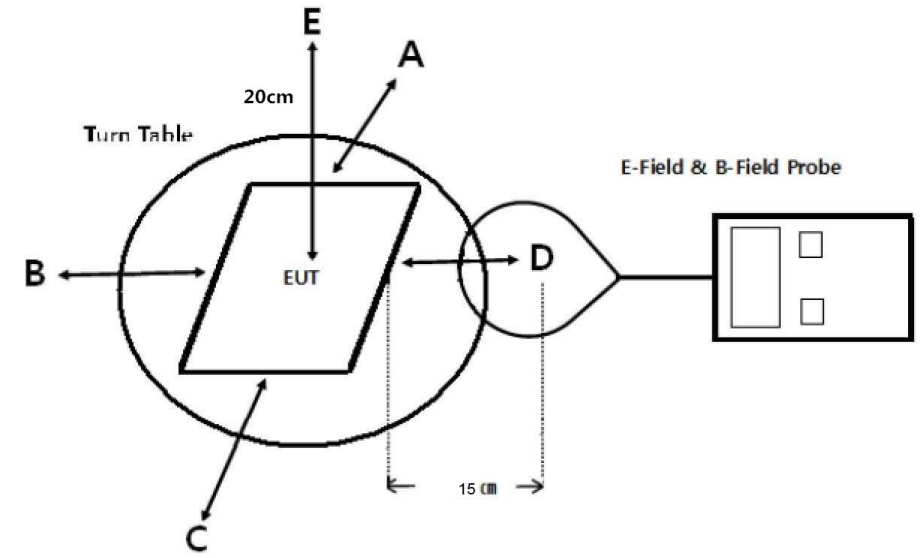
Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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
300-1500	/	/	f/300	6
1500-100,000	/	/	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
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

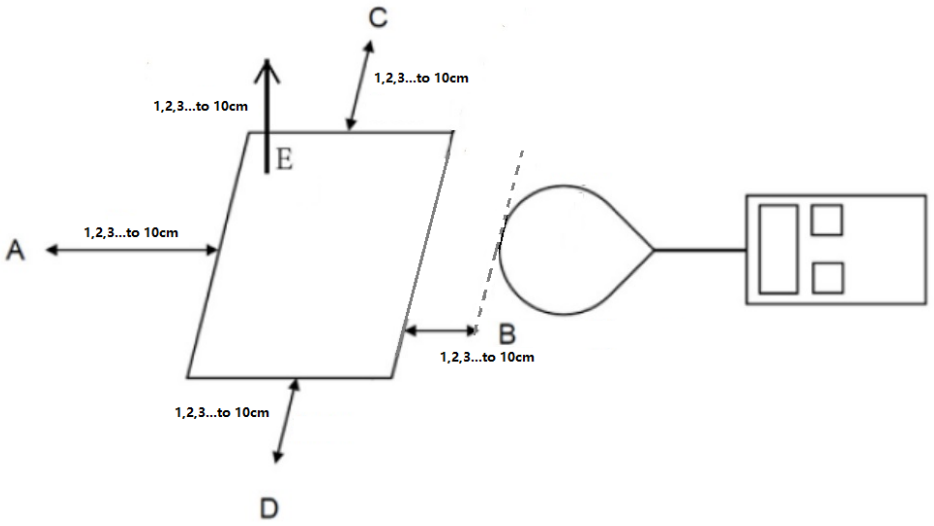
F=frequency in MHz
*=Plane-wave equivalent power density
RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in Table 1 of 1.1310(use the 300kHz limits for 150kHz:614V/m,1.63A/m).

4 Test Setup

A:



B:



5Test Procedure

(1) The RF exposure test was performed in an echoic chamber;

(2) The measurement probe was placed at test distance(15 cm from edges, 20 cm 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 of probe, for test setup B;

(4) The highest emission level are 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 KDB680106D01v03; And KDB Tracking Number 671578 ; 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.

6 Test Instruments list

Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Duedate (mm-dd-yy)
Magnetic field meter	NARDA	ELT-400	N-0925	Jul. 28, 2020	Jul. 27, 2021
B-Field Probe	NARDA	ELT-400	M-1354	Jul. 28, 2020	Jul. 27, 2021

7 Test Result

Test Result for Test setup A:

The cases which include the EUT powered by adapter and battery are tested, but the worse case is powered by battery and report its result.

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

Charging Load Worse case	Test Position A(V/m)	Test Position B(V/m)	Test Position C(V/m)	Test Position D(V/m)	Test Position E(V/m)	Limits (V/m)
<5%	0.82	0.92	0.84	0.75	0.88	614
50%	1.20	1.34	1.28	1.47	1.39	614
>90 %	1.44	1.63	1.57	1.70	1.46	614

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

Charging Load Worse case	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)
<5%	0.109	0.116	0.118	0.106	0.104	1.63
50%	0.182	0.172	0.165	0.170	0.159	1.63
>90 %	0.109	0.116	0.118	0.106	0.104	1.63

Test Result for Test setup B:

Note: The cases which include the EUT powered by adapter and battery are tested, but the worse case is powered by battery and report its result.

