SK TECH CO., LTD.

FCC-Certificate of Compliance

Test Report No.:	**SKTTRT-080716-013**		
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:	**Immobilizer, Model IM861**		
FCC ID:	**VQQ-IM861**	**Brand Name:**	**S&T Daewoo**
Receipt No.:	SKTEU08-0569	**Date of receipt:**	June 30, 2008
Date of Issue:	July 16, 2008		
Location of Testing:	**SK TECH CO., LTD.** 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:	DCD - Part 15 Low Power Transmitter Below 1705kHz RSS-210 Issue 7: Category I Equipment		
Test Result:	The above-mentioned device has been tested and passed.		

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

2008. 07. 16

Signature *Date*

Approved by: *Jong-Soo, Yoon*

2008. 07. 16

Signature *Date*

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

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- **This test report is not permitted to copy partly and entirely without our permission.**
- **This test result is dependent on only equipment to be used.**
- **This test result is based on a single evaluation of submitted samples of the above mentioned.**
- **This test report is the accredited testing items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.**

>> CONTENTS <<

1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2003 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.209.
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)
(OPEN AREA TEST SITE INDUSTRY CANADA NUMBER: IC 5429)

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	
2	EMC Spectrum Analyzer	Agilent	E7405A	US40240203	2009.02	☒
3	EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2009.02	☒
4	EMI Test Receiver	Rohde&Schwarz	ESVS10	825120/008	2008.07	
5	EMI Test Receiver	Rohde&Schwarz	ESHS10	862970/019	2008.07	
6	Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	836679/018	2008.07	
7	Pre-amplifier	HP	8447F	3113A05153	2008.07	☒
8	Pre-amplifier	MITEQ	AFS44	1116321	2009.03	
9	Pre-amplifier	MITEQ	AFS44	1116322	2009.03	
10	Power Meter	Agilent	E4418B	VS39402176	2009.03	
11	Power Sensor	Agilent	8485A	3318A13916	2008.07	
12	Attenuator (10dB)	HP	8491B	38067	2008.07	
13	Oscilloscope	Agilent	54820A	US40240160	2009.03	
14	Diode detector	Agilent	8473C	1882A03173	2009.02	
15	High Pass Filter	Wainwright	WHKX3.0/18G	8	2008.07	
16	VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	2008.11	
17	UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	2008.11	
18	Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	2008.12	☒
19	TRILOG Broadband Antenna	Schwarzbeck	VULB9160	3141	2008.07	☒
20	Horn Antenna	AH Systems	SAS-200/571	304	N/A	
21	Horn Antenna	EMCO	3115	00040723	2009.03	
22	Horn Antenna	EMCO	3115	00056768	2008.07	
23	Vector Signal Generator	Agilent	E4438C	MY42080359	2008.07	
24	PSG analog signal generator	Agilent	E8257D-520	MY45141255	2008.07	
25	DC Power Supply	HP	6622A	3448A03950	2008.07	
26	DC Power Supply	GoldStar	GP-4303A	-	-	☒
27	Digital Multimeter	HP	HP3458A	2328A14389	2009.03	☒
28	PCS Interface	HP	83236B	3711J00881	2009.03	
29	CDMA Mobile Test Set	HP	8924C	US35360253	2009.03	
30	Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2008.08	☒
31	Temperature/Humidity Chamber	All Three	ATM-50M	20030425	2009.03	
32	Temperature/Humidity Chamber	DAEJIN	DJ-THC02	06071	2009.03	

2.3 Test Date

Date of Application : June 30, 2008

Date of Test : July 02, 2008 ~ July 11, 2008

2.4 Test Environment

See each test item's description.

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The product specification described herein was obtained from the product data sheet or user's manual.

3.1 Rating and Physical Characteristics

No. Of Unit	One (125 kHz Transmitter)
Type / Model No.	Immobilizer, Model IM861
FCCID	FCC ID:VQQ-IM861
IC Number	IC:7313A-IM861
Power source	12 V Lead-acid battery in vehicles
Local Oscillator or X-Tal	X-Tal: 4 MHz
Tx Frequency	125 kHz
Antenna Type	Coil Antenna(diameter: 30 mm, Turns: 80, Cu-wire diameter: 0.2 mm)
Type of Modulation	ASK

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 measurements were taken in a test mode for RF transmitting continuously.

