



## Test Report for FCC Part 15

**Report number:** STD-FCC-03035

**Type of EUT:** DVR BOARD

**Model number:** DF-7500

**Applicant:** SEDO Co., Ltd.

**Applied standards:** FCC Part 15 subpart B (Class B)

The above mentioned EUT had been tested by EMC Laboratory of Standard Engineering Company in order to confirm the compliance with the requirements of FCC rules and this test was executed in accordance with the measurement method specified in ANSI C63.4-2001

I hereby certify that the accuracy of test-data is true and correct with my best knowledge and belief. Also I prove this measurement was performed by qualified person,

**Date of tested:** Jan.12,2004

**Date of Issued** Jan.13,2004

Tested by

J.Y. Ahn/ Test Engineer

Approved by

Y.J. Lyu/ Manager



**Standard**

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## 1. General Information

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### 1.1 Product information

Description of EUT : DVR BOARD

Model number : DF-7500

Specification :

Power Rating : DC +5V, +3.3V 2A

IN/OUT ports : DB15-BNC conversion jack x 16 ch  
RCA Jack x 1

Applied Standard : FCC Part 15 subpart B (Class B)

Test method : ANSI C63.4 - 2001

### 1.2 Client information

Applicant : SEDO Co.,Ltd.

Address : 64 -3, Sangdaewon-Dong, Jungwon-Gu  
Sungnam-Si, Kyunggi-Do, Korea

Phone No. : +82-31-741-0303

Fax. No. : +82-31-748-0797

Contact person : NAMSEOG JO

Manufacturer : SEDO Co.,Ltd.

Address : 64 -3, Sangdaewon-Dong, Jungwon-Gu  
Sungnam-Si, Kyunggi-Do, Korea

Phone No. : +82-31-741-0303

Fax. No. : +82-31-748-0797



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## 2. Information of EMC Laboratory

### Name of test laboratory

Standard Engineering Co. Ltd.

### Location

377-11 Sinjang-Ri, Eumam-Myeon, Seosan-Si Chungnam, Korea

Phone No. +82-41-663-9436~7

Fax. No. +82-41-663-9434

### FCC Filing Number : 284057

### Environment of Laboratory

This location can keep accuracy in measuring more than anywhere because surrounding noise ambient is low and silent excellently to be suitable in EMI's measuring.

### Map



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### **3. Procedure of measurement**

#### **3.1 Conducted emissions**

##### **3.1.1 Configuration of measurement**

This measurement executed in shield-room and EUT was tested on 0.8m height wooden table located on the floor with 0.1m distance from the reference ground plane.

EUT's rear part had a distance from VCP(Vertical Conducted Plane) with 0.4m length and LISN placed on the grounded plane with 0.8m distance from EUT's side part .

Excess power cord and cables fixed in bundle style of 30~40m length with non-inductive material, and power line was connected to power source through LISN to detect maximum EMI without external RFI from aux. instruments.

For the measurement, the EUT was installed on PCI slot of PC (FCC class B) and supplied-software was used for normal operation of EUT,as a software driver. Two BNC input-ports were used for the measurement with two CCD cameras.

Measuring equipments and EUT confirmed that warming-up was performed during enough time and calibration of antenna as well as calibration of measuring equipment also completed beforehand.

This measurement was performed on condition of worst-case emission.

##### **3.1.2 Detector function selection and bandwidth**

During conducted emission measurement, a radio noise meter that has a CISPR quasi-peak detector with 9 kHz IF bandwidth of 6 dB was utilized.

##### **3.1.3 Frequency range to be scanned**

For conducted emissions measurement, frequency range of 150 kHz to 30 MHz included, was investigated.

##### **3.1.4 Line impedance stabilization network (LISN)**

A LISN with characteristics that conform to the requirements of ANSI C63.4-2001 was used for the measurement of conducted power-line radio noise; (50 micro-henries / 50 ohms). Chassis and earth-points for grounding of the LISN were earth-grounded.





### **3.2 Radiated Emissions**

#### **3.2.1 Configuration of measurement**

Preliminary measurement was performed in 3 meter semi-anechoic chamber to detect correct EMI frequency. For detecting the EMI frequency in semi-anechoic chamber, TRILOG antenna used on 30-1000MHz band.

