**SK TECH CO., LTD.**



# Certificate of Compliance

| | | | |
|---|---|---|---|
| **Test Report No.:** | SKTTRT-071019-027 | | |
| **KOLAS NO.:** | KT191 | | |
| **Applicant:** | S&T Daewoo Co., Ltd. | | |
| **Applicant Address:** | 5, Songjeong-ri, Cholma-myon,Kijang-gun, Busan, Korea | | |
| **Manufacturer:** | S&T Daewoo Co., Ltd. | | |
| **Manufacturer Address:** | 5, Songjeong-ri, Cholma-myon,Kijang-gun, Busan, Korea | | |
| **Device Under Test:** | **Control unit A-RKE & ATAS** | | |
| **FCC ID:**<br>**IC:** | **VQQ-RK960NAR**<br>**7313A-RK960NAR** | **Model No.:** | RK960NAR |
| **Receipt No.:** | SKTEU07-0967 | **Date of receipt:** | September 20, 2007 |
| **Date of Issue:** | October 19, 2007 | | |
| **Location of Testing:** | **SK TECH CO., LTD.**<br>820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea | | |
| **Test Procedure:** | ANSI C63.4 / 2003 | | |
| **Test Specification:** | FCC Part 15 Rules, RSS-210 Issue 7 | | |
| **Equipment Class:**<br>**IC Equipment Category:** | CYY - Communications Receiver used w/Pt 15 Transmitter<br>RSS-210 Issue 7: Category I Equipment(Licence-exempt receivers) | | |
| **Test Result:** | The above-mentioned device has been tested and passed. | | |

**Tested & Reported by**: *Seong-Baek, Ko*

2007. 10. 19

*Signature* *Date*

**Approved by**: *Jong-Soo, Yoon*

2007. 10. 19

*Signature* *Date*

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

☞

- **The above test certificate is the accredited test results by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.**
- **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.**
- **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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# 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
(FCC Registered Test Site Number: 90752)

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.
This laboratory is recognized as a Conformity Assessment Body(CAB) for CAB's Designation Number: **KR0007** by FCC, is accredited by NVLAP for NVLAP Lab. Code: **200220-0**, DATech for DAR-Registration No.: **DAT-P-076/97-01** and KOLAS for Accreditation No. : **KT191**.

