


**Korea Technology Institute Co., Ltd.**
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## Test Report

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                            |                                                                                                                                                                                      |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>field strengthTest<br/>Report No.:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | KT106EF07002                                                                                               |                                                                                                                                                                                      |               |
| <b>Registration No.:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 99058                                                                                                      |                                                                                                                                                                                      |               |
| <b>Applicant:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | NITGEN Co.,Ltd.                                                                                            |                                                                                                                                                                                      |               |
| <b>Applicant Address:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | #Sam-Oh Bldg, 3 <sup>rd</sup> Floor, 905-4 HoGye-dong DongAn-Gu, AnYang                                    |                                                                                                                                                                                      |               |
| <b>Product:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Access Controller                                                                                          |                                                                                                                                                                                      |               |
| <b>FCC ID:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                                                                                                          | <b>Model No.</b>                                                                                                                                                                     | NAC-2500R     |
| <b>Receipt No.:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 06-0603                                                                                                    | <b>Date of receipt:</b>                                                                                                                                                              | June 05, 2006 |
| <b>Date of Issue:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | July 07, 2006                                                                                              |                                                                                                                                                                                      |               |
| <b>Testing location</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Korea Technology Institute Co., Ltd.<br>51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeonggi-Do, Korea |                                                                                                                                                                                      |               |
| <b>Test Standards:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | FCC/ANSI. C63.4: 2003                                                                                      |                                                                                                                                                                                      |               |
| <b>Rule Parts: FCC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Part 15, Class B                                                                                           |                                                                                                                                                                                      |               |
| <b>Equipment Class:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Digital device                                                                                             |                                                                                                                                                                                      |               |
| <b>Test Result:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | The above-mentioned product has been tested with compliance.                                               |                                                                                                                                                                                      |               |
| <b>Tested by: T.W. Lee</b><br>/ Engineer<br><br>_____<br>Signature                      Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                            | <b>Approved by: G. C. Min</b><br>/President<br><br>_____<br>Signature                      Date |               |
| <b>Other Aspects:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                            |                                                                                                                                                                                      |               |
| <b>Abbreviations:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | * OK, Pass=passed   * Fail=failed   * N/A=not applicable                                                   |                                                                                                                                                                                      |               |
|  <ul style="list-style-type: none"> <li>- This test report is not permitted to copy partly without our permission.</li> <li>- This test result is dependent on only equipment to be used.</li> <li>- This test result is based on a single evaluation of one sample of the above mentioned.</li> <li>- This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.</li> <li>- We certify this test report has been based on the measurement standards that is traceable to the national or international standards.</li> </ul> |                                                                                                            |                                                                                                                                                                                      |               |



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## **1. General**

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. Korea Technology Institute Co., Ltd. performed all measurements reported herein. And were made under Chief Engineer's supervisor.

We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

## **2. Test Site**

Korea Technology Institute Co., Ltd.

### **2.1 Location**

51-19, Sanglim3-Ri, Docheok-Myeun, Gwangju-Shi, Gyeongki-Do, Korea

The Test Site is in compliance with ANSI C63.4/2001 for measurement of radio Interference.



## 2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

### - Conducted Emissions

| Kind of Equipment    | Type    | S/N      | Calibrated until |
|----------------------|---------|----------|------------------|
| Spectrum Analyzer    | R3261C  | 61720417 | 02.2007          |
| Field Strength Meter | ESIB40  | 100093   | 05.2007          |
| LISN                 | KNW407  | 8-1157-2 | 01.2007          |
| LISN                 | EM-7823 | 115019   | 05.2007          |
| Conducted Cable      | N/A     | N/A      | 11.2006          |

