

Electromagnetic Emission

F C C M E A S U R E M E N T R E P O R T

Certification OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : Digital Video Station
MODEL/TYPE NO : MVS-500
FCC ID : PN7MVS-500
APPLICANT : Macro Image Technology, Inc.
East Bldg., 6th Floor, IT Venture Tower, 78 Garakbon-Dong
Songpa-Gu, Seoul, Korea 138-803
Attn. : Jae-Won, Lee / Engineer
FCC CLASSIFICATION : FCC Part 15 Subpart B
FCC RULE PART(S) : Part 15 Class B Computing Device Peripheral (JBP)
FCC PROCEDURE : Certification
TRADE NAME : Macro Image Technology, Inc.
TEST REPORT No. : E02.1217.FCC.859N
DATES OF TEST : December 13~16, 2002
DATES OF ISSUE : December 17, 2002
TEST LABORATORY : ETL Inc (FCC Registration Number : 95422)
#584 Sangwhal-ri, Kanam-myun, Youju-kun, 469-885
Kyounggi-do, Korea
Tel : (031) 885-0072 Fax : (031) 885-0074

This Digital Video Station, Model MVS-500 has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been show to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part 15, Computer peripheral Devices.

I attest to the accuracy of data. All measurement herein are 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.

The results of testing in this report apply to the product / system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Yo Han, Park

Name : Yo Han, Park

Title : Chief Engineer & Lab.Manager



E-RAE Testing Laboratory Inc.
#584 Sangwhal-ri, Kanam-myun, Youju-kun, 469-885 Kyounggi-do, Korea

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FCC MEASUREMENT REPORT

Scope – *Measurement and determination of electromagnetic emission (EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission (FCC)*

General Information

Applicant Name : Macro Image Technology, Inc.

Address : East Bldg., 6th Floor, IT Venture Tower, 78 Garakbon-Dong, Songpa-Gu, Seoul, Korea 138-803

Attention : Jae-Won, Lee / Engineer

- **EUT Type** : Digital Video Station
- **Model Number** : MVS-500
- **FCC Identifier** : PN7MVS-500
- **S/N** : NONE
- **Modulation** : NONE
- **FCC Rule Part(s)** : FCC Part 15 Subpart B
- **Test Procedure** : ANSI C63.4-1992
- **FCC Classification** : Part 15 Class B Computing Device Peripheral (JBP)
- **Dates of Tests** : December 17, 2002
- **Place of Tests** : ETL Inc
 - EMC Testing Lab (FCC Registration Number : 95422)
 - 584, Sangwhal-Ri, Kanam-Myon, Yaju-Kun, 469-885
 - Kyounggi-Do, Korea
 - Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No.** : E02.1217.FCC.859N

1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myon, Youju-kun, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 22. The ETL has site descriptions on file with the FCC for 3 and 10 meters site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission (Registration Number : 95422).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-1992) was used in determining radiated and conducted emissions from the Model : MVS-500

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test(EUT) is the Macro Image Technology, Inc. M/N:MVS-500
Please refer to Users manual

2.2 General Specification

- Antenna Input : Input Frequency : 54MHz ~ 860MHz (VSB)
: Antenna Impedance : 75Ohms
: ConnectornType : IEC 169-2, Female, F type (VSB)
: Symbol Rate : 10.76 MS/s (VSB)
- Demultiplexer : Stream Format : MPEG-2 Transport Stream
: Data Rates : up to 40 Mbps
: PID : Controls up to 32 PID
- Video : Algorithm : HDTV : MPEG-2 Main Profile @ High Level
SDTV : MPEG-2 Main Profile @ Main Level
: Decoding Format : All of ATSC Digital TV Standards
: Display Format : HD : 1920*1080P, 1920*1080i, 1280*720P etc.
SD : 720*480P, 720*480i
- Audio : Mode : Dolby AC-3, Dolby Pro Logic
: Sampling Rate : 32, 44.1, and 48kHz
: Frequency Response : 20Hz~20KHz, <+/-2 Db, 60Hz~18KHz, <+/-0.5 dB
- A/V Input : Video Input Signal : Composite(480i), S-video(480i), Component(480i),
VGA (up to 1024*768P 60Hz), Component(DTV : 480p, 720p, 1080i)
: Video Connector : 1*RCA(composite), Mini-Din(S-video), 3*RCA
(component: 480i), DSUB-15(VGA), 3*RCA(component: DTV)
: Audio Input Signal : Analog 2 channels(L,R)
4 Input(composite/s-video, component(480i),DSUB-15, component(DTV))
: Audio Connector : 2*RCA
- A/V Output : Video Output Signal : Analog : RGB(1 Vpp with 75 Ohms), YpbPr(2 Vpp with 75 Ohms)
Digital : DVI-D(TMDS)

