EMC TEST REPORT For CE

Test Report No.	:	KES-E1-19T0700
Date of Issue	:	Oct. 30, 2019
Product name	:	CCTV CAMERA
Model/Type No.	:	HCB-7000PHA
Variant Model	:	-
Applicant	:	Hanwha Techwin Co., Ltd.
Applicant Address	:	6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer	:	1. HANWHA TECHWIN (TIANJIN) CO.,LTD. 2. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD. 3. D-TECH CO.,LTD.
Manufacturer Address	:	1. No.11 Weiliu Rd,Micro-Electronic Industrial Park, TEDA,Tianjin, 300385,People's Republic of China 2. Lot O-2, Que Vo Industrial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam 3. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea (Suwon Industrial Complex)
Date of Receipt	:	Oct. 16, 2019
Test date	:	Oct. 23, 2019 ~ Oct. 27, 2019
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by



Sung Min, Choi
EMC Test Engineer

Reviewed by



Dong-Hun, Jang
EMC Technical Manager

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

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Oct. 30, 2019	KES-E1-19T0700	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Video		
Imaging Device	1/3" 4M CMOS	
Total Pixels	2720(H) x 1536(V)	
Effective Pixels	2688(H) x 1520(V)	
Scanning System	Progressive Scan	
Min. Illumination	Color : 0.16Lux (F1.2, 1/30sec) B/W : 0.009Lux (F1.2, 1/30sec)	
S / N Ratio	52dB (AGC off, Weight on)	
Video Output	BNC(AHD), additional CVBS for installation	
Resolution	2560x1440	
Max. Framerate	25fps @ 4M	
Pan / Tilt / Rotate		
Pan / Tilt / Rotate Range	-	-
Lens Type		
Focal Length (Zoom Ratio)	-	
Max. Aperture Ratio	-	
Angular Field of View	-	
Min. Object Distance	-	
Focus Control	Manual	
Lens Type	Manual / DC auto Iris	
Mount Type	C/CS	
Operational		
Viewable length	-	
On Screen Display	Multi-language Support(14) English, Spanish, French, Portuguese, German, Italian, Russian, Polish, Czech, Romanian, Serbian, Swedish, Danish, Turkish	
~~Camera Title~~	-	
Day & Night	Auto (ICR) / External / Color / B/W	
Backlight Compensation	Off / User BLC / HLC	
Wide Dynamic Range	D-WDR (Off/On)	
Contrast Enhancement	-	
Digital Noise Reduction	2D DNR	
~~Defog~~	-	
Digital Image Stabilization	Not support	
Motion Detection	Off / On(4 zones)	
Privacy Masking	Off / On (2 zones rectangle) 4가→2가	
Gain Control	Off / Low / Middle / High / Very High	
White Balance	ATW / Outdoor / Indoor / Manual / AWC (1,800K° ~ 10,500K°)	
LDC (Lens Distortion Correction)	-	
Electronic Shutter Speed	1/25sec~ 1/12,000sec	
Digital Zoom	-	
Reverse	Off / H-Rev / V-Rev	
Profile	-	
Alarm	MD output 1	
Remote control interface	Coaxial	
Protocol	AHD : ACP (AHD Coax Protocol), CVBS : Pelco-C (Coaxitron) RS-485 : Samsung T, Pelco D/P	
Video Transmission Distance	500m(5C2V Coaxial Cable)	
Environmental		
Operating Temperature / Humidity	-10°C ~ +55°C (+14°F ~ +131°F) / Less than 90% R/H	
Ingress Protection	N/A	
Vandal Resistance	N/A	
Electrical		
Input Voltage/Current	AC 230V, 50/60Hz, 70mA	
Power Consumption	MAX.4.5W	
Mechanical		
Color / Material	Black / Aluminum, Ivory / Plastic	
Dimension (WxHxD)	59.6 × 68.4 x 116.6mm	
Weight	398g	

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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 ☒ 230 Vac ☐ 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
CCTV CAMERA	HCB-7000PHA	-	HANWHA TECHWIN (TIANJIN) CO., LTD	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
DIGITAL VIDEO RECORDER	HDR-840* (*N:N T/P"PAL)	-	HANWHA TECHWIN(TIANJIN) CO., LTD	-
Adaptor1	Rs-300/120-S325		Shenzhen Jinhuasheng Power Technology Co.,Ltd.	-
Monitor	SMT-2232	C95V67VF900025B	Weihai Daewoo Electronics Co., Ltd.	-
Alarm	SIP-1201DD D0	-	SAMSUNG TECHWIN CO., LTD.	-
Controller	SPC-1010	C50E67WG10100F	SamSung Techwin Co.,Ltd.	-
Adaptor2	RS-AB1000	-	Dongguan Jinhuasheng Power Technology Co.,Ltd.	-
IR Sensor	-	-	-	-
Lens	-	-	-	-

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1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
CCTV CAMERA (EUT)	BNC	DIGITAL VIDEO RECORDER	BNC	3.0	U
	2Pin	Alarm	2Pin	3.0	U
	2Pin	IR Sensor	2Pin	1.0	U
	RS-485	Controller	RS-485	3.0	U
	4Pin	Lens	4Pin	0.1	U
DIGITAL VIDEO RECORDER	RGB	Monitor	RGB	1.4	S

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

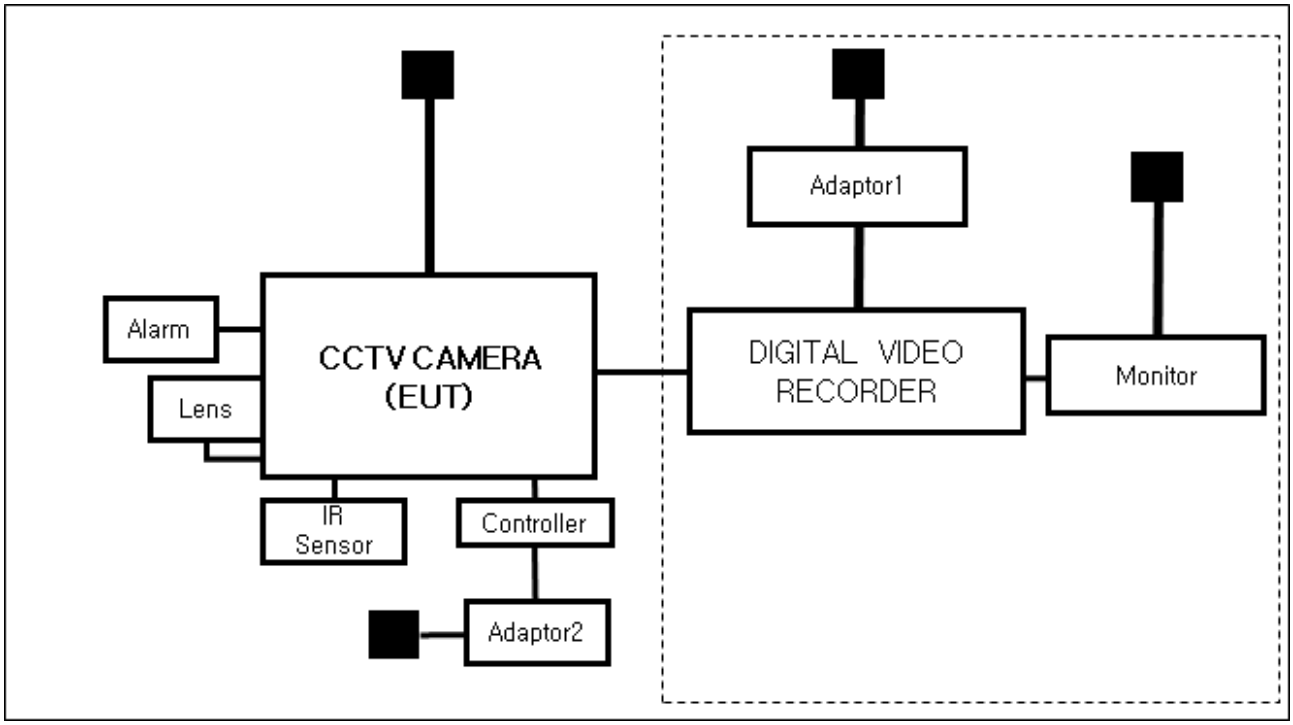
Test Mode	operating
Operation	EUT Monitoring

