

Nemko Korea Co., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA

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FCC PART 15 Class II Permissive Change

Applicant :

NComputing Co., Ltd.

Dates of Issue : December 08, 2005

2nd Fl, Daeyoung Bldg, 1423-6, Gwanyang1-Dong,
Anyang-City, Gyeonggi-Do, Korea

Test Report No. : NK2FE788

Attn : Mr. J. C. Lee

Test Site : Nemko Korea Co., Ltd.

EMC site, Korea

FCC ID

SMJL110

Brand Name

OfficeStation, PC Expansion

Contact Person

NComputing Co., Ltd.

2nd Fl, Daeyoung Bldg, 1423-6, Gwanyang1-Dong,
Dongan-Gu, Anyang-City, Gyeonggi-Do, Korea

Mr. J. C. Lee

Telephone No. : +82 31 422 5157

Applied Standard:

Part 15 & 2

Classification :

FCC Class B Device

EUT Type:

OfficeStation

The device bearing the brand name and FCC ID specified above has been shown to comply 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 and 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.



Tested By : B. J. Lim

Engineer



Reviewed By : H.H. Kim

Manager & Chief Engineer

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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 under FCC part 15.

Responsible Party : NComputing Co., Ltd.

Contact Person : Mr. J. C. Lee

Tel No.: +82 31 422 5157

Manufacturer : NComputing Co., Ltd.

2nd FI, Daeyoung Bldg, 1423-6, Gwanyang1-Dong, Dongan-Gu,
Anyang-City, Gyeonggi-Do, Korea

Factory : NComputing Co., Ltd.

2nd FI, Daeyoung Bldg, 1423-6, Gwanyang1-Dong, Dongan-Gu,
Anyang-City, Gyeonggi-Do, Korea

- FCC ID: SMJL110
- Model: L110
- Brand Name: OfficeStation, PC Expansion
- EUT Type: OfficeStation
- Electric Rating: Input : AC100-250V, 50-60Hz, 0.3A
Output : DC +5V, 2.0A
- Test Voltage: AC120V, 60Hz
- Port/Connector: LAN, PS/2 Port x 2EA, D-Sub, Audio Output Jack, DC In
- Classification: FCC Class B
- Applied Standard: FCC Part 15 & Part 2
- Test Procedure(s): ANSI C63.4 (2003)
- Dates of Test: November 25, 2005 to December 08, 2005
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2FE788

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 (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **NComputing Co., Ltd.**

FCC ID : **SMJL110, OfficeStation.**

These measurement tests were conducted at **Nemko Korea Co., Ltd. EMC Laboratory**.

The site address is 300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA

The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 kilometers (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 kilometers (18miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003.



Nemko Korea Co., Ltd.
OPEN AREA TEST SITE
300-2, Osan-Ri, Mohyun-Myun, Yongin-
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Fig. 1. The map above shows the Seoul in Korea vicinity area.

The map also shows Nemko Korea Corporation Ltd. EMC Lab and Incheon Airport.

TEST CONDITIONS & EUT INFORMATION

Operating During Test

The System of the host PC was located at outside of the shield room and connected to EUT via RJ 45 cable then the test was performed during accessing the resources of host PC system continuously.

Support Equipment

OfficeStation (EUT)	NComputing, FCC ID: SMJL110 3.0m unshielded Ethernet cable Adaptor : Ault Inc. Model: PW137KA0500N63 1.2m unshielded AC cable, 1.8m unshielded DC cable with ferrite core at DC jack end.	S/N: N/A S/N: N/A
PC (Host)	Dell Computer Corporation. Model : WHL(Precision530) 1.8 unshielded AC Power cable 2.5 unshielded RJ-45 cable DOC	S/N : N/A
CRT Monitor	Dell Computer Corporation. Model: P992 1.8m shielded D-sub cable 1.8m unshielded AC power cable DOC	S/N: 5904614
Keyboard	LG International Corp. Model: LGK-3000PLUS 1.5m unshielded Din cable	S/N: 112060509
PS/2 Mouse	Samsung Electro-Mechanics Model: SMP2000WX 1.5m unshielded Din cable DOC	S/N: N/A
Speaker	Sound King Corp. Model : MS-691 1.5m unshielded stereo jack cable	S/N : N/A
Hub	3Com, Model : Dual Speed Switch 16 3.0m unshielded Modular Jack Cable Adaptor : Ault Inc. Model : 7900-000-046-1.00 1.8m unshielded DC power cable	S/N : N/A S/N : N/A

