EMC TEST REPORT For CE

Test Report No.	:	KES-E1-19T0017
Date of Issue	:	Jan. 09, 2019
Product name	:	CAMERA HOUSING
Model/Type No.	:	SHB-4301H2
Variant Model	:	-
Applicant	:	Hanwha Techwin Co., Ltd.
Applicant Address	:	6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488, KOREA
Manufacturer	:	Ningbo Kevis Inc.
Manufacturer Address	:	10 Iaosanlu, Dagang Ind..Zone. Beilun, Ningbo, Zhejiang, China 315800
Date of Receipt	:	Dec. 21, 2018
Test date	:	Jan. 04, 2019 ~ Jan. 06, 2019
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by



Min Seong, Kim
EMC Test Engineer

Reviewed by



Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KOLAS.

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Jan. 09, 2019	KES-E1-19T0017	Issued

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1.0 General Product Description

Main Specifications of EUT are:

1. Model Name : SHB-4301 H2
2. Purpose : Outdoor Housing
3. Product Name : Box Camera Housing
4. Features : Dustproof, waterproof, IP66
5. Material : Aluminium Die-Casting ADC 12
6. Use Condition : -50℃ ~ +50 ℃
7. Weight : 3.7kg
8. Input Power : AC 100 V ~ AC 240 V
9. Power
   Consumption : Heater (20W * 2EA)
   FAN (5W)
   Defroster (10W)
10. Operation
    Temperature : Heater 1 (-5℃ ± 5℃ ON)
    Heater 2 (5℃ ± 5℃ ON)
    Fan (45℃ ± 5℃ ON)
    Defroster (Always ON)
11. Dimension
    - Outside : 184mm(W) x 127mm(H) x 460mm(D)
    - Inside : 99mm(W) x 80mm(H) x 190mm(D)
12. Color
    - Pantone Cool Gray 1C
13. Accessories
    - Housing
    : ¼" -20X3/8" Screw (x2), Spring Washer (x1)
    Flat Washer (x1), Wrench(x1)
    - Bracket
    : ¼" × 1/2" Screw (x4)

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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 ☒ 230Vac ☐ 100 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
CAMERA HOUSING	SHB-4301H2	-	Ningbo Kevis Inc.	EUT

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1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	X56K	HN11N5151FJ0045W	Hansung Computer Co., Ltd.	-
Notebook Adapter	A12-120P1A	F180271552011758	CHICONY POWER TECHNOLOGY CO.,LTD.	-
Speaker	BR1000A Cuve Black 2	-	DONGGUAN EDIFIER TECHNOLOGY Co., Ltd	-
MIC	MP1000	-	-	-
Alarm	SIP-1201DD D0	-	SAMSUNG TECHWIN CO., LTD.	-
Button Alarm	-	-	-	-
Controller	SPC-1010	C60E67WD601003	SamSung Techwin Co.,Ltd.	-
Controller Adapter	RS-AB1000	-	Dongguan Jinhuasheng Power Technology Co.,Ltd.	-
Phone	SHV-E210L	R33D713KA3F	Samsung Electronics Co.,Ltd.	-
Micro SD Card	-	-	SanDisk	8 GB
Camera	XNB-6000	-	Hanwha Techwin Co., Ltd.	-
AC / DC Adaptor	2ACB022F	-	Channel Well Technology (Guangzhou) Cp., Ltd.	-

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1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
CAMERA	RJ-45	Notebook	RJ-45	3.0	U
	3.5 ㎜	Speaker	3.5 ㎜	1.4	U
	3.5 ㎜	MIC	3.5 ㎜	1.4	U
	2 Pin	Alarm	2 Pin	3.0	U
	2 Pin	Button Alarm	2 Pin	3.0	U
	3 Pin	Controller	3 Pin	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
Notebook	3.5 ㎜	Phone	3.5 ㎜	0.8	U

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

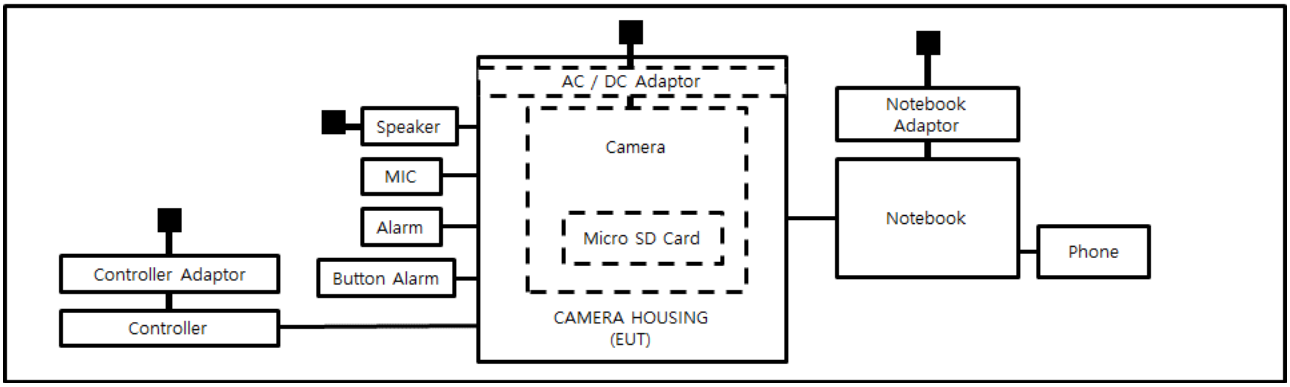
Test Mode	operating
230 V 50 Hz	EUT Monitoring, Ping Test

EUT Test operating S/W		
Name	**Version**	**Manufacture Company**
WebViewer	-	Hanwha Techwin Co., Ltd.

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1.8 Configuration

■ AC Main
□ DC Main



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1.9 Remarks when standards applied

N/A

1.10 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.

1.11 Test Facility

The measurement facility is located at 473-21 Gayeo-ro, Yeoju-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2012

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	**RRA**	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KR0100
International	**KOLAS**	EMI (3 m & 10 m Semi-Aechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KT489
USA	**FCC**	3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	KR0100
Canada	**ISED**	3 m & 10 m Semi-Aechoic Chamber and Conducted test site	23298-1
JAPAN	**VCCI**	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	R-4308, C-4798, T-2311, G-914
Europe	**TÜV SÜD**	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	CARAT 17 07 01633 001

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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 61547:2009		
☒ EN 55032:2015	☒ Class A	☐ Class B
☐ EN 55024:2010 +A1:2015		
☒ EN 50130-4:2011+A1:2014		
☒ EN 61000-3-2:2014		
☒ EN 61000-3-3:2013		
☐ EN 61326-1:2013		

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☐ **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 C63.4-2009

☐ **IC Regulation ICES-003 : 2016**

- ☐ CAN/CSA CISPR 22-10 ☐ Class A ☐ Class B
- ☐ ANSI C63.4-2014

☐ **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

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2.1 Conducted Emissions at Mains Power Ports

Test Date
Jan. 04, 2019

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	04, 25, 2019
☒	LISN	ENV216	R & S	101137	01, 31, 2019
☒	LISN	ENV216	R & S	101786	04, 25, 2019

Test Conditions
Temperature: 21,4 ℃
Relative Humidity: 55,2 % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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2.2 Conducted Emissions at Telecommunication Ports

Test Date
Jan. 04, 2019

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	SHIELD ROOM #3	-	SEMITEC	-	-
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	04, 25, 2019
☒	LISN	ENV216	R & S	101137	01, 31, 2019
☒	LISN	ENV216	R & S	101786	04, 25, 2018
☒	8-WIRE ISN CAT3	CAT3 8158	SCHWARZBECK	8158-0019	03, 22, 2019
☒	8-WIRE ISN CAT5	CAT5 8158	SCHWARZBECK	8158-0030	03, 22, 2019
☐	8-WIRE ISN CAT6	NTFM 8158	SCHWARZBECK	8158-0029	08, 10, 2019

Test Conditions
Temperature: 21,4 ℃
Relative Humidity: 55,2 % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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2.3 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Jan. 04, 2019

Test Location
☐ OPEN AREA TEST SITE #2 ☒ SEMI ANECHOIC CHAMBER #4(10m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 11, 2019
☒	AMPLIFIER	SCU 01	R & S	100603	11, 27, 2018
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	714	11, 28, 2018

Test Conditions
Temperature: 24,3 ℃
Relative Humidity: 50,8 % R.H.

