HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
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TEST REPORT

Manufacture;
Fidelix Co., Ltd.

3F, SC First Bank Bidg., 6-8, Sunae-dong, Bundang-gu, Seongnam-si, Kyunggi-do, Korea

Fidelix FRN : 007420102

Date of Issue : October 26, 2006

Test Report No.: HCT-F06-1002

Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.
HCT FRN : 0005-8664-21

EUT TYPE:	**Navigation**
FCC ID:	**QIRFX-N310**
MODEL :	**Fx-N310**

Rule Part(s):	**Part 15 & 2**
Equipment Class:	**Digital Device**
Standard(s):	**FCC Class B: 2003**
EUT Type:	**Navigation**
Model(s):	**Fx-N310**

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003.
I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Report prepared by
: Gyeong Seon KIM
Test engineer of EMC Tech.Part

Approved by
: Sang Jun LEE
Manager of EMC Tech.Part

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MEASUREMENT REPORT

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	**Fidelix Co., Ltd.**
Address:	**3F, SC First Bank Bidg., 6-8, Sunae-dong, Bundang-gu, Seongnam-si, Kyunggi-do, Korea**

- Model : **Fx-N310**
- Equipment Class: **FCC Class B Digital Device**
- EUT Type: **Navigation**
- Power Cord: **Unshielded**
- Rule Part(s): **FCC Part 15 Subpart B**
- Test Procedure(s): **ANSI C63.4 (2003)**
- Dates of Tests: **October 23, 2006**
- Place of Tests: 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO,467-701,KOREA

2.1 INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSIC63.4-2003) was used in determining radiated and conducted emissions emanating from **Fidelix Co., Ltd. Navigation, Model: Fx-N310**

The open area test site and conducted measurement facility used to collect the radiateddata are located at the 254-1, MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4and CISPR Publication 22. Detailed description of test facility was submitted to the Commissionand accepted dated July 06, 2006 (Confirmation Number: 90661)

3.1 PRODUCT INFORMATION

3.2 Equipment Description

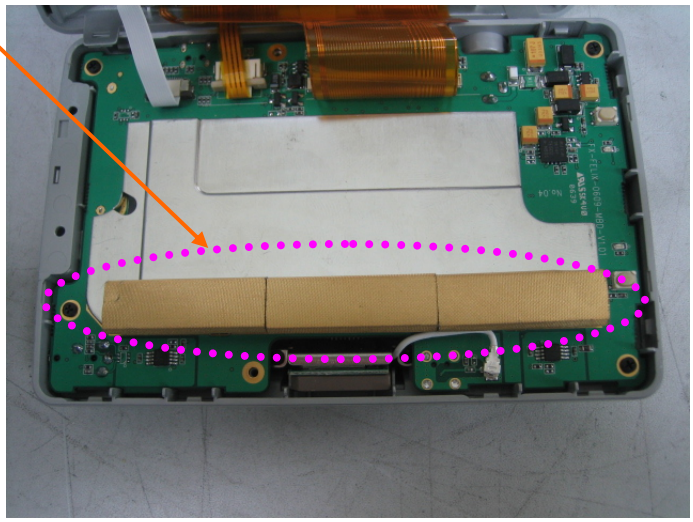
Equipment Under Test (EUT) is the **Fidelix Co., Ltd. Navigation, Model: Fx-N310**

Model:	**Fx-N310**
S/W: OS:	**Window CE 5.0 Core**
H/W: Display:	**3.5 Inch TFT Color, 320 x 240 pixels, 64K Colors**
Memory:	**RAM: 64MB SDRAM**
I/O Port	**USB 1.1 Slave, SD Card Slot, External GPS Antenna Hook Up**
Audio In/Out	**Speaker Output: Max. 1.2W x 2, Earphone Output: 20mW**
Battery:	**Lithium Ion 1,130mAh**
Power Supply	**5V Cigar Jack Vehicle Adaptor Power**
Operating/Storage Temperature:	**0 ℃~ 40 ℃ / -20 ℃~+70 ℃**
External Size(Device)	**117mm x 77mm x 25mm (30mm on GPS)**
Weight (Device):	**180g (Can be changed)**
GPS: GPS:	**16CH / Sirf III**
MAP:	**Original Source : NAVTEQ**
	Application Supplier : Space Machine
	Map Coverage : USA 50 States and DC + Canada 13 Provinces

EMI Suppression Devices:

Modifications were made to the device. Please refer to the next page.

