00HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

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CERTIFICATION

Manufacture;
DVS KOREA CO., LTD.

7TH FL. KPS BLDG.
196 KUMGOK-DONG, BOONDONG-KU
SUNGNAM CITY, KYUNGKI-DO, KOREA

Date of Issue: May 12, 2006

Test Report No.: HCT-F06-0501

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

EUT TYPE : **Navigation System**

FCC ID : **PGJVXA-2000**

Rule Part(s):	**Part 15 & 2**
Equipment Class:	**Digital Device**
Standard(s):	**Part 15 Subpart B Class B**

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	**Approved by**
: Gyeong Seon KIM	**: Sang Jun LEE**
Test engineer of EMC Tech.Part	**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:	**DVS KOREA CO., LTD**
Address:	**7TH FL. KPS BLDG. 196 KUMGOK-DONG, BOONDONG-KU SUNGNAM CITY, KYUNGKI-DO, KOREA**

- **Equipment Class**: Digital Device
- **EUT Type**: Navigation System
- **Model(s)** VXA-2000
- **CPU** SAMSUNG S3C2440A
- **RAM** 64M Bytes
- **Power** 12 V, 1 A
- **Weight** 493 g
- **Operation temperature** -35 ℃~ 75 ℃
- **External Dimensions** 182 mm(W) x 117mm(D) x 34.2 mm(H)
- **Rule Part(s)** FCC Part 15 Subpart B
- **Test Procedure(s)** ANSI C63.4 (2003)
- **Dates of Tests** May 03, 2006 ~ May 04, 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 **DVS KOREA CO., LTD. Navigation System Model : VXA-2000**

The open area test site and conducted measurement facility used to collect the radiated data 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 Commission and accepted dated July 23,2003 (Confirmation Number: EA90661)

3.1 PRODUCT INFORMATION

3.2 Equipment Description

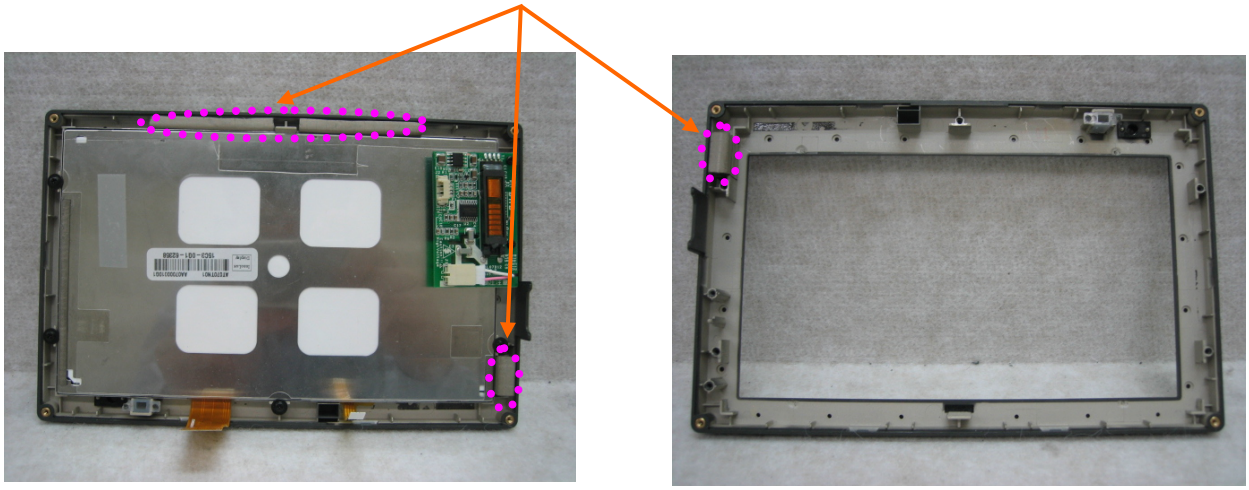
Equipment Under Test (EUT) is **DVS KOREA.CO., LTD. Navigation System (Model : VXA-2000)**