EUT Test operating S/W		
Name	**Version**	**Manufacture Company**
-	-	-

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1.8 Configuration

■ AC Main
□ DC Main



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1.9 Remarks when standards applied

In the radiated Electric Field Emissions (Below 1 ㎓), the radiated Electric Field Emissions(Above 1 ㎓)), and the radiated Electric Field Immunity test, peripheral devices were tested outside the test site.

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-Anechoic 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-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, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	KR0100
Canada	**ISED**	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	23298-1
JAPAN	**VCCI**	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 ㎓	R-20056, C-20036, T-20040, G-20057
Europe	**TÜV SÜD**	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	CARAT 001633 0003

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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 55032:2012/AC:2013	☒ Class A	☐ Class B
☐ EN 55024:2010 +A1:2015		
☒ EN 50130-4:2011		
☒ EN 61000-3-2:2014		
☒ EN 61000-3-3:2013		
☐ EN 61326-1:2013		

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☐ **VCCI-CISPR 32:2016** ☐ Class A ☐ Class B

☐ **AS/NZS CISPR32:2015** ☐ Class A ☐ Class B

☐ **47 CFR Part 15, Subpart B**

- ☐ CISPR 22:2009 +A1:2010 ☐ Class A ☐ Class B
- ☐ ANSI C63.4-2014

☐ **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
Oct. 23, 2019

Test Location
Electro wave Shieldroom #6

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	101781	04, 22, 2020
☒	LISN	ENV216	R & S	101787	01, 04, 2020
☒	LISN	ESH2-Z5	R & S	100450	04, 22, 2020
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 26, 2019

Test Conditions
Temperature: 23,0 ℃
Relative Humidity: 53,0 % 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
N/A

Test Location
Electro wave Shieldroom #6

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	101781	04, 22, 2020
☐	LISN	ENV216	R & S	101787	01, 04, 2020
☐	LISN	ESH2-Z5	R & S	100450	04, 22, 2020
☐	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 26, 2019
☐	8-WIRE ISN CAT3,5	ENY81	R & S	100174	01, 07, 2020
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	01, 07, 2020

Test Conditions
Temperature: ℃
Relative Humidity: % 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
N/A

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2.3 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Oct. 23, 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, 09, 2020
☒	AMPLIFIER	SCU 01	R & S	100603	11, 26, 2019
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020
☒	ATTENUATOR	8491A	HP	32173	03, 11, 2020

Test Conditions
Temperature: 23,0 ℃
Relative Humidity: 53,0 % 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
Oct. 23, 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, 2020
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	05, 27, 2020
☐	ATTENUATOR	8491A	HP	35496	03, 11, 2020
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 12, 2021

Test Conditions
Temperature: 24,8 ℃
Relative Humidity: 53,1 % 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
Oct. 27, 2019

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 09, 2020
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: 24,3 ℃
Relative Humidity: 53,2 % 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
Oct. 27, 2019

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 09, 2020
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: 24,3 ℃
Relative Humidity: 53,2 % 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 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
Oct. 27, 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	ESS05X4620	02, 22, 2022
☒	HCP	-	KES	-	-
☒	VCP	-	KES	-	-

Test Conditions
Temperature: 24,7 ℃
Relative Humidity: 53,1 % R.H.
Atmospheric Pressure: 100,4 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:

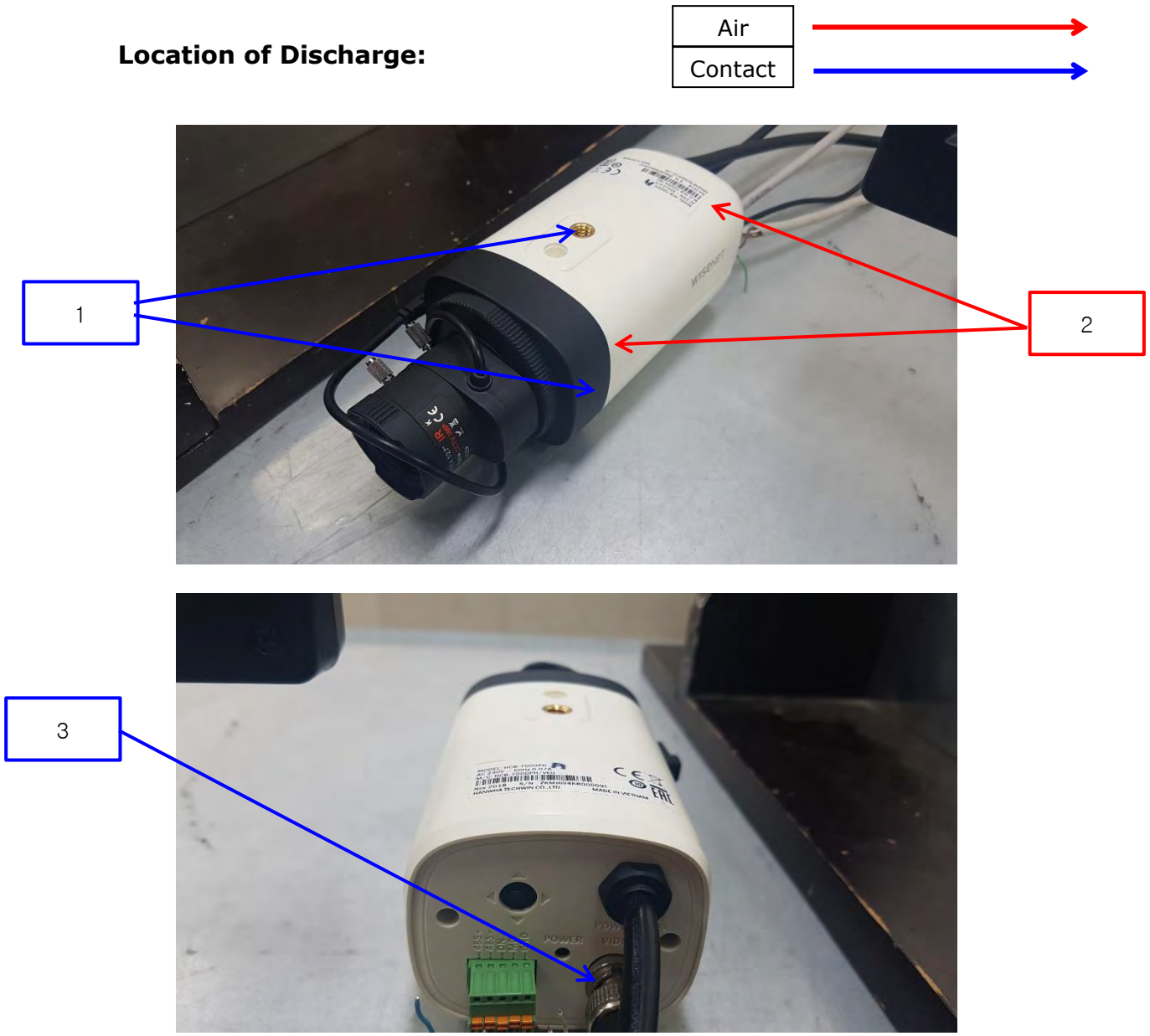
Contact	Air	HCP	VCP
☐ 2 kV	☒ 2 kV	☐ 2 kV	☐ 2 kV
☐ 4 kV	☒ 4 kV	☐ 4 kV	☐ 4 kV
☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

