

TEST REPORT

OF

FCC Part 15 Subpart C §15.209

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 ~ 2015.12.08
Date of Issue : 2015.12.30

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

Tested By:



Youngmin Park

Date:

2015.12.30

Approved By:



Hyunchoe You

Date:

2015.12.30

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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>.

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, 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.

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1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	100768	Mar. 24, 2015	Annual	Mar. 24, 2016
Signal Generator	Agilent	8648D	3847M00534	Mar. 23, 2015	Annual	Mar. 23, 2016
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 23, 2015	Annual	Mar. 23, 2016
Test Receiver	R&S	ESU26	100109	Mar. 03, 2015	Annual	Mar. 03, 2016
Loop Antenna	R&S	HFH2-Z2	100118	Jun. 04, 2015	Biennial	Jun. 04, 2017
Antenna Master	INN-CO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
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. Sample calculation

Where relevant, the following sample calculation is provided:

Field strength level (dB μ V/m) = Measured level (dB μ V) + Antenna factor (dB) + Cable loss (dB)

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1.7. Worst case of test configurations

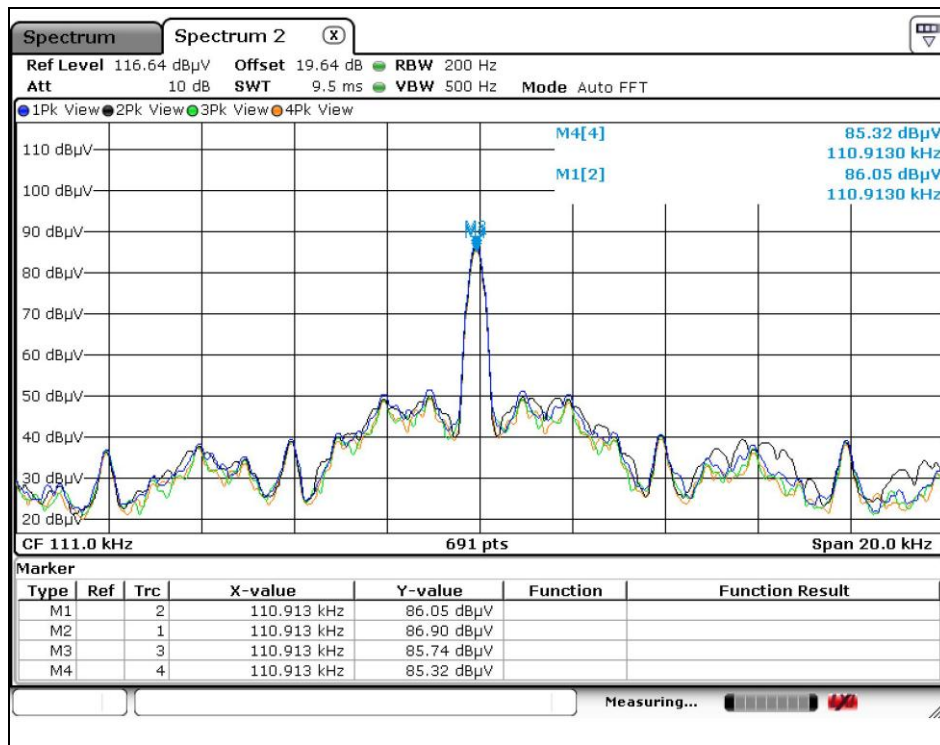
In order to check all kinds of possible configurations, EUT was evaluated with appropriate client and under each charging condition as below table.

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

Operating configurations :

Client device (SM-G900L)

- While the client device was in airplane mode (Trace#1 "M1")
- While the client device was connected to an active data connection (Trace#2 "M2")
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 wireless charger is charging without the client device. (Trace#3 "M3")
- While the wireless charger is charging with the client device turned off. (Trace#4 "M4")



Plot – fundamental emission comparison

- The level of Trace#2 was more than Trace#1, 3 and 4 so Trace#2 was selected.
- Trace#2 as **PCS GSM / GPRS1900 / 1 TX** which was found in **Middle channel** should be tested with the client device as a worst case.

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1.8. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15 Subpart C §15.209		
Section in FCC Part 15 Subpart C	Test Item	Result
15.209 15.209(a)	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
2.1049	20 dB Bandwidth	Complied

