SK TECH CO., LTD.

TEST REPORT

Test Report No.:	**SKTTRT-091028-013**		
KOLAS No.:	**KT191**		
Applicant:	**NITGEN&COMPANY Co., Ltd.**		
Applicant Address:	**Pax Tower B/D, 12FL., 231-13, Nonhyeon-dong, Gangnam-gu, Seoul, Korea(135-010)**		
Manufacturer:	**NITGEN&COMPANY Co., Ltd.**		
Manufacturer Address:	**Pax Tower B/D, 12FL., 231-13, Nonhyeon-dong, Gangnam-gu, Seoul, Korea(135-010)**		
Device Under Test:	**Fingkey Access**		
FCC ID:	**W2ASW101-R**	**Model Name:**	**SW101-R**
Brand/Trade Name:	**NITGEN**		
Receipt No.:	SKTEU09-0872	**Date of receipt:**	August 27, 2009
Date of Issue:	October 28, 2009		
Location of Testing:	**SK TECH CO., LTD.** #820-2, Wolmoon-ri, Wabu-up, Namyangju-si, Kyunggi-do, 472-905 South Korea		
Test Procedure:	**ANSI C63.4 / 2003**		
Test Specification:	**47CFR, Part 15 Rules**		
FCC Equipment Class:	**DCD - Part 15 Low Power Transmitter Below 1705kHz**		
Test Result:	The above-mentioned device has been tested and passed.		

Tested & Reported by: *Seungtaek, Shim* **Approved by**: *Jongsoo, Yoon*

Signature	*2009.10.28*	*Signature*	*2009.10.28*
	Date		*Date*

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

☞
- 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.
- The above test report is the accredited test results 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 and 15.207. 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, 472-905 South Korea
(FCC Registered Test Site Number: 90752)
(OPEN AREA TEST SITE INDUSTRY CANADA NUMBER: IC 5429)

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, and KOLAS for Accreditation No. : KT191.

2.2 List of Test and Measurement Instruments

No.	Description	Manufacturer	Model No.	Serial No.	Calibrated until	Used
1	Spectrum Analyzer	Agilent	E4405B	US40520856	2010.07	☒
2	EMC Spectrum Analyzer	Agilent	E7405A	US40240203	2010.03	☒
3	EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2010.02	☒
4	EMI Test Receiver	Rohde&Schwarz	ESHS10	862970/019	2010.07	☒
5	Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	836679/018	2010.07	☒
6	Pre-amplifier	HP	8447F	3113A05153	2010.07	☒
7	Pre-amplifier	MITEQ	AFS44	1116321	2010.07	
8	Pre-amplifier	MITEQ	AFS44	1116322	2010.03	
9	Power Meter	Agilent	E4417A	MY45100426	2010.07	
10	Power Meter	Agilent	E4418B	US39402176	2010.07	
11	Power Sensor	Agilent	E9327A	MY44420696	2010.07	
12	Power Sensor	Agilent	8482A	MY41094094	2010.07	
13	Attenuator (10dB)	HP	8491B	38067	2010.07	
14	High Pass Filter	Wainwright	WHKX3.0/18G	8	2010.07	
15	VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	2009.12	
16	UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	2009.12	
17	Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	2009.11	☒
18	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	230	2010.07	☒
19	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	189	2010.09	
20	Horn Antenna	AH Systems	SAS-200/571	304	N/A	
21	Horn Antenna	EMCO	3115	00040723	2010.03	
22	Horn Antenna	EMCO	3115	00056768	2010.09	
23	Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170318	2010.08	
24	Vector Signal Generator	Agilent	E4438C	MY42080359	2010.07	
25	PSG analog signal generator	Agilent	E8257D-520	MY45141255	2010.07	
26	DC Power Supply	HP	6622A	3448A032223	2009.11	
27	DC Power Supply	HP	6268B	2542A-07856	2010.07	
28	Temperature/Humidity Chamber	All Three	ATM-50M	20030425	2010.03	
29	Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2010.07	☒

2.3 Test Date

Date of Test: September 14, 2009 ~ October 22, 2009

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

Power source		External AC/DC adaptor
Local Oscillator or X-Tal		X-Tal: (Main board) 32.768 kHz, 3.6864 MHz, 20 MHz (RF board) 8 MHz
Transmit Frequency		126 kHz
Antenna Type		Integral inductive loop coil antenna (24 × 39 mm)
Type of Modulation		ASK
External Ports	- RJ-45 - Terminal - DC Input Port	- Ethernet interface - External connection to a door lock - AC/DC Adaptor used Manufacturer: SI Tech Co., Ltd. Model Name: SAD04212-UV Input: AC 100 – 240 V, 50/60 Hz, 1.1 A Output: DC 12 V, 3.5 A

**: The test report for compliance with FCC Part 15B as a digital device was made under Verification process with a separate the report.

