



Test report No:
2330084R-RF-US-P20V01

FCC Exposure TEST REPORT

Product Name	Wireless Phone Charger
Trademark	Tesla
Model and /or type reference	WC5
FCC ID	2AEIM-WC5
Applicant's name / address	Tesla, Inc 3500 Deer Creek Road, Palo Alto, 94304 California, United State
Test method requested, standard	FCC Part 2.1091
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Feng Jiao/ Project Engineer 
Approved by (name / position & signature)	Jack Zhang/ Manager 
Date of issue	2023-04-26
Report Version	V1.1
Report template No	Template_FCC MPE-RF-V1.0

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Mar. 06, 2023
Date (start test)	Mar. 08, 2023
Date (finish test)	Mar. 24, 2023

1. This report is only referred to the item that has undergone the test.
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ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C - 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
Tx	: Transmitter
Rx	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2330084R-RF-US-P20V01	V1.0	Initial issue of report.	2023-04-21
2330084R-RF-US-P20V01	V1.1	P6 Remove color annotations and modify frequency range. P18 Add note.	2023-04-26

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
1. These test results on a sample of the device are for the purpose of demonstrating Compliance with KDB 680106, KDB 447498 and FCC Part 2.1091.
2. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
3. The test results presented in this report relate only to the object tested.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
5. This report will not be used for social proof function in China market.
6. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;

1. General Information

1.1. EUT Description

Product Name..... :	Wireless Phone Charger
Model No. :	WC5
Trademark..... :	Tesla
FCC ID :	2AEIM-WC5
Manufacturer..... :	Tesla, Inc
Manufacturer address..... :	3500 Deer Creek Road, Palo Alto, 94304 California, United State

Operating Frequency Range..... :	122.72~132.72kHz
Type of Modulation..... :	ASK
Number of Channel :	1
Operating Temperature Range:	-40°C ~ 85°C

Wireless Specification..... :	NFC
Operating frequency range(s)..... :	13.56 MHz
Type of modulation..... :	ASK
Number of channel..... :	1

Rated power supply..... :	Voltage and Frequency	
	<input type="checkbox"/>	AC: 220 – 240 V, 50 / 60 Hz,
	<input type="checkbox"/>	AC: 100 – 240 V, 50 / 60 Hz
	<input checked="" type="checkbox"/>	DC: 13.5 V
	<input type="checkbox"/>	Battery: 12 Vdc
	<input type="checkbox"/>	Adapter:
Adapter..... :	N/A	
Mounting position..... :	<input type="checkbox"/>	Table top equipment
	<input type="checkbox"/>	Wall/Ceiling mounted equipment
	<input type="checkbox"/>	Floor standing equipment
	<input type="checkbox"/>	Hand-held equipment
	<input checked="" type="checkbox"/>	Other: Equipment for vehicular use

1.2. Antenna information

Antenna model / type number	N/A		
Antenna serial number	N/A		
Antenna Delivery	<input checked="" type="checkbox"/>	1TX + 1RX	
	<input type="checkbox"/>	2TX + 2RX	
	<input type="checkbox"/>	Others:.....	
Antenna technology	<input checked="" type="checkbox"/>	SISO	
	<input type="checkbox"/>	MIMO	<input type="checkbox"/> CDD
			<input type="checkbox"/> Beam-forming
Antenna Type	<input type="checkbox"/>	External	<input type="checkbox"/> Dipole
			<input type="checkbox"/> Sectorized
			<input type="checkbox"/> Ceramic Chip
	<input checked="" type="checkbox"/>	Internal	<input type="checkbox"/> PIFA
			<input type="checkbox"/> PCB
			<input checked="" type="checkbox"/> Others: Coil antenna
Antenna Gain.....	N/A		