Video Format : Analog : 480i, 480p, 720p, 768p, 1024p, 1080i, 1080p

Digital : 480p, 720p, 768p, 1024p, 1080i, 1080p

Video Connector : 5*BNC(Y/G,Pb/B,Pr/R,H,V), DSUB-15(RGBHV), DVI-D

Video Sync : 5*BNC(Tri/Bi-level sync on Y separate H & V)

Audio Output Signal : Analog : 2 channels (L,R)

Digital : S/PDIF (5.1-Ch. Dolby AC-3 or 2-Ch. PCM)

Audio Connector : Analog : 2*RCA,

Digital : Optical : Optical and Coaxial(1*RCA)

● Function Free-to Air : Yes, Multi-Lingual : Yes, Screen Size : 16:9 / 4:3

On Screen Display : Yes, Channel Memory : Max.1,024

Firmware Download : RS232-C Port

● Memory Flash Memory : 4Mbytes, DRAM : 8Mbytes, EEPROM : 32Kbytes

Frame Buffe Memory : 16Mbytes

● Power Power : 100V~250V AC, 47Hz~63Hz

Power Consumption : 34W

Standby Power : <5W Consumption

Protection : Separate internal fuse

● Environmental Operating Temperature : 0 ~ +45

Condition Storage Temperature : -10 ~ +50

Operating Humidity : 10% ~ 85% RH Non condensed

Storage Humidity : 5% ~ 90% RH Non condensed

Weight : 3.6Kg

Dimension : 380mm * 275mm * 65mm

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50 /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 a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located inside a shielded room 1m X 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the side wall of the shielded room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from another EMCO LISN. Power to the LISN is filtered by a noise cut 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 these supply lines will be connected to the EMCO LISN. Non-inductive bundling to a 1m length shortened all interconnecting cables more than 1m. Sufficient time for the 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 R3261A Spectrum Analyzer to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

3. DESCRIPTION OF TESTS

3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with ANSI C63.4-1992. The measurements were 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 measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determined the frequency producing the max. emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using SchwarzBeck Log-Bicon antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 10-meters. The test equipment was placed on a wooden turn-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 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, support equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, support 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 max. emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Test Setup photos.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

4.2 EUT operation

Operating Mode	The worst operating condition
Stand Mode	X
"H" Pattern display Mode	0
DVD Play Mode	X
TV Signal Receiving Mode	X

O : Worst case investigated during the Test

4.3 Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

EUT – Digital Video Station

FCC ID : PN7MVS-500
Model Name : MVS-500
Serial No. : N/A
Manufacturer : Macro Image Technology, Inc.
Power Supply Type : Switching
Power Cord : Non-shielded, Detachable: 1.5m
Port : ANT IN: 1, I-Link: 2, S-VHS: 1, Audio In: 2, Composite: 1, DVD In: 5, DTV In: 5, RGB In: 1, PC Audio In: 2, RGB Out: 1, DVI-D Out: 1, Audio Out: 3, Optical: 1, RGB BNC Out: 5

Support Unit 1-Personal computer (DELL)

FCC ID : N/A (DOC)
Model Name : MMP
Serial No. : SK1W31S
Manufacturer : DELL
Power Supply Type : Switching
Power Cord : Non-shielded, Detachable: 1.2m
Port : Parallel: 1, USB: 2, Keyboard: 1, Mouse: 1, RS-232: 2, RGB: 1
RJ-45:1, Audio in: 1, Audio out: 1, MIC in: 1

