RF Exposure Evaluation

FCC ID: 2AX9S-RCWPA

1. Client Information

Applicant	:	Molonlave Group LLC
Address	:	36-20 34th Street, Long Island City, NY 11106, USA
Manufacturer	:	Molonlave Group LLC
Address	:	36-20 34th Street, Long Island City, NY 11106, USA

2. General Description of EUT

EUT Name	:	Wireless pad	
Models No.	:	RCWPA	
Sample ID	:	TBBJ-20201120-13-01	
Model Difference	:	N/A	
Product Description	:	Operation Frequency:	110KHz-205KHz
		Modulation Type:	ASK
		Antenna:	Coil Antenna
Power Rating	:	Input: DC 9V/5A Total Output: DC 9V/4.5A Max Single Output: DC 9V/1.2A Max	
Software Version	:	1.1	
Hardware Version	:	1.1	
Connecting I/O Port(S)	:	Please refer to the User's Manual	

Note: More test information about the EUT please refer the RF Test Report.

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RF Exposure Considerations

1. Measuring Standard

KDB 680106 D01 RF Exposure Wireless Charging App v03.

2. Requirements

According to the item 5.2 of KDB 680106 D01v03:
Inductive wireless power transfer applications that meet all of the following requirements are excluded from submitting an RF exposure evaluation:

(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 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.

(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).

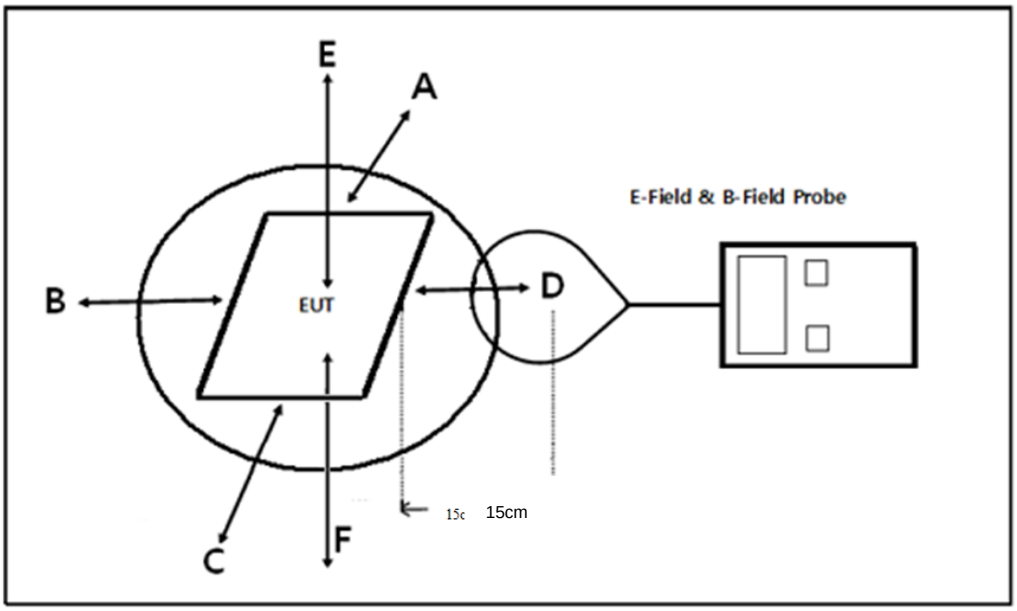
(6) The aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.

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).

3. Test Setup



Note: 1) For mobile RF exposure condition, due to installation limitations no tests from the underside of the charging device are required.
2)For portable RF exposure, need measure all sides.

4.Test Procedure

For mobile RF exposure:

a) The RF exposure test was performed on 360 degree turn table in anechoic chamber.
b) The measurement probe was placed at test distance (15cm) which is between the edge of the charger and the geometric center of probe.
c) The turn table was rotated 360d degree to search of highest strength.
d) The highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D, E) were completed.
e) The EUT were measured according to the dictates of KDB 680106D01v03.