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	Enclosure	Contact Discharge	Complied	-
2	Enclosure	Air Discharge	Complied	-
3	BNC	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
Oct. 24, 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, 2020
☒	BROADBAND AMPLIFIER	BBA100	R & S	101239	08, 06, 2020
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 06, 2020
☒	POWER METER	NRP2	R & S	103475	08, 06, 2020
☒	AVG POWER SENSOR	NRP-Z91	R & S	102526	08, 06, 2020
☒	AVG POWER SENSOR	NRP-Z91	R & S	102527	08, 06, 2020
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DIRECTIONAL COUPLER	KYDC-D1070-DX40	KY TELECOM	KY150001	08, 06, 2020
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 12, 2021

Test Conditions
Temperature: 25,1 ℃
Relative Humidity: 53,6 % R.H.
Atmospheric Pressure: 100,8 kPa

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Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Field Strength: ☐ 1 V/m ☐ 3 V/m
☒ 10 V/m

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 1,4 GHz to 2,7 GHz
☒ 80 MHz 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
Oct. 27, 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, 28, 2019

Test Conditions
Temperature: 24,7 ℃
Relative Humidity: 53,1 % R.H.
Atmospheric Pressure: 100,4 ㎪

Test Specifications

Pulse Amplitude & Polarity: (AC Power Lines)	☐ ± 1.0 ㎸ ☐ ± 4.0 ㎸	☒ ± 2.0 ㎸
Pulse Amplitude & Polarity: (Other supply / Signal Lines)	☐ ± 0.5 ㎸ ☐ ± 2.0 ㎸	☒ ± 1.0 ㎸
Burst Period:	☒ 300 ㎳	☐ 2 s
Repetition Rate:	☐ 5 ㎑	☒ 100 ㎑
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
PE	Complied	Complied
L – N	Complied	Complied
L – PE	Complied	Complied
N – PE	Complied	Complied
L – N - PE	Complied	Complied

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

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
L1	-	-
L2	-	-
L1 – L2	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
Alarm Out	Complied	Complied
BNC	Complied	Complied
RS-485	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
Oct. 27, 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, 26, 2019
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2019
☐	CDN	CNV 508N1	EM TEST	P1610176296	11, 28, 2019

Test Conditions
Temperature: 24,7 ℃
Relative Humidity: 53,1 % R.H.
Atmospheric Pressure: 100,4 kPa

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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 (㎸)
L – PE	Complied	Complied
N – PE	Complied	Complied

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
☐ NOT APPLICABLE

Remarks

PASS Required Performance Criteria

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3.5 Conducted Disturbance

Reference Standard
EN 61000-4-6:2014

Test Date
Oct. 23, 2019

Test Location
EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.11	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 26, 2019
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 26, 2019
☒	CDN	CDN M016	TESEQ	43694	11, 26, 2019
☐	CDN	CDN M016	TESEQ	43697	11, 26, 2019
☐	CDN	CDN T800	TESEQ	42800	11, 26, 2019
☒	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 27, 2019

Test Conditions
Temperature: 23,7 ℃
Relative Humidity: 53,3 % R.H.
Atmospheric Pressure: 100,5 ㎪

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 – PE	CDN	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L1 – L2	CDN	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
Alarm Out	Clamp	Complied
BNC	Clamp	Complied
RS-485	Clamp	Complied

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
Oct. 27, 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, 2029
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2029

Test Conditions
Temperature: 24,7 ℃
Relative Humidity: 53,1 % R.H.
Atmospheric Pressure: 100,4 kPa

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Test Specifications & Observations/Remarks

- Voltage Dips and Short Interruptions

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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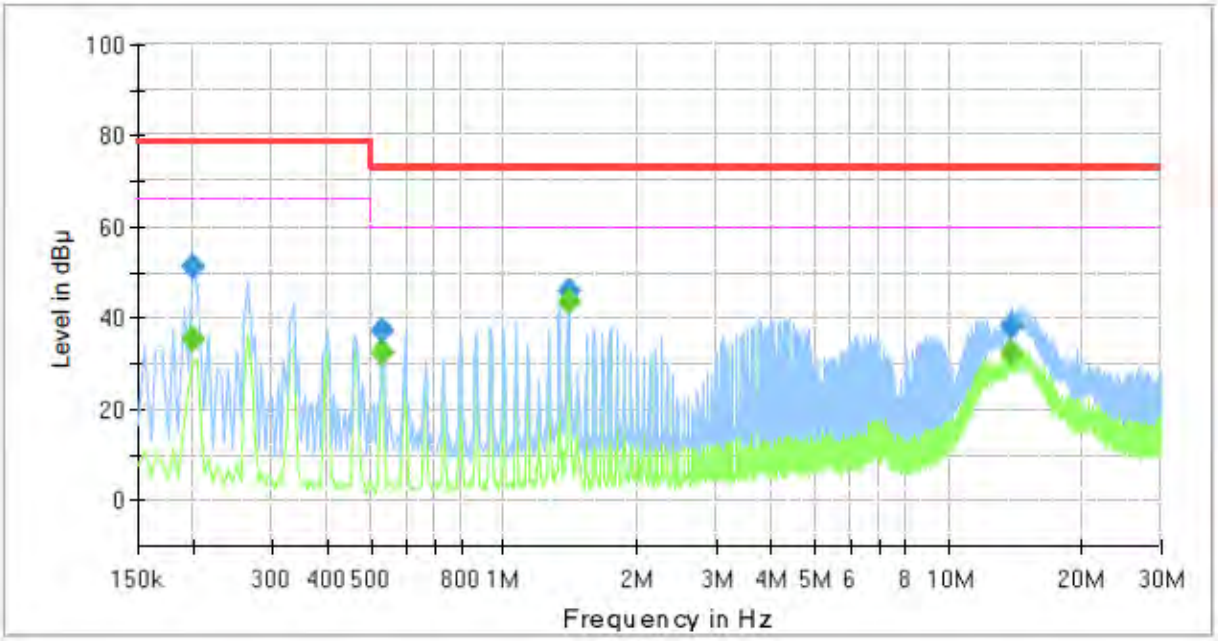
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	HCB-7000PHA
Phase:	H
Mode:	
Operator Name:	KES