Frequency Range of Measurement
30 ㎒ to 1 ㎓

Instrument Settings
IF Band Width: 120 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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2.4 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Jan. 05, 2019

Test Location
SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESR7	R & S	101190	08, 06, 2019
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	05, 31, 2019
☐	ATTENUATOR	8491A	HP	35496	03, 21, 2019
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	05, 02, 2019

Test Conditions
Temperature: 24,5 ℃
Relative Humidity: 51,3 % R.H.

Frequency Range of Measurement
1 ㎓ to 6 ㎓

Instrument Settings
IF Band Width: 1 ㎒

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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2.5 Harmonic Current Emissions

Test Date
Jan. 04, 2019

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	dpa.control	EM TEST	5.4.11.0	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	08, 08, 2019
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: 21,4 ℃
Relative Humidity: 55,2 % R.H.

Classification of Equipment for Harmonic Current Emissions
☒ Class A
☐ Class B
☐ Class C(Below 25 W)
☐ Class C(Above 25 W)
☐ Class D

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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2.6 Voltage Fluctuations and Flicker

Test Date
Jan. 04, 2019

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	dpa.control	EM TEST	5.4.11.0	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	08, 08, 2019
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: 21,4 ℃
Relative Humidity: 55,2 % R.H.

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:
EN 50130-4:2011+A1:2014 Alarm systems-Part 4: Electromagnetic compatibility Product family standard: Immunity requirements for components of fire, intruder and social alarm systems

The variety and the diversity of the apparatus within the scope of this document makes it

difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard, the apparatus

becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance by the manufacture and noted in the test

report, based on the following criteria:

Electrostatic discharge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing that is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Radiated electromagnetic fields

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

which could be interpreted by associated equipment as a change, and no such

Flickering of indicators occurs at a field strength of 3 V/m.

For components of CCTV systems, where the picture is allowed at 10 V/m, providing.

(a) there is no permanent damage or change to EUT

(e.g. no corruption of memory or changes to programmable setting etc.)

(b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and

(c) there is no observable deterioration of the picture at 1 V/m.

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Fast transient burst / slow high energy voltage surge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any

change in outputs, which could be interpreted by associated equipment as a change.

Conducted RF immunity

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any

change in outputs, which could be interpreted by associated equipment as a change,

and no such flickering of indicators oeuvres at U = 130 dBμV.

For component of CCTV systems, where the status is monitored by observing the TV picture,

then deterioration of the picture is allowed at U = 140 dBμV, providing:

(a) there is no permanent damage or change to the EUT

(e.g. no corruption of memory or changes to programmable settings etc.)

(b) at U = 130 dBμV, any deterioration of the picture is so minor that the system could

still be used; and

(c) there in no observable deterioration of the picture at U = 120 dBμV.

Voltage dip/interruption / Voltage variation

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the conditioning is permissible, providing that there is no residual

change in the EUT or any change in outputs, which could be interpreted by associated equipment

as a change. The EUT shall meet the acceptance criteria for the functional test, after the conditioning.

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3.1 Electrostatic Discharge

Reference Standard
EN 61000-4-2:2009

Test Date
Jan. 05, 2019

Test Location
EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	10, 11, 2019
☒	HCP	-	KES	-	-
☒	VCP	-	KES	-	-

Test Conditions
Temperature: 24,6 ℃
Relative Humidity: 52,8 % R.H.
Atmospheric Pressure: 101,4 kPa

Test Specifications
Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

Kind of Discharge: Air, Contact (direct and indirect)

Polarity: Positive and Negative
Number of Discharge: 10 at all locations for Air discharge
10 at all locations for Contact discharge

Discharge Voltage:

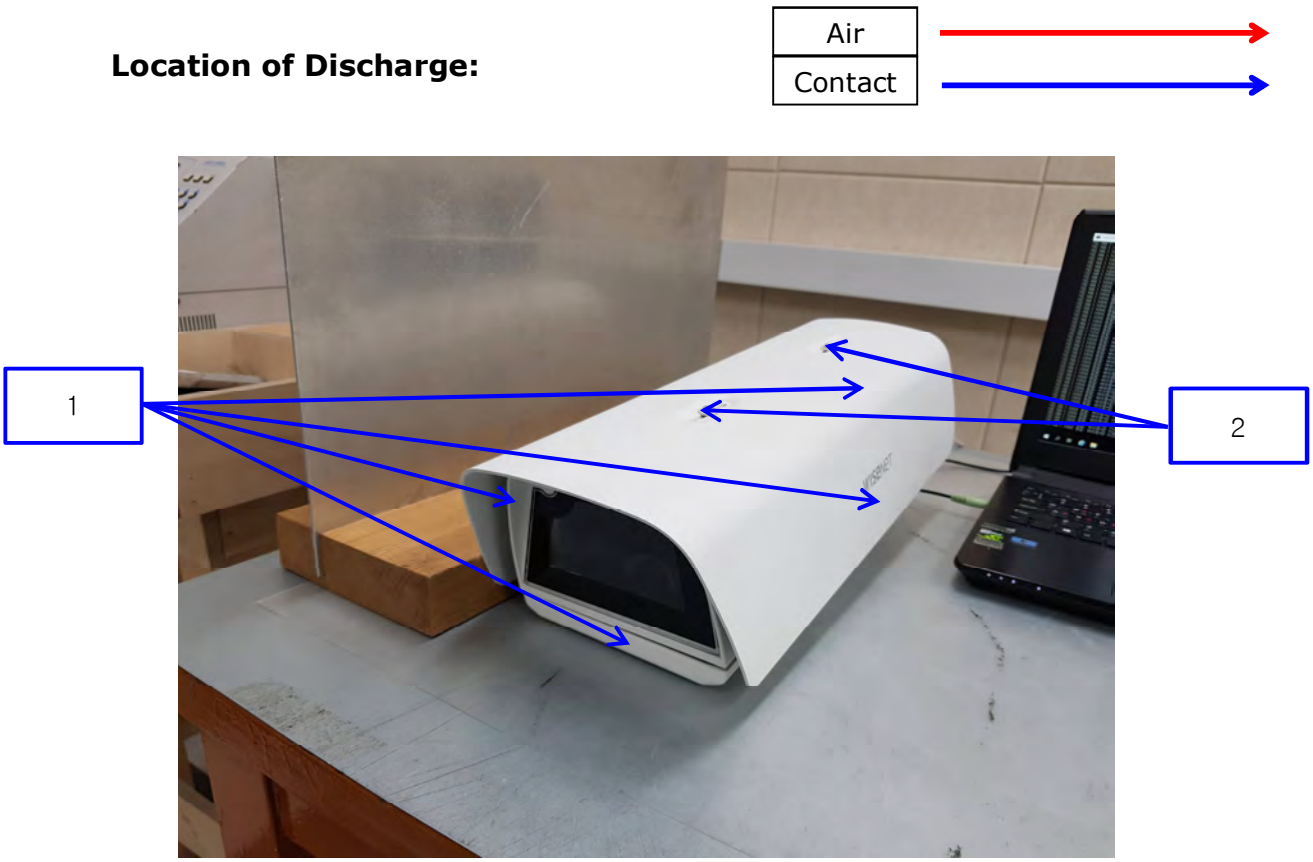
Contact	Air	HCP	VCP
☐ 2 kV	☒ 2 kV	☐ 2 kV	☐ 2 kV
☐ 4 kV	☒ 4 kV	☐ 4 kV	☐ 4 kV
☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

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Location of Discharge:



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Test Data

Indirect Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	HCP Contact	Contact Discharge	Complied	-
2	VCP Contact	Contact Discharge	Complied	-

