

**SK TECH CO., LTD.**

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Certificate of Compliance

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. 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		Approved by: Jae-Kyung, Bae	
 12/15/2003 Signature Date		 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 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 2nd Local: 10.25MHz X-Tal: 4.0 MHz	1st IF: 10.7MHz, 2nd IF: 455kHz 2nd Local: 10.25MHz 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 = ± 4.74 dB (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.

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

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



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:

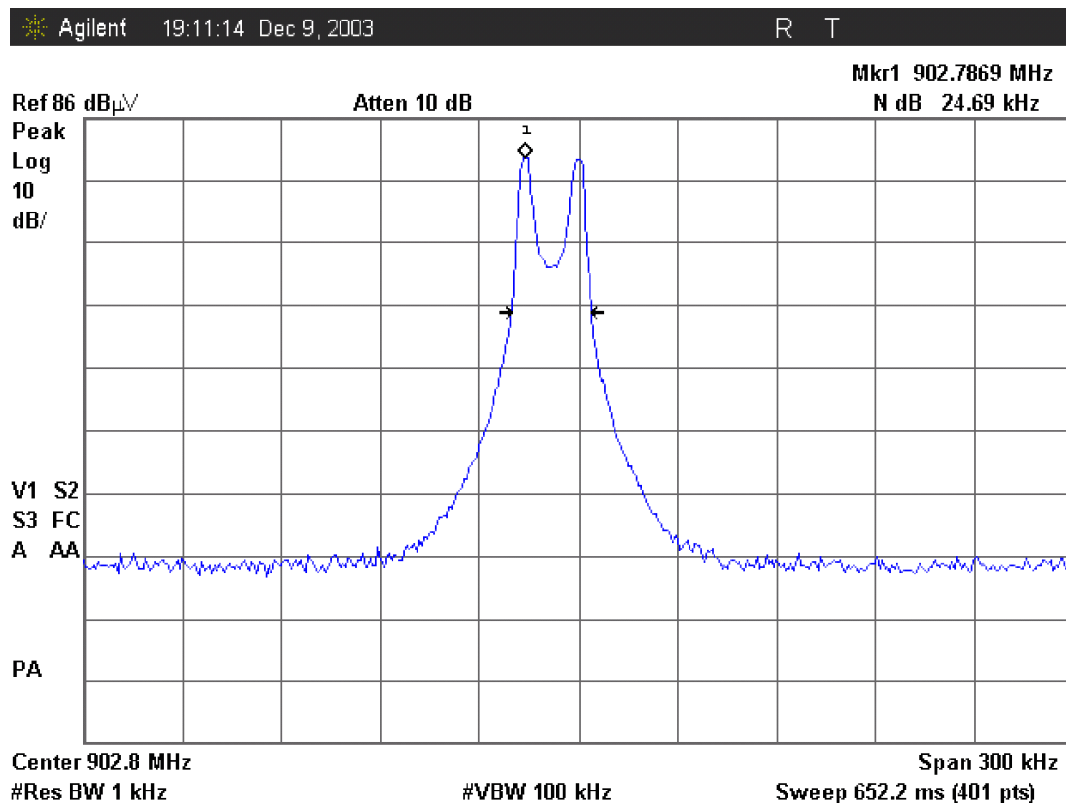
PASS

Table 4: Measured values of the Occupied bandwidth

Operating frequency (MHz)	26 dB Bandwidth (kHz)	Limit (MHz)
902.80	24.69	<i>within 902 - 928</i>
904.75	25.44	

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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)**