Support Unit 2-Keyboard (DELL)

FCC ID	: N/A (DOC)
Model Name	: SK-8000
Serial No.	: N/A
Manufacturer	: DELL
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Shielded, 1.5m

Support Unit 4-Mouse (LOGITECH)

FCC ID	: N/A
Model Name	: M-S48a
Serial No.	: 9K1W31S
Manufacturer	: LOGITECH
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Non-Shielded, 1.2m

Support Unit 5- Monitor (E-RAE)

FCC ID	: OIOELM-150
Model Name	: ELM-150B
Serial No.	: N/A
Manufacturer	: E-RAE Electronics Industry Co., Ltd.
Power Supply Type	: DC12V From Adaptor, Switching
Power Cord	: Non-shielded, Detachable: 1.2m
Data Cable	: Shielded 15pin D-sub, 1.5m

Support Unit 7- DVD (Alpha Cast)

FCC ID	: N/A
Model Name	: DVDP-M100
Serial No.	: N/A
Manufacturer	: Alpha Cast
Power Supply Type	: DC12V From Adaptor, Switching
Power Cord	: Non-shielded, Detachable: 1.2m
Port	: Audio Input: 6, Audio Output: 3, Component Video: 3, S-VHS: 1,

5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule Parts	Measurement Required	Result
15.107(e)	Conducted Emission Measurement	Passed by -11.10dB
15.109(e)	Radiated Emissions Measurement	Passed by -4.45dB

The data collected shows that the **Macro Image Technology, Inc. Digital Video Station** complies with technical requirements of above rules part 15.107(e) and 15.109(e) Class B Limits.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement.

No EMI suppression device(s) was added and/or modified during testing.

5. TEST RESULTS

5.2 Conducted Emissions Measurement

EUT	Digital Video Station /MVS-500 (SN: N/A)
Limit apply to	15.107(e) : CISPR Pub.22(1997) Class B
Test Date	December 13, 2002
Operating Condition	Test Program executed "H" Pattern display & TV Signal Receiving,
Environment Condition	Humidity Level : 32 %RH, Temperature : 21
Result	Passed by -11.10dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarization of live and neutral line.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 9 KHz)

Frequency [MHz]	Reading [dB μ V]		Phase (*H/**N)	Limit [dB μ V]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Q. Peak	Average
0.162	36.60	-	N	65.36	55.36	28.76	-
0.186	32.70	-	N	64.21	54.21	31.51	-
0.486	43.20	-	N	56.23	46.23	13.03	-
0.890	43.10	-	N	56.00	46.00	12.90	-
1.080	43.50	31.70	N			12.50	14.30
4.145	44.90	29.30	N			11.10	16.70
14.17	47.30	30.00	N	60.00	50.00	12.70	20.00
15.64	41.30	-	N			18.70	-
18.89	36.10	-	N			23.90	-
23.68	32.30	-	H			27.70	-

NOTES :

1. * H : HOT Line , **N : Neutral Line
2. Margin value = Limit – Reading
3. Measurement were performed at the AC Power Inlet of PC in the frequency band of 150kHz ~ 30MHz according to the CISPR 22 Class B
4. If the Reading Quasi-Peak value is bellowed the Average Limit, Do not test Average Mode.