EUT Information

Clock	80MHz(X1), 25MHz
Chipset(s)	U1(K4S643232F), U2(EP1C6Q240C8), U3(EPM3128A), U6(RTL8201)
Port(s)	LAN, PS/2 Port x 2EA, D-Sub, Audio Output Jack, DC In

Description of the Changes according to FCC part 2.1043

1. Add the AC/DC Adaptor (PW137KA0500N63, Ault Inc.) – Class II Permissive Change
2. Add the Brand Name (PC Expansion) – Class I Permissive Change

SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	Paragraph No.	Result	Remark
Conducted Emission	15.107(a)	Complies	
Radiated Emission	15.109(g)	Complies	

RECOMMENDATION/CONCLUSION

The data collected shows that the **NComputing Co., Ltd.**

FCC ID : **SMJL110, OfficeStation.**

The highest emission observed was at **0.50 MHz** for conducted emissions with a A.V margin of **7.4 dB**, at **125.00 MHz** for radiated emissions with a margin of **2.5 dB**.

SAMPLE CALCULATION

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

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

EX. 1.

@165.0 MHz

Class B limit = 30.0 dB $\mu\text{V}/\text{m}$

Reading = 38.2 dB μV (calibrated level)

Antenna factor + Cable Loss + Amplifier Gain = -12.9 dB

Total = 25.30 dB $\mu\text{V}/\text{m}$

Margin = 30.0 – 25.30 = 4.70

4.70 dB below the limit

DESCRIPTION OF TESTS

Conducted Emissions

The Line conducted emission test facility is located inside a 4 X 7 X 2.5 meter shielded enclosure.

It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.

A 1m X 1.5m wooden table 0.8m height is placed 0.4m away from the vertical wall and 0.5m away from the side of wall of the shielded room

Rohde & Schwarz (ESH3-Z5) and Kyoritsu (KNW-407) of the 50ohm/50uH Line Impedance Stabilization Network(LISN) are bonded to the shielded room.

The EUT is powered from the Rohde & Schwarz LISN and the support equipment is powered from the Kyoritsu LISN. Power to the LISN s are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1/2".

If DC power 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 LISNs,

All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.

Sufficient time for EUT, support equipment, and test equipment was 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 from the EUT. The spectrum was scanned from 150kHz to 30MHz with 20msec sweep time.

The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30).

The detector function were set to CISPR quasi-peak mode & average mode.

The bandwidth of receiver was set to 9KHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.

Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.

Each EME reported was calibrated using the R&S signal generator.

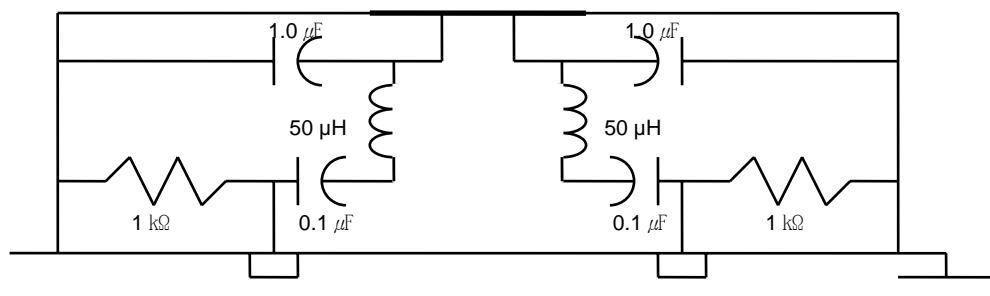


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TESTS

Radiated Emissions

Preliminary measurement were made indoors at 3 meter using broad band 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 Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found. The spectrum was scanned from 30 to 1000MHz using Biconical log Antenna(ARA, LPB-2520/A).

Final Measurements were made outdoors at 3m test range using Logbicon Super Antenna(Schwarzbeck, VULB9166).

The test equipment was placed on a wooden table.

Sufficient time for the EUT, support 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 reexamined and investigated using EMI test receiver.(ESCS30)

The detector function were set to CISPR quasi-peak and peak mode and the bandwidth of the receiver were set to 120KHz and 1MHz depending on the frequency or type of signal.

The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.

The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non- metallic 1.0X 1.5 meter table.

The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.

The turn table containing the Technology was rotated; the antenna height was varied 1 to 4meter and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.

Each EME reported was calibrated using the R/S signal generator.