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Sarfare	Contact Discharge	Complied	-
2	Screw	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.2 Radiated Electric Field Immunity

Reference Standard
EN 61000-4-3:2006 +A2:2010

Test Date
Jan. 05, 2019

Test Location
EMS-RS: ☐ SEMI ANECHOIC CHAMBER #2 ☒ SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	10.10.02	-
☒	SIGNAL GENERATOR	SMB 100A	R & S	177586	08, 06, 2019
☒	BROADBAND AMPLIFIER	BBA100	R & S	101239	08, 06, 2019
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 06, 2019
☒	POWER METER	NRP2	R & S	103475	08, 06, 2019
☒	AVG POWER SENSOR	NRP-Z91	R & S	102526	08, 06, 2019
☒	AVG POWER SENSOR	NRP-Z91	R & S	102527	08, 06, 2019
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DIRECTIONAL COUPLER	KYDC-D1070-DX40	KY TELECOM	KY150001	08, 06, 2019
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	05, 02, 2019

Test Conditions
Temperature: 24,5 ℃
Relative Humidity: 51,3 % R.H.
Atmospheric Pressure: 100,1 kPa

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Test Specifications

Antenna Polarization:	Horizontal & vertical unless indicated otherwise	
Antenna Distance:	☒ 3 m	
Field Strength:	☐ 1 V/m ☒ 10 V/m	☐ 3 V/m
Frequency Range:	☐ 80 MHz to 1 GHz ☒ 80 MHz to 2,7 GHz	☐ 1,4 GHz to 2,7 GHz
Modulation:	☒ AM, 80 %, 1 kHz sine wave ☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)	
Frequency step:	☒ 1 % step	
Dwell Time:	☒ 1 s	☐ 3 s
# of Sides Radiated:	☒ 4	
Required Performance Criteria:	☒ Complied	

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Test Data

Side Exposed	Observations	
	Horizontal	Vertical
Front	Complied	Complied
Right	Complied	Complied
Back	Complied	Complied
Left	Complied	Complied

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.3 Electrical Fast Transients/Bursts

Reference Standard
EN 61000-4-4:2012

Test Date
Jan. 06, 2019

Test Location
EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 27, 2019
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2019
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 26, 2019

Test Conditions

Temperature:	24,3 ℃
Relative Humidity:	53,6 % R.H.
Atmospheric Pressure:	101,6 kPa

Test Specifications

Pulse Amplitude & Polarity: (AC Power Lines)	☐ ± 1.0 kV ☐ ± 4.0 kV	☒ ± 2.0 kV
Pulse Amplitude & Polarity: (Other supply / Signal Lines)	☐ ± 0.5 kV ☐ ± 2.0 kV	☒ ± 1.0 kV
Burst Period:	☒ 300 ms	☐ 2 s
Repetition Rate:	☐ 5 kHz	☒ 100 kHz
Duration of Test Voltage:	☒ ≥ 1 min	
Required Performance Criteria:	☒ Complied	

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Test Data

☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
L	Complied	Complied
N	Complied	Complied
L - N	Complied	Complied

☐ Input d.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
-	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
RJ-45	Complied	Complied
Alarm (2Pin)	Complied	Complied
Button Alarm (2Pin)	Complied	Complied
Controller (3Pin)	Complied	Complied

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.4 Surge Transients

Reference Standard
EN 61000-4-5:2014

Test Date
Jan. 06, 2019

Test Location
EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2019
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2019
☐	CDN	CNV 508N1	EM TEST	P1610176296	11, 28, 2019
☐	CDN	CNV 504N7.3	EM TEST	P1744207079	11, 28, 2019

Test Conditions
Temperature: 24,3 ℃
Relative Humidity: 53,6 % R.H.
Atmospheric Pressure: 101,6 ㎪

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Test Specifications

AC Power Lines

Source Impedance: 12 ohm for common Mode and 2 ohm for differential Mode

Surge Amplitude :
Common Mode
☐ (0,5 / 1,0 / 2,0) kV
Differential Mode
☒ (0,5 / 1,0) kV

Number of Surges: ☒ 5 surges per angle

Angle: ☒ 0°, 90°, 180°, 270° (input a.c. power port)

Polarity: ☒ Positive & Negative

Repetition Rate: ☐ 1 surge per min ☒ 1 surge per 30 sec.

Required Performance Criteria: ☒ Complied

Other supply / Signal Lines

Source Impedance: 42 ohm for common Mode
Surge Amplitude:
Common Mode
☐ (0,5 / 1,0) kV

Number of Surges: ☐ 5 Surges

Polarity: ☐ Positive & Negative

Repetition Rate: ☐ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☐ Complied

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Test Data

☒ Line to Line – Differential Mode

Mode of Application	Observations	
	(+) Surge (㎸)	(-) Surge (㎸)
L - N	Complied	Complied

☐ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (㎸)	(-) Surge (㎸)
-	-	-

Signal Lines

☐ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (㎸)	(-) Surge (㎸)
-	-	-

Note:"Blank" = Not performed
Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.5 Conducted Disturbance

Reference Standard
EN 61000-4-6:2014

Test Date
Jan. 06, 2019

Test Location
EMS-CS: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.7	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1	EM TEST	V0936105119	08, 09, 2019
☒	ATTENUATOR	ATT6	EM TEST	1208-34	08, 08, 2019
☒	CDN	CDN-M2/M3N	EM TEST	0909-06	08, 06, 2019
☒	CDN	CDN T8RJ45	EM TEST	0909-09	08, 06, 2019
☒	EM INJECTION CLAMP	EM 101	Liithi	35943	02, 02, 2019

Test Conditions
Temperature: 24,5 ℃
Relative Humidity: 55,0 % R.H.
Atmospheric Pressure: 101,5 kPa

Test Specifications

Frequency range: ☒ 150 ㎑ to 100 ㎒ ☐ 150 ㎑ to 80 ㎒

Voltage Level: ☐ 1 Vrms ☐ 3 Vrms
☒ 10 Vrms

Modulation: ☒ AM, 80 %, 1 ㎑ sine wave
☒ PM, 1 ㎐ (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ Complied

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Test Data

☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L – N	CDN	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☐ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

Notes: CDN = Coupling Decoupling Network
"blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.6 Voltage Dips and Short Interruptions

Reference Standard
EN 61000-4-11:2004

Test Date
Jan. 06, 2019

Test Location
EMS-Voltage dip: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 27, 2019
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2019

Test Conditions
Temperature: 24,3 ℃
Relative Humidity: 53,6 % R.H.
Atmospheric Pressure: 101,6 kPa

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Test Specifications & Observations/Remarks

(Test Voltage : 230 V)

Test Level	Duration [in period/ms (50 ㎐)]	Results
☒ 20 % dip	☒ 250 / 5 000	Complied
☒ 30 % dip	☒ 25 / 500	Complied
☒ 60 % dip	☒ 10 / 200	Complied
☒ 100 % dip	☒ 250 / 5 000	Complied

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	Complied
☒ Unom - 15 %	☒ 195.5 V (ac)	Complied

