

**SK TECH CO., LTD.**

Page 1 of 11

# Certificate of Compliance

|                                                                                                                                     |                                                                                         |                                                                                                                                      |               |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Test Report No.:</b>                                                                                                             | SKTTRT-060818-022                                                                       |                                                                                                                                      |               |
| <b>NVLAP CODE:</b>                                                                                                                  | 200220-0                                                                                |                                                                                                                                      |               |
| <b>Applicant:</b>                                                                                                                   | EZ Telematics                                                                           |                                                                                                                                      |               |
| <b>Applicant Address:</b>                                                                                                           | DABO B/D 5F, 164-1, Anyang-1Dong, Manan-Gu<br>Anyang-City, Kyunggi-Do, Korea            |                                                                                                                                      |               |
| <b>Device Under Test:</b>                                                                                                           | CAR ALARM SYSTEM                                                                        |                                                                                                                                      |               |
| <b>FCC ID:</b>                                                                                                                      | <b>UGI-R5000</b>                                                                        | <b>Model No.:</b>                                                                                                                    | R-5000        |
| <b>Receipt No.:</b>                                                                                                                 | SKTEU06-0429                                                                            | <b>Date of receipt:</b>                                                                                                              | July 20, 2006 |
| <b>Date of Issue:</b>                                                                                                               | August 18, 2006                                                                         |                                                                                                                                      |               |
| <b>Location of Testing:</b>                                                                                                         | <b>SK TECH CO., LTD.</b><br>820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea |                                                                                                                                      |               |
| <b>Test Procedure:</b>                                                                                                              | ANSI C63.4 / 2003                                                                       |                                                                                                                                      |               |
| <b>Test Specification:</b>                                                                                                          | 47CFR, Part 15 Subpart C                                                                |                                                                                                                                      |               |
| <b>Equipment Class:</b>                                                                                                             | DSR - Part 15 Remote Control / Security Device Transceiver                              |                                                                                                                                      |               |
| <b>Test Result:</b>                                                                                                                 | The above-mentioned device has been tested and passed.                                  |                                                                                                                                      |               |
| <b>Tested &amp; Reported by:</b> Chang-Min, Moon                                                                                    |                                                                                         | <b>Approved by:</b> Jae-Kyung, Bae                                                                                                   |               |
| <br>_____<br>Signature                      Date |                                                                                         | <br>_____<br>Signature                      Date |               |
| <b>Other Aspects:</b>                                                                                                               |                                                                                         |                                                                                                                                      |               |
| <b>Abbreviations:</b>                                                                                                               | · 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.



