SKT

SK TECH CO., LTD.

Certificate of Compliance

Test Report No.:	**SKTTRT-050801-017**		
NVLAP CODE:	**200220-0**		
Applicant:	**DAEWOO PRECISION INDUSTRIES LTD.**		
Applicant Address:	609-600 P.O.BOX 25, KumJeong, Busan, Korea		
Manufacturer:	**DAEWOO PRECISION INDUSTRIES LTD.**		
Manufacturer Address:	609-600 P.O.BOX 25, KumJeong, Busan, Korea		
Device Under Test:	**Remote Keyless Entry System (Receiver), Model RK950NAR**		
FCC ID: **IC:**	**IT7-RK950NAR** **1176A-RK950NAR**	**Trade Name:**	**GMDAT, DPI**
Receipt No.:	SKTEU05-0427	**Date of receipt:**	June 22, 2005
Date of Issue:	August 1, 2005		
Location of Testing:	**SK TECH CO., LTD.** 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea		
Test Specification:	**FCC Part 15 Rules, RSS-210 Issue 5**		
FCC Equipment Class: **IC Equipment Category:**	**CYY – Communications Receiver used w/Pt 15 Transmitter** **Category I Receiver**		
Test Result:	The above-mentioned device has been tested and passed.		

Tested & Reported by: *Jong-Soo, Yoon*

2005. 08. 01

Signature *Date*

Approved by: *Jae-Kyung, Bae*

2005. 08. 01

Signature *Date*

Other Aspects:	
Abbreviations:	**· OK, Pass = passed · Fail = failed · N/A = not applicable**

☞
- **This test report is not permitted to copy partly without our permission.**
- **This test result is dependent on only equipment to be used.**
- **This test result is based on a single evaluation of one sample of the above mentioned.**
- **This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S Government.**
- **We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.**

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NVLAP Lab. Code: 200220-0

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1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2003 for unintentional radiators, and in accordance with the limits set forth in FCC Part 15.109. The EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards.

We attest to the accuracy of data. All measurements reported herein were performed by SK Tech Co., Ltd. and were made under Chief Engineer's supervision.
We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. TEST SITE

SK TECH Co., Ltd.

2.1 Location

820-2, Wolmoon Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.
This laboratory is accredited by NVLAP for NVLAP Lab. Code: 200220-0 and DATech for DAR-Registration No.: TTI-P-G155/97-10

2.2 List of Test and Measurement Instruments

Description	Manufacturer	Model #	Serial #	
Spectrum Analyzer	Agilent	E4405B	US40520856	
EMC Spectrum Analyzer	Agilent	E7405A	US40240203	☒
EMI Test Receiver	Rohde&Schwarz	ESVS10	825120/013	☒
EMI Test Receiver	Rohde&Schwarz	ESVS10	834468/008	☒
EMI Test Receiver	Rohde&Schwarz	ESHS10	825120/013	
EMI Test Receiver	Rohde&Schwarz	ESHS10	834468/008	
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	836679/018	
Pre-amplifier	HP	8447F	3113A05153	☒
Pre-amplifier	HP	8349B	2644A03250	☒
Power Meter	Agilent	E4418B	3318A13916	
Power Sensor	HP	8485A	3318A13916	
VHF Precision Dipole Antenna (TX & RX)	Schwarzbeck	VHAP	1014 & 1015	
UHF Precision Dipole Antenna (TX & RX)	Schwarzbeck	UHAP	989 & 990	
Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	
TRILOG Broadband Antenna	Schwarzbeck	VULB9160	3141	☒
Biconical Antenna	Schwarzbeck	VHA9103	2265	☒
Log-Periodic Antenna	Schwarzbeck	UHALP9107	1819	☒
Horn Antenna	AH Systems	SAS-200/571	304	☒
Horn Antenna	ETS-LINDGREN	3115	00040723	
Horn Antenna	ETS-LINDGREN	3115	00056768	
Vector Signal Generator	Agilent	E4438C	MY42080359	
Signal Generator	HP	8349B	2644A03250	
DC Power Supply	HP	6634A	2926A-01078	
DC Power Supply	HP	6268B	2542A-07856	
Digital Multimeter	HP	HP3458A	2328A14389	☒
PCS Interface	HP	83236B	3711J00881	
CDMA Mobile Test Set	HP	8924C	US35360253	
Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	☒
Temperature/Humidity Chamber	All Three	ATH-50M	20030425	

2.3 Test Date

Date of Application : June 22, 2005

Date of Test : July 29, 2005 ~ July 30, 2005

2.4 Test Environment

See each test item's description.