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria
☐ NOT APPLICABLE

Remarks

PASS Required Performance Criteria

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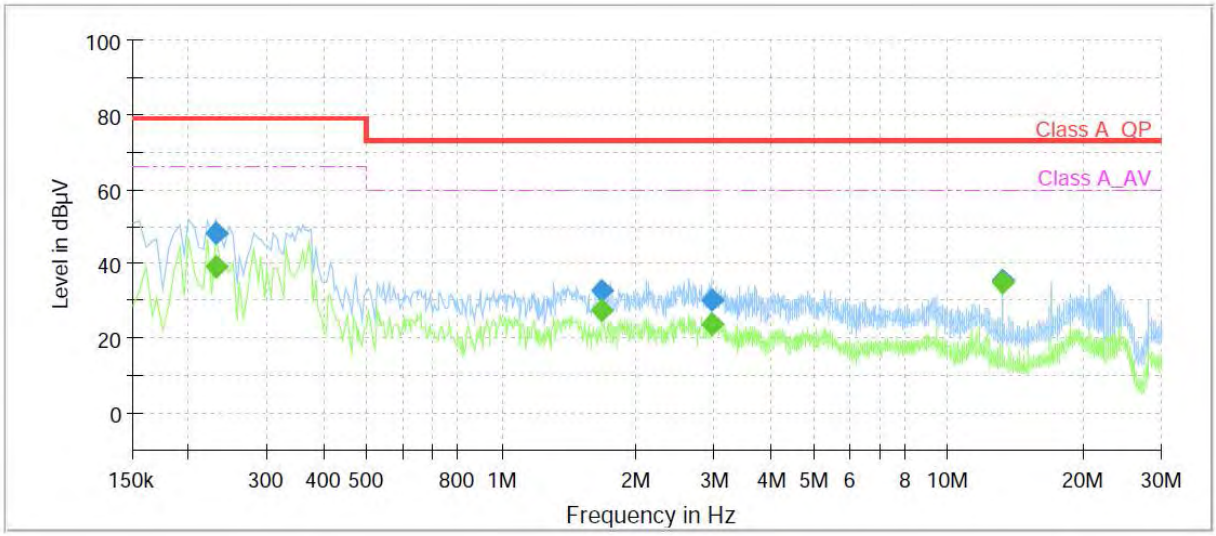
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	SHB-4301H2
Mode	H
Operator Name:	KES



Final_Result

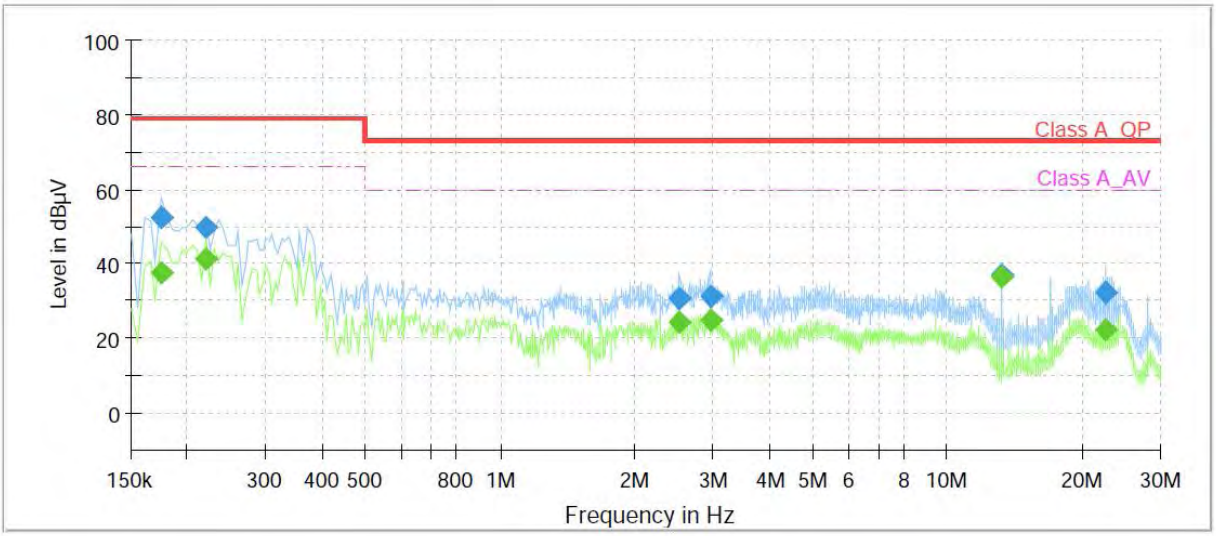
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.230000	---	39.02	66.00	26.98	1000.0	9.000	L1	9.7
0.230000	47.96	---	79.00	31.04	1000.0	9.000	L1	9.7
1.680000	---	27.51	60.00	32.49	1000.0	9.000	L1	10.1
1.680000	32.59	---	73.00	40.41	1000.0	9.000	L1	10.1
2.950000	---	23.83	60.00	36.17	1000.0	9.000	L1	10.2
2.950000	30.43	---	73.00	42.57	1000.0	9.000	L1	10.2
13.170000	---	34.78	60.00	25.22	1000.0	9.000	L1	9.9
13.170000	35.36	---	73.00	37.64	1000.0	9.000	L1	9.9

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[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	SHB-4301H2
Mode	N
Operator Name:	KES



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.175000	---	37.76	66.00	28.24	1000.0	9.000	N	9.7
0.175000	52.29	---	79.00	26.71	1000.0	9.000	N	9.7
0.220000	---	41.53	66.00	24.47	1000.0	9.000	N	9.7
0.220000	49.89	---	79.00	29.11	1000.0	9.000	N	9.7
2.525000	---	24.26	60.00	35.74	1000.0	9.000	N	10.2
2.525000	30.66	---	73.00	42.34	1000.0	9.000	N	10.2
2.945000	---	24.69	60.00	35.31	1000.0	9.000	N	10.2
2.945000	31.38	---	73.00	41.62	1000.0	9.000	N	10.2
13.170000	---	36.64	60.00	23.36	1000.0	9.000	N	10.0
13.170000	36.98	---	73.00	36.02	1000.0	9.000	N	10.0
22.580000	---	22.38	60.00	37.62	1000.0	9.000	N	10.2
22.580000	32.48	---	73.00	40.52	1000.0	9.000	N	10.2

♦ 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 + Pulse Limiter FACTOR))

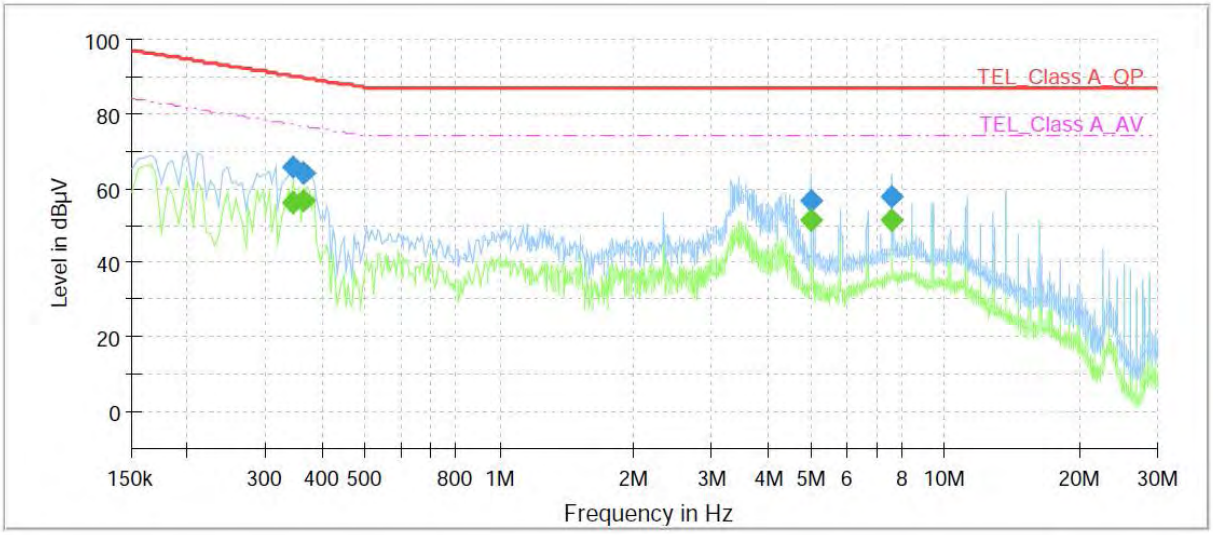
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Conducted Emissions at Telecommunication Ports

[10 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	SHB-4301H2
Mode	10 Mbps
Operator Name:	KES