Item	Details	Remark
OS	MS WINDOWS CE.NET 4.2	
CPU	SAMSUNG S3C2440A	
RAM	64M Bytes	
FLASH	512M Bytes	
DISPLAY	7"TFT LCD (Touch screen support)	
AUDIO	Internal speaker (1 watt) Line-out output Connect to the car audio using FM Transmitter (Option)	
GPS module	SiRF star III GPS engine, external type	
GPS sensitivity	First start sensitivity: -134dBm Restart sensitivity: -146dBm Sensitivity in motion: -153dBm	
Input power	12V, 1A	
Temperature	In storage: -35 ~ 75° C In running: -10 ~ 60° C	
Size	182㎜ × 117㎜ × 34.2㎜	
Weight	493g	

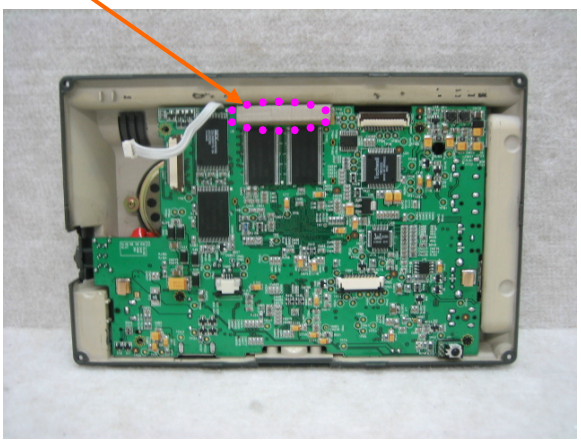
EMI Suppression Devices:

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

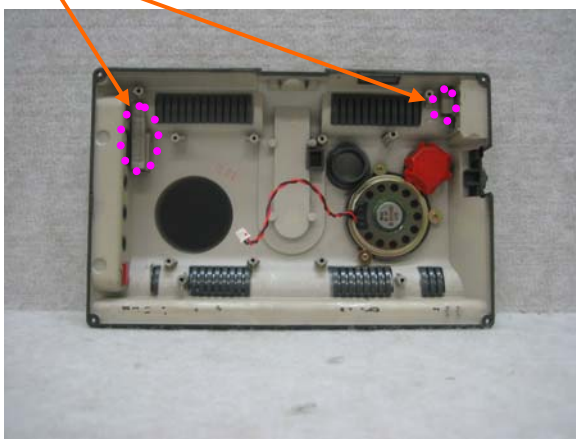
1. Attach a gasket on the Rear panel and inside front cover.



2. Attach a gasket on the Board



3. Attach a gasket on the Rear cover



4.1 Description of Tests(Conducted)

4.2 Powerline Conducted RFI (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 remeasured 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 center with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached.

RFI CONDUCTED	CISPR 22 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. RFI Conducted Limits

4.3 Description of Tests(Radiated)

Radiated Emissions

Preliminary measurements were made indoors at 1 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 300 MHz using biconical antenna, 300 to 1000 MHz using log- periodic 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**	**No Specified Limit**
*** Limit extrapolated 20 dB/decade**			

Table 2. Radiated Class B limits @ 10-meters

5.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
Navigation System	DVS KOREA	VXA-2000	PGJVXA-2000	EUT
Printer	H.P	C4569A	-	-
Notebook PC	TOSHIBA	PAS50K-04W007	-	-
Notebook PC Adaptor	DELTA ELECTRONICS (JIANG SU), LTD.	ADP-60RH A	-	-

5.2 Cable Description

		Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
EUT	Audio Out	N/A	Y	1.8(D)
	Audio Video In	N/A	Y	1.8(D)
	Comm	N/A	Y	1.8(D)
	GPS	N/A	Y	0.5(D)
	DC In	Y	N	1.8(P,D)
	PC	N/A	Y	1.0(D)
PC	DC In	Y	N	1.8(P,D)
	Parallel	N	Y	1.8(P,D)
	USB	N	Y	1.8(P,D)
Printer	AC In	N	N/A	1.8(P)

