



EMC TEST REPORT

Test Report No. : KES-EM-23T0300
Date of Issue : Apr 10, 2023
Product Name : NETWORK VIDEO ENCODER
Model/Type No. : SPE-420
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)
Date of Receipt : Mar 23, 2023
Test Date : Mar 25, 2023 ~ Mar 30, 2023
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Jae Won, Lee
EMC Test Engineer

Reviewed by

Dae Jung, Choi
EMC Technical Manager

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



REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Apr 10, 2023	KES-EM-23T0300	Issued

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.

TABLE OF CONTENTS

1.0	General Product Description	5
1.1	Test Voltage & Frequency	6
1.2	Variant Model Differences.....	6
1.3	Device Modifications	6
1.4	Equipment Under Test.....	6
1.5	System Configuration	6
1.6	Support Equipments	7
1.7	External I/O Cabling	8
1.7	EUT Operating Mode(s)	10
1.8	Configuration.....	11
1.9	Remarks When Standards Applied	12
1.10	Calibration Details of Equipment Used for Measurement	12
1.11	Test Facility	12
1.12	Laboratory Accreditations and Listings	12
2.0	Test Regulations.....	13
2.1	Conducted Emissions at Mains Power Ports	14
2.2	Conducted Emissions at Telecommunication Ports	15
2.3	Impulse Noise (click)	16
2.4	Radiated Electric Field Emissions(Below 1 GHz)	17
2.5	Radiated Electric Field Emissions(Above 1 GHz)	18
2.6	Harmonic Current Emissions.....	19
2.7	Voltage Fluctuations and Flicker	20
3.0	Criteria for Compliance	21
3.1	Electrostatic Discharge.....	22
3.2	Radio-frequency Electromagnetic Field.....	26
3.3	Fast Transients.....	29
3.4	Surges.....	32
3.5	Conducted Disturbance	36
3.6	Power Frequency Magnetic Field Immunity	39
APPENDIX A – TEST DATA.....		42
Conducted Emissions at Mains Power Ports.....		42
Conducted Emissions at Telecommunication Ports		44
Impulse Noise (click)		46
Radiated Electric Field Emissions(Below 1 GHz)		47
Radiated Electric Field Emissions(Above 1 GHz).....		49
Harmonic Current Emissions and Voltage Fluctuations and Flicker		51
Test Setup Photos and Configuration		54
Conducted Emissions at Mains Power Ports.....		54
Conducted Emissions at Telecommunication Ports		55
Impulse Noise (click)		57
Radiated Electric Field Emissions(Below 1 GHz)		58
Radiated Electric Field Emissions(Above 1 GHz).....		60
Harmonic Current Emissions and Voltage Fluctuations and Flicker		62
Electrostatic Discharge		63
Radio-frequency Electromagnetic Field.....		64
Fast Transients		65
Surges.....		66
Conducted Disturbance		67



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-EM-23T0300
Page (4) of (75)

Power Frequency Magnetic Field Immunity	68
EUT Photographs	72
EUT Internal Layout Photographs	73

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



1.0 General Product Description

Main Specifications of EUT are:

Video	
Input Channel	4CH BNC, 1.0 Vp-p / 75Ω composite NTSC/PAL
Input Signal & Resolution	CVBS, AHD/CVI/TVI (1, 2, 4, 5MP) Auto Detection
Video Out	1 HDMI OUT (4 multi Image, 1920x1080)
Operational	
Motion Detection	Off / On
Privacy Masking	Off / On (4ea rectangular zones)
De-Interlacing	support
Alarm I/O	4 Input / 2 Output
Alarm Trigger	Motion Detection, Alarm Input, Video Loss, Tampering, Network disconnect
Alarm Events	File Upload Via FTP, E-mail
Audio I/O	4 Line Input / 1 Line Output(1 NO/COM/NC, 1 NO/COM)
OSD	Title
Remote Control Interface	1ea RS-485(Half Duplex)
RS-485 Protocol	SAMSUNG-T, PELCO-P/D
Coaxial Control	CVBS(Pelco-C) AHD, TVI, CVI
Network	
Ethernet	1 RJ-45 10/100
Video Compression Format	H.265, H.264 (MPEG-4 Part 10/AVC) : Main / Baseline / High, MJPEG
Resolution	2560x1920, 2560x1440, 1920x1080, 1280x720, 928x480(N), 928x240(N), 704x480(N), 704x240(N), 640x360, 352x240(N) 928x576(P), 928x288(P), 704x576(P), 704x288(P), 640x360, 352x288(P)
Max. Framerate	- Main Stream 5MP : 12fps/CH, 4MP : 15fps/CH, 1080p/720p/WD1/4CIF/CIF : 30fps/CH(N), 25fps/CH(P) - Sub Stream WD1/4CIF : 30fps/CH, 2CIF/CIF/QVGA/QCIF : 30fps/CH(N), 25fps/CH(P) - MJPEG : 2fps @ 640x360, 352x240, SD camera : 2fps @ 480x240, 352x240
Bitrate Control Method	H.265, H.264 : CBR or VBR
Streaming Capability	Multiple Streaming (Up to 2 Profiles per channel)
Audio Compression	G.711 u-law
IP	IPv4, IPv6
Protocol	TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP,RTSP, NTP, HTTP, HTTPS, SSL/TLS, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, UPnP, ONVIF, Bonjour
Security	HTTPS (SSL) Login Authentication, Digest Login Authentication IP Address Filtering, User Access Log, 802.1X Authentication (EAP-TLS, EAP-LEAP)
Streaming Method	Unicast / Multicast
Max. User Access	max. 16 users(4 Users/CH) at Unicast Mode
Webpage Languages	English, French, German, Spanish, Italian, Russian, Turkish, Polish, Dutch, Swedish, Portuguese, Czech, Chinese, Japanese, Korean, Hungarian, Greek
Web Viewer	"Supported OS: Windows 10 or later, Mac OS X 10.13 or later Non-plugin WebViewer Supported Browser: Google Chrome 80 or later, MS Edge 83 or later, Mozilla Firefox 72 or later, Apple Safari 11.0.1 or later * The video playback performance of the web viewer depends on the user's CPU/GPU performance"
Application Programming Interface	ONVIF profile S, SUNAPI (HTTP API)
Compatible Software & Recoder	SmartViewer, NVR(Hanwha Techwin, P/X/Q series)
Environmental	
Operating Temperature / Humidity	-10°C ~ +50°C / 20% ~ 80% RH
Electrical	
Input Voltage / Current	DC12V, PoE(IEEE 802.3af)
Power Consumption	MAX : 5W (12V, 0.417A)
Mechanical	
Color / Material	Dark Gray / Metal
Dimension (WxHxD)	(W) 178.0 × (H) 34.0 × (D)127.8(include Connector 148.7)mm
Weight	520g(1.146lb)

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.

