

Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
TEL(031)322-2333 FAX(031)322-2332

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacture :

Woori Technology Inc.
#1205, 12F, Byucksan Digital Valley III,
212-13, Guro-Dong, Guro-Gu, Seoul, Korea

Attn : Y. S. Um

Dates of Tests : June 20 – July 10, 2006
Test Report No. : **NK 2G E 521.FCC**
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea.

FCC ID

MODEL

BRAND NAME

CONTACT PERSON

RO3AVR445

AVR445

Harman Kardon

#1205, 12F, Byucksan Digital Valley III,,
212-13, Guro-Dong, Guro-Gu, Seoul, Korea
Y. S. Um

Telephone No. : + 82-2-2102-5315

FCC Rule Part(s) : **Part 15 & 2**
Classification : **FCC Class B Device (AV Receiver)**
Port/Connector(s) : Audio IN/OUT (20), 8CH Direct IN (8), 8CH Pre-OUT (8),
Digital Coaxial IN/OUT (5), Component Video IN/OUT (4),
S-Video IN/OUT (7), Composite Video IN/OUT (7), IR IN/OUT (3),
Multi Room IR OUT (1), Trigger OUT (2), RS-232 (1), A-BUS (1),
USB (1), XM (1), DMP the Bridge (1), HDMI IN/OUT (3),
Antenna FM/AM (2), Speaker (7), Microphone (1), Headphone (1)

The device bearing the trade name and model 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.

The test results of this report are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003.

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.



Test By : J. Y. YU
Engineer



Reviewed By : H.H. Kim
Manager & Chief Engineer

TABLE OF CONTENTS

SCOPE	3
INTRODUCTION (Site Description)	5
PRODUCT INFORMATION	6
DESCRIPTION OF TEST (Conducted Emissions)	7
DESCRIPTION OF TEST (Radiated Emissions)	8
LIST OF SUPPORT EQUIPMENT USED	9
TEST DATA (Conducted Emissions)	10
TEST DATA (Radiated Emissions)	11
PLOTS OF EMISSION	13
Conducted Emissions Diagram	14-17
SAMPLE CALCULATIONS	18
ACCURACY of MEASUREMENT	19
LIST of TEST EQUIPMENT	20
RECOMMENDATION/CONCLUSION	21
APPENDIX A - LABELLING REQUIREMENTS	26
APPENDIX B - CIRCUIT DIAGRAM	27
APPENDIX C - PHOTOGRAPHS of TEST SET-UP	28
LINE-Conducted Test Picture	29
Radiated Test Picture	31
Antenna Power Conducted Test Picture	32
APPENDIX D - EUT PHOTOGRAPHS	33
APPENDIX E - USER's MANUAL	52
APPENDIX F – SCHEMATIC DIAGRAMS	53

MEASUREMENT REPORT

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* :	WOORI Technology Inc.
Contact Person :	Mr. Y. S. Um (Michael Um) Tel No.: + 82-2-2102-5315 Fax No.: + 85-2-2102-5319
Factory:	Guangzhou Telefield Ltd. No. 1 Industrial Area, Zhuliao, Guanzhou Baiyun Area, Guangdong Province, P.R. China. Tel No.: + 86-20-8744-0109(ext. 218) Mr. Young Dae, Rho (Managing Director)

- **FCC ID:** [RO3AVR445](#)
- **Trade / Model:** [AVR445](#)
- **Brand Name:** [Harman Kardon](#)
- **EUT Type:** [AV Receiver](#)
- **Port/Connectors:** Audio IN/OUT (20), 8CH Direct IN (8), 8CH Pre-OUT (8), Digital Coaxial IN/OUT (5), Component Video IN/OUT (4), S-Video IN/OUT (7), Composite Video IN/OUT (7), IR IN/OUT (3), Multi Room IR OUT(1), Trigger OUT (2), RS-232 (1), A-BUS (1), USB (1), XM (1), DMP the Bridge (1), HDMI IN/OUT (3), Antenna FM/AM (2), Speaker (7), Microphone (1), Headphone (1)
- **Classification:** [FCC Class B](#)
- **Rule Part(s):** [FCC Part 15 & Part 2, ICES-003](#)
- **Test Procedure(s):** ANSI C63.4 (2003)
- **Dates of Test:** June 20 – July 10, 2006
- **Place of Tests:** Nemko Korea Co., Ltd. EMC Site
- **Test Report No.:** [NK 2G E 521. FCC](#)

* NOTE: Please refer to the duties and responsibilities of the Responsible Party attached.

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 9 kHz to 40GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **WOORI Technology Inc.**

FCC ID : RO3AVR445, AV Receiver.

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 50 kilometers (30 miles) southeast and Seoul International Airport (Kimpo 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 on June 06, 2003.

