



KOREA TOKIN EMC ENGINEERING CO., LTD

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TEST REPORT

Test Report No. : KTEOS-980023

NVLAP CODE: 200220-0

Client: ORION ELECTRIC CO., LTD.

Client Address: 165, Gong Dan-Dong, Gumi, Kyung-Buk, Korea, 730-030

Test item: Color Monitor

Model No.: OC-17DB07

Serial No.

N/A(Pre-Pro)

FCC ID : EWBOC17DB02

Receipt No.: KTE980122-98

Date of receipt:

22. Jan. 1998

Date of Issue 01. Apr. 1998

Testing location: KOREA TOKIN EMC ENGINEERING CO., LTD.

820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

Test specification: ANSI C63.4

Rule parts: FCC parts 15

Test Result The above mentioned product has been tested and passed.

prepared by: Y.H. Kang tested by: D.H. Kang/Assistant Manager reviewed by: Charlie Park / Manager & Chief Engineer

Kang 98/4/19

Date Name Signature

98/4/21

Date Name Signature

Charlie Park 98/4/21/98

Date Name Signature

Other Aspects:

Abbreviations: OK, Pass = passed
Fail = failed
N/A = not applicable

- This test report is not permitted to copy partly without our permission.
- This test result is dependent on only equipment to be used.
- This test result is based on a single evaluation of one sample of the above mentioned.
- This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.
- We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.



TEST SUMMARY

FCC ID : EWBOC17DB02

5.1.1 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE

Result: Pass

5.2.1 ELECTROMAGNETIC RADIATION DISTURBANCE

Result: Pass

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1. General

This report displays the emission and the immunity against disturbances of the tested product. If the tested product will be used with additional equipment other than those mentioned in this report or if the tested product will be used against the manufacturers description, the compliance with relevant standards for the system has to be ensured.

Any mentioning of Korea TOKIN EMC Engineering or testing done by Korea TOKIN EMC Engineering in connection with distribution or use of the product described in this report must be approved by Korea TOKIN EMC Engineering in writing.

2. Test Site

Korea Tokin EMC Engineering Co., Ltd.

2.1 Location

820-2, Wolmoon Ri, Wabu-Up,
Namyangju-Si, Kyunggi-Do, Korea

The test site is in accordance with ANSI C63.4 for measurement of radio interference.



2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

● EMI Radiation Test

Kind of Equipment	Type	S/N	Calibrated until
Field Strength Meter	ESVS 10	825120/013	02.99
Spectrum Analyzer	R3361A	11730187	06.98
Amplifier	8447F	3113A05153	03.99
Log Periodic Antenna	UHALP9107	91071238	02.99
Biconical Antenna	BBA9106	TB-01-1	02.99
Open Site Cable	N/A	ME-CO-1	06.98
Antenna Mast	5907	ME-01	N/A
Antenna & Turntable controller	5900	N/A	N/A
Amp & Receiver connection cable	N/A	ME-RC-1	06.98
Amp & Spectrum connection cable	N/A	ME-RC-2	06.98
50Ω Switcher	MP59B	M93083	06.98

● EMI Conducted Test

Kind of Equipment	Type	S/N	Calibrated until
Field Strength Meter	ESHS 10	862970/019	02.99
LISN	KNW-407	M632838-929-19	06.98
Conducted Cable	N/A	ME-CC-1	06.98

* Our calibration period of all equipment is at least 12 months.

2.3 Test Date

Application : 22. Jan. 1998
 Test : 22. Jan. 1998 ~ 02. Mar. 1998



2.4 Test Environment

See each test item's description.

3. Description of the tested samples

The EUT is Color Monitor.

** The reason of Class II Permissive change is bellows ;

- Change the type of Video pre-amp IC from national, LM1282 To Motorola, MC13282.
- Add Horizontal Blacking circuit
- Change the pattern layout of video PCB.