3.2 Equipment Modifications

None

3.3 Submitted Documents

Block diagram

Schematic diagram

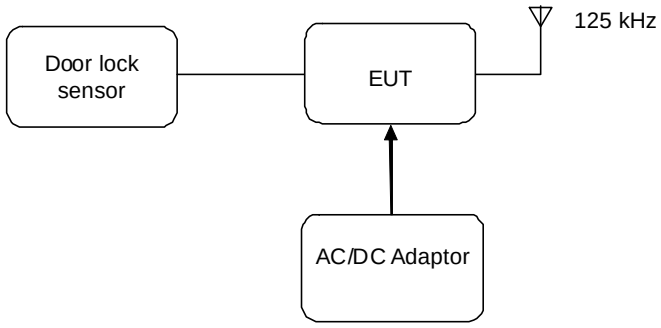
Part List

User manual

4. MEASUREMENT CONDITIONS

4.1 Description of test configuration

The measurements were taken in transmitting RF signals continuously.



[System Block Diagram of Test Configuration]

4.2 List of Peripherals

Equipment Type	Manufacturer	Model	S/N
AC/DC Adaptor	SI Tech Co., Ltd.	SAD04212-UV	0805001476BB
Door lock sensor	Supplied by the applicant	-	-

4.3 Type of Used Cables

#	START		END		CABLE	
	NAME	I/O PORT	NAME	I/O PORT	LENGTH(m)	SHIELDED
1	EUT	DC IN	AC/DC Adaptor	DC OUT	1.8	NO (Ferrite core)
2	AC/DC Adaptor	AC IN	AC mains	AC mains	1.2	NO (Ferrite core)
3	EUT	Terminal	Door lock sensor	Terminal	3.0	NO

4.4 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	FCC, 47CFR15	Report Section	Test Result
Antenna Requirement	15.203	5.1	PASS
Radiated Spurious Emissions	15.209	5.2	PASS
AC Power Line Conducted Emissions	15.207	5.3	PASS

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

5.2 RADIATED EMISSIONS

5.2.1 Regulation

- 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.

5.2.2 Measurement Procedure

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 1 meter or 3 meters.
2. The EUT was placed on the top of the 0.8-meter height, 1 × 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˚.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna and from 30 MHz to 1000 MHz or to tenth harmonic of the highest fundamental frequency, whichever is higher, using the TRILOG broadband antenna.

4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.
5. 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.
6. The EUT is situated in three orthogonal planes (if appropriate)
7. 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.

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 (kHz)	Bandwidth (kHz)	Reading ** (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Emissions (Average Detector)				
126.06	0.2	55.4	105.6	50.2
378.35	9	33.1	96.1	63.0
Emissions (Peak Detector)				
126.06	0.2	69.1	125.6	56.5
378.35	9	44.0	116.1	72.1
Emissions (Quasi-peak Detector)				
630.01	9	30.9	71.6	40.7
882.34	9	24.2	68.7	44.5
1256.93	9	28.4	65.6	37.2
1386.60	9	20.8	64.8	44.0
1496.64	9	18.8	64.1	45.3

** Reading values shown above table included the antenna factor and cable loss.

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]
298.59	120	V	1.46	50.15	26.38	12.96	1.78	38.51	46.00	7.49
298.59	120	H	1.25	49.66	26.38	12.96	1.78	38.02	46.00	7.98
398.12	120	V	1.32	46.80	26.93	15.28	2.04	37.19	46.00	8.81
398.12	120	H	1.14	42.64	26.93	15.28	2.04	33.03	46.00	12.97
497.65	120	V	1.00	46.70	27.36	17.29	2.27	38.90	46.00	7.10
497.65	120	H	1.85	42.58	27.36	17.29	2.27	34.78	46.00	11.22

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. These test results of Table 1 and Table 2 were measured at the 3 m distance.

5.3 AC POWER LINE CONDUCTED EMISSIONS

5.3.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Qausi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