Final_Result

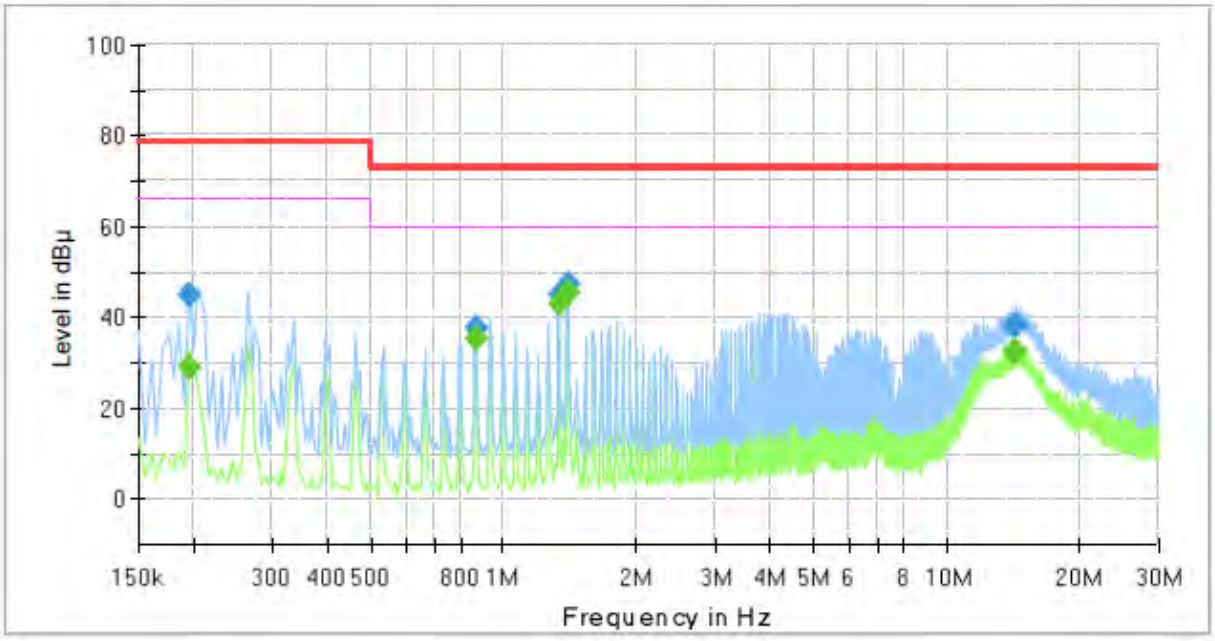
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.200000	---	35.56	66.00	30.44	1000.0	9.000	L1	19.5
0.200000	51.15	---	79.00	27.85	1000.0	9.000	L1	19.5
0.530000	---	32.35	60.00	27.65	1000.0	9.000	L1	19.9
0.530000	37.32	---	73.00	35.68	1000.0	9.000	L1	19.9
1.395000	---	43.60	60.00	16.40	1000.0	9.000	L1	20.4
1.395000	46.01	---	73.00	26.99	1000.0	9.000	L1	20.4
13.900000	---	32.36	60.00	27.64	1000.0	9.000	L1	20.2
13.900000	38.10	---	73.00	34.90	1000.0	9.000	L1	20.2

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[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	HCB-7000PHA
Phase:	N
Mode:	
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	---	29.08	66.00	36.92	1000.0	9.000	N	19.5
0.195000	44.84	---	79.00	34.16	1000.0	9.000	N	19.5
0.865000	---	35.45	60.00	24.55	1000.0	9.000	N	20.2
0.865000	37.61	---	73.00	35.39	1000.0	9.000	N	20.2
1.330000	---	43.07	60.00	16.93	1000.0	9.000	N	20.4
1.330000	45.09	---	73.00	27.91	1000.0	9.000	N	20.4
1.395000	---	45.25	60.00	14.75	1000.0	9.000	N	20.4
1.395000	47.30	---	73.00	25.70	1000.0	9.000	N	20.4
14.095000	---	32.61	60.00	27.39	1000.0	9.000	N	20.2
14.095000	38.28	---	73.00	34.72	1000.0	9.000	N	20.2
14.360000	---	32.54	60.00	27.46	1000.0	9.000	N	20.3
14.360000	38.27	---	73.00	34.73	1000.0	9.000	N	20.3

♦ 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

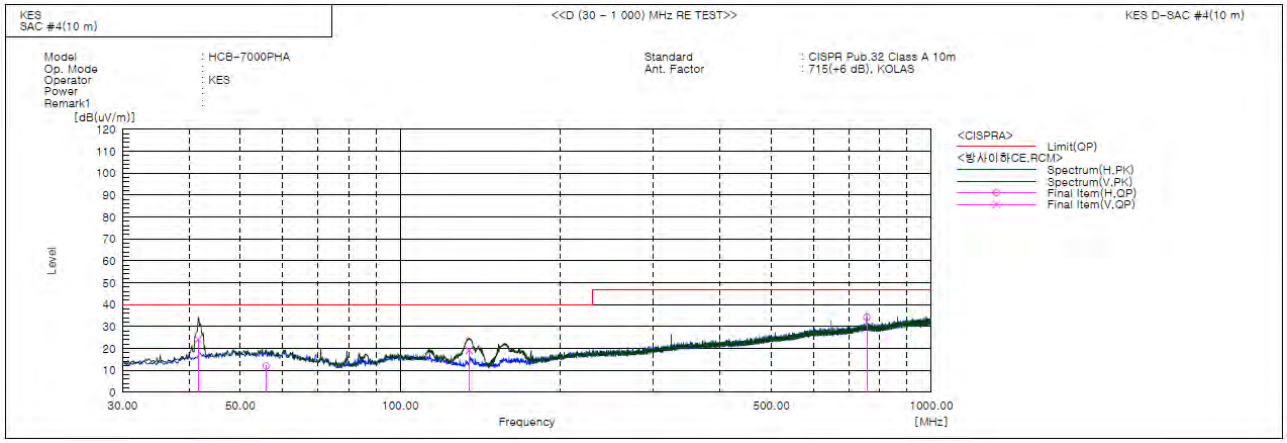
[1 000 Mbps]

N/A

♦ 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 ㎓)



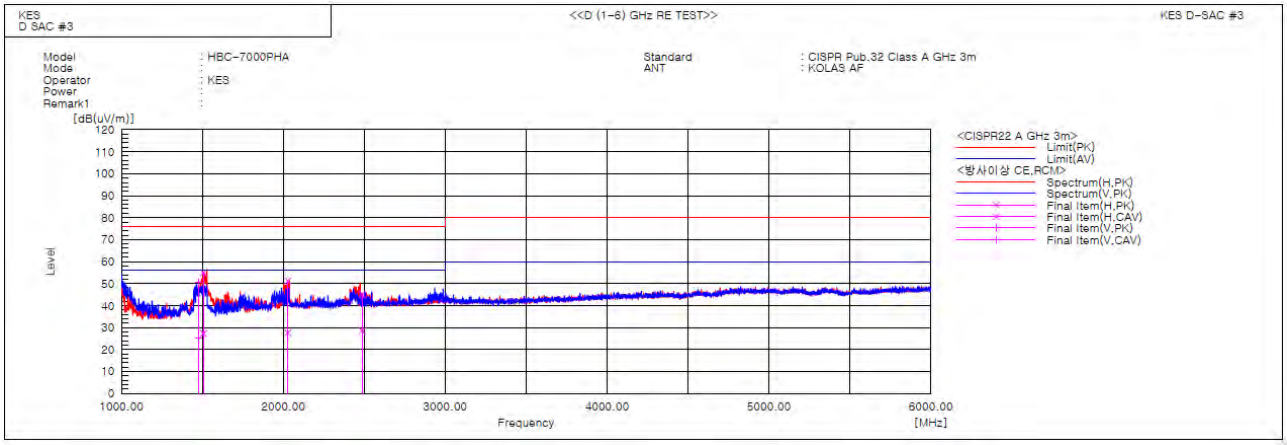
Final Result

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	41.640	V	46.5	-22.4	24.1	40.0	15.9	100.0	322.0	
2	55.948	H	33.9	-21.9	12.0	40.0	28.0	400.0	285.0	
3	134.760	V	45.0	-25.9	19.1	40.0	20.9	138.0	209.0	
4	756.045	H	41.7	-7.4	34.3	47.0	12.7	243.0	239.0	