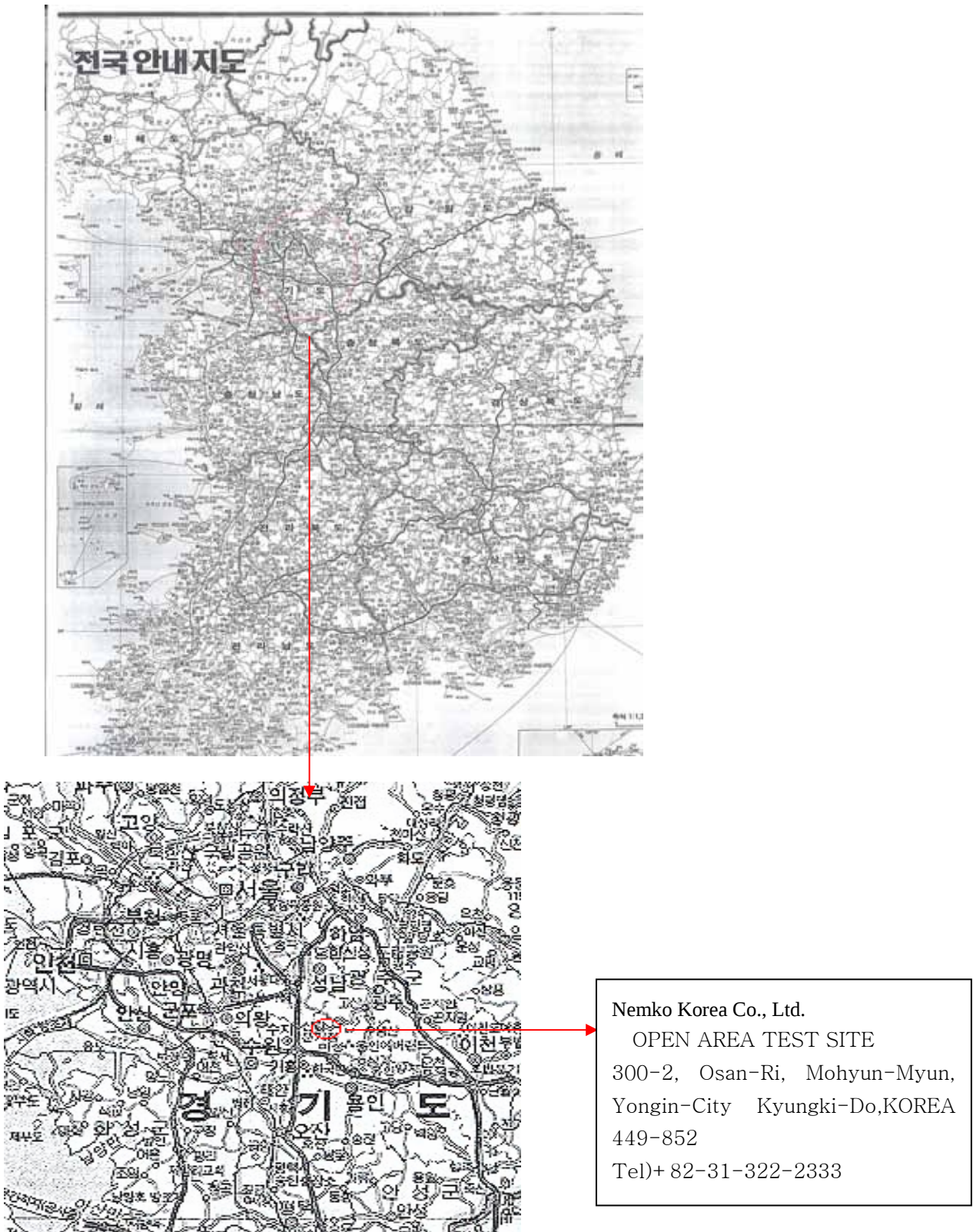


Fig. 1. The map above shows the Seoul in Korea vicinity area.
 The map also shows Nemko Korea Corporation Ltd. EMC Lab and Kimpo Airport.

PRODUCT INFORMATION

Equipment Description:

The Equipment Under Test (EUT) is the *WOORI Technology Inc.*

FCC ID: RO3AVR445, AV Receiver.

Clock : 14.318 MHz (Y100), 17.734 MHz (Y101), 28.636 MHz (Y200),
5.0 MHz (Y101), 24.576 MHz (Y201), 6.0 MHz (Y301),
45.1584 (Y1), 7.2 MHz (X-Tal)

Chipset(s) : LC74763M (IC16), ADV7180 (IC21),
uPD70F3261YGC (IC11), TMS320DA610 (IC21), TUSB3200A (IC33),
XMDTIC (IC32), LC72131M (IC02)

Port(s) : Audio IN/OUT (20), 8CH Direct IN (8), 8CH Pre-OUT (8),
Digital Coaxial IN/OUT (5), Component Video IN/OUT (4),
S-Video IN/OUT (7), Composite Video IN/OUT (7), IR IN/OUT (3)
Multi Room IR OUT(1), Trigger OUT (1), RS-232 (1), A-BUS (1),
USB (1), XM (1), DMP the Bridge (1), HDMI IN/OUT (3),
Antenna FM/AM (2), Speaker (7), Microphone (1), Headphone (1)

Power Consumption : AC 120V/60Hz 450W

PWB Description

P.W. Board Name	Part No.(Model)	Manufacture	S/N.	Remark
Main	PB-D27-KMAI-20-R-7	Woori Technology Inc.	N/A	
DSP	PB-D31-KDSB-20-R-A	Woori Technology Inc.	N/A	
Processor	PB-D27-KPOB-20-R-0	Woori Technology Inc.	N/A	
Video	PB-565-KVDJ-20-R-9	Woori Technology Inc.	N/A	
Front	PB-D27-KFRI-20-R-6	Woori Technology Inc.	N/A	
Supply	PB-D31-KSUI-20-R-7	Woori Technology Inc.	N/A	
Surround Amp.	PB-D27-KSUI-20-R-7	Woori Technology Inc.	N/A	
RS232	PB-D31-KSUI-20	Woori Technology Inc.	N/A	
Tuner	KST-MB011MW 0-81	KWANG SUNG	N/A	

EMI suppression device(s) installed in production:

- see circuit diagram ([Appendix B](#))

EMI suppression device(s) added and/or modified during testing:

- none

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 1mX 1.5M wooden table 0.8m height is placed 0.4m away from the vertical wall and 1.5m 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 LISN's,

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 out put 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 150 kHz 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 was set to CISPR quasi-peak mode.