Ho Jin, Kim

Tested by : Ho Jin, Kim
 Test Engineer

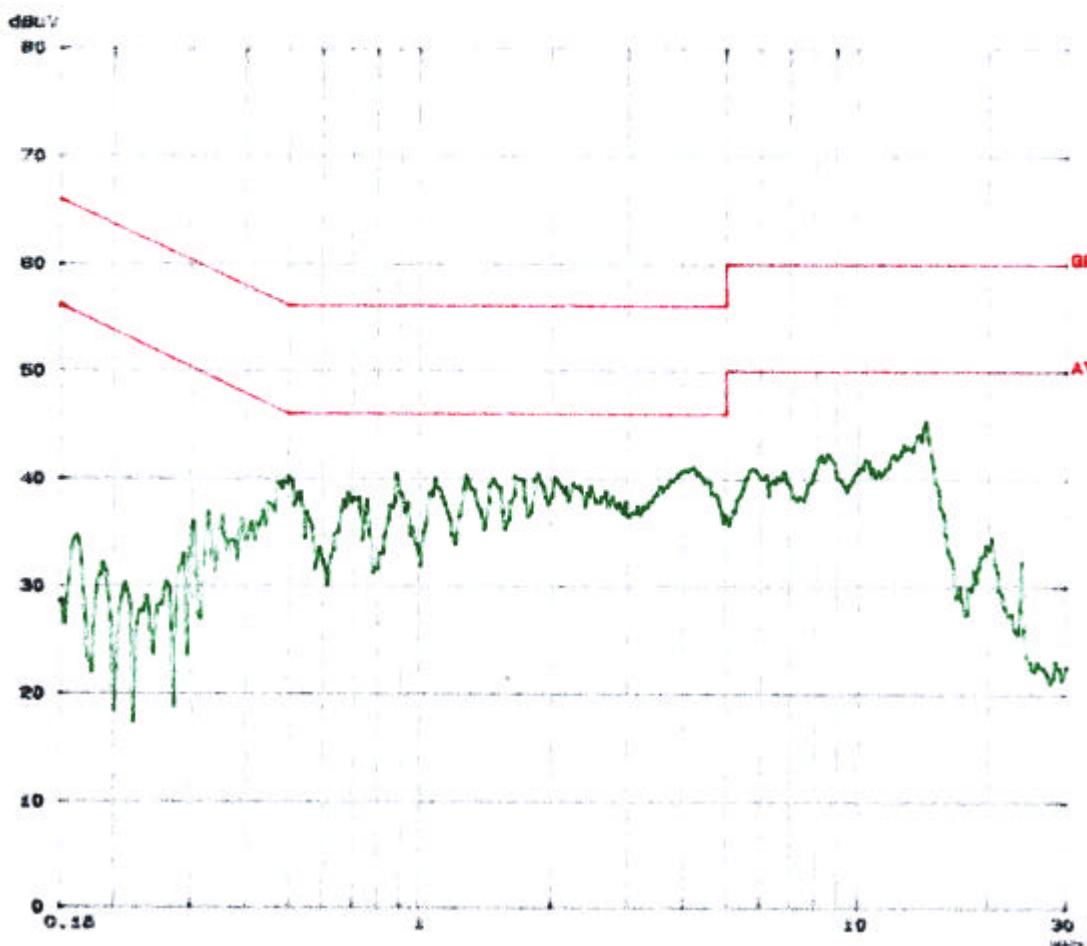
5. TEST RESULTS

Line Polarity : Hot

ETL INC.
CONDUCTED EMISSION

EUT: MVS-500
Manuf: MACRO
Test Spec: CLASS B
Comment: HOT

Scan Settings (3 Ranges)
Frequencies Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150K 500K 2K 10K PK 20ms AUTO LN OFF 60dB
500K 5M 5K 10K PK 20ms AUTO LN OFF 60dB
5M 30M 10K 10K PK 20ms AUTO LN OFF 60dB
Final Measurement: x GP Transducer No. Start Stop Name
Meas Time: 1 s 1 100K 30M EN55022
Subranges: 50
Acc Margin: 3dB