1. 1. Attach a gasket



4.1 Description of Tests(Conducted & Radiated)

4.2 Powerline Conducted Emission (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.
The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were 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. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was measured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the centre with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached. Each EME reported was calibrated using the Rohde & Schwarz SMX signal generator and are listed on Table 1. RFI Conducted FCC Class B

RFI CONDUCTED	FCC CLASS B Limits dB(uV/m)	
Freq. Range	CISPR 22 Quasi-Peak	CISPR 22 Average
150kHz - 0.5MHz	66-56*	56-46*
0.5MHz - 5MHz	56	46
5MHz - 30MHz	60	50
*Limits decreases linearly with the logarithm of frequency		

Table 1. FCC CLASS B Conducted Emission Limits

4.3 Description of Tests(Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 3 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The spectrum was scanned from 30 to 1000 MHz using Tri-log antenna, and above 1 GHz using linearly polarized horn antennas. Final measurements were made outdoors at 10-meter test range using Dipole antennas and EMI receiver. For frequencies above 1 GHz, horn antennas were used. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The EMI receiver detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz. The EUT, support equipment, and interconnecting cables were arranged to the configuration that produces the maximum EME emission found during preliminary scan. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Horizontal and vertical antenna polarizations were checked. Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/ or support equipment, and powering the monitor the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

ITE Radiated Limits			
Frequency (MHz)	**FCC Limit @ 3m. Quasi-Peak dB[μV/m]**	**FCC Limit @ 10m.* Quasi – Peak dB [μV/m]**	**CISPR Limit @ 10m. Quasi-Peak dB [μV/m]**
30-88	**40.0**	**29.5**	**30.0**
88-216	**43.5**	**33.0**	**30.0**
216-230	**46.0**	**35.6**	**30.0**
230-960	**46.0**	**35.6**	**37.0**
960-1000	**54.0**	**43.5**	**37.0**
> 1000	**54.0**	**43.5**	
*** Limit extrapolated 20 dB/decade**			

Table 2. Radiated Class B limits @ 3-meters

5.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
Navigation	Fidelix Co., Ltd.	Fx-N310	DoC	PC
Notebook PC	TOSHIBA	PAS50K-04W007	DoC	EUT
Notebook PC Adaptor	DELTA ELECTRONICS(JIANG SU),LTD.	ADP-60RH A	DoC	PC

5.2 Cable Description

		Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	
Navigation	DC-5V	-	N/A	1.8
	USB	N/A	Y	1.0
	GPS	N/A	Y	2.5

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

5.3 Noise Suppression Parts on Cable. (I/O CABLE)

		Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
Navigation	USB	Y	BOTH END	Y	BOTH END
	GPS	N	N/A	Y	EUT END

6.1 CONDUCTED TEST DATA

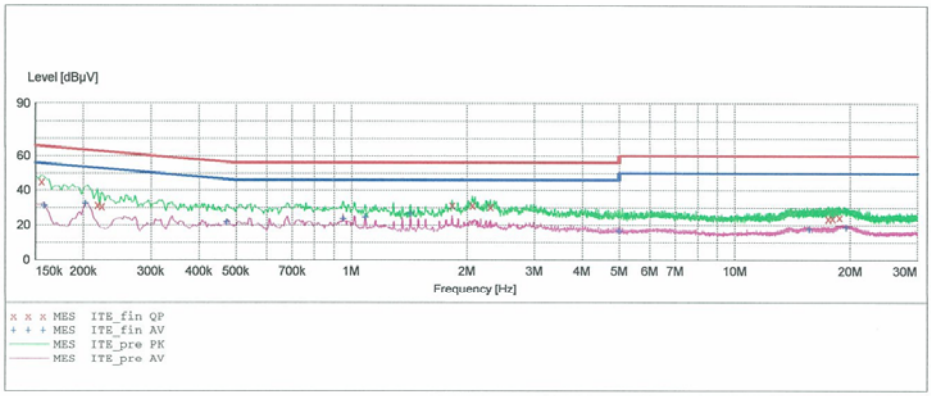
HCT

EMC TEST LAB.

```
EUT:                    FX-N310
Manufacturer:           Fidelix Co., Ltd.
Operating Condition:    NORMAL
Test Site:              SHIELD ROOM
Operator:               GS-KIM
Test Specification:     CISPR 22 CLASS B
Comment:                H
```

