



EMC TEST REPORT For FCC

Test Report No. : KES-E1-17T0178-R1
Date of Issue : Feb. 24, 2023
Product name : CCTV CAMERA
Model/Type No. : HCB-6001
Variant Model : -
Applicant : Hanwha Vision Co., Ltd
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : 1. HANWHA VISION VIETNAM COMPANY LIMITED
2. D-TECH CO.,LTD.
Manufacturer Address : 1. Lot O-2, Que Vo Industrial Zone extended area,
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do,
Korea (Suwon Industrial Complex)
Equipment authorization : ☐ Declaration of Conformity
☒ Verification
☐ Certification
Date of Receipt : Feb. 06, 2017
Test date : Feb. 23, 2017
Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by

Reviewed by

Min Seong, Kim
EMC Test Engineer

Dong-Hun, Jang
EMC Technical Manager

Tested by Young Suk, Song
(Retries person)
Proxy signature : Min Seong, Kim

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-E1-17T0178-R1
Page (2) of (34)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Feb. 28, 2017	KES-E1-17T0178	Issued
Feb. 24, 2023	KES-E1-17T0178-R1	Change the Model/Type No., Applicant, Applicant Address, Manufacturer and Manufacturer Address at the request of the customer

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd. This document may be altered or revised by KES Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by KES Co., Ltd. will constitute fraud and shall nullify the document.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-E1-17T0178-R1
Page (3) of (34)

TABLE OF CONTENTS

1.0	General Product Description.....	4
1.1	Test Voltage & Frequency	5
1.2	Variant Model Differences	5
1.3	Device Modifications	5
1.4	Equipment Under Test.....	5
1.5	Support Equipments	5
1.6	External I/O Cabling	6
1.7	EUT Operating Mode(s)	7
1.8	Configuration	8
1.9	Calibration Details of Equipment Used for Measurement	9
1.10	Test Facility	9
1.11	Laboratory Accreditations and Listings	9
2.0	Test Regulations.....	10
2.1	Conducted Emissions at Mains Power Ports	12
2.2	Radiated Electric Field Emissions(Below 1 GHz)	13
2.3	Radiated Electric Field Emissions(Above 1 GHz)	14
APPENDIX A – TEST DATA.....		15
Conducted Emissions at Mains Power Ports.....		15
Radiated Electric Field Emissions(Below 1 GHz)		17
Radiated Electric Field Emissions(Above 1 GHz)		19
Test Setup Photos and Configuration		23
Conducted Voltage Emissions		23
Radiated Electric Field Emissions(Below 1 GHz)		24
Radiated Electric Field Emissions(Above 1 GHz)		26
EUT External Photographs		28
EUT Internal Photographs		29

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-E1-17T0178-R1

Page (4) of (34)

1.0 General Product Description

Main Specifications of EUT are:

Video	
Imaging Device	1/2.8" 2M CMOS
Total Pixels	1,945(H) x 1,109(V) 2.16M pixels
Effective Pixels	1,945(H) x 1,097(V) 2.13M pixels
Scanning System	Progressive Scan
Min. Illumination	Color : 0.04Lux (F1.2)
S / N Ratio	52dB (AGC off, Weight on)
Video Output	BNC(AHD / TVI / CVI / CVBS Selectable)
Resolution	1920 x 1080
Max. Framerate	30fps @1080p 25fps @1080p
Lens Type	
Focal Length (Zoom Ratio)	-
Max. Aperture Ratio	-
Angular Field of View	-
Min. Object Distance	-
Focus Control	Simple focus / Manual, Button control(Manual Simple focus, Day&Night)
Lens Type	Manual / DC auto Iris
Mount Type	C/CS
Auto Back Focus(ABF)	-
Operational	
IR LED	-
Viewable length	-
On Screen Display	Multi-language Support(16)
Camera Title	Off / On (Displayed 15 characters)
Day & Night	Auto (ICR) / External / Color / B/W
Backlight Compensation	Off / User BLC / HLC
Wide Dynamic Range	120dB
Contrast Enhancement	-
Digital Noise Reduction	SSNR4 (Off / On)
Defog	AUTO / MANUAL / OFF
Digital Image Stabilization	Not support
Motion Detection	Off / On(4 zones)
Privacy Masking	Off / On (4zones rectangle)
Gain Control	Off / Low / Middle / High / Very High
White Balance	ATW / Outdoor / Indoor / Manual / AWC (1,800K ~ 10,500K)
LDC (Lens Distortion Correction)	Not support
Electronic Shutter Speed	1sec~ 1/12,000sec
Digital Zoom	Not support
Reverse	Off / H-Rev / V-Rev / HV-Rev
Profile	Basic, Day & Night, Backlight, ITS, Indoor, User
Intelligent Video Analytics	Not support
Alarm	MD output 1, External D/N 1
Remote control interface	Coaxial, RS-485
Protocol	Coax : ACP(AHD Coax Protocol)
Video Transmission Distance	500m(5C2V Coaxial Cable)
Environmental	
Operating Temperature / Humidity	-10°C ~ +55°C (+14°F ~ +131°F) / Less than 90% RH
Ingress Protection	-
Vandal Resistance	-
Electrical	
Input Voltage/Current	Dual (24VAC±10% & 12VDC±10%)
Power Consumption	Max. 3.5W
Mechanical	
Color / Material	Ivory / Plastic Black/Metal
Dimension (WxHxD)	133.4*73*67.2
Weight	287g

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage ☐ 100 Vac ☐ 120 Vac ☒ 24 Vac ☒ 12 Vdc ☐ PoE
Frequency ☐ 50 Hz ☒ 60 Hz ☐ Hz

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
CCTV CAMERA	HCB-6001	-	HANWHA VISION VIETNAM COMPANY LIMITED	E.U.T

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
MONITOR	M1950DM	108KCLH4W536	LG Electronics Co., Ltd.	-
MONITOR Adapter	PA-1650-68	OCOGN612314034864	LITE-ON TECHNOLOGY CORPORATION	-
LENS	GL-D50V500CS	-	Honeywell	-
Alarm	-	-	-	-

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-E1-17T0178-R1

Page (6) of (34)

1.6 External I/O Cabling

- AC 24 V Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
CCTV CAMERA (E.U.T)	BNC	MONITOR	Component	3.0	S
	IRIS	LENZ	IRIS	0.1	U
	2 Pin	Alarm	2 Pin	3.0	U

- DC 12 V Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
CCTV CAMERA (E.U.T)	BNC	MONITOR	Component	3.0	S
	IRIS	LENZ	IRIS	0.1	U
	2 Pin	Alarm	2 Pin	3.0	U

* Unshielded = U, Shielded = S

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-E1-17T0178-R1

Page (7) of (34)