Final_Result

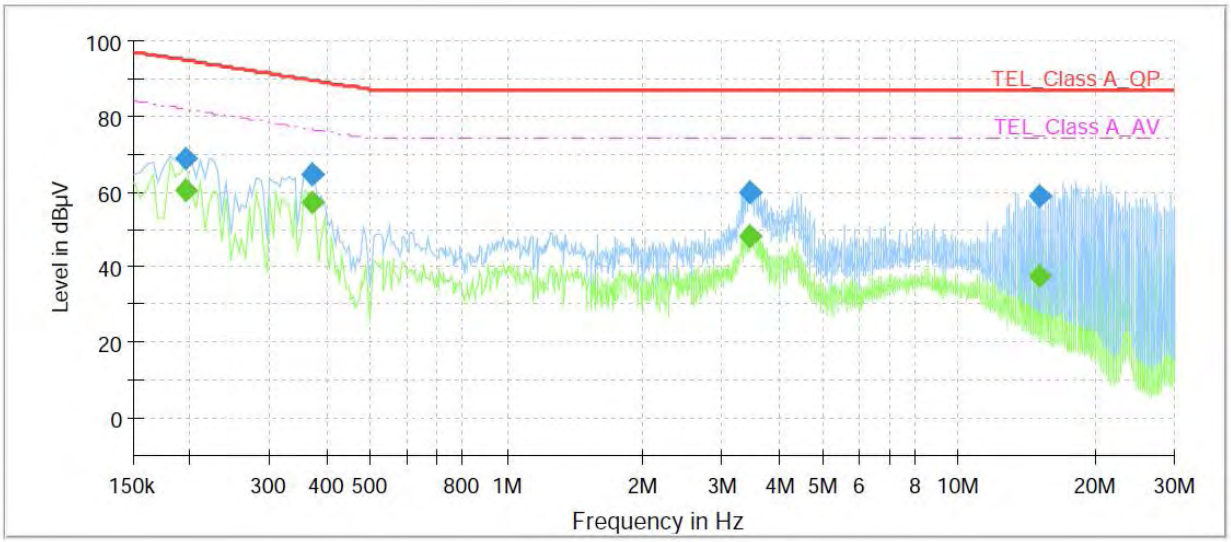
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.345000	---	56.37	77.08	20.71	1000.0	9.000	Single Line	10.1
0.345000	65.44	---	90.08	24.64	1000.0	9.000	Single Line	10.1
0.365000	---	56.83	76.61	19.78	1000.0	9.000	Single Line	10.1
0.365000	63.89	---	89.61	25.72	1000.0	9.000	Single Line	10.1
5.000000	---	51.18	74.00	22.82	1000.0	9.000	Single Line	10.2
5.000000	56.78	---	87.00	30.22	1000.0	9.000	Single Line	10.2
7.555000	---	51.58	74.00	22.42	1000.0	9.000	Single Line	10.0
7.555000	57.44	---	87.00	29.56	1000.0	9.000	Single Line	10.0

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[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	SHB-4301H2
Mode	100 Mbps
Operator Name:	KES



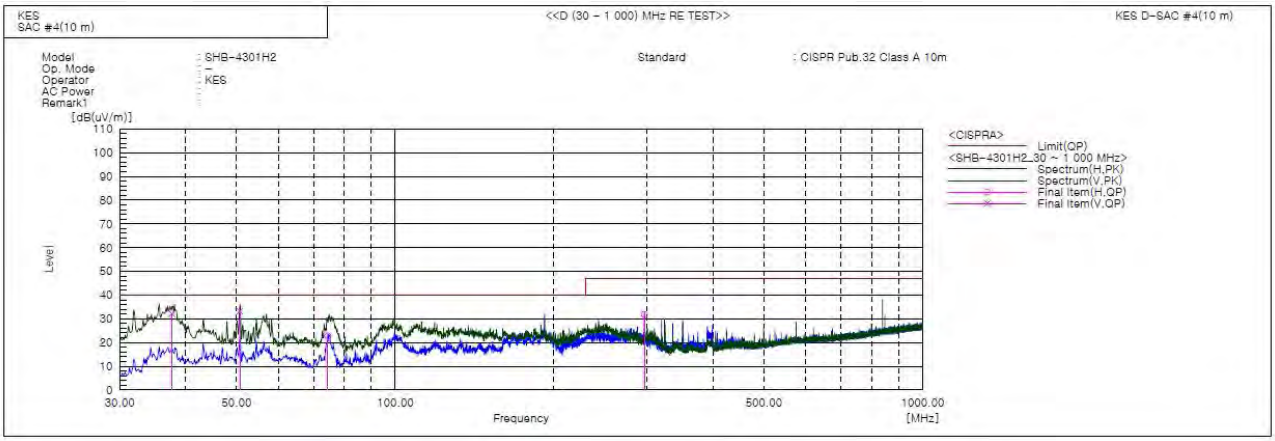
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.195000	---	60.32	81.82	21.50	1000.0	9.000	Single Line	9.7
0.195000	68.91	---	94.82	25.91	1000.0	9.000	Single Line	9.7
0.370000	---	57.25	76.50	19.25	1000.0	9.000	Single Line	9.6
0.370000	64.72	---	89.50	24.78	1000.0	9.000	Single Line	9.6
3.450000	---	48.32	74.00	25.68	1000.0	9.000	Single Line	9.7
3.450000	59.85	---	87.00	27.15	1000.0	9.000	Single Line	9.7
15.020000	---	37.64	74.00	36.36	1000.0	9.000	Single Line	9.6
15.020000	58.92	---	87.00	28.08	1000.0	9.000	Single Line	9.6

♦ 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 (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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Radiated Electric Field Emissions(Below 1 ㎓)



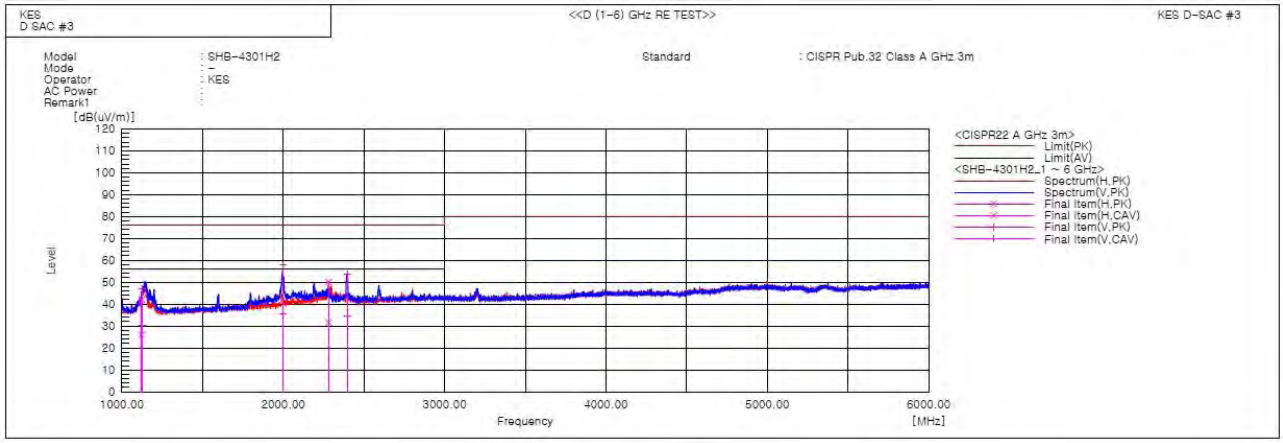
Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	37.722	V	62.4	-30.3	32.1	40.0	7.9	100.0	186.0	
2	50.734	V	60.9	-27.7	33.2	40.0	6.8	143.0	296.0	
3	74.499	H	55.9	-33.2	22.7	40.0	17.3	363.0	178.0	
4	296.993	H	56.4	-24.6	31.8	47.0	15.2	371.0	114.0	

♦ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)
Result(QP) [㏈(㎶/m)] = (Reading(QP)[㏈(㎶)] + c.f[㏈(1/m)]
Margin(QP)[㏈] = Limit[㏈(㎶/m)] - Result(QP) [㏈(㎶/m)]
Reading(QP) : Reading value, Result(QP) : Reading value + Factor value
Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

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Radiated Electric Field Emissions(Above 1 ㎓)



