

TEST REPORT

OF

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

FCC ID : OSLOKA-202W

Equipment Under Test : UNIT ASSY – WIRELESS CHARGING
Model Name : OKA-202W
Applicant : Omron Automotive Electronics Korea Co., Ltd.
Manufacturer : Omron Automotive Electronics Korea Co., Ltd.
Date of Receipt : 2016.11.01
Date of Test(s) : 2016.12.07 ~ 2016.12.13
Date of Issue : 2016.12.15

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

Tested By:



Jinhyoung Cho

Date:

2016.12.15

Technical
Manager:

Hyunchae You

Date:

2016.12.15

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

INDEX

<u>TABLE OF CONTENTS</u>	Page
1. General Information -----	3
2. Test Result -----	6

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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>.

Phone No. : +82 31 688 0901

Fax No. : +82 31 688 0921

1.2. Details of applicant

Applicant : Omron Automotive Electronics Korea Co., Ltd.

Address : 790-12, Bogaewonsam-ro, Bogae-myeon, Anseong-si, Gyeonggi-do, 17507, 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-202W
Power Supply	DC 12 V
Frequency Range	111 kHz (WPC)
Antenna Type	Inductive loop coil antenna
H/W Version	1.00
S/W Version	1.00

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.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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. 02, 2016	Annual	Aug. 02, 2017
Magnetic Field Sensor	HIOKI	0850-B1	3471	Jul. 22, 2016	Annual	Jul. 22, 2017
Magnetic Field Hitester	HIOKI	FT3470-50	140430999	Jul. 22, 2016	Annual	Jul. 22, 2017
Spectrum Analyzer	R&S	FSV30	100768	Mar. 30, 2016	Annual	Mar. 30, 2017
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 21, 2016	Annual	Mar. 21, 2017
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.
Mobile Test Unit	R&S	CMW 500	144034	Feb. 29, 2016	Annual	Feb. 28, 2017

► Support equipment

Description	Manufacturer	Model	FCC ID
Mobile Phone	Samsung Electronics Co., Ltd.	SM-G900L	A3LSMG900S

1.6. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL010649	2016.12.15	Initial

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

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	Mode	Description
Charging Mode with client device (Model : SM-G900L, FCC ID : A3LSMG900S)	Ant. 1	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery
	Ant. 2	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery
	Ant. 3	Less than 1 % of battery
		Less than 50 % of battery
		100 % full charging of battery

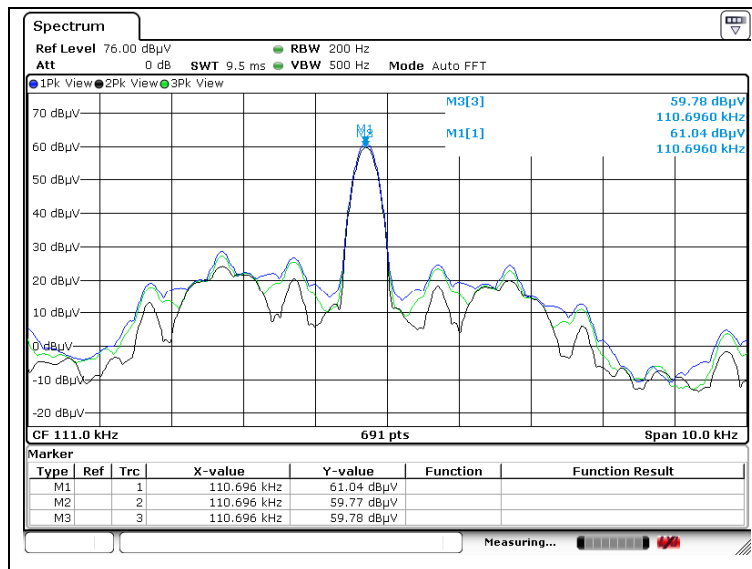
EUT setup configuration:

- The EUT has three power transfer zones.
- The EUT can be capable of charging one client at a time.
- The measurement is performed with a typical WPT client device on each power transfer zone.