SCAN TABLE: "CISPR 22 Voltage"

```
Short Description:                  CISPR 22 Voltage
Start       Stop        Step        Detector    Meas.     IF       Transducer
Frequency   Frequency   Width                   Time      Bandw.
150.1 kHz   500.0 kHz   2.5 kHz     MaxPeak     10.0 ms   9 kHz    None
                                    Average
500.0 kHz   5.0 MHz     5.0 kHz     MaxPeak     10.0 ms   9 kHz    None
                                    Average
5.0 MHz     30.0 MHz    5.0 kHz     MaxPeak     10.0 ms   9 kHz    None
                                    Average
```



MEASUREMENT RESULT: "ITE_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.155100	45.00	10.1	66	20.7	---	---
0.217600	31.50	10.1	63	31.4	---	---
0.222600	30.60	10.1	63	32.1	---	---
1.830000	31.20	10.3	56	24.8	---	---
2.065000	31.10	10.3	56	24.9	---	---
2.305000	30.50	10.3	56	25.5	---	---
17.560000	23.80	10.5	60	36.2	---	---
17.990000	23.90	10.5	60	36.1	---	---
18.740000	24.40	10.5	60	35.6	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.157600	31.20	10.1	56	24.4	---	---
0.202600	32.40	10.1	54	21.1	---	---
0.472600	21.90	10.1	47	24.6	---	---
0.950000	23.60	10.1	46	22.4	---	---
1.085000	24.80	10.1	46	21.2	---	---
1.425000	26.70	10.2	46	19.3	---	---
5.000000	16.50	10.3	46	29.5	---	---
15.650000	17.50	10.5	50	32.5	---	---
19.520000	18.70	10.5	50	31.3	---	---

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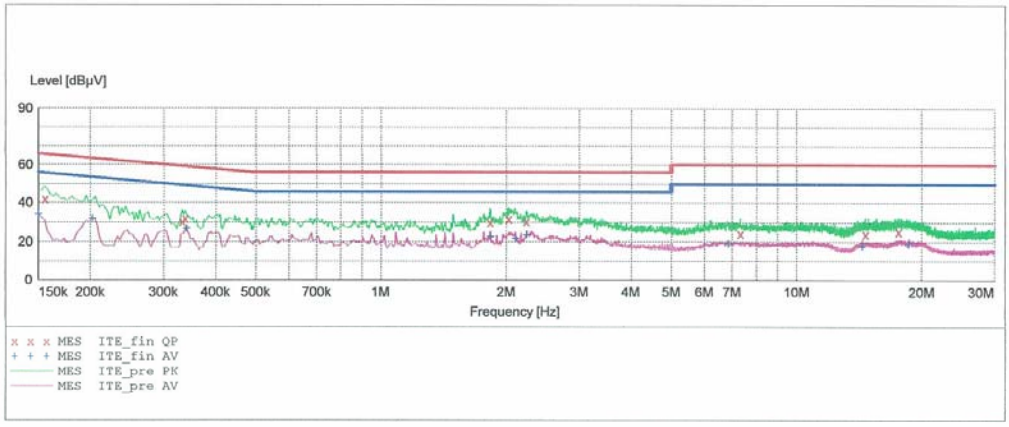
EMC TEST LAB.

```
EUT:                  FX-N310
Manufacturer:         Fidelix Co., Ltd.
Operating Condition:  NORMAL
Test Site:            SHIELD ROOM
Operator:             GS-KIM
Test Specification:   CISPR 22 CLASS B
Comment:              N
```

