



## **HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.**

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## **CERTIFICATION**

**Manufacture;**  
**HYUNDAI AUTONET Co., Ltd.**

San 136-1, Ami-ri, Bubal-eub, Ichon-si,  
Kyoungki-do, 467-860 Korea

**HYUNDAI AUTONET FRN :0012844114**

**Date of Issue : MARCH 07, 2005**

**Test Report No.: HCT-F05-0301**

**Test Site: HYUNDAI CALIBRATION & CERTIFICATION  
TECHNOLOGIES CO., LTD.**

**HCT FRN : 0005-8664-21**

**FCC ID :**

**PINPNAV-3530**

**MODEL :**

**PNAV-3530**

<b>Rule Part(s):</b>	<b>Part 15 &amp; 2; ET Docket 95-19</b>
<b>Equipment Class:</b>	<b>FCC Class B Peripheral Device (JBP)</b>
<b>Standard(s):</b>	<b>FCC Class B: 1998 (CISPR 22)</b>
<b>EUT Type:</b>	<b>Portable MP3 Navigation</b>
<b>Model(s):</b>	<b>PNAV-3530</b>
<b>Port/Connector(s)</b>	<b>USB Port, Serial Port, Earphone Port, Power Connector</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 C63.4-2001.

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.

Ki-Soo Kim

**Report prepared by : Ki-Soo Kim**  
**Manager of EMC Tech. Part**

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

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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.

<b>Applicant Name:</b>	HYUNDAI AUTONET Co., Ltd.
<b>Address:</b>	San 136-1,Ami-ri,Bubal-eub, Ichon-si, Kyoungki-do,467-860 Korea

- **FCC ID : PINPNAV-3530**
- Equipment Class: **FCC Class B Peripheral Device (JBP)**
- EUT Type: **Portable MP3 Navigation**
- Model(s): **PNAV-3530**
- Port(s): **USB Port, Serial Port, Earphone Port, Power Connector**
- Rule Part(s): **FCC Part 15 Subpart B**
- Test Procedure(s): **ANSI C63.4 (2001)**
- Dates of Tests: **FEBRURY 28, 2005 ~ MARCH 02, 2005**
- 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 (ANSIC63.4-2001) was used in determining radiated and conducted emissions emanating from **HYUNDAI AUTONET Co., Ltd. Portable MP3 Navigation FCC ID : PINPNAV-3530**

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 C63.4 and 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

The **Portable MP3 Player** made by **HYUNDAI AUTONET Co., Ltd.** in Korea. Refer to the user's manual for more information.

- **FCC ID : PINPNAV-3530**
- Equipment Class: **FCC Class B Peripheral Device (JBP)**
- EUT Type: **Portable MP3 Navigation**
- Model(s): **PNAV-3530**
- Port(s): **USB Port, Serial Port, Earphone Port, Power Connector**
- Rule Part(s): **FCC Part 15 Subpart B**
- Test Procedure(s): **ANSI C63.4 (2001)**

## 4.1 Description of Tests(Conducted & Radiated)

### 4.1.1 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)	
	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

## 4.1.2 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[ $\mu$ V/m]	FCC Limit @ 10m.* Quasi – Peak dB [ $\mu$ V/m]	CISPR Limit @ 10m. Quasi-Peak dB [ $\mu$ V/m]
<b>30-88</b>	<b>40.0</b>	<b>29.5</b>	<b>30.0</b>
<b>88-216</b>	<b>43.5</b>	<b>33.0</b>	<b>30.0</b>
<b>216-230</b>	<b>46.0</b>	<b>35.6</b>	<b>30.0</b>
<b>230-960</b>	<b>46.0</b>	<b>35.6</b>	<b>37.0</b>
<b>960-1000</b>	<b>54.0</b>	<b>43.5</b>	<b>37.0</b>
<b>&gt; 1000</b>	<b>54.0</b>	<b>43.5</b>	<b>43.5</b>
* 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	HYUNDAI AUTONET Co., Ltd.	PNAV-3530	PINPNAV-3530	NOTEBOOK PC
PRINTER	H.P	C6410A	-	NOTEBOOK PC
NOTEBOOK PC	TOSHIBA	PAS50K-04W007	-	EUT END
NOTBOOK ADAPTOR	DELTA ELECTRONICS (JIANG SU), Ltd.	ADP-60RHA	-	NOTEBOOK PC
EUT ADAPTOR	FRD Inc.	SP1010D	-	EUT END
MOUSE	MICROSOFT	Intellimouse optical USB and PS/2 Compatible	-	NOTEBOOK PC