☒ AC 230 V, 50 Hz ☒ PoE

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
NETWORK VIDEO ENCODER	SPE-420	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT

1.5 System Configuration

Description	Model Number	Serial Number	Manufacturer	Remarks
-	-	-	-	-



1.6 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Adaptor	2ACB022F	-	Channel Well Technology (Guangzhou) Co., Ltd.	-
PoE Adaptor	PT-PSE109GBRO-AH	-	Dongguan PROCET Network Technology Co.,Ltd	-
Notebook	P95G001	8KM8HT2	DELL INC.	-
Notebook Adapter	HA65NM130	-	Chicony Power Technology (Suzhou)Co.,Ltd.	-
Monitor	-	-	LG Electronics	-
CAMERA	-	-	HANWHA VISION VIETNAM COMPANY LIMITED	-
CAMERA Adaptor	JL1205B	-	Dooheon Electric Co., Ltd.	-
Alarm1	-	-	-	-
Alarm2	-	-	-	-
Speaker	BR10000A CUVE	-	BEIJING EDIFIER HI-TECH GROUP.	-
MIC	CMK-303	-	CAMAC	-
Controller	SPC-1010	C50E67WG10100F	SamSung Techwin Co.,Ltd.	-
Controller Adaptor	RS-AB1000	-	Dongguan Jinhuasheng Power Technology Co.,Ltd.	-
Smartphone	-	-	SAMSUNG	-



1.7 External I/O Cabling

■ DC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK VIDEO ENCODER (EUT)	RJ-45 (LAN)	Notebook	RJ-45 (LAN)	3.5	U
	BNC	CAMERA	BNC	3.5	S
	HDMI	Monitor	HDMI	1.6	S
	Audio IN	MIC	Audio OUT	1.6	U
	Audio OUT	Speaker	Audio IN	1.6	U
	Alarm IN	Alarm1	Alarm OUT	3.5	U
	Alarm OUT	Alarm2	Alarm IN	3.5	U
	RS-485	Controller	RS-485	3.5	U
	2 Pin	Adaptor	2 Pin	1.6	U
	Enclosure Ground	Ground	Enclosure Ground	3.5	-
CAMERA	2 Pin	CAMERA Adaptor	2 Pin	1.6	U
Controller	DC Jack	Controller Adaptor	DC Jack	1.5	U
Notebook	DC Jack	Notebook Adaptor	DC Jack	1.7	U
	3.5 mm	Smartphone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S



■ PoE Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK VIDEO ENCODER (EUT)	RJ-45 (PoE)	PoE Adaptor	RJ-45 (PoE)	3.5	U
	BNC	CAMERA	BNC	3.5	S
	HDMI	Monitor	HDMI	1.6	S
	Audio IN	MIC	Audio OUT	1.6	U
	Audio OUT	Speaker	Audio IN	1.6	U
	Alarm IN	Alarm1	Alarm OUT	3.5	U
	Alarm OUT	Alarm2	Alarm IN	3.5	U
	RS-485	Controller	RS-485	3.5	U
	Enclosure Ground	Ground	Enclosure Ground	3.5	-
CAMERA	2 Pin	CAMERA Adaptor	2 Pin	1.6	U
Controller	DC Jack	Controller Adaptor	DC Jack	1.6	U
Notebook	RJ-45 (LAN)	PoE Adaptor	RJ-45 (LAN)	1.5	U
Notebook	DC Jack	Notebook Adaptor	DC Jack	1.7	U
	3.5 mm	Smartphone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S



1.7 EUT Operating Mode(s)

■ DC Mode, PoE Mode

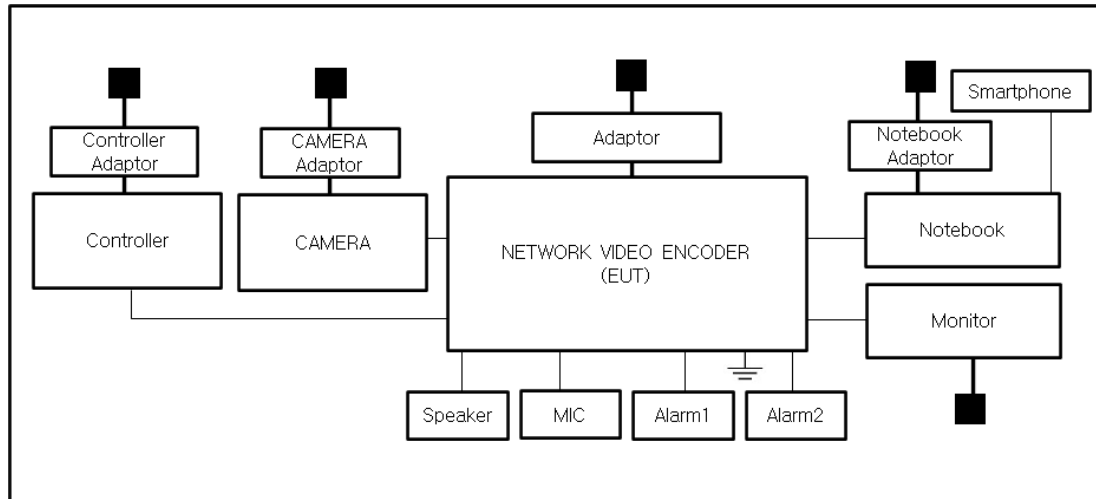
Test mode	operating
Operation	- Check the image output of the camera on the monitor, and check the normal operation of the network function through the laptop ping test. - Press Alarm 1 to check the operation in Alarm 2. -Check the camera movement using the controller. -Run 1 kHz Tone on your smartphone to check the output from the speaker and check the microphone input

EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Vision Co., Ltd

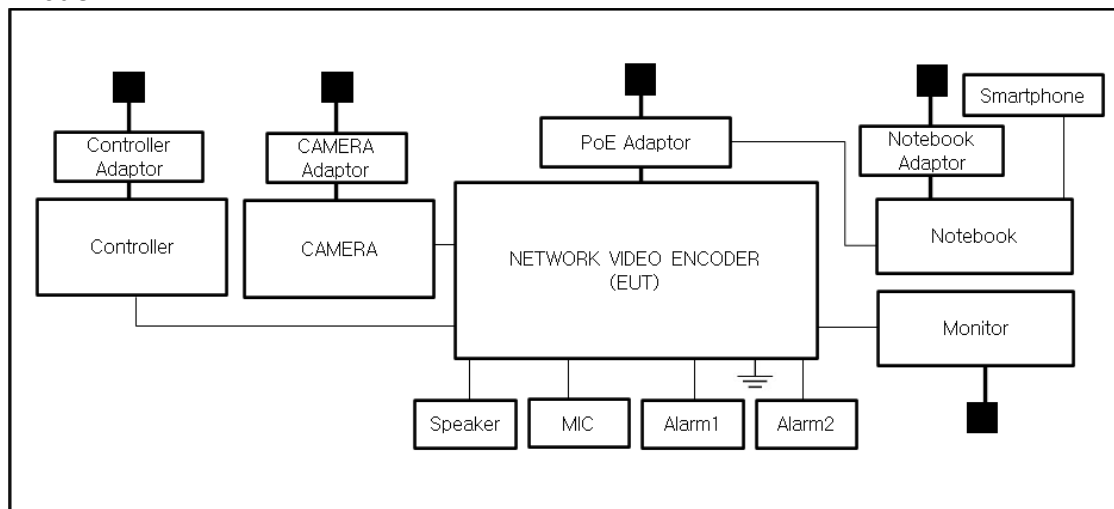
1.8 Configuration

■ AC Main
 □ DC Main

■ DC Mode



■ PoE Mode



1.9 Remarks When Standards Applied

- PoE port is considered to be wired network port, so power-related test items are excluded.
- The console port is for administrators, so it is not tested.

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, 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

1.12 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 50121-4:2016/A1:2019

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

2.1 Conducted Emissions at Mains Power Ports

Test Date

Mar 26, 2023

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	101783	Nov 11, 2023
☒	LISN	ENV216	R & S	101787	Nov 10, 2023
☒	LISN	ESH2-Z5	R & S	100450	Nov 10, 2023
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	Nov 10, 2023

Test Conditions

Temperature: (23,4 ± 0,1) °C

Relative Humidity: (43,7 ± 0,1) % R.H.

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

Remarks

See Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date

Mar 26, 2023

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	101783	Nov 11, 2023
☒	LISN	ENV216	R & S	101787	Nov 10, 2023
☒	LISN	ESH2-Z5	R & S	100450	Nov 10, 2023
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	Nov 10, 2023
☒	8-WIRE ISN CAT3,5	ENY81	R & S	100174	Nov 22, 2023
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	Nov 22, 2023

Test Conditions

Temperature: (23,4 ± 0,1) °C

Relative Humidity: (43,7 ± 0,1) % R.H.

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

Remarks

See Appendix A for test data.



2.3 Impulse Noise (click)

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	CLICK METER SOFTWARE CMS FOR DDA55	AFJ	4.19	-
☐	CLICK ANALYZER	DDA55+	AFJ INSTRUMENTS	14042211198	Mar 21, 2024
☐	LISN	ENV216	R & S	101787	Nov 10, 2023
☐	LISN	ESH2-Z5	R & S	100450	Nov 10, 2023

Test Conditions

Temperature:

°C

Relative Humidity:

% R.H.

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

Remarks

N/A



2.4 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Mar 26, 2023

Test Location

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

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	Mar 21, 2024
☒	AMPLIFIER	SCU 01	R & S	100603	Nov 10, 2023
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	Nov 17, 2024
☒	ATTENUATOR	8491A	HP	32173	Mar 03, 2024

Test Conditions

Temperature: (23,8 ± 0,1) °C
Relative Humidity: (44,1 ± 0,1) % R.H.

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

Remarks

See Appendix A for test data.



2.5 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Mar 26, 2023

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	Aug 01, 2023
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	Mar 06, 2024
☒	ATTENUATOR	8491A	HP	35496	Mar 03, 2024
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	Mar 06, 2024

Test Conditions

Temperature: (23,5 ± 0,1) °C

Relative Humidity: (43,8 ± 0,1) % R.H.

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.



2.6 Harmonic Current Emissions

Test Date

Mar 30, 2023

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	Mar 27, 2024
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,6 ± 0,1) °C

Relative Humidity: (44,1 ± 0,1) % 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.



2.7 Voltage Fluctuations and Flicker

Test Date

Mar 30, 2023

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	Mar 27, 2024
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,6 ± 0,6) °C
Relative Humidity: (44,1 ± 0,6) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

3.0 Criteria for Compliance

Criteria for compliance was based on the following guidelines:

General performance criteria

The general principles (performance criteria) for the evaluation of the immunity test results are the following.

Performance criterion A

The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.



3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Mar 25, 2023

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	Jan 31, 2024
☒	HCP	-	KES	-	-
☒	VCP	-	KES	-	-

Test Conditions

Temperature: (23,6 ± 0,1) °C
Relative Humidity: (44,2 ± 0,1) % R.H.
Atmospheric Pressure: (100,2 ± 0,0) 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

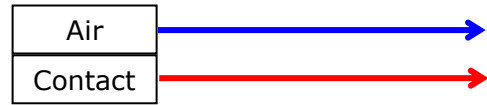
Discharge Voltage:	Contact	Air	HCP	VCP
	☒ 2 kV	☒ 2 kV	☒ 2 kV	☒ 2 kV
	☒ 4 kV	☒ 4 kV	☒ 4 kV	☒ 4 kV
	☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
	☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
	☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