The bandwidth of receiver was set to 9 kHz. 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.

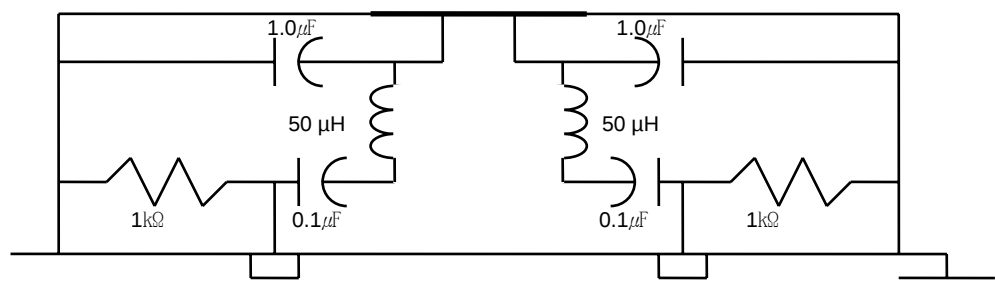


Fig. 2. LISN Schematic Diagram

Radiated Emissions

Preliminary measurements were made indoors at 1 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 system 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). Above 1GHz, Doppels Teg Horn antenna (EMCO, DAA-37121:upto 1~18GHz) was used.

Final Measurements were made outdoors at 3 or 10m test range using Logbicon Super Antenna (Schwarzbeck, VULB9166) or Doppels Teg Horn antenna.(EMCO, DAA-37121)

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 was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 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 system 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.

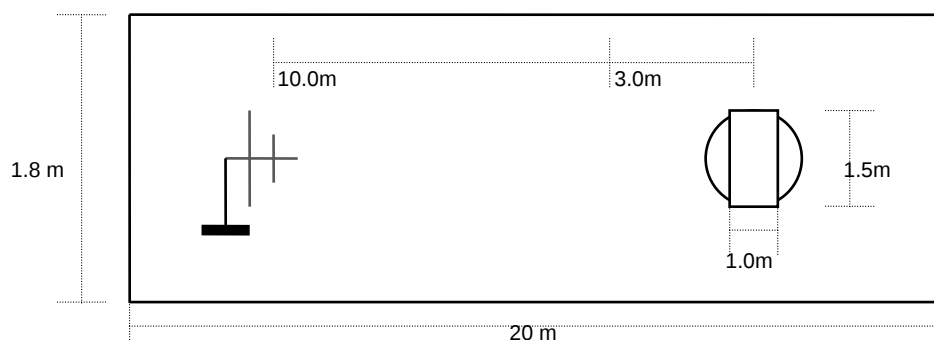


Fig. 3. Dimensions of Outdoor Test Site

SUPPORT EQUIPMENT USED

Description	Model No.	Spec.	Manufacture	S/N	Remark
AV Receiver (EUT)	RO3AVR445	120V/60Hz	WOORI TG	N/A	
RCA Cable	-	-	-	N/A	1.5 M Shield Cable
S-Video Cable	-	-	-	N/A	1.5 M Shield Cable
Component Video	-	-	-	N/A	1.5 M Shield Cable
Remote Cable	-	-	-	N/A	1.5 M Shield Cable
A-BUS Cable	-	-	-	N/A	2.0 M Non Shield Cable
Microphone	Ez Set/EQ	-	Harman Kardon	N/A	5.0 M Non Shield Cable
Headphone	B.K Sound	-	B.K Sound	N/A	2.0 M Shield Cable
DMP the Bridge	The Bridge	-	Harman Kardon	SZHKB-0000074	1.6 M Shield Cable
XM-Ready Module	CNP-1000	-	Audiovox	1095023	3.0 M Shield Cable
USB Cable	-	-	-	-	3.0 M Shield Cable
R-Load	IRF500NC	8 ohm	RARA	N/A	1.0 M non Shield Cable
RS-232C	-	-	-	-	2.0 M Shielded
Notebook	CM2080	P-III	Compaq	5Y12FP74KC49	
Notebook Adapter	PA-1600-02		Lite-Elec.		2.0M Shield cable
Printer	Stylus C-80		Epson	G3FE005162	2.0M Shield D-sub cable
Keyboard	ACK-206	-	Solid Year	910044844	1.8M shield Din cable
PS/2 Mouse	SMP2000WX	-	Samsung	N/A	1.8M shield Din cable

