


SK TECH CO., LTD.

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TEST REPORT

Test Report No.:	SKTRFC-110321-004		
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)		
Equipment Under Test:	Fingkey Access Plus		
FCC ID:	W2ASW101-RP	Model No.:	SW101-R+
Brand/Trade Name:	NITGEN		
Receipt No.:	SKTEU11-0030	Date of receipt:	January 12, 2011
Date of Issue:	March 21, 2011		
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		
Equipment Class:	DCD - Part 15 Low Power Transmitter Below 1705kHz		
Test Result:	The above-mentioned device has been tested and passed.		

Tested & Reported by: Jungtae Kim

Approved by: Jongsoo Yoon

March 21, 2011

Signature

March 21, 2011

Signature

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.



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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 5429A)

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.



2.2 List of Test and Measurement Instruments

No.	Description	Manufacturer	Model No.	Serial No.	Calibrated until	Used
1	Spectrum Analyzer	Agilent	E4405B	US40520856	2012.03	
2	Spectrum Analyzer	Agilent	E4440A	MY46186322	2011.05	<input checked="" type="checkbox"/>
3	EMC Spectrum Analyzer	Agilent	E7405A	US40240203	2012.03	<input checked="" type="checkbox"/>
4	EMI Test Receiver	Rohde&Schwarz	ESPI	101206	2011.07	<input checked="" type="checkbox"/>
5	EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2012.03	
6	EMI Test Receiver	Rohde&Schwarz	ESHS10	862970/019	2011.07	<input checked="" type="checkbox"/>
7	Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	836679/018	2011.07	<input checked="" type="checkbox"/>
8	Pre-amplifier	HP	8447F	3113A05153	2011.07	<input checked="" type="checkbox"/>
9	Pre-amplifier	MITEQ	AFS44	1116321	2011.12	
10	Pre-amplifier	MITEQ	AFS44	1116322	2011.07	
11	Power Meter	Agilent	E4417A	MY45100426	2011.07	
12	Power Meter	Agilent	E4418B	US39402176	2011.07	
13	Power Sensor	Agilent	E9327A	MY44420696	2011.07	
14	Power Sensor	Agilent	8482A	MY41094094	2011.07	
15	Attenuator (10dB)	HP	8491B	38067	2011.07	
16	Attenuator (20dB)	Weinschel	44	AH6967	2011.07	
17	High Pass Filter	Wainwright	WHKX3.0/18G	8	2011.07	
18	VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	2011.05	
19	UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	2011.05	
20	Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	2011.11	<input checked="" type="checkbox"/>
21	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	230	2011.07	<input checked="" type="checkbox"/>
22	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	189	2011.05	
23	Horn Antenna	AH Systems	SAS-200/571	304	N/A	
24	Horn Antenna	EMCO	3115	00040723	2011.04	
25	Horn Antenna	EMCO	3115	00056768	2010.09	
26	Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170318	2013.09	
27	Vector Signal Generator	Agilent	E4438C	MY42080359	2011.08	
28	PSG analog signal generator	Agilent	E8257D-520	MY45141255	2011.07	
29	DC Power Supply	HP	6633A	3448A032223	2011.08	
30	DC Power Supply	HP	6268B	2542A-07856	2011.07	
31	Temperature/Humidity Chamber	All Three	ATM-50M	20030425	2012.03	
32	Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2011.07	<input checked="" type="checkbox"/>

2.3 Test Date

Date of Test: March 4, 2011 ~ March 10, 2011

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, 12 MHz (Sub board) 11.0592 MHz, 3.5795 MHz (RF board) 8 MHz
Tx Frequency	125 kHz
Antenna Type	Integral inductive loop coil antenna (42 × 23 mm)
Type of Modulation	ASK
External Ports** DC Input Port	<ul style="list-style-type: none"> - RJ-45 - USB - Terminal - Ethernet interface - DATA communication with a EUT - 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 report.

3.2 Equipment Modifications

None

3.3 Submitted Documents

Block diagram

Schematic diagram

Part List

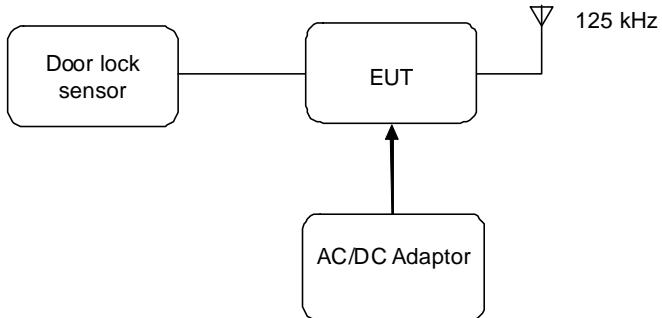
User manual



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	-	-
RFID tag	HID CORPORATION	-	S013-05523

