

RF Exposure Evaluation

1 General Description of EUT

FCC ID	2AZBF-CK60
Product Name:	Magnetic Wireless Charger
Model/Type reference:	CK60
Serial No.:	CK50
Test sample(s) ID:	GTSL202103000119-1(Engineer sample) GTSL202103000119-2(Normal sample)
Power supply:	Type-C Input: 5V--- 2A(Max) USB Output: 5V--- 2.1A; Wireless changer Output: 10W Battery Capacity: 3.7V, 5000mAh, 18.5Wh
Test frequency:	145KHz
Modulation type:	ASK
Antenna type:	Loop coil antenna

2 Measuring Standard

According to §1.1307(b)(1), 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.

According to §1.1310 and §2.1091 RF exposure is calculated.

According KDB 680106 D01 RF Exposure Wireless Charging App v03

3 Requirements

According to the item 5 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 1MHz.
- (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.

Remark: Meet all the above requirements.

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)

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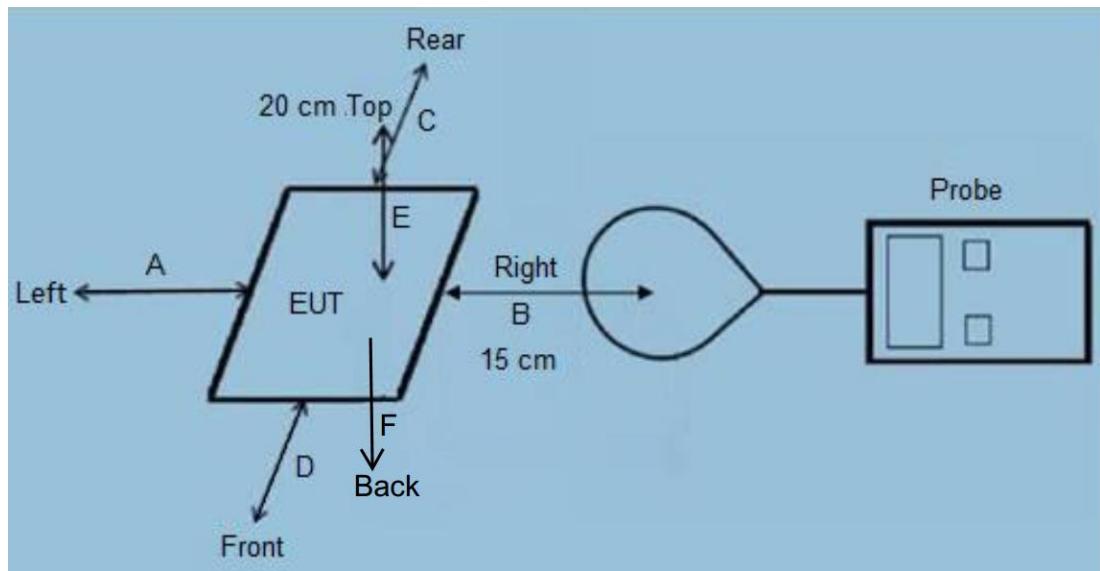
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	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



5 Test Procedure

For mobile RF exposure

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

For portable RF exposure

- The RF exposure test was performed on 360 degree turn table in anechoic chamber.
- The measurement probe was placed at test distance (0cm) which is between the edge of the charger and the geometric center of probe.
- The turn table was rotated 360d degree to search of highest strength.
- 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.
- Repeated measured (a) – (d) at measure distance 5cm, 10cm and 15cm.
- The EUT were measured according to the dictates of KDB 680106D01v03.

6 Equipment Approval Considerations

The EUT does comply with KDB 680106 D01 as follow table.

Requirements of KDB 680106 D01	Yes / No	Description
Power transfer frequency is less than 1 MHz	Yes	The device operate in the frequency range 110KHz~205KHz
Output power from each primary coil is less than 15 watts	Yes	The maximum output power for each primary coil is 10W.
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	The transfer system includes only one primary coils.
Client device is placed directly in contact with the transmitter.	Yes	Client device is placed directly in contact with the transmitter.
Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).	No	Mixed mobile and portable exposure conditions
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 EUT 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.

