

# EMI TEST REPORT

## FCC PART 15 CLASS B

*for*

**NAVIUS Co., Ltd.**  
**6F Seoyang Bldg. #1460-1, Seochodong,**  
**Seochogu, Seoul 137-070, KOREA**

*on the*

**Cellvic GPS Receiver**  
**CVGPS-1820**

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**Prepared By:**

**Test Date:** November 2, 2001

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[Appendix A](#) - EUT Schematics/Block Diagram

[Appendix B](#) - User's Manual

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## 1. General Information

### 1.1 Introduction

The EMI Measurements and Test Report of a Class B Information Technology Equipment is prepared on behalf of named applicant in accordance with the ANSI C63.4-1992. The detailed description of the measurement facility was found to be in compliance with the requirement of Section 2.948 of the FCC Rules.

All radiated emission and conducted emission measurements are performed manually at Korea Standard Quality Laboratories. The radiated emission measurements required by the FCC Rules were performed on 3 meter or 10 meter, Open Area Test Site (OATS), test range maintained by Korea Standard Quality Laboratories (KSQ), 102 Jangdeok-Dong, Hwaseong-City, Kyeonggi-Do, KOREA. Complete ANSI 63.4-1992 description and site attenuation measurement data records are maintained at the test facility and have been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure also located at the same facility.

### 1.2 Product Description for Equipment Under Test (EUT)

NAVIUS Co., Ltd.'s Cellvic GPS (Global Positioning System) Receiver or the "EUT" as referred to in this report is powerful & efficient mobile computing platform for real PDA.

Main Features of EUT are:

- Motorola 68EZ328 16MHz
- 160 x 160 dots 4/16 gray LCD, 0.26dot pitch
- FLASH 2MB, RAM 8MB
- Multimedia Card 16/32MB Option
- CellVic OS (English, Chinese and Korean)
- IrDA or RS-232C Interface
- Li-ion 3.7V 1,550mAh Rechargeable Battery or AAA x 3
- 12V/24V DC Auto Adapter, 110/220V AC Adapter
- 12 Channel GPS Receiver & Internal Passive Antenna
- External Active Antenna
- Accuracy 15M (95%) without S/A

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## 1.3 Support Equipment

Description	Model Number	Serial Number	Manufacturer	Remarks
Host Computer	JT4102	JT004000053	Jooyontech Computer	ATX
VGA Monitor	DP15LS	H1EK403730	Samsung Electronics	15"
Keyboard	SEM-DT35	95001529	Samsung Electronics	PS/2
Mouse	OK-520	none	A4-Tech	Serial
Printer	2225C	3037S84200	Hwelett Packard	Inkjet
PC Camera	PCC2200	PK2-0020	Pro-chips	USB
Joystick	DHA-2000	none	Dahwoon Electronics	Game
Speaker	GL-2000	none	Comsources	-
Microphone	JPM601	none	Hi-sonic	-
AC Adapter	HW0.1	none	Salcomp	for EUT
GPS Receiver	CVGPS-1820	none	Navius Co., Ltd.	EUT

## 1.4 External I/O Cabling

Description	Length (m)	Port/From	Port/To	Remarks
Video Cable	1.5	Dsub/Host	Monitor	Shielded
Keyboard Cable	2.0	PS2/Host	Keyboard	Shielded
Mouse Cable	2.0	PS2/Host	Mouse	Shielded
Printer Cable	1.5	Dsub/Host	Printer	Shielded
Serial Cable	1.5	Dsub/Host	EUT	Shielded
USB Cable	2.0	USB/Host	PC Camera	Shielded
Joystick Cable	1.5	Dsub/Host	Joystick	Shielded
Speaker Cable	1.0	Jack/Host	Speaker	Shielded
Microphone Cable	2.0	Jack/Host	Microphone	Shielded
Antenna Cable	5.0	EUT	GPS Antenna	Non-shielded

## 1.5 Special Accessories

As shown in section 1.7, all interface cables used for compliance testing are shielded as normally supplied or by use respective component manufacturers.