NVLAP Lab. Code: 200220-0



>> CONTENTS <<

**1. GENERAL .....3**

**2. TEST SITE .....3**

2.1 Location ..... 3

2.2 List of Test and Measurement Instruments ..... 4

2.3 Test Date ..... 4

2.4 Test Environment ..... 4

**3. DESCRIPTION OF The EQUIPMENT UNDER TEST .....5**

3.1 Rating and Physical Characteristics ..... 5

3.2 Equipment Modifications ..... 5

3.3 Submitted Documents ..... 5

**4. MEASUREMENT CONDITIONS .....6**

4.1 Description of test configuration ..... 6

4.2 List of Peripherals ..... 6

4.3 Uncertainty ..... 6

**5. TEST AND MEASUREMENTS .....7**

**5.1 ANTENNA REQUIREMENT .....7**

5.1.1 Regulation ..... 7

5.1.2 Result ..... 7

**5.2 OCCUPIED BANDWIDTH / Dwell Time .....8**

5.2.1 Regulation ..... 8

5.2.2 Test Procedure ..... 8

5.2.3 Test Results ..... 9

**5.3 RADIATED EMISSION .....10**

5.3.1 Regulation ..... 10

5.3.2 Test Procedure ..... 10

5.3.3 Test Results..... 11



## **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 15.231 for Remote Control / Security Device Transceiver.

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-G155/97-01



## 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 | ESIB40        | 100277      | ☒ |
| Pre-amplifier                        | HP            | 8447F         | 3113A05153  | ☒ |
| Pre-amplifier                        | MITEQ         | AFS44         | 1116321     | ☒ |
| Pre-amplifier                        | MITEQ         | AFS44         | 1116322     |   |
| Power Meter                          | Agilent       | E4418B        | US39402179  |   |
| Power Meter                          | Agilent       | E4417A        | MY45100426  |   |
| Power Sensor                         | Agilent       | E9327A        | MY44420696  |   |
| Power Sensor                         | HP            | 8485A         | 3318A13916  |   |
| Oscilloscope                         | Agilent       | 54820A        | US40240160  |   |
| Diode detector                       | Agilent       | 8473C         | 1882A03173  |   |
| 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        | ☒ |
| TRILOG Broadband Antenna             | Schwarzbeck   | VULB9168      | 9168-230    | ☒ |
| Biconical Antenna                    | Schwarzbeck   | VHA9103       | 2265        |   |
| Log-Periodic Antenna                 | Schwarzbeck   | UHALP9107     | 1819        |   |
| Horn Antenna                         | AH Systems    | SAS-200/571   | 304         | ☒ |
| Horn Antenna                         | EMCO          | 3115          | 00040723    |   |
| Horn Antenna                         | EMCO          | 3115          | 00056768    |   |
| Vector Signal Generator              | Agilent       | E4438C        | MY42080359  |   |
| PSG analog signal generator          | Agilent       | E8257D-520    | MY45141255  |   |
| 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: July 20, 2006

Date of Test: July 20, 2006 ~ August 17, 2006

## 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

|                           |                               |
|---------------------------|-------------------------------|
| Type (Model No.)          | CAR ALARM SYSTEM (R-5000)     |
| Power source              | DC 1.5V ( Alkaline Battery)   |
| Local Oscillator or X-Tal | X-Tal: 20.945 MHz, 32.768 kHz |
| Tx / Rx Frequency         | 433.92 MHz (Tx/Rx)            |
| Antenna Type              | Spring Antenna                |
| Type of Modulation        | FSK                           |
| RF Output Power           | 80 dBuV/m(@3m) Under          |
| Interface Ports           | -                             |

#### 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 configured for testing in a typical fashion (as a user would normally use it). During the exploratory tests, the EUT was set to transmit the control signal continuously in order to conduct subpart C tests.

### 4.2 List of Peripherals

| Equipment Type | Manufacture | Model | Cable Description |
|----------------|-------------|-------|-------------------|
|----------------|-------------|-------|-------------------|

None

### 4.3 Uncertainty

| Measurement Item      | Combined Standard Uncertainty<br>$U_c$ | Expanded Uncertainty<br>$U = KU_c$ ( $K = 2$ ) |
|-----------------------|----------------------------------------|------------------------------------------------|
| Radiated disturbance  | $\pm 2.30$ dB                          | $\pm 4.60$ dB                                  |
| Conducted disturbance | $\pm 1.47$ dB                          | $\pm 2.94$ dB                                  |



## 5. TEST AND MEASUREMENTS

### Summary of Test Results

| Requirement                     | CFR Section             | Report Section | Test Result |
|---------------------------------|-------------------------|----------------|-------------|
| Antenna Requirement             | 15.203                  | 5.1            | PASS        |
| Occupied Bandwidth / Dwell Time | 15.231(c), 15.231(a)(1) | 5.2            | PASS        |
| Radiated Emission               | 15.231(b), 15.209       | 5.3            | PASS        |
| Conducted Emission              | 15.207(a)               | N/A            | N/A*        |

\* Not required, the EUT is only battery powered.

### 5.1 ANTENNA REQUIREMENT

#### 5.1.1 Regulation

FCC 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.

#### 5.1.2 Result:

**PASS**

The EUT have an integral spring antenna and meets the requirements of this section.



## 5.2 OCCUPIED BANDWIDTH / Dwell Time

### 5.2.1 Regulation

According to §15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

Bandwidth is determined at the point 20 dB down from the modulated carrier.

The 20 dB bandwidth limit =  $F \times 0.0025 = 433.92 \text{ MHz} \times 0.0025 = 1084.8 \text{ kHz}$

According to §15.231(a)(1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### 5.2.2 Test Procedure

ANSI C63.4-2003 Section 13.1.7, Occupied Bandwidth Measurements.

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the un-modulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce worst-case (i.e., the widest) bandwidth.

The measurements were performed at operating frequency (433.92 MHz). The spectrum trace data around fundamental frequency of the EUT was obtained with the spectrum analyzer in Max Hold mode. The bandwidth value was determined between the two points of 20dB down from the reference level.