3.1 Rating and Physical Characteristics

Picture Tube	17" (16V) diagonal measurement
Input Signal	*D-SUB Input
	Analog RGB Video : 0.7Vp-p 75Ω Sync.:TTL Level
Sweep Frequency	Horizontal : 30-69KHz(Automatically) Vertical : 50-120Hz
Video Bandwidth	110MHz Max.
Display Area	Full size : 324x244mm
(16" Viewable size)	Preset Size : 305x225mm
Power Input	AC 100-240V, 50/60Hz(Free Voltage)
Dimensions	558(W) x 526(D) x 492(H) (Carton Box)
Weight	Gross : 19.2Kg Net:16.3Kg
Resolution	1280 dots x 1024 lines (Max.)

3.2 Submitted Documents

- Annex #1 Modification List - 1page
- Annex #2 ID Label Drawing - 1page
- Annex #3 Block Diagram - 1page
- Annex #4 Manual - 17pages
- Annex #5 Photographs of EUT - 14pages



4. Measurement Conditions

Testing Input Voltage : AC 120V, 60Hz

4.1 Modes of Operation

Independent modes of operation are operating at the maximum power consumption.
The equipment displayed "H" patterns at normal VGA mode(H=31.5kHz) and it's highest resolution(H=64kHz)

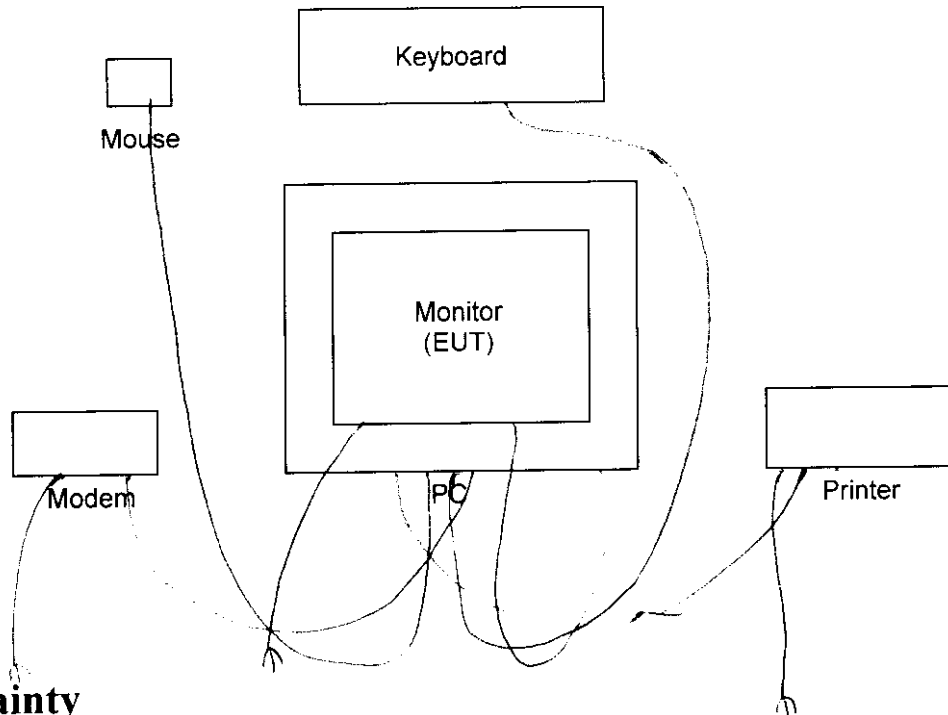
4.2 Additional Equipment for EUT

	Manufacturer	FCC ID	S/N	Cables & connectors
Color Monitor (EUT)	Orion Electric	EWBOC17DB02	N/A	1.8m non-shielded power cable 1.5m shielded cable
Personal Computer	Dell	E2KALTAL	N/A	1.8m shielded power cable
Keyboard	Dell	GYUR36SK	N/A	2.0m shielded cable
Printer	H.P	DSI6XU2225	N/A	1.8m non-shielded power cable 1.5m shielded interface cable
Serial Modem	Epson	BKM552C202A	N/A	1.8m non-shielded power cable 1.2m shielded interface cable
Mouse	Logitech	DZL211029	N/A	1.8m shielded cable
Video Board	ATI	EXM385	N/A	



4.3 Test Setup

External supply connections and interfaces are listed on the Test setup pictures.



