Certification of Compliance

CFR 47 Part 15 Subpart B / Class B Digital Devices

Test Report File No.	03-IST-176	**Date of Issue**	Nov. 13, 2003
Model	**PN-100**		

Kind of Product	Portable CAR Navigation System
Applicant	Digitalsis Co., Ltd.
Address	Korea Design Center #505, 344-1, Yatap, Bundang, Seongnam, Kyonggi-Do, 463-828, Korea
Manufacturer	Digitalsis Co., Ltd.
Address	Korea Design Center #505, 344-1, Yatap, Bundang, Seongnam, Kyonggi-Do, 463-828, Korea

Test Result **(*)Positive** **( ) Negative**

Reviewed By

J.H. Lee / General Manager of EMC

Approved By

G. Chung / Chief

- Investigations requested : Measurement to the relevant clauses of F.C.C rules and regulations Part 15 Subpart B - Class B Digital Devices
- The test report with appendix consists of 19 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued 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 1992.

TABLE OF CONTENTS

INFORMATIONS OF TEST LABORATORY

EMC LABORATORY of IST Co., Ltd. (Yongin Lab., ***Filed to FCC***)
San 21-8, Goan-Ri, Baekam-Myun, Yongin-City
Kyonggi-Do, 449-860, Korea
TEL : +82 31 333 4093 FAX : +82 31 333 4094

EMC LABORATORY of IST Co., Ltd. (Yangji Lab., ***Filed to FCC***)
80, Jeil-RI, Yangji-Myun, Yongin-City
Kyonggi-Do, 449-825, Korea
TEL : +82 31 323 3012 FAX : +82 31 323 3014

ENVIRONMENTAL CONDITIONS

Temperature	29 ℃
Humidity	48 %
Atmospheric pressure	1001 mbar

POWER SUPPLY SYSTEM USED

Power supply system	120Vac 60Hz

Product Information

CPU	Intel StrongARM 206MHz
Display	3.5 inch 240x320 TFT 64K color LCD
KEYPAD	Four function key / Alpha-numeric key support Exclusive keys for Car-Navigation
GPS	High capability 12 or 18 channel GPS engine
Antenna	High sensitive Helical Active Antenna
Battery	Lithium Polimer Rechargeable 3.7V, 2100mAH
I/O Port	1 USB Port/1 DC-IN / 1 Serial(Option) 1 CF Slot
Control Button	Volume Up/Down, LCD Lighting control, Reset
AC Adapter	7.5V DC / 1.1A, AC 100~240V, 50/60Hz
Cigar Power Jack	For car 12V/24V cpnnecting cable

Find product information in User's manual.

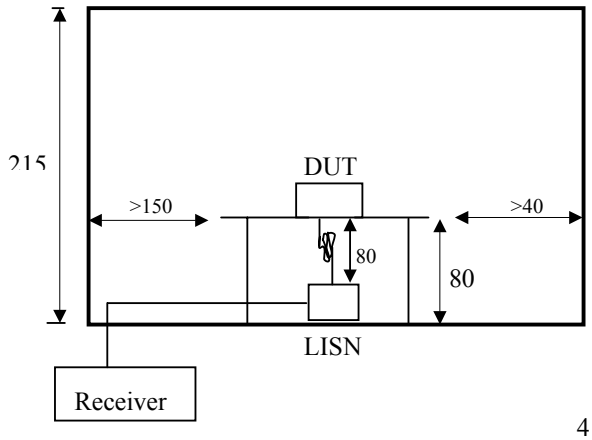
DESCRIPTIONS OF TEST

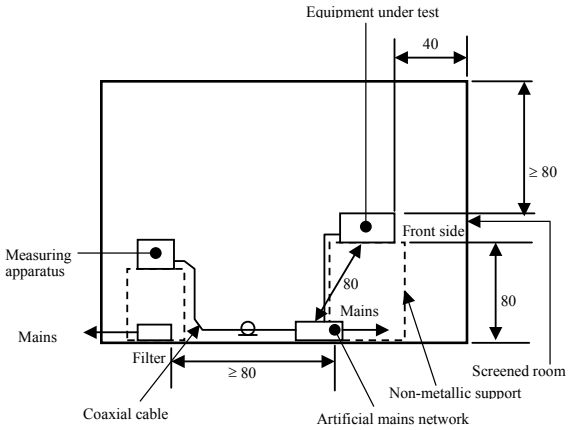
Conducted Emissions:

The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within an bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located in a shielded room. The wooden table 80cm height is placed 40cm away from the vertical wall and 1.5m away from the other wall of the shielded room. The LISNs are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80cm from the LISN and powered from the powered LISN .The peripheral equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cutting power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. 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 appropriate LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was re-measured using Quasi-Peak detector and average detector by manual measurement or final measurement program of R&S, after scanned by automatic Peak mode for frequency range from 0.15 to 30MHz. The bandwidth of the receiver was set to 10kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.





