

Emission and Immunity of electromagnetic disturbance

Test Report No. : CEC2009-0093

Equipment : PC Based Digital Video Recorder

Name of basic model : 9I16G4

Family model : None

Manufacturer : Win4net Co., Ltd.

Applicant : Win4net Co., Ltd.

Tested date : 2009. 03. 28 – 2009. 04. 01.

Receipt of date : 2009. 03. 27.

Issued date : 2009. 04. 06.

Tested Environment : Temperature:(16.1 – 17.1) °C, Relative Humidity:(33.9 – 38.4) % R.H.,
 Atmospheric Pressure : (100.5 – 100.9) kPa

Test results : Pass

Test Standards : EN 55022 : 2006
 EN 50130-4 : 1995 + A1 : 1998 + A2 : 2003

Affirmation	Measurements performed by	Approved by
	Title : Manager Name : Kim, Young-Sik (Signature)	Title : Manager Name : Hur, Gweon (Signature)

CONTENTS

- 1. CLIENT INFORMATION**
- 2. LABORATORY INFORMATION**
- 3. EQUIPMENT UNDER TEST INFORMATION (EUT)**
- 4. TEST SPECIFICATIONS**
- 5. TEST RESULTS SUMMARY**
 - 5.1 TEST RESULTS**
 - 5.2 GENERAL PERFORMANCE CRITERIA**
 - 5.3 CONTINUOUS DISTURBANCE VOLTAGE AT MAIN TERMINALS**
 - 5.4 RADIATED DISTURBANCE : 30 MHz – 1 000 MHz**
 - 5.5 IMMUNITY TO ELECTROSTATIC DISCHARGE**
 - 5.6 IMMUNITY TO RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD.**
 - 5.7. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY**
 - 5.8. SURGE IMMUNITY**
 - 5.9. IMMUNITY TO CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS.**
 - 5.10. VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY.**
 - 5.11. MAINS SUPPLY VOLTAGE VARIATIONS**
- 6. PRODURCT PHOTOGRAPHS**

1. CLIENT INFORMATION

The EUT has been tested by request of :

Company : Win4net Co., Ltd.
Address : Win4net Building, 1027-5, Hogye-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
Name of contact : Jeong, Ji-Han
Telephone : +82-31-455-8600
Facsimile : +82-31-455-8601

2 LABORATORY INFORMATION

The 10 m Semi-anechoic chamber and/or EMC facilities are used for these testing.
These facilities were accredited by KOLAS, EK, MIC of Korea and FCC of USA.

Address

EMC RESEARCH INSTITUTE.
66-6, Jeil-Ri, Yangji-Myun, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, Korea

Telephone No. : + 82-31-679-9600
Facsimile No. : + 82-31-336-1184

Registered No.

KOLAS : 111
EK : J
MIC, FCC(DoC) : KR0030
FCC Filing No. : 302567

3 EQUIPMENT UNDER TEST INFORMATION(EUT)**3.1. Identification of the EUT**

Type of equipment : PC Based Digital Video Recorder
Model name : 9116G4

Applicant Address

Company : Win4net Co., Ltd.
Address : Win4net Building, 1027-5, Hogye-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
Country of origin : Korea
Rating : AC 230 V, 50 Hz

3.2. Additional information about the EUT

Items	Note
Classifications	Class B
Power rating	AC 230 V, 50 Hz

Family/Variant model list is given below.

Basic model	Family/Variant model	Difference point
9116G4	-	-

3.3. Peripheral equipment

Equipment needed for correct operation of the EUT is given below

Description	Model No.	Serial No.	Manufacture	Comment
Mouse1	-	-	Microsoft	-
Mouse2	Com-E1	-	Quick	-
Keyboard1	TRI-270	107013318	Solid Year Co., Ltd	-
Keyboard2	SDM4510UH	4M020619	Samsung Electronics	-
Monitor	750S	9017HICKCC8158	Samsung Electronics	-
Headset	Actto	-	-	-
Color pattern generator	PM5418TDSI	LO 612359	PHILIPS	-

4 TEST SPECIFICATIONS

4.1. Standards

The standards for a EUT are the following:

European Standard	IEC/CISPR Standard
EN 55022 : 2006	CISPR 22 : 2006
EN 50130-4 : 1995 + A1 : 1998 + A2 : 2003	-

5 TEST RESULTS SUMMARY

The results in this report apply only to sample tested:

Standards	Test items / Frequency	Result
EN 55022	Disturbance voltage at the mains terminals	Pass
	Radiated disturbances	Pass
EN 61000-4-2	Electrostatic discharge immunity	Acceptable
EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity	Acceptable
EN 61000-4-4	Electrical fast transient/burst immunity	Acceptable
EN 61000-4-5	Surge immunity	Acceptable
EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields	Acceptable
EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity	Acceptable

5.1 Test result

5.1.1 Measurement Uncertainty

Although the measured emissions indicate that the EUT complies with required limits, some measurements are close to these limits. When the uncertainty of measurement is considered, there is some possibility that the EUT may not be compliant

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{lab} is less than or equal to U_{cispr}

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit

If U_{lab} is greater than U_{cispr}

- compliance is deemed to occur if no measured disturbance, increased by $(U_{lab}-U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab}-U_{cispr})$, exceeds the disturbance limit;
- Conducted disturbance(9 kHz – 150 kHz) : ± 3.96 dB (Confidence level 95 %, $k=2$)
- Conducted disturbance(150 kHz – 30 MHz) : ± 3.60 dB (Confidence level 95 %, $k=2$)
- Radiated disturbance(30 MHz – 200 MHz) : ± 4.26 dB (Confidence level 95 %, $k=2$)
- Radiated disturbance (200 MHz – 1 000 MHz) : - 4.10 dB – +3.94 dB (Confidence level 95 %, $k=2$)
- Radiated disturbance (1 000 MHz – above): Under consideration by CISPR 16-4-2:2003