SCAN TABLE: "CISPR 22 Voltage"

Short Description: CISPR 22 Voltage

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "ITE_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.155100	41.90	10.1	66	23.9	---	---
0.332600	30.40	10.1	59	29.0	---	---
0.337600	31.90	10.1	59	27.4	---	---
1.830000	30.00	10.3	56	26.0	---	---
2.030000	31.70	10.3	56	24.3	---	---
2.235000	30.50	10.3	56	25.5	---	---
7.315000	24.30	10.3	60	35.7	---	---
14.675000	23.90	10.5	60	36.1	---	---
17.595000	25.20	10.5	60	34.8	---	---

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MEASUREMENT RESULT: "ITE_fin AV"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150100	34.50	10.1	56	21.5	---	---
0.202600	32.20	10.1	54	21.3	---	---
0.340100	26.90	10.1	49	22.3	---	---
1.835000	22.90	10.3	46	23.1	---	---
2.105000	21.80	10.3	46	24.2	---	---
2.240000	23.80	10.3	46	22.2	---	---
6.850000	19.20	10.3	50	30.8	---	---
14.400000	17.80	10.5	50	32.2	---	---
18.665000	19.00	10.5	50	31.0	---	---

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NOTES:

1. **All modes of operation were investigated, and the worst-case emissions are reported.**
2. **The conducted limits are listed on Table 1 (Page7).**
3. **Line H = Hot Line N = Neutral**

** Measurements using CISPR quasi-peak mode.

7.1 RADIATED TEST DATA

Frequency MHz	Reading dBuV	Ant. Factor dB	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
72.0	9.6	9.3	1.8	V	20.7	40.0	19.3
120.0	8.7	11.3	2.4	V	22.4	43.5	21.1
132.1	8.6	12.2	2.6	V	23.4	43.5	20.1
205.2	7.8	9.6	3.2	V	20.6	43.5	22.9
304.2	13.2	13.2	4.0	H	30.4	46.0	15.6
522.3	7.7	17.8	5.2	V	30.7	46.0	15.3
588.6	7.1	19.5	5.5	V	32.1	46.0	13.9

Radiated Measurements at 3.-meters.

NOTES:

1. **All modes of operation were investigated, and the worst-case emissions are reported.**
2. **The radiated limits are listed on Table 2 (Page 8).**

*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

8.1 Sample Calculations

$$dB\ \mu V = 20 \log_{10} (\mu V)$$

$$dB\ \mu V = \mathbf{dBm + 107}$$

8.2 Example 1:

@ 1.425 MHz

Class B limit	=	46.0 dB μV
Reading	=	26.70 dB μV (calibrated level)
Margin	=	26.70– 46.0=- 19.3dB μV
	=	**19.3 dB below limit**

8.3 Example 1:

@ 588.6 MHz

Class B limit	=	46dB μV/m
Reading	=	7.1 dB μV/m (calibrated level)
Antenna Factor + Cable Loss	=	25.0 dB
Total	=	32.1 B μV/m
Margin	=	32.1- 46.0=-13.9 dB μV/m
	=	**13.9 dB below limit**

9.1 Test Equipment

Type	Manufacture	Model Number	CAL Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI40	2006.11.16
EMI Test Receiver	Rohde & Schwarz	ESCI	2007.09.13
LISN	Rohde & Schwarz	ESH2-Z5	2007.04.26
Attenuator	Rohde & Schwarz	ESH3-Z6	2007.04.11
TRILOG Antenna	Schwarzbeck	9160	2007.04.17
Antenna Position Tower	HD	MA240	N/A
Turn Table	EMCO	1050	N/A
Power Analyzer	Voltech	PM 3300	2007.03.22
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2007.01.05
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A
PULSE LIMITER	Rohde & Schwarz	ESH3-Z2	2006.11.16

10.1 Test Software Used

Connecting peripheral devices test E.U.T on navigation mode, MP3 player mode and PC mode.

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

11.1 Conclusion

The data collected shows that the **Fidelix Co., Ltd. Navigation, Model: Fx-N310** complies with §15.107 and §15.109 of the FCC Rules.