TEST DATA

Conducted Emissions

FCC ID : RO3AVR445

1. Test Mode : Tuner FM 98.0 MHz

Frequency (MHz)	Level(dB μ V)		Line	Limit(dB μ V)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	40.4	16.0	N	66.0	56.0	25.6	40.0
0.16	37.3	15.2	N	65.5	55.5	28.2	40.3
1.78	29.8	29.0	N	56.0	46.0	26.2	17.0
2.26	28.9	27.1	N	56.0	46.0	27.1	18.9
3.57	25.2	24.0	L1	56.0	46.0	30.8	22.0
15.77	22.7	13.9	N	60.0	50.0	37.3	36.1

2. Test Mode : DVD 7CH Stereo Mode

Frequency (MHz)	Level(dB μ V)		Line	Limit(dB μ V)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	40.2	18.2	N	66.0	56.0	25.8	37.8
0.16	37.8	16.2	N	65.5	55.5	27.7	39.3
1.36	38.9	38.3	N	56.0	46.0	17.1	7.7
1.63	42.2	41.7	N	56.0	46.0	13.8	4.3
2.11	36.6	34.8	L1	56.0	46.0	19.4	11.2
4.22	33.5	29.0	L1	56.0	46.0	22.5	17.0

Table 1. Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using CISPR quasi-peak mode
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3. The limit for Class B device is on the FCC part section 15.107 (a).
4. LINE : L1 =Line , N = Neutral



Tested by **Jae Young, Yu**

TEST DATA

1. Radiated Emissions (Receiving Mode)

FCC ID : RO3AVR445

T.Freq.* (MHz)	Freq. (MHz)	Reading (dB μ V)	AFCL+ Amp. (dB)**	Pol *** (H/V)	Limit (dB μ V)	Result (dB μ V)	Margin (dB)
87.5	98.20	37.1	-11.51	V	43.5	25.6	17.90
	196.40	40.7	-9.48	H	43.5	31.2	12.30
	294.60	43.5	-8.35	H	46.0	35.1	10.90
	392.80	41.9	-7.21	H	46.0	34.7	11.30
98.0	108.70	39.7	-11.35	V	43.5	28.3	15.20
	217.40	38.6	-9.70	H	46.0	28.9	17.10
	326.10	39.5	-8.30	H	46.0	31.2	14.80
	434.80	26.5	-6.05	H	46.0	20.4	25.60
108.0	118.70	41.6	-11.24	V	43.5	30.4	13.10
	237.40	47.5	-10.02	V	46.0	37.5	8.50
	356.10	35.8	-8.36	H	46.0	27.4	18.60
	474.80	32.7	-5.00	H	46.0	27.7	18.30

Table 2. Radiated Measurements at 3meters.

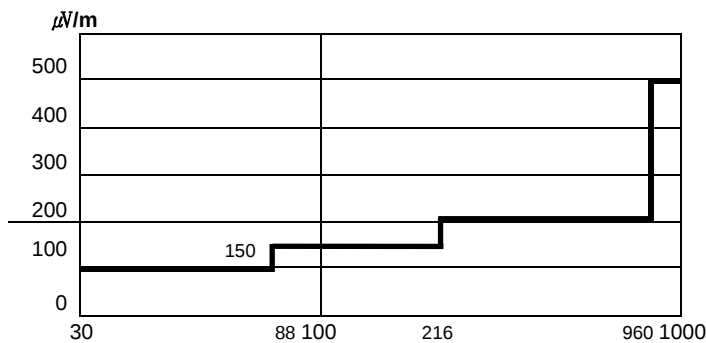


Fig. 4. Limits at 3 meters

NOTES:

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

* T.Freq = Turning Frequency

** AFCL+Amp. = Antenna Factor + Cable Loss + Amplifier

*** 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.



Tested by **Jae Young, Yu**

TEST DATA

2. Radiated Emissions (Others)

FCC ID : RO3AVR445

Test Mode : DVD Analog 7CH Stereo Mode

Frequency (MHz)	Reading (dB μ V)	Pol* (H/V)	AFCL+ Amp. (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
65.43	42.2	V	-16.6	25.6	40.0	14.4
86.01	37.8	H	-13.1	24.7	43.5	18.8
148.49	41.3	H	-8.3	33.0	43.5	10.5
233.47	51.8	H	-9.9	41.9	46.0	4.1
256.49	51.0	V	-9.8	41.2	46.0	4.8
283.50	48.6	V	-8.9	39.7	46.0	6.3
319.48	44.9	H	-7.8	37.1	46.0	8.9
393.21	48.0	V	-7.2	40.8	46.0	5.2
442.37	46.5	H	-5.8	40.7	46.0	5.3
491.51	45.9	H	-4.8	41.1	46.0	4.9
516.09	43.3	V	-4.6	38.7	46.0	7.3
638.97	40.0	V	-1.8	38.2	46.0	7.8
884.71	38.2	V	2.5	40.7	46.0	5.3

* Above 1GHz : Not significant or detectable.

