SK TECH CO., LTD.



# Certificate of Compliance

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|---|---|---|---|
| **Test Report No.:** | **SKTTRT-031215-010** | | |
| **NVLAP CODE:** | **200220-0** | | |
| **Applicant:** | **Trinus Systems Inc.** | | |
| **Applicant Address:** | 310-3, ShinCheon-4Dong, Dong-Gu, Daegu, Korea 701-024 | | |
| **Device Under Test:** | **Wireless Transceiver System** | | |
| **FCC ID:** | **ROYTPRF-900B** | **Model No.:** | **TPRF-900B** |
| **Receipt No.:** | SKTEU03-0682 | **Date of receipt:** | December 3, 2003 |
| **Date of Issue:** | December 15, 2003 | | |
| **Location of Testing:** | **SK TECH CO., LTD.**<br>820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea | | |
| **Test Procedure:** | **ANSI C63.4 / 2001** | | |
| **Test Specification:** | **FCC Title 47, Part 15 Subpart C / August 26, 2003** | | |
| **Equipment Class:** | **Part 15 Low Power Communication Device Transmitter** | | |
| **Test Result:** | The above-mentioned device has been tested and passed.- | | |

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

*12/15/2003*

*Signature* *Date*

**Approved by**: *Jae-Kyung, Bae*

*12/15/2003*

*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.**

NVLAP®

**NVLAP Lab. Code: 200220-0**

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# 1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2001 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.249 for Low Power Communication Device Transmitter. 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

| Equipment Type | Manufacturer | Model No. | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESVS 10 | 825120/013 | 10, 2004 |
| EMI Test Receiver | Rohde&Schwarz | ESVS 10 | 834468/008 | 10, 2004 |
| EMC Analyzer | Agilent | E7405A | US40240203 | 12, 2003 |
| Spectrum Analyzer | Agilent | E4405B | US40520856 | 07. 2004 |
| Amplifier | H.P | 8447F | 3113A05153 | 10, 2004 |
| Amplifier | H.P | 8349B | 2644A03250 | 08, 2004 |
| TRILOG broadband antenna | Schwarzbeck | VULB9160 | 3141 | 05, 2004 |
| Log Periodic Antenna | Schwarzbeck | UHALP9107 | 1819 | 10, 2004 |
| Biconical Antenna | Schwarzbeck | BBA9106 | 91031626 | 10, 2004 |
| Horn Antenna | AH Systems | SAS-200/571 | 304 | 03, 2004 |
| Antenna Mast | TOKIN | 5907 | N/A | N/A |
| Antenna & Turntable controller | TOKIN | 5906 | N/A | N/A |
| 50Ω Switcher | Anritsu | MP59B | 6100214538 | N/A |

## 2.3 Test Date

Date of Application : December 3, 2003
Date of Test : December 5, 2003 ~ December 15, 2003

## 2.4 Test Environment

See each test item's description.

# 3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The EUT is BASE as a part of a 900 MHz wireless system that can be used by the Police Department to record dialog between the police and a suspect. When a policeman arrests a suspect, he must read the Miranda Rights to suspect. At the scene, the main system including camera and VCR is recording the scene. The EUT is normally installed in a vehicle and it will receive/transmit the audio signals from/to the transmitter (HANDSET). 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.) | Wireless Transceiver System * | |
|---|---|---|
| | BASE | HANDSET ** |
| Power source | DC 12V supplied from a vehicle | DC 3.6V (AAA Ni-MH x 3) |
| Local Oscillator or X-Tal | 1st IF: 10.7MHz, 2nd IF: 455kHz<br>2nd Local: 10.25MHz<br>X-Tal: 4.0 MHz | 1st IF: 10.7MHz, 2nd IF: 455kHz<br>2nd Local: 10.25MHz<br>X-Tal: 4.19 MHz |
| Transmit Frequency | 902.80 ~ 904.75 MHz | 925.30 ~ 927.25 MHz |
| Antenna Type | External (SMA connector), 50 Ω | Affixed antenna |
| Channel Number | 40 Channels, Full Duplex | |
| Channel Spacing | 50 kHz | |
| Type of Modulation | FM | |
| RF Output power | 1mW under | |
| External Ports | RJ45 *** | - |

* The BASE has RF module RU0902B18HKB, and HANDSET has RU0926H18HKB.
** The test report for the HANDSET should be issued with other test report number, SKTTRT-031215-009, and the application documents for FCC equipment authorization are submitted with different FCC ID, ROYTPRF-900H, at the time this test report submitted.
*** The RJ45 connector is used for DC power supply and for audio signal transmission to the VCR in the trunk of the cars.