For portable RF exposure:

a) The RF exposure test was performed on 360 degree turn table in anechoic chamber.
b) The measurement probe was placed at test distance (0cm) which is between the edge of the charger and the geometric center of probe.
c) The turn table was rotated 360d degree to search of highest strength.
d) The highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D, E, F) were completed.
e). Repeated measured (a) – (d) at measure distance 5cm and 10cm.
f) The EUT were measured according to the dictates of KDB 680106D01v03.

5. Test Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Magnetic field meter	NARDA	ELT-400	EE030	Sep. 11, 2020	Sep. 10, 2021

5.4 Deviation From Test Standard

No deviation

6. Mode of operation during the test / Test peripherals used

Test Conditions	Description	Exposure conditions	
TM1	AC/DC Adapter + EUT + 1*Wireless Power Bank (Battery Status: <1%)	☒ Mobile	Record
TM2	AC/DC Adapter + EUT + 1*Wireless Power Bank (Battery Status: <50%)	☒ Mobile	Record
TM3	AC/DC Adapter + EUT + 1*Wireless Power Bank (Battery Status: <100%)	☒ Mobile	Record
TM4	AC/DC Adapter + EUT + 2*Wireless Power Bank (Battery Status: <1%)	☒ Mobile	Record
TM5	AC/DC Adapter + EUT + 2*Wireless Power Bank (Battery Status: <50%)	☒ Mobile	Record
TM6	AC/DC Adapter + EUT + 2*Wireless Power Bank (Battery Status: <100%)	☒ Mobile	Record
TM7	AC/DC Adapter + EUT + 3*Wireless Power Bank (Battery Status: <1%)	☒ Mobile	Record
TM8	AC/DC Adapter + EUT + 3*Wireless Power Bank (Battery Status: <50%)	☒ Mobile	Record
TM9	AC/DC Adapter + EUT + 3*Wireless Power Bank (Battery Status: <100%)	☒ Mobile	Record
TM10	AC/DC Adapter + EUT + 4*Wireless Power Bank (Battery Status: <1%)	☒ Mobile	Record
TM11	AC/DC Adapter + EUT + 4*Wireless Power Bank (Battery Status: <50%)	☒ Mobile	Record
TM12	AC/DC Adapter + EUT + 4*Wireless Power Bank (Battery Status: <100%)	☒ Mobile	Record
Note: All test modes were pre-tested, but we only recorded the worst case in this report.			

7. Test Result

EUT was tested with empty load, half load and full load, the full load is the worst case and we listed the results in the report.

Symbols

For the purpose of the present document, the following symbols apply;

E: Filed strength

H: Magnetic field strength

E_{AVG} = Spatial average of Filed strength

H_{AVG} = Spatial average of Magnetic field strength

E_1: Filed Strength of wireless charge port 1

H_1: Magnetic field strength of wireless charge port 1

E_2: Filed Strength of wireless charge port 2

H_2: Magnetic field strength of wireless charge port 2

E_1: Filed Strength of wireless charge port 3

H_1: Magnetic field strength of wireless charge port 3

E_2: Filed Strength of wireless charge port 4

H_2: Magnetic field strength of wireless charge port 4

E-Filed Strength at 15 cm from the edges surrounding the EUT and 15 cm above the top surface

Charge Port	Charging Battery Level	Frequency Range (MHz)	Measured E-Field Strength Values (V/m)					E-Field Strength 50% Limits (V/m)	E-Field Strength Limits (V/m)
			Test Position A	Test Position B	Test Position C	Test Position D	Test Position E		
E1	1%	0.129	13.25	14.25	15.36	14.85	16.85	307.0	614.0
	50%	0.129	14.00	13.64	15.81	14.25	16.63	307.0	614.0
	99%	0.129	12.75	13.28	15.36	14.00	15.95	307.0	614.0
E2	1%	0.129	13.40	13.05	15.90	14.56	15.20	307.0	614.0
	50%	0.129	12.79	13.50	15.26	14.65	15.21	307.0	614.0
	99%	0.129	13.94	13.79	15.18	14.60	15.56	307.0	614.0
E3	1%	0.129	13.03	14.65	15.61	14.29	16.99	307.0	614.0
	50%	0.129	12.50	13.94	15.42	13.92	16.99	307.0	614.0
	99%	0.129	13.09	14.73	15.48	13.31	16.33	307.0	614.0
E4	1%	0.129	13.38	15.32	15.45	13.79	15.57	307.0	614.0
	50%	0.129	12.28	15.56	15.65	13.02	15.27	307.0	614.0
	99%	0.129	14.17	14.07	14.24	15.67	15.67	307.0	614.0