5.3 CONTINUOUS DISTURBANCE VOLTAGE AT MAIN TERMINALS
: Frequency range 0.15 MHz to 30 MHz

5.3.1 Operating Condition

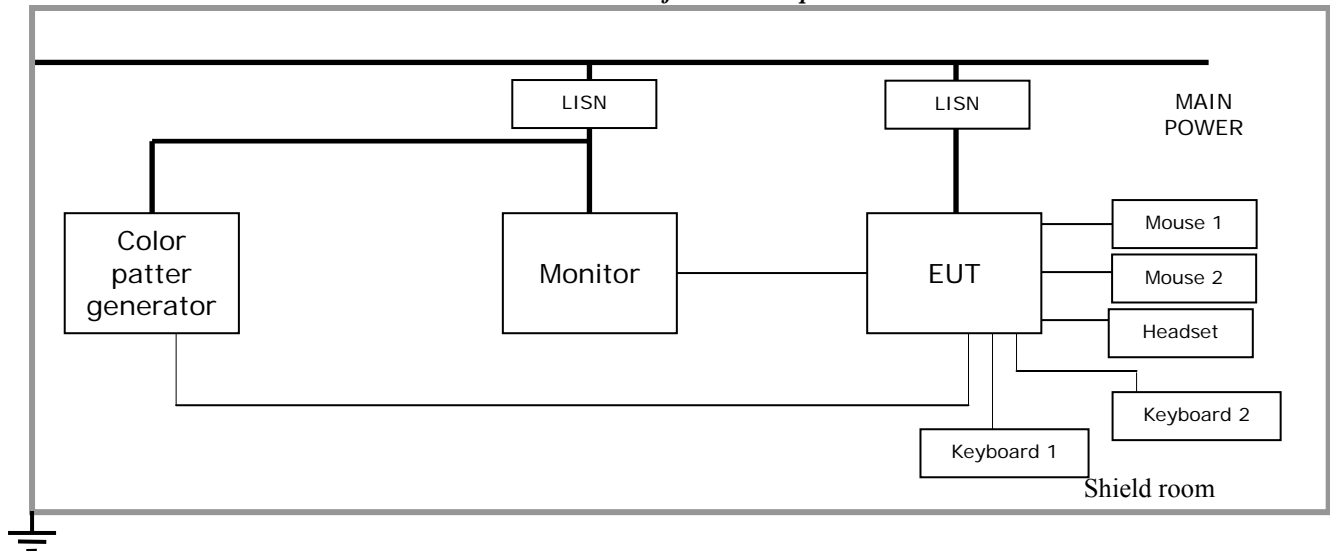
The EUT was performed with recording and playing the signal of audio and video.

5.3.2 Test set-up and test procedures

Photograph for Test set-up



Schematic for test set-up



- Procedure

The conducted disturbance at mains terminals was measured with the equipment under Test (EUT) in a shield room. The EUT was connected to an artificial mains Network (LISN) placed on the floor. The EUT was placed on non-metallic table 0.8 m above the metallic, grounded floor. The distance to other metallic surface was at least 0.8 m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

5.3.3 Test instrument

Instrument	Model No	Serial No.	Makers	Range (MHz)	Used
Test receiver	ESCS30	100021	R&S	0.009 - 2 750	○
L.I.S.N.	ESH3-Z5	100031	R&S	0.009 - 30	○
	ESH3-Z5	100030	R&S	0.009 - 30	○
	ESH3-Z6	100393	R&S	0.1 – 20	-
	ESH3-Z6	825993/010	R&S	0.1 – 20	-
Shield room	8 m/W× 6 m/L × 3.3 m/H	-	-	-	○

5.3.4 Test results

Date of test : 2009. 03. 28

An overview sweep performed with peak & average detectors is included in the following data.

Result: Pass

Comment: The measured emissions level of the EUT met the requirement of specified limit.

TEST GRAPH

CONTINUOUS DISTURBANCE VOLTAGE

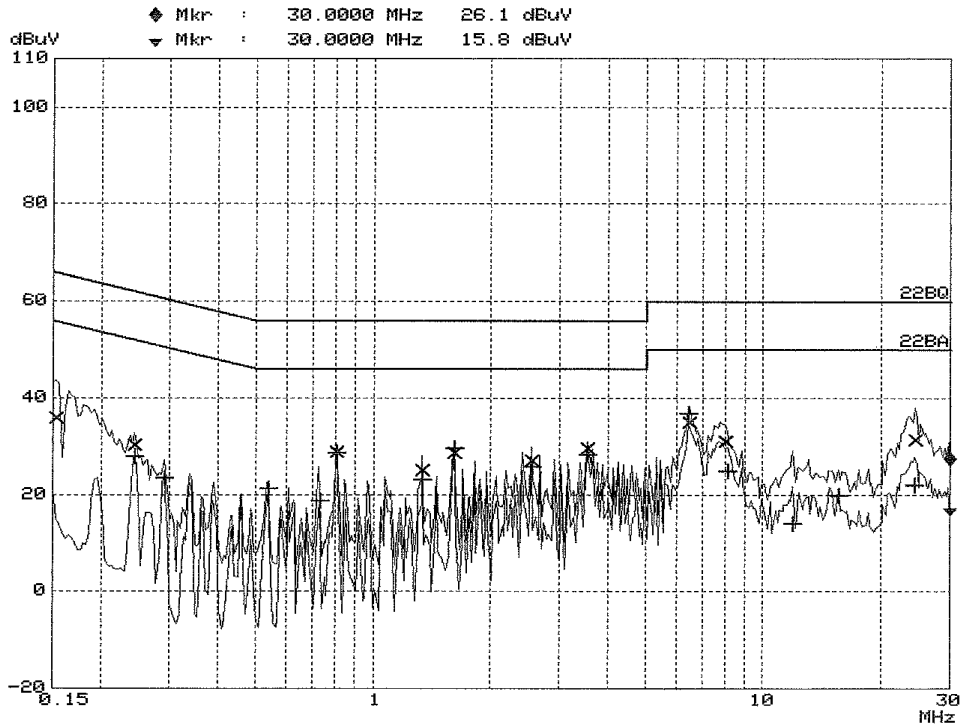
EUT: 911664
 Manuf: WIN4NET
 Op Cond: L
 Operator: ERI
 Date: 28. Mar 09 15:32

Scan Settings (2 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	3M	3k	9k	PK+AV	5ms	AUTO	LN ON
3M	30M	10k	9k	PK+AV	1ms	AUTO	LN ON

Transducer No.	Start	Stop	Name
7	9k	30M	ESH3_Z5

Final Measurement: x QP / + AV
 Meas Time: 1 s
 Subranges: 16
 Acc Margin: 30dB



CONTINUOUS DISTURBANCE VOLTAGE

EUT: 9116G4
 Manuf: WIN4NET
 Op Cond: L
 Operator: ERI
 Date: 28. Mar 09 15:32

Final Measurement Results:

Indicated Phase/PE shows Configuration of max. Emission

Frequency MHz	QP Level dBuV	Delta Limit dB	Phase -	PE -
0.15300	35.9	-29.9	L1	gnd
0.24300	30.3	-31.6	N	gnd
0.80400	28.9	-27.0	N	gnd
1.33800	25.3	-30.6	L1	gnd
1.60800	28.9	-27.1	N	gnd
2.54400	27.1	-28.8	N	gnd
3.55000	29.6	-26.3	N	gnd
6.46000	35.0	-24.9	L1	gnd
8.00000	31.2	-28.7	L1	gnd
24.43000	31.5	-28.4	L1	gnd