## 5.2 Cable Description

Product Name	PORT	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
EUT	<b>AUDIO OUT</b>	N/A	Y	1.8(D)
	<b>USB</b>	N/A	Y	1.3(D)
	<b>POWER</b>	Y	N	1.5(P)
NOTEBOOK PC	<b>MOUSE</b>	N/A	Y	1.8(D)
	<b>POWER</b>	Y	N	1.8(P)
	<b>PRINTER</b>	N	Y	1.8(P,D)

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

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

Product Name	PORT	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	<b>AUDIO OUT</b>	N	N/A	Y	EUT END
	<b>USB</b>	N	N/A	Y	BOTH END
	<b>POWER</b>	Y	EUT END	Y	EUT END
NOTEBOOK PC	<b>MOUSE</b>	Y	NOTEBOOK PC END	Y	NOTEBOOK PC END
	<b>POWER</b>	N	N/A	Y	BOTH END
	<b>PRINTER</b>	N	N/A	Y	NOTEBOOK PC END

## 6.1 CONDUCTED TEST DATA

Test

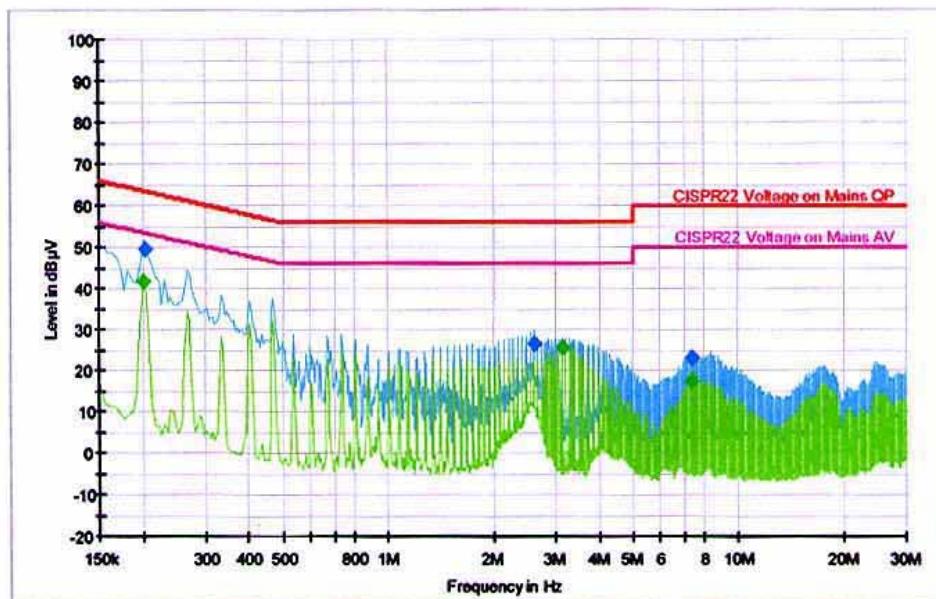
1

### Conducted Emission Report

#### Test Information

EUT Name: PNAN-3530  
Serial Number: -  
Test Description: CISPR22 CLASS B  
Operating Conditions: NORMAL  
Operator Name: KH-KIM  
Comment: N  
Description: -

#### CISPR22 CLASS B Neutral Line



Test

2

**Final Measurement Detector 1**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.204000	49.5	N	10.2	13.9	63.4
2.615000	26.7	N	9.8	29.3	56.0
7.313000	23.0	N	10.1	37.0	60.0

**Final Measurement Detector 2**

Frequency (MHz)	Average (dB $\mu$ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.199500	41.9	N	10.2	11.8	53.6
3.155000	25.5	N	9.9	20.5	46.0
7.380500	17.4	N	10.1	32.6	50.0