5.3.2 Test Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

5.3.3 Test Results: **PASS**

Table 3: Measured values of the Conducted Emissions

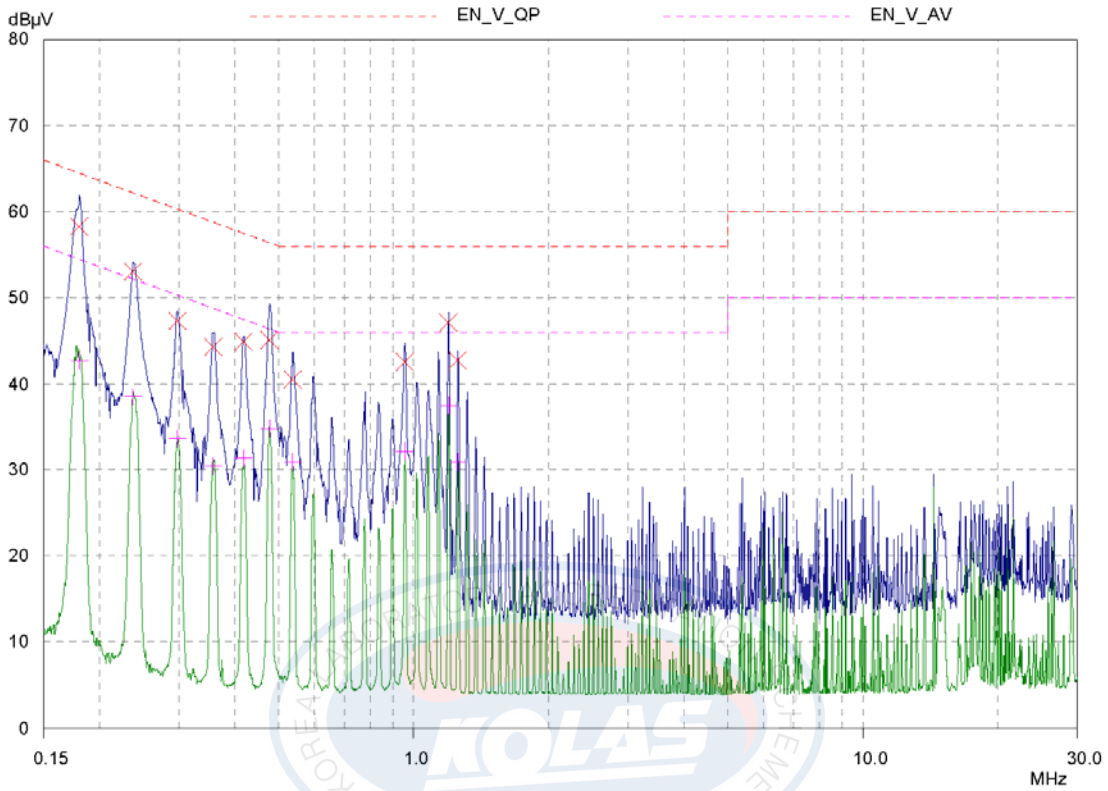
Frequency [MHz]	Reading [dBμV]	L / N	CF [dB]	CL [dB]	Actual [dBμV]	Limit [dBμV]	Margin [dB]
QUASI-PEAK DATA							
0.1788	58.09	N	0.05	0.01	58.15	64.54	6.39
0.1802	58.27	L	0.06	0.01	58.34	64.48	6.14
0.2374	53.05	L	0.12	0.02	53.19	62.19	9.00
0.2383	51.91	N	0.14	0.02	52.07	62.15	10.08
0.2969	46.51	N	0.14	0.02	46.67	60.33	13.66
0.2981	47.32	L	0.12	0.02	47.46	60.30	12.84
0.3581	43.38	N	0.14	0.02	43.54	58.77	15.23
0.4185	43.49	N	0.14	0.02	43.65	57.48	13.83
0.4774	42.73	N	0.14	0.02	42.89	56.38	13.49
0.5381	40.47	N	0.12	0.05	40.64	56.00	15.36
0.9562	45.02	N	0.13	0.07	45.22	56.00	10.78
1.1352	44.17	N	0.14	0.07	44.38	56.00	11.62
1.1957	48.32	N	0.14	0.07	48.53	56.00	7.47
1.2544	42.77	L	0.14	0.07	42.98	56.00	13.02
AVERAGE DATA							
0.1788	44.65	N	0.05	0.01	44.71	54.54	9.83
0.1802	42.69	L	0.06	0.01	42.76	54.48	11.72
0.2374	38.44	L	0.12	0.02	38.58	52.19	13.61
0.2383	39.96	N	0.14	0.02	40.12	52.15	12.03
0.2969	35.15	N	0.14	0.02	35.31	50.33	15.02
0.2981	33.51	L	0.12	0.02	33.65	50.30	16.65
0.3581	32.54	N	0.14	0.02	32.70	48.77	16.07
0.4185	33.36	N	0.14	0.02	33.52	47.48	13.96
0.4774	34.98	N	0.14	0.02	35.14	46.38	11.24
0.5381	32.31	N	0.12	0.05	32.48	46.00	13.52
0.9562	34.59	N	0.13	0.07	34.79	46.00	11.21
1.1352	35.68	N	0.14	0.07	35.89	46.00	10.11
1.1957	38.43	N	0.14	0.07	38.64	46.00	7.36
1.2544	30.86	L	0.14	0.07	31.07	46.00	14.93

Margin (dB) = Limit – Actual
[Actual = Reading + CF + CL]
L/N = LINE / NEUTRAL
CF/CL = Correction Factor and Cable Loss

NOTE: All emissions not reported were more than 20 dB below the specified limit.

Figure 1. Plot of the Conducted Emissions

Line – PE (Peak and Average detector used)



Neutral – PE (Peak and Average detector used)