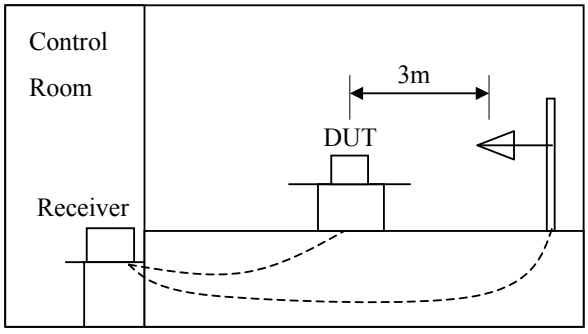
DESCRIPTION OF TEST

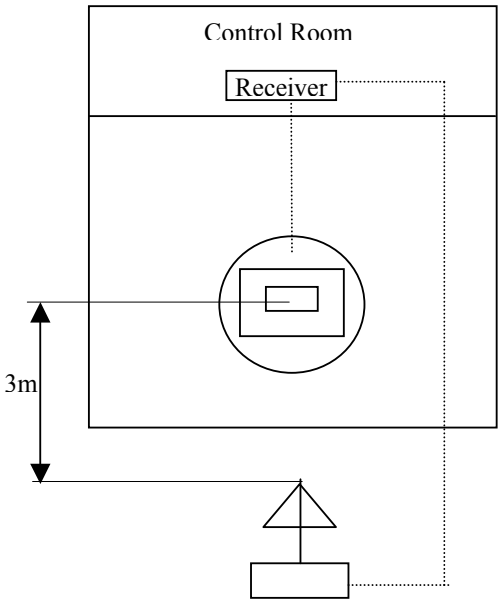
Radiated Emissions:

The measurement was performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using bi-conical and log-periodic antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 230MHz using bi-conical antenna and 230 to 1000MHz using log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3 or 10 meters test distance using Bi-log antenna, Bi-conical antenna, Log-periodic antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuations. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were configured as same in chamber, were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. 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. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.





SUMMARY

☒ Conducted Emission

The requirements are	● MET ○ Not MET
Minimum limit margin	2.2dB at 6.75MHz
Maximum limit exceeding	

Remarks : With average detector/Neutral Phase

☒ Radiated Emission

The requirements are	● MET ○ Not MET
Minimum limit margin	2.8dB at 309.1MHz
Maximum limit exceeding	

Remarks :

Reported By

H.C. Kim / EMC Engineer

Note :

☒ means the test is applicable, ☐ is not applicable.

TEST CONDITIONS AND DATA

Conducted Emissions

[Applicable]

◆ Test Equipment Used

Model Name	Manufacturer	Description	Next Cal. Date
ESH3	Rohde Schwarz	Receiver	Dec. 9, 2004
ESH2-Z5	Rohde Schwarz	LISN	Dec. 9, 2004
NNLK8121	Schwarzbeck	LISN	Dec. 9, 2004
ESH3-Z2	Rohde Schwarz	Pulse Limiter	Dec. 10, 2004