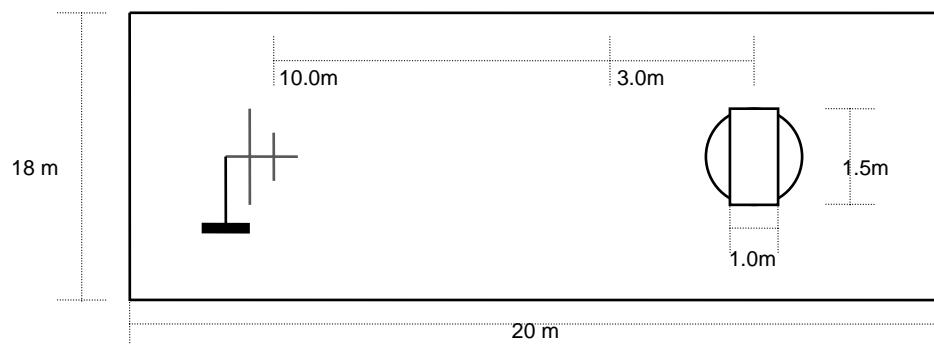


Fig. 3. Dimensions of Outdoor Test Site

TEST DATA

Conducted Emissions

FCC ID : SMJL110

Frequency (MHz)	Level(dB μ N)		Line	Limit(dB μ N)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.20	48.0	36.2	N	63.6	53.6	15.6	17.4
0.30	41.9	35.0	N	60.2	50.2	18.3	15.2
0.50	40.1	38.6	N	56.0	46.0	15.9	7.4
0.60	38.8	36.8	L	56.0	46.0	17.2	9.2
1.50	38.8	37.0	L	56.0	46.0	17.2	9.0
1.61	39.4	37.4	N	56.0	46.0	16.6	8.6

Table 1. Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operations were invested and the worst -case emission were reported. See attached Plots.
3. LINE : L =Line , N = Neutral
4. The limit for Class B device is on the FCC Part section 15.107(a).



Tested by : **B. J. Lim**

TEST DATA

Radiated Emissions

FCC ID : SMJL110

Frequency (MHz)	Reading (dB μ V)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
80.00	47.2	V	-20.7	26.5	30.0	3.5
125.00	44.0	V	-16.5	27.5	30.0	2.5
250.00	42.7	H	-12.5	30.2	37.0	6.8
300.00	33.6	H	-11.3	22.3	37.0	14.7
375.00	39.6	V	-9.4	30.2	37.0	6.8
400.00	42.1	V	-8.7	33.4	37.0	3.6

Table 2. Radiated Measurements at 10meters

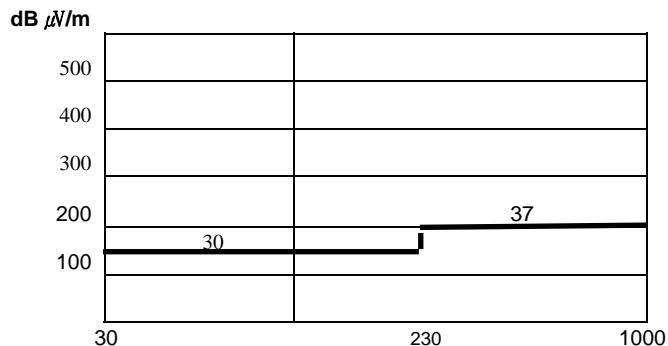


Fig. 4. Limits at 10 meters

NOTES:

1. All modes were measured and the worst-case emission was reported.
- 2 The radiated limits are shown on Figure 4. Above 1GHz the limit is 500 μ V/m.

NOTES:

1. *Pol. H=Horizontal V=Vertical
2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.
3. Measurements using CISPR quasi-peak mode.
4. The limit for Class B device is on the FCC Part section 15.109(g).

Tested by : B. J. Lim

PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Line)***

NEMKO KOREA (NK-2F-E-788)