### - Radiated Emissions

| Kind of Equipment              | Type      | S/N        | Calibrated until |
|--------------------------------|-----------|------------|------------------|
| Field Strength Meter           | ESIB40    | 100093     | 05.2007          |
| Spectrum Analyzer              | R3261C    | 61720417   | 02.2007          |
| Pre Amplifier                  | 8447D     | 2944A06874 | 11.2006          |
| Loop Antenna                   | 6502      | 3434       | 04.2007          |
| Biconical Antenna              | VHA9103   | 1111       | 01.2007          |
| LogPeriodic Antenna            | UHALP9107 | 1568       | 01.2007          |
| Horn Antenna                   | 3115      | 6443       | 07.2006          |
| Open Site Cable                | N/A       | N/A        | 11.2006          |
| Antenna Mast                   | DETT-03   | N/A        | N / A            |
| Antenna & Turntable controller | DETT-04   | 91X519     | N / A            |

## 2.3 Test Date

Date of Application: June 23, 2006

Date of Test: June 27, 2006

## 2.4 Test Environment

25°C/43%/1003mbar



### 3. Description of the tested samples

The EUT is a Access Controller.

#### 3.1. Rating and Physical Characteristics

Table 2: Rating and Physical Characteristics

| Function             |                                               | Spec.                                                       |
|----------------------|-----------------------------------------------|-------------------------------------------------------------|
| Display              | Type                                          | 128 * 32 Dots LCD                                           |
|                      | Language                                      | Default: Korean, English                                    |
| Sensor               | Model / Type                                  | OPP03 / Optical                                             |
|                      | Resolution                                    | 500 DPI                                                     |
| Authentication       | Speed                                         | 1:1 mode: less than 1 sec / 1:N mode: Application Note      |
|                      | Algorithm                                     | FRR: less than 0.1%, FAR: less than 0.001%                  |
| #of registered users | Terminal                                      | 780(1 finger prints per user) 400(2 finger prints per user) |
| Communication        | TCP/IP                                        | 10 base-T Ethernet (optional)                               |
|                      | RS-485                                        | Max. 115200bps (custom requirement)                         |
| Size                 | Case                                          | 90(W) * 200(L) * 48(H) mm                                   |
| Power                | Adapter 1                                     | In: AC100V ~ 240V, 50/60Hz / Out: DC12V, 3A(24V OK)         |
|                      | Adapter 2                                     | In: AC100V ~ 240V, 50/60Hz / Out: DC 5V, 3A(24V OK)         |
| Additional function  | Guidelines recorded in voice                  |                                                             |
|                      | Downloadable logo / firmware                  |                                                             |
|                      | IP length ( 4~15 digits)                      |                                                             |
|                      | Authentication results to be displayed in LED |                                                             |
| Optional             | Network Board                                 |                                                             |
|                      | Door Control Board                            |                                                             |
|                      | RF Module( 125KHz HID)                        |                                                             |
| Temperature          | Storage                                       | -25℃ ~ 65℃                                                  |
|                      | Operation                                     | -20℃ ~ 60℃ (with no dew condensation)                       |
| Humidity             | Storage                                       | 15% ~ 90% RH                                                |
|                      | Operation                                     | 25% ~ 85% RH                                                |

#### 3.2 Submitted Documents

- User's Guide
- Block Diagram



## 4. Measurement Conditions

Testing Input Voltage: AC 220V

### 4.1 Modes of Operation

The EUT was in the following operation mode during all testing;

- 1) EUT operates a finger print job with connection to the Note Pc

### 4.2 Additional Equipment

| DEVICE TYPE | Manufacturer        | M/N        | S/N   | FCC ID |
|-------------|---------------------|------------|-------|--------|
| Note PC     | Samsung             | SFM-3200LW | N / A | DOC    |
| Mouse       | EUNXING ELECTRONICS | M2000      | N / A | DOC    |
| Adapter     | DongKwan samsung    | AD-9019    | N / A | DOC    |