1.9. Test Report Revision

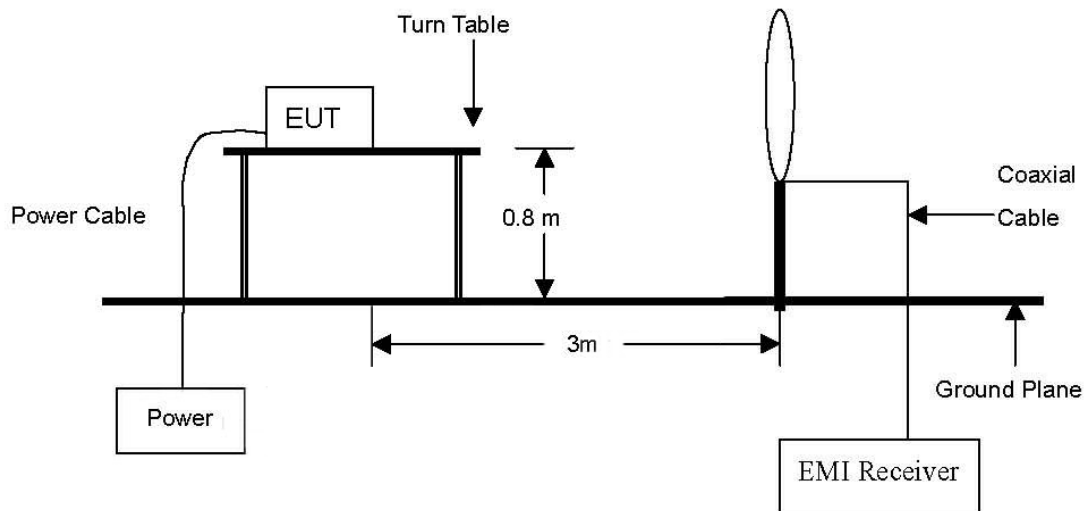
Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL009334	2015.12.23	Initial
1	F690501/RF-RTL009334-1	2015.12.30	Added EMC performance considering all the transmitters of the associated cellular device

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2. Field Strength of Fundamental and Spurious Emission

2.1. Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



2.2. Limit

2.2.1. Radiated emission limits, general requirements

According to §15.209 (a), Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meter)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections §15.231 and §15.241

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2.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10-2009

2.3.1. Test Procedures for emission from 9 kHz to 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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2.4. Field Strength of Fundamental Test Result

Ambient temperature : $(24 \pm 1) ^\circ\text{C}$
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical. The field strength of spurious emission was measured in one orthogonal EUT position (x-axis). Definition of DUT for a orthogonal plane was described in the test setup photo.

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
Charging mode with client (less than 1 % battery status)									
0.111	61.00	Average	H	19.59	0.05	80.64	0.64	26.70	26.06
Charging mode with client (less than 50 % battery status)									
0.111	60.40	Average	H	19.59	0.05	80.04	0.04	26.70	26.66
Charging mode with client (100 % battery status)									
0.111	61.97	Average	H	19.59	0.05	81.61	1.61	26.70	25.09

Note;

1. According to §15.31 (f)(2) 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m).
2. According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
3. The limit above was calculated based on table of §15.209 (a).
4. All antennas of operation were investigated and the worst-case antenna was reported considering the highest levels of radiated emissions.

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2.5. Spurious Emission Test Result

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Charging mode with client device (less than 1 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
0.035	26.00	Average	H	19.70	0.02	45.72	-34.28	36.72	71.00
0.094	30.60	Quasi Peak	H	19.61	0.05	50.26	-29.74	28.14	57.88
0.110	16.30	Average	H	19.60	0.05	35.95	-44.05	26.78	70.83
0.334	30.80	Average	H	19.48	0.04	50.32	-29.68	17.13	46.81
Above 0.400	Not detected	-	-	-	-	-	-	-	-

Charging mode with client device (less than 50 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
0.050	43.00	Average	H	19.70	0.03	62.73	-17.27	33.62	50.89
0.094	30.80	Quasi Peak	H	19.61	0.05	50.46	-29.54	28.14	57.68
0.110	19.40	Average	H	19.60	0.05	39.05	-40.95	26.78	67.73
0.333	30.00	Average	H	19.48	0.04	49.52	-30.48	17.16	47.64
Above 0.400	Not detected	-	-	-	-	-	-	-	-

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Charging mode with client device (100 % battery status)

Radiated Emissions			Ant.	Correction Factors		Total		Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	Ant. (dB/m)	Cable (dB)	Actual (dB μ V/m) at 3 m	Actual (dB μ V/m) at 300 m	Limit (dB μ V/m) at 300 m	Margin (dB)
0.050	38.90	Average	H	19.70	0.03	58.63	-21.37	33.62	54.99
0.094	30.50	Quasi Peak	H	19.61	0.05	50.16	-29.84	28.14	57.98
0.110	19.20	Average	H	19.60	0.05	38.85	-41.15	26.78	67.93
0.335	28.20	Average	H	19.48	0.04	47.72	-32.28	17.10	49.38
Above 0.400	Not detected	-	-	-	-	-	-	-	-