5. TEST RESULTS

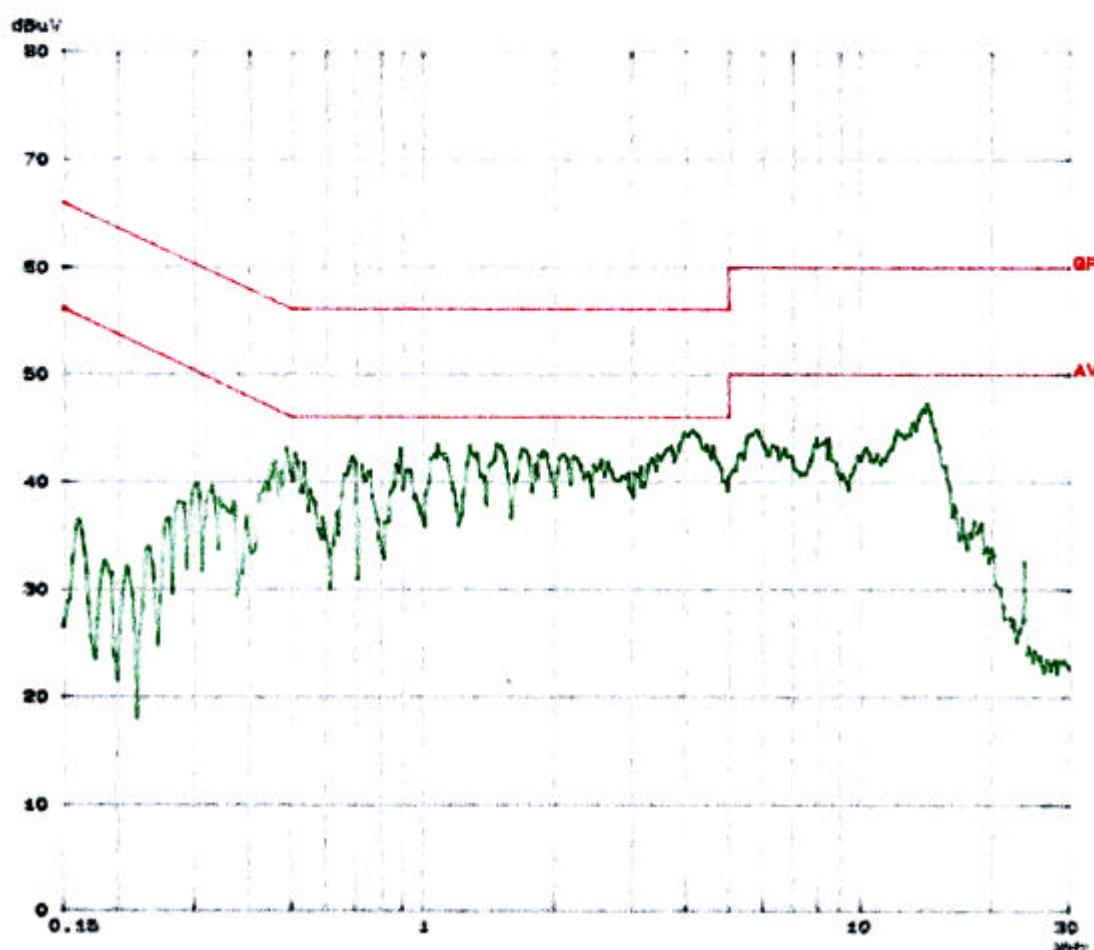
Line Polarity : Neutral

ETL INC.
CONDUCTED EMISSION

EUT: MVS-500
Manuf: MACRO
Test Spec: CLASS B
Comment: NEUTRAL

Scan Settings (3 Ranges)
| ----- Frequencies ----- | ----- Receiver Settings ----- |
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150K 500K 2K 10K PK 20ms AUTO LN OFF 60dB
500K 5M 5K 10K PK 20ms AUTO LN OFF 60dB
5M 30M 10K 10K PK 20ms AUTO LN OFF 60dB

Final Measurement: x GP Transducer No. Start Stop Name
Meas Time: 1 s 1 100K 30M EN55022
Subranges: 50
Acc Margin: 3dB



5. TEST RESULTS

5.3 Out-of-band Radiated Emissions

EUT	Digital Video Station /MVS-500 (SN: N/A)
Limit apply to	15.109(e) : CISPR Pub.22(1997) Class B
Test Date	December 16, 2002
Operating Condition	Test Program executed "H" Pattern display & TV Signal Receiving,
Environment Condition	Humidity Level : 38 %RH, Temperature : 25
Result	Passed by - 4.45dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 120 kHz)