Frequency MHz	AV Level dBuV	Delta Limit dB	Phase -	PE -
0.24300	28.1	-23.9	L1	gnd
0.29100	23.6	-26.8	N	gnd
0.53700	21.4	-24.5	L1	gnd
0.72900	18.9	-27.0	L1	gnd
0.80400	28.8	-17.1	N	gnd
1.33800	23.3	-22.6	L1	gnd
1.60800	29.7	-16.2	N	gnd
2.54700	26.0	-19.9	L1	gnd
3.55000	28.4	-17.5	N	gnd
6.43000	36.8	-13.1	N	gnd
8.10000	25.0	-24.9	N	gnd
11.88000	14.1	-35.8	N	gnd
15.53000	20.0	-29.9	N	gnd
24.31000	22.1	-27.8	L1	gnd

* limit exceeded

< LINE : LIVE >

Uncertainty : $U = -3.60 \text{ dB} \sim +3.60 \text{ dB}$ (confidence level 95 %, $k = 2$)

CONTINUOUS DISTURBANCE VOLTAGE

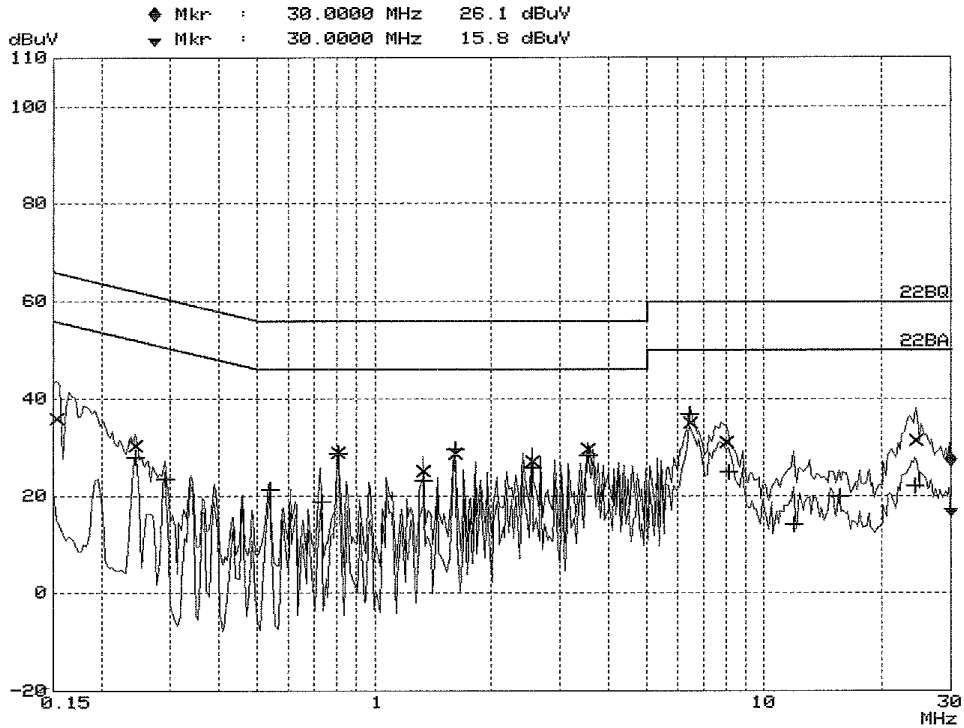
EUT: 9116G4
 Manuf: WIN4NET
 Op Cond: N
 Operator: ERI
 Date: 28. Mar 09 15:32

Scan Settings (2 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	3M	3k	9k	PK+AV	5ms	AUTO LN	ON
3M	30M	10k	9k	PK+AV	1ms	AUTO LN	ON

Transducer No. Start Stop Name
 7 9k 30M ESH3_Z5

Final Measurement: x QP / + AV
 Meas Time: 1 s
 Subranges: 16
 Acc Margin: 30dB



CONTINUOUS DISTURBANCE VOLTAGE

EUT: 9116G4
 Manuf: WIN4NET
 Op Cond: N
 Operator: ERI
 Date: 28. Mar 09 15:32

Final Measurement Results:

Indicated Phase/PE shows Configuration of max. Emission

Frequency MHz	QP Level dBuV	Delta Limit dB	Phase -	PE -
0.15300	35.9	-29.9	L1	gnd
0.24300	30.3	-31.6	N	gnd
0.80400	28.9	-27.0	N	gnd
1.33800	25.3	-30.6	L1	gnd
1.60800	28.9	-27.1	N	gnd
2.54400	27.1	-28.8	N	gnd
3.55000	29.6	-26.3	N	gnd
6.46000	35.0	-24.9	L1	gnd
8.00000	31.2	-28.7	L1	gnd
24.43000	31.5	-28.4	L1	gnd

Frequency MHz	AV Level dBuV	Delta Limit dB	Phase -	PE -
0.24300	28.1	-23.9	L1	gnd
0.29100	23.6	-26.8	N	gnd
0.53700	21.4	-24.5	L1	gnd
0.72900	18.9	-27.0	L1	gnd
0.80400	28.8	-17.1	N	gnd
1.33800	23.3	-22.6	L1	gnd
1.60800	29.7	-16.2	N	gnd
2.54700	26.0	-19.9	L1	gnd
3.55000	28.4	-17.5	N	gnd
6.43000	36.8	-13.1	N	gnd
8.10000	25.0	-24.9	N	gnd
11.88000	14.1	-35.8	N	gnd
15.53000	20.0	-29.9	N	gnd
24.31000	22.1	-27.8	L1	gnd

* limit exceeded

< LINE : NEUTRAL >

Uncertainty : $U = -3.60 \text{ dB} \sim +3.60 \text{ dB}$ (confidence level 95 %, $k = 2$)