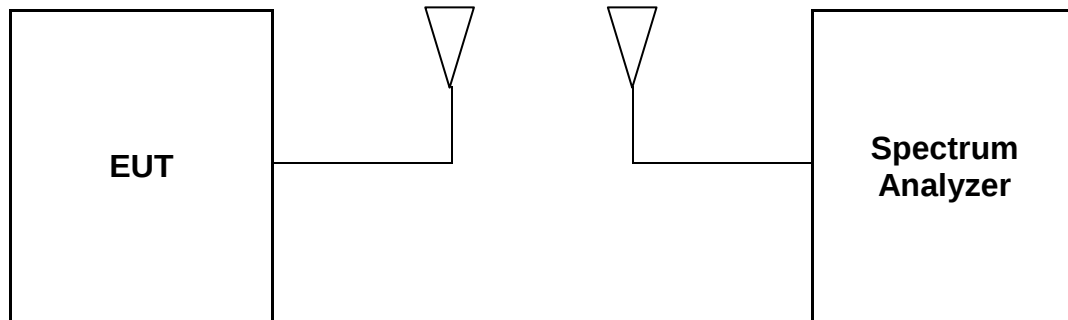
Note;

- According to §15.31 (f)(2)
 - 300 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(300/3) (dB μ V/m)
 - 30 m Result(dB μ V/m) = 3 m Result(dB μ V/m) – 40log(30/3) (dB μ V/m)
- According to field strength table of general requirement in §15.209 (a), field strength limits below 1.705 MHz were calculated as below.
 - 9 kHz to 490 kHz : 20log(2 400 / F (kHz)) at 300 m (dB μ V/m)
 - 490 kHz to 1 705 kHz : 20log(24 000 / F (kHz)) at 30 m (dB μ V/m)
- According to §15.209 (d), the measurements were tested by using Quasi peak detector except for the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1 GHz in these three bands on measurements employing an average detector.
- All antennas of operation were investigated and the worst-case antenna was reported considering the highest levels of radiated emissions.

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3. 20 dB Bandwidth

3.1. Test Setup



3.2. Limit

None; for reporting purposed only

3.3. Test Procedure

20 dB Bandwidth

- Span = approximately 2 to 3 times the 20 dB bandwidth, RBW = greater than 1 % of the 20 dB bandwidth, VBW = RBW, Sweep = auto, Detector = peak, Trace = max hold.
- The marker-to-peak function to set the mark to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is 20 dB bandwidth of the emission.

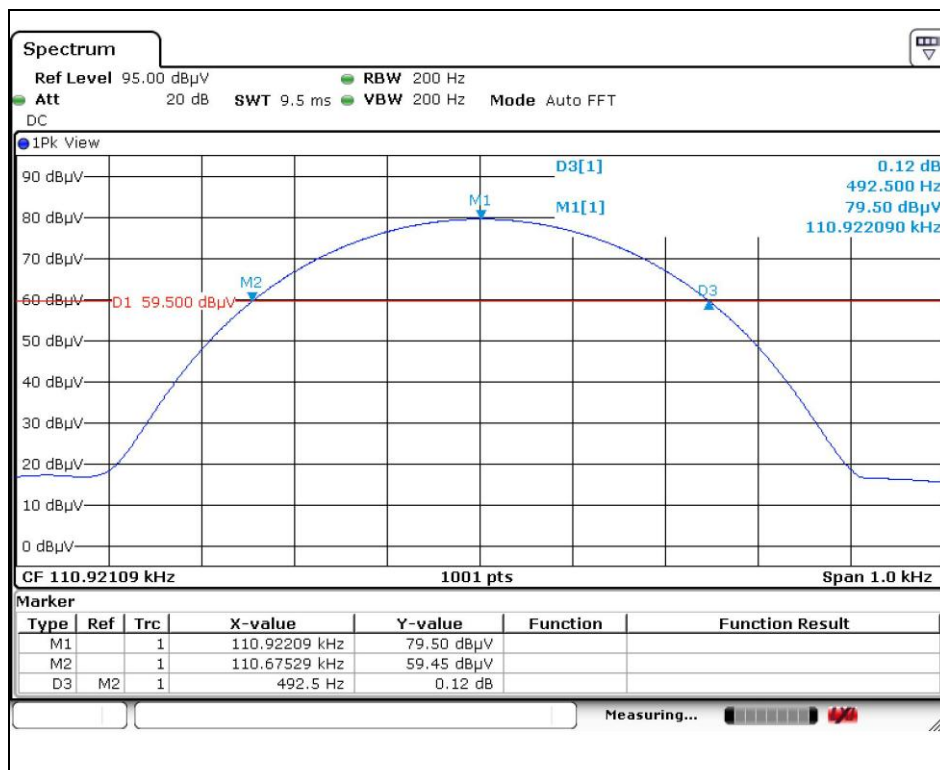
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3.4. Test Result

Ambient temperature : (24 ± 1) °C
Relative humidity : 47 % R.H.

EUT status	20 dB Bandwidth (kHz)	Limit
With client device (100 % of battery)	0.493	Reporting proposed only

20 dB Bandwidth



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