## 3.2 Equipment Modifications

None.

## 3.3 Submitted Documents

Block diagram, Schematic diagram, Antenna Specification, RF Module Specification, Part List, User manual

# 4. MEASUREMENT CONDITIONS

## 4.1 Description of test configuration

The operating frequencies of the EUT were set to CH01, CH20 & CH40 and continuously transmitting modes that were controlled by test mode of EUT.

## 4.2 List of Peripherals

| Equipment Type | Description | Manufacture | Model |
|---|---|---|---|
| Main System | Mobile Video System including VCR | * | PCV-1 |
| Camera | STALKER Vision | * | - |
| Controller | STALKER Vision VHS | * | - |

* For testing the BASE in typical operating conditions, the applicant provided the peripherals listed above and cables listed below, and those peripherals are labeled as APPLIED CONCEPTS INC.

## 4.3 Type of Used Cables

| Description | Length | Type of shield | Remark |
|---|---|---|---|
| Connecting Camera to Controller | 0.5 m | Unshield | Labeled: 200-0565-00 |
| Connecting Main System to Controller | 6.25 m | Unshield | Labeled: Main cable |
| Connecting Power Supply* to Main System | 6.05 m | Unshield | Labeled: 200-0568-00 |
| Connecting EUT (BASE) to Main System | 6.05 m | Unshield | RJ45 connector |

* In normal operating conditions, the Main System is powered from the battery (DC 12V) in a vehicle.

## 4.4 Uncertainty

### Radiated disturbance

Uc (Combined standard Uncertainty) = ± 2.37 dB

Expanded uncertainty U = KUc = ±4.74dB (K = 2)

# 5. TEST AND MEASUREMENTS

| SUMMARY OF TEST RESULTS | | | |
|---|---|---|---|
| **Requirement** | **47CFR Section** | **Report Section** | **Test Result** |
| Antenna Requirement | 15.203 | 5.1 | PASS |
| Radiated Emissions | 15.249, 15.209, 15.109 | 5.2 | PASS |
| Occupied Bandwidth (Band Edge) | 15.249, 15.209 | 5.3 | PASS |
| Conducted Emissions | 15.207, 15.107 | * | * |

**** Not required, the EUT only employs battery power for operation.***

## 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 uses a permanently connected antenna

☒ The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector

☐ The EUT requires professional installation (attach supporting documentation if using this option)

## 5.2 RADIATED EMISSIONS

### 5.2.1 Regulation

According to §15.249(a), the filed strength of emissions from intentional radiators operated within the band 902-928MHz shall comply with the following:

| Fundamental frequency (MHz) | Field strength of Fundamental (mV/m @ 3m ) | Field strength of Fundamental (dBuV/m @ 3m ) | Field strength of Harmonics (uV/m @ 3m ) | Field strength of Harmonics (dBuV/m @ 3m ) |
|---|---|---|---|---|
| 902 - 928 | 50 | 94 | 500 | 54 |

According to §15.249(d), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
According to §15.109(a), for Class B digital devices, the field strength of radiated emissions has the same limits specified in §15.209(a).

| 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 tables are based on measurement instrumentation employing a CISPR quasi-peak detector below 1000 MHz and an average detector above 1000 MHz. However, the peak field strength of any emission shall not exceed the average limit by more than 20 dB.*

### 5.2.2 Test Procedure

The 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 was scanned from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 10000 MHz using the horn antenna. 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 and tested in three orthogonal planes. The measurements were performed at the operating frequency: 1 near top, 1 near middle and 1 near bottom.