4.4 Uncertainty

1) Radiated disturbance

$$U_c \text{ (Combined standard Uncertainty)} = \pm 1.9 \text{ dB}$$

$$\text{Expanded uncertainty } U = KU_c$$

$$K = 2$$

$$\therefore U = \pm 3.8 \text{ dB}$$

2) Conducted disturbance

$$U_c = \pm 0.88 \text{ dB}$$

$$U = KU_c = 2 \times U_c = \pm 1.8 \text{ dB}$$



5. Test Results EMISSION

5.1 AC Mains

5.1.1 Mains Terminal Continuous Disturbance Voltage

Result: Pass (tested by *SS/4/21*)

The EUT was placed on a non-conduction 1.0 by 1.5 meter table which is 0.8 meters in height. The line-conducted facility is located inside a (2.0 X 3.6 X 7.2) shielded enclosure and is placed 40cm away from the vertical wall. Power to the EUT and peripherals are provided through a 50 ohm/50 uH Line Impedance Stabilization Networks(LISNs) which are bounded to ground plane. Power to LISNs is filtered by high-power high-insertion loss power line filter. The power cables to the LISN are shielded by braided tinned copper zipper with 1.7" inner diameter. 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 LISN. AC power to the support equipment was obtained from the same filter source through a separate ganged outlet box.

All interconnecting cables more than 1 meter were shortened by non-inductive bundling to a 1-meter length. 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 spectrum was scanned from 450 kHz to 30 MHz with 20 msec sweep-time. Level was reexamined using spectrum analyzer and quasi-peak adapter or test receiver(ESHS 10). The detector function was set to CISPR quasi-peak mode. The bandwidth of the receiver was set to 9 kHz, The EUT support equipment, and interconnecting cables were arranged as ANSI C63.4.

Each emission was maximized by moving power cable; varying the mode of operation, clock or data exchanged speed; and by scrolling H pattern to the EUT and / or support equipment, if applicable, whichever determined the worst case emission. Photograph of the worst case emission can be seen in photograph of conducted test. Each EME reported was calibrated using self-calibration mode. 1m X 1.2m Metal plate is used to ground two LISNs. The Metal plate is grounded whole sides to shielded room ground by copper tape.



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Figure 1: Spectral Diagram, Hot Line (640x480 H=31.5kHz)