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1121.894	H	49.6	33.6	-7.5	42.1	26.1	76.0	56.0	33.9	29.9	100.0	90.2	
2	1124.914	V	54.6	37.8	-7.5	47.1	30.3	76.0	56.0	28.9	25.7	100.0	184.7	
3	1998.370	V	60.0	37.9	-2.1	57.9	35.8	76.0	56.0	18.1	20.2	100.0	347.2	
4	2260.154	H	50.9	32.6	-0.8	50.1	31.8	76.0	56.0	25.9	24.2	100.0	194.9	
5	2399.299	V	54.1	34.8	-0.4	53.7	34.4	76.0	56.0	22.3	21.6	100.0	39.3	

♦ Calculation
Result(PK/CAV) [㏈(㎶/m)] = (Reading(PK/CAV)[㏈(㎶)] + c.f[㏈(1/m)]
Margin(PK/CAV)[㏈] = Limit[㏈(㎶/m)] - Result(PK/CAV) [㏈(㎶/m)]
Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value
Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

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Harmonic Current Emissions and Voltage Fluctuations and Flicker

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	26.148E-3			
2	1.835E-3			PASS
3	17.672E-3	0.768	2.30	PASS
4	2.010E-3			PASS
5	18.603E-3	1.632	1.14	PASS
6	1.502E-3			PASS
7	18.775E-3	2.438	770.00E-3	PASS
8	1.620E-3			PASS
9	17.353E-3	4.338	400.00E-3	PASS
10	1.664E-3			PASS
11	16.793E-3	5.089	330.00E-3	PASS
12	1.523E-3			PASS
13	16.282E-3	7.753	210.00E-3	PASS
14	1.608E-3			PASS
15	15.327E-3	10.218	150.00E-3	PASS
16	1.452E-3			PASS
17	14.723E-3	11.124	132.35E-3	PASS
18	1.368E-3			PASS
19	13.952E-3	11.782	118.42E-3	PASS
20	1.390E-3			PASS
21	12.856E-3	7.999	160.71E-3	PASS
22	1.261E-3			PASS
23	12.080E-3	8.232	146.74E-3	PASS
24	1.286E-3			PASS
25	11.194E-3	8.292	135.00E-3	PASS
26	1.201E-3			PASS
27	10.299E-3	8.240	124.99E-3	PASS
28	1.154E-3			PASS
29	9.248E-3	7.946	116.39E-3	PASS
30	1.104E-3			PASS
31	8.234E-3	7.563	108.87E-3	PASS
32	988.326E-6			PASS
33	7.544E-3	7.377	102.27E-3	PASS
34	1.084E-3			PASS
35	6.351E-3	6.586	96.44E-3	PASS
36	937.458E-6			PASS
37	5.487E-3	6.016	91.21E-3	PASS
38	905.261E-6			PASS
39	4.834E-3			PASS
40	916.428E-6			PASS

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

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Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	26.337E-3			
2	2.506E-3			PASS
3	18.115E-3	0.525	3.45	PASS
4	2.588E-3			PASS
5	18.794E-3	1.099	1.71	PASS
6	1.777E-3			PASS
7	18.988E-3	1.644	1.15	PASS
8	2.004E-3			PASS
9	17.553E-3	2.925	600.00E-3	PASS
10	2.147E-3			PASS
11	16.926E-3	3.419	495.00E-3	PASS
12	1.928E-3			PASS
13	16.439E-3	5.219	315.00E-3	PASS
14	2.091E-3			PASS
15	15.422E-3	6.854	225.00E-3	PASS
16	1.793E-3			PASS
17	14.818E-3	7.464	198.52E-3	PASS
18	1.722E-3			PASS
19	14.073E-3	7.923	177.63E-3	PASS
20	1.764E-3			PASS
21	12.990E-3	8.083	160.71E-3	PASS
22	1.569E-3			PASS
23	12.198E-3	8.312	146.74E-3	PASS
24	1.595E-3			PASS
25	11.307E-3	8.376	135.00E-3	PASS
26	1.537E-3			PASS
27	10.435E-3	8.348	124.99E-3	PASS
28	1.445E-3			PASS
29	9.387E-3	8.066	116.39E-3	PASS
30	1.394E-3			PASS
31	8.362E-3	7.681	108.87E-3	PASS
32	1.214E-3			PASS
33	7.693E-3	7.523	102.27E-3	PASS
34	1.413E-3			PASS
35	6.489E-3	6.729	96.44E-3	PASS
36	1.180E-3			PASS
37	5.613E-3	6.154	91.21E-3	PASS
38	1.085E-3			PASS
39	4.968E-3			PASS
40	1.181E-3			PASS

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

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Test Data - Voltage Fluctuations

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.190	4.00	PASS
Tmax [s]	0.000	0.50	PASS

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Test Setup Photos and Configuration

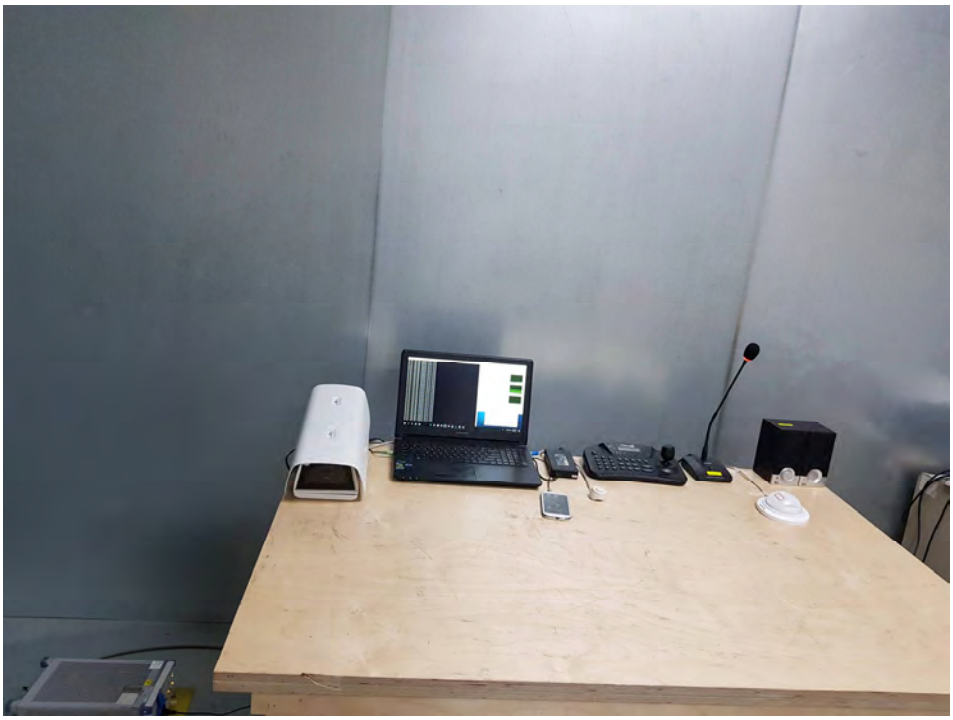
Conducted Voltage Emissions





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Conducted Telecommunication Emissions





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Radiated Electric Field Emissions(Below 1 ㎓)

