



ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test report file number : E022R-044

Applicant : OMRON AUTOMOTIVE ELECTRONICS KOREA CO., LTD.

Address : 481-2, Kasan-Dong, Kumchun-Gu, Seoul 153-023 Korea

Manufacturer : OMRON AUTOMOTIVE ELECTRONICS KOREA CO., LTD.

Address : 481-2, Kasan-Dong, Kumchun-Gu, Seoul 153-023 Korea

Type of Equipment : REMOTE KEYLESS ENTRY SYSTEM

FCC ID : OSLOKA-221T

Model / Type No. : OKA-221T

Serial number : N/A

Total page of Report : 12 pages (including this page)


Date of Incoming : February 4, 2002


Date of issuing : February 21, 2002

SUMMARY

The equipment complies with the regulation; FCC PART 15 SUBPART C §15.231

This test report contains only the result of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by: 
 G. W. Lee/ Asst. Chief Engineer
 EMC Dept.
 ONETECH Corp.

Reviewed by: 
 Y. K. Kwon/ Chief Engineer
 EMC Dept.
 ONETECH Corp.



document property name.

document property name.

CONTENTS

	Page
1. VERIFICATION OF COMPLIANCE.....	4
2. GENERAL INFORMATION.....	5
2.1 PRODUCT DESCRIPTION.....	5
2.2 RELATED SUBMITTAL(S) / GRANT(S)	5
2.3 TEST SYSTEM DETAILS.....	6
2.4 TEST METHODOLOGY	6
2.5 TEST FACILITY	6
3. SYSTEM TEST CONFIGURATION.....	6
3.1 JUSTIFICATION.....	6
3.2 EUT EXERCISE SOFTWARE.....	6
3.3 EQUIPMENT MODIFICATIONS	6
3.4 CONFIGURATION OF TEST SYSTEM.....	7
3.5 ANTENNA REQUIREMENT	7
4. PRELIMINARY TEST.....	7
4.1 AC POWER LINE CONDUCTED EMISSIONS TESTS	7
4.2 RADIATED EMISSIONS TESTS	7
5. FINAL RESULT OF MEASUREMENT.....	9
5.1 FIELD STRENGTH OF THE CARRIER TEST.....	9
5.4 BANDWIDTH OF THE OPERATING FREQUENCY.....	11
6. FIELD STRENGTH CALCULATION	13
7. LIST OF TEST EQUIPMENT.....	14

document property name.

1. VERIFICATION OF COMPLIANCE

APPLICANT : OMRON AUTOMOTIVE ELECTRONICS KOREA CO., LTD.
 ADDRESS : 481-2, Kasan-Dong, Kumchun-Gu, Seoul 153-023 Korea
 CONTACT PERSON : K. Y. Jang / Section Manager
 TELEPHONE NO : 82-2-8505-747
 FCC ID : OSLOKA-221T
 MODEL NO/NAME : OKA-221T
 SERIAL NUMBER : N/A
 DATE : February 21, 2002

DEVICE TYPE	REMOTE KEYLESS ENTRY SYSTEM - INTENTIONAL RADIATOR
E.U.T. DESCRIPTION	RF REMOTE KEYLESS ENTRY SYSTEM FOR VEHICLE - TRANSMITTER
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4/1992
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C 15.231
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 METER OPEN AREA TEST SITE

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

document property name.

2. GENERAL INFORMATION

2.1 Product Description

The OMRON AUTOMOTIVE ELECTRONICS KOREA CO., LTD., Model OKA-221T (referred to as the EUT in this report) is a transmitter that it controls locking and unlocking the door and opening the trunk of a vehicle by wireless remote controller. The associated receiver is manufactured by Omron Automotive Electronics Korea Co., Ltd, Model No: OKA-221R, FCC ID: OSLOKA-221R. The product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Plastic
TX FREQUENCY	307.9 MHz
MODULATION	FSK
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	307.9 MHz
ANTENNA TYPE	Built-in on the PCB in the EUT
TRANSMISSION TIME	Not longer than 1 sec
RATED SUPPLY VOLTAGE	DC 3V (Lithium cell)
OPERATING VOLTAGE RANGE	DC 3V, 5mA
NUMBER OF LAYERS	2 LAYERS
FUNCTION OF BUTTON	Doors Lock, Doors Unlock and Trunk Open

* Remark: This equipment automatically deactivates the transmitter within not more than 1 second of being released.

Model Differences:

-. No other model differences have been mentioned

2.2 Related Submittal(s) / Grant(s)

-. None

document property name.