tested by

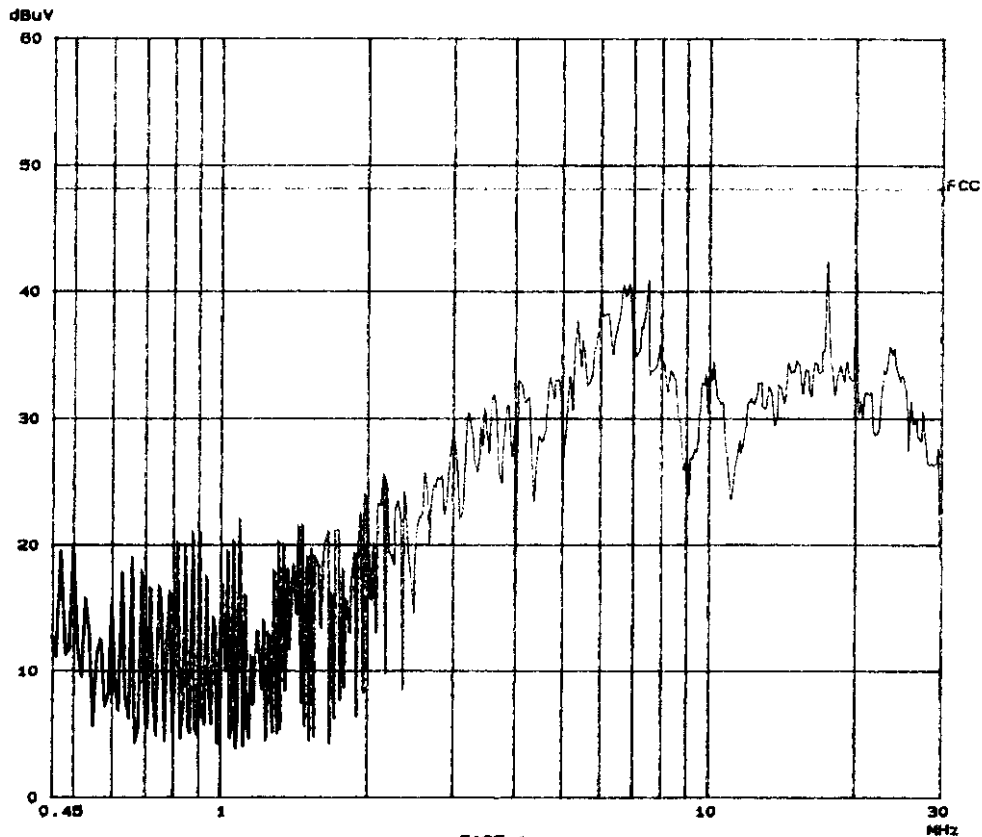
ss/0/24

EUT: FCC ID: EWBOC17DB02
Op Cond: 640X480 H=31.5kHz V=60Hz
Comment: LINE: HOT

02. Mar 98 18: 21

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
480k	30M	10k	10k	PK	100ms	AUTO	LN	OFF 60dB





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Figure 2: Spectral Diagram, Neutral Line(640x480 H=31.5kHz)

tested by

98/4/21

EUT: FCC ID: EWBOC17DB02
Op Cond: 640X480 H=31.5kHz V=60Hz
Comment: LINE: NEUTRAL

02. Mar 98 18:30

Scan Settings (1 Range)			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Presamp	OpAmp
480k	30M	10k	10k	PK	100ms	AUTO	LH	OFF

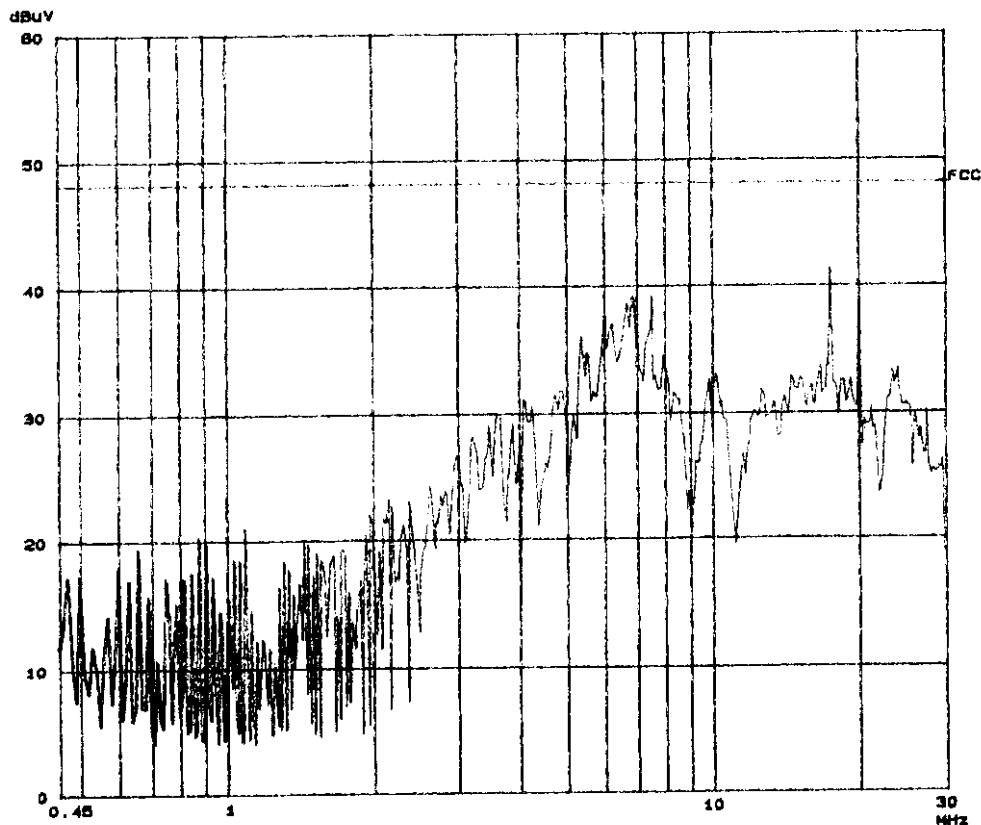




Figure 3: Spectral Diagram, Hot Line (1280x1024 H=64kHz)

