

TEST REPORT

OF

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID : OSLOKA-101W

Equipment Under Test : UNIT ASSY – WIRELESS CHARGING
Model Name : OKA-101W
Applicant : Omron Automotive Electronics Korea Co., Ltd.
Manufacturer : Omron Automotive Electronics Korea Co., Ltd.
Date of Test(s) : 2015.12.01 ~ 2016.01.11
Date of Issue : 2016.01.26

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Youngmin Park

Date:

2016.01.26

Approved By:



Hyunchae You

Date:

2016.01.26

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

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1.2. Details of applicant

Applicant : Omron Automotive Electronics Korea Co., Ltd.

Address : 790-12, Bogaewonsam-ro, Bogae-myeon, Anseong-si, Gyeonggi-do, Korea

Contact Person : Nam, Sang-Il

Phone No. : +82 2 850 5789

1.3. Description of EUT

Kind of Product	UNIT ASSY – WIRELESS CHARGING
Model Name	OKA-101W
Power Supply	DC 12 V (Used vehicle battery)
Frequency Range	111 kHz (WPC)
Operating Conditions	-30 °C ~ 75 °C
Antenna Type	Inductive loop coil antenna
H/W Version	A1.00
S/W Version	A1.00

1.4. Declarations by the manufacturer

- Operation temperature: -30 °C ~ 75 °C
- The EUT has 3 loop coil antennas with one amplifier, and only one antenna can transmit at once.
- Maximum loading condition is charging mode with less than 1% battery status of client device.

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
E-Field Probe	D.A.R.E!! Instruments	RadiSense 4	13I00444SNO04	Aug. 05, 2015	Annual	Aug. 05, 2016
Magnetic Field Sensor	HIOKI	0850-B1	3471	Jul. 16, 2015	Annual	Jul. 16, 2016
Magnetic Field Hitester	HIOKI	FT3470-50	140430999	Jul. 16, 2015	Annual	Jul. 16, 2016
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 23, 2015	Annual	Mar. 23, 2016
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.

1.6. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009335	2015.12.23	Initial
1	F690501/RF-RTL009335-1	2016.01.11	Added H-Field Strength at various test distance with maximum loading condition.
2	F690501/RF-RTL009335-2	2016.01.26	Added comments for test distances.

1.7. Worst case of test configurations

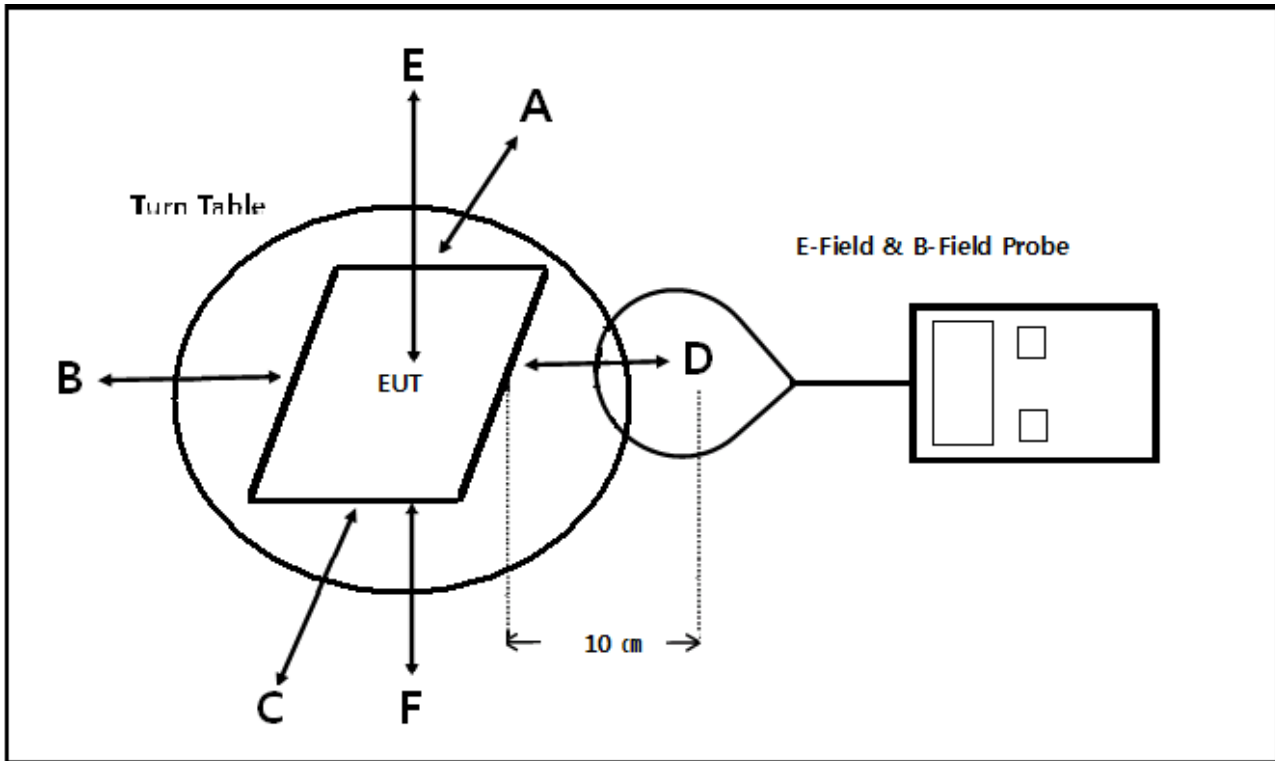
In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