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
EUT	Audio Out	N	N/A	Y	BOTH
	AudioVideo in	N	N/A	Y	BOTH
	Comm	N	N/A	Y	BOTH
	PC	Y	EUT END	Y	BOTH
	GPS	N	N/A	Y	EUT END
PC	USB	Y	Mouse END	Y	PC END
	Parallel	N	N/A	Y	BOTH END

6.1 LINE-CONDUCTED TEST DATA

HCT

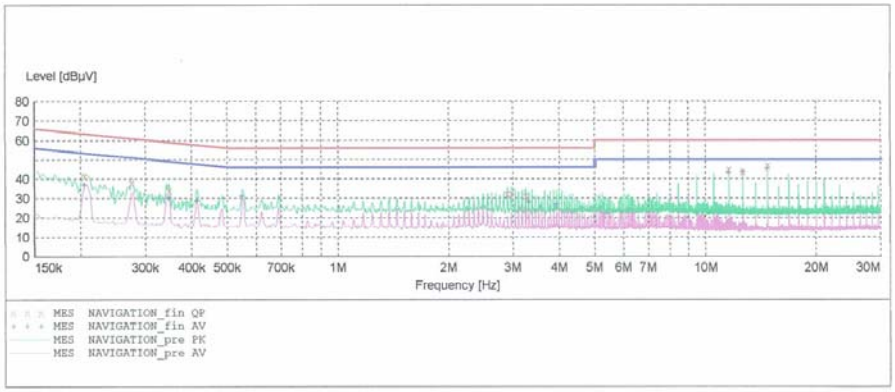
EMC TEST LAB

EUT:	VXA-2000
Manufacturer:	DVS KOREA 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 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: "NAVIGATION_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.205100	41.70	10.1	63	21.7	---	---
0.275100	38.30	10.1	61	22.6	---	---
0.347600	34.40	10.1	59	24.6	---	---
2.895000	32.50	10.2	56	23.5	---	---
2.965000	32.60	10.2	56	23.4	---	---
3.240000	31.30	10.2	56	24.7	---	---
11.590000	44.70	10.4	60	15.3	---	---
12.640000	43.90	10.4	60	16.1	---	---
14.750000	46.80	10.5	60	13.2	---	---

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MEASUREMENT RESULT: "NAVIGATION_fin AV"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.205100	37.10	10.1	53	16.3	---	---
0.347600	30.30	10.1	49	18.7	---	---
0.415100	28.90	10.1	48	18.7	---	---
0.550000	31.20	10.1	46	14.8	---	---
3.310000	28.20	10.2	46	17.8	---	---
3.930000	26.90	10.3	46	19.1	---	---
11.590000	43.60	10.4	50	6.4	---	---
12.640000	43.70	10.4	50	6.3	---	---
14.750000	45.80	10.5	50	4.2	---	---