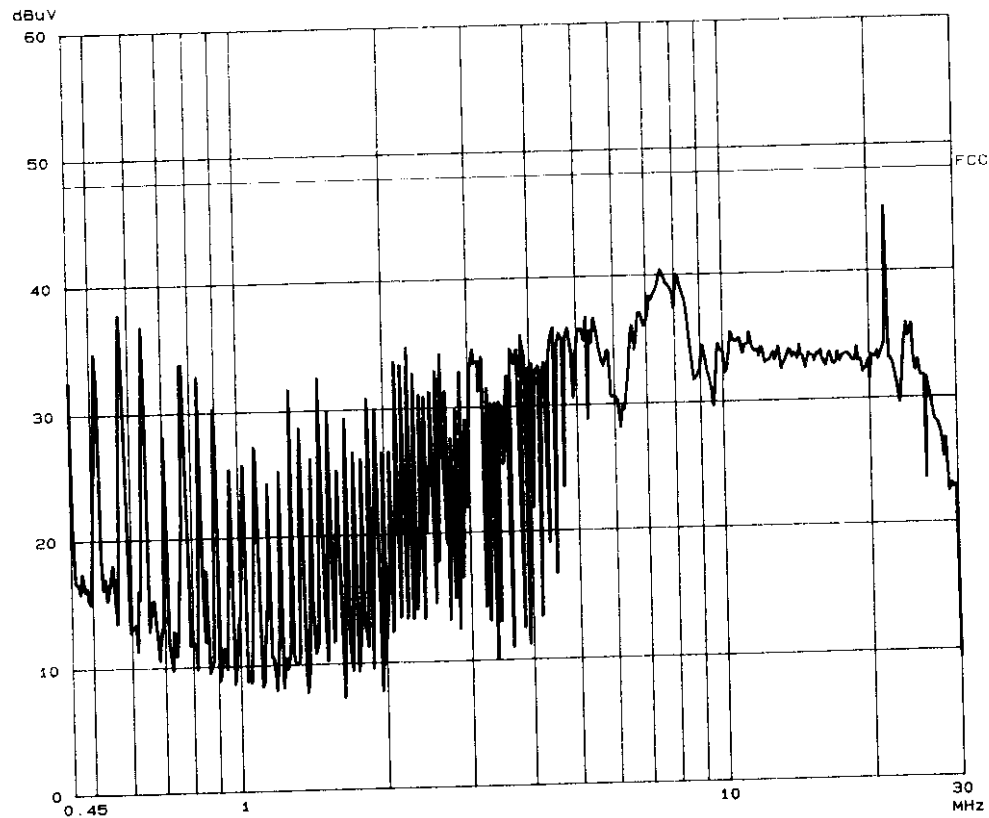
tested by

98/4/21

EUT: FCC ID: EWBOC17DB02
Op Cond: 1280X1024 H=64KHz V=60Hz
Comment: LINE: HOT

22. Jan 98 15:37

Scan Settings (1 Range)			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	100ms	AUTO	LN OFF	60dB





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Figure 4: Spectral Diagram, Neutral Line(1280x1024 H=64kHz)

tested by 98/4/21

EUT: FCC ID: EWBOC17DB02
Op Cond: 1280x1024 H=64kHz V=60Hz
Comment: LINE: NEUTRAL

22. Jan 98 15:23

Scan Settings (1 Range)			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450K	30M	5K	10K	PK	100ms	AUTO	LN	OFF 60dB