♦ 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	1475.638	V	57.1	31.9	-6.7	50.4	25.2	76.0	56.0	25.6	30.8	100.0	336.0	
2	1506.244	H	61.6	33.8	-6.5	55.1	27.3	76.0	56.0	20.9	28.7	100.0	57.6	
3	2027.042	H	53.1	29.4	-1.8	51.3	27.6	76.0	56.0	24.7	28.4	100.0	35.1	
4	2487.747	H	45.3	28.7	-0.2	45.1	28.5	76.0	56.0	30.9	27.5	100.0	88.3	

♦ 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	0.013			
2	0.001	0.076	1.080	n/a
3	0.010	0.425	2.300	PASS
4	0.001	0.169	0.430	n/a
5	0.009	0.783	1.140	PASS
6	0.001	0.204	0.300	n/a
7	0.008	1.078	0.770	PASS
8	0.001	0.261	0.230	n/a
9	0.008	1.948	0.400	PASS
10	0.001	0.325	0.184	n/a
11	0.007	2.232	0.330	PASS
12	0.001	0.367	0.153	n/a
13	0.007	3.297	0.210	PASS
14	0.001	0.412	0.131	n/a
15	0.006	4.297	0.150	PASS
16	0.001	0.452	0.115	n/a
17	0.006	4.470	0.132	PASS
18	0.001	0.503	0.102	n/a
19	0.005	4.523	0.118	PASS
20	0.001	0.557	0.092	n/a
21	0.005	2.988	0.161	n/a
22	0.001	0.613	0.084	n/a
23	0.004	2.892	0.147	n/a
24	0.001	0.679	0.077	n/a
25	0.004	2.765	0.135	n/a
26	0.001	0.713	0.071	n/a
27	0.003	2.606	0.125	n/a
28	0.000	0.748	0.066	n/a
29	0.003	2.443	0.116	n/a
30	0.000	0.803	0.061	n/a
31	0.003	2.299	0.109	n/a
32	0.000	0.851	0.058	n/a
33	0.002	2.174	0.102	n/a
34	0.000	0.914	0.054	n/a
35	0.002	2.090	0.096	n/a
36	0.000	0.952	0.051	n/a
37	0.002	2.035	0.091	n/a
38	0.000	1.000	0.048	n/a
39	0.002	2.050	0.087	n/a
40	0.000	1.051	0.046	n/a

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	0.013			
2	0.002	0.145	1.620	n/a
3	0.010	0.291	3.450	PASS
4	0.001	0.195	0.645	n/a
5	0.009	0.533	1.710	PASS
6	0.001	0.230	0.450	n/a
7	0.009	0.793	1.155	PASS
8	0.001	0.276	0.345	n/a
9	0.008	1.396	0.600	PASS
10	0.001	0.376	0.276	n/a
11	0.008	1.603	0.495	PASS
12	0.001	0.354	0.230	n/a
13	0.007	2.340	0.315	PASS
14	0.001	0.430	0.197	n/a
15	0.007	3.041	0.225	PASS
16	0.001	0.453	0.173	n/a
17	0.006	3.143	0.199	PASS
18	0.001	0.529	0.153	n/a
19	0.006	3.208	0.178	PASS
20	0.001	0.631	0.138	n/a
21	0.005	3.213	0.161	PASS
22	0.001	0.662	0.125	n/a
23	0.004	2.986	0.147	n/a
24	0.001	0.781	0.115	n/a
25	0.004	2.945	0.135	n/a
26	0.001	0.753	0.106	n/a
27	0.003	2.737	0.125	n/a
28	0.001	0.782	0.099	n/a
29	0.003	2.508	0.116	n/a
30	0.001	0.920	0.092	n/a
31	0.003	2.362	0.109	n/a
32	0.001	0.890	0.086	n/a
33	0.002	2.259	0.102	n/a
34	0.001	1.001	0.081	n/a
35	0.002	2.173	0.096	n/a
36	0.001	0.997	0.077	n/a
37	0.002	2.128	0.091	n/a
38	0.001	1.112	0.073	n/a
39	0.002	2.252	0.087	n/a
40	0.001	1.153	0.069	n/a