1.7 EUT Operating Mode(s)

Test mode	operating
AC 24 V, DC 12 V	E.U.T Monitoring

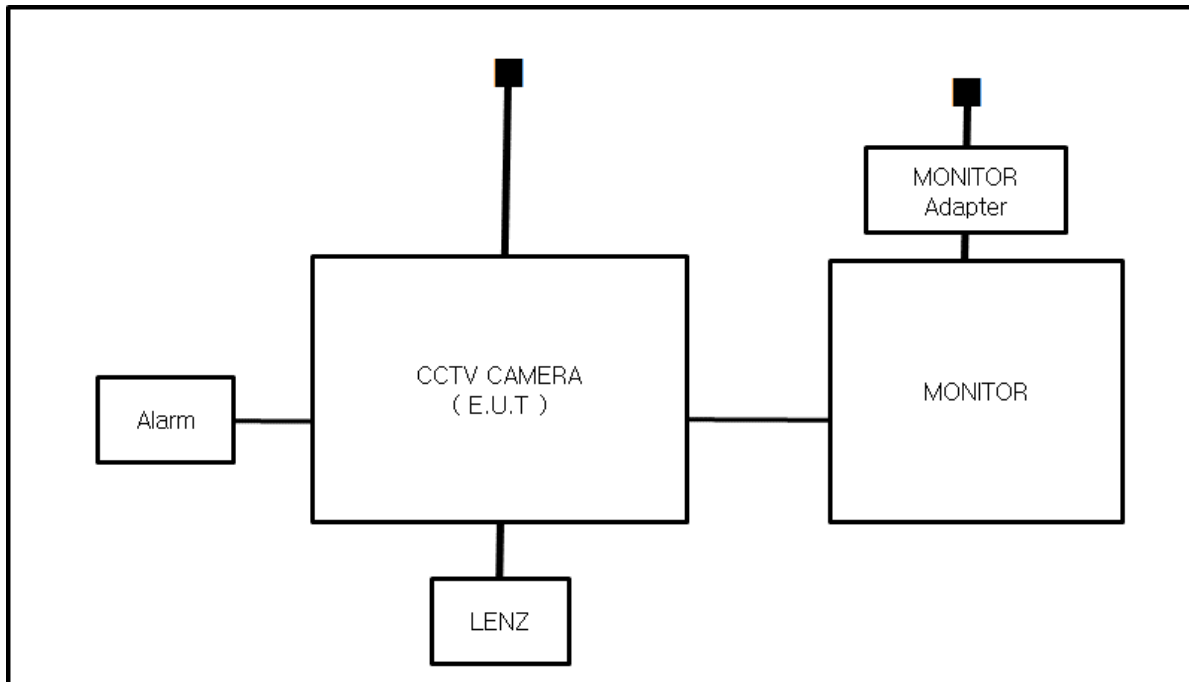
E.U.T Test operating S/W		
Name	Version	Manufacture Company
-	-	-

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

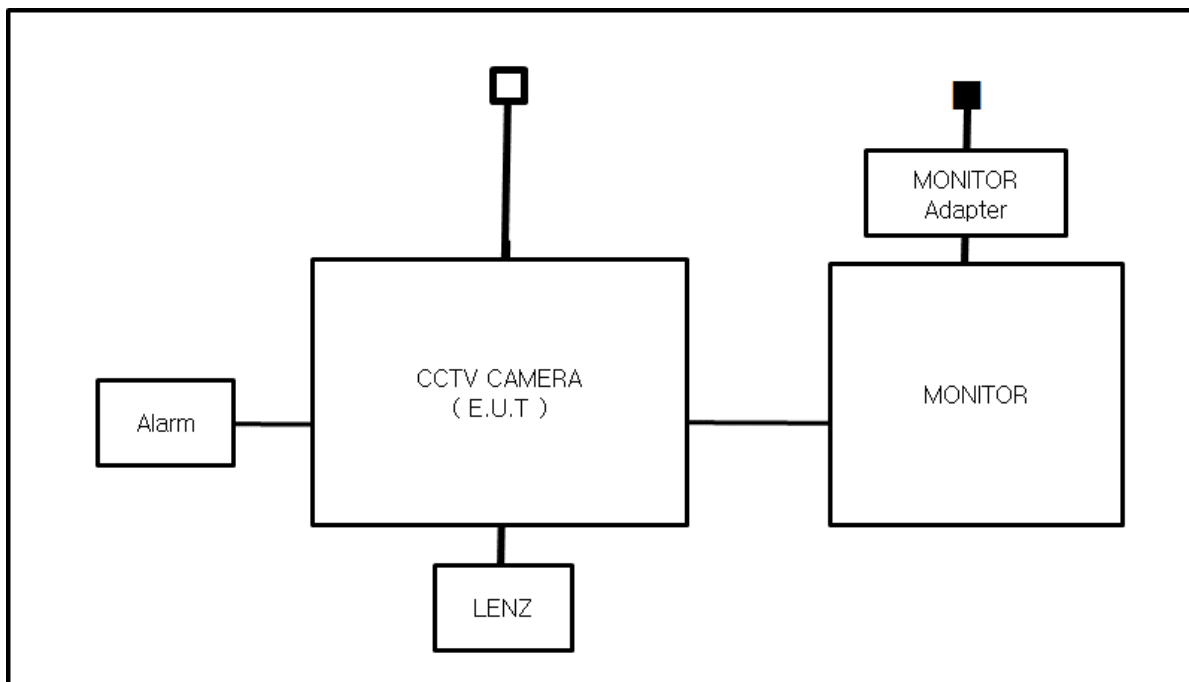
1.8 Configuration

■ AC Main
 □ DC Main

- AC 24 V Mode



- DC 12 V Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact kes@kes.co.kr

1.9 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

1.10 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

1.11 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298
JAPAN	VCCI	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)	 C-20136, T-20137, R-20181, G-20176
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☐ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1
☐ Class A

☐ Group 2
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 55022:2010

☐ Class A

☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-E1-17T0178-R1

Page (11) of (34)

-
- | | | |
|--|---|----------------------------------|
| ☐ VCCI V-3 / 2015.04 | ☐ Class A | ☐ Class B |
| ☐ AS/NZS CISPR22:2009 +A1:2010 | ☐ Class A | ☐ Class B |
| ☒ 47 CFR Part 15, Subpart B | | |
| ☐ CISPR 22:2009 +A1:2010 | ☐ Class A | ☐ Class B |
| ☒ ANSI C63.4-2014 | ☒ Class A | ☐ Class B |
| ☐ IC Regulation ICES-003 : 2016 | | |
| ☐ CAN/CSA CISPR 22-10 | ☐ Class A | ☐ Class B |
| ☐ ANSI C63.4-2014 | | |
| ☐ MEDICAL – Directive 93/42/EEC | | |
| ☐ EN 60601-1-2 :2007 | | |
| ☐ RE– Directive 2014/53/EU | | |
| ☐ EN 301 489-1 V1.9.2 | | |
| ☐ Equipment for fixed use | | |
| ☐ Equipment for vehicular use | | |
| ☐ Equipment for portable use | | |
| ☐ EN 301 489-3 V1.6.1 | | |
| ☐ EN 301 489-17 V2.2.1 | | |
| ☐ EN 60945:2002 | | |

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

2.1 Conducted Emissions at Mains Power Ports

Test Date

Fen. 23, 2017

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test Receiver	ESR3	R & S	101783	05, 03, 2017
☒	LISN	ENV216	R & S	101137	02, 03, 2018
☒	LISN	ENV216	R & S	101786	05, 02, 2017
☒	PULSE LIMITER	ESH3-Z2	R & S	101914	12, 13, 2017
☒	Shield Room #3	-	SEMITEC	-	-
☒	EMI Test S/W	EMC32	R & S	9.12.00	-

Test Conditions

Temperature: 22,2 °C

Relative Humidity: 39,7 %

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.2 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Feb. 23, 2017

Test Location☐ Open Area Test Site #1☒ Open Area Test Site #2**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI TEST Receiver	ESR3	R & S	101781	05, 03, 2017
☒	Trilog-Broadband ANT	VULB 9163	Schwarzbeck	715	04, 14, 2018
☒	OATS	-	KES	-	-
☒	Antenna Mast	-	DAEIL EMC	-	-
☒	Turn Table	-	DAEIL EMC	-	-
☒	EMI Test S/W	-	-	-	-