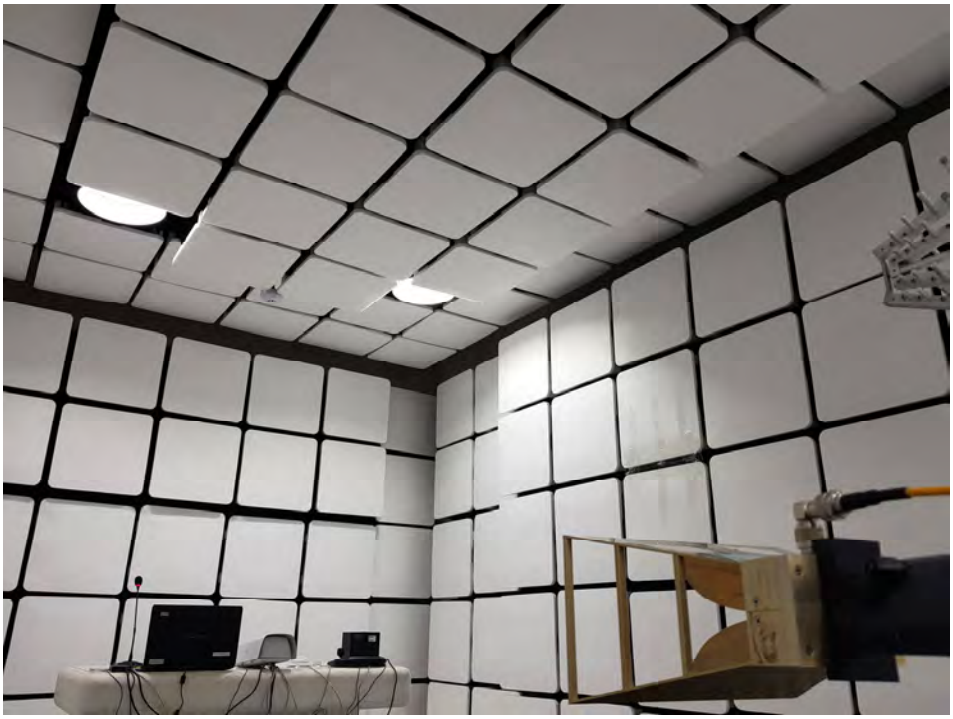




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Radiated Electric Field Emissions(Above 1 ㎓)





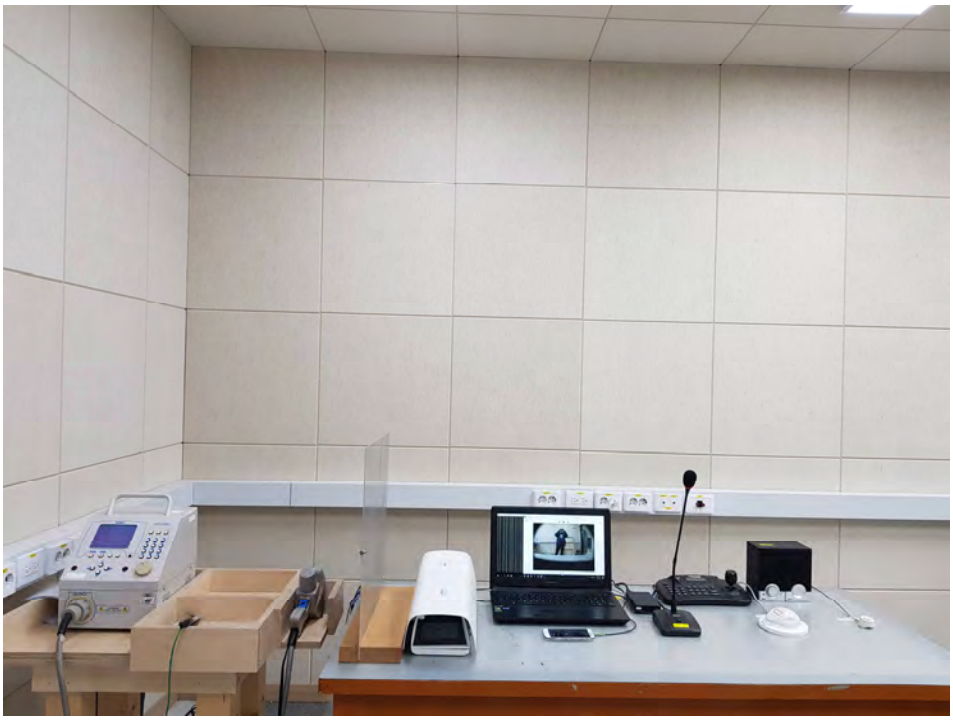
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Harmonic Current Emissions and Voltage Fluctuations and Flicker



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Electrostatic Discharge



Radiated Electric Field Immunity



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Electrical Fast Transients/Bursts

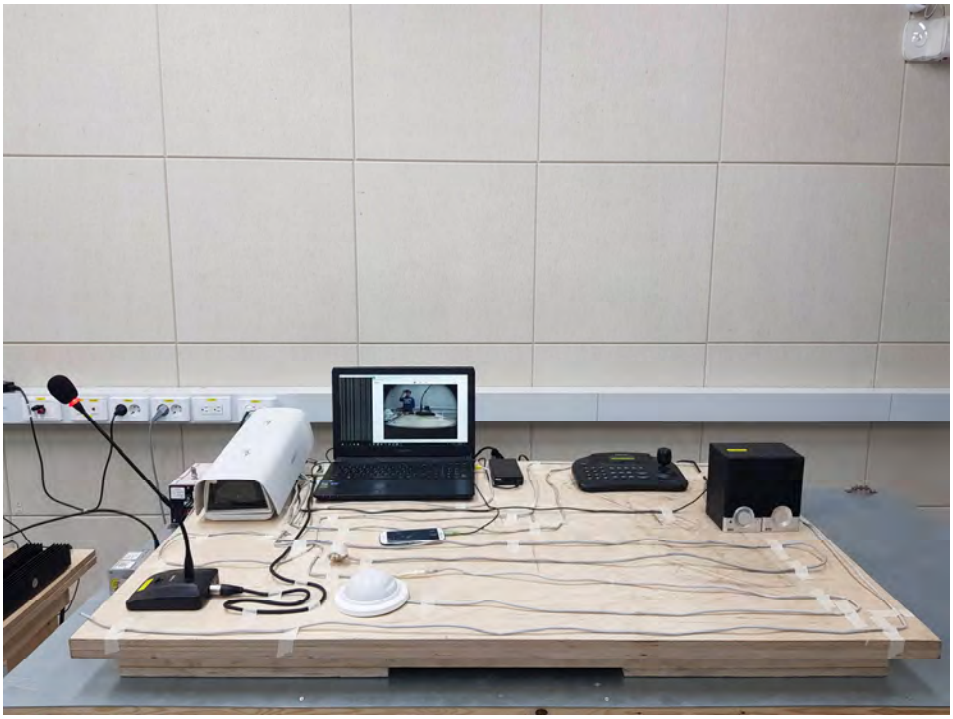


Surge Transients



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Conducted Disturbance



Voltage Dips and Short Interruptions



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EUT External Photographs

(Top)



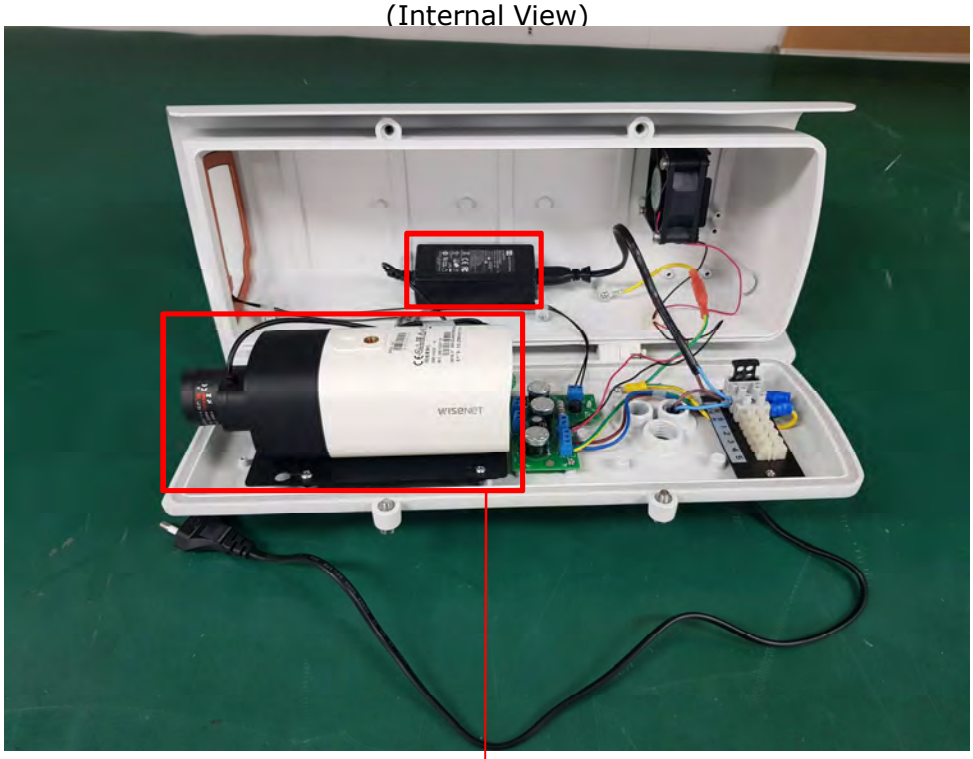
(Bottom)