◆ Auxiliary Equipment Used

Model Name	Manufacturer	Descriptions

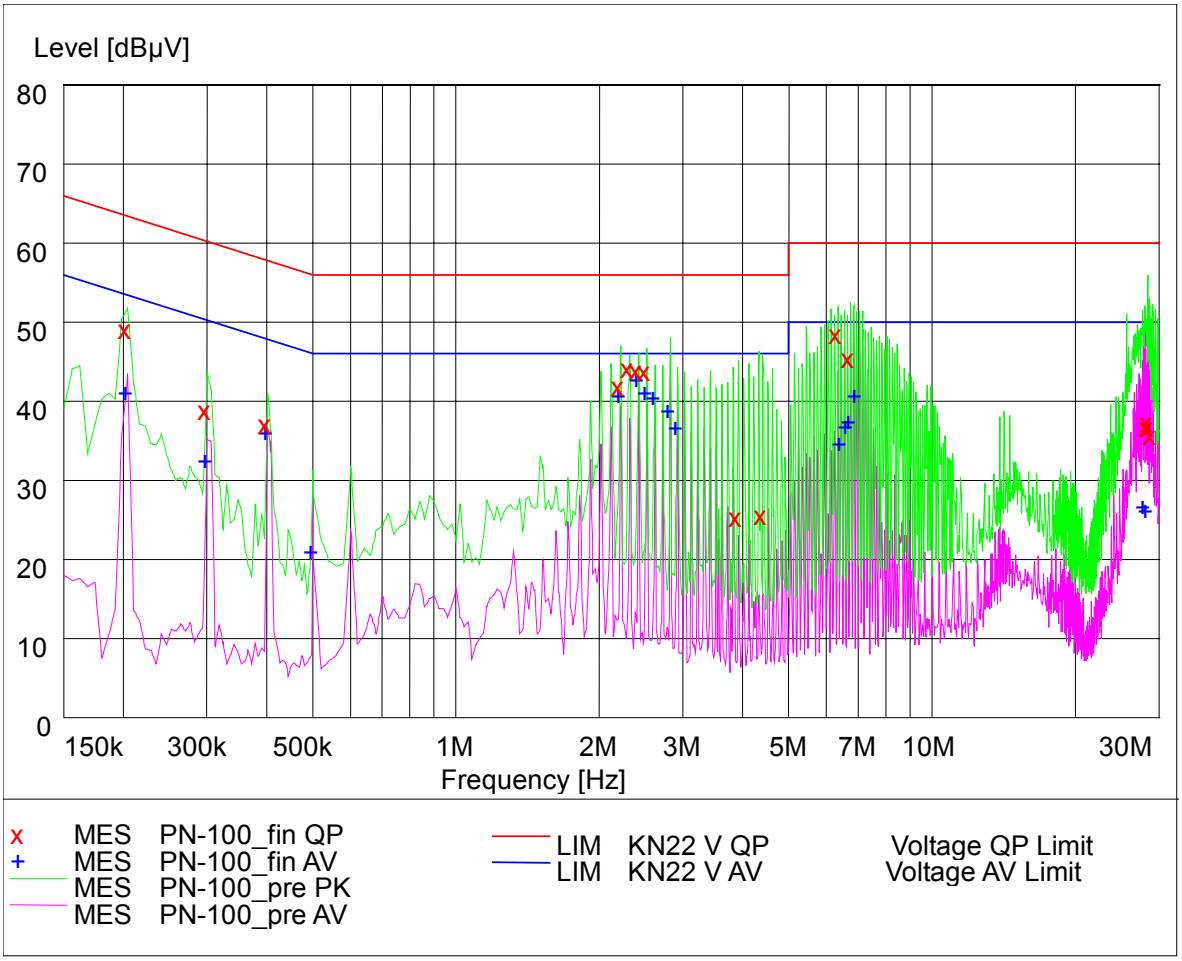
◆ Test Program GPS Navigation

◆ Test Area Shielded Room

Note : The test was performed for only GPS navigation mode because the AC/DC adapter is provided by manufacturer.

It was employed the EN standard in lieu of CFR 47 Part 15 Sec. 15.107.

Conducted Emissions



Live Phase

MEASUREMENT RESULT: "PN-100_fin QP"

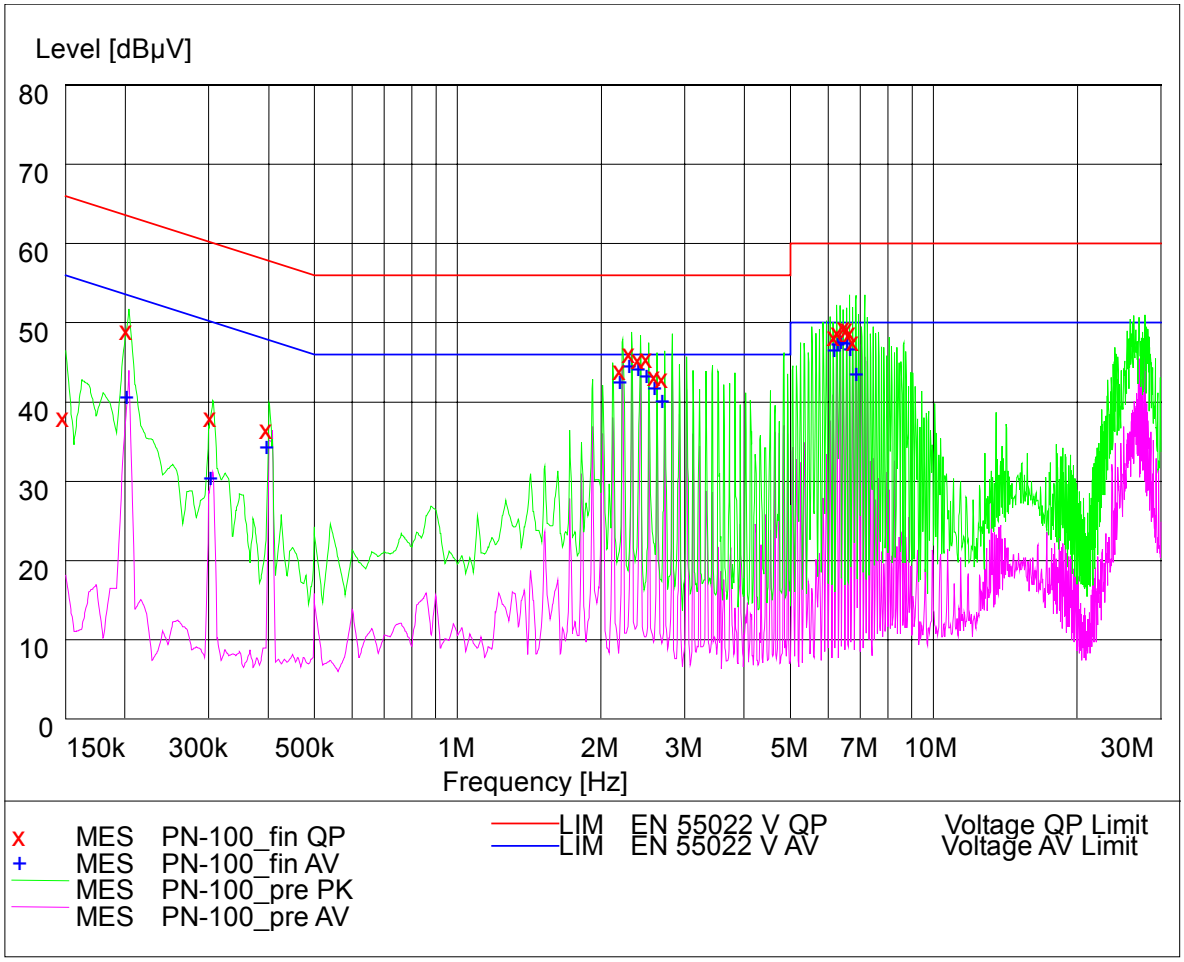
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.204000	50.20	10.0	63	13.2	L1	GND
0.300000	40.00	10.0	60	20.2	L1	GND
0.402000	38.20	10.0	58	19.6	L1	GND
2.220000	43.00	10.0	56	13.0	L1	GND
2.320000	45.30	10.0	56	10.7	L1	GND
2.420000	45.00	10.0	56	11.0	L1	GND
2.520000	44.90	10.0	56	11.1	L1	GND
3.920000	26.40	10.0	56	29.6	L1	GND
4.420000	26.70	10.0	56	29.3	L1	GND
6.350000	49.70	10.0	60	10.3	L1	GND
6.750000	46.60	10.0	60	13.4	L1	GND
28.400000	37.90	10.0	60	22.1	L1	GND
28.600000	38.50	10.0	60	21.5	L1	GND
28.700000	37.90	10.0	60	22.1	L1	GND
29.100000	36.80	10.0	60	23.2	L1	GND