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HCT

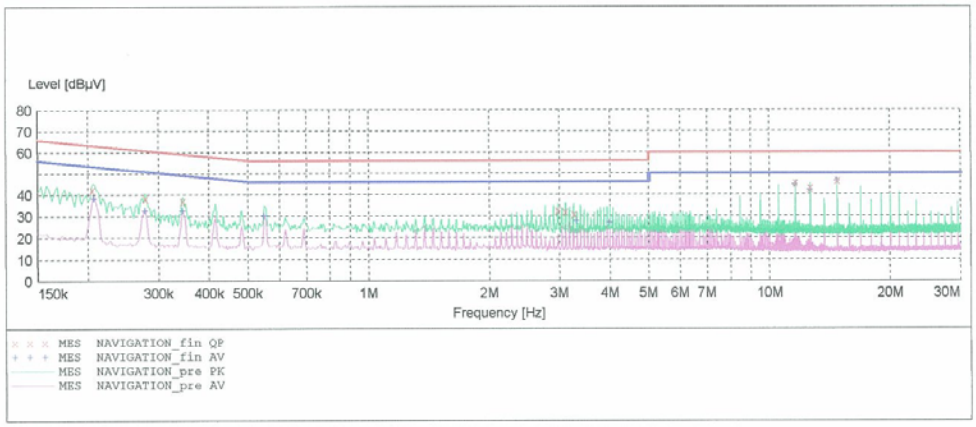
EMC TEST LAB

EUT: VXA-2000
Manufacturer: DVS KOREA 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: "NAVIGATION_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.205100	42.50	10.1	63	20.9	---	---
0.277600	38.60	10.1	61	22.3	---	---
0.345100	37.40	10.1	59	21.7	---	---
2.965000	32.60	10.2	56	23.4	---	---
3.105000	32.10	10.2	56	23.9	---	---
3.245000	30.90	10.2	56	25.1	---	---
11.605000	45.40	10.4	60	14.6	---	---
12.660000	43.10	10.4	60	16.9	---	---
14.765000	46.60	10.5	60	13.4	---	---

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MEASUREMENT RESULT: "NAVIGATION_fin AV"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.207600	38.50	10.1	53	14.8	---	---
0.277600	32.60	10.1	51	18.3	---	---
0.345100	32.60	10.1	49	16.5	---	---
0.550000	30.30	10.1	46	15.7	---	---
3.310000	27.70	10.2	46	18.3	---	---
4.000000	27.10	10.3	46	18.9	---	---
11.605000	44.60	10.4	50	5.4	---	---
12.660000	42.10	10.4	50	7.9	---	---
14.765000	46.30	10.5	50	3.7	---	---

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NOTES:

1. **All modes of operation were investigated and the worst-case emissions are reported.**
2. **The CISPR RFI conducted limits are listed on Table 1 (Page 7).**
3. **Line H = Phase Line N = Neutral Line**

** 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
115.7	9.1	10.8	2.4	V	22.3	30.0	7.7
197.6	10.7	9.7	3.2	V	23.6	30.0	6.4
296.0	15.7	13.0	4.0	V	32.7	37.0	4.3
374.0	11.5	14.7	4.4	H	30.6	37.0	6.4
526.0	8.1	17.9	5.2	V	31.2	37.0	5.8
740.0	2.4	22.0	6.2	H	30.6	37.0	6.4

Radiated Measurements at 10-meters.

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported(Page 16).
2. The radiated limits are listed on Table 2 (Page 7).

*** 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

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

8.2 Example 1:

@14.765 MHz

Class B limit	=	50.0 dB μV
Reading	=	46.3 dB μV (calibrated level)
Margin	=	46.3 – 50.0 = - 3.7 dB μV
	=	**3.7 dB below limit**

8.3 Example 2:

@296.0 MHz

Class B limit	=	37 dB $\mu V/m$
Reading	=	15.7 dB $\mu V/m$ (calibrated level)
Antenna Factor + Cable Loss	=	17.0 dB
Total	=	32.7 dB $\mu V/m$
Margin	=	32.7 – 37.0 = - 4.3 dB $\mu V/m$
	=	**4.3 dB below limit**

9.1 Test Equipment

Type	Manufacture	Model Number	CAL Due Date
EMI Test Receiver	Rohde & Schwarz	ESVS30	2006.07.01
EMI Test Receiver	Rohde & Schwarz	ESCI	2006.09.13
LISN	Rohde & Schwarz	ESH2-Z5	2007.04.26
LISN	EMCO	703125	2007.04.26
TRILOG Antenna	Schwarzbeck	9160	2006.05.27
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	2006.11.25
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

The EUT was acted standby mode during radiated and conducted testing.

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.

The device under test was operated during the measurement under following conditions:

- 1000 Hz Audio signal
- DVD Play mode
- MP-3 mode
- Audio mode
- Game mode

11.1 Conclusion

The data collected shows that **DVS KOREA.CO., LTD. Navigation System.(Model : VXA-2000)** complies with §15.107 and §15.109 of the FCC Rules.