**5.2.3 Test Results: PASS**

**Table 1: Open Field Radiated Emissions (BASE – Transmitting mode)**

| 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] |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emissions in 15.249(a)** | | | | | | | | | | |
| 902.80 | 120 | V | 1.41 | 283 | 81.23QP | 27.9 | 25.4/7.3 | 86.03 | 94 | 7.97 |
| 903.75 | 120 | V | 1.30 | 270 | 79.84QP | 27.8 | 25.4/7.3 | 84.74 | 94 | 9.26 |
| 904.75 | 120 | V | 1.38 | 265 | 80.66QP | 27.8 | 25.4/7.3 | 85.56 | 94 | 8.44 |
| **Emissions - Harmonics in 15.249(a)** | | | | | | | | | | |
| 1805.65 | 1000 | H | 1.00 | 255 | 30.94PK | 18.2 | 27.1/12.1 | 51.94 | 74 | 22.06 |
| 1805.65 | 1000 | H | 1.00 | 255 | 26.44AV | 18.2 | 27.1/12.1 | 47.44 | 54 | 6.56 |
| | | | | | | | | | | |
| 1807.45 | 1000 | H | 1.00 | 255 | 30.28PK | 18.2 | 27.1/12.1 | 51.28 | 74 | 22.72 |
| 1807.45 | 1000 | H | 1.00 | 255 | 24.24AV | 18.2 | 27.1/12.1 | 45.24 | 54 | 8.76 |
| | | | | | | | | | | |
| 1809.35 | 1000 | H | 1.66 | 68 | 29.04PK | 18.2 | 27.1/12.1 | 50.04 | 74 | 23.96 |
| 1809.35 | 1000 | H | 1.66 | 68 | 23.12AV | 18.2 | 27.1/12.1 | 44.12 | 54 | 9.88 |
| **Emissions in 15.249(d) and 15.209(a)** | | | | | | | | | | |
| 451.41 | 120 | H | 1.00 | 249 | 41.49QP | 28.1 | 17.9/4.2 | 35.49 | 46 | 10.51 |
| 468.00 | 120 | H | 1.00 | 240 | 43.34QP | 28.1 | 18.1/4.3 | 37.64 | 46 | 8.36 |
| 936.01 | 120 | H | 1.00 | 0 | 32.39QP | 27.9 | 24.8/7.4 | 36.69 | 46 | 9.31 |
| | | | | | | | | | | |
| 468.48 | 120 | H | 1.00 | 243 | 42.95QP | 28.2 | 18.1/4.3 | 37.15 | 46 | 8.85 |
| 936.95 | 120 | H | 1.00 | 0 | 32.00QP | 27.8 | 24.8/7.4 | 36.40 | 46 | 9.60 |
| | | | | | | | | | | |
| 452.38 | 120 | H | 1.00 | 250 | 40.42QP | 28.1 | 17.9/4.2 | 34.42 | 46 | 11.58 |
| 468.98 | 120 | H | 1.00 | 240 | 42.92QP | 28.2 | 18.1/4.3 | 37.12 | 46 | 8.88 |
| 937.94 | 120 | H | 1.00 | 0 | 31.98QP | 27.9 | 24.8/7.4 | 36.28 | 46 | 9.72 |

**Table 2: Open Field Radiated Emissions (BASE – Standby / Receiving mode)**

| 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] |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emissions below 1000 MHz** | | | | | | | | | | |
| 468.50 | 120 | H | 1.00 | 230 | 42.80QP | 28.2 | 18.1/4.3 | 37.00 | 46 | 9.00 |
| 937.46 | 120 | H | 1.00 | 230 | 31.54QP | 27.8 | 24.8/7.4 | 35.94 | 46 | 10.06 |
| **Emissions above 1000 MHz** | | | | | | | | | | |
| | 1000 | | | | **No emissions found above 1000 MHz** | | | | | |

*1. H = Horizontal, V = Vertical Polarization*

*2. AF/CL = Antenna Factor and Cable Loss*

*3. QP = Quasi-Peak, AV = Average, and PK = Peak detection mode.*

*4. The spectrum was scanned from 30 MHz to 10 GHz. All emissions not reported were more than 20 dB below the specified limit or in the noise floor.*

***Margin (dB) = Limit – Actual***

***[Actual = Reading – Amp Gain + AF + CL]***

## 5.3 OCCUPIED BANDWIDTH (BAND EDGE)

### 5.3.1 Regulation

According to §15.249(d), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### 5.3.2 Test Procedure

ANSI C63.4-2001 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 unmodulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce worst-case (widest) bandwidth.