## 1.6 EUT Modifications

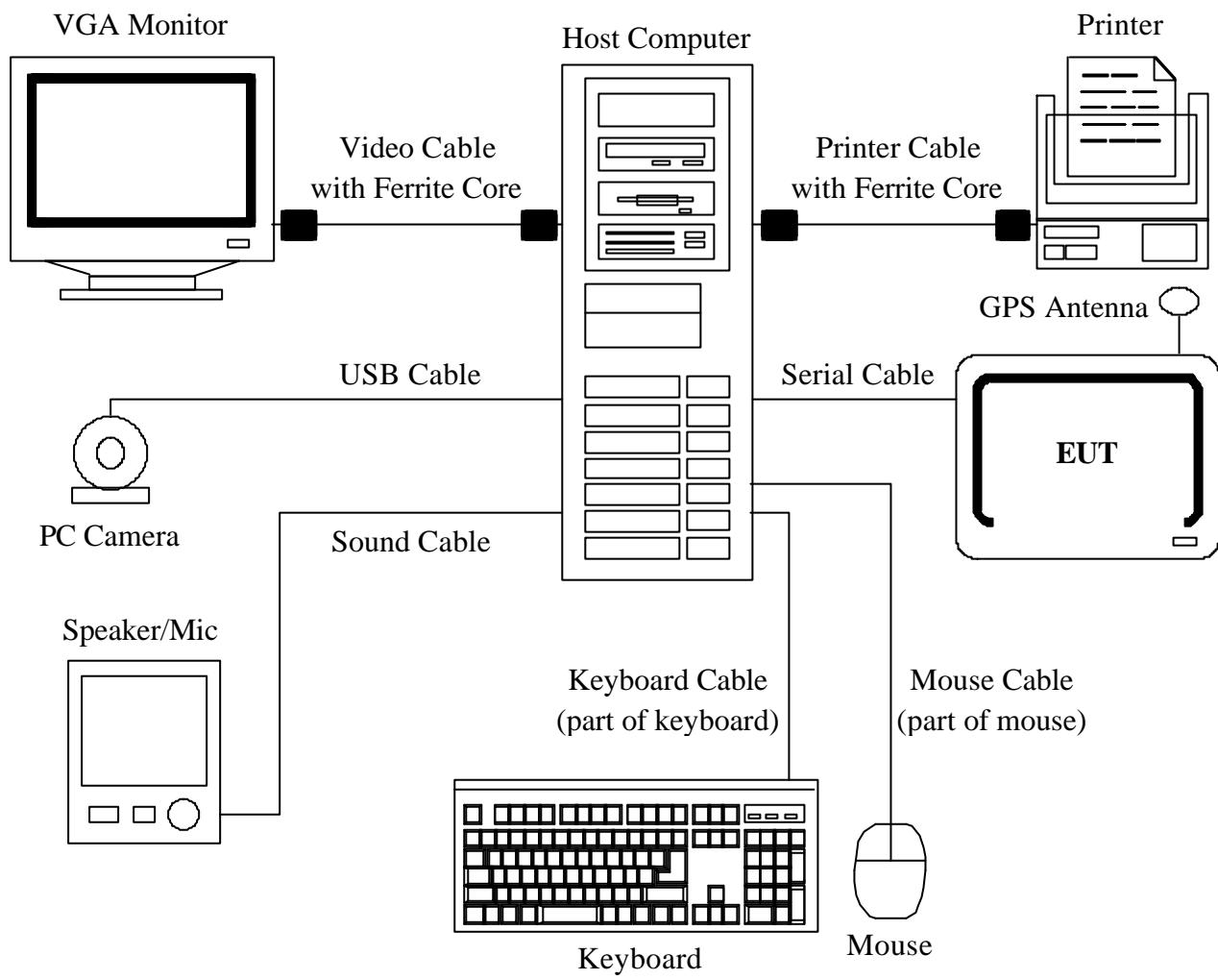
No modifications were made to the EUT in order to achieve and maintain compliance to the standards described in this report.