Test Conditions

Temperature: -2,4 °C

Relative Humidity: 60,0 %

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Feb. 23, 2017

Test Location

Semi Anechoic Chamber #1

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	Log-Periodic Antenna	STLP 9149	SCHWARZBECK	9149-255	05, 17, 2018
☒	EMI Test Receiver	ESU26	R & S	100551	04, 18, 2017
☒	Preamplifier	SCU 18	R & S	102232	06, 29, 2017
☒	Semi Anechoic Chamber #1	-	KES	-	-
☒	Tilt Antenna Mast	TAM 4.0-E	maturro	18100116	-
☒	Turn Table	DT 2000-1,5T	INN-CO	-	-
☒	EMI Test S/W	N/A	N/A	N/A	-

Test Conditions

Temperature: 21,9 °C

Relative Humidity: 39,1 %

Frequency Range of Measurement

1 GHz to 6 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

APPENDIX A – TEST DATA

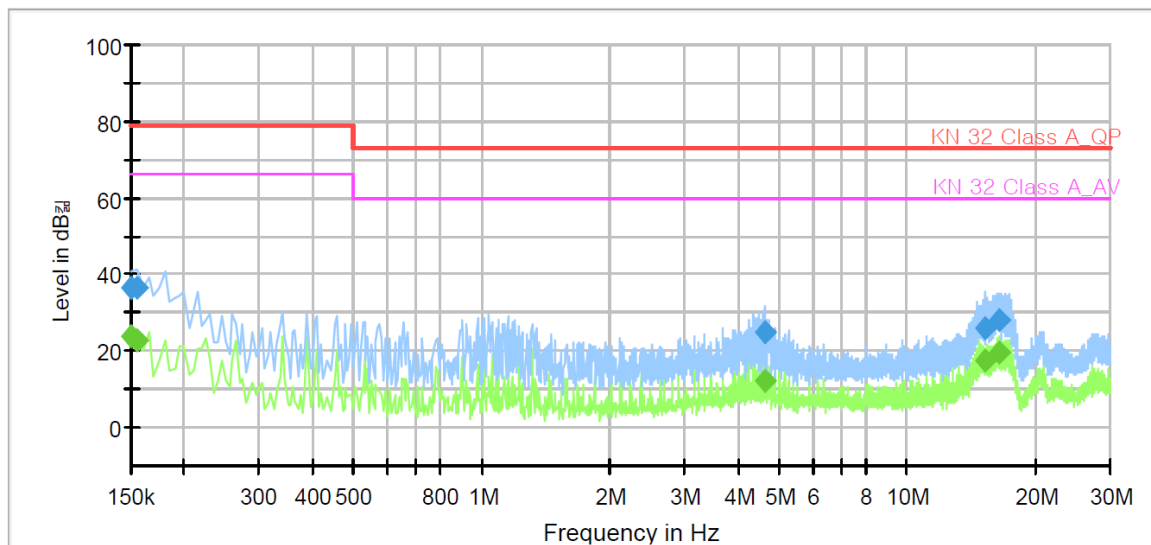
Conducted Emissions at Mains Power Ports

[HOT]

- AC 24 V Mode

Common Information

Test Description:	Conducted Emission
Model No.:	HCB-6001N
Mode	AC 24 V_H
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	---	23.59	66.00	42.41	1000.0	9.000	L1	21.1
0.150000	36.56	---	79.00	42.44	1000.0	9.000	L1	21.1
0.155000	---	22.94	66.00	43.06	1000.0	9.000	L1	21.0
0.155000	36.37	---	79.00	42.63	1000.0	9.000	L1	21.0
4.610000	---	12.12	60.00	47.88	1000.0	9.000	L1	19.7
4.610000	25.03	---	73.00	47.97	1000.0	9.000	L1	19.7
15.180000	---	17.46	60.00	42.54	1000.0	9.000	L1	20.1
15.180000	25.85	---	73.00	47.15	1000.0	9.000	L1	20.1
16.435000	---	19.50	60.00	40.50	1000.0	9.000	L1	20.1
16.435000	28.31	---	73.00	44.69	1000.0	9.000	L1	20.1

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

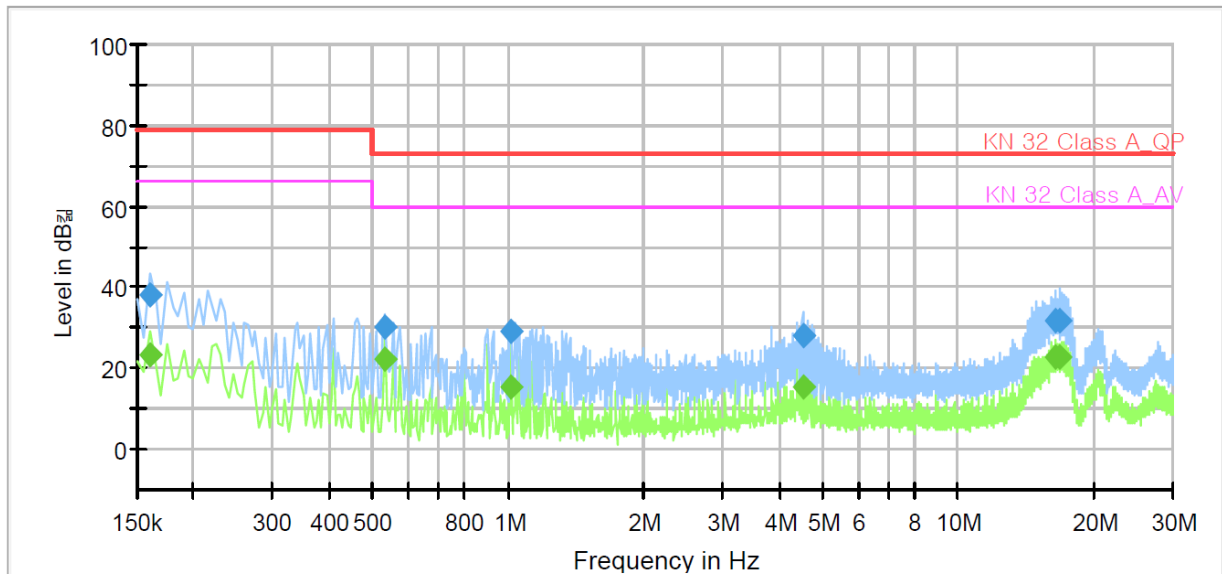
Corr. : Correction values (LISN FACTOR+ Cable Loss)

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact kes@kes.co.kr

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	HCB-6001N
Mode	AC 24 V_N
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	23.48	66.00	42.52	1000.0	9.000	N	21.0
0.160000	38.32	---	79.00	40.68	1000.0	9.000	N	21.0
0.535000	---	22.02	60.00	37.98	1000.0	9.000	N	20.5
0.535000	30.37	---	73.00	42.63	1000.0	9.000	N	20.5
1.015000	---	15.62	60.00	44.38	1000.0	9.000	N	20.1
1.015000	29.21	---	73.00	43.79	1000.0	9.000	N	20.1
4.510000	---	15.25	60.00	44.75	1000.0	9.000	N	19.7
4.510000	28.30	---	73.00	44.70	1000.0	9.000	N	19.7
16.480000	---	22.91	60.00	37.09	1000.0	9.000	N	20.1
16.480000	31.70	---	73.00	41.30	1000.0	9.000	N	20.1
16.845000	---	22.86	60.00	37.14	1000.0	9.000	N	20.1
16.845000	31.85	---	73.00	41.15	1000.0	9.000	N	20.1

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR+ Cable Loss)

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact kes@kes.co.kr



Radiated Electric Field Emissions(Below 1 GHz)