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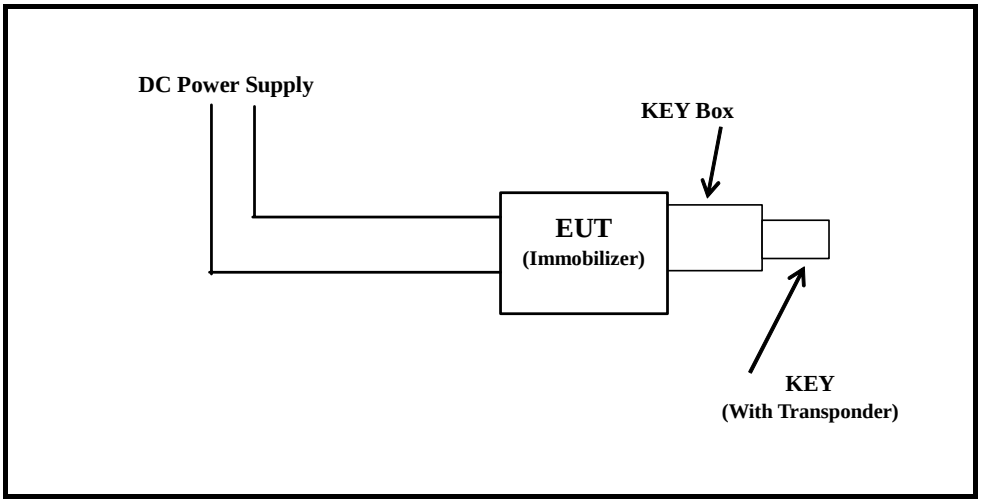

4.2 List of Peripherals

Equipment Type	Manufacture	Model	Cable Description
DC Power Supply	GoldStar	GP-4303A	1.2 m/ Unshielded Cable
KEY Box	Supplied by the applicant	-	-

4.3 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Radiated disturbance	± 2.30 dB	± 4.60 dB
Conducted disturbance	± 1.96 dB	± 3.92 dB

5. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	CFR Section	RSS Standards	Report Section	Test Result
Antenna Requirement	15.203	RSS-Gen, 7.1.4	5.1	PASS
Radiated Emission - Field Strength	15.209	RSS-210, 2.6	5.2	PASS
Occupied Bandwidth	N/A	RSS-210, 4.6.1	5.3	-
Conducted Emission	15.207	RSS-Gen, 7.2.2	N/A	N/A**

** Not required, the EUT is only battery powered in the car.

5.1 ANTENNA REQUIREMENT

5.1.1 Regulation

[FCC 47 CFR section 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

[RSS-Gen, Issue 2 - 7.1.4]

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

5.1.2 Result: PASS

The EUT has an integral coil antenna (125 kHz transmitter), and meets the requirements of this section.

5.2 RADIATED EMISSIONS

5.2.1 Regulation

[FCC 47 CFR section 15.209]

- Emissions below 30 MHz

According to §15.209, the field strength of emissions from intentional radiators operated under this frequency band shall not exceed the following:

Frequency (MHz)	Field strength	Calculation of Field Strength (uV/m)	Calculation of Field Strength (dBuv/m)
0.009 – 0.490	2400/F(kHz) (uV/m @ 300m)	266.7 – 4.9 (uV/m @ 300m)	48.5 – 13.8 (dBuV/m @ 300m)
0.490 – 1.705	24000/F(kHz) (uV/m @ 30m)	49.0 – 14.1 (uV/m @ 30m)	33.8 – 23.0 (dBuV/m @ 30m)
1.705 – 30.0	30 (uV/m @ 30m)	30 (uV/m @ 30m)	29.5 (dBuV/m @ 30m)

- Emissions above 30 MHz

The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in §15.209.

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

The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector. For the frequency bands 9 – 90 kHz, 110 – 490 kHz and above 1000 MHz, the radiated emission limits are based on measurements employing an average detector.