Notes: HCP: Horizontal Coupling Plane

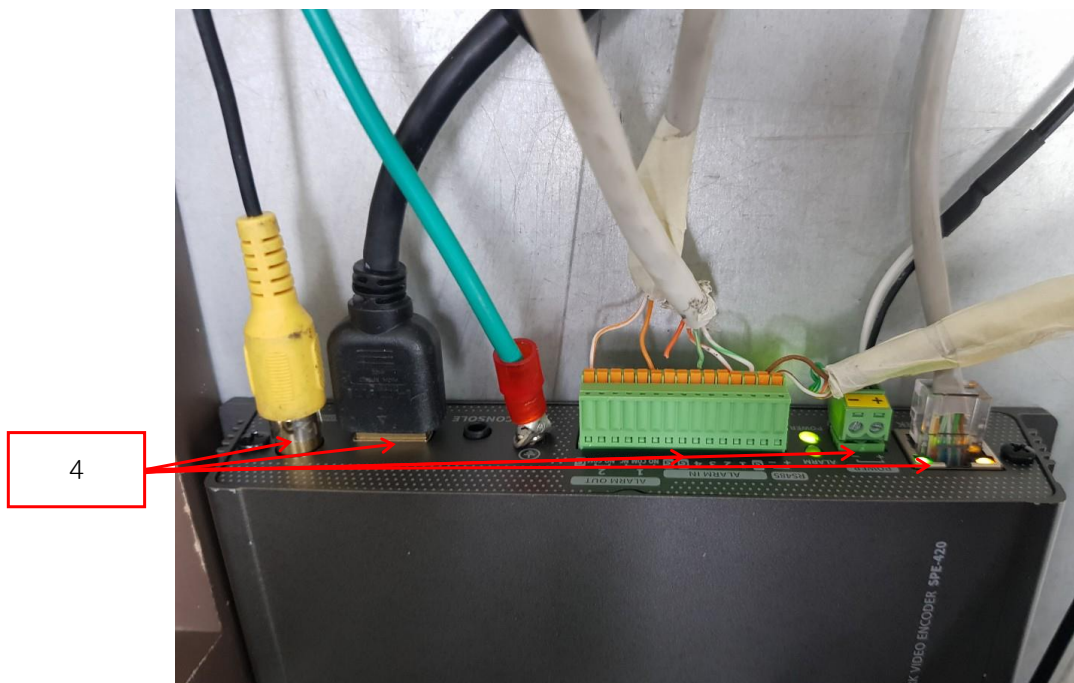
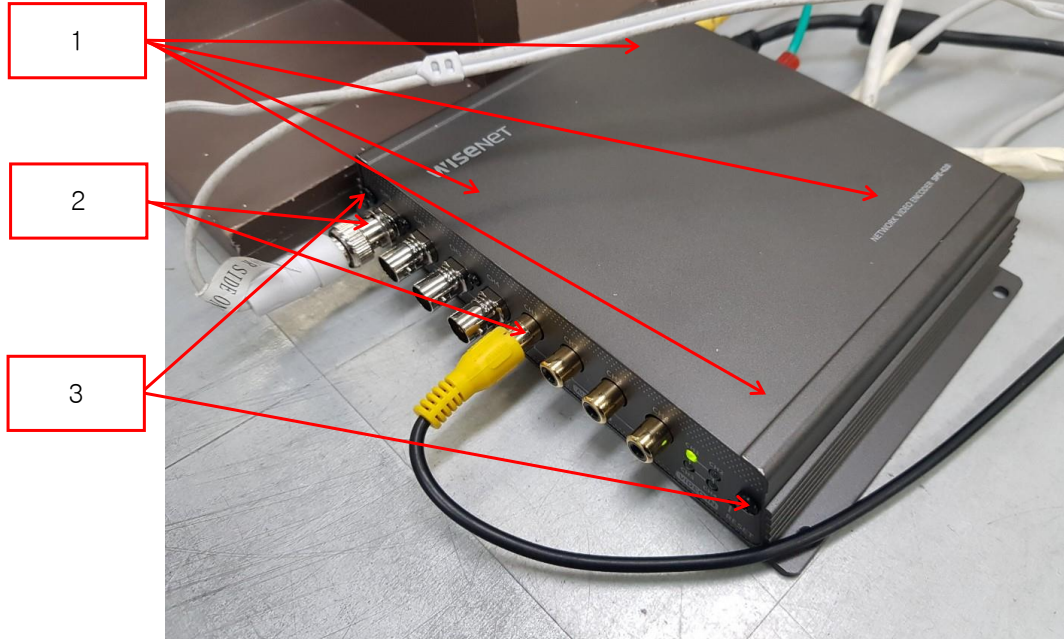
VCP: Vertical Coupling Plane

Required Performance Criteria: ☒ B

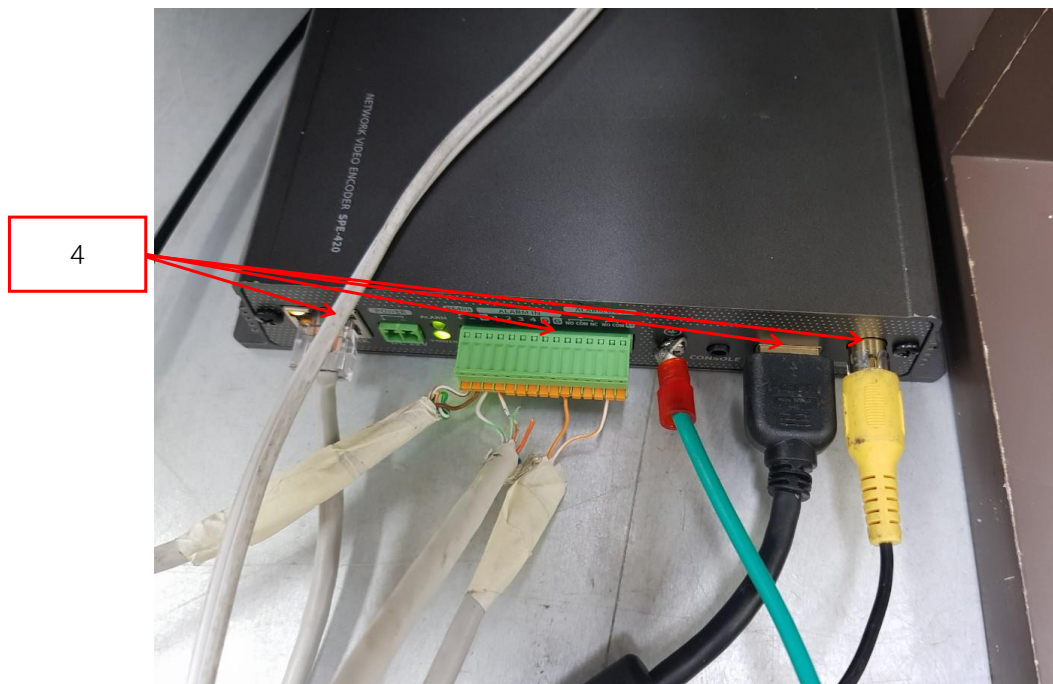
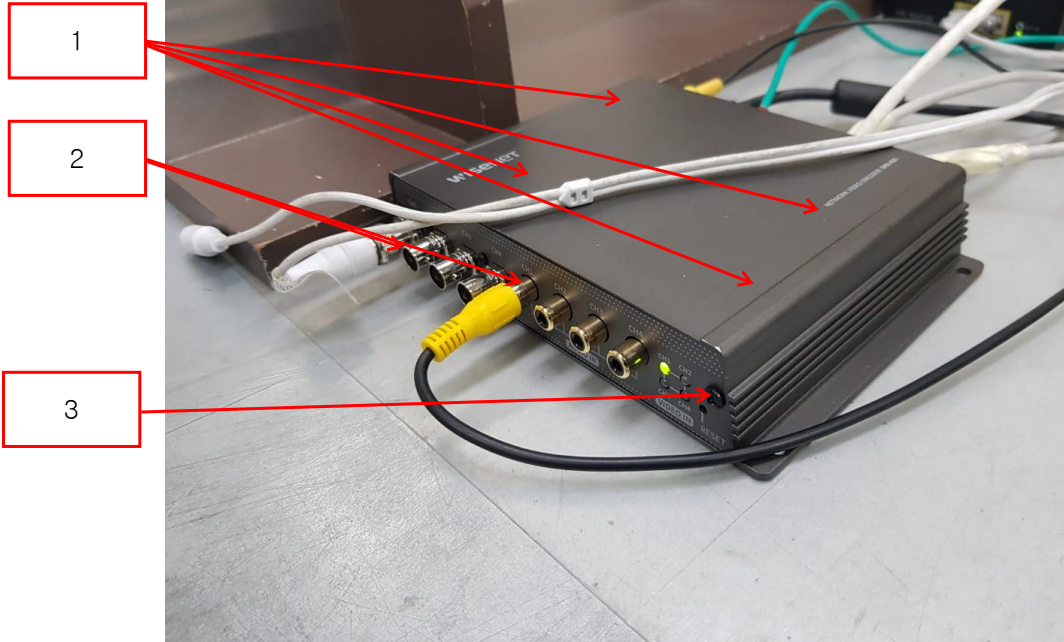
Location of Discharge:



■ DC Mode



■ PoE Mode



Test Data
■ DC Mode
Indirect Discharge

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure	Contact Discharge	A	-
2	Around Port 1	Contact Discharge	A	-
3	Screw	Contact Discharge	A	-
4	Around Port 2	Contact Discharge	A	-

■ PoE Mode
Indirect Discharge

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure	Contact Discharge	A	-
2	Around Port 1	Contact Discharge	A	-
3	Screw	Contact Discharge	A	-
4	Around Port 2	Contact Discharge	A	-

Note: "Blank" = Not performed

Observations:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

- ☒ PASS Required Performance Criteria
- ☐ NOT PASS Required Performance Criteria

Remarks

Any degradations of performance was not observed during in the test.

3.2 Radio-frequency Electromagnetic Field

Reference Standard

EN IEC 61000-4-3:2020

Test Date

Mar 26, 2023

Test Location

EMS-RS: ☒ SEMI ANECHOIC CHAMBER #3 ☐ SEMI ANECHOIC CHAMBER #4(10 m)

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	Rohde & Schwarz	108252	Aug 01, 2023
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
☒	POWER METER	E4419B	Agilent	GB40203000	Mar 21, 2024
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY52170007	Mar 21, 2024
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY41498669	Mar 21, 2024
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM, INC	781	Mar 06, 2024

Test Conditions

Temperature: (23,5 ± 0,6) °C
Relative Humidity: (43,8 ± 0,6) % R.H.
Atmospheric Pressure: (100,3 ± 0,0) kPa



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-EM-23T0300
Page (27) of (75)

Test Specifications

Antenna Polarization: Horizontal & Vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Frequency Range: ☒ 80 MHz to 800 MHz [10V/m]
[Field Strength] ☒ 800 MHz to 1 GHz [20 V/m]
☒ 1,4 GHz to 2,0 GHz [10 V/m]
☒ 2,0 GHz to 2,7 GHz [5 V/m]
☒ 5,1 GHz to 6,0 GHz [3 V/m]

Modulation: ☒ 80 % AM, 1 kHz sine wave

Frequency Step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ A

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-EM-23T0300
Page (28) of (75)

Test Data**■ DC Mode**

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

■ PoE Mode

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

Note: "Blank" = Not performed

Observations:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

- ☒ PASS Required Performance Criteria
- ☐ NOT PASS Required Performance Criteria

Remarks

Any degradations of performance was not observed during in the test.

3.3 Fast Transients

Reference Standard

EN 61000-4-4:2012

Test Date

Mar 28, 2023

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	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	Nov 28, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	Nov 29, 2023
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	Nov 28, 2023
☐	3-PHASE CDN	CNI 503B8	EM TEST	P1622180299	Dec 01, 2023

Test Conditions

Temperature: (23,3 ± 0,4) °C
Relative Humidity: (43,9 ± 0,4) % R.H.
Atmospheric Pressure: (100,3 ± 0,0) kPa

Test Specifications

Pulse Amplitude & Polarity: ☒ ± 2.0 kV ☐ ± 4.0 kV
(Power Lines)

Pulse Amplitude & Polarity: ☒ ± 2.0 kV ☐ ± 4.0 kV
(Signal Lines)

Pulse Amplitude & Polarity: ☒ ± 1.0 kV
(Earth Lines)

Burst Period: ☒ 300 ms

Repetition Rate: ☒ 5 kHz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ A

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 Data

■ DC Mode

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

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
L	A	A
N	A	A
PE	-	-
L – N	A	A
L – PE	-	-
N – PE	-	-
L – N – PE	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45 (LAN)	A	A
Alarm In	A	A
Alarm Out	A	A
BNC	A	A
RS-485	A	A

☒ Earth ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
Enclosure Ground	A	A

■ PoE Mode

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45 (PoE)	A	A
Alarm In	A	A
Alarm Out	A	A
BNC	A	A
RS-485	A	A

☒ Earth ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
Enclosure Ground	A	A

Note: “Blank” = Not performed

Observations:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

Any degradations of performance was not observed during in the test.