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

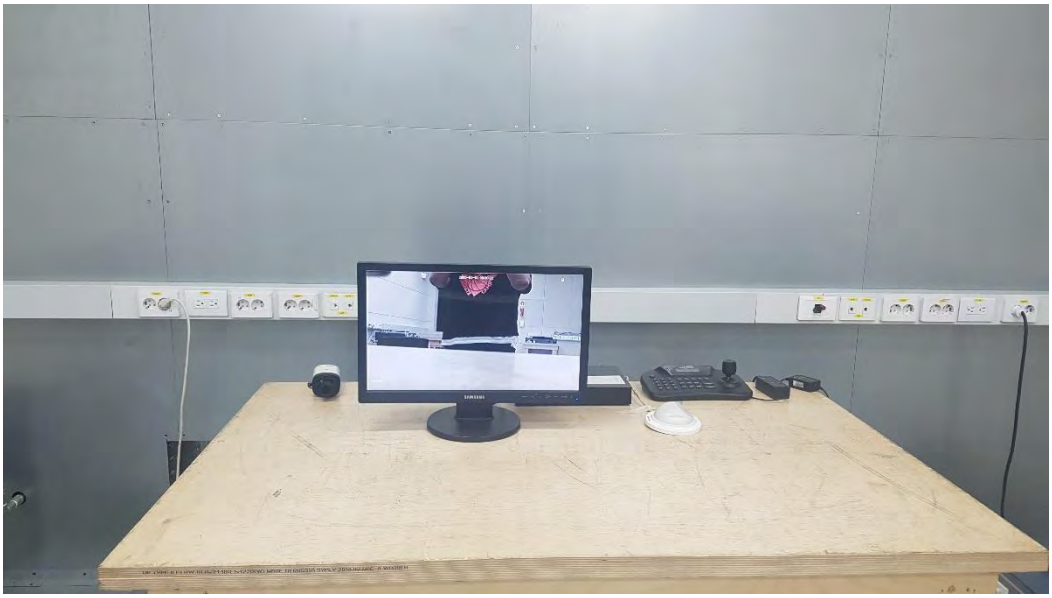
Maximum Flicker results

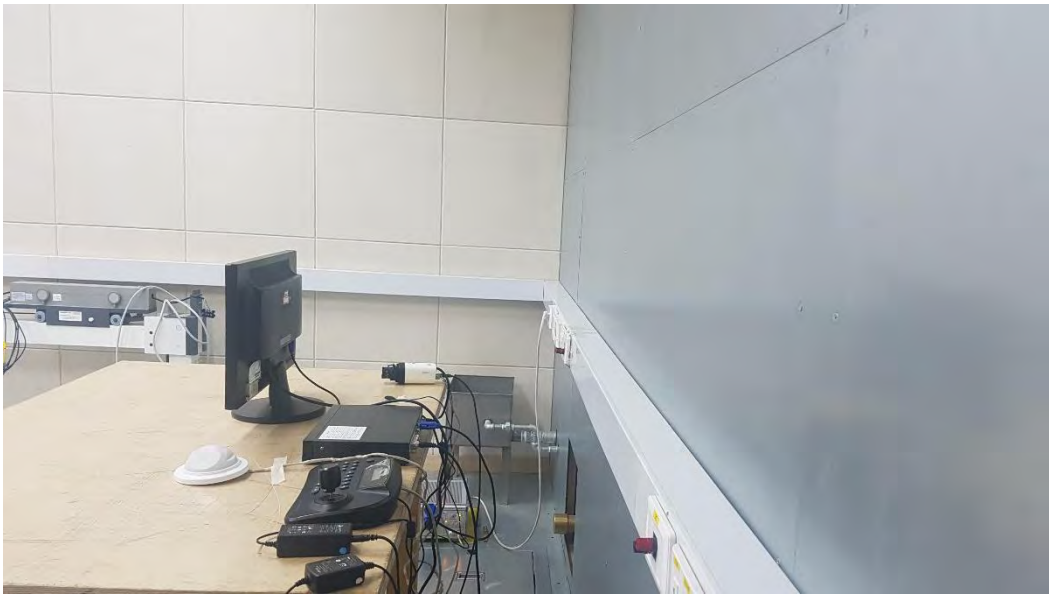
Flicker Measurements					
	Plt	**Max Pst**	**Max Dc**	**Max Dmax**	**Max Tmax**
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

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Test Setup Photos and Configuration

Conducted Voltage Emissions





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Conducted Telecommunication Emissions

N/A

N/A

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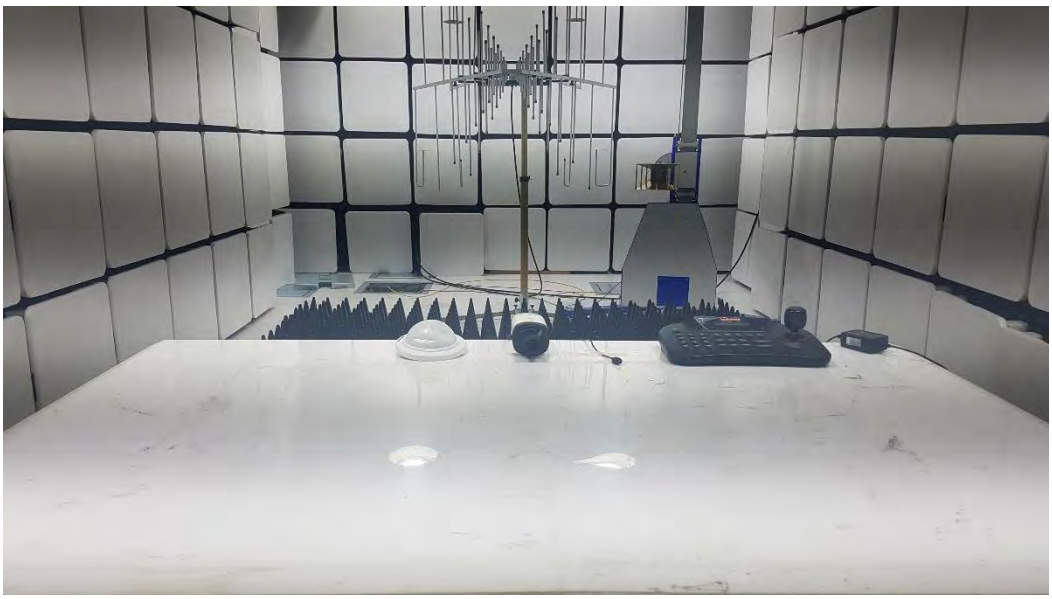
Radiated Electric Field Emissions(Below 1 ㎓)

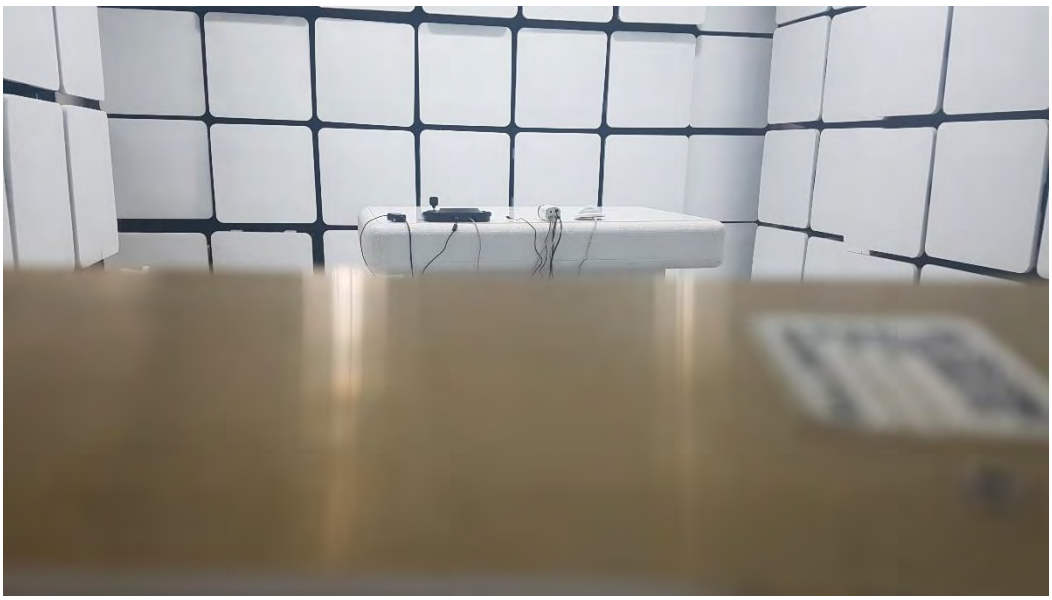




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Radiated Electric Field Emissions(Above 1 ㎓)