EUT configuration	Description
Charging Mode with client device (Galaxy S5 : SM-G900L FCC ID : A3LSMG900S)	Less than 1 % of battery
	Less than 50 % of battery
	100 % full charging of battery

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2. Test Result

2.1. Test Setup



2.2. Measurement procedure

- The RF exposure test was performed in anechoic chamber.
- The measurement probe was placed at test distance (10 cm) which is between the edge of the charger and the geometric center of probe.
- 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.
- The EUT were measured according to the dictates of KDB 680106 D01v02.

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2.3. Equipment Approval Considerations item 5.2 of KDB 680106 D01v02.

a) Power transfer frequency is less than 1 MHz.

- The device operates at a frequency of 111 kHz.

b) Output power from each primary coil is less than 5 watts.

- Output power from each primary coil : 15 W (Max.)

c) 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.

- The transfer system including a charging system with multiple primary coils is to detect and allow only between individual pairs of coils.

d) Client device is inserted in or placed directly in contact with the transmitter.

- Client device is placed directly in contact with the transmitter. Refer to a photo in the External photos.

e) The maximum coupling surface area of the transmit (charging) device:

- The EUT coupling surface area : $12.5 \text{ cm (W)} \times 7.34 \text{ cm (H)} = 91.75 \text{ cm}^2$,
 $60 \text{ cm}^2 < 91.75 \text{ cm}^2 < 400 \text{ cm}^2$

f) Aggregate leakage fields at 10 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 30 % of the MPE limit.

- Refer to following test results.

The EUT field strength levels < 30 % of the MPE limit 1.63 A/m
 0.340 A/m (Max.) < 0.489 A/m

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2.4. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

§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), except in the case of portable devices which shall be evaluated according to the provisions of FCC part 2.1093 of this chapter

TABLE 1 - LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A) Limits for Occupational /Control 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 – 1 500			f/300	6
1 500 – 100 000			5	6
(B) Limits for General Population / Uncontrol Exposures				
<u>0.3 – 1.34</u>	<u>614</u>	<u>1.63</u>	*(100)	30
1.34 – 30	824/f	2.19/f	*(180/f ²)	30
30 – 300	27.5	0.073	0.2	30
300 – 1 500			f/1 500	30
1 500 – 100 000			1.0	30

f = frequency in MHz

* = Plane wave equivalent power density

Note 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

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2.5. E and H field strength

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

2.5.1. E-Field Strength at 10 cm from the edges surrounding the EUT

Test Mode : Normal charging mode with client device

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
111	22.30	32.80	15.60	14.40	50.90	3.55	614.00

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
111	21.50	33.70	15.80	14.20	50.70	3.52	614.00

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Probe Position E (V/m)	Probe Position F (V/m)	Limits (V/m)
111	22.60	33.50	16.00	13.90	51.30	3.46	614.00

Note.

1. All antennas of operation were investigated and the worst-case antenna was reported considering the highest exposure.

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2.5.2. H-Field Strength at 10 cm from the edges surrounding the EUT

Test Mode : Normal charging mode with client device

Test condition: Charging mode (less than 1 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
111	0.324	0.281	0.298	0.293	0.307	0.306	1.630

Test condition: Charging mode (less than 50 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
111	0.304	0.322	0.340	0.290	0.300	0.300	1.630

Test condition: Charging mode (100 % battery status of client device)

Frequency Range (kHz)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Probe Position E (A/m)	Probe Position F (A/m)	Limits (A/m)
111	0.296	0.314	0.294	0.286	0.305	0.325	1.630