- AC 24 V Mode

Frequency	Amplitude	ANT	ANT. Height	Correction Factor		Corrected Amplitude	Applicable Limit	Margin
[MHz]	[dB μ V]	Polar. (H/V)	[m]	ANT. [dB/m]	Cable [dB]	[dB μ V/m]	[dB μ V/m]	[dB]
161.93	12.62	H	2.35	8.58	3.17	24.37	43.50	19.13
216.00	17.04	H	2.14	11.82	3.73	32.59	43.50	10.91
216.23	15.36	V	2.94	11.82	3.73	30.91	46.40	15.49
262.74	10.96	V	3.14	12.77	4.27	28.00	46.40	18.40
334.44	12.24	V	2.33	14.15	4.81	31.20	46.40	15.20
334.48	10.28	H	1.09	14.15	4.81	29.24	46.40	17.16

* H : Horizontal, V : Vertical

◆ Calculation

Corrected Amplitude [dB μ V] = Amplitude[dBuV] + Correction Factor [dB]

Corrected Amplitude : The Final Value, Amplitude : Reading Value,

Correction Factor : ANT FACTOR + Cable loss

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-E1-17T0178-R1
Page (18) of (34)

- DC 12 V Mode

Frequency	Amplitude	ANT	ANT. Height	Correction Factor		Corrected Amplitude	Applicable Limit	Margin
[MHz]	[dBμV]	Polar. (H/V)	[m]	ANT. [dB/m]	Cable [dB]	[dBμV/m]	[dBμV/m]	[dB]
216.24	12.36	V	1.25	11.82	3.73	27.91	46.40	18.49
266.63	10.97	V	3.01	12.83	4.30	28.10	46.40	18.30
266.64	10.25	H	1.28	12.83	4.30	27.38	46.40	19.02
334.15	17.11	H	1.95	14.14	4.81	36.06	46.40	10.34
334.49	14.94	V	2.69	14.15	4.81	33.90	46.40	12.50
446.14	13.22	H	1.96	16.37	6.00	35.59	46.40	10.81

* H : Horizontal, V : Vertical

◆ Calculation

Corrected Amplitude [dBμV] = Amplitude[dBuV] + Correction Factor [dB]

Corrected Amplitude : The Final Value, Amplitude : Reading Value,

Correction Factor : ANT FACTOR + Cable loss

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-E1-17T0178-R1
Page (19) of (34)

Radiated Electric Field Emissions(Above 1 GHz)

- AC 24 V Mode

- PK

Frequency	Amplitude	ANT Polar. (H/V)	ANT. Height	Correction Factor			Corrected Amplitude	Applicable Limit	Margin
[MHz]	[dB μ V]		[m]	ANT. [dB /m]	Cable [dB]	AMP [dB]	[dB μ V/m]	[dB μ V/m]	[dB]
1 914.000	53.770	H	2.960	25.160	4.360	43.750	39.540	80.000	40.460
2 574.000	49.440	V	2.140	28.010	5.160	44.040	38.570	80.000	41.430
2 930.000	50.860	V	2.330	29.500	5.330	44.170	41.520	80.000	38.480
2 945.000	51.420	H	1.580	29.560	5.340	44.180	42.140	80.000	37.860
4 152.000	50.350	V	2.360	31.670	6.790	44.230	44.580	80.000	35.420
4 695.000	48.550	H	3.010	32.670	6.910	44.290	43.840	80.000	36.160

◆ Calculation

Correction Factor [dB] = Ant Factor[dB/m] + Cable Loss [dB] – Preamp Factor [dB]

Corrected Amplitude [dB μ V] = Amplitude[dB μ V] + Correction Factor [dB]

Corrected Amplitude : The Final Value, Amplitude : Reading Value

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-E1-17T0178-R1
Page (20) of (34)

- AV

Frequency	Amplitude	ANT Polar.	ANT. Height	Correction Factor			Corrected Amplitude	Applicable Limit	Margin
[MHz]	[dBμV]	(H/V)	[m]	ANT. [dB/m]	Cable [dB]	AMP [dB]	[dBμV/m]	[dBμV/m]	[dB]
1 921.000	43.850	H	1.580	25.200	4.360	43.760	29.650	60.000	30.350
2 571.000	40.400	V	2.330	27.990	5.160	44.040	29.510	60.000	30.490
2 928.000	37.910	V	1.950	29.490	5.330	44.170	28.560	60.000	31.440
2 941.000	39.450	H	3.210	29.540	5.330	44.180	30.140	60.000	29.860
4 153.000	35.900	V	1.290	31.670	6.800	44.230	30.140	60.000	29.860
4 692.000	33.380	H	3.000	32.660	6.900	44.290	28.650	60.000	31.350

◆ Calculation

Correction Factor [dB] = Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]

Corrected Amplitude [dBuV] = Amplitude[dBuV] + Correction Factor [dB]

Corrected Amplitude : The Final Value, Amplitude : Reading Value

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-E1-17T0178-R1

Page (21) of (34)

- DC 12 V Mode

- PK

Frequency	Amplitude	ANT Polar.	ANT. Height	Correction Factor			Corrected Amplitude	Applicable Limit	Margin
[MHz]	[dBμV]	(H/V)	[m]	ANT. [dB /m]	Cable [dB]	AMP [dB]	[dBμV/m]	[dBμV/m]	[dB]
1 735.000	57.430	V	2.630	24.250	4.160	43.700	42.140	80.000	37.860
2 104.000	54.440	H	1.250	26.040	4.600	43.830	41.250	80.000	38.750
2 921.000	51.970	H	2.330	29.460	5.320	44.170	42.580	80.000	37.420
2 988.000	52.360	V	1.950	29.740	5.350	44.200	43.250	80.000	36.750
4 722.000	46.160	H	3.250	32.720	6.930	44.290	41.520	80.000	38.480
4 782.000	48.880	V	1.250	32.830	6.980	44.300	44.390	80.000	35.610

◆ Calculation

Correction Factor [dB] = Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]

Corrected Amplitude [dBuV] = Amplitude[dBuV] + Correction Factor [dB]

Corrected Amplitude : The Final Value, Amplitude : Reading Value

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-E1-17T0178-R1
Page (22) of (34)

- AV

Frequency [MHz]	Amplitude [dBμV]	ANT Polar. (H/V)	ANT. Height [m]	Correction Factor			Corrected Amplitude [dBμV/m]	Applicable Limit [dBμV/m]	Margin [dB]
				ANT. [dB /m]	Cable [dB]	AMP [dB]			
1 736.000	44.920	V	2.540	24.250	4.160	43.700	29.630	60.000	30.370
2 103.000	41.670	H	1.250	26.030	4.600	43.830	28.470	60.000	31.530
2 914.000	38.760	H	2.000	29.430	5.320	44.170	29.340	60.000	30.660
2 988.000	39.360	V	2.950	29.740	5.350	44.200	30.250	60.000	29.750
4 730.000	34.870	H	1.250	32.730	6.940	44.290	30.250	60.000	29.750
4 789.000	32.680	V	3.010	32.840	6.990	44.300	28.210	60.000	31.790

◆ Calculation

Correction Factor [dB] = Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]

Corrected Amplitude [dBuV] = Amplitude[dBuV] + Correction Factor [dB]