### 4.3 Uncertainty

- 1) Radiated disturbance

$U_c$  (Combined standard Uncertainty) =  $\pm 1.8\text{dB}$

Expanded uncertainty  $U = K U_c$

$K = 2$

$\therefore U = \pm 3.6\text{dB}$

- 2) Conducted disturbance

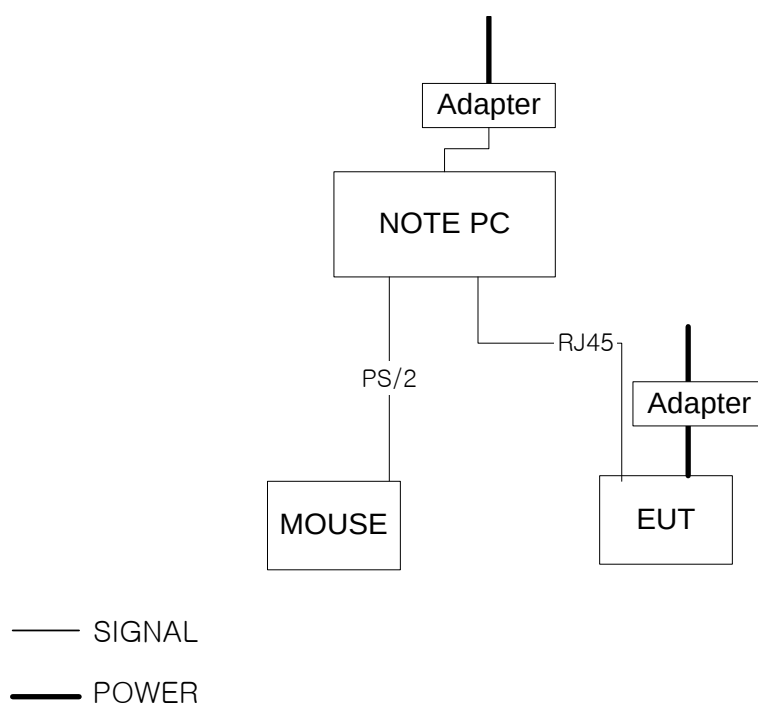
$U_c = \pm 0.88\text{dB}$

$U = K U_c = 2 \times U_c = \pm 1.8\text{dB}$



## 4.4 Test Setup

Figure 1 : Test Setup





## 5. Conducted EMISSION Test

### **Result:** **Pass**

The line-conducted facility is located inside a 2.3M x 3.5M x 5.5M shielded closure.

The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 605-05. A 1m x 1.5m wooden table 80cm high is placed 80cm away from the conducting ground plane and 40cm away from the sidewall of the shielded room. Electro-Metroics Model EM-7823 (9kHz-30MHz) 50ohm/50 uH Line-Impedance Stabilization Networks (LISN) are bonded to the shielded room.

The EUT is powered from the Electro-Metroics LISN and the support equipment is powered from the Kyoritsu LISN. Power to the LISN are filtered by a high-current high-insertion loss shield enclosures power line filters (100dB 14kHz-1GHz).

The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure.

All electrical cables are shielded by copper pipe with inner diameter of 1".

If the EUT is a DC-Powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the Rohde & Schwarz LISN.

All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter length.

Sufficient time for the EUT, Support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.

The frequency producing the maximum level was reexamined using EMI field Intensity meter (ESIB40 ). The detector function was set to CISPR quasi-peak mode.

The bandwidth of the receiver was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; if applicable; whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in photograph of conducted test.

Each EME reported was calibrated using self-calibrating mode.