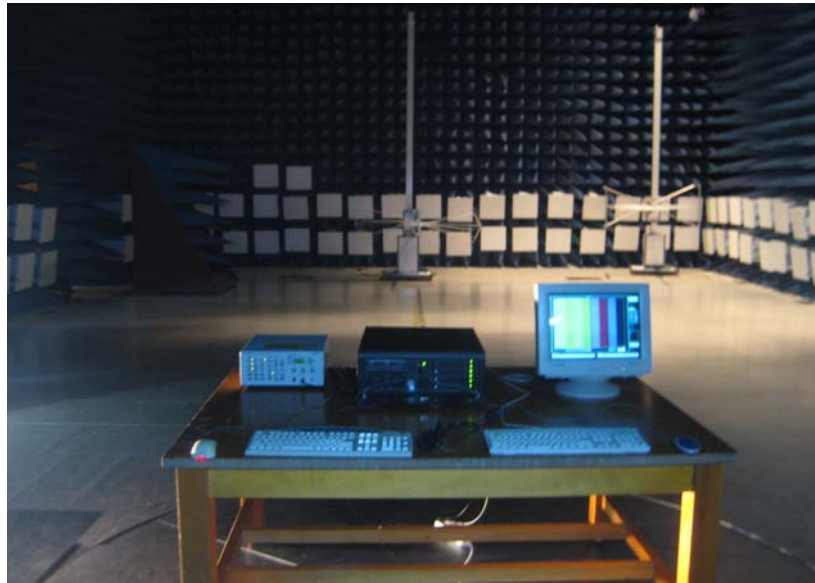
5.4 RADIATED DISTURBANCE : 30 MHz – 1 000 MHz

5.4.1 Operating Condition

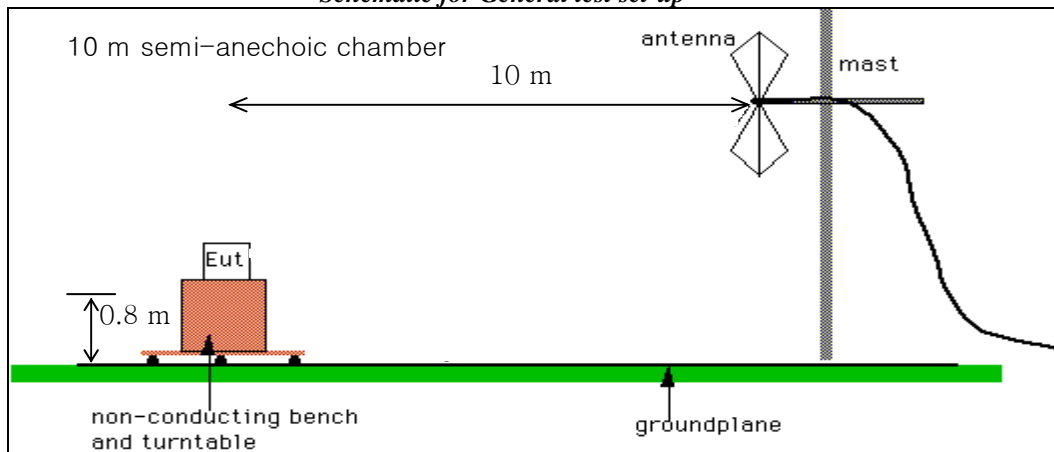
The EUT was performed with recording and playing the signal of audio and video.

5.4.2 Test set-up

Photograph for Test set-up



Schematic for General test set-up



- Test procedure

The frequency range investigated was 30 MHz to 1 000 MHz.

All readings are quasi-peak unless stated otherwise. 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 set-up to produce the Maximum emission for the frequency and were placed on top of a 0.8 m High non-metallic 1 m X 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each radiated emission.

The turntable containing the system was rotated the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. And this device(EUT) was tested in 3 orthogonal planes.

The antenna measured both horizontal and vertical polarization.

5.4.3 Test instrument

Instrument	Model No.	Serial No.	Makers	Range (MHz)	Used
Test receiver	ESCS30	830986/015	R&S	0.009 - 2 750	O
BI LOG Antenna	VULB9156	2041	Schwarzbeck	30 - 1 500	O
Antenna Mast	MA240	-	HD	-	O
Turn Table	DT430S	-	HD	-	O
Spectrum	E7402A	US40240261	Agilent	-	O

5.4.4 Test results (EN 55022)

Date of test : 2009. 03. 28.

Freq (MHz)	Reading (dBμV)	Ant pol	AF (dB/m)	CL (dB)	Result [A] (dBμV/m)	Limit [B] (dBμV/m)	Margin [A]-[B] (dB)
36.00	10.0	V	9.3	1.9	21.2	30	8.8
49.12	6.3	V	10.2	4.1	20.5	30	9.5
122.04	8.3	V	11.0	2.5	21.8	30	8.2
163.90	9.3	V	11.6	2.8	23.7	30	6.3
188.08	13.3	H	10.2	3.0	26.5	30	3.5
192.05	11.6	V	10.1	3.0	24.8	30	5.2
296.02	9.7	H	13.1	3.8	26.6	37	10.4
351.07	7.8	H	14.2	4.1	26.1	37	10.9
364.55	11.4	H	14.4	4.2	30.0	37	7.0
405.79	11.8	H	15.1	4.6	31.5	37	5.5
457.99	8.5	H	16.7	5.0	30.2	37	6.8
487.94	9.3	H	17.2	5.0	31.6	37	5.5

* Meter reading: *Include Antenna Factor and cable loss*

* Receiving Antenna Mode: *Horizontal, Vertical*

* Test distance : 10 m

Result: Pass

Comment: The measured emissions level of the EUT met the requirement of specified limit.

5.5 IMMUNITY TO ELECTROSTATIC DISCHARGE

5.5.1 Operating Condition

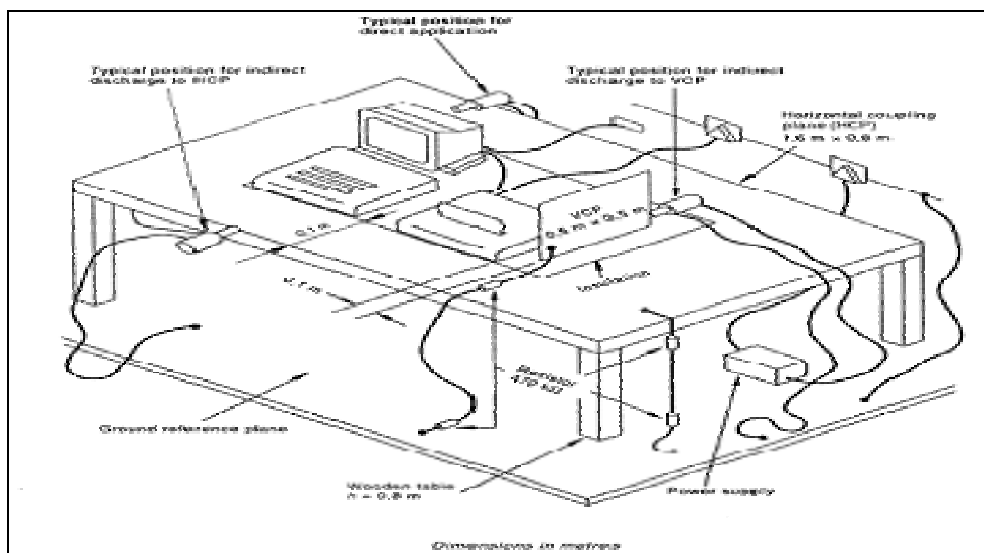
The EUT was performed with recording and playing the signal of audio and video.