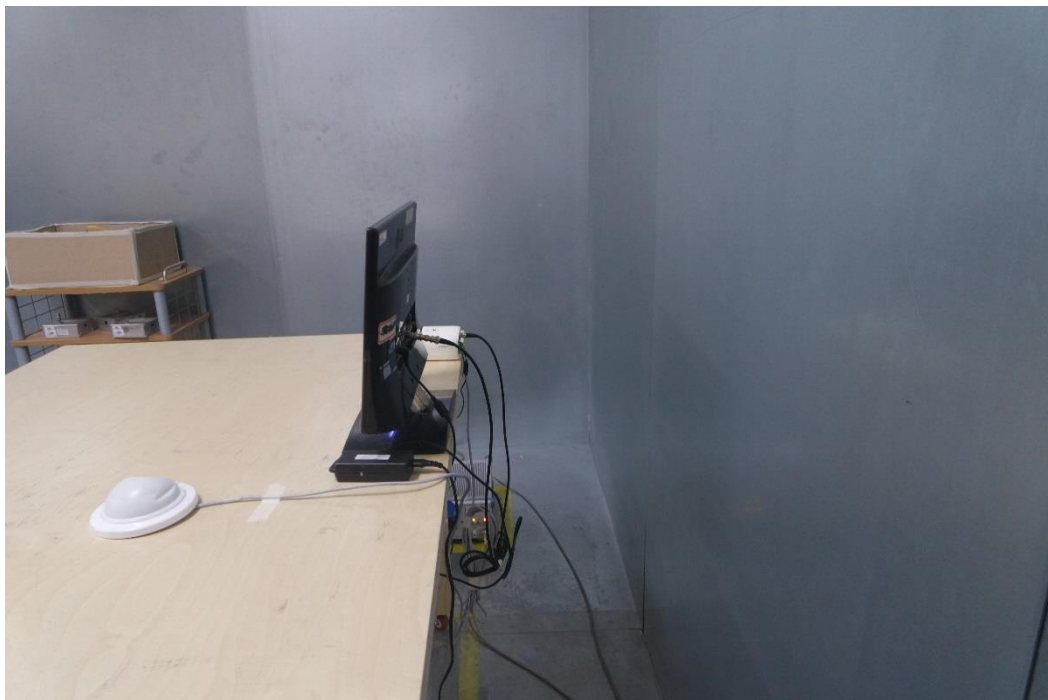
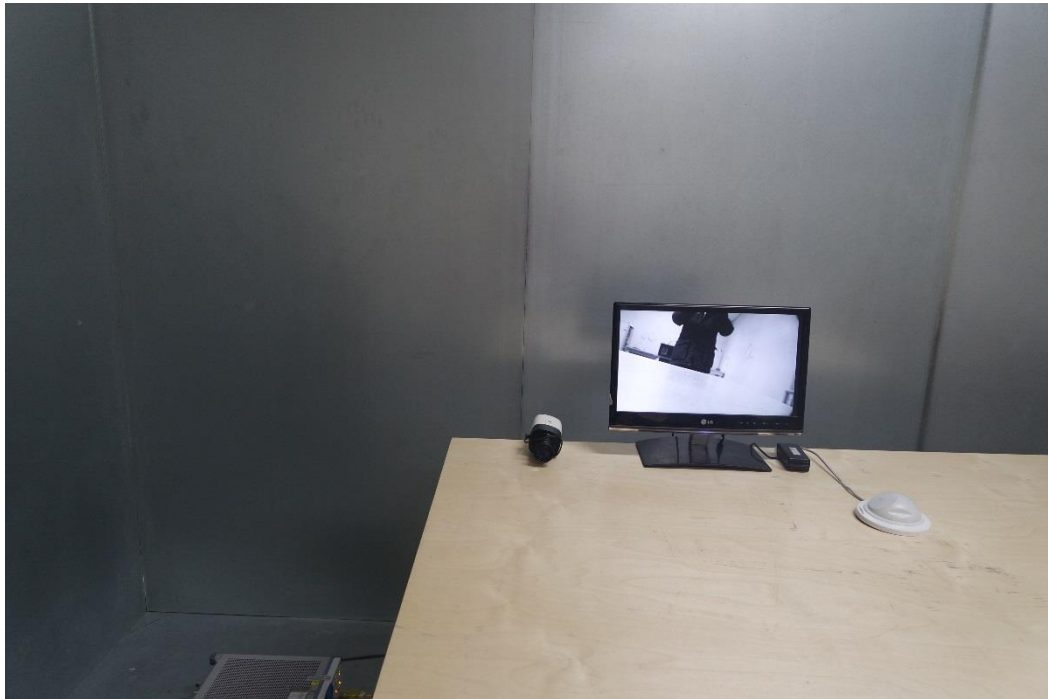
Corrected Amplitude : The Final Value, Amplitude : Reading Value

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Test Setup Photos and Configuration

Conducted Voltage Emissions

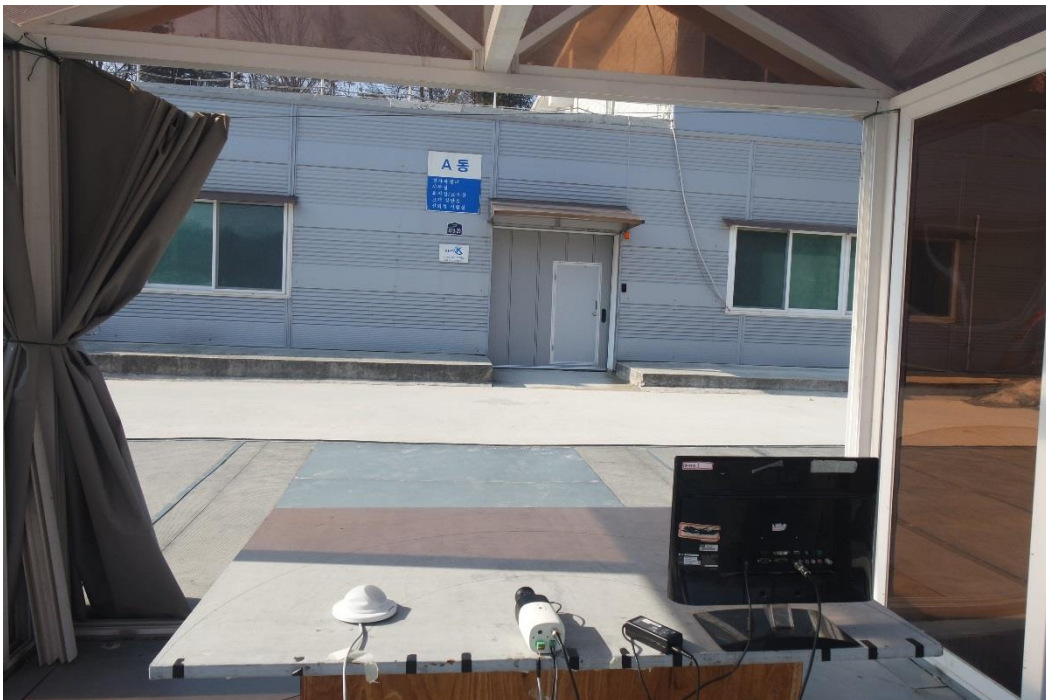
- AC 24 V Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Radiated Electric Field Emissions(Below 1 GHz)

- AC 24 V Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

- DC 12 V Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Radiated Electric Field Emissions(Above 1 GHz)

- AC 24 V Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

- DC 12 V Mode



EUT External Photographs

(Top)