MEASUREMENT RESULT: "PN-100_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.204000	42.20	10.0	53	11.2	L1	GND
0.300000	33.50	10.0	50	16.7	L1	GND
0.402000	37.00	10.0	48	10.8	L1	GND
0.500000	22.00	10.0	46	24.0	L1	GND
2.220000	41.80	10.0	46	4.2	L1	GND
2.420000	43.70	10.0	46	2.3	L1	GND
2.520000	42.20	10.0	46	3.8	L1	GND
2.620000	41.50	10.0	46	4.5	L1	GND
2.820000	39.90	10.0	46	6.1	L1	GND
2.920000	37.70	10.0	46	8.3	L1	GND
6.450000	35.70	10.0	50	14.3	L1	GND
6.650000	37.80	10.0	50	12.2	L1	GND
6.750000	38.40	10.0	50	11.6	L1	GND
6.950000	41.80	10.0	50	8.2	L1	GND
28.000000	27.70	10.0	50	22.3	L1	GND
28.300000	27.30	10.0	50	22.7	L1	GND

Note : The maximum insertion loss of LISN is 2.7dB for Live phase at 30MHz.
The insertion loss of 2.42MHz is 0.2dB.

Conducted Emissions



Neutral

MEASUREMENT RESULT: "PN-100_fin QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150000	39.30	10.0	66	26.7	N	GND
0.204000	50.20	10.0	63	13.2	N	GND
0.306000	39.30	10.0	60	20.8	N	GND
0.402000	37.70	10.0	58	20.1	N	GND
2.220000	45.10	10.0	56	10.9	N	GND
2.320000	47.30	10.0	56	8.7	N	GND
2.420000	46.60	10.0	56	9.4	N	GND
2.520000	46.70	10.0	56	9.3	N	GND
2.620000	44.40	10.0	56	11.6	N	GND
2.720000	44.10	10.0	56	11.9	N	GND
6.250000	49.40	10.0	60	10.6	N	GND
6.350000	50.00	10.0	60	10.0	N	GND
6.550000	50.60	10.0	60	9.4	N	GND
6.650000	50.40	10.0	60	9.6	N	GND
6.750000	50.00	10.0	60	10.0	N	GND
6.850000	48.80	10.0	60	11.2	N	GND

MEASUREMENT RESULT: "PN-100_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.204000	41.80	10.0	53	11.6	N	GND
0.306000	31.50	10.0	50	18.6	N	GND
0.402000	35.40	10.0	48	12.4	N	GND
2.220000	42.60	10.0	46	3.4	N	GND
2.320000	43.60	10.0	46	2.4	N	GND
2.420000	43.20	10.0	46	2.8	N	GND
2.520000	42.30	10.0	46	3.7	N	GND
2.620000	41.90	10.0	46	4.1	N	GND
2.720000	41.20	10.0	46	4.8	N	GND
6.250000	47.60	10.0	50	2.4	N	GND
6.350000	46.40	10.0	50	3.6	N	GND
6.450000	46.70	10.0	50	3.3	N	GND
6.650000	46.60	10.0	50	3.4	N	GND
6.750000	47.80	10.0	50	2.2	N	GND
6.950000	44.60	10.0	50	5.4	N	GND

Note : The maximum insertion loss of LISN is 2.7dB for Live phase at 30MHz.
The insertion loss of 2.0MHz to 7.0MHz is 0.2dB to 0.4dB. It is not significant to the test results.

TEST CONDITIONS AND DATA

Radiated Emission

[Applicable]

◆ Test Equipment Used

Model Name	Manufacturer	Description	Next Cal. Date
ESVS10	Rohde & Schwarz	Receiver	Dec. 9, 2004
VHA9103	Schwarzbeck	Antenna	Jun. 20, 2004
HUF Z3	Rohde & Schwarz	Antenna	Jun. 18, 2004
3115	EMCO	Horn Antenna	Sep. 25, 2004
E7402A	Agilent	Spectrum Analyzer	Aug. 21, 2004

◆ Auxiliary Equipment Used

Model Name	Manufacturer	Descriptions	FCC Authorization
LIFEBOOK P-2040	FUJITSU	Notebook PC	DoC
M-U48a	Logitech	Mouse	JNZ211360
Termination	-	75 ohms for S-Video	N/A
AN2005	Aion Korea	Headset	N/A

◆ Test Program GPS navigation / Scrolling 'H' while USB connected

◆ Test Area Open Area Test Site

Note : The DUT is also a digital device equipped with CPU and operating system. The test was performed with USB connected mode to making maximum emission condition. The test program were employed not only GPS receiving but also scrolling "H" while testing.