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## 1.7 Configuration of Test System



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## 2. Test Performed

### 2.1 Conducted Emission Measurements

#### 2.1.1 Test Description

The power line conducted emission measurements were performed in a shielded enclosure, using the setup in accordance with ANSI C63.4-1992 conducted emission measurement procedure.

#### 2.1.2 Test Equipments

Description	Manufacturer	Model Number	Serial Number	Cal. Due
Spectrum Analyzer	Advantest	3261A	21720240	10, 2002
LISN1	Electro Metrics	ANS-25/2	2535	10, 2002
LISN2	Kyoritsu	KNW-407	8-1010-14	10, 2002
Plotter	Hewlett Packard	7550B	3050A14513	n/a

#### 2.1.3 Test Environments

Ambient Temperatures	Relative Humidity
15~35°C	30~60%

#### 2.1.4 Test Limits

Frequency (MHz)	FCC Part 15 Limit			
	Class B		Class A	
	(dBuV)	(uV)	(dBuV)	(uV)
0.45 to 1.705	48.0	250	60.0	1000
1.705 to 30.00	48.0	250	69.5	3000

#### 2.1.5 Test Procedure

Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6dB bandwidth was set to 9kHz. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 450kHz to 30MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP".

The conducted emission test was performed with the EUT exercise program loaded, and the emissions were scanned between 450kHz to 30MHz on the HOT side and NEUTRAL side, herein referred to as H and N, respectively.

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## 2.1.6 Test Results

According to the data in section 2.1.7, the EUT complied with the FCC Part 15 standards, and had the worst margin reading of:

-4.9dB at 4.32MHz in the HOT side.

## 2.1.7 Test Data

Line Conducted Emission				FCC Part 15 Class B		
Frequency (MHz)	Amplitude (dBuV)	Phase Hot/Neutral	Detector QP/AV/PK	Applicable Limit		Margin (dB)
				(dBuV)	(uV)	
0.57	27.5	N	PK	48.0	250	-20.5
0.64	28.1	N	PK	48.0	250	-19.9
0.71	24.8	N	PK	48.0	250	-23.2
0.87	25.4	N	PK	48.0	250	-22.6
0.92	27.8	N	PK	48.0	250	-20.2
1.31	26.9	N	PK	48.0	250	-21.1
1.76	41.7	H	PK	48.0	250	-6.3
2.32	39.7	H	PK	48.0	250	-8.3
4.00	36.8	N	PK	48.0	250	-11.2
4.32	43.1	H	PK	48.0	250	-4.9
7.01	39.9	N	PK	48.0	250	-8.1
7.32	39.2	N	PK	48.0	250	-8.8