[RSS-210, Issue 7 - 2.6]

[REMARK: THE SAME AS THE FIELD STRENGTH LIMITS SPECIFIED IN FCC PART 15.209]

Tables 2 and 3 show the general field strength limits of unwanted emissions, where applicable, for transmitters and receivers operating in accordance with the provisions specified in this RSS. Transmitters whose wanted emissions are also within the limits shown in Tables 2 and 3 may operate in any of the frequency bands of Tables 2 and 3, other than the restricted bands of Table 1 and the TV bands, and shall be certified under RSS-210. (Note: Devices operating below 490 kHz all of whose emissions are at least 40 dB below the limit given in Table 3 are Category II devices subject to RSS-310.) Unwanted emissions of transmitters and receivers are permitted to fall into Table 1 and TV frequencies but intentional emissions are prohibited. See the note of Table 2 for further details.

5.2.2 Measurement Procedure

For tabletop equipment, the EUT is placed on a 1 × 1.5 meter wide and 0.8 meter high on conductive table that sits on a flush mounted metal turntable. Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

The initial step in collecting radiated data is a peak scan of the measurement range with an EMI test receiver under closer distances as given in the rule.

The significant peaks are then measured with the appropriate detectors (QP, AV and PK).

5.2.3 Calculation of the field strength limits

- Emissions below 30 MHz

No special calculation for obtaining the field strength in dBuV/m is necessary, because the EMI receiver and the active loop antenna operate as a system, where the reading gives directly the field strength result (dBuV/m). The gain, antenna factors and cable losses are already taken into consideration.

For test distance other than what is specified, but fulfilling the requirements of section 15.31 (f) (2) the field strength is calculated by adding additionally an extrapolation factor of 40dB/decade (inverse linear distance for field strength measurements).

All following emission measurements were performed using the test receiver's average detector and peak detector function.

The basic equation is as follow ;

FS= RA + DF

Where

FS = Field strength in dBuV/m

RA = Receiver Amplitude in dBuV/m

DF = Distance Extrapolation Factor in dB

Where DF = 20log(Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance

DF = 40log(3m/300m)= - 80 dB (Frequency : 0.009 ~ 0.490 MHz)

DF = 40log(3m/30m)= - 40 dB (Frequency : 0.490 ~ 30 MHz)

5.2.4 Test Results: PASS

Table 1: Measured values of the Field strength (below 30 MHz)

Frequency (MHz)	Bandwidth (kHz)	Reading (dBuV)	Limit (dBuV/m)	Margin (dB)
Emissions (Average Detector)				
0.125	0.2	60.64	105.7	45.06
0.250	9	37.23	99.6	62.37
0.375	9	32.95	96.1	63.15
Emissions (Peak Detector)				
0.125	0.2	63.29	125.7	62.41
0.250	9	55.88	119.6	63.72
0.375	9	51.07	116.1	65.03
Emissions (Quasi-peak Detector)				
0.500	9	38.71	73.6	34.89
0.625	9	42.10	71.7	29.60
0.750	9	42.02	70.1	28.08
0.875	9	37.93	68.8	30.87
1.000	9	44.23	67.6	23.37
1.125	9	38.81	66.6	27.79
1.250	9	44.30	65.7	21.40
1.375	9	34.80	64.8	30.00

Margin (dB) = Limit - Reading

Table 2: Measured values of the Field strength (above 30 MHz)

Frequency [MHz]	RBW [kHz]	POL [V/H]	ANT [m]	Reading [dBuV]	AMP [dB]	AF [dB/m]	CL [dB]	Actual [dBuV/m]	Limit [dBuV/m]	Margin [dB]

No Spurious Radiated Emissions Found

Margin (dB) = Limit - Actual
[Actual = Reading - Amp Gain + AF + CL]
1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss

NOTE:
1. All emissions not reported were more than 20 dB below the specified limit or in the noise floor.
2. This test results of Table 1 and Table 2 were measured in 3 m distance.

5.3 OCCUPIED BANDWIDTH

5.3.1 Regulation

[RSS-Gen, Issue 2 - 4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

5.3.2 Test Results: PASS

Operating frequency (kHz)	RBW (kHz)	99 % BW (kHz)	Limit (kHz)
125	1.0	30.66	-

Figure 1: Plot of the Occupied bandwidth(99 %)