2.3 Test System Details

The EUT was tested with the following all equipment used in the tested systems are:

Model	Manufacturer	FCC ID	Description	Connected to
OKA-221R	OMRON AUTOMOTIVE ELECTRONICS KOREA CO., LTD.	OSLOKA-221R	RECEIVER	N/A

2.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-080 Korea. Description details of test facilities were submitted to the Commission on January 18, 2002. (Registration Number: 92819)

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MAIN BOARD	OMRON AUTOMOTIVE ELECTRONICS KOREA CO., LTD.	XG-US	N/A

3.2 EUT exercise Software

To get a maximum radiated emission from the EUT, the button on the EUT was continuously pressed to transmit the signal. To activate continuous transmission, place a small plastic block between rubber band and the push button on the EUT. During the testing, the battery of the EUT was changed with a new battery.

3.3 Equipment Modifications

None

document property name.

3.4 Configuration of Test System

Line Conducted Test: It needs not to test this requirement, because the EUT supplies from a DC battery.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3meter open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

Occupied Bandwidth Measurement:

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer. The plot is taken at 50kHz/division frequency span, 10kHz resolution bandwidth and 5dB/division logarithmic display from an 8568B spectrum analyzer.

3.5 Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The transmitter antenna of the EUT is built-in on the PCB in the EUT, no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
N/A	N/A
It is not need to test this requirement, because the power of the EUT is supplied from a DC battery.	

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
----------------	---



document property name.

TX mode	X
---------	---

document property name.

5. FINAL RESULT OF MEASUREMENT

5.1 Field Strength of the Carrier Test

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

Humidity Level : 49 % Temperature : 13°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
 Type of Test : Intentional Radiator
 Result : PASSED BY -10.36 dB

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 5, 2002
 Operating Condition : TX mode
 Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Carrier Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dBuV/m)	Cable (dB)	Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
307.9	48.3	Peak	H	14.48	2.05	64.83	75.19	-10.36
307.9	44.6	Average	H	14.48	2.05	61.13	75.19	-14.06

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.



Tested by: Young-Min, Choi / Project Engineer

document property name.

5.3 Spurious Emission Test

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

Humidity Level : 49 % Temperature : 13°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
 Type of Test : Intentional Radiator
 Result : PASSED BY -13.52dB at 923.70 MHz

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 5, 2002
 Operating Condition : TX mode
 Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors		Total(dBuV/m)	FCC Limit(dBuV/m)	
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dBuV/m)	Cable (dB)	Peak	Limit	Margin(dB)
615.8	15.70	Peak	V	19.02	2.96	37.68	55.19	-17.51
923.70	14.90	Peak	H	22.74	4.03	41.67	55.19	-13.52
1231.60	6.90	Peak	V	24.96	5.06	36.92	55.19	-18.27
1575.00	6.10	Peak	V	27.78	5.90	39.78	55.19	-15.41
Other spurious frequencies were not found up to 3000 MHz.								

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.



Tested by: Young-Min, Choi / Project Engineer

document property name.

5.4 Bandwidth of the operating frequency

Humidity Level : 49 % Temperature : 13°C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231 (c)
 Type of Test : Intentional Radiator
 Result : PASSED

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 5, 2002
 Operating Condition : TX mode
 Minimum Resolution
 Bandwidth : 10 kHz

Carrier Freq. (MHz)	Bandwidth of the emission. (kHz)	Limit (kHz)	Remark
307.9	113	769.75	<u>The point 20dB down from the modulated carrier</u>

Remark: Please refer to Plotted Data #2 for test data.