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
2	AC/DC Adaptor	AC IN	AC mains	AC mains	1.2	NO
3	EUT	Terminal	Door lock sensor	Terminal	0.3	NO

4.4 Uncertainty

Measurement Item	Combined Standard Uncertainty U_c	Expanded Uncertainty $U = k \times U_c (k = 1.96)$
Radiated disturbance	± 2.30 dB	± 4.51 dB
Conducted disturbance	± 1.96 dB	± 3.84 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

FCC 47CFR15 – 15.209

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength limit (μ V/m)	Field strength limit (dB μ V/m)	Measurement Distance (m)
0.009 – 0.490	$2400/F$ (kHz) = 266.7 – 4.9	48.5 – 13.8	300
0.490 – 1.705	$24000/F$ (kHz) = 49.0 – 14.1	33.8 – 23.0	30
1.705 – 30.0	30	29.5	30
30 – 88	100	40.0	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

* 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.

* The lower limit shall apply at the transition frequencies.

5.2.2 Measurement Procedure

Radiated Emissions Test, 9 kHz to 30 MHz (Magnetic Field Test)

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions at a distance of 1 meter or 3 meters according to Section 15.31(f)(2).
2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table.
3. Emissions from the EUT are maximized by adjusting the orientation of the Loop antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions if applicable.
4. To obtain the final measurement data, 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.

Radiated Emissions Test, above 30 MHz

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 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 30 to 1000 MHz 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 below 30 MHz

1. No special calculation for obtaining the field strength in dB μ V/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 (dB μ V/m). The antenna factors and cable losses are already taken into consideration.
2. 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).
3. All following emission measurements were performed using the test receiver's average, peak, and quasi-peak detector function with specified bandwidth.
4. The basic equation is as follows;

$$FS = RA + DF$$

Where

FS = Field strength in dB μ V/m

RA = Receiver Amplitude in dB μ V/m

DF = Distance Extrapolation Factor in dB

Where $DF = 40\log(D_{TEST} / D_{SPEC})$ where D_{TEST} = Test Distance and D_{SPEC} = Specified Distance

$DF = 40\log(3m/300m) = -80\text{dB}$, for frequency band: 0.009 to 0.490MHz

$DF = 40\log(3m/30m) = -40\text{dB}$, for frequency band: 0.490 to 30MHz



5.2.4 Test Results:

PASS

Table 1: Field strength below 30 MHz

Frequency [kHz]	RBW [kHz]	Reading [dB(μ V/m)]	Cable Loss [dB]	Actual [dB(μ V/m)]	Limit (at 3m) [dB(μ V/m)]	Margin [dB]
Emissions (Average Detector)						
124.97	0.2	52.24	0.3	57.47	105.60	48.13
375.90	9	31.79	0.3	32.09	96.10	64.01
Emissions (Peak Detector)						
124.97	0.2	63.16	0.3	71.25	125.60	54.35
375.90	9	43.15	0.3	43.45	116.10	72.65
Emissions (Quasi-peak Detector)						
1928.00	9	35.20	0.3	35.50	69.50	34.00

Actual (dB μ V/m) = Reading + Cable Loss

Margin (dB) = Limit – Actual

NOTE: These test results were measured at the 3 m distance.

Table 2: Measured values of the Field strength (above 30 MHz)

Frequency [MHz]	RBW [kHz]	POL [V/H]	ANT [m]	Reading [dB μ V]	AMP [dB]	AF [dB/m]	CL [dB]	Actual [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
149.40	120	H	1.23	48.33	28.04	12.95	1.20	34.44	43.50	9.06
149.40	120	V	1.00	51.22	28.04	12.95	1.20	37.33	43.50	6.17
204.10	120	H	1.10	49.80	27.74	10.43	1.40	33.89	43.50	9.61
204.10	120	V	1.00	43.74	27.74	10.43	1.40	27.83	43.50	15.67
298.59	120	H	1.69	50.56	27.50	12.58	1.70	37.34	46.00	8.66
298.59	120	V	1.00	47.82	27.50	12.58	1.70	34.60	46.00	11.40
320.01	120	H	1.53	56.71	27.65	12.84	1.76	44.61	46.00	2.34**
320.01	120	V	1.00	53.82	27.65	12.84	1.76	40.77	46.00	5.23
640.01	120	H	1.24	48.25	28.93	18.92	2.50	40.74	46.00	5.26
640.01	120	V	1.00	47.66	28.93	18.92	2.50	40.15	46.00	5.85

Margin (dB) = Limit – Actual

[Actual = Reading + 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 measured at the 3 m distance.

** The measured result is within the test standard limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance.



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 $50\mu\text{H}/50\Omega$ 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 (dB μV)	
	Quasi-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 $50\Omega/50\mu\text{H}$ 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.