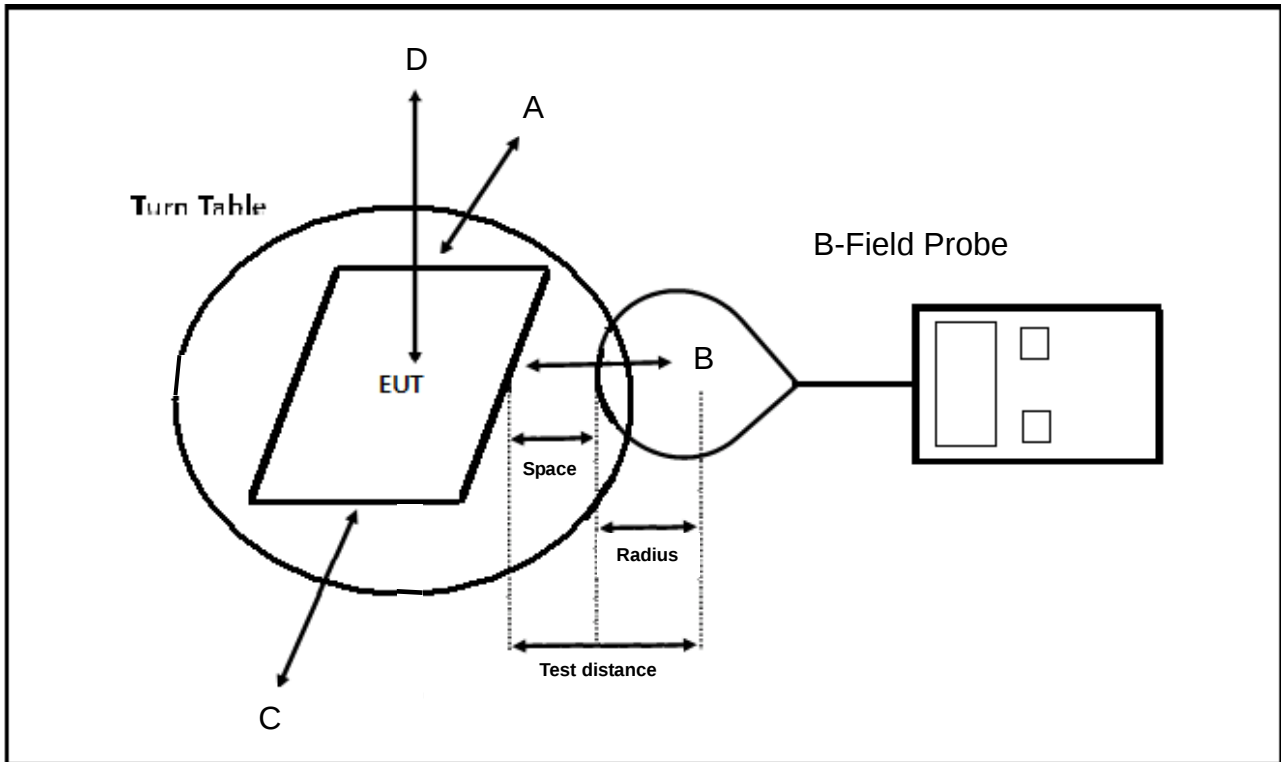
Note.

1. All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.

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2.6. H-Field Strength at various test distance with maximum loading condition

2.6.1. Test Setup



Note;

The equipment is designed for usage in a vehicle. Considering the usage of the closest distance from the users, the RF Radiation Exposure measurement is performed as close as possible and on out to 10 cm.

The physical radius of B-Field probe is 6 cm, and to reduce measurement error, we gave 1 mm space between probe and edge of EUT.

Therefore, minimum measurement distance is 6.1 cm.

2.6.2. Measurement procedure

- The RF exposure test was performed in anechoic chamber.
- The measurement probe was placed at test distance as close as possible and on out to 10 cm (6.1 cm, 7 cm, 8 cm, 9 cm and 10 cm) which is between the edge of the charger and the geometric center of probe. Please refer to the above test setup diagram for the details.
- The highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D) were completed.
- The EUT were measured according to the dictates of KDB 680106 D01v02.

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2.6.3. H field strength

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Test Mode : Normal charging mode with client device

Test condition: Charging mode (less than 1 % battery status of client device)

Distance (cm)	Probe Position A (A/m)	Probe Position B (A/m)	Probe Position C (A/m)	Probe Position D (A/m)	Limits (A/m)
6.1	0.478	0.177	0.460	0.403	1.630
7	0.359	0.153	0.391	0.356	1.630
8	0.278	0.132	0.292	0.278	1.630
9	0.210	0.113	0.216	0.219	1.630
10	0.160	0.099	0.165	0.190	1.630

Note.

1. All antennas of operation were investigated and the worst-case antenna was reported considered the highest exposure.
2. The testing was performed under maximum loading condition which is charging mode with less than 1 % battery status of client device.

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