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The EUT is a receiver installed in vehicles as a car alarm system. The product specification described herein was obtained from the product data sheet or user's manual.

3.1 Rating and Physical Characteristics

	Remote Keyless Entry System	
	Receiver (EUT)	Transmitter *1
Model Name	RK950NAR	RK950NAT
Power source	DC 12V supplied from a vehicle	DC 3V, Lithium battery
Consumption current	Max 5mA	Max 14mA
Local Oscillator	4MHz, 50.7167 MHz	9.84375 MHz
Operating frequency	315 MHz	
Type of Modulation	-	FSK
Output power	-	1mW under
Antenna	Dedicated, detachable antenna	PCB pattern antenna
Sensitivity	-100dBm(Min)	-
External Interface	26 PIN connector (DC power input and signal lines)	-

*1: The test report for the transmitter should be separately issued with FCC ID: IT7-RK950NAT, IC: 1176A-RK950NAT.

3.2 Equipment Modifications

None

3.3 Submitted Documents

Block diagram

Schematic diagram

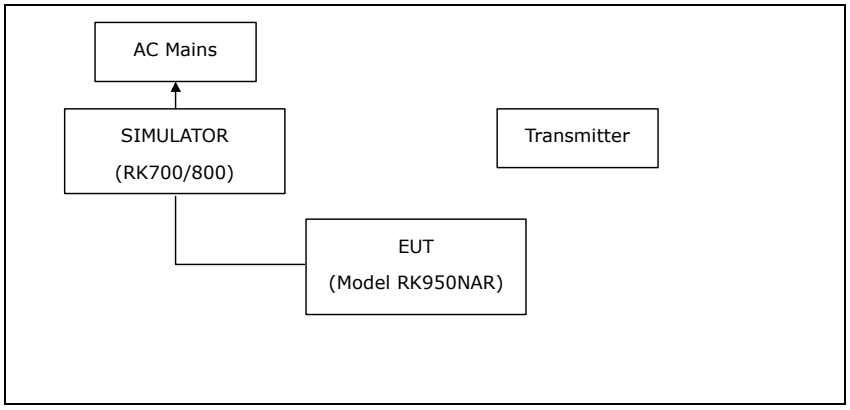
Part List

Instruction manual

4. MEASUREMENT CONDITIONS

4.1 Description of test configuration

The EUT was connected to the SIMULATOR that can be used to supply 12V DC power and verify the states of EUT's operation. The measurements were taken in continuous receiving mode.



4.2 List of Peripherals

Equipment Type	Manufacture	Model	S/N
SIMULATOR	DAEWOO PRECISION INDUSTRIES LTD.	RK700/800	-
Transmitter	DAEWOO PRECISION INDUSTRIES LTD.	RK950NAT	-

4.3 Type of Used Cables

START		END		Cable Spec.	
Name	I/O Port	Name	I/O Port	Length	Shield
EUT	Connector (26 PIN)	SIMULATOR	I/O	1.2 m	Unshielded
SIMULATOR	AC Input	AC mains	-	1.8 m	Unshielded

4.4 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 1.49 dB	±2.98dB
Radiated disturbance	± 2.37 dB	±4.74dB
Conducted disturbance	± 1.47 dB	±2.94dB

5. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	FCC, 47CFR15	RSS-210, Issue 5	Report Section	Test Result
Radiated Emission – Field Strength	15.109(a)	7.3, Table 3	5.1	PASS
Conducted Emissions	15.107(a)	7.4, 6.6	5.2	N/A**

[** REMARK: Not required, the EUT is only battery powered]