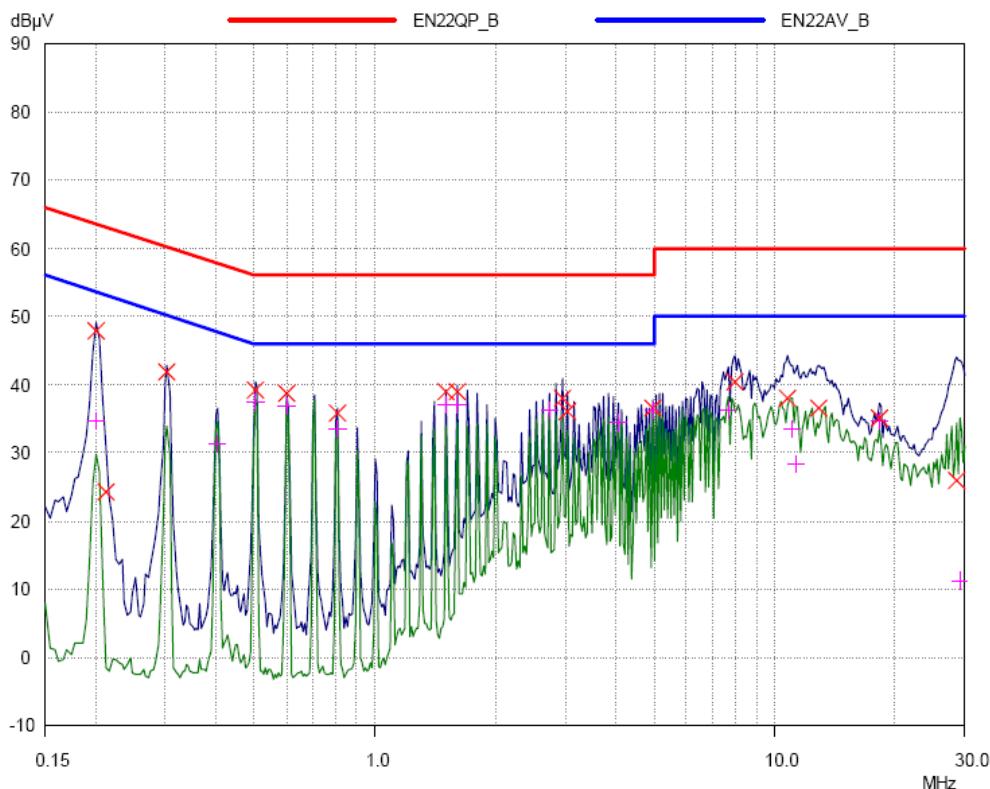
07 Dec 2005 15:34

Conducted Emissions

EUT: OfficeStation
 Manuf: NComputing Co., Ltd.
 Op Cond: AC: 120V / 60Hz
 Operator: Byoung Jin, Lim
 Test Spec: FCC Part 15
 Comment: MODEL : L110
 LINE : LINE
 Result File: e788l.dat : FCC Part 15

Scan Settings		(1 Range)				Receiver Settings				
		Frequencies		Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
Start	Stop	3.9063kHz	9kHz	PK+AV	20msec	10 dB	OFF	60dB		
Transducer	No.	Start	Stop	Name						
	1	150kHz	30MHz	CE_LINE						

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 16
 Acc Margin: 40 dB



PLOTS OF EMISSIONS

- Conducted Emission at the Mains port (Neutral)

NEMKO KOREA (NK-2F-E-788)

07 Dec 2005 15:18

Conducted Emissions

EUT: OfficeStation
 Manuf: NComputing Co., Ltd.
 Op Cond: AC: 120V / 60Hz
 Operator: Byoung Jin, Lim
 Test Spec: FCC F 15
 Comment: MODEL : L110
 LINE : NEUTRAL
 Result File: e788n.dat : FCC Part 15