Final measurement was executed at 3 meters OATS(Open Area Test Site) using Quasi-peak detector and TRILOG antenna.

EUT was placed on 0.8m height wooden table located on the reference ground plane.

Excess power cord and other excess cables fixed in bundle style of 30~40m length with non-inductive material to detect maximum EMI emission from EUT.

For the measurement, the EUT was installed on PCI slot of PC (FCC class B) and supplied-software was used for normal operation of EUT, as a software driver. Two BNC input-ports were used for the measurement with two CCD cameras.

Measuring equipments and EUT confirmed that warming-up was performed during enough time and calibration of antenna as well as calibration of measuring equipment also completed beforehand.

Measurement antenna height was varied 1 to 4 meters and set position in both horizontal and vertical plane to search maximum EMI emission frequency.

#### **3.2.2 Detector function selection and bandwidth**

In radiated emissions measurement, a field strength meter that has a CISPR quasi-peak detector was used. The 6 dB bandwidth of the detector of instrument is 120 kHz over frequency range of 30 to 1000 MHz.



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### **3.3 Method of Calculations**

#### **3.3.1 Unit of Conducted emission measurement**

Conducted Emission Test results for conducted emissions are reported in micro-volts.

#### **3.3.2 Unit of Radiated emission measurement**

Test results of radiated emissions measurement are reported in micro-volts per meter at the specific distance. Using the unit of dBuV on the test instrument, the indication unit was converted to field strength unit of dBuV/m as following method;

$$F (\mu V/m) = 10^{\{(R+CL+AF)/20\}} (\mu V/m)$$

F: Field Strength in  $\mu$ V/m, R: Meter Reading Level in dB( $\mu$ V),

CL: Cable Loss from antenna to meter in dB,

AF: Antenna Factor of receiving antenna in dB(/m)

#### **Sample calculation (Radiated emission)**

Emission level is calculated as follows;

Emission Level(dBuV/m)

= Reading Level + Ant. Factor + Cable Loss – Amp Gain

Margin Level is calculated as follows;

Margin(dBuV/m) = Limit Level – Emission Level

Example) Standard limit = 40 dBuV/m,

Reading Level = 10 dBuV,

Ant. Factor = 15 dB,

Cable Loss= 1 dB

External Amp Gain= 0 dB

**Emission Level(dBuV/m) = 10 + 15 + 1 - 0 = 26 (dBuV/m)**

**Margin(dBuV/m) = 40 – 26 = 14 (dBuV/m)**



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## 4. Environments of measurement

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### 4.1 Conditions of environment

Shield room	Temperature	20 °C
	Humidity	38 %
	Pressure	1020 hPa
OATS	Temperature	8°C
	Humidity	45 %
	Pressure	1020 hPa

### 4.2 Measurement uncertainty

All measurements, especially EUT's measurement includes uncertain level that can happen for the reason as following;

Variation of antenna factor by changes of height, center, polarization, directivity.

Uncertainty factor by change of measurement distance, site's imperfection.

Radiated emissions measurements:  $\pm 5$  dB

Power line conducted emission measurements:  $\pm 3$  dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurement uncertainty was calculated in accordance with NAMAS NIS 81 :  
The treatment of uncertainty in EMC measurement.”

The measurement uncertainty was given with a confidence of 95%.



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#### 4.3 List of Test equipments

	Equipment	Maker	Model No.	S/No.	Cal. Due date.
■	EMI Test Receiver	Rhode & Schwarz	ESIB7	100119	05/31/2004
■	EMI Test Receiver	Rhode & Schwarz	ESCS30	100171	11/21/2004
□	Artificial Mains	Rhode & Schwarz	ESH2-Z5	100064	12/03/2004
■	Artificial Mains	Rhode & Schwarz	ESH3-Z5	100204	11/29/2004
□	Signal Generator	Rhode & Schwarz	SML03	101003	12/03/2004
□	Absorbing Clamp	Rhode & Schwarz	MDS-21	100076	10/29/2004
■	TRILOG Antenna	Schwarzbeck	VULB9163	164	06/02/2004
□	2 Wire ISN	Rhode & Schwarz	ENY22	10086	N/A
□	4 Wire ISN	Rhode & Schwarz	ENY41	100095	N/A
■	Pulse Limitter	Rhode & Schwarz	ESH3-Z2	100137	N/A
□	Attenuator	Rhode & Schwarz	DNF	100041	N/A
□	Ferrite Clamp	Rhode & Schwarz	EZ-24	100002	N/A