3.4 Surges

Reference Standard

EN 61000-4-5:2014+A1:2017

Test Date

Mar 29, 2023

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	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	Nov 28, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	Nov 29, 2023
☒	CDN	CNV 508N1	EM TEST	P1610176296	Nov 29, 2023

Test Conditions

Temperature: (23,7 ± 0,6) °C
Relative Humidity: (43,7 ± 0,6) % R.H.
Atmospheric Pressure: (100,2 ± 0,0) kPa



Test Specifications

AC Power Lines

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

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

Number of Surges: ☒ 5 surges per angle

Angle: ☒ 0°, 90°, 180°, 270° (input AC power port)

Polarity: ☒ Positive & Negative

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

Required Performance Criteria: ☒ B

DC Power Lines

Source Impedance: 42 ohm

Surge Amplitude: Common Mode
☐ (2,0) kV
Differential Mode
☐ (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: ☐ B

Signal Lines

Source Impedance: 42 ohm

Surge Amplitude: Common Mode
☒ (2,0) kV
Differential Mode
☒ (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: ☒ B

Test Data

☒ DC Mode

☒ Line to Line – Differential Mode

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

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – PE	A	A
N – PE	A	A

Signal Lines

☒ Line to Line – Differential Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45(LAN)	CDN	A	A
	LINE	A	A

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
RJ-45 (LAN)	A	A

☒ PoE Mode

☐ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

Signal Lines

☒ Line to Line – Differential Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45(PoE)	CDN	A	A
	LINE	A	A

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
RJ-45 (PoE)	A	A

Note: "Blank" = Not performed

Observations:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

Remarks

Any degradations of performance was not observed during in the test.

3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Mar 27, 2023

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	5.3.12	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	Nov 10, 2023
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	Nov 10, 2023
☒	CDN	CDN M016	TESEQ	43694	Nov 10, 2023
☒	CDN	CDN M016	TESEQ	43697	Nov 10, 2023
☒	CDN	CDN T800	TESEQ	42800	Nov 10, 2023
☒	EM CLAMP	KEMZ 801A	TESEQ	44099	Nov 14, 2023

Test Conditions

Temperature: (23,2 ± 0,6) °C
 Relative Humidity: (43,6 ± 0,6) % R.H.
 Atmospheric Pressure: (100,2 ± 0,0) kPa

Test Specifications

Frequency Range: ☒ 150 kHz to 80 MHz
 Voltage Level: ☒ 10 Vrms
 Modulation: ☒ 80 % AM, 1 kHz sine wave
 Frequency Step: ☒ 1 % step
 Dwell Time: ☐ 1 s ☒ 3 s
 Required Performance Criteria: ☒ A

Test Data

■ DC Mode

☒ Input a.c. power ports

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

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45 (LAN)	CDN	A
Alarm In	Clamp	A
Alarm Out	Clamp	A
BNC	Clamp	A
RS-485	Clamp	A

☒ Earth ports

Coupling Location (Line Stressed)	Coupling Method	Observations
Enclosure Ground	Clamp	A

☒ PoE Mode

☐ Input a.c. power ports

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

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45 (PoE)	CDN	A
Alarm In	Clamp	A
Alarm Out	Clamp	A
BNC	Clamp	A
RS-485	Clamp	A

☒ Earth ports

Coupling Location (Line Stressed)	Coupling Method	Observations
Enclosure Ground	Clamp	A

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

Observations:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

- ☒ PASS Required Performance Criteria
- ☐ NOT PASS Required Performance Criteria

Remarks

Any degradations of performance was not observed during in the test.

3.6 Power Frequency Magnetic Field Immunity

Reference Standard

EN 61000-4-8:2010

Test Date

Mar 29, 2023

Test Location

EMS-Magnetic: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	EMS Test S/W	NET.CONTROL	EM TEST	1.2.11	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	Nov 28, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	Nov 29, 2023
☒	MAGNETIC FIELD COIL	MS 100N	EM TEST	P1536163691	Nov 28, 2023
☒	CURRENT TRANSFORMER	MC 26100	EM TEST	P1550168963	Mar 22, 2024
☒	MULTIFUNCTION AC/DC POWER SOURCE	NETWAVE 7-400	EM TEST	P1614178393	Nov 11, 2023
☒	MAGNETICFIELD COIL	INA 703	Teseq AG	3006	Mar 22, 2024

Test Conditions

Temperature: (23,7 ± 0,1) °C
Relative Humidity: (43,7 ± 0,1) % R.H.
Atmospheric Pressure: (100,2 ± 0,0) kPa



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-EM-23T0300
Page (40) of (75)

Test Specifications

Field Strength(Power Source): ☒ 100 A/m (ac)

☒ 300 A/m (dc)

Frequency (ac): ☒ 16.7 Hz ☒ 50 Hz ☐ 60 Hz

Frequency (dc): ☒ 0 Hz

Required Performance Criteria: ☒ A

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 Data☒ DC Mode☒ Immersion method

Coil orientation	Result
X	A
Y	A
Z	A

☐ Proximity method

Coil orientation	Result
X	-
Y	-
Z	-

☒ PoE Mode☒ Immersion method

Coil orientation	Result
X	A
Y	A
Z	A

☐ Proximity method

Coil orientation	Result
X	-
Y	-
Z	-

Note: "blank" = Not performed

Observations:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**Any degradations of performance was not observed during in the test.

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

APPENDIX A – TEST DATA

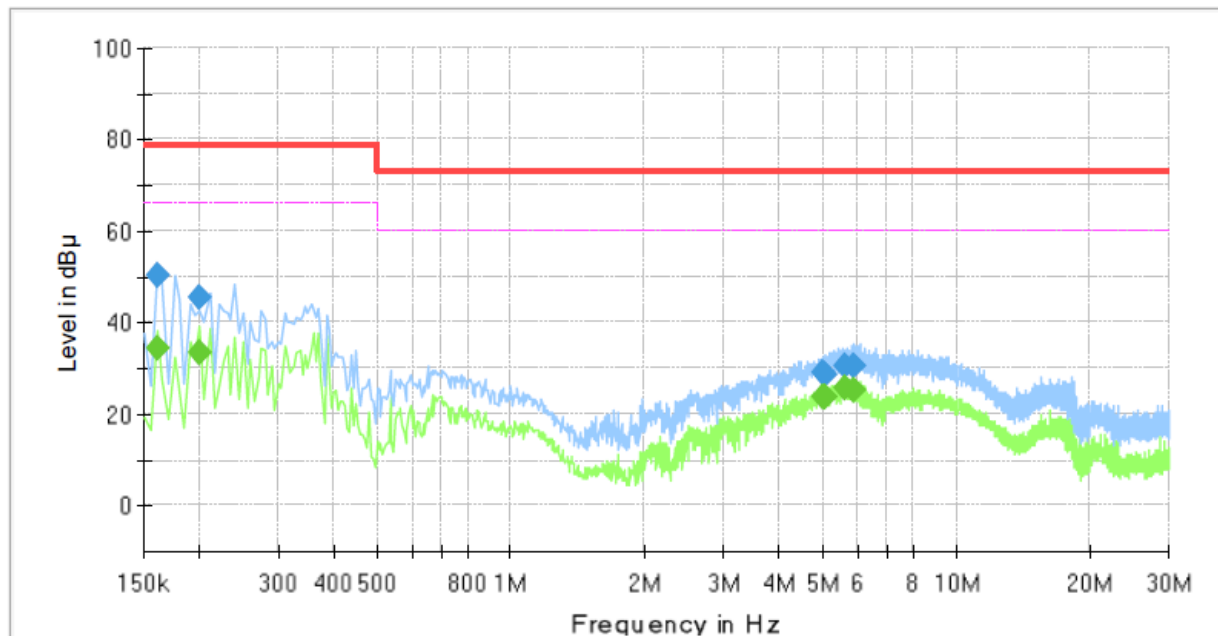
Conducted Emissions at Mains Power Ports