Figure 2: Spectral Diagram, LINE-PE

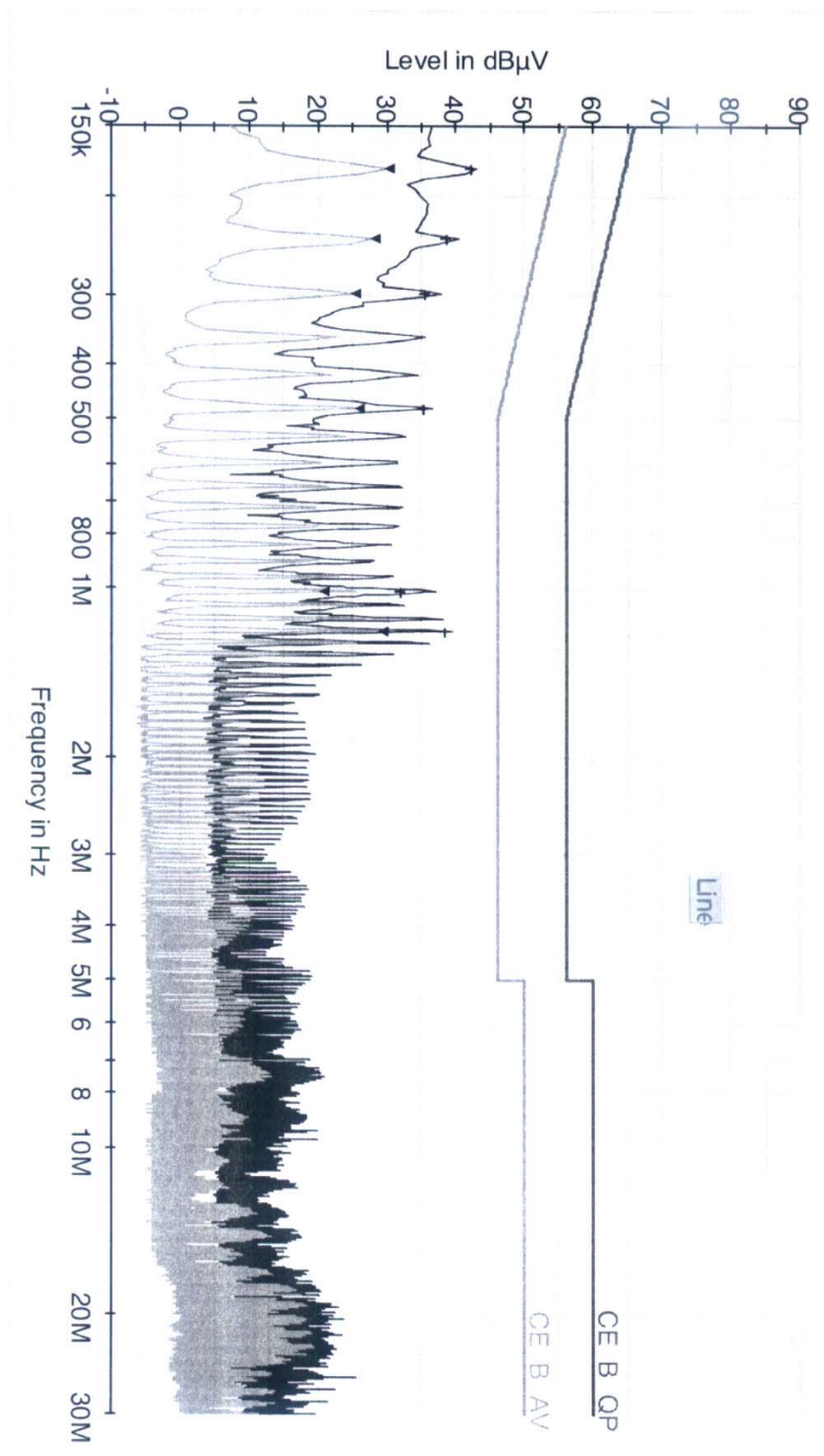




Figure 3: Spectral Diagram, NEUTRAL-PE

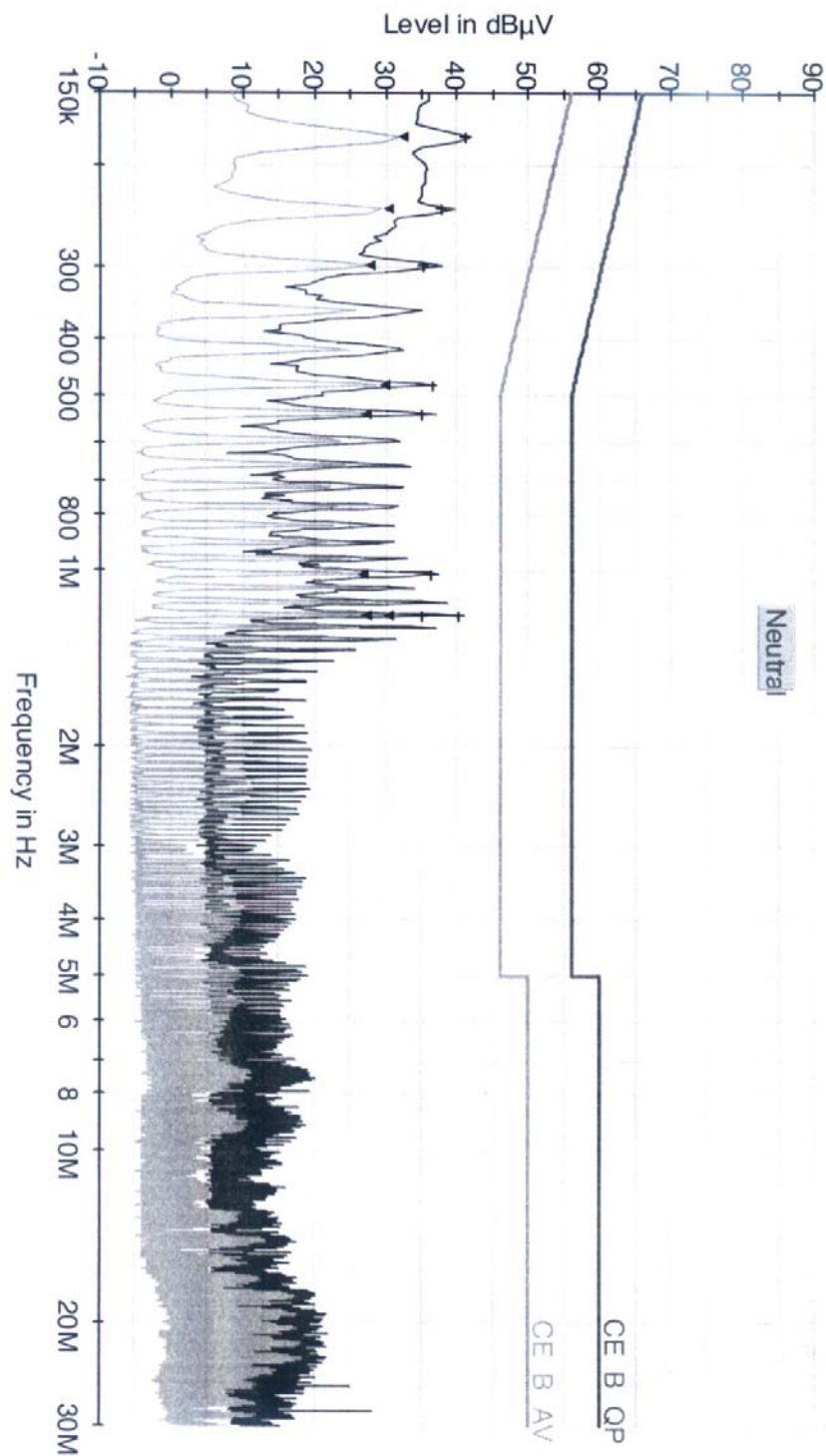




Table 3: Test Data, Conducted Emissions

| Frequency<br>(MHz) | (1) Reading<br>(dBμV) | Line | (2)C/F<br>(dB) | (3)Actual<br>(dBμV) | (4) Limit<br>(dBμV) | (5) Margin<br>(dB) |
|--------------------|-----------------------|------|----------------|---------------------|---------------------|--------------------|
| 0.18               | 41.98                 | L1   | 0.22           | 42.20               | 64.49               | 22.29              |
| 0.24               | 38.38                 | L1   | 0.22           | 38.60               | 62.10               | 23.50              |
| 0.30               | 35.38                 | L1   | 0.22           | 35.60               | 60.24               | 24.64              |
| 0.48               | 36.29                 | L2   | 0.31           | 36.60               | 56.34               | 19.74              |
| 1.01               | 39.76                 | L2   | 0.24           | 40.00               | 56.00               | 16.00              |
| 1.19               | 35.96                 | L2   | 0.24           | 36.20               | 56.00               | 19.80              |

**NOTES:**

1. All modes of operation were investigated  
And the worst-case emissions are reported.
2. All other emissions are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR Quasi-peak mode.
5. L1 = LINE-PE, L2 = NEUTRAL-PE
6. C/F = Correction Factor(LISN factor + Cable loss)
7. The limit for Class B digital device is 66dBuV to 56dBuV from 150KHz to 500KHz, 56dBuV from 500KHz to 5MHz, 60dBuV Above 5MHz.