Test

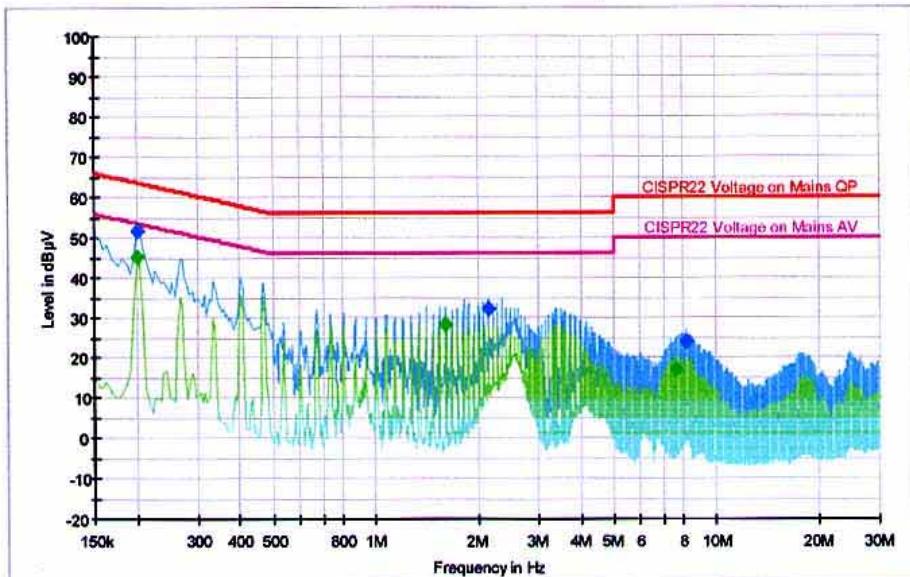
1

## Conducted Emission Report

### Test Information

EUT Name: PNAN-3530  
Serial Number: -  
Test Description: CISPR22 CLASS B  
Operating Conditions: NORMAL  
Operator Name: KH-KIM  
Comment: H  
Description: -

### CISPR22 CLASS B Hot Line



2005-02-28

오후 4:13:34

Test

2

**Final Measurement Detector 1**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.199500	51.9	L1	10.2	11.7	63.6
2.147000	32.4	L1	9.7	23.6	56.0
8.186000	23.9	L1	10.1	36.1	60.0

**Final Measurement Detector 2**

Frequency (MHz)	Average (dB $\mu$ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.199500	45.1	L1	10.2	8.5	53.6
1.611500	28.2	L1	9.7	17.8	46.0
7.650500	17.0	L1	10.1	33.0	50.0

**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 6).

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\*\* Measurements using CISPR quasi-peak mode.

## 7.1 RADIATED TEST DATA

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss Db	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
60.3	10.5	11.2	1.8	V	23.5	30	-6.5
118.3	10.2	11.3	2.4	V	23.9	30	-6.1
166.5	11.2	12.4	2.9	H	26.5	30	-3.5
181.0	11.9	11.1	3.0	V	26.0	30	-4.0
260.5	15.4	11.6	3.7	H	30.7	37	-6.3
390.9	13.2	14.8	4.5	V	32.5	37	-4.5
498.9	9.2	16.9	5.1	H	31.2	37	-5.8
521.2	7.4	17.5	5.2	V	30.1	37	-6.9

Radiated Measurements at 10-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).

\*\* AFCL = Antenna Factor (Roberts dipole) and Cable Loss .

\*\*\* 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

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

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

### 8.2 Example 1:

@ 0.51 MHz

Class B limit	= 56 dB $\mu\text{V}$
Reading	= 46.1 dB $\mu\text{V}$ (calibrated level)

Margin	= 46.1 - 56 = - 9.9 dB $\mu\text{V}$
	= <b>9.9 dB below limit</b>

### 8.3 Example 2:

@ 716.1 MHz

Class B limit	= 37 dB $\mu\text{V}$
Reading	= 3.3 dB $\mu\text{V}$ (calibrated level)
Antenna Factor + Cable Loss	= 28.7 dB $\mu\text{V}$
Total	= 32 dB $\mu\text{V}$

Margin	= 32 - 37 = - 6.2 dB $\mu\text{V}$
	= <b>6.2 dB below limit</b>

## 9.1 Test Equipment

Type	<u>Manufacture</u>	<u>Model Number</u>	<u>Next CAL Date</u>
EMI Test Receiver	Rohde & Schwarz	ESI40	2005.11.16
EMI Test Receiver	Rohde & Schwarz	ESVS30	2005.07.16
EMI Test Receiver	Rohde & Schwarz	ESCI	2005.09.13
LISN	Rohde & Schwarz	ESH2-Z5	2005.07.28
LISN	EMCO	3816/2SH	2005.08.10
LISN	Rohde & Schwarz	ESH3-Z6	2005.03.12
Attenuator	Rohde & Schwarz	ESH3-Z2	2005.11.16
Amplifier	Hewlett-Packard	8447E	2005.04.26
Absorbing Clamp	Rohde & Schwarz	MDS-21	2005.04.24
TRILOG Antenna	Schwarzbeck	VULB9160	2005.04.06
Antenna Position Tower	HD	MA240	N/A
Turn Table	EMCO	1060	N/A
Power Analyzer	Voltech	PM 3300	2005.04.02
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2005.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A

## 10.1 Test Software Used

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disc, was inserted into drive A and is auto starting on power-up. Once loaded, the program sequentially exercises each system component in turn.

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 **HYUNDAI AUTONET Co., Ltd. Portable Navigation**  
**FCC ID : PINPNAV-3530** complies with §15.107 and §15.109 of the FCC Rules.