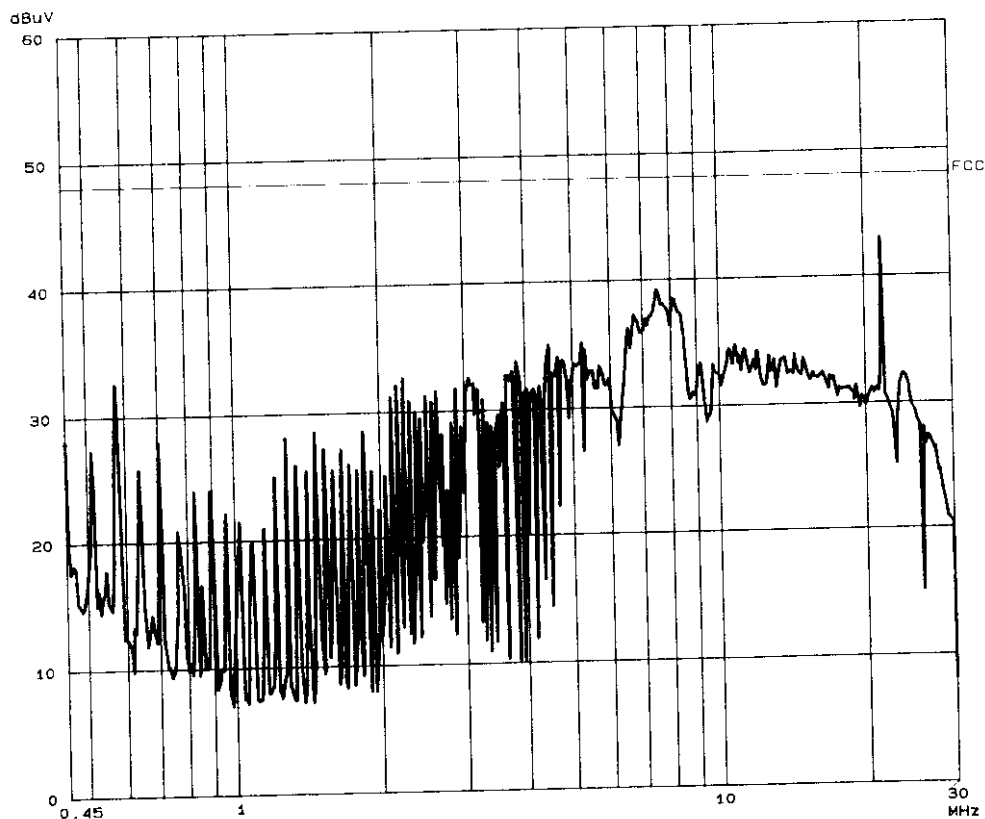




Figure 5: Test Data, Conducted Emission (640x480 H=31.5kHz)

Frequency (MHz)	Reading (dB μ V)	Line	C/F (dB)	C/L (dB)	Actual (dB μ V)	Limit (dB μ V)	Margin (dB)
5.442	37.4	A	0.3	0.2	37.9	48.0	10.1
6.008	37.7	A	0.3	0.2	38.2	48.0	9.8
6.826	40.5	A	0.3	0.2	41.0	48.0	7.0
7.550	38.5	A	0.3	0.2	39.0	48.0	9.0
17.619	40.6	A	0.4	0.4	41.4	48.0	6.6
20.137	40.2	A	0.6	0.5	41.3	48.0	6.7

NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emissions are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. Line A = Hot Line B = Neutral
6. C/F = Correction Factor
7. C/L = Cable Loss

Tested by

98/4/21



Figure 6: Test Data, Conducted Emission (1280X1024 H=64kHz)

Frequency (MHz)	Reading (dB μ V)	Line	C/F (dB)	C/L (dB)	Actual (dB μ V)	Limit (dB μ V)	Margin (dB)
0.574	37.3	A	0.1	0.0	37.4	48.0	10.6
0.639	36.9	A	0.0	0.0	36.9	48.0	11.1
5.503	35.0	A	0.3	0.2	35.5	48.0	12.5
7.489	40.5	A	0.3	0.2	41.0	48.0	7.0
8.001	38.1	A	0.3	0.2	38.6	48.0	9.4
21.637	44.0	A	0.6	0.5	45.1	48.0	2.9

NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emissions are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. Line A = Hot Line B = Neutral
6. C/F = Correction Factor
7. C/L = Cable Loss

Tested by

98/4/21



5.2 Enclosure

5.2.1 Electromagnetic Radiation Disturbance

Result :

Pass(tested by

88/4/21

)

Preliminary measurements were made in door at 1 meter using broadband antennas 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 mode of operation with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 300 MHz using biconical antenna and 300 to 1000 MHz using log-periodic antenna. Final measurements were made outdoor at 3-meter test range using SCHWARZBECK dipole antenna. The test equipment was placed on a test room that is 20 meter distance between turntable. Turntable was to protect from weather in the dome that made with FRP. Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operation condition. Each frequency found during pre-scan measurements was re-examined and investigated using test receiver(ESVS 10).