5.5.2 Test set-up and test procedures

Photograph for Test set-up



Schematic for General test set-up



- Procedures

The EUT was placed on a non-metallic support 0.8 m above a reference ground plane (RGP).

A vertical coupling plane (VCP) and horizontal coupling plane (HCP) were connected to the RGP with a cable with two 470 kΩ resistors.

5.5.3 Test instrument

Instrument	Model No.	Serial No.	Makers	Range (kV)	Used
ESD tester	PESD1600	H807257	Haefely	-	-
ESD tester	ESS-100LA	0100C03345	NoiseKen	0 - 31	O
HCP	-	-	-	-	O
VCP	-	-	-	-	O

Reference ground plane: Immunity test area bottom

Vertical coupling plane : Aluminum 0.5 m × 0.5 m × 1.5 mm.

5.5.4 Test mode

1. Discharge voltage :	<input checked="" type="checkbox"/> Contact discharge : ± (2, 4, 6) kV <input checked="" type="checkbox"/> Air discharge : ± (2, 4, 8) kV
2. Discharge impedance :	<input checked="" type="checkbox"/> 330 Ω / 150 pF <input type="checkbox"/> 2 kΩ / 330 pF
3. Discharge interval :	<input checked="" type="checkbox"/> ≥ 1 s
4. Number of discharge :	<input checked="" type="checkbox"/> ≥ 10 times at each point
5. Criterion :	B


5.5.5 Test protocols

Date of test : 2009. 03. 30.

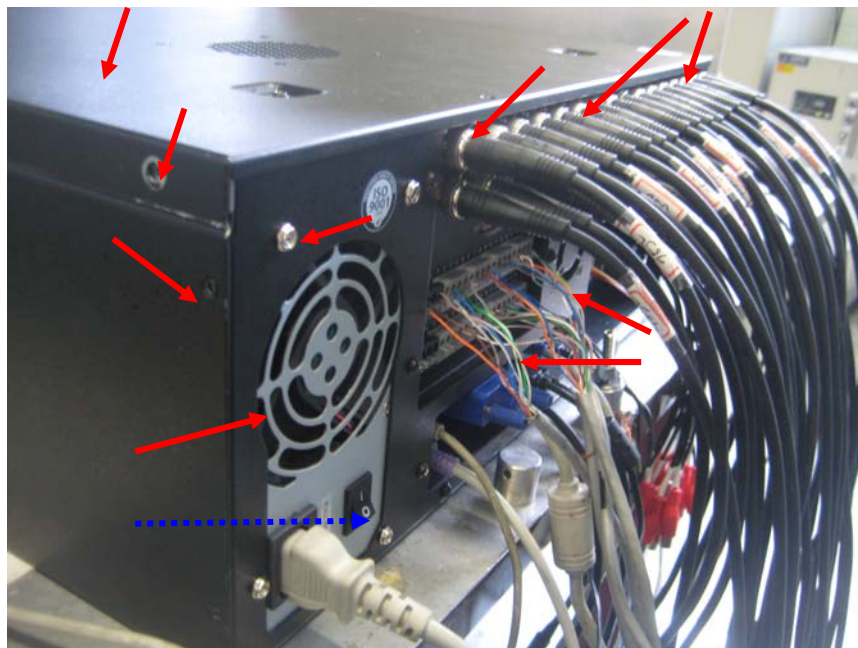
Test point	Test level [kV]	Air/ Contact	Polarity (+ / -)	Result	Comment
Enclosure, Screw	2, 4, 6	Contact	+ / -	Pass [A]	Normally Operated
Front / Rear USB	2, 4, 6	Contact	+ / -	Pass [A]	Normally Operated
Rear I/O port	2, 4, 6	Contact	+ / -	Pass [A]	Normally Operated
Front LED	2, 4, 8	Air	+ / -	Pass [A]	Normally Operated
Front / Rear S/W	2, 4, 8	Air	+ / -	Pass [A]	Normally Operated
HCP/VCP	2, 4, 6	Contact	+ / -	Pass [A]	Normally Operated

Indirect contact discharges were applied to the HCP and VCP.

Drawing of the EUT shows the location of the selected test point.

Contact discharge 

Air discharge 



5.5.6 Test Results

Result : Pass

Comment : The permanent or temporary malfunction of EUT was not detected during the test.

5.6 IMMUNITY TO RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD

5.6.1 Operating Condition

The EUT was performed with recording and playing the signal of audio and video.

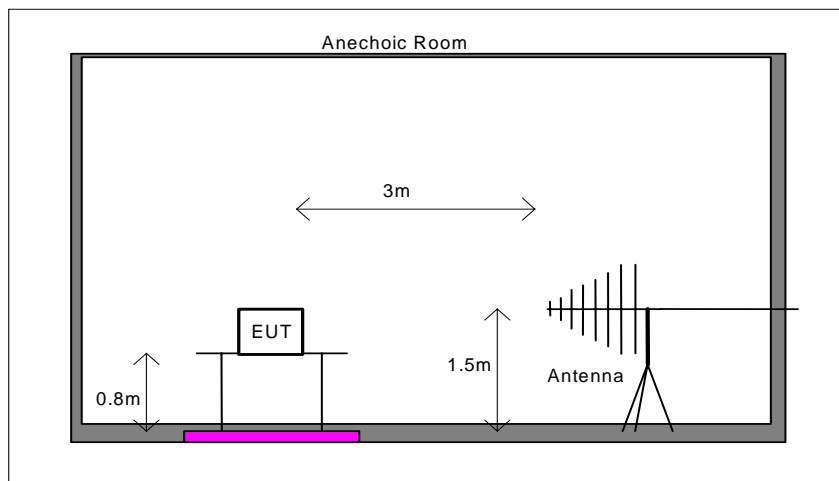
5.6.2 Test set-up and test procedures.

The EUT was placed on a non-metallic support 0.8 m above a reference ground plane (RGP).