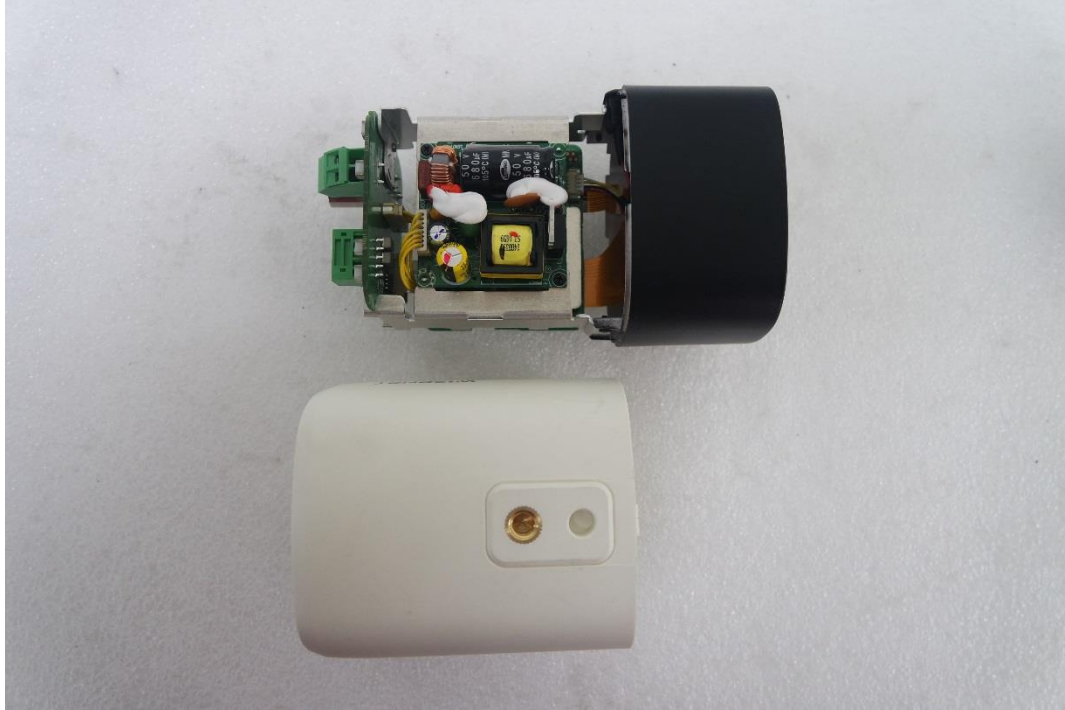


(Bottom)



EUT Internal Photographs

(Internal View)

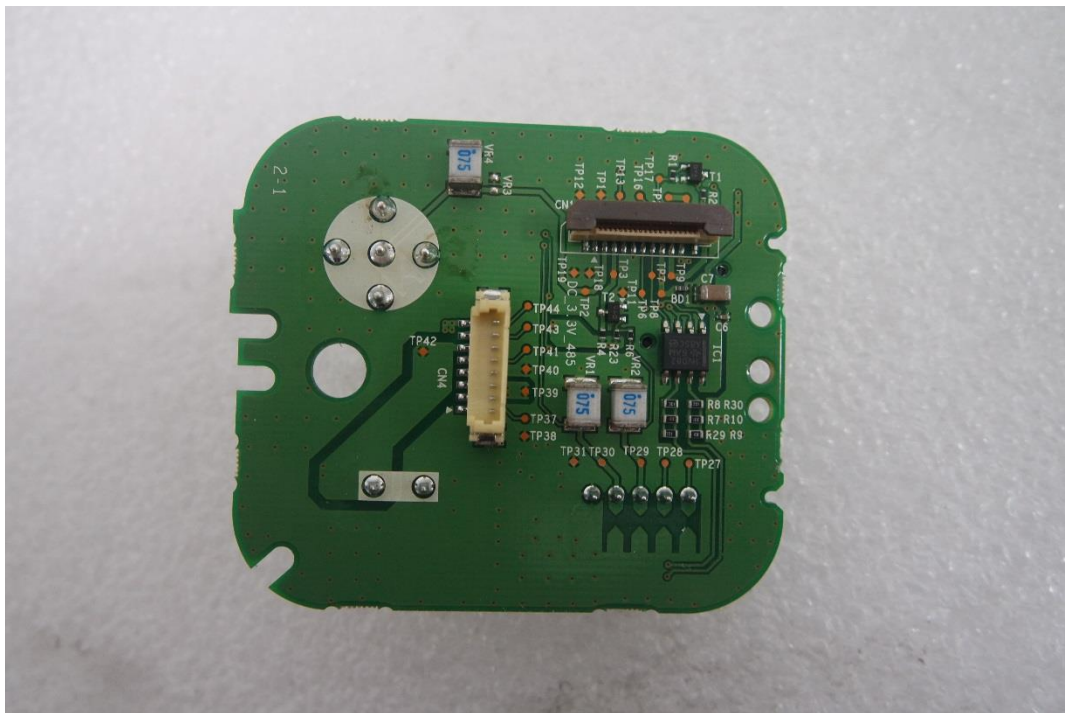


EUT Internal View – Sub Board 1

(Top)



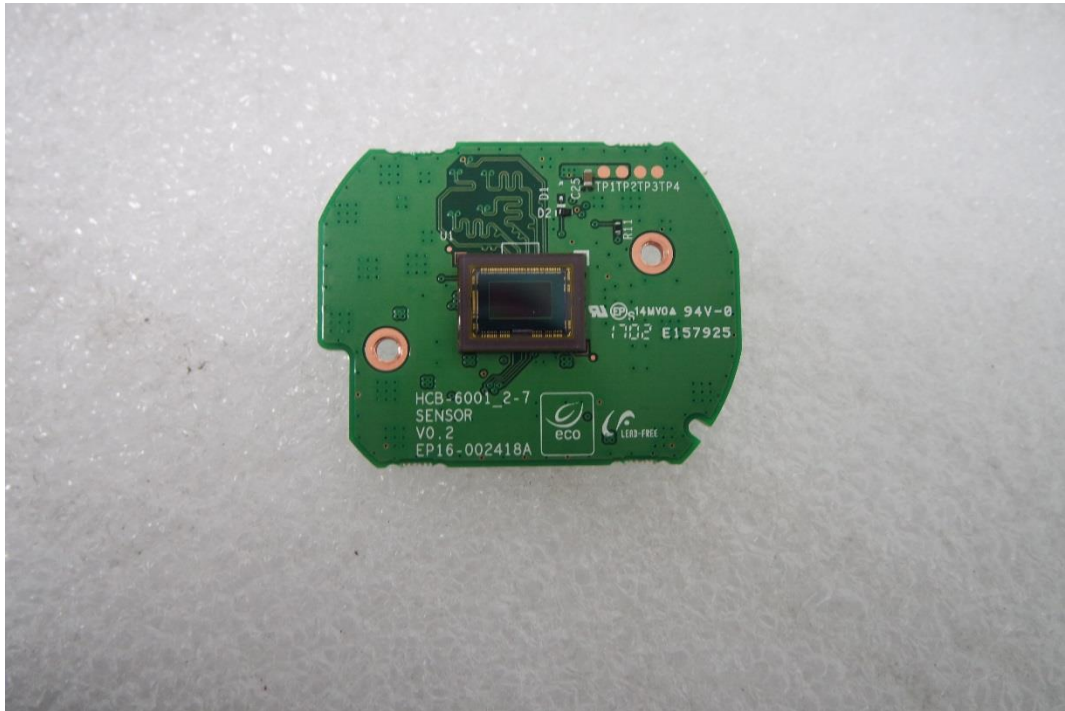
(Bottom)