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EUT Internal Photographs

(Internal View)

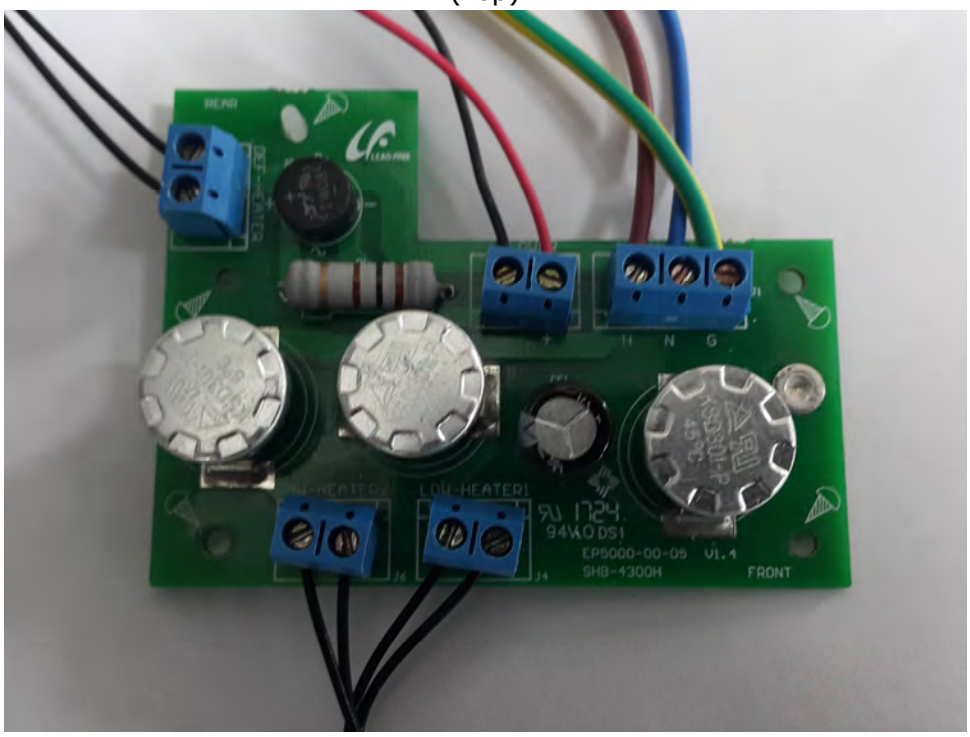


The camera and AC/DC adapter are not included in E.U.T.

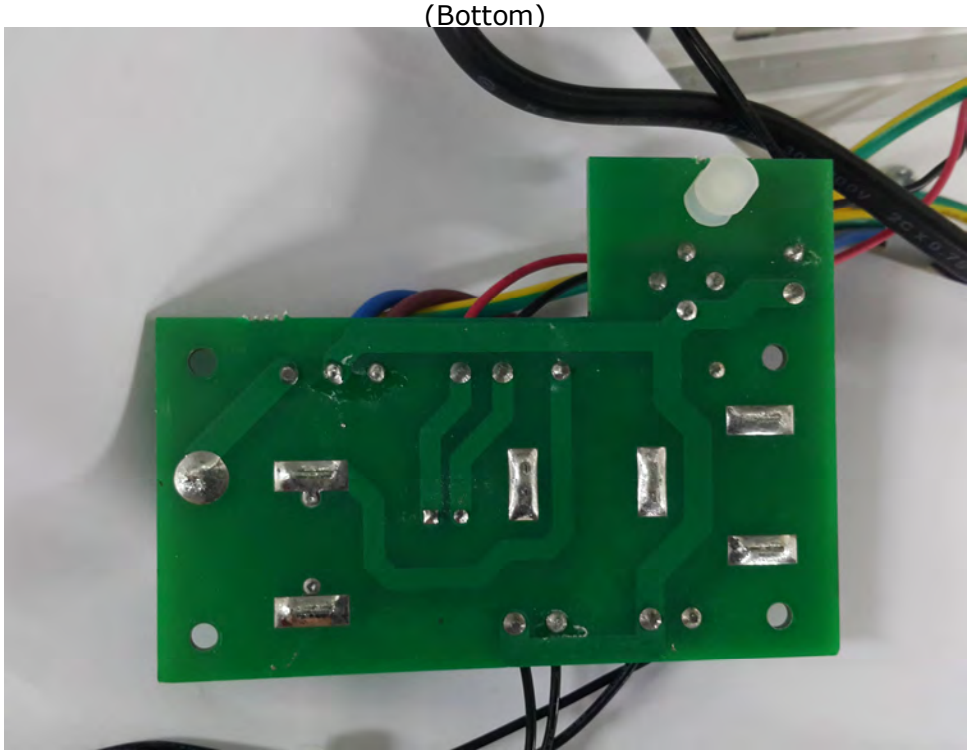
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EUT Internal View – Power interface Board

(Top)

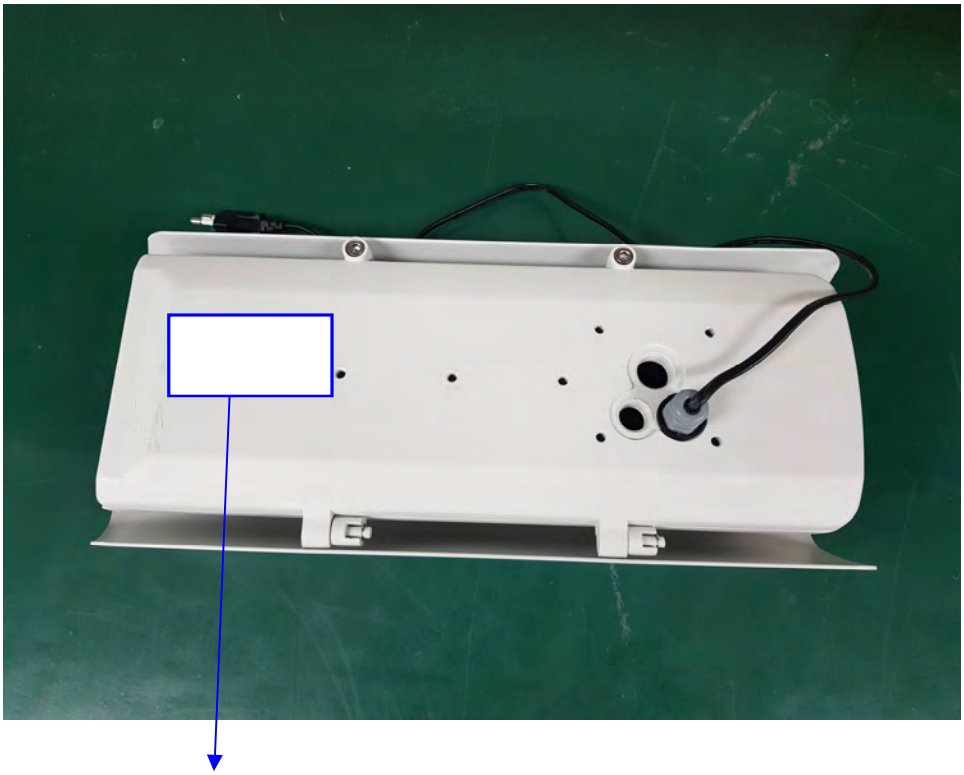


(Bottom)



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Label and Location



CAMERA HOUSING

Model No : SHB-4301H2

Manufacturer : Ningbo Kevis Inc.

Made in China

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