Photograph for Test set-up



General test set-up for radiated immunity



5.6.3 Test instrument

Instrument	Model No.	Serial No.	Makers	Range (MHz)	Used
Signal Generator	SMT03	831809/008	R&S	0.005 – 3 000	O
Power Meter	NRVD	832025/049	R&S	-	O
Power Amplifier	500A100AM3	26379	AR	0.01 – 100	O
Power Amplifier	250W1000A	0323268	AR	80 – 1 000	O
Horn Antenna	AT4002A	312313	AR	26 – 3 000	O

Reference ground plane: Immunity test area bottom

5.6.4 Test Mode

1. Frequency range	<input checked="" type="checkbox"/> 80 MHz – 2 000 MHz <input type="checkbox"/> 900 MHz ± 5 MHz <input type="checkbox"/> 26 MHz – 500 MHz
2. Test level	<input checked="" type="checkbox"/> 1 V/m <input checked="" type="checkbox"/> 3 V/m <input checked="" type="checkbox"/> 10 V/m
3. Modulation	<input checked="" type="checkbox"/> AM : 1 kHz, 80 % <input checked="" type="checkbox"/> 1 Hz (0.5 s ON , 0.5 s OFF)
4. Dwell time	<input checked="" type="checkbox"/> 3 s <input type="checkbox"/> 2 s <input type="checkbox"/> 1 s
5. Frequency Step	<input checked="" type="checkbox"/> log 1 % step <input type="checkbox"/> log 3 % step <input type="checkbox"/> log 5 % step
6. Criterion	A (only test level 1 V/m)

5.6.5 Test protocols

Date of test : 2009. 03. 30.

Freq. [MHz]	Level [V/m]	Antenna	Positions	Result	Comment
80 - 2 000	10	H / V	Front	Pass [A]	Normally Operated
			Rear	Pass [A]	Normally Operated
			Left	Pass [A]	Normally Operated
			Right	Pass [A]	Normally Operated
	3	H / V	Front	Pass [A]	Normally Operated
			Rear	Pass [A]	Normally Operated
			Left	Pass [A]	Normally Operated
			Right	Pass [A]	Normally Operated
	1	H / V	Front	Pass [A]	Normally Operated
			Rear	Pass [A]	Normally Operated
			Left	Pass [A]	Normally Operated
			Right	Pass [A]	Normally Operated

5.6.6 Test results

Result : Pass

Comment: The permanent or temporary malfunction of EUT was not detected during the test.

5.7 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY

5.7.1 Operating Condition

The EUT was performed with recording and playing the signal of audio and video.

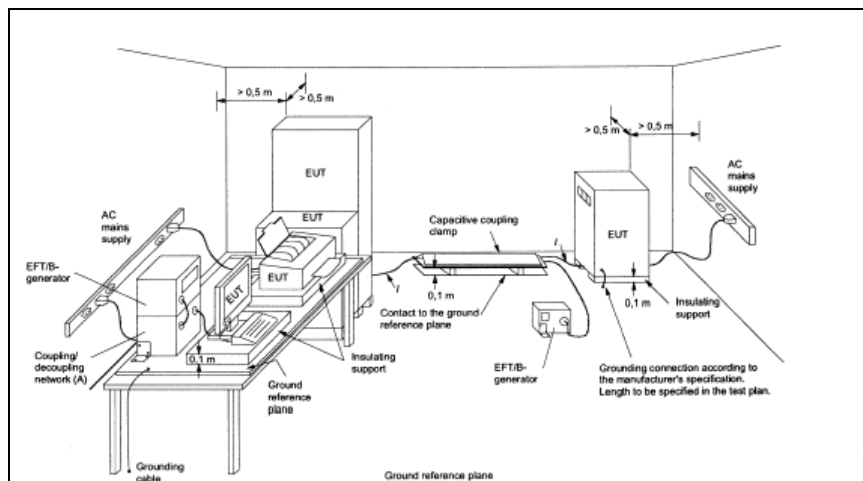
5.7.2 Test set-up and test procedures

The EUT was placed on a non-metallic support 0.1 m above a reference ground plane(RGP).

Photograph for Test set-up of EUT



General test set-up for immunity to EFT/B interference



5.7.3 Test instrument

Instrument	Model No.	Serial No.	Makers	Range (kV)	Used
EFT tester	PEFT	081161-05	Haefely	-	O
Coupling filter	FP-EFT 32.1	081383-03	Haefely	-	O
	PHV 41.2	083740-03	Haefely	-	O
Clamp	-	-	EM test	-	O
ERI lab	-	-	-	-	O

Reference ground plane : Immunity test area bottom

5.7.4 Test Mode

1. Coupling mode and severity level:	<input checked="" type="checkbox"/> AC mains : ± 2 kV <input checked="" type="checkbox"/> Signal : ± 1 kV
2. Type of line :	<input checked="" type="checkbox"/> AC mains <input checked="" type="checkbox"/> Signal <input type="checkbox"/> Telecommunication line
3. Test mode (DC main) :	<input checked="" type="checkbox"/> L <input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> PE <input checked="" type="checkbox"/> L + N <input checked="" type="checkbox"/> L + PE <input checked="" type="checkbox"/> N + PE <input checked="" type="checkbox"/> L + N + PE
4. Rise time/width :	5 kHz 5 ns / 50 ns
5. Duration :	≥ 60 s
6. Criterion :	B

5.7.5 Test protocols

Date of test : 2009. 03. 31.

Test mode	Level [kV]	Polarity (+ / -)	Result	Comment
L	2	+ / -	Pass [A]	Normally Operated
N	2	+ / -	Pass [A]	Normally Operated
PE	2	+ / -	Pass [A]	Normally Operated
L + N	2	+ / -	Pass [A]	Normally Operated
L + PE	2	+ / -	Pass [A]	Normally Operated
N + PE	2	+ / -	Pass [A]	Normally Operated
L + N + PE	2	+ / -	Pass [A]	Normally Operated
CH1~16	1	+ / -	Pass [A]	Normally Operated
LAN, Alarm	1	+ / -	Pass [A]	Normally Operated

5.7.6 Test results

Result : Pass

Comment: The permanent or temporary malfunction of EUT was not detected during the test.

5.8 SURGE IMMUNITY

5.8.1 Operating Condition

The EUT was performed with recording and playing the signal of audio and video.

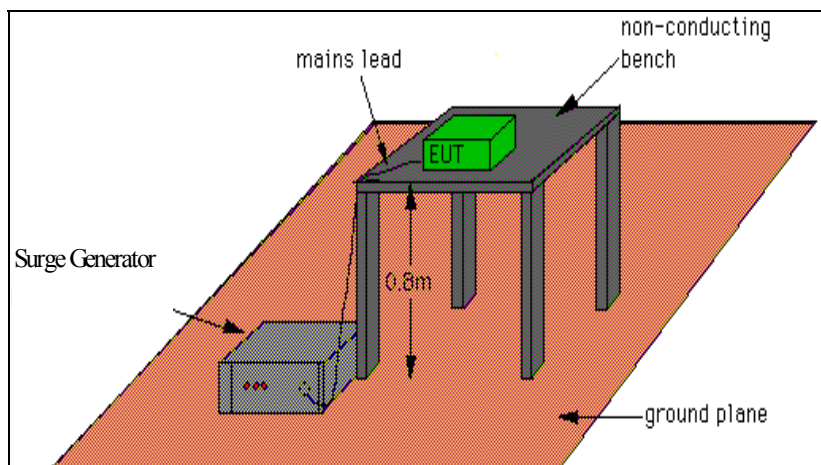
5.8.2 Test set-up and test procedures

The EUT was placed on a non-metallic support 0.8 m above a reference ground plane(RGP).