The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1 MHz depending on the type of signal. The half-wave dipole antenna was tuned to the frequency found during preliminary and final radiated measurement. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 by 1.5 meter table. The EUT, support equipment, and interconnecting cable were re-arranged and manipulated to maximized each EME 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;clock or data exchange speed;and by scrolling H pattern to the EUT and / or support equipment, if applicable;and by changing the polarity of antenna, whichever determined the worst-case emission. Photograph of the worst-case emission can be seen in photograph of radiated emission test. Each EME reported was calibrated using self-calibrating mode.



Figure 7 : Test Data Radiation (640X480, H=31.5kHz)

Frequency (MHz)	Reading (dB μ V)	AFCL (dB/m)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	POL
32.37	10.2	20.6	30.8	40.0	9.2	H
43.20	15.9	15.2	31.1	40.0	8.9	H
54.02	18.3	11.0	29.3	40.0	10.7	H
216.10	18.6	19.8	38.4	46.0	7.6	H
259.35	18.5	21.4	39.9	46.0	6.1	H
270.15	17.6	21.8	39.4	46.0	6.6	H

Table. Radiated Measurements at 3-meters

NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emission are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. AFCL = Antenna factor and cable loss
6. H = Horizontal V = Vertical Polarization

Tested by

98/4/21



Figure 8 : Test Data Radiation (1280X1024, H=64kHz)

Frequency (MHz)	Reading (dB μ V)	AFCL (dB/m)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	POL
32.39	15.2	20.6	35.8	40.0	4.2	H
43.21	20.2	15.2	35.4	40.0	4.6	H
54.03	23.3	11.0	34.3	40.0	5.7	H
216.12	22.1	19.8	41.9	46.0	4.1	H
259.37	21.4	21.4	42.8	46.0	3.2	H
270.18	19.5	21.8	41.3	46.0	4.7	H

Table. Radiated Measurements at 3-meters

NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emission are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. AFCL = Antenna factor and cable loss
6. H = Horizontal V = Vertical Polarization

Tested by

S.S/4/21



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Annex #1

Modification List

ORION ELECTRIC CO., LTD.

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SEOUL OFFICE : DAEWOO SECURITIES 9TH FLOOR, 34-3 YEODEUDO-DONG, YEONGDEUNGPO-GU, SEOUL, KOREA Tel: (02)768-8730-2/Fax: (02)784-8759

TEL : 82-546-469-6330
FAX : 82-546-463-0243
DATE : Apr. 01. 1998

Federal Communications Commission
Authorization and Evaluation Division
Equipment Authorization Branch
7435 Oakland Mills Road
Columbia, MD 20146, U.S.A.

Ref. : FCC ID #EWBOC17DB02

Gentlemen,

It is acknowledged by Orion Electronics Co., Ltd. / that the modification listed below
will be installed to our Model OC17DB07 in order to comply with FCC Rules for a Class B
Computing device.

These modifications will be incorporated into each unit sold under the
FCC ID #EWBOC17DB02

1. We added 2 earth wire between video shield case and main board.
2. We added 2 earth wire between video shield case and FBT H/S.
3. We added 3EMI filters. (L105,L106,L107)
4. We added 3 beads. (L108, L109, L110)
5. We added 2 ferrite core between 12V line and 8V line.
6. We added 1 ferrite core on the GND of AC inlet socket.
7. We added 1 ferrite core between FBT screen and focus wire.

We understand that changes may be made to the product if the product is re-tested and
Class I or Class II permissive change (as applicable) is applied for.
We understand that the equipment Grant Authorization must be issued before we can
market our product.

Tel. : (410) 290 - 6652
Fax.: (410) 290 - 6654

Sincerely Yours,

YOUNG CHUL KIM/ Executive director of monitor Div.