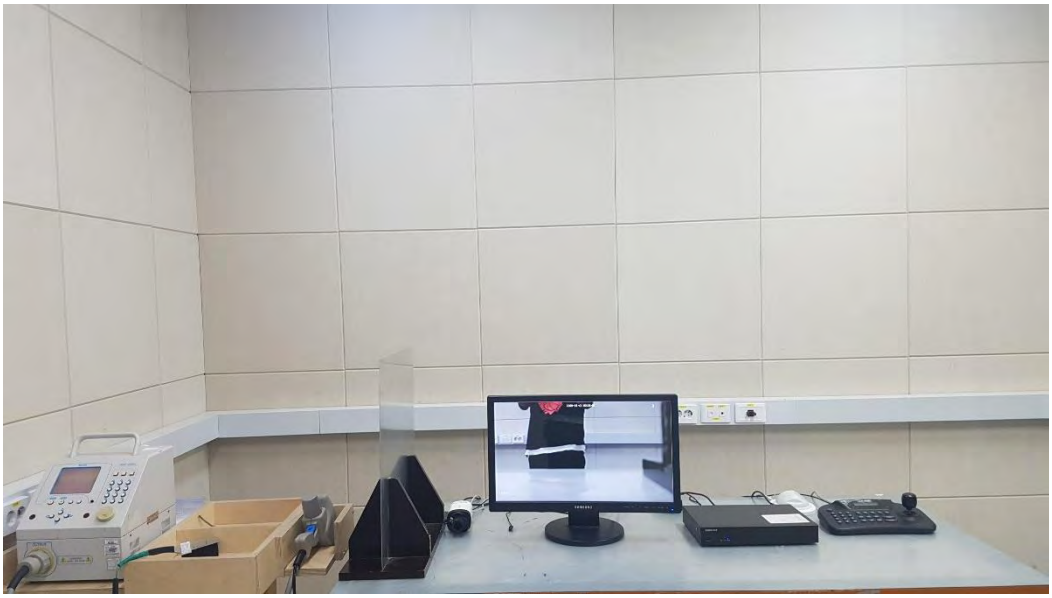
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Harmonic Current Emissions and Voltage Fluctuations and Flicker



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Electrostatic Discharge

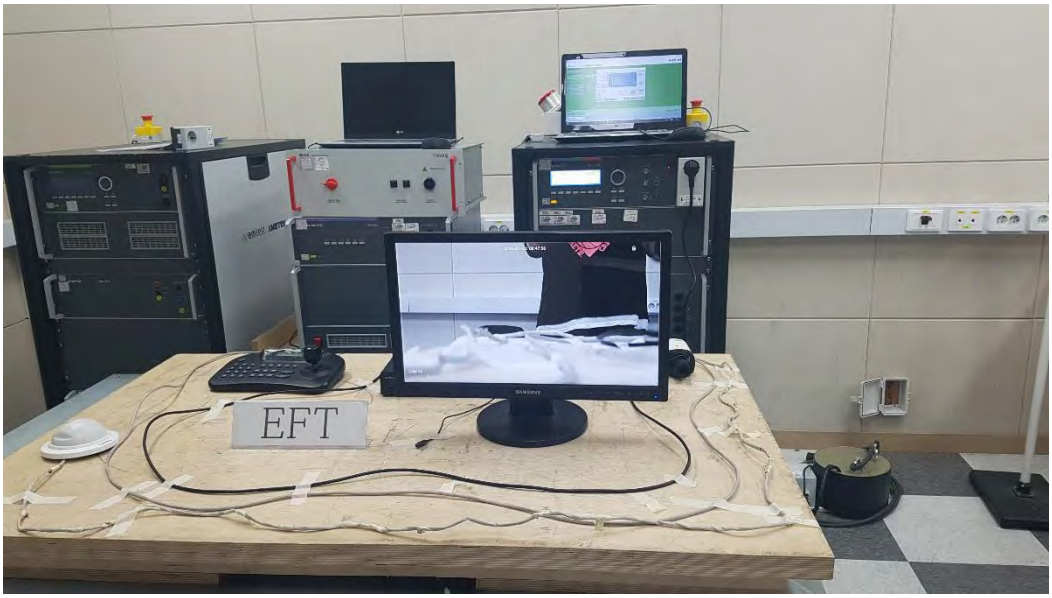


Radiated Electric Field Immunity



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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

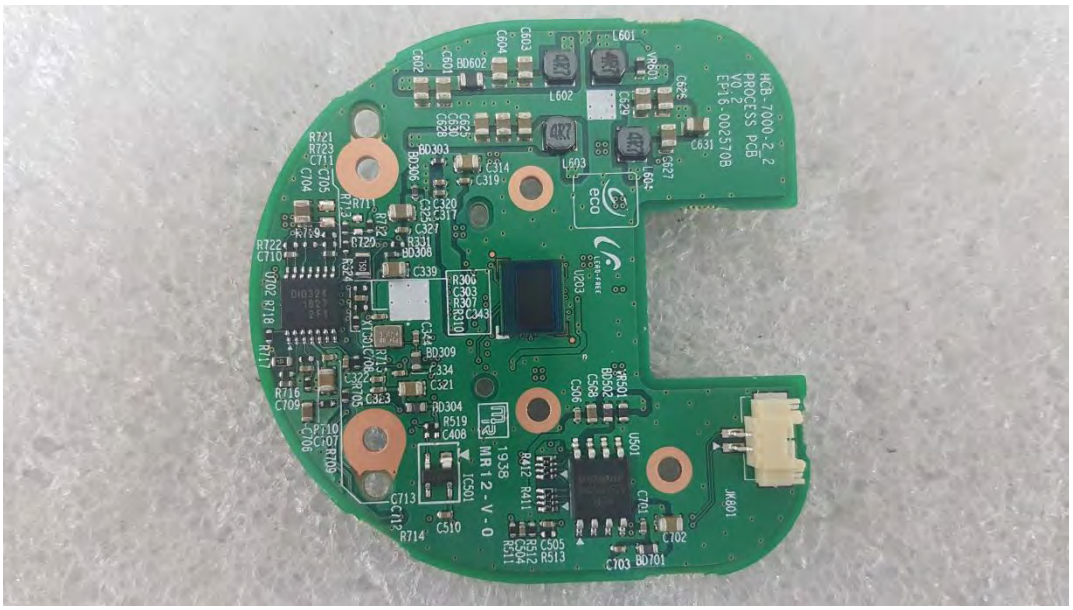
(Internal View)



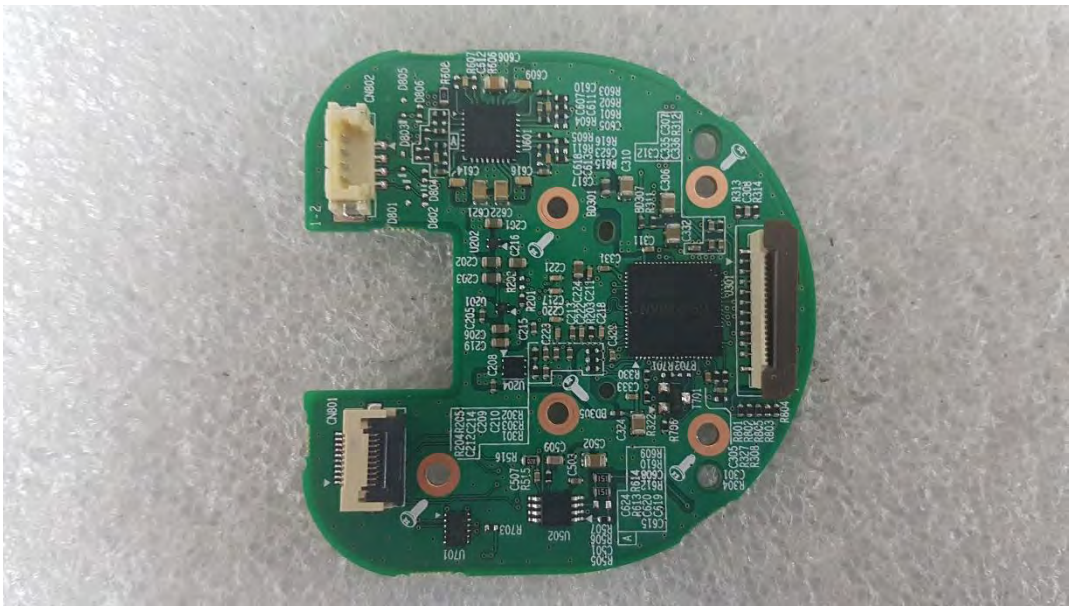
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EUT Internal View – Board 1