Radiated Emissions

(Disturbance Radiation)

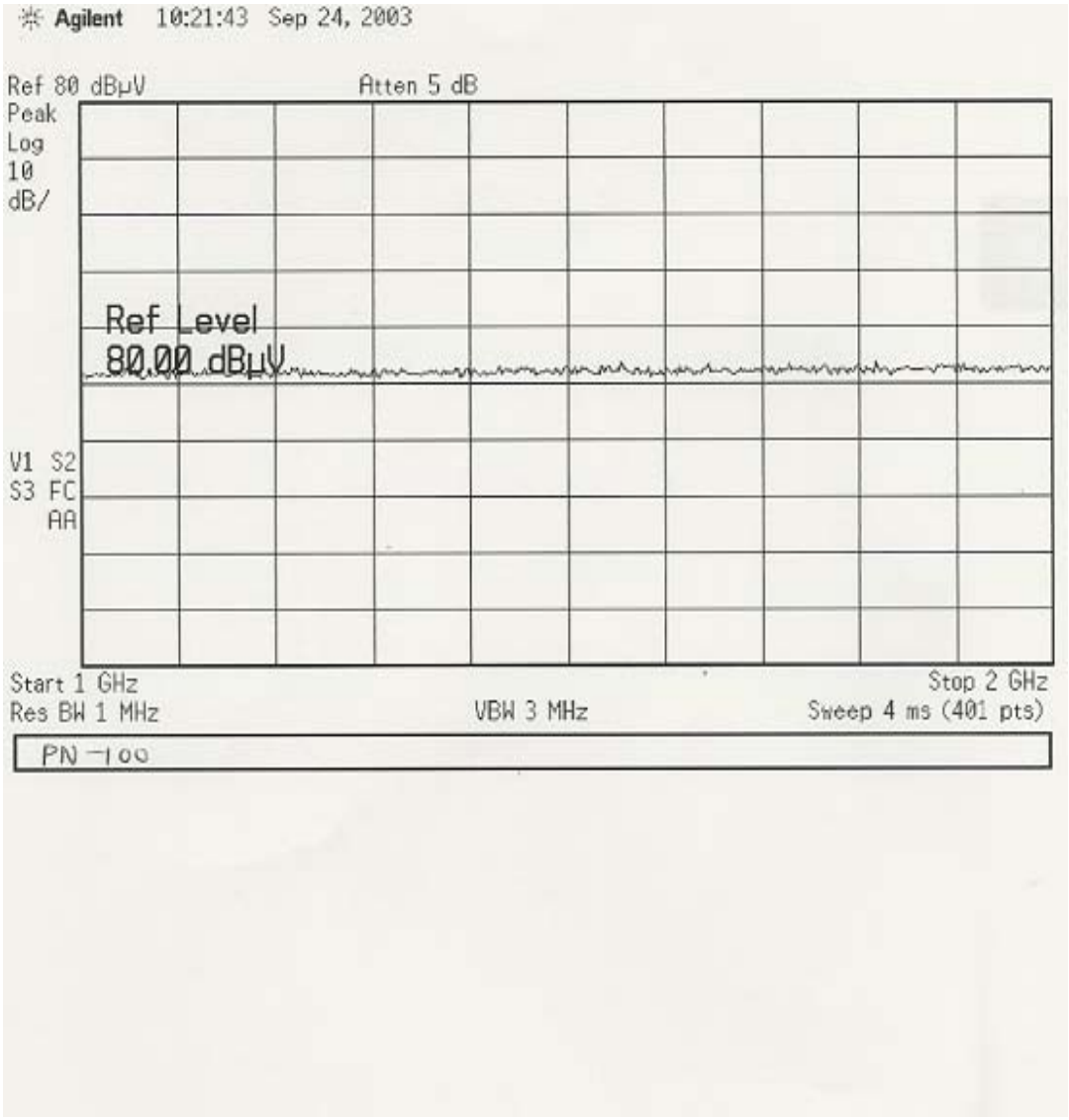
- The measured values are as following

	Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB]	Cable Loss [dB]	Angle [deg]	Polar. [H/V]	Result [dBuV]	Limit [dBuV]	Margin [dB]
	102.9	14.8	10.7	2.1	167	H	43.5	27.6	15.9
	154.3	11.5	15.0	2.9	74	H	43.5	29.4	14.1
	206.4	17.6	16.4	3.6	362	H	43.5	37.6	5.9
	309.1	24.3	14.5	4.4	241	H	46.0	43.2	2.8
	-	-	-	-	-	-	-	-	-

End of data

Note :