#### 4.4 List of Peripherals & Cables

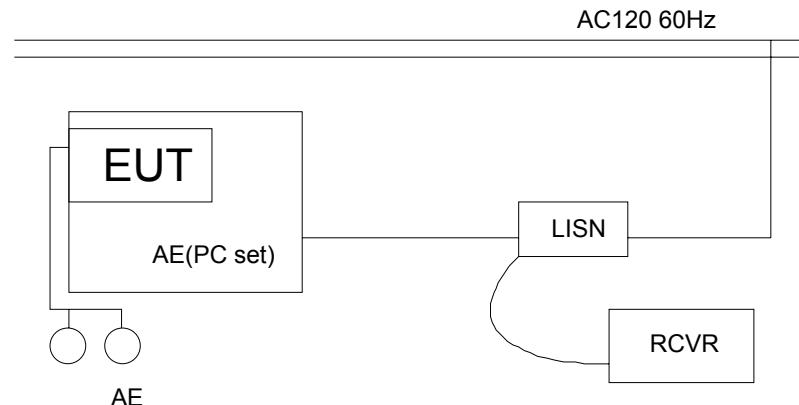
	Descriptions	Maker	Type	S/No.	RMKS/cert.
■	Reference PC set	DELL	Dimension 4600	D39Z81S	CE/FCC/MIC
■	Reference Printer	EPSON	P730A	60H0187628	FCC
□	Reference Printer	HP	Deskjet 540	US52M1B0NF	CE/FCC
□	DC Power Supply	HP	6574A	US36340515	
■	M/W Cable/2GHz 5m	H+Suhner	SF104/2x11BNC	14354	
□	M/W Cable/2GHz10m	“	“	14353	
□	M/W Cable/18GHz18m	“	SF104/2x11N	6025	
□	M/W Cable/18GHz18m	“	“	6026	
■	M/W Cable/18GHz10m	“	“	6027	
■	M/W Cable/2GHz43m	Thermax	MS-P400		
■	CCD Camera x 2 set		CCD		



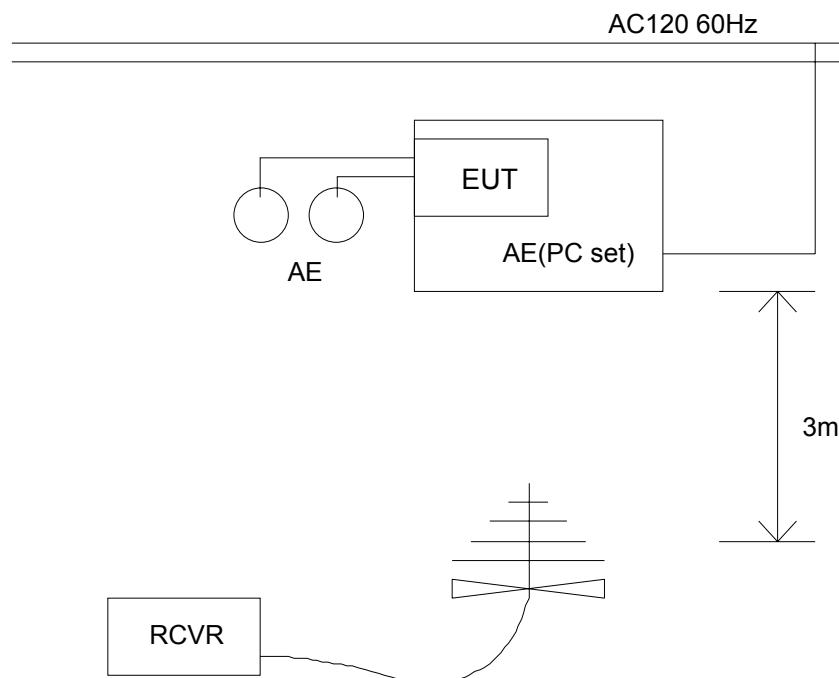


#### **4.5 Connection of EUT**

##### **Conducted emission**



##### **Radiated emission**



<b>EUT</b>	DVR BOARD (DF-7500)		
<b>AE</b>	Personal Computer: DELL Dimension 4600 (FCC Class B) CCD Camera x 2 set		
<b>ANT</b>	Antenna VULB9163	LISN	ESH3-Z5