Photograph for Test set-up of EUT



General test set-up for immunity to Surge interference



5.8.3 Test instrument

Instrument	Model No.	Serial No.	Makers	Range (kV)	Used
Surge tester	PSURGE6.1	081196-03	Haefely	-	O
Coung filter	PSURGE 32.1	081839-03	Haefely	-	O
Coupling network	IP6.2	081811-10	Haefely	-	-
Decoupling network	DEC1A	081897-05	Haefely	-	-
Decoupling network	DEC3A	081583-03	Haefely	-	-
Impulse module	PHV 30.2	081299-03	Haefely	-	O
EM clamp	-	-	EM Test	-	-
Ultra compact simulator	UCS 500 M6	0500-16	EM Test	-	-
Power simulator	MV2616	0301-04	EM Test	-	-
ERI lab	-	-	-	-	O

Reference ground plane: Immunity test area bottom

5.8.4 Test mode

1. Coupling mode and severity level :	<input checked="" type="checkbox"/> AC mains Line to Line : $\pm (0.5, 1)$ kV Line to Ground : $\pm (0.5, 1, 2)$ kV <input type="checkbox"/> Signal line : $\pm (0.5, 1)$ kV
2. Number of transients :	5
3. Rise time/width :	<input checked="" type="checkbox"/> 1.2 μ s / 50 μ s (8 μ s / 20 μ s) <input type="checkbox"/> 1 μ s / 50 μ s (6.4 μ s / 16 μ s)
4. Test mode(AC main) :	<input checked="" type="checkbox"/> L + N <input checked="" type="checkbox"/> L + PE <input checked="" type="checkbox"/> N + PE
5. Phase angles :	0° - 360° / 90° Step
6. Repetition rate :	≤ 60 s
7. Criterion :	B

5.8.5 Test protocols

Date of test : 2009. 03. 31.

Test mode	Level [kV]	Phase[°]	Diff. / Com	Result	Comment
L + N	0.5, 1	0, 90, 180, 270	Diff	A	Normally operated.
L + PE	0.5, 1, 2	0, 90, 180, 270	Com	A	Normally operated.
N + PE	0.5, 1, 2	0, 90, 180, 270	Com	A	Normally operated.
CH1~16	0.5, 1	-	Com	A	Normally operated.
LAN, Alarm	0.5, 1	-	Com	A	Normally operated.

5.8.6 Test results

Result : Pass

Comment: The permanent or temporary malfunction of EUT was not detected during the test.

5.9 IMMUNITY TO CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS

5.9.1 Operating Condition

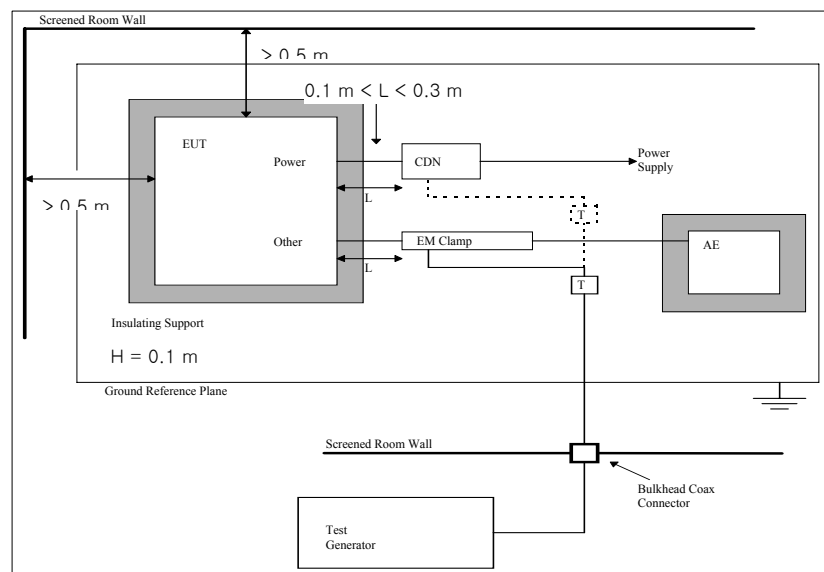
The EUT was performed with recording and playing the signal of audio and video.

5.9.2 Test set-up and test procedures

Photograph for Test set-up of EUT



General test set-up for immunity to EFT/B interference



- Test procedure

The EUT was placed on a non-metallic support 0.1 m above a reference ground plane(RGP) with the coupling/decoupling networks (CDN) placed 0.3 m from the EUT on the RGP.

The disturbance signal level was calibrated as specified in the standard. A power meter for calibration was connected to the EUT side of the CDN through a 150 Ω - 50 Ω adapter. The auxiliary equipment (AE) side of the network was terminated with 150 Ω to ground during the calibration. The generator settings obtained during the calibration procedure were later repeated in the tests.

5.9.3 Test instrument

Instrument	Model No.	Maker	Serial No.	Range (MHz)	Used
Signal generator	SMT03	R&S	831809/008	0.005 - 3 000	O
Power meter	NRVD	R&S	832025/049	-	O
RMS voltmeter	URE 3	R&S	DE30506	-	O
Power amplifier	500A100AM3	AR	26379	0.01 - 100	O
	FCC-801-M3-16A	FCC	06067	0.15 - 230	O
EM clamp	F-203I-32MM	FCC	500	-	O

Reference ground plane: Immunity test area bottom

5.9.4 Test Mode

1. Frequency range :	<input checked="" type="checkbox"/> 150 kHz – 100 MHz <input type="checkbox"/> 150 kHz – 230 MHz <input type="checkbox"/> 150 kHz – 500 MHz
2. Test level :	<input checked="" type="checkbox"/> 120 dB μ V(1 V) <input checked="" type="checkbox"/> 130 dB μ V(3 V) <input checked="" type="checkbox"/> 140 dB μ V(10 V)
3. Modulation :	<input checked="" type="checkbox"/> AM : 1 kHz, 80 % <input checked="" type="checkbox"/> PM : 1 Hz (0.5 s ON : 0.5 s OFF)
4. Frequency Step :	<input checked="" type="checkbox"/> log 1 % step <input type="checkbox"/> log 3 % step <input type="checkbox"/> log 5 % step
5. Dwell time :	<input checked="" type="checkbox"/> 3 s <input type="checkbox"/> 2 s <input type="checkbox"/> 1 s
6. Lines for test :	<input checked="" type="checkbox"/> DC power Port : M3 <input checked="" type="checkbox"/> Signal : clamp <input type="checkbox"/> Telecommunication line
7. Criterion :	A (only test level 1 V/m)

5.9.5 Test protocols

Date of test : 2009. 04. 01.