7 Description of the test mode

Equipment under test was operated during the measurement under the following conditions:

Charging and communication mode

Test Conditions	Description	Exposure conditions	
TM1	AC/DC Adapter (5V/2A) + EUT + iphone (Battery Level <1%)	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable	Record
TM2	AC/DC Adapter (5V/2A) + EUT + iphone (Battery Level 50%)	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable	Record
TM3	AC/DC Adapter (5V/2A) + EUT + iphone (Battery Level >99%)	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable	Record
TM4	EUT + iphone (Battery Level <1%)	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable	Record
TM5	EUT + iphone (Battery Level 50%)	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable	Record
TM6	EUT + iphone (Battery Level >99%)	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable	Record
TM7	AC/DC Adapter (9V/1.8A) + EUT + iphone (Battery Level <1%)	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable	Pre-tested
TM8	AC/DC Adapter (9V/1.8A) + EUT + iphone (Battery Level 50%)	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable	Pre-tested
TM9	AC/DC Adapter (9V/1.8A) + EUT + iphone (Battery Level >99%)	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable	Pre-tested

Note: 1. During the test the phone is attached the network in WWAN traffic mode and Wifi/BT is connected.

2. All test modes were pre-tested, but we only recorded the worst case in this report.

8 Description of Support Units

Follow auxiliary equipment(s) test with EUT that provided by the manufacturer or laboratory is listed as follow:

Description	Manufacturer	Model	Technical Parameters	Certificate	Provided by
Adapter	CHENYANG ELECTRONICS	CD107	Input: 100-240V~, 50/60Hz, 0.5A Output: 5V==2A / 9V==1.8A	FCC	laboratory
Phone 12	Apple	/	/	FCC	laboratory

9 Test Instruments list

Description	Brand	Model No.	Frequency Range	Calibrated Date	Calibrated Until
Broadband Field Meter	NARDA	NBM-550	-	June. 27, 2020	June. 28, 2021
Magnetic Field Meter	NARDA	ELT-400	1 – 400kHz	June. 27, 2020	June. 28, 2021
Magnetic Probe	NARDA	HF-3061	300kHz – 30MHz	June. 27, 2020	June. 28, 2021
Magnetic Probe	NARDA	HF-0191	27 – 1000MHz	June. 27, 2020	June. 28, 2021
Broadband Field Meter	NARDA	NBM-550	-	June. 27, 2020	June. 28, 2021
Electric Field Meter	COMBINOVA	EFM 200	5Hz – 400kHz	June. 27, 2020	June. 28, 2021
E-Field Probe	NARDA	EF-0391	100kHz – 3GHz	June. 27, 2020	June. 28, 2021
E-Field Probe	NARDA	EF-6091	100MHz – 60GHz	June. 27, 2020	June. 28, 2021

10 Test Result

For mobile exposure

E-Field Strength at 15 cm from the edges surrounding the EUT and 15cm from the top surface of the EUT

Test Mode	Unit	Measured E-Field Strength Values (V/m)					FCC E-Field Strength 50% Limits (V/m)	FCC E-Field Strength Limits (V/m)
		Test Position A	Test Position B	Test Position C	Test Position D	Test Position E		
Mode 1	v/m	89.726	85.579	87.087	91.234	93.119	307.0	614.0
Mode 2	v/m	61.451	63.713	67.483	68.614	66.352	307.0	614.0
Mode 3	v/m	47.502	49.387	51.649	53.534	50.895	307.0	614.0

Note: V/m= A/m *377

H-Field Strength at 15 cm from the edges surrounding the EUT and 15cm from the top surface of the EUT

Test Mode	Unit	Measured H-Field Strength Values (A/m)					FCC H-Field Strength 50% Limits (A/m)	FCC H-Field Strength Limits (A/m)
		Test Position A	Test Position B	Test Position C	Test Position D	Test Position E		
Mode 1	uT	0.298	0.284	0.289	0.303	0.309	--	--
Mode 1	A/m	0.238	0.227	0.231	0.242	0.247	0.815	1.63
Mode 2	uT	0.204	0.211	0.224	0.228	0.220	--	--
Mode 2	A/m	0.163	0.169	0.179	0.182	0.176	0.815	1.63
Mode 3	uT	0.158	0.164	0.171	0.178	0.169	--	--
Mode 3	A/m	0.126	0.131	0.137	0.142	0.135	0.815	1.63

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

Test Mode	Unit	Measured H-Field Strength Values (A/m)		FCC H-Field Strength 50% Limits (A/m)	FCC H-Field Strength Limits (A/m)
		Test Position E			
Mode 1	uT	0.261		--	--
Mode 1	A/m	0.209		0.815	1.63
Mode 2	uT	0.199		--	--
Mode 2	A/m	0.159		0.815	1.63
Mode 3	uT	0.145		--	--
Mode 3	A/m	0.116		0.815	1.63