Measurement Distance : 10 meters

Frequency [MHz]	Reading [dB μ V]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Emission Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
43.76	7.83	V	11.98	1.65	21.50	30.00	8.50
60.00	6.97	V	11.03	2.00	20.00	30.00	10.00
82.90	11.41	V	7.34	2.26	21.00	30.00	9.00
163.00	3.45	V	12.77	3.28	19.50	30.00	10.50
196.62	7.06	V	9.08	3.87	20.00	30.00	10.00
540.70	4.48	H	17.64	6.38	28.50	37.00	8.50
742.50	2.12	H	21.16	7.57	30.85	37.00	6.15
783.00	2.90	H	21.67	7.93	32.50	37.00	4.50
810.03	2.01	H	21.88	8.16	32.05	37.00	4.95
816.80	2.43	H	21.92	8.20	32.55	37.00	4.45

NOTES :

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss
3. Margin value = Limit - Emission Level
4. The measurement was performed for the frequency range 30MHz ~ 1000MHz according to the CISPR 22 Class B

Ho Jin. Kim

Tested by : Ho Jin, Kim
 Test Engineer

6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

$$dB(\mu V/m) = 20 \log_{10} (\mu V /m) : \text{Equation 1}$$

$$dB\mu V = dBm + 107 : \text{Equation 2}$$

Example 1 : @ 4.145MHz

Class B Limit	=	630.9 uV	=	56 dBuV
Reading	=	44.90 dBuV		
Convert to uV	=	175.79 uV		
Margin	=	44.90	-	56.00 = -11.10
			=	-11.10 dB below Limit

Example 2 : @816.80 MHz

Class B Limit	=	70.79 uV	=	37.0 dBuV/m
Reading	=	2.43 dBuV		
Antenna Factor + Cable Loss	=	30.12 dB		
Total	=	32.55 dBuV/m		
Margin	=	32.55	-	37.00 = -4.45
			=	-4.45 dB below Limit

7. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Date
<input checked="" type="checkbox"/>	Spectrum Analyzer	R3261A	Advantest	21720033	03-10-23
<input checked="" type="checkbox"/>	Spectrum Analyzer	HP E7402A	HP	US39110107	03-05-16
<input checked="" type="checkbox"/>	Receiver	ESVS 10	R & S	835165/001	03-04-06
<input checked="" type="checkbox"/>	EMI Test Receiver	ESHS 30	R & S	040190/002	03-03-19
<input checked="" type="checkbox"/>	Preamplifier	HP8447D	HP	2944A07626	03-01-10
<input type="checkbox"/>	Preamplifier	HP 8347A	HP	2834A00544	03-05-23
<input checked="" type="checkbox"/>	LISN	3825/2	EMCO	9006-1669	02.12.27
<input checked="" type="checkbox"/>	LISN	3825/2	EMCO	9208-1995	02.12.27
<input checked="" type="checkbox"/>	TriLog Antenna	VULB9160	Schwarz Beck	3082	03-06-19
<input type="checkbox"/>	LogBicon	VULB9165	Schwarz Beck	2023	03-06-21
<input type="checkbox"/>	Dipole Antenna	VHAP	Schwarz Beck	964	03-05-03
<input type="checkbox"/>	Dipole Antenna	VHAP	Schwarz Beck	965	03-05-03
<input type="checkbox"/>	Dipole Antenna	UHAP	Schwarz Beck	949	03-05-03
<input type="checkbox"/>	Dipole Antenna	UHAP	Schwarz Beck	950	03-05-03
<input type="checkbox"/>	Broad band Horn Antenna	BBHA 9120 D	Schwarz Beck	277	03-11-03
<input checked="" type="checkbox"/>	Turn-Table	DETT-03	Daeil EMC	-	N/A
<input checked="" type="checkbox"/>	Antenna Master	DEAM-03	Daeil EMC	-	N/A
<input type="checkbox"/>	Plotter	7440A	H.P	2725A 75722	N/A
<input checked="" type="checkbox"/>	Chamber	DTEC01	DAETONG	-	N/A
<input type="checkbox"/>	Thermo Hygrograph	3-3122	ISUZU	3312201	03-12-20
<input type="checkbox"/>	BaroMeter	-	Regulus	-	-