Freq. [MHz]	Level [V]	Tested line	Result	Comment
0.15 - 100	10 V	AC IN	Pass [A]	Normally operated.
		CH1~16, Alarm, LAN	Pass [A]	Normally operated.
	3 V	AC IN	Pass [A]	Normally operated.
		CH1~16, Alarm, LAN	Pass [A]	Normally operated.
	1 V	AC IN	Pass [A]	Normally operated.
		CH1~16, Alarm, LAN	Pass [A]	Normally operated.

5.9.6 Test results**Result : Pass****Comment:** The permanent or temporary malfunction of EUT was not detected during the test.

5.10 VOLTAGE DIPS, SHORT INTERRUPTIONS AND VOLTAGE VARIATIONS IMMUNITY

5.10.1 Operating Condition

The EUT was performed with recording and playing the signal of audio and video.

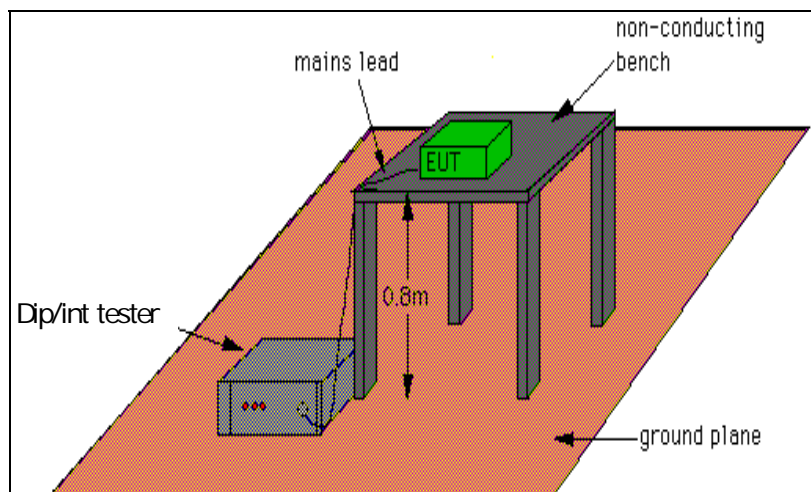
5.10.2 Test set-up and test procedures

The shortest mains cable is used, unless otherwise specified by the manufacturer.

Photograph for Test set-up of EUT



General test set-up for immunity to voltage dips, short interruptions



5.10.3 Test instrument

Instrument	Model No.	Serial No.	Makers	Range	Used
Line interference test system	PLINE 1610	0814510-02	Haefely	-	-
Power simulator	MV2616	0301-04	EM test	-	O
Ultra compact generator	UCS 500 M6	0500-16	EM test	-	O

Reference ground: Shield room bottom

5.10.4 Test Mode

Date of test : 2009. 04. 01.

Voltage reduction %UT	Duration /Period	Phase (°)	Count number	Result	Comment
30 %	0.5	0, 180	3 T	Pass [A]	Normally operated.
	1	0, 180	3 T	Pass [A]	Normally operated.
	5	0, 180	3 T	Pass [A]	Normally operated.
	10	0, 180	3 T	Pass [A]	Normally operated.
60 %	0.5	0	3 T	Pass [A]	Normally operated.
	1	0	3 T	Pass [A]	Normally operated.
	5	0	3 T	Pass [A]	Normally operated.
	10	0	3 T	Pass [A]	Normally operated.
100 %	0.5	0	3 T	Pass [A]	Normally operated.
	1	0	3 T	Pass [A]	Normally operated.
	5	0	3 T	Pass [A]	Normally operated.

5.10.5 Test results

Result : Pass

Comment: The permanent or temporary malfunction of EUT was not detected during the test.

5.11 MAINS SUPPLY VOLTAGE VARIATIONS

5.11.1 Operating Condition

The EUT was performed with recording and playing the signal of audio and video.

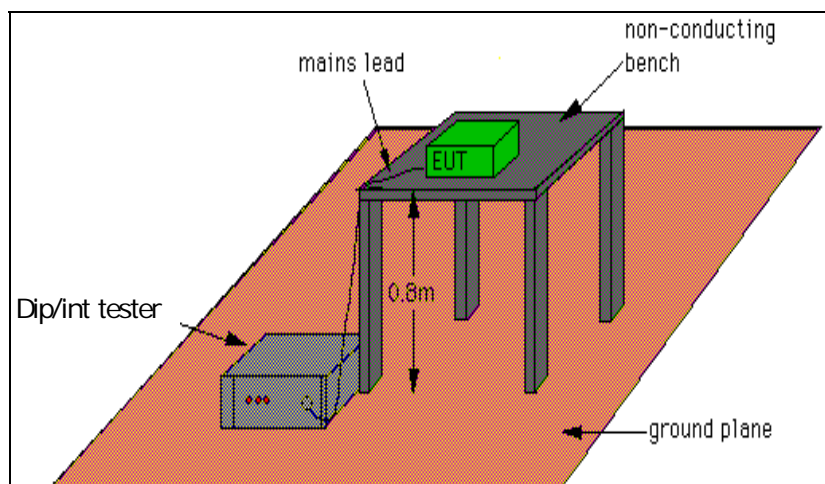
5.11.1 Test set-up and test procedures

The shortest mains cable is used, unless otherwise specified by the manufacturer.

Photograph for Test set-up of EUT



General test set-up for immunity to Voltage variation



5.11.2 Test instrument

Instrument	Model No.	Serial No.	Makers	Range-	Used
Line interference test system	PLINE 1610	0814510-02	Haefely	-	-
Power simulator	MV2616	0301-04	EM test	-	O
Ultra compact generator	UCS 500 M6	0500-16	EM test	-	O

Reference ground: Shield room bottom

5.11.3 Operating mode

Date of test: 2009. 04. 01.

Supply voltage Max %UT	Unom(V)	Supply voltage	Result & Comment
Umax	230	Unom + 10 %	Normally operated.
Umin	230	Umin – 15 %	Normally operated.

5.11.4 Test results

Result : Pass

Comment: The permanent or temporary malfunction of EUT was not detected during the test.

6 PRODUCT PHOTOGRAPHS

6.1. Photograph of EUT

[Front Side]



[Rear Side]