Operating configurations :

Client device (SM- G900L)

- While the client device was connected to an active data connection (Trace#1 "M1")
The device was tested under all modes and bands like 2G and 3G.
In the result, **PCS GSM / GPRS1900 / 1 TX** was found in **Middle channel**.
- While the client device was in airplane mode (Trace#2 "M2")
- While the wireless charger is charging with the client device turned off. (Trace#3 "M3")



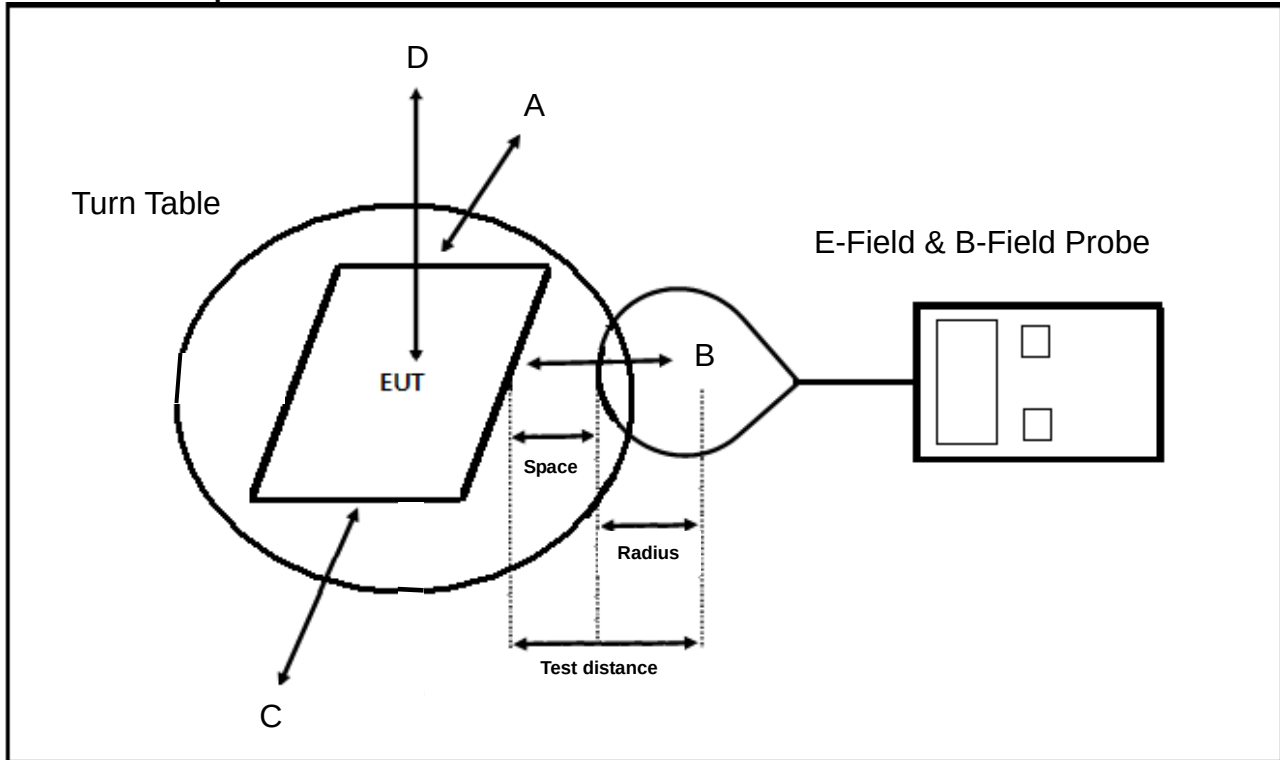
Plot – fundamental emission comparison

- The level of Trace#1 was higher than Trace#2 and 3 so Trace#1 was selected.
- Trace#1 as **PCS GSM / GPRS1900 / 1 TX** which was found in **Middle channel** should be tested with the client device as a worst case.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

2. H-Field Strength at various test distance

2.1.1. 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 at 20 cm.