## 5. Result of Measurement

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### 5.1 Conducted Emission

#### 5.1.1 Test data

Frequency [MHz]	Line	Limit [dBuV]		Reading [dBuV]		Factor [dB]	Margin [dBuV]	
		QP	AV	QP	AV		QP	AV
0.150	N	66.00	56.00	24.66	2.36	10.84	30.50	42.80
0.250	N	61.76	51.76	23.44	11.64	10.86	27.46	29.26
0.255	N	61.59	51.59	21.74	10.14	10.86	28.99	30.59
0.375	L	59.39	48.39	21.45	16.35	10.85	27.09	21.19
3.580	N	56.00	46.00	24.58	18.38	11.12	20.30	16.50
3.610	N	56.00	46.00	19.46	13.56	11.14	25.40	21.30

\* Detector function was set into Quasi-peak & Average mode.

\* Factor=LISN Factor + Cable loss + Pulse Limiter(10dB)

#### 5.1.2 Result

Complied





## **5.2 Radiated Emission**

### **5.2.1 Test data**

Frequency [MHz]	Polarization [Ver/Hor]	Limit [dBuV/m]	Reading [dBuV/m]	Factor [dB]	Margin [dBuV]
32.312	V	40.00	11.71	11.39	16.90
54.000	V	40.00	10.46	12.37	17.17
97.312	V	43.50	10.21	12.89	20.40
162.000	H	43.50	21.50	9.55	12.45
243.000	H	46.00	11.16	14.10	20.74
299.812	V	46.00	10.37	15.60	20.03
333.125	V	46.00	17.08	16.49	12.43
648.000	H	46.00	12.60	23.42	9.98

\* Detector function was set into Quasi-peak mode.

\* Factor = Antenna Factor + Cable loss

### **5.2.1 Result**

Complied





#### **6.4 Data sheet of Conducted Emission**

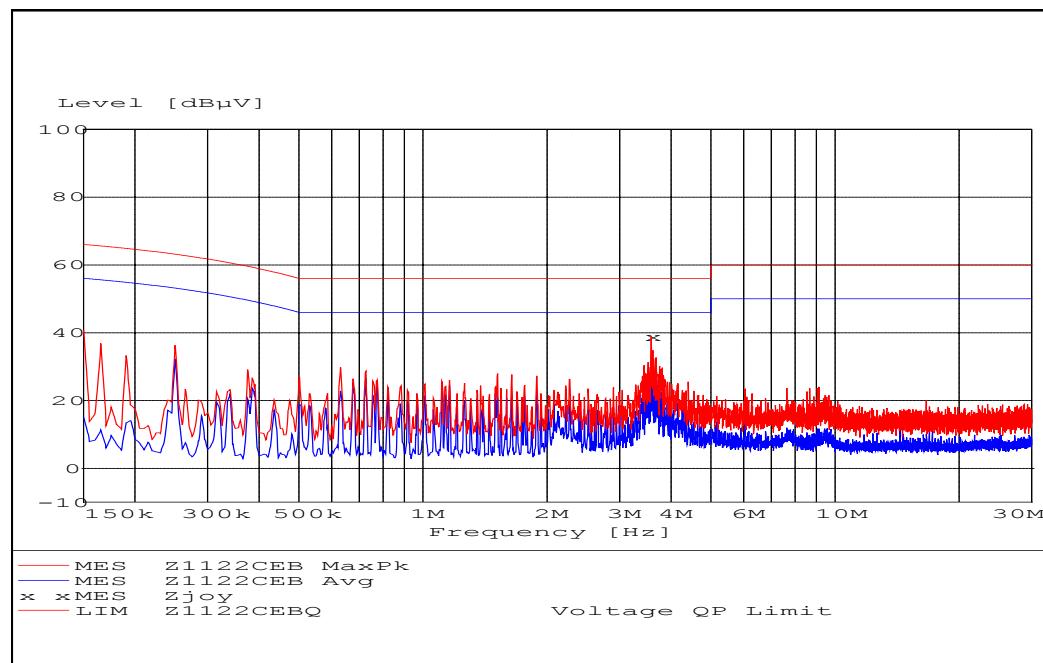
Standard Engineering Co., Ltd.  
Conducted Emission Measurement