The measurements were performed at the lowest and highest operating frequency: 902.8 MHz and 904.75 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 26dB down from the reference level.

### 5.3.3 Test Results: PASS

**Table 4: Measured values of the Occupied bandwidth**

| Operating frequency (MHz) | 26 dB Bandwidth (kHz) | Limit (MHz) |
|---|---|---|
| 902.80 | 24.69 | *within* 902 - 928 |
| 904.75 | 25.44 | |

*Figure 1: Plot of the Occupied bandwidth (BASE, Operating at 902.80 MHz)*

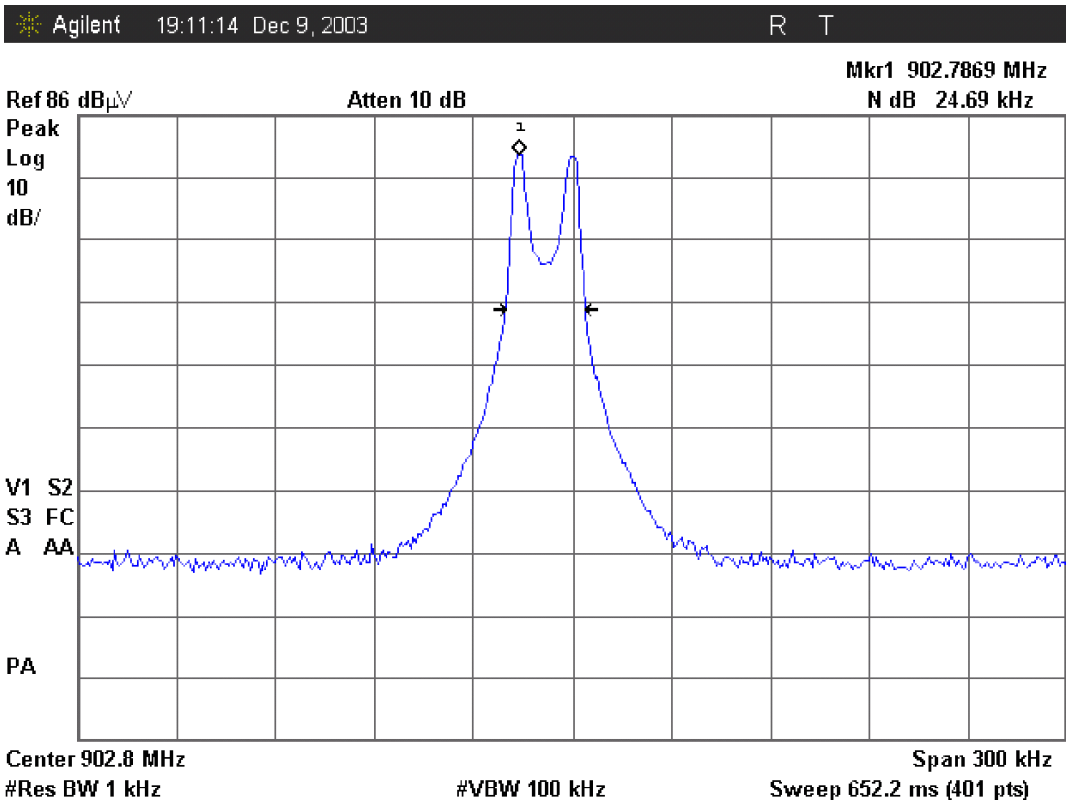


*Figure 2: Plot of the Occupied bandwidth (BASE, Operating at 904.75 MHz)*