The test plot of frequency range 1GHz~3GHz with whole polarity



Appendix A. The DUT Photos

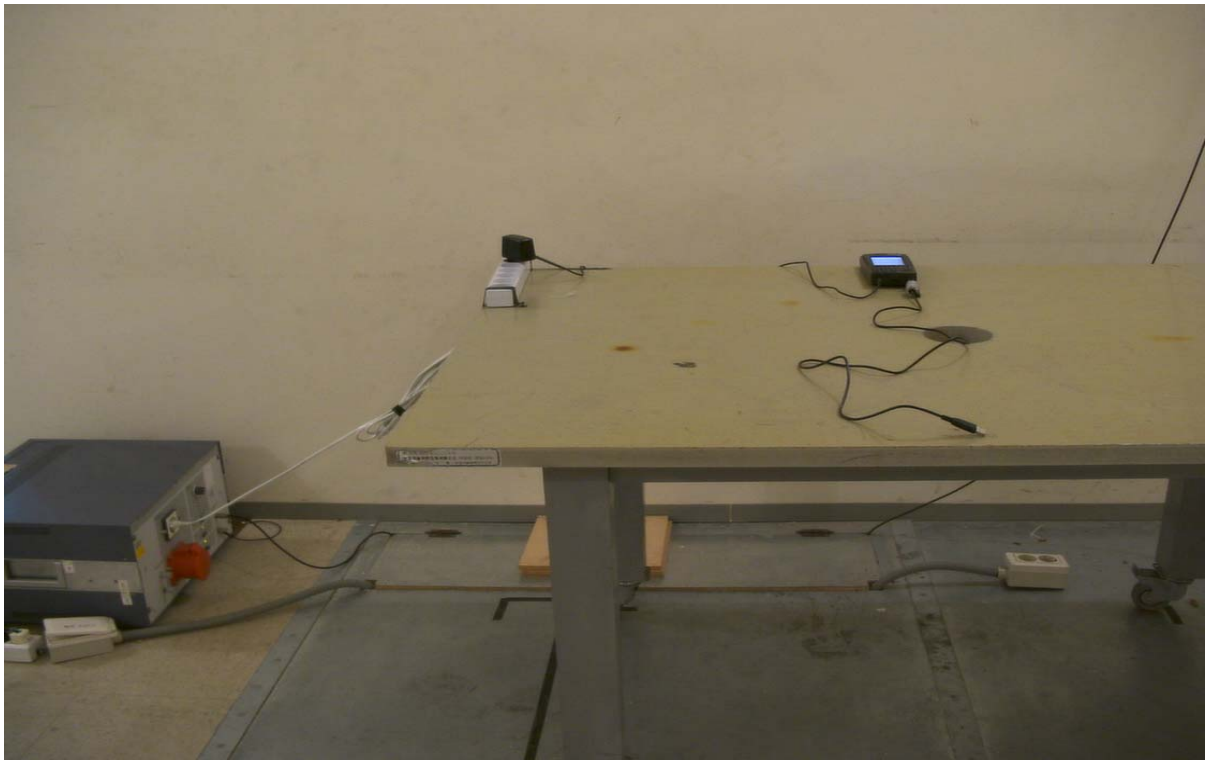
Front View

Rear View

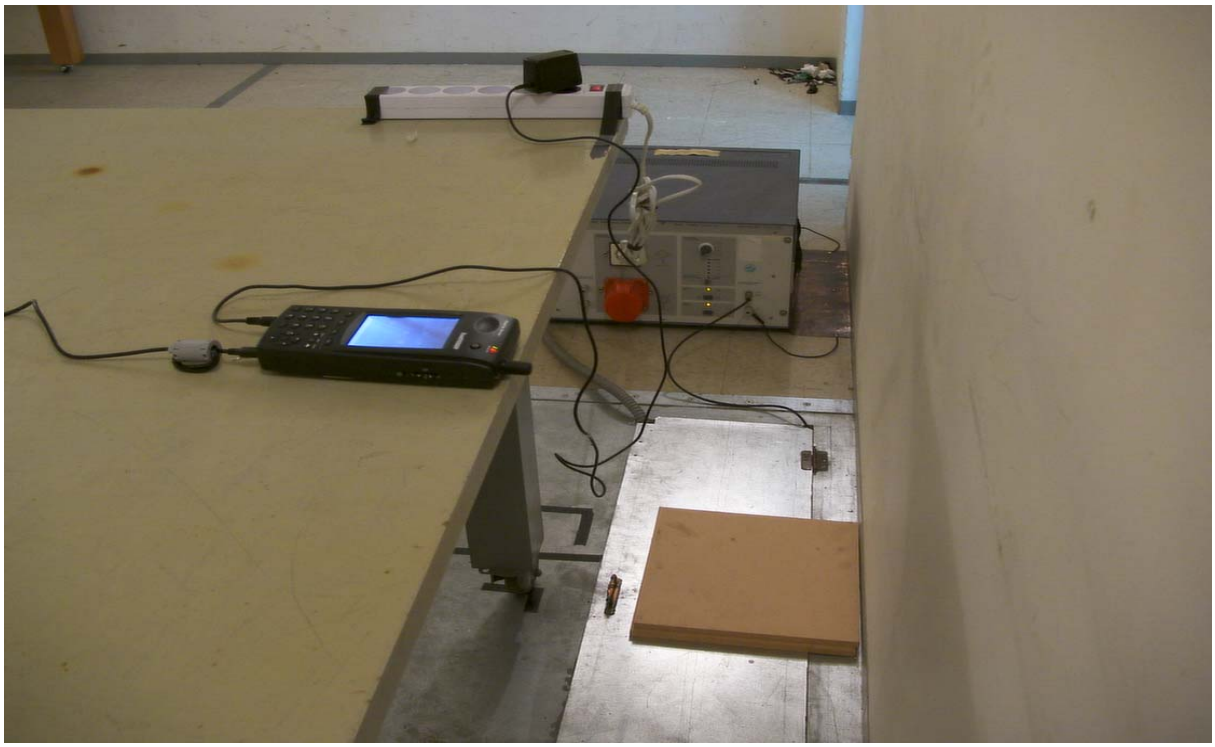