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5.4.3 Test Results:
PASS
Table 3: Measured values of the Conducted Emissions

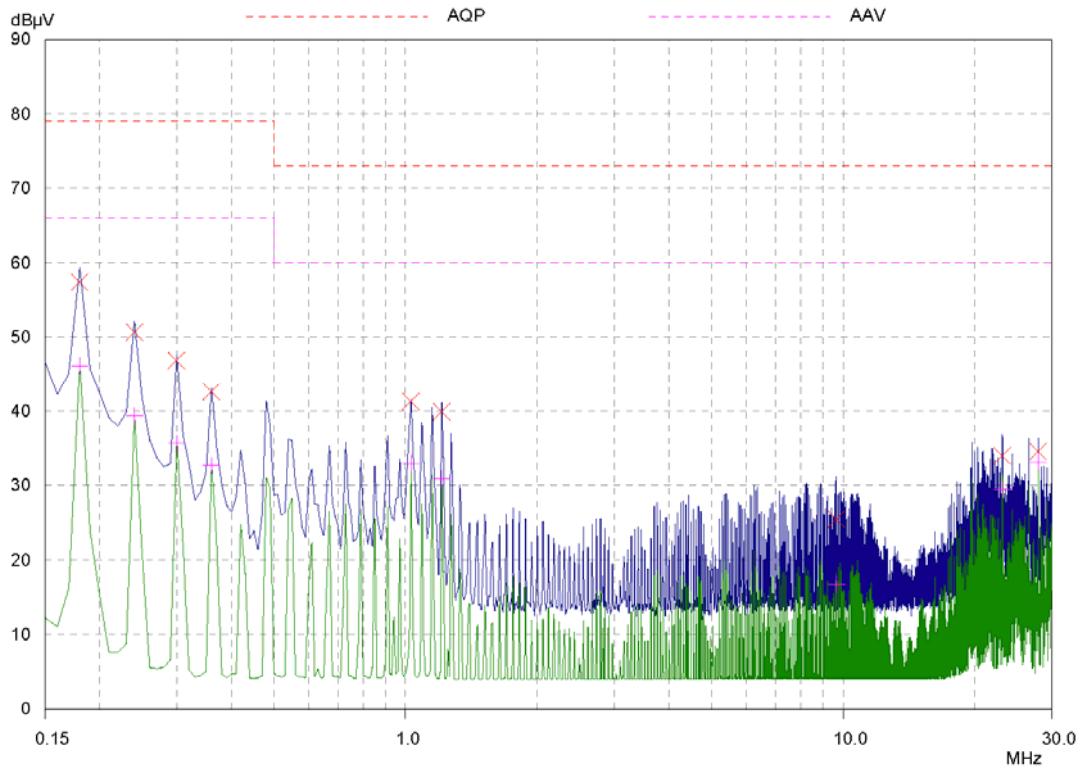
Frequency [MHz]	Reading [dB μ V]	L / N	CF [dB]	CL [dB]	Actual [dB μ V]	Limit [dB μ V]	Margin [dB]
QUASI-PEAK DATA							
0.18	57.42	L	0.14	0.02	57.58	79.00	21.42
0.24	50.66	L	0.13	0.02	50.81	79.00	28.19
0.30	46.84	L	0.12	0.02	46.98	79.00	32.02
0.36	42.62	L	0.12	0.02	42.76	79.00	36.24
0.55	32.98	N	0.12	0.04	33.14	73.00	39.86
1.03	41.20	L	0.14	0.07	41.41	73.00	31.59
1.15	37.96	N	0.12	0.07	38.15	73.00	34.85
1.21	39.84	L	0.14	0.07	40.05	73.00	32.95
23.13	33.98	L	0.86	0.30	35.14	73.00	37.86
27.95	34.54	L	0.86	0.30	35.70	73.00	37.30
AVERAGE DATA							
0.18	46.15	L	0.14	0.02	46.31	66.00	19.69
0.24	39.32	L	0.13	0.02	39.47	66.00	26.53
0.30	35.59	L	0.12	0.02	35.73	66.00	30.27
0.36	32.66	L	0.12	0.02	32.80	66.00	33.20
0.55	25.53	N	0.12	0.04	25.69	60.00	34.31
1.03	30.52	N	0.12	0.07	30.71	60.00	29.29
1.15	30.41	N	0.12	0.07	30.60	60.00	29.40
1.21	30.88	L	0.14	0.07	31.09	60.00	28.91
23.13	29.40	L	0.86	0.30	30.56	60.00	29.44
27.95	33.15	L	0.86	0.30	34.31	60.00	25.69

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.

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Figure 1. Plot of the Conducted Emissions**Line – PE (Peak and Average detector used)****Neutral – PE (Peak and Average detector used)**