■ DC Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	SPE-420
Phase:	DC_L1
Mode:	
Operator Name:	KES



Final Result

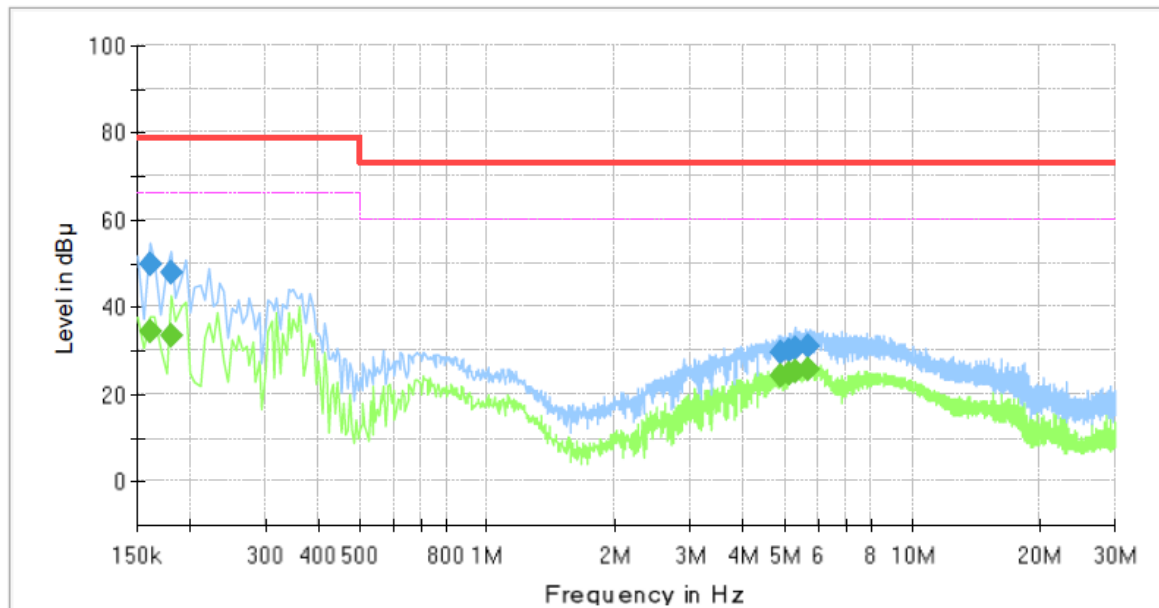
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	34.42	66.00	31.58	5000.0	9.000	L1	19.5
0.160000	50.37	---	79.00	28.63	5000.0	9.000	L1	19.5
0.200000	---	33.54	66.00	32.46	5000.0	9.000	L1	19.5
0.200000	45.27	---	79.00	33.73	5000.0	9.000	L1	19.5
5.030000	---	23.72	60.00	36.28	5000.0	9.000	L1	19.7
5.030000	28.87	---	73.00	44.13	5000.0	9.000	L1	19.7
5.050000	---	23.66	60.00	36.34	5000.0	9.000	L1	19.7
5.050000	28.83	---	73.00	44.17	5000.0	9.000	L1	19.7
5.600000	---	25.49	60.00	34.51	5000.0	9.000	L1	19.6
5.600000	30.68	---	73.00	42.32	5000.0	9.000	L1	19.6
5.905000	---	25.00	60.00	35.00	5000.0	9.000	L1	19.6
5.905000	30.74	---	73.00	42.26	5000.0	9.000	L1	19.6

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.:	SPE-420
Phase:	DC_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)
0.160000	---	34.40	66.00	31.60	5000.0	9.000	N	19.4
0.160000	49.82	---	79.00	29.18	5000.0	9.000	N	19.4
0.180000	---	33.34	66.00	32.66	5000.0	9.000	N	19.5
0.180000	47.84	---	79.00	31.16	5000.0	9.000	N	19.5
4.880000	---	24.19	60.00	35.81	5000.0	9.000	N	19.7
4.880000	29.77	---	73.00	43.23	5000.0	9.000	N	19.7
5.110000	---	24.61	60.00	35.39	5000.0	9.000	N	19.7
5.110000	30.06	---	73.00	42.94	5000.0	9.000	N	19.7
5.280000	---	25.24	60.00	34.76	5000.0	9.000	N	19.6
5.280000	30.58	---	73.00	42.42	5000.0	9.000	N	19.6
5.690000	---	25.72	60.00	34.28	5000.0	9.000	N	19.6
5.690000	31.06	---	73.00	41.94	5000.0	9.000	N	19.6

◆ 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 (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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