EUT: DF-7500  
Manufacturer: SEDO Co., Ltd.  
Operating Condition: Normal  
Test Site: Shield Room  
Operator: Joy Ahn  
Test Specification: Conducted Emission CISPR 22 Class B  
Comment: Phase N

##### SCAN TABLE:

Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak	1.0 ms	9 kHz	ESH3-Z5
						Average

Unit: dBuV





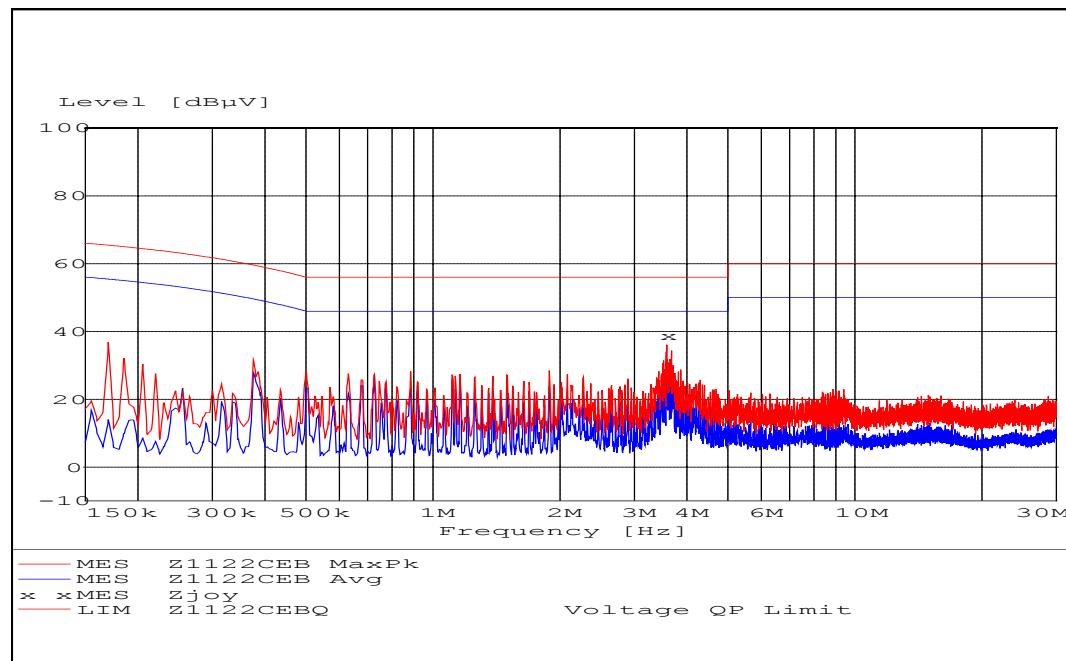
Standard Engineering Co., Ltd.  
Conducted Emission Measurement

EUT: DF-7500  
Manufacturer: SEDO Co., Ltd.  
Operating Condition: Normal  
Test Site: Shield Room  
Operator: Joy Ahn  
Test Specification: Conducted Emission CISPR 22 Class B  
Comment: Phase L

SCAN TABLE:

Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak	1.0 ms	9 kHz	ESH3-Z5
						Average

Unit: dB<sub>u</sub>V





## **7. Attachments**

### **7.1 Sample Label & Location**

### **7.2 Photographs of Set-up**

### **7.3 Photographs of EUT**

### **7.4 Block Diagram & Schematics**

### **7.5 User's Manual**