**♣ Margin Calculation**

$$(5) \text{ Margin} = (4) \text{ Limit} - (3) \text{ Actual}$$

$$[(3) \text{ Actual} = (1) \text{ Reading} + (2) \text{ C/F}]$$



## 6. Radiated EMISSION Test

### Summary of Test Results

Table 4: Test Data, Radiated Emissions

| 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. -.

## 6.1 ANTENNA REQUIREMENT

### 6.1.1 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 of 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, 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.

### 6.1.2 Results: PASS

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



## 6.2 Test and Measurements

### 6.2.1 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( $\mu V/m$ ) | Calculation of Field strength(dB $\mu V/m$ ) |
|----------------|-----------------------------------|--------------------------------------------|----------------------------------------------|
| 0.009 – 0.490  | 2400/F(kHz)<br>( $\mu V/m@300m$ ) | 266.7 - 4.9<br>( $\mu V/m@300m$ )          | 48.5 – 13.8<br>(dB $\mu V/m@300m$ )          |
| 0.490 – 1.705  | 24000/F(kHz)<br>( $\mu V/m@30m$ ) | 49.0 – 14.1<br>( $\mu V/m@30m$ )           | 33.8 – 23.0<br>(dB $\mu V/m@30m$ )           |
| 1.705 – 30.0   | 30( $\mu V/m@30m$ )               | 30( $\mu V/m@30m$ )                        | 29.5(dB $\mu V/m@30m$ )                      |

#### -Emissions above 30MHz

According to the Section 15.33(b)(1) and 15.109, Radiated Emissions were reported in Report No.KT106

### 6.2.2 Measurement Procedure

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8meter 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).



### 6.2.3 Calculation of the field strength limits

#### -Emissions below 30MHz

No special calculation for obtaining the field strength in  $\text{dB}\mu\text{V}/\text{m}$  is necessary, because the EMI receiver and the active loop antenna operate as a system, where the reading gives directly the field strength result( $\text{dB}\mu\text{V}/\text{m}$ ). 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;

$$\text{FS} = \text{RA} + \text{DF}$$

Where

FS = Field strength in  $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude in  $\text{dB}\mu\text{V}/\text{m}$

DF = Distance Extrapolation Factor in dB

Where  $\text{DF} = 20\log(\text{Dtest}/\text{Dspec})$  where Dtest = Test distance and Dspec = Specified Distance

$\text{DF} = 40\log(3\text{m}/300\text{m}) = -80\text{dB}$  (Frequency : 0.009 ~ 0.490 MHz)

$\text{DF} = 40\log(3\text{m}/30\text{m}) = -40\text{dB}$  (Frequency : 0.490 ~ 30 MHz)

#### 6.2.4 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 13.25  $\text{dB}\mu\text{V}/\text{m}$  @ 3m at 0.167 MHz, This is 40.75 dB below the specified limit.

**Table 5 : Measured values of the Field strength (below 30MHz)**

| Frequency(MHz)                                | Reading(dB $\mu$ V) | Limit(dB $\mu$ V/m) | Margin(dB) |
|-----------------------------------------------|---------------------|---------------------|------------|
| <b>Emissions (Average Detector)</b>           |                     |                     |            |
| 167.0667                                      | 13.25               | 54                  | 40.75      |
| 126.4364                                      | 40.94               | 54                  | 13.06      |
|                                               |                     |                     |            |
|                                               |                     |                     |            |
| <b>Emissions (Peak Detector)</b>              |                     |                     |            |
|                                               |                     |                     |            |
|                                               |                     |                     |            |
|                                               | No Emissions Found. |                     |            |
|                                               |                     |                     |            |
| <b>Emissions DATA 15.205 Restricted Bands</b> |                     |                     |            |
|                                               |                     |                     |            |
|                                               |                     |                     |            |
|                                               | No Emissions Found. |                     |            |
|                                               |                     |                     |            |
|                                               |                     |                     |            |

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



## Spurious