(Top)



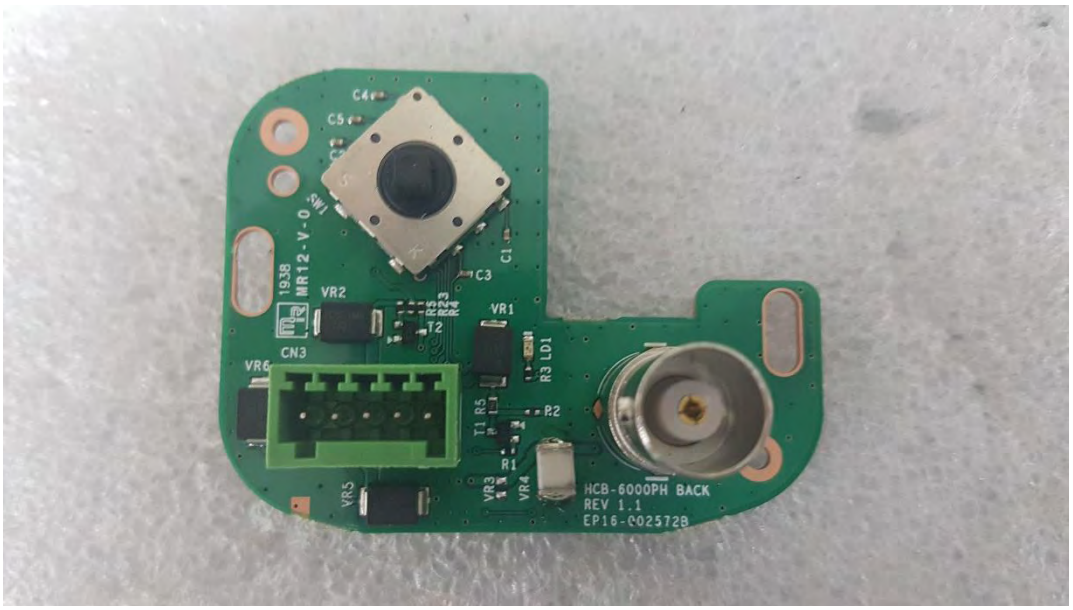
(Bottom)



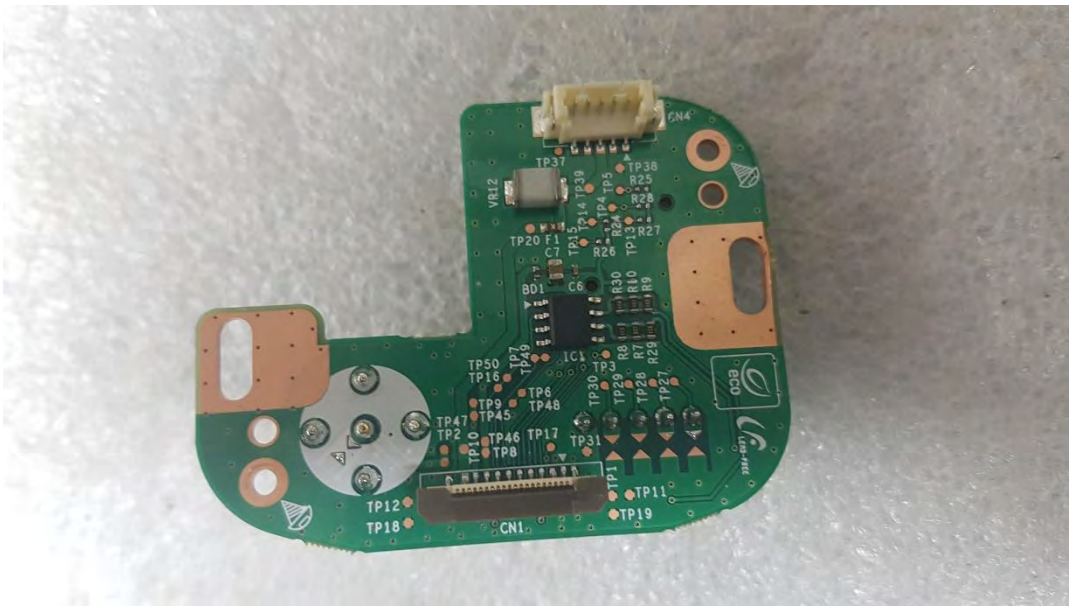
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EUT Internal View – Board 2

(Top)



(Bottom)



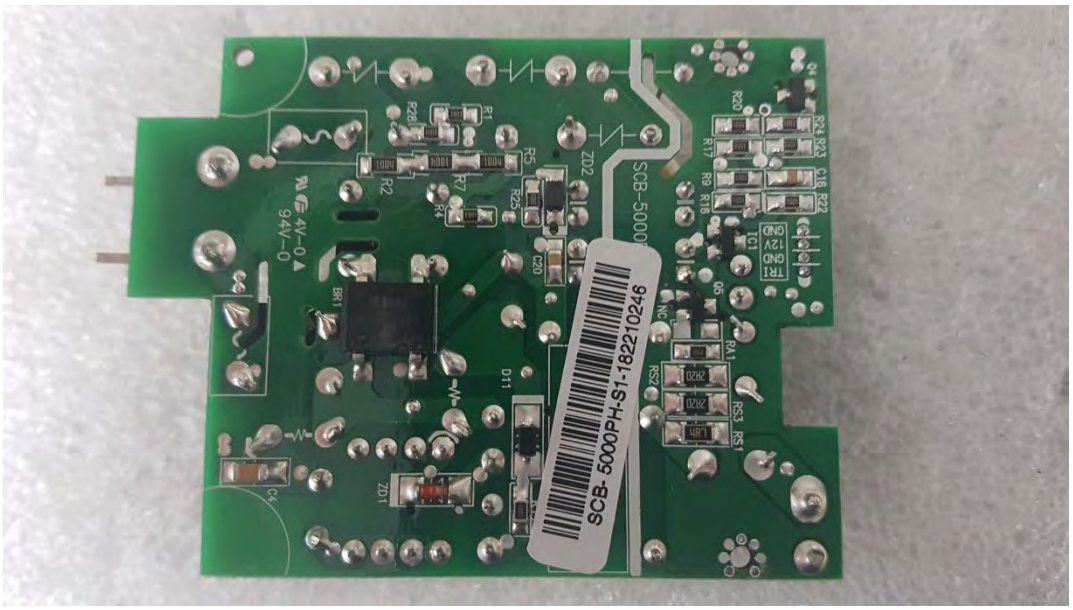
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EUT Internal View – Board 3

(Top)



(Bottom)



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Manufacturer : HANWHA TECHWIN (TIANJIN) CO.,LTD.

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