### 5.2.3 Test Results:

**PASS**

#### Measured values of the Occupied Bandwidth

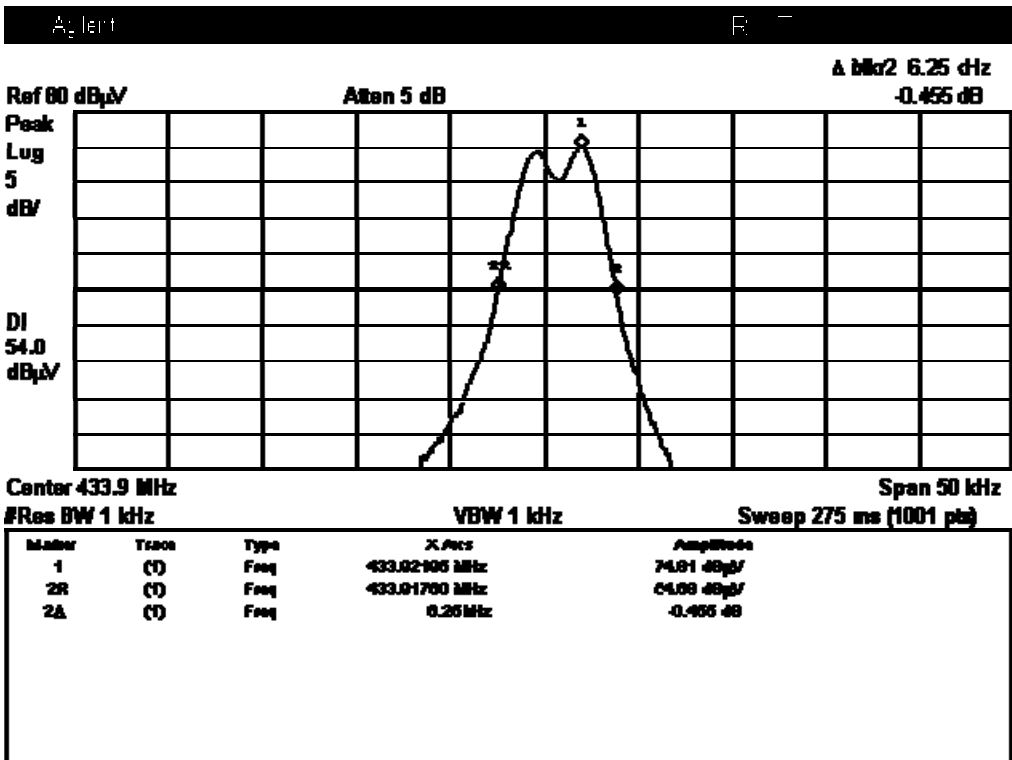
| Center frequency (MHz) | Limit (kHz) | Measured occupied bandwidth (kHz) |
|------------------------|-------------|-----------------------------------|
| 433.92                 | 1084.8      | 6.25                              |

#### Measured values of the Dwell Time

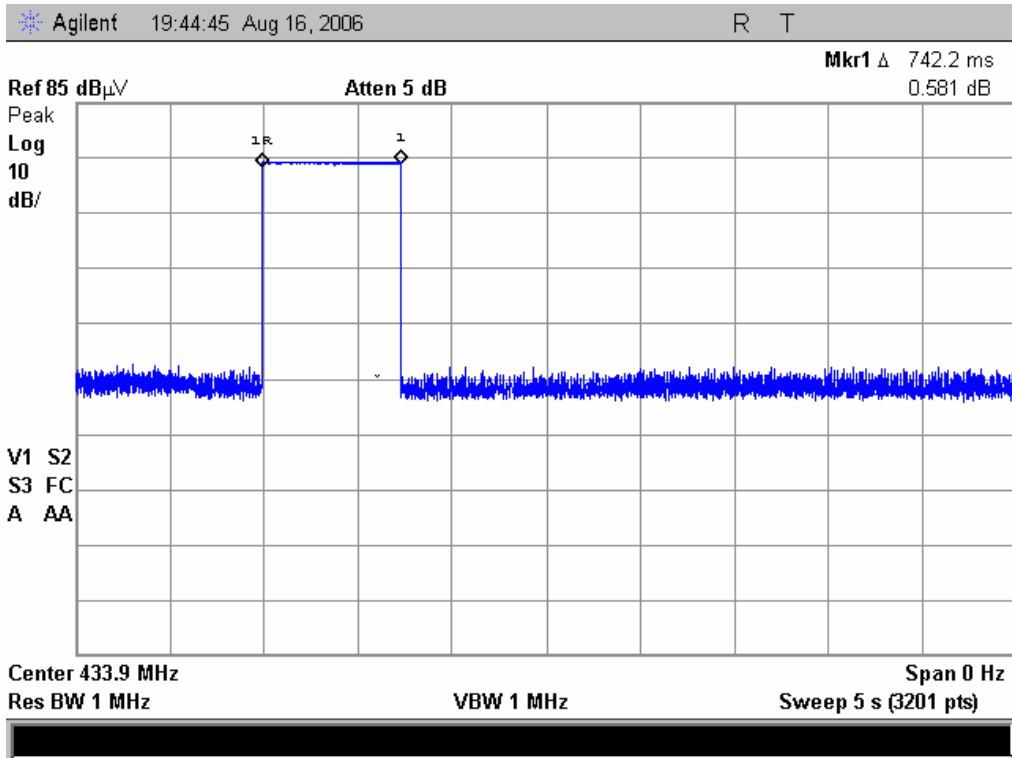
| Center frequency (MHz) | Limit (s) | Measured Dwell Time (s) |
|------------------------|-----------|-------------------------|
| 433.92                 | 5         | 0.742                   |