To reduce measurement error, we gave 1 mm space between probe and edge of EUT.

1. E-Field probe radius is 3.5 cm.

→ measurement distance is 3.6 cm including space 1 mm from edge of EUT to center of E-field probe.

→ measurement distance is 20 cm including space 16.5 cm from edge of EUT to center of E-field probe.

2. B-Field probe radius is 6 cm.

→ measurement distance is 6.1 cm including space 1 mm from edge of EUT to center of B-field probe.

→ measurement distance is 20 cm including space 14 cm from edge of EUT to center of B-field probe.

2.1.2. Measurement procedure

a) The RF exposure test was performed in anechoic chamber.

b) The measurement probe was placed at test distance as close as possible and at 20 cm (3.6 cm, 6.1 cm, 20 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.

c) The highest emission level was recorded and compared with limit as soon as measurement of each points (A, B, C, D) were completed.

d) The EUT were measured according to the dictates of KDB 680106 D01v02.

Remark.

- Rear and bottom of EUT shall be connected into the vehicle.

So these parts are not considered from MPE measurement.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

2.2. 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 : 12 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 three 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.
- 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 at 10 cm < 30 % of the MPE limit 1.63 A/m
 0.264 A/m (Max. at 10 cm) < 0.489 A/m

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

2.3. 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.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

2.4. E and H field strength

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

2.4.1. E-Field Strength

Test condition : Ant. 1

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	12.50	22.40	18.20	27.50	614.00
20	2.34	2.02	1.95	2.27	614.00

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	15.80	20.70	15.50	28.00	614.00
20	2.50	2.13	1.85	2.10	614.00

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	13.60	21.80	16.70	25.20	614.00
20	2.11	1.98	2.05	2.37	614.00

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Test condition : Ant. 2

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	49.10	39.30	47.70	76.70	614.00
20	2.73	2.73	3.16	2.35	614.00

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	43.80	30.70	42.50	80.90	614.00
20	2.36	2.17	2.85	2.67	614.00

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	45.40	33.60	40.70	77.30	614.00
20	2.15	2.52	2.67	2.18	614.00

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Test condition : Ant. 3

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	41.40	28.20	31.30	74.50	614.00
20	2.30	2.61	2.07	3.90	614.00

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	37.50	31.30	22.80	78.80	614.00
20	2.14	2.61	1.48	3.88	614.00

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

Distance (cm)	Probe Position A (V/m)	Probe Position B (V/m)	Probe Position C (V/m)	Probe Position D (V/m)	Limits (V/m)
3.6	39.50	28.10	23.30	84.10	614.00
20	2.35	2.61	1.24	5.74	614.00

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

2.4.2. H-Field Strength

Test Mode : Ant. 1

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	0.242	0.446	0.218	0.464	1.630
20	0.059	0.048	0.064	0.054	1.630

Test condition: Charging mode (less than 50 % 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	0.236	0.470	0.201	0.505	1.630
20	0.057	0.056	0.054	0.056	1.630

Test condition: Charging mode (100 % 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	0.229	0.429	0.232	0.530	1.630
20	0.062	0.064	0.066	0.057	1.630

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Test Mode : Ant. 2

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	0.181	0.348	0.170	0.448	1.630
20	0.067	0.045	0.058	0.067	1.630

Test condition: Charging mode (less than 50 % 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	0.229	0.412	0.189	0.505	1.630
20	0.072	0.053	0.056	0.054	1.630

Test condition: Charging mode (100 % 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	0.202	0.404	0.206	0.536	1.630
20	0.073	0.050	0.070	0.072	1.630

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

Test Mode : Ant. 3

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	0.470	0.669	0.608	0.962	1.630
20	0.109	0.078	0.073	0.084	1.630

Test condition: Charging mode (less than 50 % 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	0.504	0.778	0.589	0.926	1.630
20	0.114	0.081	0.063	0.074	1.630

Test condition: Charging mode (100 % 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	0.490	0.721	0.606	1.022	1.630
20	0.098	0.073	0.067	0.079	1.630

- End of the Test Report -

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.