Table 2. Radiated Measurements at 3meters

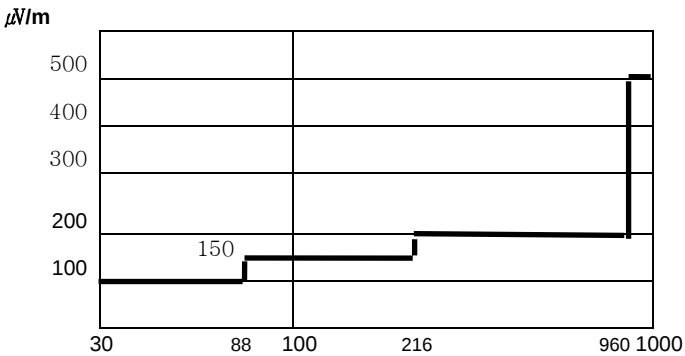


Fig. 4. Limits at 3 meters

- NOTES:**
1. All modes of operation were investigated the worst-case emission are reported.
 2. The radiated limits are shown on Figure 4.
Above 1GHz the limit is 500μV/m.

- * Pol. H =Horizontal V=Vertical
- ** AFCL+Amp. = Antenna Factor + Cable Loss + Amplifier.
- *** 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.

Tested by **Jae Young, Yu**

TEST DATA

1. Antenna Power Conducted Emissions (*Receiving Mode*)

FCC ID : RO3AVR445

T.Freq.* (MHz)	Freq. (MHz)	Level (dB μ V)	MPL** (dB)	Limit (dB μ V)	F/S (dB μ V)	Margin*** (dB)
87.5	98.20	29.8	7.5	50.0	37.30	12.70
	196.40	20.5	7.5	50.0	28.00	22.00
	294.60	11.1	7.5	50.0	18.60	31.40
	392.80					
	491.00	-				
	589.20	-	More than 30dB Margin			
	687.40	-				
	758.60	-				
	883.80	-				
	982.00	-				
98.0	108.70	30.1	7.5	50.0	37.60	12.40
	217.40	22.5	7.5	50.0	30.00	20.00
	326.10	13.2	7.5	50.0	20.70	29.30
	434.80	10.5	7.5	50.0	18.00	32.00
	543.50		More than 30dB Margin			
	652.20					
	760.90					
	869.60					
	978.30					
108.0	118.70	30.2	7.5	50.0	37.70	12.30
	237.40	24.6	7.5	50.0	32.10	17.90
	356.40	13.6	7.5	50.0	21.10	28.90
	474.80	12.6	7.5	50.0	20.10	29.90
	593.50		More than 30dB Margin			
	712.20					
	830.90					
	949.60					

Table 4. Antenna Power Conducted Emissions Tabulated Data

NOTES ;

1. All modes of operation were investigated the worst-case emission are reported.
2. The limits is 2.0 nanowatts from 30MHz to 960MHz.

* T.Freq = Turning Frequency.

** MPL = Matching Pad Loss.

*** Measurements using CISPR quasi-peak mode.



Tested **Jae-Young, Yu**

2. Antenna Power Conducted Emissions (*Others*)

FCC ID : RO3AVR445

Freq. (MHz)	Level (dB μ V)	MPL** (dB)	Limit (dB μ V)	F/S (dB μ V)	Margin*** (dB)
		7.5	50.0		
		7.5	50.0		
		7.5	50.0	More than 20dB Margin	
		7.5	50.0		
		7.5	50.0		
		7.5	50.0		

Table 5. Antenna Power Conducted Emissions Tabulated Data

NOTES:

1. All modes of operation were investigated the worst-case emission are reported.
2. The limits is 2.0 nanowatts from 30MHz to 960MHz.

* T.Freq = Turning Frequency.

** MPL = Matching Pad Loss.

*** Measurements using CISPR quasi-peak mode.



Tested **Jae-Young, Yu**

PLOTS OF EMISSIONS

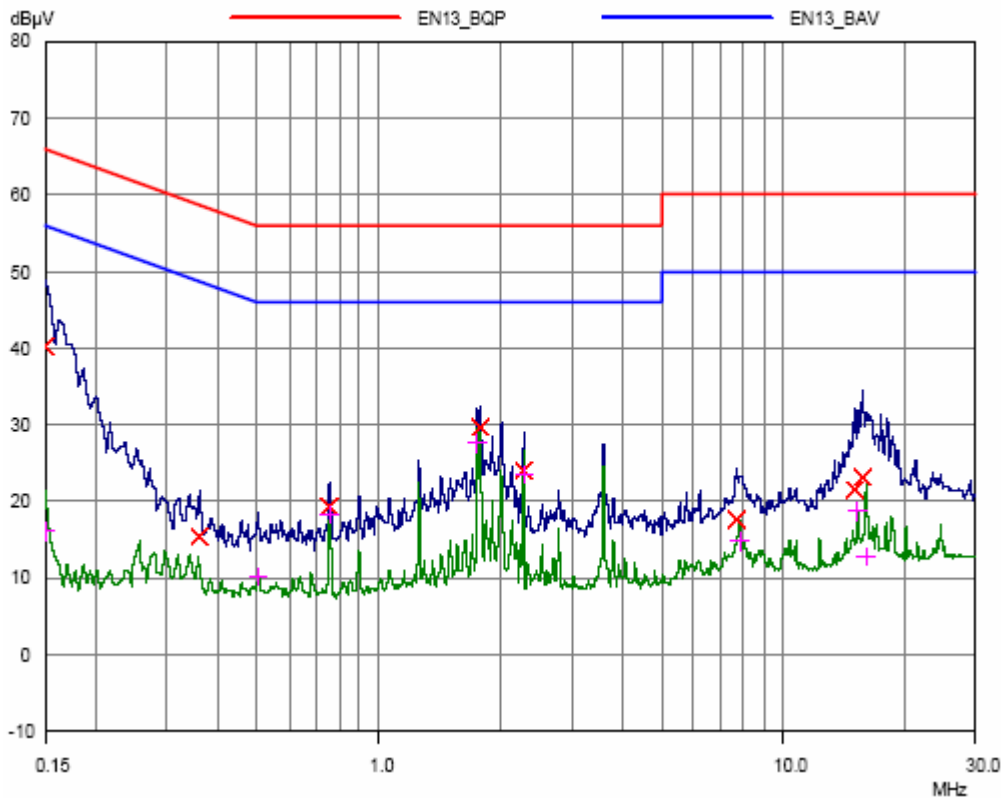
1-1. Tuner Mode (L1)