<5%, 50%, >90% load all have been tested, only worse case Max load (>90% load) 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 of probe,) surrounding the EUT (V/m)

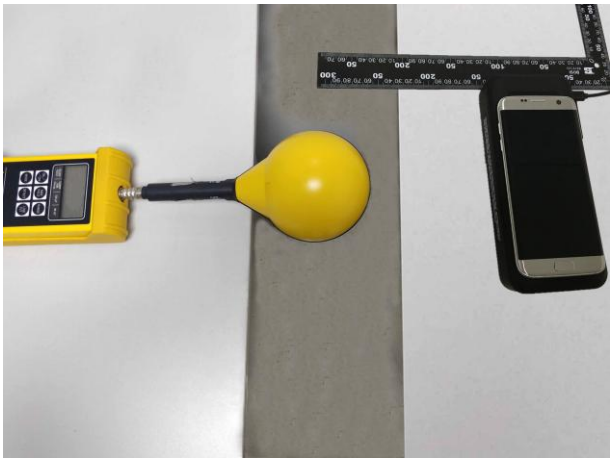
Test distance (cm)	Test Position A (V/m)	Test Position B (V/m)	Test Position C (V/m)	Test Position D (V/m)	Test Position E (V/m)	Limits (V/m)
1	18.06	18.22	18.14	18.46	17.91	614
2	16.53	16.74	16.63	16.85	16.42	614
3	15.01	15.16	15.11	15.33	14.94	614
4	12.49	12.57	12.50	12.65	12.38	614
5	10.35	10.60	10.49	10.77	10.24	614
6	8.24	8.43	8.37	8.61	8.15	614
7	6.87	6.95	6.91	7.13	6.61	614
8	5.12	5.41	5.29	5.78	5.08	614
9	3.38	3.50	3.45	3.69	3.15	614
10	1.56	1.68	1.61	1.85	1.54	614

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 of of probe,) surrounding the EUT (A/m)

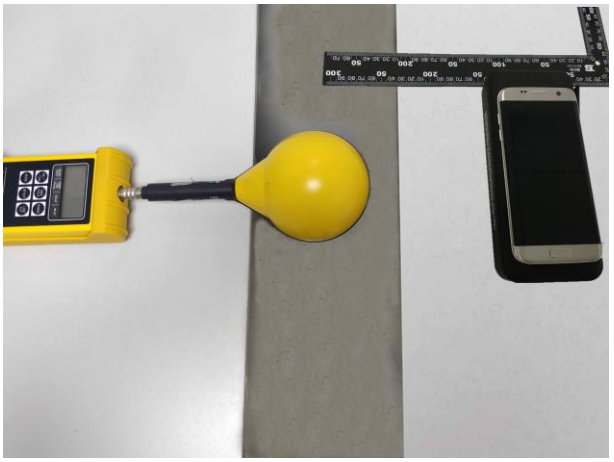
Test distance (cm)	Test Position A(A/m)	Test Position B(A/m)	Test Position C(A/m)	Test Position D(A/m)	Test Position E(A/m)	Limits (A/m)
1	0.285	0.304	0.327	0.279	0.266	1.63
2	0.216	0.238	0.249	0.212	0.208	1.63
3	0.203	0.226	0.231	0.200	0.192	1.63
4	0.149	0.152	0.161	0.147	0.135	1.63
5	0.123	0.140	0.145	0.120	0.118	1.63
6	0.118	0.132	0.136	0.117	0.115	1.63
7	0.115	0.130	0.133	0.113	0.112	1.63
8	0.112	0.126	0.130	0.111	0.110	1.63
9	0.110	0.125	0.122	0.110	0.108	1.63
10	0.110	0.123	0.120	0.109	0.106	1.63

7 Test Set-up Photo

Test setup A

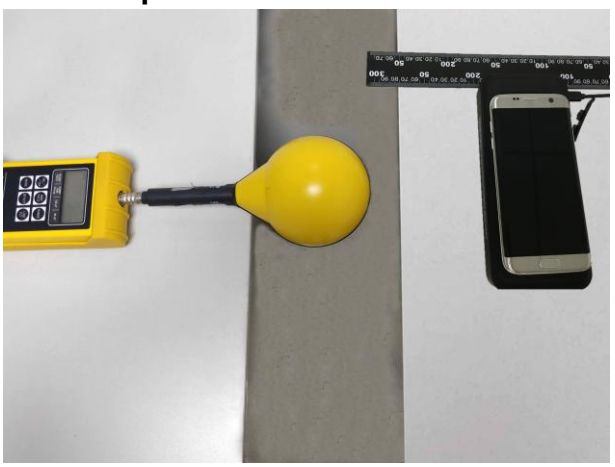


Powerd by adapter

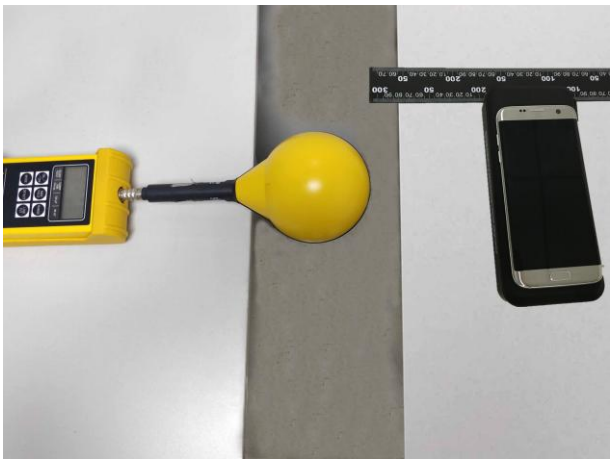


Powerd by battery

Test setup B



Powerd by adapter



Powerd by battery