H-Field Strength at 15 cm from the edges surrounding the EUT

Test mode	Charging Battery Level	Frequency Range (MHz)	Measured H-Field Strength Values (A/m)					H-Field Strength 50% Limits (A/m)	H-Field Strength Limits (A/m)
			Test Position A	Test Position B	Test Position C	Test Position D	Test Position E		
H1	1%	0.129	0.156	0.124	0.123	0.124	0.157	0.815	1.63
	50%	0.129	0.168	0.112	0.114	0.098	0.146	0.815	1.63
	99%	0.129	0.185	0.109	0.098	0.105	0.135	0.815	1.63
H2	1%	0.129	0.146	0.126	0.121	0.118	0.128	0.815	1.63
	50%	0.129	0.139	0.118	0.125	0.108	0.126	0.815	1.63
	99%	0.129	0.158	0.128	0.089	0.112	0.142	0.815	1.63
H3	1%	0.129	0.126	0.148	0.102	0.132	0.128	0.815	1.63
	50%	0.129	0.175	0.126	0.112	0.107	0.132	0.815	1.63
	99%	0.129	0.145	0.135	0.105	0.113	0.142	0.815	1.63
H4	1%	0.129	0.146	0.142	0.112	0.132	0.139	0.815	1.63
	50%	0.129	0.128	0.135	0.108	0.115	0.128	0.815	1.63
	99%	0.129	0.168	0.142	0.099	0.123	0.178	0.815	1.63

H-Field Strength at 20cm from the top surface of the EUT

Test mode	Charging Battery Level	Frequency Range (MHz)	Measured H-Field Strength Values (A/m)	H-Field Strength 50% Limits (A/m)	H-Field Strength Limits (A/m)
			Test Position E		
H1	1%	0.129	0.136	0.815	1.63
	50%	0.129	0.128	0.815	1.63
	99%	0.129	0.147	0.815	1.63
H2	1%	0.129	0.138	0.815	1.63
	50%	0.129	0.124	0.815	1.63
	99%	0.129	0.165	0.815	1.63
H3	1%	0.129	0.172	0.815	1.63
	50%	0.129	0.142	0.815	1.63
	99%	0.129	0.138	0.815	1.63
H4	1%	0.129	0.142	0.815	1.63
	50%	0.129	0.154	0.815	1.63
	99%	0.129	0.148	0.815	1.63

For Simultaneous E-Filed Strength and H-Filed Strength:

KDB 447498 points for simultaneous transmission on far-filed measurement, while for below 30 MHz usually measured at near-filed. KDB680106 require aggregate leakage fields at 15 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit;
KDB680106 can accept 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.
Test labs suggest use Computational modelling to calculate Nerve Stimulation BRs;
Computational modelling, such as finite-difference time-domain (FDTD) may be used to demonstrate compliance with FCC § 1.1310 limits requirement,
Basic Calculations - The following calculations may be used to evaluate systems without consideration for the effects of phase resulting from multiple frequency and/or multiple antennas co-located in the measurement space, which may overestimate the actual result. If the result exceeds the limits, the advanced calculations described in follows may be used.

$$E_{AVG} = \frac{1}{n}\sum_{t=1}^{n}(E_{MaxRMS})_t$$

Where:
E-field measurements
E_{AVG} = Spatial average
E_{MaxRMS} = E-field at a measurement point
N = Number of spatially averaged points

