

RF Exposure Evaluation Report

1. Product Information

FCC ID	2A5UA-W07
Product Name	3 in 1 magnetic wireless charger
Model Number	W07
Series Models	W07-1, W07-1S, W8, W09, W10
Power Supply	DC 9V/2A, DC 12V/2A from adapter
Maximum Rated Power of WPT	Output 1:5W/7.5W/10W/15W (Wireless phone) Output 2:5W max. (TWS) Output 3:2.5W (iWatch)
Modulation Type	ASK
Operation Frequency	From 110KHz~205KHz
Antenna Type	Coil Antenna
Hardware version	WB20B_A V1.2
Software version	V1.0
Exposure category	General population/uncontrolled environment
Test Sample ID:	CTA220321012-1#
EUT Type	Production Unit
Device Type	Mobile Device

2. Evaluation Limit

2.1 Refer Evaluation Method

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 v03r01

2.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30

1500 – 100,000	/	/	1.0	30
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F=frequency in MHz

*=Plane-wave equivalent power density

3. Test Facility and Accreditation

Shenzhen CTA Testing Technology Co., Ltd.

Address: Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

FCC-Registration No.: 517856 Designation Number: CN1318.

A2LA-Lab Cert. No.: 6534.01

4. Test Instruments list

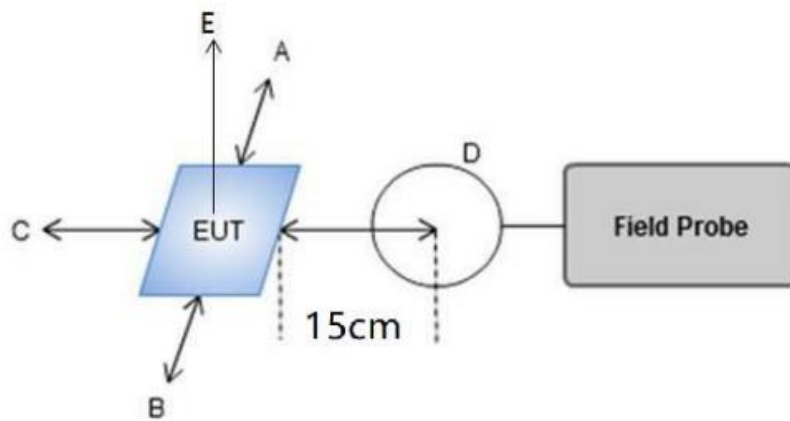
Test Equipment	Manufacturer	Model No.	SN.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
Exposure Level Tester	Narda	ELT-400	N-0231	2021/11/2	2022/11/01
Magnetic field probe 100cm ²	Narda	ELT probe 100cm ²	M0675	2021/11/2	2022/11/01

5. Equipment Approval Considerations

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 15W/5W/2.5W.
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	The transfer system includes 3 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).	Yes	Mobile exposure conditions only
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.

6. TEST CONDITIONS AND RESULTS

6.1 Test Setup



Note: A, B, C, D, E for five surfaces of the product.

The surfaces of each charge port is defined as figure below:

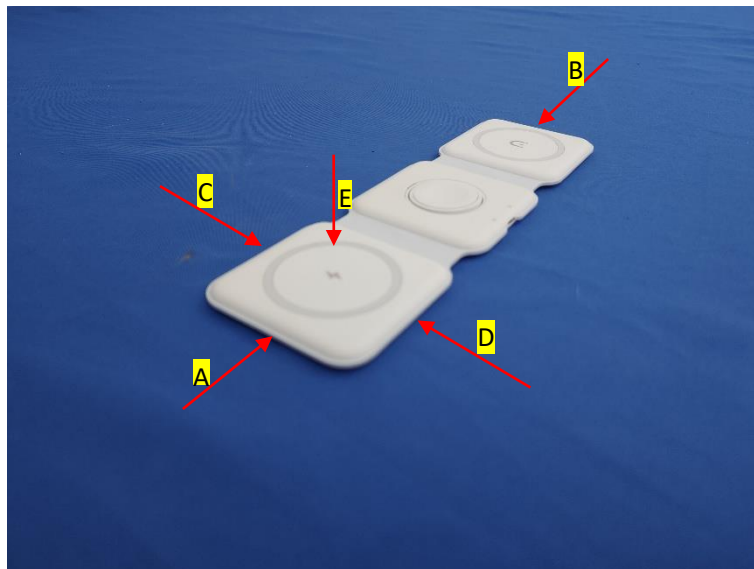


Figure1: surface define for phone charger port during the test

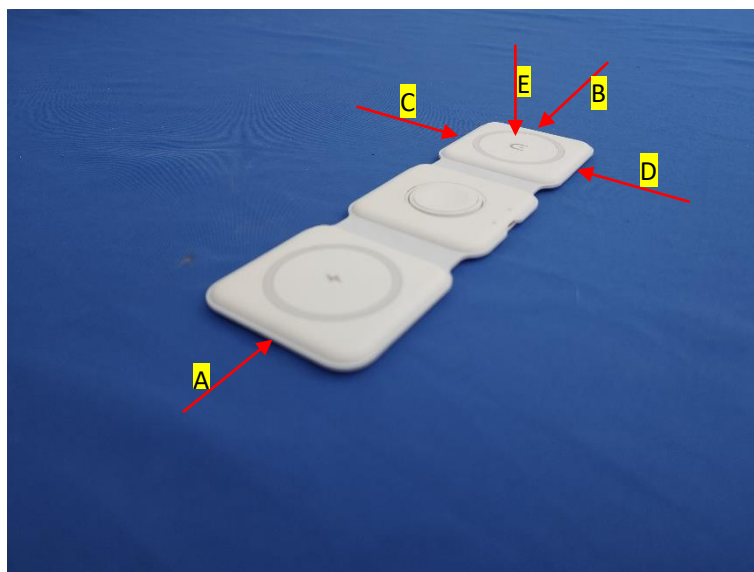


Figure 2: surface define for AirPods charger port during the test.

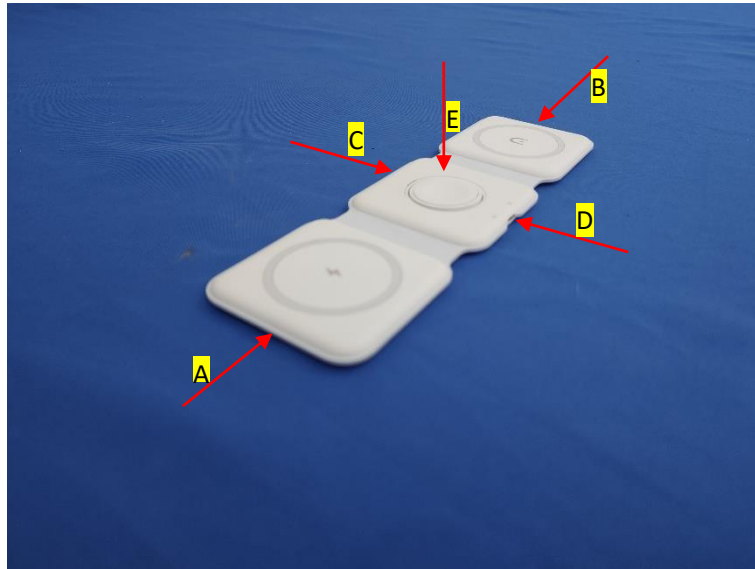


Figure 3:surface define for iWatch charger port during the test

6.2 Measurement Procedure

- The RF exposure test was performed on table in shield room.
- The client with a very low battery level (close to 1%) to make sure maximum power consumption during the test.
- The measurement probe was placed at test distance (15cm/20cm) which is between the edge of the charger and the geometric centre of probe.
- 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 680106 D01 RF Exposure Wireless Charging App v03 and October 2020 TCB Workshop.