1.3. Mode of Operation

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

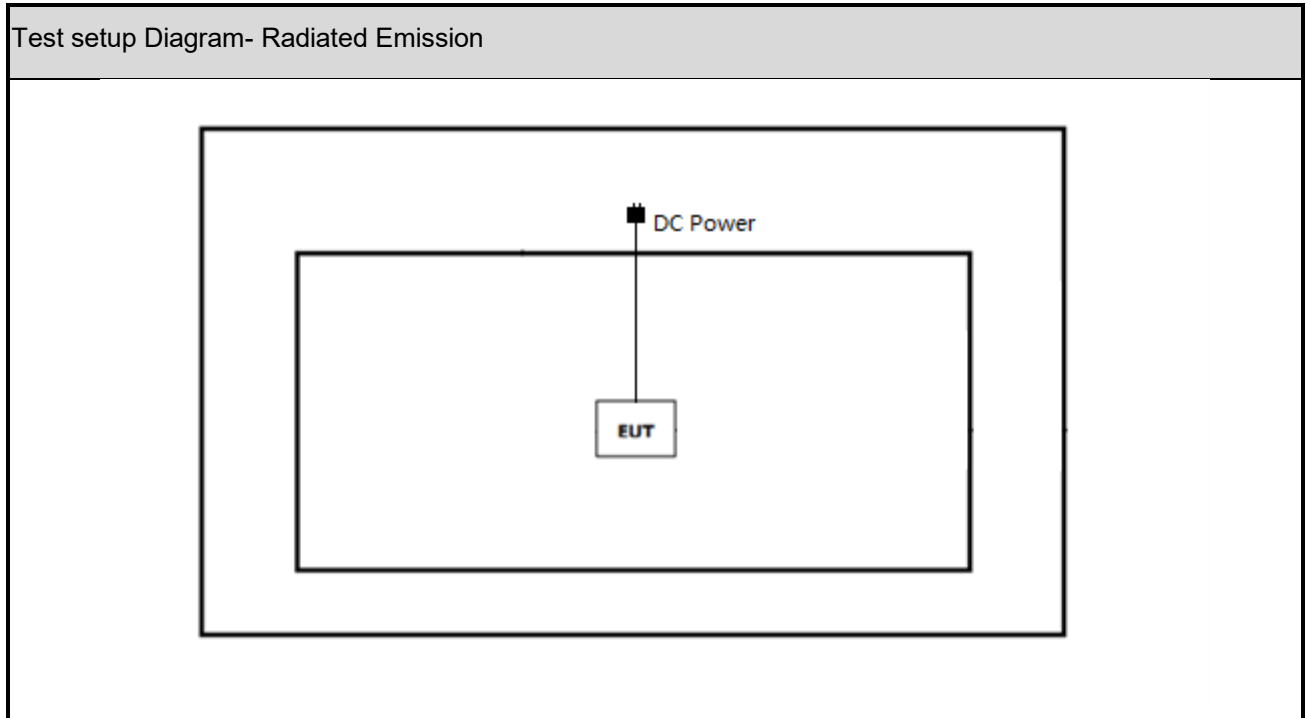
Test Mode
Mode 1: Transmit

1.4. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 N/A	N/A	N/A	N/A	N/A

1.5. Configuration of Tested System



1.6. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of equipment.
3	Start to continue transmit.

2. Technical Test

2.1. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Electric Field Strength / Magnetic Field Strength