Note:A/m=uT/1.25

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For portable exposure

E-Field Strength at 0/5/10/15 cm from the edges surrounding the EUT

Test Conditions	Unit	Measured Distance (cm)	Measured E-Field Strength Values (V/m)						FCC E-Field Strength Limits (V/m)
			Test Position A	Test Position B	Test Position C	Test Position D	Test Position E	Test Position F	
Mode 4	V/m	0	175.305	183.222	177.944	193.024	196.417	191.516	614.0
Mode 5	V/m	0	148.538	141.752	138.359	127.803	143.637	144.768	614.0
Mode 6	V/m	0	108.953	103.298	90.103	99.905	97.266	81.809	614.0
Mode 4	V/m	5	162.864	160.979	155.701	166.634	154.193	144.014	614.0
Mode 5	V/m	5	107.445	117.624	127.803	115.739	131.573	125.164	614.0
Mode 6	V/m	5	91.611	89.349	75.777	78.793	83.317	90.857	614.0
Mode 4	V/m	10	130.442	119.886	130.442	136.474	130.819	108.953	614.0
Mode 5	V/m	10	85.202	81.432	89.349	81.809	92.365	94.627	614.0
Mode 6	V/m	10	71.253	72.384	67.106	68.991	63.713	70.876	614.0
Mode 4	V/m	15	78.793	75.023	90.857	76.154	79.924	74.646	614.0
Mode 5	V/m	15	63.713	61.828	65.221	63.336	68.237	65.975	614.0
Mode 6	V/m	15	50.895	42.224	46.748	49.387	44.486	47.879	614.0

Note: V/m= A/m *377

H-Field Strength at 0/5/10/15 cm from the edges surrounding the EUT

Test Conditions	Charging Battery Level	Measured Distance (cm)	Measured H-Field Strength Values (A/m)						FCC H-Field Strength Limits (A/m)
			Test Position A	Test Position B	Test Position C	Test Position D	Test Position E	Test Position F	
Mode 4	uT	0	0.581	0.608	0.590	0.640	0.651	0.635	--
Mode 4	A/m	0	0.465	0.486	0.472	0.512	0.521	0.508	1.63
Mode 5	uT	0	0.493	0.470	0.459	0.424	0.476	0.480	--
Mode 5	A/m	0	0.394	0.376	0.367	0.339	0.381	0.384	1.63
Mode 6	uT	0	0.361	0.343	0.299	0.331	0.323	0.271	--
Mode 6	A/m	0	0.289	0.274	0.239	0.265	0.258	0.217	1.63
Mode 4	uT	5	0.540	0.534	0.516	0.553	0.511	0.478	--
Mode 4	A/m	5	0.432	0.427	0.413	0.442	0.409	0.382	1.63
Mode 5	uT	5	0.356	0.390	0.424	0.384	0.436	0.415	--

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Mode 5	A/m	5	0.285	0.312	0.339	0.307	0.349	0.332	1.63
Mode 6	uT	5	0.304	0.296	0.251	0.261	0.276	0.301	--
Mode 6	A/m	5	0.243	0.237	0.201	0.209	0.221	0.241	1.63
Mode 4	uT	10	0.433	0.398	0.433	0.453	0.434	0.361	--
Mode 4	A/m	10	0.346	0.318	0.346	0.362	0.347	0.289	1.63
Mode 5	uT	10	0.283	0.270	0.296	0.271	0.306	0.314	--
Mode 5	A/m	10	0.226	0.216	0.237	0.217	0.245	0.251	1.63
Mode 6	uT	10	0.236	0.240	0.223	0.229	0.211	0.235	--
Mode 6	A/m	10	0.189	0.192	0.178	0.183	0.169	0.188	1.63
Mode 4	uT	15	0.261	0.249	0.301	0.253	0.265	0.248	--
Mode 4	A/m	15	0.209	0.199	0.241	0.202	0.212	0.198	1.63
Mode 5	uT	15	0.211	0.205	0.216	0.210	0.226	0.219	--
Mode 5	A/m	15	0.169	0.164	0.173	0.168	0.181	0.175	1.63
Mode 6	uT	15	0.169	0.140	0.155	0.164	0.148	0.159	--
Mode 6	A/m	15	0.135	0.112	0.124	0.131	0.118	0.127	1.63

Note: A/m = uT/1.25

11 Conclusion

A minimum safety distance of 0 cm to the antenna is required when the device is charging a smart phone for portable exposure and 20 cm to the antenna for mobile exposure. The detected emissions are below the limitations according FCC KDB 680106 and confirmed by the FCC according to KDB Inquire.

12 Test Set-up Photo



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