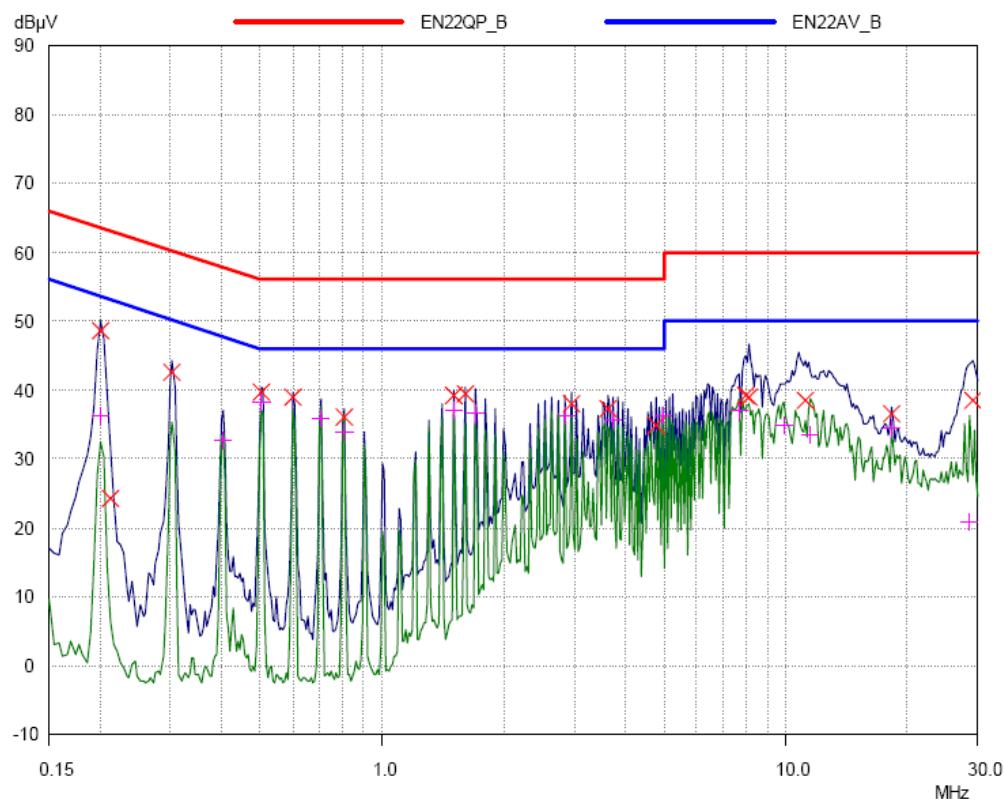
Scan Settings

(1 Range)

Frequencies				Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	10 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	CE_LINE

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 16
 Acc Margin: 40 dB



ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

1. Radiation Uncertainty Calculation

Contribution	Probability Distribution	Uncertainty(+/-dB)
Antenna Factor	Normal (k=2)	± 0.5
Cable Loss	Normal (k=2)	± 0.04
Receiver Specification	Rectangular	± 2.0
Antenna directivity	Rectangular	± 1.0
Antenna Factor variation with Height		
Antenna Phase Center Variation		
Antenna Factor Frequency Interpolation		
Measurement Distance Variation	Rectangular	± 2.0
Site Imperfections	Rectangular	± 2.0
Mismatch: Receiver VRC $r_i=0.3$ Antenna VRC $r_R=0.1(B_i)0.4(L_p)$ Uncertainty Limits $20\log(1+/-r_i r_R)$	U-Shaped	+ 0.25 / - 0.26
System Repeatability	Std.deviation	± 0.05
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.77
Expended Uncertainty U	Normal (k=2)	± 3.5

2. Conducted Uncertainty Calculation

Contribution	Probability Distribution	Uncertainty(+/-dB)
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch: Receiver VRC $r_i=0.3$ LISN vrc $r_g=0.1$ Uncertainty Limits $20\log(1+/-r_i r_R)$	U-Shaped	± 0.26
System Repeatability	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

LIST OF TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Aug. 17 2005	1year
2	*Test Receiver	R & S	ESCS 30	100302	Dec. 7 2004	1year
3	Amplifier	Agilent	8447F	3113A04549	Aug. 17 2005	1year
4	*Amplifier	HP	8447F	2805A03351	Oct. 26 2005	1year
5	*Amplifier	HP	8447F	2805A03427	Aug. 17 2005	1year
6	Amplifier	HP	8449B	3008A00107	Mar.06 2005	1year
7	Spectrum Analyzer	HP	8566B	267A03469	Mar.16 2005	1year
8	*Spectrum Analyzer	HP	8568B	1012A00573	Oct.25 2005	1year
9	*Logbicon Super Antenna	Schwarzbeck	VULB9166	1067	May 16 2005	1year
10	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	1201	Aug.30 2005	1year
11	*Biconical Log Antenna	ARA	LPB-2520/A	1180	Jan. 17 2005	1year
12	Signal Generator	R & S	SMP02	833286/003	Aug.17 2005	1year
13	*LISN	R & S	ESH3-Z5	833874/006	Oct.26 2005	1year
14	*LISN	Kyoritsu	KNW-407	8-1034-10	Mar.22 2005	1year
15	LISN	Kyoritsu	KNW-408	8-1058-2	Dec.9 2004	1year
16	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
17	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
18	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
19	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
20	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
21	Position Controller	Seo-Young EMC	N/A	N/A	N/A	N/A
22	Turn Table	Seo-Young EMC	N/A	N/A	N/A	N/A
23	Antenna Mast	Seo-Young EMC	N/A	N/A	N/A	N/A
24	Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
25	Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A

**) Test equipment used during the test*

APPENDIX D – SCHEMATIC DIAGRAM

APPENDIX E – USER'S MANUAL

APPENDIX F – BLOCK DIAGRAM