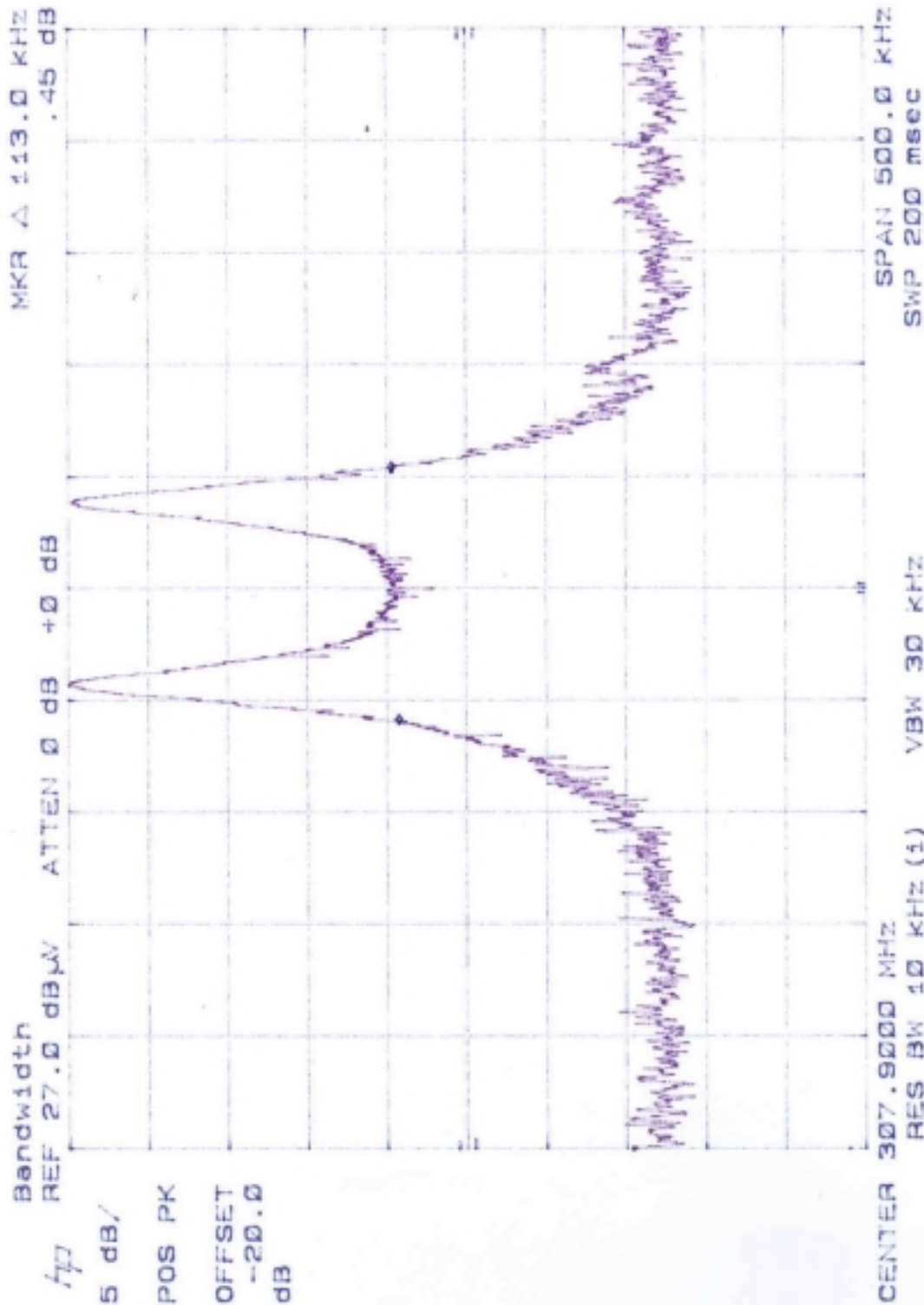


Tested by: Young-Min, Choi / Project Engineer



document property name.

Plotted Data



document property name.

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

$$\begin{aligned} &+ \text{ Meter reading} && (\text{dBuV}) \\ &+ \text{ Cable Loss} && (\text{dB}) \\ &+ \text{ Antenna Factor (Loss)} && (\text{dB/meter}) \\ \hline &= \text{ Corrected Reading} && (\text{dBuV/meter}) \\ &- \text{ Specification Limit} && (\text{dBuV/meter}) \\ &= \text{ dB Relative to Spec} && (+/- \text{ dB}) \end{aligned}$$



document property name.

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESVS 10	827864/005	SEP/01	12MONTH	■
2.	Test receiver	R/S	ESHS10	834467/007	APRIL/01	12MONTH	
3.	Spectrum analyzer	HP	8568B	3026A0226	SEP/01	12MONTH	■
4.	RF preselector	HP	85685A	3107A01264	SEP/01	12MONTH	■
5.	Quasi-Peak Adapter	HP	85650A	3107A01542	SEP/01	12MONTH	■
6.	Dipole Antenna	EMCO	3121C	9107-745	JUN/01	12MONTH	
7.	Biconical antenna	EMCO	3104C	9109-4441 9109-4443 9109-4444	MAR/01	12MONTH	■
8.	Log Periodic antenna	EMCO	3146	9109-3213 9109-3214 9109-3217	MAR/01	12MONTH	■
10.	Horn Antenna	EMCO	3115	9509-4563	MAR/01	12MONTH	■
11.	LISN	EMCO	3825/2	9109-1867 9109-1869	FEB/01	12MONTH	
12.	RF Amplifier	HP	8447F	3113A04554	JUN/01	N/A	
13.	Spectrum Analyzer	HP	8561E	3350A00546	SEP/01	12MONTH	■
14.	Spectrum Analyzer	HP	8591A	3131A02312	APR/01	12MONTH	
15.	Computer System	HP	98581C	98543A	N/A	N/A	■
	Hard disk drive		9153C	CMC762Z9153	N/A	N/A	■
16.	Plotter	HP	7475A	30052 22986	N/A	N/A	■
17.	Position Controller	EMCO	1090	9107-1038	N/A	N/A	■
18.	Turn Table	EMCO	1080-1.21	9109-1576	N/A	N/A	■
19.	Antenna Master	EMCO	1070-1	9109-1624	N/A	N/A	■