SK TECH CO., LTD.

Certificate of Compliance

Test Report No.:	**SKTTRT-030624-002**		
NVLAP CODE:	**200220-0**		
Applicant:	**NITGEN Co., Ltd.**		
Applicant Address:	Sanhak Research Foundation B/D 18th Fl. 1337-31, Seocho-Dong, Seocho-Ku, Seoul, Korea		
Device Under Test:	**Access Controller**		
FCC ID:	PEBNAC-3000R	**Model No.:**	NAC-3000R
Receipt No.:	SKTEU03-0355	**Date of receipt:**	June 10, 2003
Date of Issue:	June 24, 2003		
Location of Testing:	**SK TECH CO., LTD.** 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea		
Test Procedure:	**ANSI C63.4 / 1992**		
Test Specification:	**FCC Title 47, Part 15 Subpart C**		
Equipment Class:	**Part 15 Low Power Transmitter Below 1705kHz**		
Test Result:	The above-mentioned device has been tested and passed.		

Tested & Reported by: *Chang-Min, Moon*

2003. 06. 24

Signature *Date*

Approved by: *Jae-Kyung, Bae*

2003. 06. 24

Signature *Date*

Other Aspects:	**According to the Section 15.33 (b) (1) & (c), Radiated Emissions & Conducted Emissions were reported in Report No. SKTFCE-030621-080.**
Abbreviations:	**· OK, Pass = passed · Fail = failed · N/A = not applicable**

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NVLAP Lab. Code: 200220-0

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1. GENERAL

These tests were performed using the test procedure outlined in ANSI C64.4, 1992 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.209, 15.207, 15.109, and 15.107.
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, 2003
EMI Test Receiver	Rohde&Schwarz	ESVS 10	834468/008	10, 2003
Spectrum Analyzer	Advantest	R3361A	11730187	10, 2003
EMC Spectrum Analyzer	Agilent	E7405A	US40240203	12. 2003
Amplifier	H.P	8447F	3113A05153	10, 2003
LOOP ANTENNA	Rohde & Schwarz	HFH2-Z2	8630481019	09, 2003
Log Periodic Antenna	Schwarzbeck	UHALP9107	1819	10, 2003
Biconical Antenna	Schwarzbeck	BBA9106	91031626	10, 2003
Horn Antenna	Schwarzbeck	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 : June 10, 2003
Date of Test : June 15, 2003 ~ June 21, 2003

2.4 Test Environment

See each test item's description.

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The EUT is a low power 125 kHz transceiver using loop coil antenna.
The EUT is powered from AC Adapter (output :DC12V).
The EUT is Power ON and operate continuously in TRANSMITTING and READING mode for recognizing RF ID CARD.
RF ID CARD is approached to the EUT and then EUT verifies the identification of the CARD.

3.1 Rating and Physical Characteristics

	Transceiver (EUT)
Type (Model No.)	NAC-3000R
Power source	AC Adapter (DC 12V)
Consumption current	Max 150mA
Local Oscillator	-
Operating frequency	0.125MHz
Type of Modulation	ASK
Rated Output	< 19.2 μV/m@300m

3.2 Submitted Documents

Description of Transceiver
Block diagram for Transceiver
Circuit diagram for Transceiver

4. MEASUREMENT CONDITIONS

4.1 Description of test configuration

The EUT was tested in a typical fashion. During preliminary emission tests the EUT was operated in continuous TRANSMITTING and READING mode for finding worst case emission mode. Therefore, final qualification testing was completed with EUT operated in both of the continuous modes.

4.2 List of Peripherals

Equipment Type	Manufacture	Model	Serial Number
AC Adapter (supplied with EUT)	ANAM INSTRUMENTS Co.,Ltd.	AP03611-UV	0304000294AA

4.3 Type of Used Cables

Description	Length	Type of shield	Manufacturer

None

4.4 Uncertainty

Radiated disturbance

Uc (Combined standard Uncertainty) = ± 1.9 dB

Expanded uncertainty U = KUc

K = 2

∴ U = ±3.8dB

Conducted disturbance

Uc (Combined standard Uncertainty) = ± 1.47 dB

Expanded uncertainty U = KUc

K = 2

∴ U = ±2.94dB

5. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	CFR Section	Report Section	Test Result
Antenna Requirement	15.203	5.1	PASS
Radiated Spurious Emissions	15.209	5.2	PASS
Conducted Emissions	15.207	*	*
Radiated Spurious Emissions	15.109	*	*
Conducted Emissions	15.107	*	*

* **According to the Section 15.33 (b) (1) & (c), Radiated Emissions & Conducted Emissions were reported in Report No. SKTFCE-030621-080.**

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 transmitter has an integral loop coil antenna and meets the requirements of this section.

5.2 RADIATED EMISSIONS

5.2.1 Regulation

- Emissions below 30MHz

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 30MHz

According to the Section 15.33 (b) (1) and 15.109, Radiated Emissions were reported in Report No. SKTFCE-030621-080.

5.2.2 Measurement Procedure

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive 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 30MHz

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 lineardistance 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)= -80dB (Frequency : 0.009 ~ 0.490MHz)

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

5.2.4 Test Results: PASS

The results of the field strength of the fundamental and spurious/harmonic emissions are shown in Table 1. The worst-case emission level is 72.8 dBuV/m @ 3m at 0.125 MHz, This is 39.2 dB below the specified limit.

Table 1: Measured values of the Field strength (below 30MHz)			
Frequency (MHz)	Reading (dBuV)	Limit (dBuV/m)	Margin (dB)
Emissions (Average Detector)			
0.125	72.8	105.7	32.9
0.375	38.6	99.6	61.0
Emissions (Peak Detector)			
0.125	80.3	125.7	45.4
0.375	47.2	119.6	72.4
Emissions DATA 15.205 Restricted Bands			

No Emissions Found.

Margin (dB) = Limit – Reading