And

$$H_{AVG} = \frac{1}{n}\sum_{t=1}^{n}(H_{MaxRMS})_t$$

Where:
H-field levels of magnetic field strength
H_{AVG} = Spatial average
H_{MaxRMS} = H-field at a measurement point
N = Number of spatially averaged points

E-Filed Strength at 15 cm from the edges surrounding the EUT and 15 cm above the top surface

Charge Port	Charging Battery Level	Frequency Range (MHz)	Measured E-Field Strength Values (V/m)					E-Field Strength 50% Limits (V/m)	E-Field Strength Limits (V/m)
			Test Position A	Test Position B	Test Position C	Test Position D	Test Position E		
E_{AVG}	1%	0.129	13.265	14.318	15.580	14.373	16.153	307.0	614.0
	50%	0.129	12.893	14.160	15.535	13.960	16.025	307.0	614.0
	99%	0.129	13.488	13.968	15.065	14.395	15.878	307.0	614.0

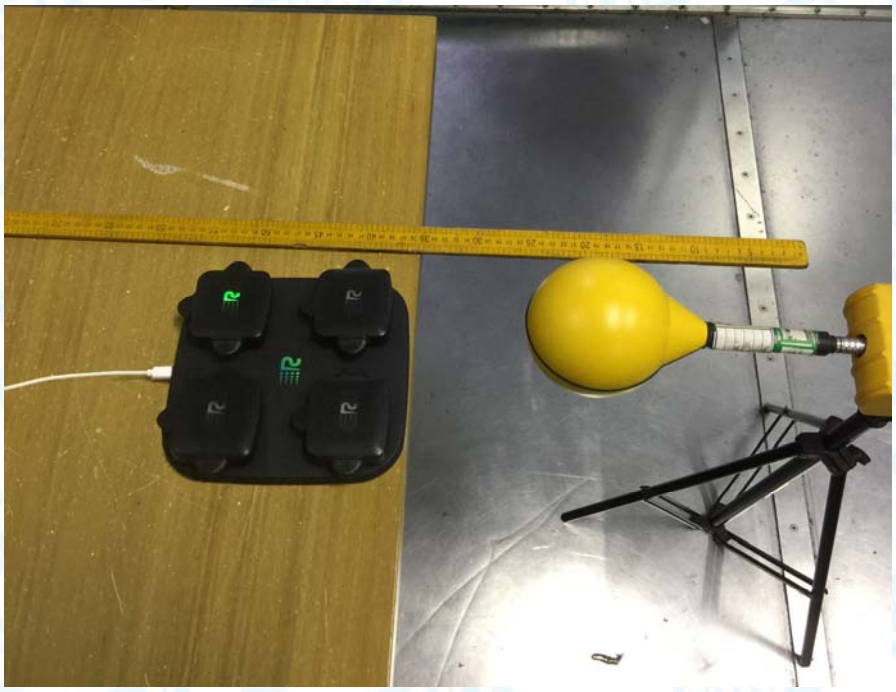
H-Field Strength at 15 cm from the edges surrounding the EUT

Test mode	Charging Battery Level	Frequency Range (MHz)	Measured H-Field Strength Values (A/m)					H-Field Strength 50% Limits (A/m)	H-Field Strength Limits (A/m)
			Test Position A	Test Position B	Test Position C	Test Position D	Test Position E		
H_{AVG}	1%	0.129	0.144	0.135	0.115	0.127	0.138	0.815	1.63
	50%	0.129	0.153	0.123	0.115	0.107	0.133	0.815	1.63
	99%	0.129	0.164	0.129	0.098	0.113	0.149	0.815	1.63

H-Field Strength at 20cm from the top surface of the EUT

Test mode	Charging Battery Level	Frequency Range (MHz)	Measured H-Field Strength Values (A/m)	H-Field Strength 50% Limits (A/m)	H-Field Strength Limits (A/m)
			Test Position E		
H_{AVG}	1%	0.129	0.147	0.815	1.63
	50%	0.129	0.137	0.815	1.63
	99%	0.129	0.150	0.815	1.63

8. Test Set-up Photo

Test Set-up Photo


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