## 2.2 List of Test and Measurement Instruments

| No. | Description | Manufacturer | Model # | Serial # | Calibrated until | Used |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | E4405B | US40520856 | 2008.07.23 | ☐ |
| 2 | EMC Spectrum Analyzer | Agilent | E7405A | US40240203 | 2008.02.02 | ☒ |
| 3 | EMI Test Receiver | Rohde&Schwarz | ESIB40 | 100277 | 2008.07.23 | ☒ |
| 4 | EMI Test Receiver | Rohde&Schwarz | ESVS10 | 825120/008 | 2008.07.24 | ☐ |
| 5 | EMI Test Receiver | Rohde&Schwarz | ESHS10 | 862970/019 | 2008.07.24 | ☐ |
| 6 | Artificial Mains Network | Rohde&Schwarz | ESH2-Z5 | 834549/011 | 2008.07.25 | ☐ |
| 7 | Pre-amplifier | HP | 8447F | 3113A05153 | 2008.02.23 | ☒ |
| 8 | Pre-amplifier | MITEQ | AFS44 | 1116321 | 2008.03.07 | ☒ |
| 9 | Pre-amplifier | MITEQ | AFS44 | 1116322 | 2008.02.06 | ☐ |
| 10 | Power Meter | Agilent | E4417A | MY45100426 | 2008.07.24 | ☐ |
| 11 | Power Sensor | Agilent | E9327A | MY44420696 | 2008.07.24 | ☐ |
| 12 | Attenuator (10dB) | HP | 8491B | 38067 | 2008.07.25 | ☒ |
| 13 | Oscilloscope | Agilent | 54820A | US40240160 | 2008.03.06 | ☐ |
| 14 | Diode detector | Agilent | 8473C | 1882A03173 | 2008.02.06 | ☐ |
| 15 | High Pass Filter | Wainwright | WHKX3.0/18G | 8 | 2008.07.25 | ☐ |
| 16 | VHF Precision Dipole Antenna (TX/RX) | Schwarzbeck | VHAP | 1014 / 1015 | 2007.11.27 | ☐ |
| 17 | UHF Precision Dipole Antenna (TX/RX) | Schwarzbeck | UHAP | 989 / 990 | 2007.11.27 | ☐ |
| 18 | Loop Antenna | Schwarzbeck | HFH2-Z2 | 863048/019 | 2007.12.01 | ☐ |
| 19 | TRILOG Broadband Antenna | Schwarzbeck | VULB9160 | 3141 | 2008.05.29 | ☒ |
| 20 | Horn Antenna | AH Systems | SAS-200/571 | 304 | N/A | ☐ |
| 21 | Horn Antenna | EMCO | 3115 | 00040723 | 2008.03.15 | ☒ |
| 22 | Horn Antenna | EMCO | 3115 | 00056768 | 2008.07.24 | ☐ |
| 23 | Vector Signal Generator | Agilent | E4438C | MY42080359 | 2008.07.25 | ☐ |
| 24 | PSG analog signal generator | Agilent | E8257D-520 | MY45141255 | 2008.07.25 | ☐ |
| 25 | DC Power Supply | HP | 6622A | 3448A03950 | 2008.07.23 | ☐ |
| 26 | DC Power Supply | HP | 6268B | 2542A-07856 | 2008.07.23 | ☐ |
| 27 | Digital Multimeter | HP | HP3458A | 2328A14389 | 2008.03.07 | ☐ |
| 28 | PCS Interface | HP | 83236B | 3711J00881 | 2008.03.09 | ☐ |
| 29 | CDMA Mobile Test Set | HP | 8924C | US35360253 | 2008.03.09 | ☐ |
| 30 | Hygro/Thermo Graph | SATO | PC-5000TRH-II | - | 2008.04.09 | ☒ |
| 31 | Temperature/Humidity Chamber | All Three | ATM-50M | 20030425 | 2008.03.06 | ☐ |
| 32 | Temperature/Humidity Chamber | DAEJIN | DJ-THC02 | 06071 | 2008.03.07 | ☐ |

## 2.3 Test Date

Date of Application: September 20, 2007

Date of Test: October 15, 2007 ~ October 15, 2007

## 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 | Transmitter [*1] |
| Model Name | RK960NAR | RK960NAT |
| Type | - | NTP: Non Transponder |
| | - | WTP: With Transponder |
| | HB: Hatch Back | - |
| | NB: Notch Back | - |
| Power Source | DC 12 V from the vehicle | DC 3 V, Lithium battery |
| Consumption current | standby: Max. 5 mA | standby: Max. 1 uA |
| | | operating: Max. 10 mA |
| Local Oscillator | 10.17813 MHz | 9.84375 MHz |
| Operating frequency | 315 MHz | |
| Type of modulation | - | FSK |
| Output power | - | Under 75 dBuV/m(@ 3 m) |
| Antenna | Internal Herical antenna | PCB Pattern Antenna |
| Sensitivity | - 100 dBm(Min.) | - |

[*1]: The test report for the transmitter should be separately issued with FCC ID: VQQ-RK960NAT, IC: 7313A-RK960NAT.

## 3.2 Equipment Modifications

None.