6.3 Description of the test mode

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

☒ Charging and communication mode

Test Conditions	Description
TM1	AC/DC Adapter + EUT + Mobile Phone
TM2	AC/DC Adapter + EUT + iWatch
TM3	AC/DC Adapter + EUT + AirPods
TM4	AC/DC Adapter + EUT + Mobile Phone+ iWatch
TM5	AC/DC Adapter + EUT + Mobile Phone + AirPods
TM6	AC/DC Adapter + EUT + iWatch + AirPods
TM7	AC/DC Adapter + EUT + Mobile Phone + iWatch + AirPods

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

6.4 Test Result of E and H field Strength

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

Test mode	Frequency Range (MHz)	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		
TM1	0.125	81.06	36.57	78.79	79.55	108.95	307.0	614.0
TM2	0.125	21.49	22.24	32.80	35.82	47.13	307.0	614.0
TM3	0.125	25.64	39.21	42.22	40.72	69.37	307.0	614.0

Test mode	Frequency Range (MHz)	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		
TM4								
Phone port	0.125	81.81	38.45	81.81	81.06	110.84	307.0	614.0
iWatch port	0.125	80.68	36.95	42.22	40.72	59.19	307.0	614.0

Test mode	Frequency Range (MHz)	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		
TM5								
Phone port	0.125	79.92	45.99	80.68	82.19	107.45	307.0	614.0
AirPods port	0.125	81.06	47.88	42.98	41.09	70.50	307.0	614.0

Test mode	Frequency Range (MHz)	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		
TM6								
iWatch port	0.125	26.77	40.34	34.31	34.68	47.88	307.0	614.0
AirPods port	0.125	26.01	39.59	43.36	41.85	72.38	307.0	614.0

Test mode TM7	Frequency Range (MHz)	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		
Phone port	0.125	81.81	39.96	82.19	84.45	113.85	307.0	614.0
iWatch port	0.125	82.56	41.47	35.44	38.45	50.90	307.0	614.0
AirPods port	0.125	82.19	41.09	45.62	44.86	74.27	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	Frequency Range (MHz)	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		
TM1	0.125	uT	0.269	0.121	0.261	0.264	0.361	--	--
		A/m	0.215	0.097	0.209	0.211	0.289	0.815	1.63
TM2	0.125	uT	0.071	0.074	0.109	0.119	0.156	--	--
		A/m	0.057	0.059	0.087	0.095	0.125	0.815	1.63
TM3	0.125	uT	0.085	0.130	0.140	0.135	0.230	--	--
		A/m	0.068	0.104	0.112	0.108	0.184	0.815	1.63

Test mode TM4	Frequency Range (MHz)	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		
Phone port	0.125	uT	0.271	0.128	0.271	0.269	0.368	--	--
		A/m	0.217	0.102	0.217	0.215	0.294	0.815	1.63
iWatch port	0.125	uT	0.268	0.123	0.140	0.135	0.196	--	--
		A/m	0.214	0.098	0.112	0.108	0.157	0.815	1.63

Test mode TM5	Frequency Range (MHz)	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		
Phone port	0.125	uT	0.265	0.153	0.268	0.273	0.356	--	--
		A/m	0.212	0.122	0.214	0.218	0.285	0.815	1.63
AirPods	0.125	uT	0.269	0.159	0.143	0.136	0.234	--	--

port		A/m	0.215	0.127	0.114	0.109	0.187	0.815	1.63
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Test mode TM6	Frequency Range (MHz)	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		
iWatch port	0.125	uT	0.089	0.134	0.114	0.115	0.159	--	--
		A/m	0.071	0.107	0.091	0.092	0.127	0.815	1.63
AirPods port	0.125	uT	0.086	0.131	0.144	0.139	0.240	--	--
		A/m	0.069	0.105	0.115	0.111	0.192	0.815	1.63

Test mode TM7	Frequency Range (MHz)	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		
Phone port	0.125	uT	0.271	0.133	0.273	0.280	0.378	--	--
		A/m	0.217	0.106	0.218	0.224	0.302	0.815	1.63
iWatch port	0.125	uT	0.274	0.138	0.118	0.128	0.169	--	--
		A/m	0.219	0.110	0.094	0.102	0.135	0.815	1.63
AirPods port	0.125	uT	0.273	0.136	0.151	0.149	0.246	--	--
		A/m	0.218	0.109	0.121	0.119	0.197	0.815	1.63

Note:A/m=uT/1.25

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

Test mode	Frequency Range (MHz)	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		
TM1	0.125	uT	0.330	--	--
		A/m	0.264	0.815	1.63
TM2	0.125	uT	0.125	--	--
		A/m	0.100	0.815	1.63
TM3	0.125	uT	0.200	--	--
		A/m	0.160	0.815	1.63