NEMKO KOREA (NK-2G-E521)

Conducted Emissions

EUT: AV Receiver
Manuf: Danech (Harman Kardon)
Op Cond: FM Tuner 98.0MHz (1kHz Audio Signal)
Operator:
Test Spec: FCC Class B
Comment: Model : AVR445
LINE : L1

Scan Settings		(1 Range)			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	1	150kHz	30MHz	CE_LINE					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	8						
		Acc Margin:	40 dB						



[Signature]

Tested **Jae-Young, Yu**

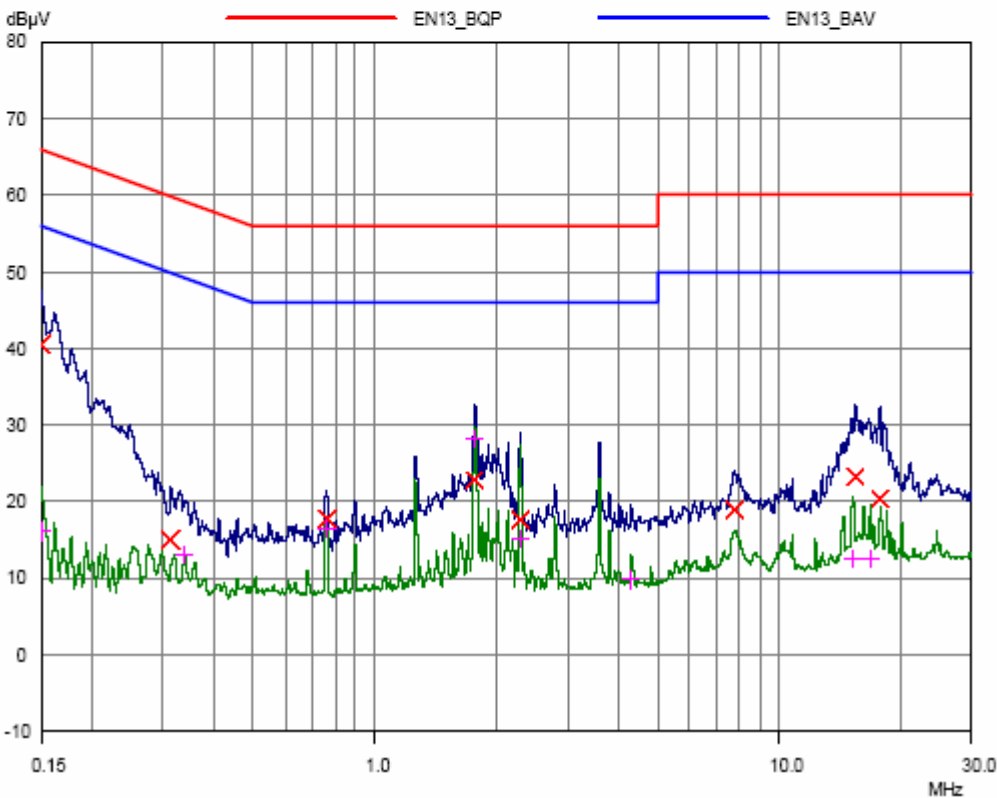
1-2. Tuner Mode (Neutral)

NEMKO KOREA (NK-2G-E521)

Conducted Emissions

EUT: AV Receiver
Manuf: Danech (Harman Kardon)
Op Cond: FM Tuner 98.0MHz (1kHz Audio Signal)
Operator:
Test Spec: FCC Class B
Comment: Model : AVR445
LINE : Neutral

Scan Settings		(1 Range)			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	1	150kHz	30MHz	CE_NEUT					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	8						
		Acc Margin:	40 dB						