PK = Peak; QP = Quasi-peak; AV = Average

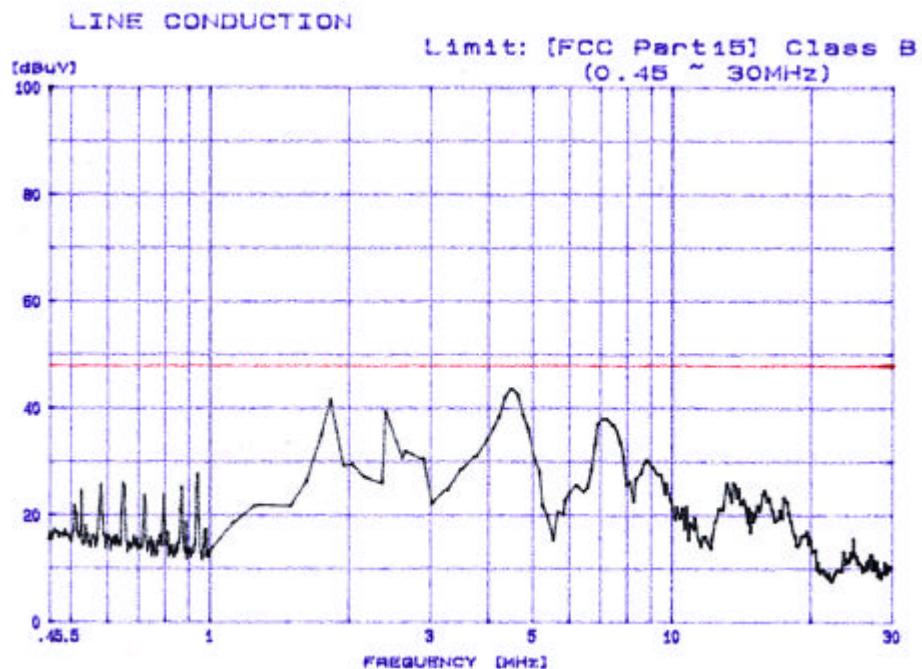
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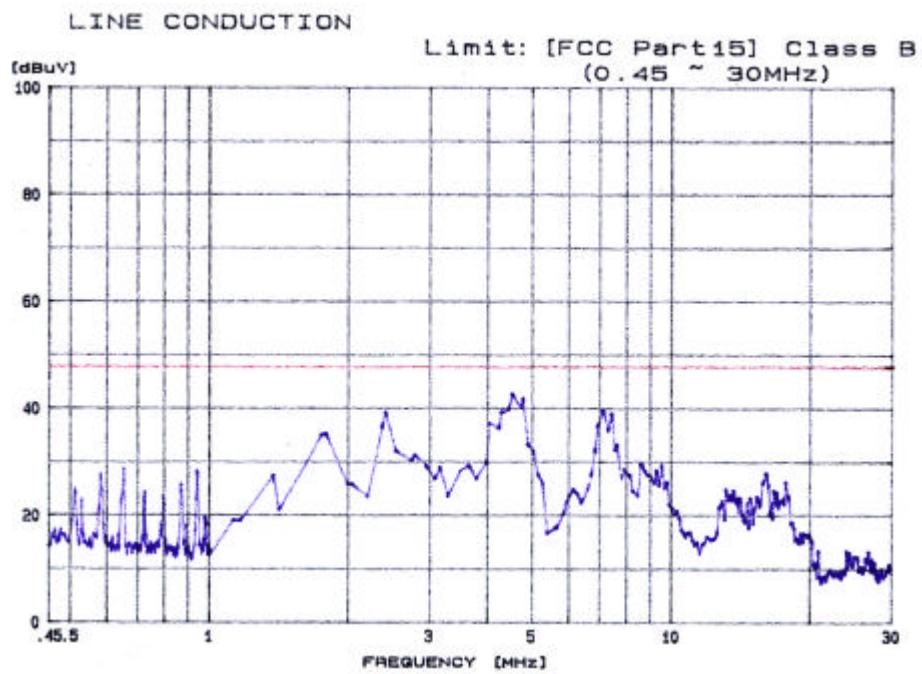
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## 2.1.8 Plots of Test Data

Polarization: HOT



Polarization: NEUTRAL



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## 2.2 Radiated Emission Measurements

### 2.2.1 Test Description

The radiated emission measurements were performed in a Open Area Test Site, using the setup in accordance with ANSI C63.4-1992 radiated emission measurement procedure.

### 2.2.2 Test Equipments

Description	Manufacturer	Model Number	Serial Number	Cal. Due
Spectrum Analyzer	Hewlett Packard	8568B	3217A05629	08, 2002
Spectrum Display	Hewlett Packard	85682A	3144A20886	08, 2002
RF Preselector	Hewlett Packard	85685A	3221A01366	08, 2002
Quasi-Peak Adapter	Hewlett Packard	85650A	3145A01652	08, 2002
Biconical Antenna	Electro Metrics	BIA-30S	164	10, 2002
Log Periodic Antenna	Electro Metrics	LPA-30	387	10, 2002
Turn Table	KSQ	KSQ-T10	KSQ98121	n/a
Antenna Mast	KSQ	KSQ-A10	KSQ98122	n/a