Test mode TM4	Frequency Range (MHz)	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		
Phone port	0.125	uT	0.334	--	--
		A/m	0.267	0.815	1.63
iWatch port	0.125	uT	0.171	--	--
		A/m	0.137	0.815	1.63

Test mode TM5	Frequency Range (MHz)	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		
Phone port	0.125	uT	0.320	--	--
		A/m	0.256	0.815	1.63
AirPods port	0.125	uT	0.214	--	--
		A/m	0.171	0.815	1.63

Test mode TM6	Frequency Range (MHz)	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		
iWatch port	0.125	uT	0.139	--	--
		A/m	0.111	0.815	1.63
AirPods port	0.125	uT	0.220	--	--
		A/m	0.176	0.815	1.63

Test mode TM7	Frequency Range (MHz)	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		
Phone port	0.125	uT	0.349	--	--
		A/m	0.279	0.815	1.63
iWatch port	0.125	uT	0.143	--	--
		A/m	0.114	0.815	1.63
AirPods port	0.125	uT	0.225	--	--
		A/m	0.180	0.815	1.63

Note:A/m=uT/1.25

6.5 Simultaneous E-Filed Strength and H-Filed Strength

KDB 447498 points for simultaneous transmission on far-field measurement, while for below 30 MHz usually measured at near-field. 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.

$$E_{AVG} = \frac{1}{n} \sum_{i=1}^n (E_{MAXRMS})_i$$

Where:

E-field measurements

E_{AVG} = Spatial average

E_{MaxRMS} = E-field at a measurement point

N = Number of spatially averaged points

And

$$H_{AVG} = \frac{1}{n} \sum_{i=1}^n (H_{MaxRMS})_i$$

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

Simultaneous combination	Frequency Range (MHz)	Max.Measured E-Field Strength Values (V/m)			Spatial Average E_{AVG} (V/m)	FCC E-Field Strength 50% Limits (V/m)	FCC E-Field Strength Limits (V/m)
		Phone port	AirPods port	iWatch port			
Phone+ iWatch TM4	0.125	110.84	--	80.68	95.760	307.0	614.0
Phone+ AirPods TM5	0.125	107.45	81.06	--	94.255	307.0	614.0
AirPods+iWatch TM6	0.125	--	72.38	47.88	60.130	307.0	614.0
Phone+AirPods +iWatch TM7	0.125	113.85	82.19	82.56	92.867	307.0	614.0

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

Simultaneous combination	Frequency Range (MHz)	Max. Measured H-Field Strength Values (A/m)			Spatial Average H_{AVG} (A/m)	FCC H-Field Strength 50% Limits (A/m)	FCC H-Field Strength Limits (A/m)
		Phone port	AirPods port	iWatch port			
Phone+ iWatch TM4	0.125	0.294	--	0.214	0.254	0.815	1.63
Phone+ AirPods TM5	0.125	0.285	0.215	--	0.250	0.815	1.63
AirPods+iWatch TM6	0.125	--	0.192	0.127	0.160	0.815	1.63
Phone+AirPods +iWatch TM7	0.125	0.302	0.218	0.219	0.246	0.815	1.63

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

Simultaneous combination	Frequency Range (MHz)	Max. Measured H-Field Strength Values (A/m)			Spatial Average H_{AVG} (A/m)	FCC H-Field Strength 50% Limits (A/m)	FCC H-Field Strength Limits (A/m)
		Phone port	AirPods port	iWatch port			
Phone+ iWatch TM4	0.125	0.267	--	0.137	0.202	0.815	1.63
Phone+ AirPods TM5	0.125	0.256	0.171	--	0.214	0.815	1.63
AirPods+iWatch TM6	0.125	--	0.176	0.111	0.144	0.815	1.63
Phone+AirPods +iWatch TM7	0.125	0.279	0.180	0.114	0.191	0.815	1.63

7. Conclusion

A minimum safety distance of at 15 cm surrounding the device and 20 cm above the top surface of the device is required when the device is charging a smart phone. The detected emissions with a distance of 15 cm surrounding the device and 20 cm above the top surface of the device are below the limitations according to FCC KDB 680106 D01 Section 3. RF Exposure Requirement Clause 3.

8. Test Setup Photos of the EUT



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