Jae-Young, Yu

Tested **Jae-Young, Yu**

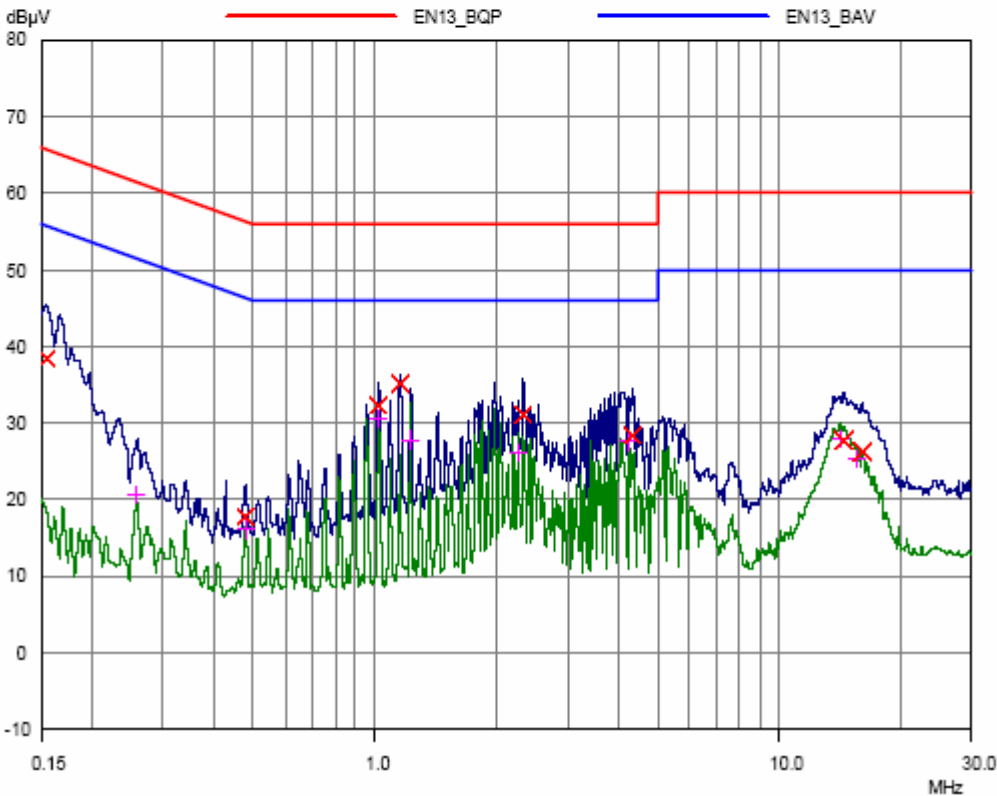
2-1. DVD Mode (L1)

NEMKO KOREA (NK-2G-E521)

Conducted Emissions

EUT: AV Receiver
Manuf: Danech (Harman Kardon)
Op Cond: DVD 7CH Stereo mode (1kHz Audio Signal)
Operator:
Test Spec: FCC Class B
Comment: Model : AVR445
LINE : L1

Scan Settings		(1 Range)			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	1	150kHz	30MHz	CE_LINE					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	8						
		Acc Margin:	40 dB						



[Signature]

Tested **Jae-Young, Yu**

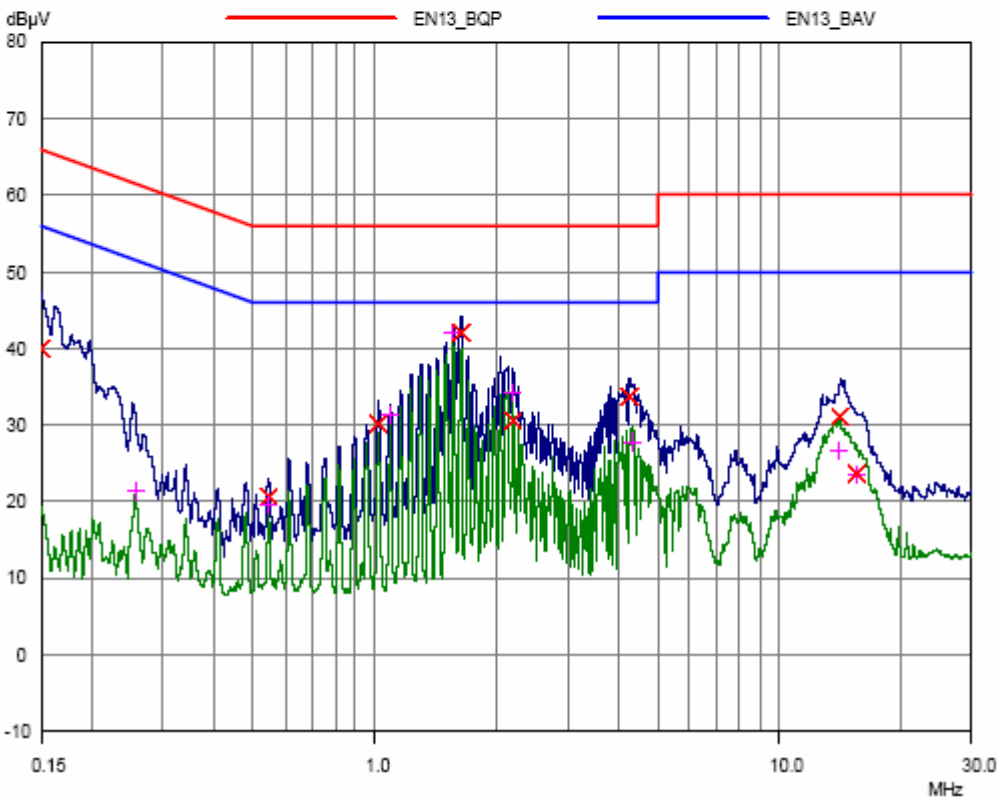
2-2. DVD Mode (Neutral)

NEMKO KOREA (NK-2G-E521)

Conducted Emissions

EUT: AV Receiver
Manuf: Danech (Harman Kardon)
Op Cond: DVD 7CH Stereo mode (1kHz Audio Signal)
Operator:
Test Spec: FCC Class B
Comment: Model : AVR445
LINE : Neutral

Scan Settings		(1 Range)			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	1	150kHz	30MHz	CE_NEUT					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	8						
		Acc Margin:	40 dB						



[Signature]

Tested **Jae-Young, Yu**

SAMPLE CALCULATIONS

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

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

EX. 1.