## 3.3 Submitted Documents

Block diagram

Schematic diagram

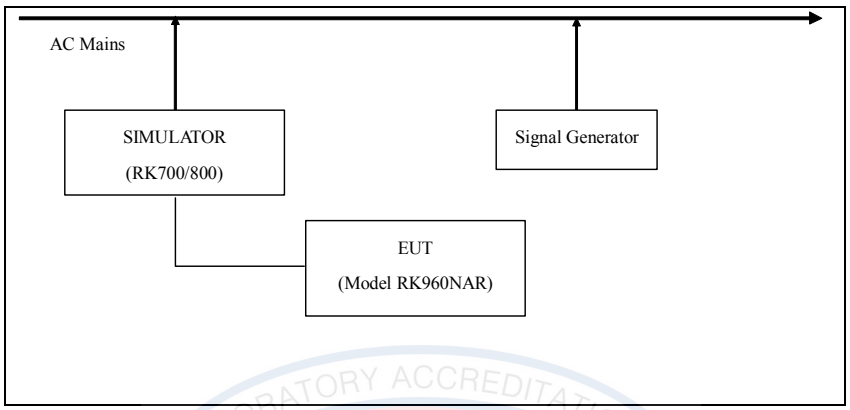
Part List

User 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 and a signal generator transmitted the continuous signal at the operating frequency of EUT.




## 4.2 List of Peripherals

| Equipment Type | Manufacture | Model | S/N |
|---|---|---|---|
| SIMULATOR | Supplied by the applicant | RK700/800 | - |
| Signal Generator | Agilent | E8257D-520 | MY45141255 |

## 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) |
|---|---|---|
| Radiated disturbance | ± 2.30 dB | ±4.60 dB |
| Conducted disturbance | ± 1.47 dB | ±2.94 dB |

# 5. TEST AND MEASUREMENTS

### Summary of Test Results

| Requirement | CFR Section | RSS Standards | Report Section | Test Result |
|---|---|---|---|---|
| Radiated Emission – Field Strength | 15.109(a) | RSS-Gen, 7.2.3 | 5.1 | PASS |
| Conducted Emissions | 15.107(a) | RSS-Gen, 7.2.2 | 5.2 | N/A** |

** 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-Gen, Issue 2 – 7.2.3 Receiver Spurious Emissions (Radiated)**

Receiver radiated spurious emissions in each polarization (vertical and horizontal polarization) shall not exceed the limits in Table 1. 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) |
| Above 960 | 500 (75 nW) | 500 (75 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 Test Procedure

1. 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 high, 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 analyzer was scanned from 30 to 1000 MHz using the Bi-Log antenna. Above 1 GHz, linearly polarized double ridge horn antenna was used.
4. To obtain the final test 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 3 meter test distance.
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. The EUT was operated in transmitting mode.

**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] | Reading [dB(μV)] | Amp Gain [dB] | ATT [dB] | AF [dB/m] | CL [dB] | Actual [dB(μV/m)] | Limit [dB(μV/m)] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Receiver type__HB** | | | | | | | | | | | |
| 630 | 120 | H | 1.0 | 39.90 | 28.5 | 0.0 | 19.4 | 2.3 | 33.1 | 46 | 12.9 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| **Receiver type__NB** | | | | | | | | | | | |
| 630 | 120 | H | 1.0 | 40.64 | 28.5 | 0.0 | 19.4 | 2.3 | 33.9 | 46 | 12.1 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Note*

1. *H = Horizontal, V = Vertical Polarization*
2. *AF = Antenna Factor*
3. *CL = Cable Loss*
4. *ATT = Attenuator*

***Margin (dB) = Limit – Actual***

***Actual = Reading – Amp Gain + ATT + AF + CL***

# 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-Gen, Issue 7 – 7.2.2 AC Power Lines Conducted Emissions**

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. the tighter limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network.

| **Frequency range(MHz)** | **Conducted limit(dBuV)** | |
|---|---|---|
| | **Quasi-peak** | **Average** |
| 0.15 – 0.5 | 66 to 56 * | 56 to 46 * |
| 0.5 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

### 5.2.2 Test 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 2: 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** | | | | | | | | | |
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| **NEUTRAL – PE** | | | | | | | | | |
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**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**