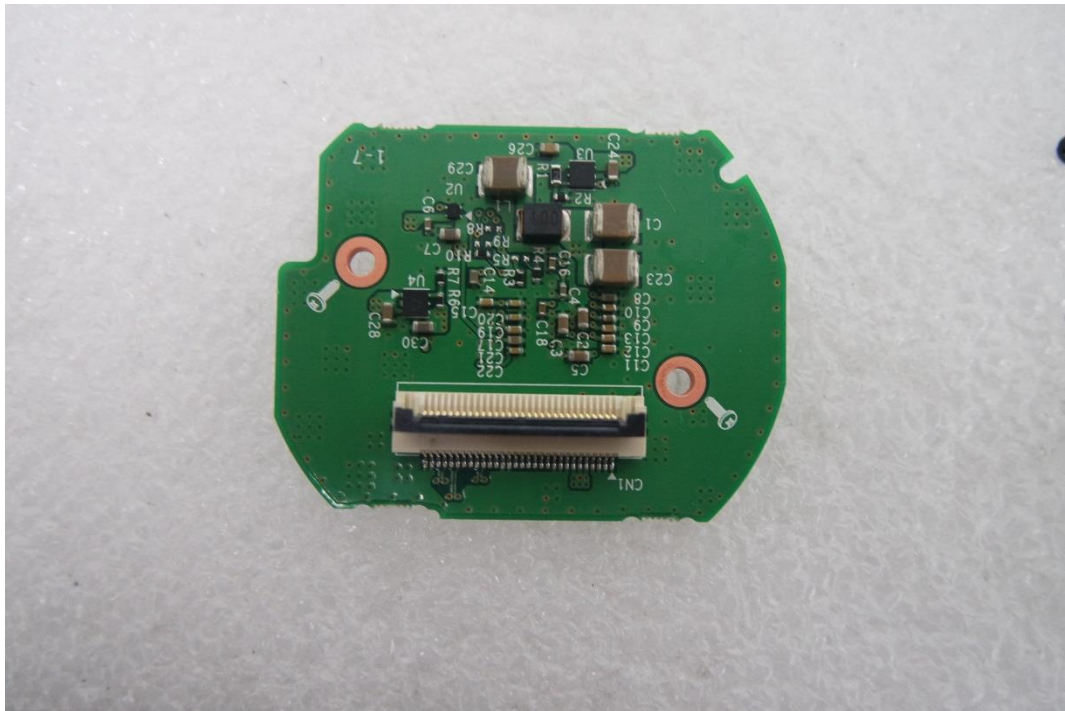
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Lens Board 1

(Top)

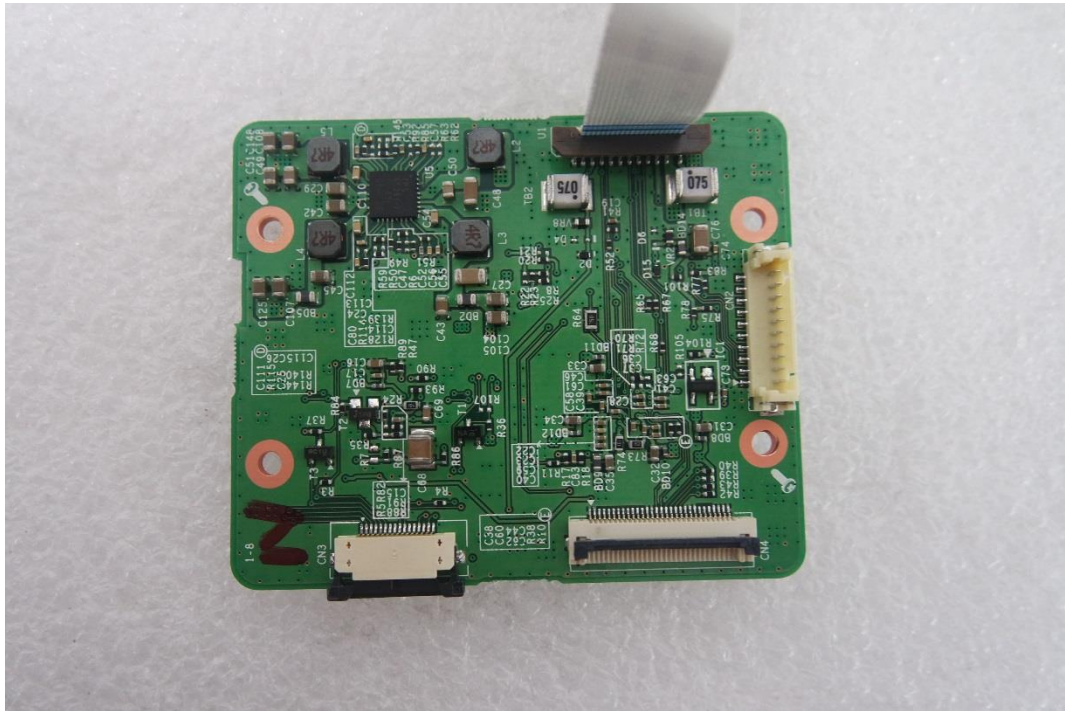


(Bottom)

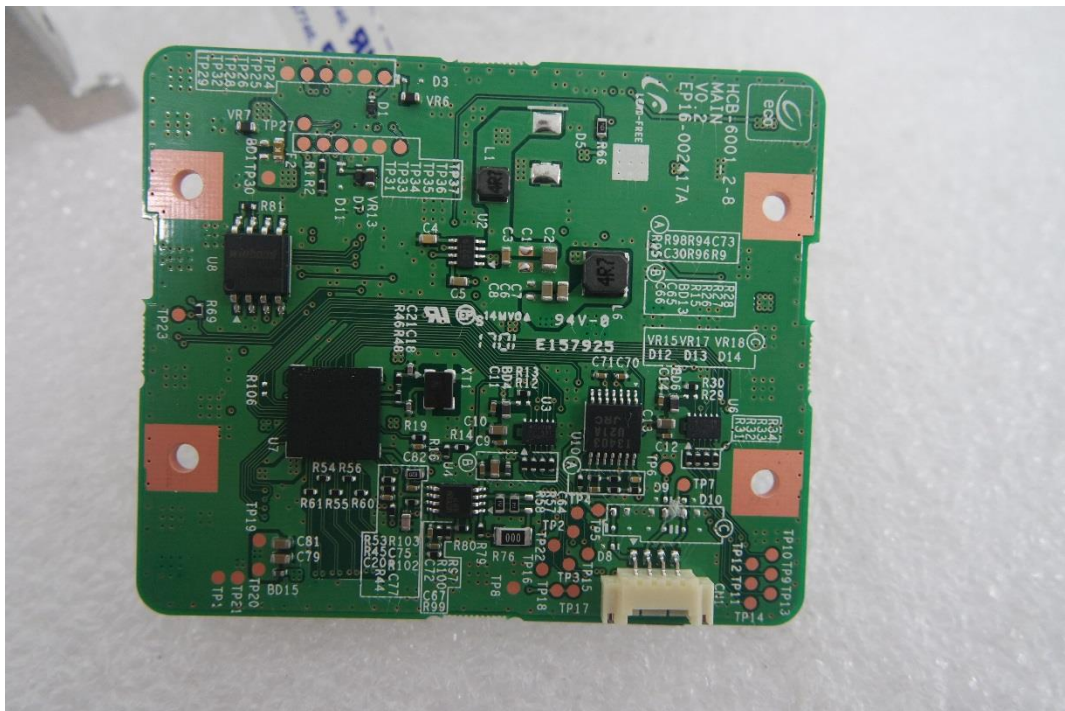


EUT Internal View – Main Board 1

(Top)