@57.7 MHz

Class B limit = 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$

Reading = 19.1 dB μV (calibrated level)

Antenna factor + Cable Loss = 10.12 dB

Total = 29.22 dB $\mu\text{V}/\text{m}$

Margin = 40.0 - 29.22 = 10.78

10.78 dB below the limit

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		
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 Repeatibility	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 Repeatibility	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Due to Calibration
1. EMI TEST SYSTEM				
1	* Test Receiver	R & S	ESCS 30	2006. 08
2	* Test Receiver	R & S	ESCS 30	2006. 12
3	* Amplifier	HP	8447F	2006. 08
4	* Amplifier	HP	8447F	2007. 03
5	Spectrum Analyzer	HP	8568B	2006. 10
6	Spectrum Analyzer	Advantest	R4136	2006. 12
7	* Logbicon Super Antenna	Schwarzbeck	VULB9166	2007. 02
8	Loop Antenna	EMCO	6502	2006. 12
9	Dipole Antenna	R & S	VHA9103	2007. 05
10	Dipole Antenna	R & S	UHA9105	2007. 05
11	Biconical Log Antenna	ARA	LPB-2520/A	2007. 05
12	Absorbing Clamp	R & S	MDS21	2007. 06
13	High Voltage Probe	R & S	ESH2-Z3	2006. 09
14	Signal Generator	R & S	SMP02	2006. 08
15	* Matching Pad	R & S	RAM358_5414.02	2007. 05
16	* LISN	R & S	ESH3-Z5	2006. 10
17	* LISN	Kyoritsu	KNW-407	2007. 03
18	LISN	Kyoritsu	KNW-408	2006. 12
19	* Position Controller	Daeil EMC	N/A	N/A
20	* Turn Table	Daeil EMC	N/A	N/A
21	* Antenna Mast	Daeil EMC	N/A	N/A
22	* Anechoic Chamber	EM Eng.	N/A	N/A
23	* Shielded Room	EM Eng.	N/A	N/A
24	* Anechoic Chamber	Seo-Young EMC	N/A	N/A
25	* Shielded Room	Seo-Young EMC	N/A	N/A

*) Test Equipment used during the test.

No.	Instrument	Manufacturer	Model	Due to Calibration
2. RADIATED IMMUNITY SYSTEM				
1	Signal Generator	R & S	SMY01	2007. 04
2	Function Generator	HP	33.20A	2007. 04
3	Power Amplifier	Noiseken	NA25MF1G2010C	2006. 11
4	Power Sensor	HP	8482A	2007. 04
5	Power Meter	HP	E4419B	2007. 04
6	Biconical Antenna	EMCO	3109	2007. 05
7	Biconical log Antenna	ARA	LPB-2520/A	2007. 05
8	Wideband field probe	CHASE	EMC-20	2007. 03
3. CONDUCTED IMMUNITY SYSTEM				
1	Power Amplifier	Noiseken	NA01K80M5C	2006. 11
2	Current Monitor Probe	FCC	NMP-33-1	2007. 03
3	Attenuator	TME	CFA-10NPJ-20	N/A
4	Attenuator	TME	CFA-100ANJJ-3	N/A
5	CDN	FCC	NCDN-M1-16A	2007. 06
6	CDN	FCC	NCDN-M2-16A	2007. 06
7	CDN	FCC	NCDN-M3-16A	2007. 06
8	CDN	FCC	NCD-T2	2007. 06
9	CDN	FCC	NCD-T4	2007. 06
10	150-50ohm adapter	FCC	NCDN-150-50-CF	2006. 09
11	Termination	TME	CT-01BP	N/A
12	Termination	TME	CT-10NP	N/A
13	EM Clamp	FCC	NEM-32mm EM Clamp	2006. 09

*) Test Equipment used during the test.

RECOMMENDATION/CONCLUSION

The data collected shows that the **WOORI Technology Inc.**

FCC ID: RO3AVR445, AV Receiver (Model: AVR445) complies with §15.107 and 15.109 and 15.111 of the FCC Rules.

The highest emission observed was at 1.78 MHz for FM Tuner mode of conducted emissions with a average margin of 17.0 dB and at 1.63 MHz for DVD analog 7CH stereo Mode of conducted emissions with a average margin of 4.3 dB and at 237.4 MHz for radiated emissions FM receiving mode with a margin of 8.5 dB and at 233.47 MHz for radiated emissions others mode with a margin of 4.1 dB and at 118.7 MHz for antenna power conducted emissions with a margin of 12.3 dB.

APPENDIX B – CIRCUIT DIAGRAM

APPENDIX C – TEST PHOTOGRAPHS

The **Line-Conducted** and **Radiated Test Picture** show the worst-case configuration and cable placement.

APPENDIX D – EUT PHOTOGRAPHS

APPENDIX E – USER'S MANUAL

APPENDIX F – Schematic Diagrams