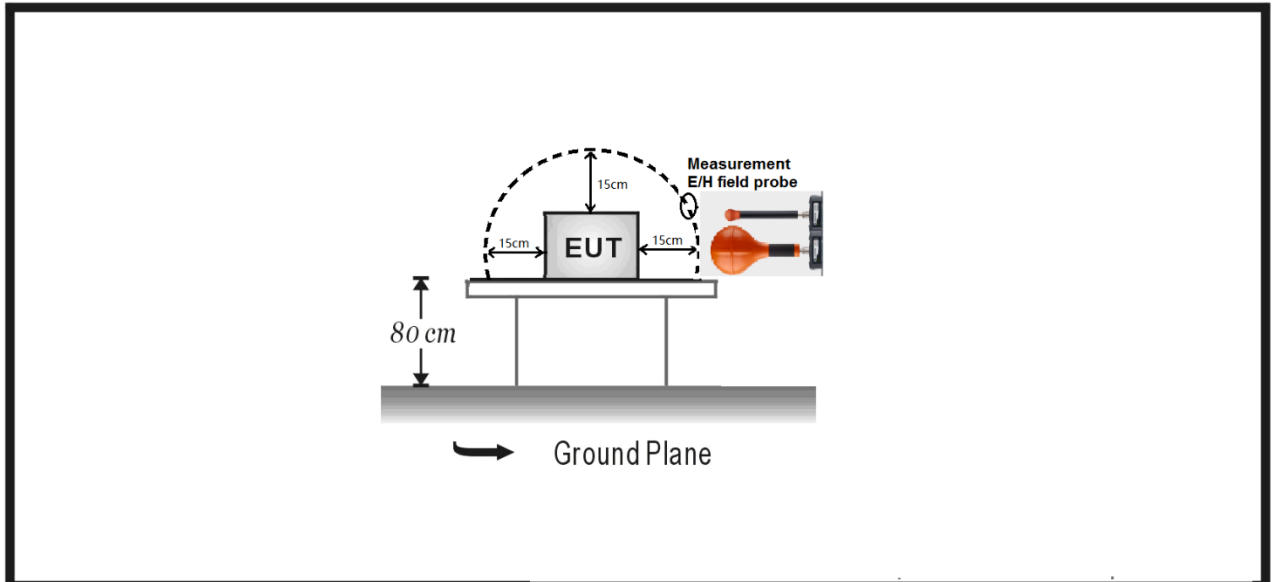
3.1. Test Equipment

Electric Field Strength / Magnetic Field Strength / AC-6					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Field Meter	WAVECONTROL	SMP2	20SN1286	2022.09.01	2023.08.31
E&H Field Probe	WAVECONTROL	WP400	20WP100630	2022.09.01	2023.08.31
E Field Probe	WAVECONTROL	WPF3	20WP030374	2022.09.01	2023.08.31
Temperature/Humidity Meter	RTS	RTS-8S	RF06	2022.07.07	2023.07.06

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup

3kHz~10MHz Test Setup:



3.3. Limit

According to KDB 680106 D01v03r01 Clause 3.c: For devices designed for typical desktop applications, such a wireless charging pads, RF exposure evaluation should be conducted assuming a user separation distance of 15 cm. E and H field strength measurements or numerical modeling may be used to demonstrate compliance. Measurements should be made from all sides and the top of the primary/client pair, with the 15 cm measured from the center of the probe(s) to the edge of the device. Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m.

According to FCC 1.1310: 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)

(a) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
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
1500-100000	--	--	5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S)(mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	F/1500	30
1500-100000	--	--	1.0	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

Friis Formula

Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

3.4. Test Procedure

- a. Set the measurement frequency of the measurement probe to the fundamental frequency of the device under test.
- b. Set the span to encompass the entire emission bandwidth.
- c. Set the RBW greater than the 99% OBW of the fundamental emission.

Note: This step is not required for a broadband measurement probe that integrates the entire frequency range.

- d. Set the detector to Peak and trace display to Max-Hold.
- e. Allow the spectrum to fill; for pulsing devices this may require an increased monitoring period.
- f. Using a marker, set it to the maximum level of the spectral envelope.
- g. Repeat steps (b) to (f) while scanning a parallel plane at the measurement distance of 10cm on each side of the device to find the peak level.
- h. Repeat steps (b) to (g) for any frequencies where the field value is greater than -20 dBc below the maximum level identified.
- i. If there are multiple frequencies transmitted by the device under test, use equations (2) and (3) to determine compliance.

Note: When scanning around the entire device, the location found to be the maximum for the E- or H-field may not be the same location as the opposite field.

3.5. Uncertainty

The measurement uncertainty is defined as ± 3.10 dB

3.6. Test Result

Wireless charging

Test Location	Test Separation Distance (cm)	Maximum Electric Field Level (V/m)	Maximum Magnetic Field Level (A/m)	Electric Field Limit (V/m)	Magnetic Field Limit (A/m)	Result
Top	15	4.587	0.558	83	1.63	Pass
Front	15	1.687	0.125	83	1.63	Pass
Back	15	1.558	0.087	83	1.63	Pass
Left	15	1.214	0.154	83	1.63	Pass
Right	15	0.987	0.229	83	1.63	Pass

NFC:

Axial	Test Separation Distance (cm)	Maximum Freq. (MHz)	Maximum Level (mV/m)	Limit (V/m)	Result
X	15	13.56	154	60.77	Pass
Y	15	13.56	172	60.77	Pass
Z	15	13.56	132	60.77	Pass
Axial	Test Separation Distance (cm)	Maximum Freq. (MHz)	Maximum Level (µA/m)	Limit (A/m)	Result
X	15	13.56	25	0.16	Pass
Y	15	13.56	33	0.16	Pass
Z	15	13.56	27	0.16	Pass

Note: WPT and NFC will not be transmitted simultaneously during normal use of the product.

4. RF Exposure Evaluation

WPT Device requirement	
<input checked="" type="checkbox"/>	Wireless power transfer frequency is below 1 MHz.
<input checked="" type="checkbox"/>	Output power from each primary coil is less than or equal to 15 watts.
<input checked="" type="checkbox"/>	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.
<input checked="" type="checkbox"/>	Client device is placed directly in contact with the transmitter.
<input checked="" type="checkbox"/>	Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).
<input checked="" type="checkbox"/>	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.

Note: The WPT device can meet all the six requirements above.

_____ The End _____