AC/DC Adapter

USB Cable

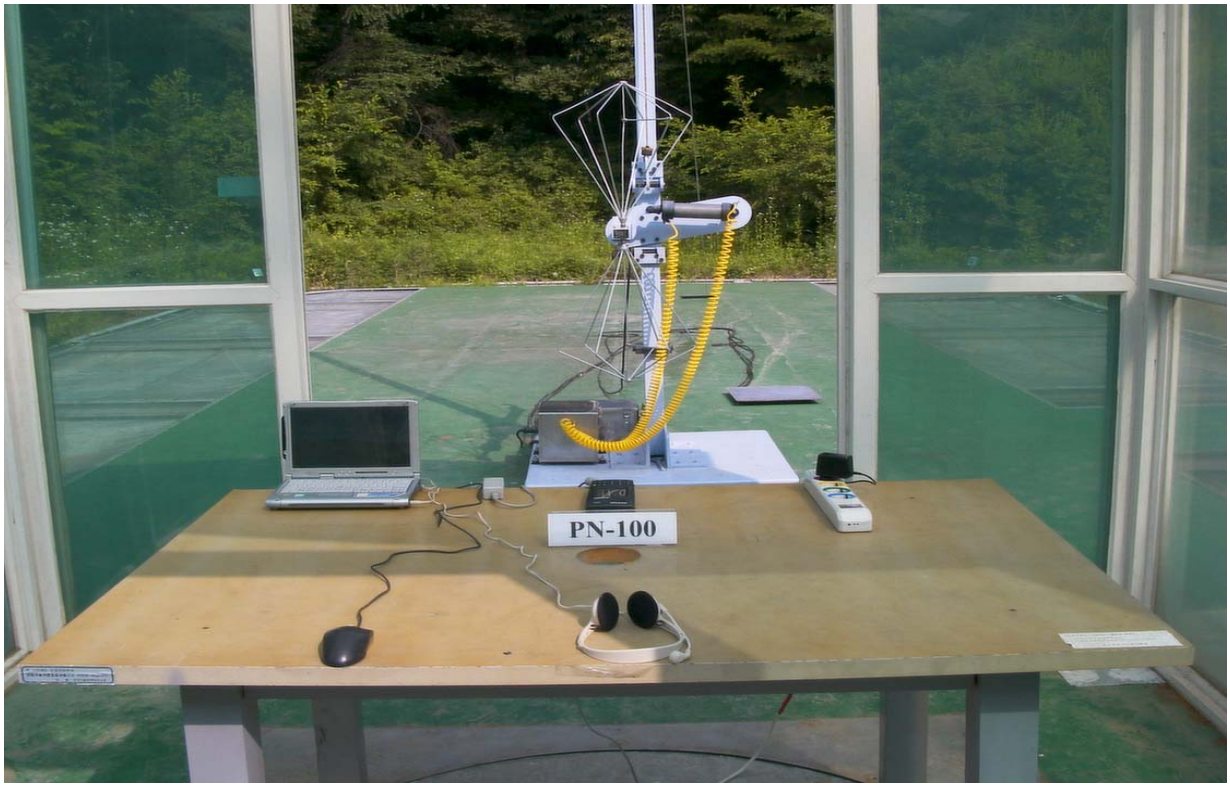
Appendix B. The Test Setup Photos



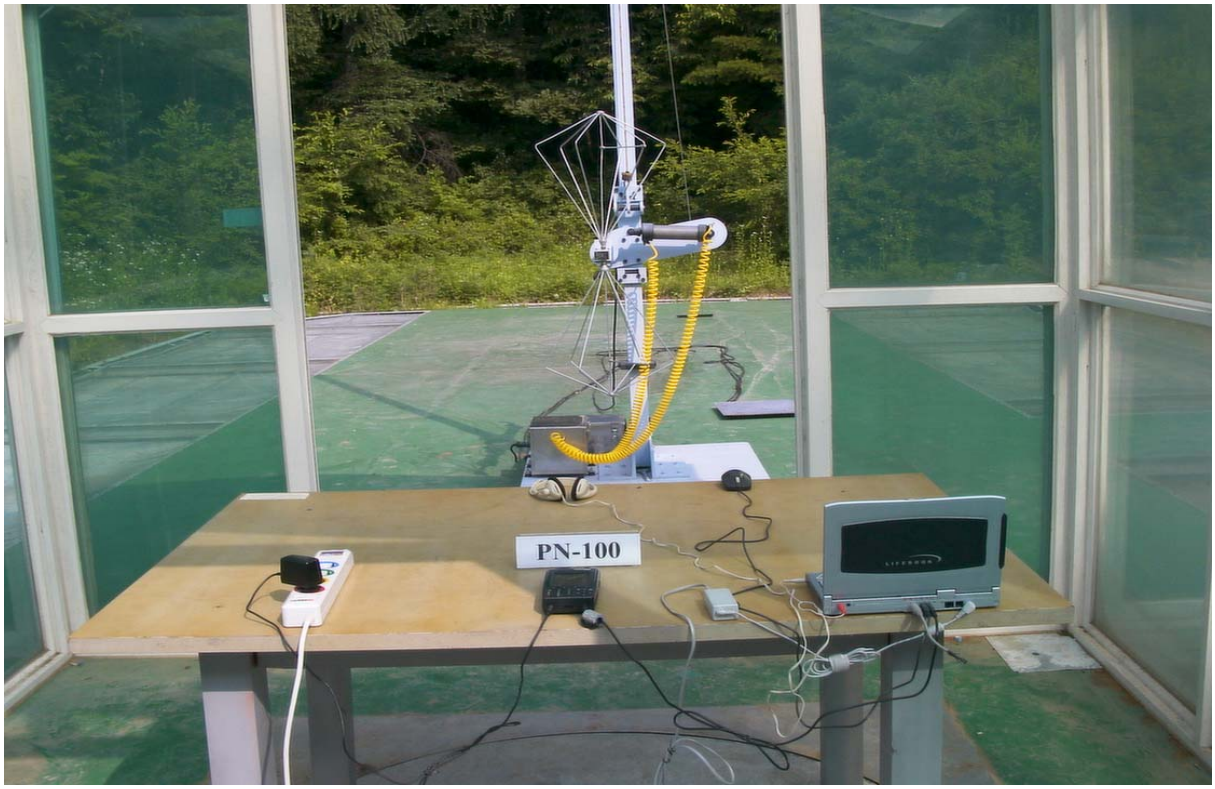
Conducted Emissions-Front View