Plot of the Occupied bandwidth



Plot of the Dwell Time





## 5.3 RADIATED EMISSIONS

### 5.3.1 Regulation

According to 15.231(b), In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

| Fundamental frequency<br>(MHz) | Field strength of fundamental<br>(uV/m @ 3m ) | Field strength of Spurious<br>Emissions (uV/m @ 3m ) |
|--------------------------------|-----------------------------------------------|------------------------------------------------------|
| 40.66 ~ 40.70                  | 2250                                          | 225                                                  |
| 70 ~ 130                       | 1250                                          | 125                                                  |
| 130 ~ 174                      | 1250 to 3750 **                               | 125 to 375 **                                        |
| 174 ~ 260                      | 3750                                          | 375                                                  |
| 260 ~ 470                      | 3750 to 12500**                               | 375 to 1250**                                        |
| Above 470                      | 12500                                         | 1250                                                 |

\*\* Linear interpolations

Any emissions that fall within the restricted bands specified in FCC Section 15.205 shall not exceed the following limits according to §15.209:

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

### 5.3.2 Test Procedure

Preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters. The EUT was placed on the top of the 0.8 meter high, 1 x 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°.

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.

To obtain the final test data, the EUT was arranged on a turntable situated on a 4x4 meter at the Open Area Test Site. The EUT was tested at a 3-meter test distance. 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. 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.

**5.3.3 Test Results:****PASS**

| Measured values of the Field strength |            |               |                |               |                |                 |                |             |
|---------------------------------------|------------|---------------|----------------|---------------|----------------|-----------------|----------------|-------------|
| Frequency (MHz)                       | Pol. (V/H) | AH/TA (m)/(°) | Reading (dBμV) | Amp Gain (dB) | AF + CL (dB/m) | Actual (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| 433.92                                | V          | 1.0 / 119     | 86.7           | 27.9          | 17.0           | 75.8 PK         | 108.8 PK       | 33.0        |
| 433.92                                | V          | 1.0 / 119     | 85.6           | 27.9          | 17.0           | 74.7 AV         | 80.8 AV        | 6.1         |
| 482.13                                | V          | 1.0 / 238     | 51.9           | 28.2          | 18.6           | 42.3 PK         | 80.8 PK        | 38.5        |
| 482.13                                | V          | 1.0 / 238     | 48.8           | 28.2          | 18.6           | 39.2 AV         | 60.8 AV        | 21.6        |
|                                       |            |               |                |               |                |                 |                |             |
|                                       |            |               |                |               |                |                 |                |             |
|                                       |            |               |                |               |                |                 |                |             |
|                                       |            |               |                |               |                |                 |                |             |
|                                       |            |               |                |               |                |                 |                |             |

**Note**

1. H = Horizontal, V = Vertical Polarization
2. AH=Antenna Height, TA=Table Angle
3. PK=Peak detector, AV=Average detector
4. AF/CL = Antenna Factor and Cable Loss
5. Resolution Bandwidth: 120 kHz for below 1 GHz, 1 MHz for over 1 GHz
6. The frequency range was scanned from 30 MHz to 5 GHz. All emissions not reported were more than 20 dB below the specified limit or in the noise floor.
7. Field strength limit of the fundamental frequency:  

$$\text{Limit} = (F-260) \cdot (12500-3750) / (470-260) + 3750 = 10996.7 \mu\text{V/m} = 80.8 \text{ dBuV/m}$$
 Field strength limit of spurious emissions:  

$$\text{Limit} = (F-260) \cdot (1250-375) / (470-260) + 375 = 1099.6 \mu\text{V/m} = 60.8 \text{ dBuV/m}$$

$$\text{Margin (dB)} = \text{Limit} - \text{Actual}$$

$$[\text{Actual} = \text{Reading} - \text{Amp Gain} + \text{AF} + \text{CL}]$$