### 2.2.3 Test Environments

Ambient Temperatures	Relative Humidity
15~35°C	30~60%

### 2.2.4 Test Limits

Frequency (MHz)	FCC Part 15 Limit			
	Class B @3m		Class A @10m	
	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)
30 to 88	40.0	100	39.5	90
88 to 216	43.5	150	43.5	150
216 to 960	46.0	200	46.5	210
above 960	54.0	500	49.5	300

## 2.2.5 Test Procedure

Before final measurements of radiated emission were made on the OATS, the EUT was scanned in semi-anechoic chamber in order to determine its emission spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emission in amplitude, direction and frequency. This process was repeated during final radiated emission measurements on the OATS range, at each frequency, in order to ensure that maximum emissions amplitudes were attained.

The radiated emission test was performed with EUT exercise program loaded, and the emissions were scanned between 30MHz to 1000MHz using a HP 8568B spectrum analyzer. The spectrum analyzer's 6dB bandwidth was set to 120kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. Measurements were taken using both HORIZONTAL and VERTICAL antenna polarization, herein referred to as H and V, respectively.

## 2.2.6 Field Strength Calculation

The Field Strength (FS) is calculated by adding the Antenna Factor (AF) and Cable Factor (CF) from the Measured Reading (MR). The basic equation with a sample calculation is as follows:

$$FS(\text{dBuV/m}) = MR(\text{dBuV}) + [AF(\text{dB/m}) + CF(\text{dB})]$$

## 2.2.7 Test Results

According to the data in section 2.2.8, the EUT complied with the FCC Part 15 standards, and had the worst margin reading of:

-5.7dB at 132.38MHz in the VERTICAL antenna polarization.

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## 2.2.8 Test Data

Indicated		Antenna		Table	Correction Factor		Corrected Amplitude	FCC Part15 Class B		
Freq. (MHz)	Ampl. (dBuV/m)	Polar. (H/V)	Height (m)	Angle (deg.)	Ant. (dB)	Cable (dB)	(dBuV/m)	Applicable Limit (dBuV/m)	Margin (uV/m)	(dB)
49.99	20.7	H	3.1	220	8.8	1.3	30.8	40.0	100	-9.2
66.60	23.6	H	2.7	200	5.7	1.7	31.0	40.0	100	-9.0
75.50	19.7	H	2.9	270	6.9	1.9	28.5	40.0	100	-11.5
80.54	21.2	H	2.5	300	8.0	2.1	31.3	40.0	100	-8.7
84.58	21.1	V	1.5	180	8.8	2.1	32.0	40.0	100	-8.0
86.01	17.1	H	2.2	290	8.9	2.1	28.1	40.0	100	-11.9
100.69	18.5	H	2.3	350	11.7	2.4	32.6	43.5	150	-10.9
110.58	22.3	H	2.0	360	12.6	2.4	37.3	43.5	150	-6.2
132.38	21.0	V	1.3	150	14.1	2.7	37.8	43.5	150	-5.7
144.00	20.1	V	1.0	120	14.7	2.8	37.6	43.5	150	-5.9
167.05	19.8	H	2.2	30	14.9	3.0	37.7	43.5	150	-5.8
197.22	18.6	H	2.1	10	15.4	3.3	37.3	43.5	150	-6.2
217.62	20.4	H	1.8	350	15.3	3.4	39.1	46.0	200	-6.9
233.20	18.8	H	1.5	330	16.3	3.4	38.5	46.0	200	-7.5
240.01	20.2	H	1.6	350	16.4	3.4	40.0	46.0	200	-6.0
334.13	20.6	V	1.0	180	14.4	3.6	38.6	46.0	200	-7.4
432.02	16.5	H	1.9	270	15.3	4.0	35.8	46.0	200	-10.2
451.20	15.1	H	1.4	270	16.1	4.2	35.4	46.0	200	-10.6
-	-	-	-	-	-	-	-	54.0	500	-
-	-	-	-	-	-	-	-	54.0	500	-