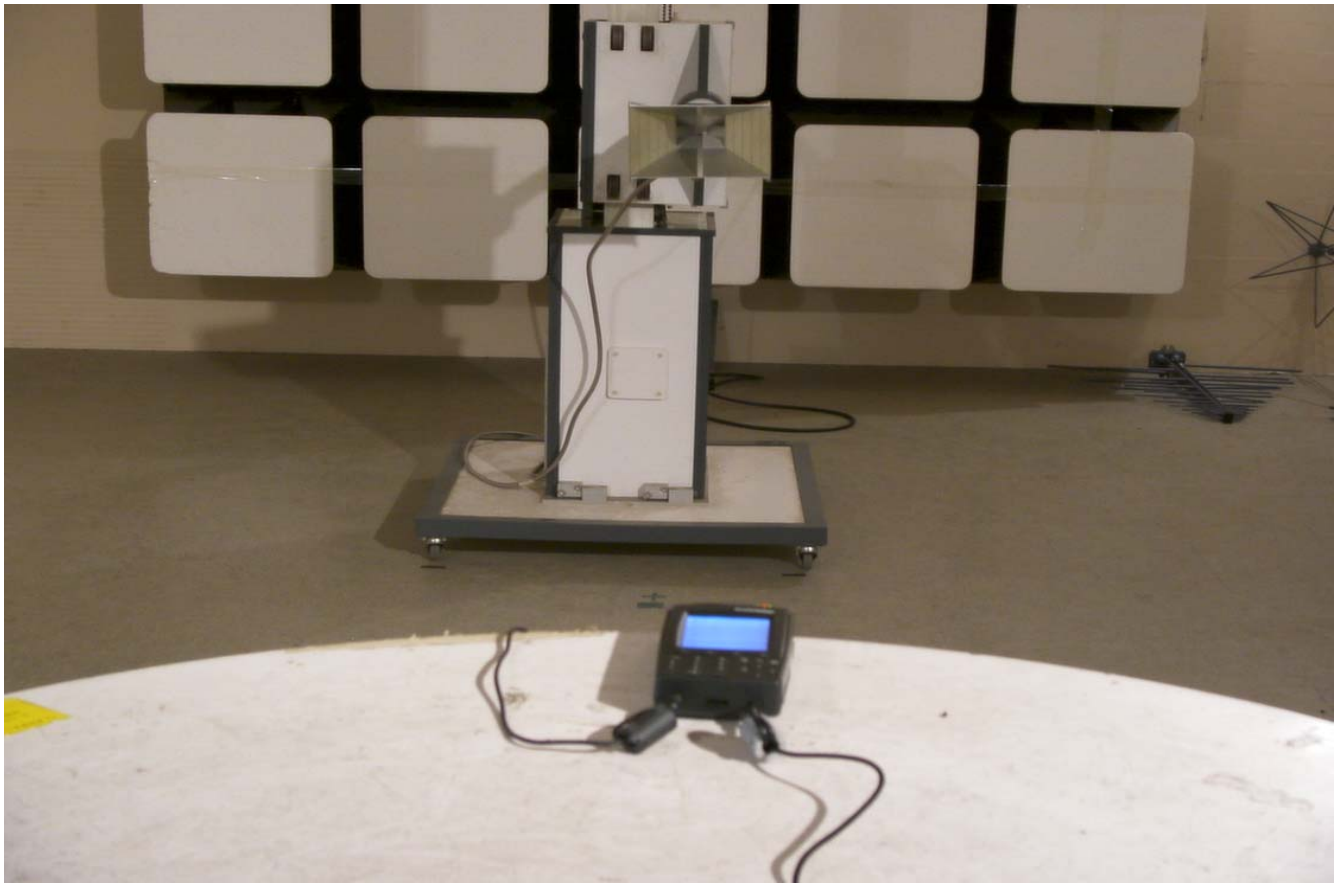
Conducted Emissions-Rear View



Radiated Emissions-Front View



Radiated Emissions-Rear View



Radiated Emissions up to 2GHz