5.1 RADIATED EMISSIONS

5.1.1 Regulation

FCC 47CFR15 – 15.209(a) - Radiated emission limits

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field strength (uV/m @ 3m)	Field strength (dBuV/m @ 3m)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

RSS-210, Issue 5 – 7.3 Receiver Spurious Emissions (Radiated)

Receiver radiated spurious emissions in each polarization (vertical and horizontal polarization) shall not exceed the limits in Table 3. The resolution bandwidth of the spectrum analyser shall be 100 kHz for measuring spurious emissions below 1 GHz, and 1 MHz for above 1 GHz. Alternatively, a CISPR quasi-peak detector may be used for measurement below 1 GHz.

Frequency (MHz)	Field strength uV/m at 3 metres (watts, EIRP)	
	Transmitter	Receiver
30 – 88	100 (3 nW)	100 (3 nW)
88 – 216	150 (6.8 nW)	150 (6.8 nW)
216 – 960	200 (12 nW)	200 (12 nW)
960 – 1610	500 (75 nW)	500 (75 nW)
Above 1610	500 (75 nW)	1000 (300 nW)

* Use quasi-peak below 1000 MHz and averaging meter above 1000 MHz.

* The lower limit shall apply at the transition frequencies.

5.1.2 Measurement Procedure

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.
2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360˚.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 18000 MHz using the horn antenna.
4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.
5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.
6. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.

5.1.3 Test Results: PASS

Table 1: Measured values of the Field strength

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. (V/H)	Antenna Height [m]	Table Angle [°]	Reading [dB(μV)]	Amp Gain [dB]	AF / CL [dB(1/m)]	Actual [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
43.21	120	V	1.2	80	43.2 QP	28.3	13.2/0.7	28.8 QP	40.0	11.2
121.06	120	V	1.2	160	38.9 QP	27.8	13.2/1.7	26.0 QP	43.5	17.5
132.36	120	V	1.5	80	37.7 QP	27.7	13.9/1.8	25.7 QP	43.5	17.8
250.71	120	V	1.3	65	29.8 QP	27.0	17.6/2.7	23.1 QP	46.0	22.9

Margin (dB) = Limit – Actual
[Actual = Reading – Amp Gain + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss
3. QP = Quasi-peak, AV = Average, and PK = Peak value

NOTE: The spectrum was scanned from 30 MHz to 2 GHz. All emissions not reported were more than 20 dB below the specified limit or in the noise floor.

5.2 CONDUCTED EMISSIONS

5.2.1 Regulation

FCC 47CFR15 – 15.107(a) Conducted limits.

Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Qausi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

** Decreases with the logarithm of the frequency.

RSS-210, Issue 5 – 7.4 & 6.6 AC Wireline Conducted Emissions

(a) On any frequency or frequencies within the band of 0.45-30 MHz, the measured RF voltage (CISPR meter) shall not exceed 250 microvolts (across 50 ohms).

(b) Transmitters marketed for use only in a commercial, industrial or business environment and not intended for use in homes are permitted a limit of 1000 microvolts (0.45 - 1.705 MHz) and 3000 microvolts (1.705 - 30 MHz).

5.2.2 Measurement Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz.

5.2.3 Test Results: N/A

Table 9: Measured values of the Conducted Emissions

Frequency [MHz]	Reading [dBµV]		CF/CL [dB]	Actual [dBµV]		Limit [dBµV]		Margin [dB]	
	Qp	Ave		Qp	Ave	Qp	Ave	Qp	Ave
LINE – PE									
NEUTRAL – PE									

Margin (dB) = Limit – Actual
[Actual = Reading + CF + CL]
1. Remark "---" means the level is undetectable or the Qausi-peak value is lower than the limit of Average.
2. CF/CL = Correction Factor and Cable Loss
3. Qp = Quasi-peak, Ave = Average value

NOTE: The frequency range was scanned from 150 kHz to 30 MHz. All emissions not reported were more than 20 dB below the specified limit.

Figure 1. Plot of the Conducted Emissions

Line – PE (Quasi-Peak reading)

N/A

Neutral – PE (Quasi-Peak reading)

N/A