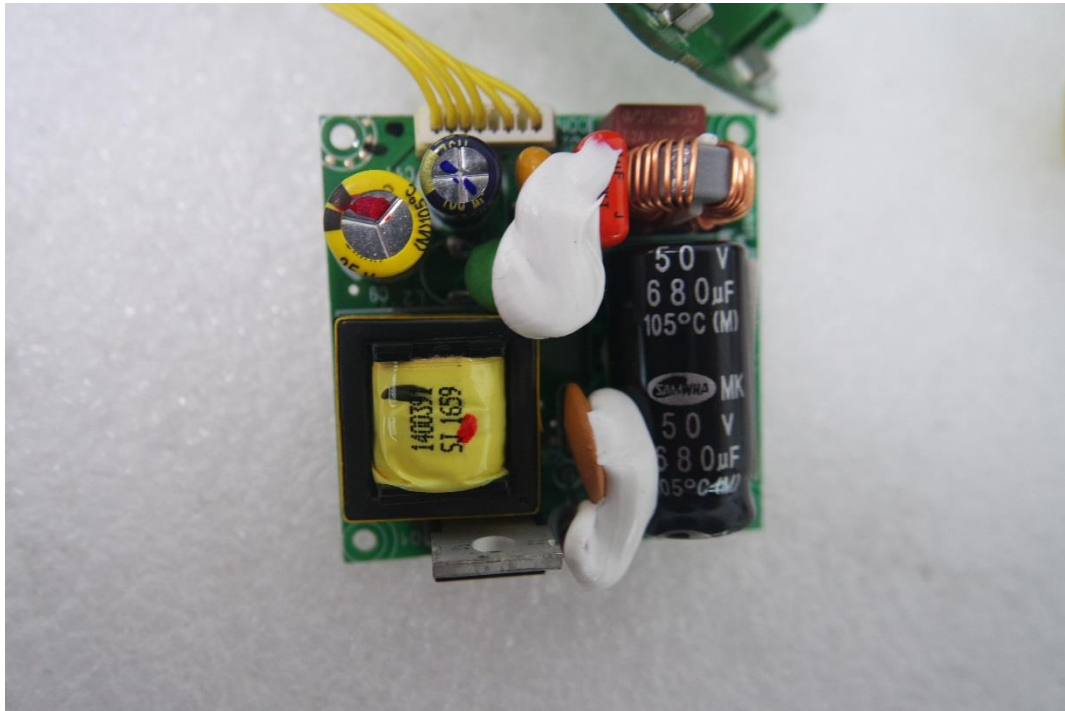
(Bottom)



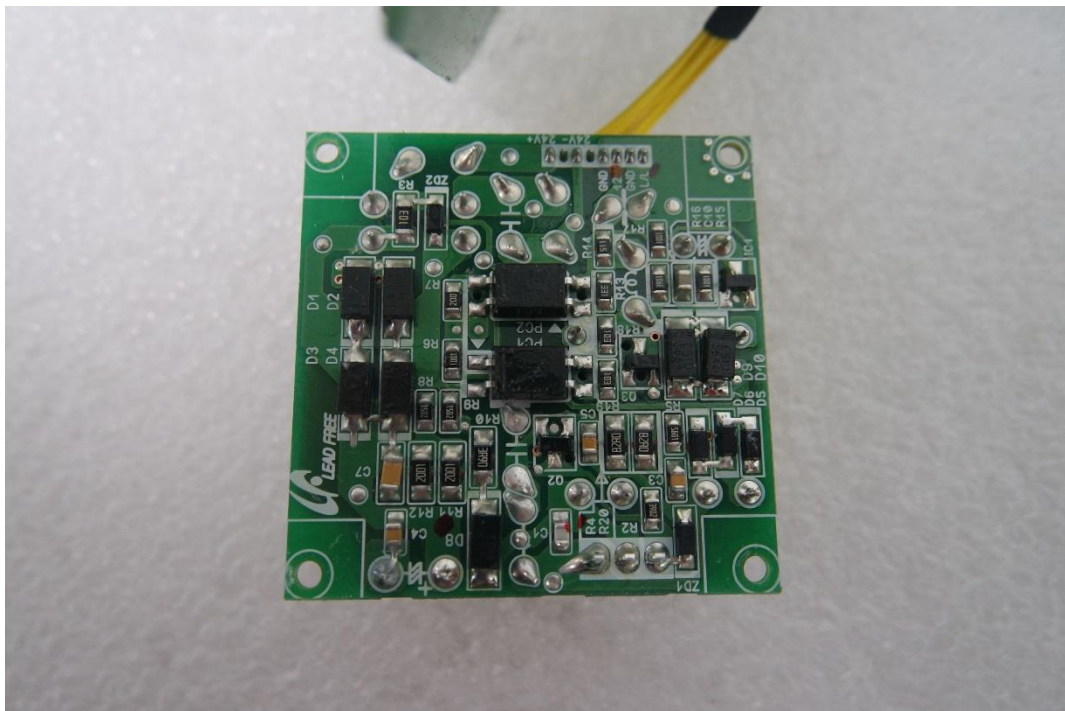
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Board 1

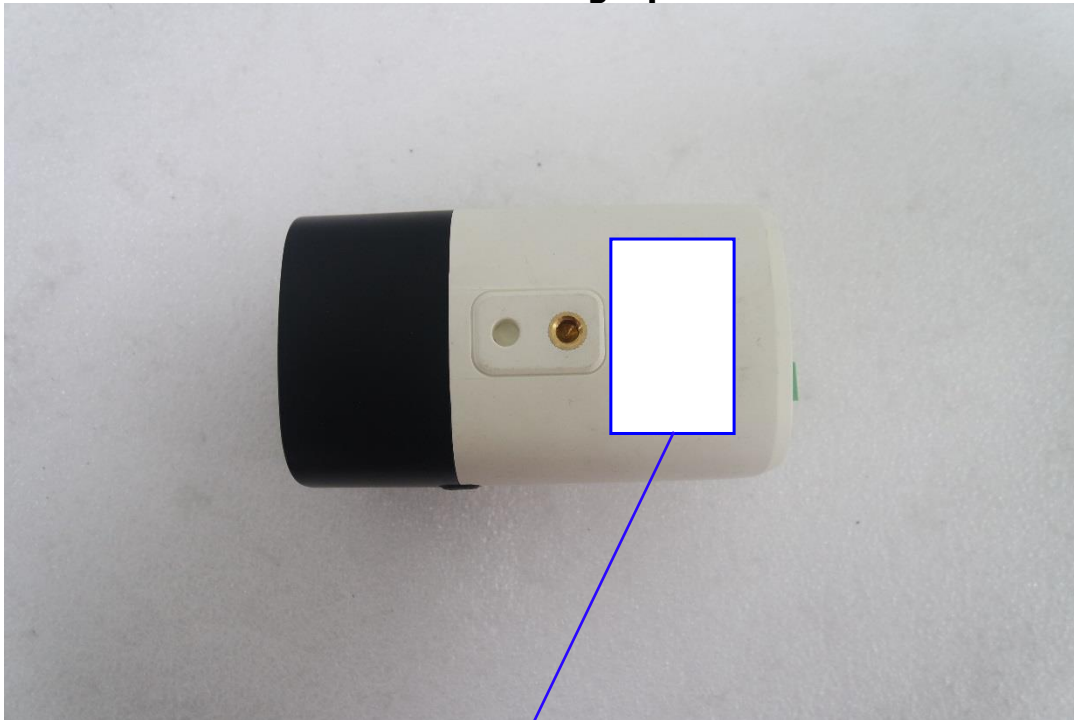
(Top)



(Bottom)



Label Photographs



This device complies with part 15 of the FCC Rules. Operation in subject to the following two conditions: (1) This device Sep not cause harmful interference, and (2) this device must accept any interference received, including interference that Sep cause undesired operation.