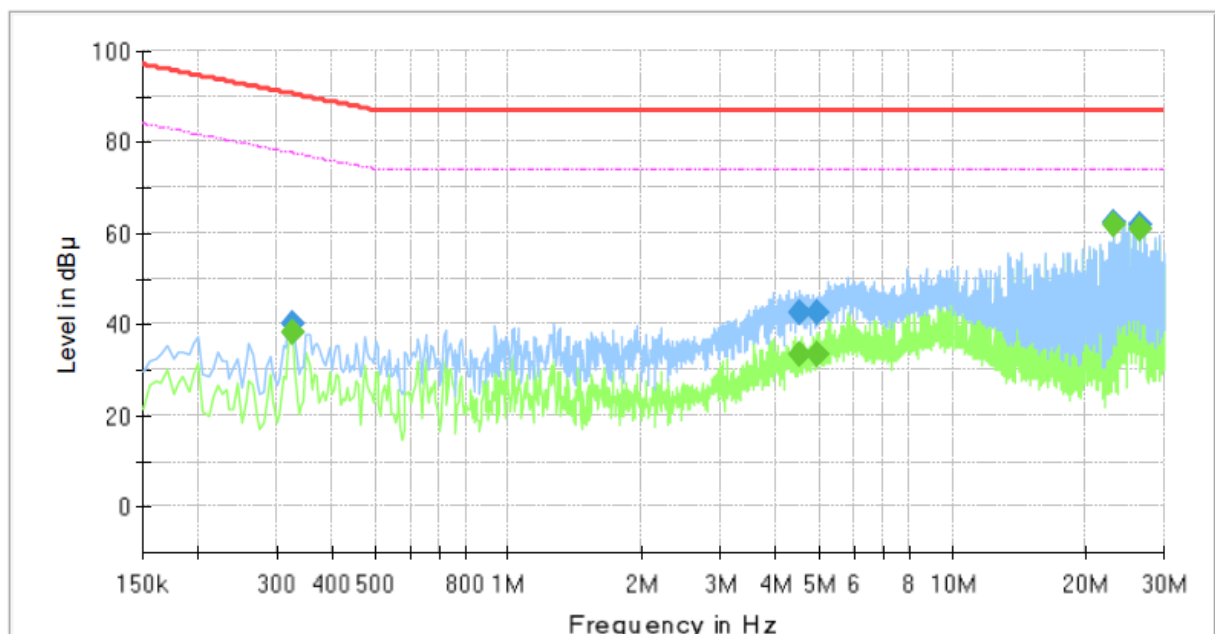
Conducted Emissions at Telecommunication Ports

■ DC Mode

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	SPE-420
Mode :	DC_TEL 100 Mbps
Speed :	
Operator Name:	KES



Final Result

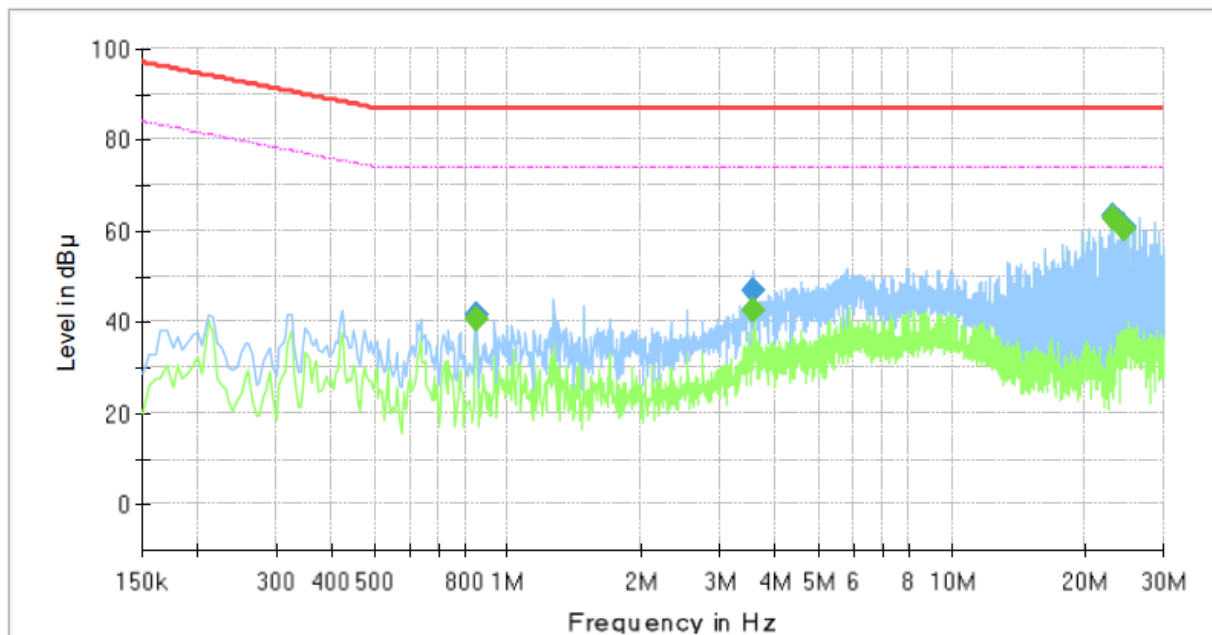
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.325000	---	38.12	77.58	39.46	1000.0	9.000	Single Line	19.6
0.325000	40.36	---	90.58	50.22	1000.0	9.000	Single Line	19.6
4.545000	---	33.42	74.00	40.58	1000.0	9.000	Single Line	19.5
4.545000	42.53	---	87.00	44.47	1000.0	9.000	Single Line	19.5
4.945000	---	33.49	74.00	40.51	1000.0	9.000	Single Line	19.4
4.945000	42.56	---	87.00	44.44	1000.0	9.000	Single Line	19.4
23.130000	---	62.10	74.00	11.90	1000.0	9.000	Single Line	19.9
23.130000	62.42	---	87.00	24.58	1000.0	9.000	Single Line	19.9
26.485000	---	60.77	74.00	13.23	1000.0	9.000	Single Line	20.1
26.485000	61.93	---	87.00	25.07	1000.0	9.000	Single Line	20.1

■ PoE Mode

[100 Mbps]

Common Information

Test Description: Telecommunication Emission
 Model No.: SPE-420
 Mode : PoE_TEL 100 Mbps
 Speed :
 Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.845000	---	40.48	74.00	33.52	1000.0	9.000	Single Line	19.9
0.845000	41.82	---	87.00	45.18	1000.0	9.000	Single Line	19.9
3.580000	---	42.75	74.00	31.25	1000.0	9.000	Single Line	19.8
3.580000	46.71	---	87.00	40.29	1000.0	9.000	Single Line	19.8
23.130000	---	62.87	74.00	11.13	1000.0	9.000	Single Line	19.9
23.130000	63.17	---	87.00	23.83	1000.0	9.000	Single Line	19.9
24.350000	---	60.33	74.00	13.67	1000.0	9.000	Single Line	20.1
24.350000	61.10	---	87.00	25.90	1000.0	9.000	Single Line	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 (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))



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-EM-23T0300
Page (46) of (75)

Impulse Noise (click)

N/A

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



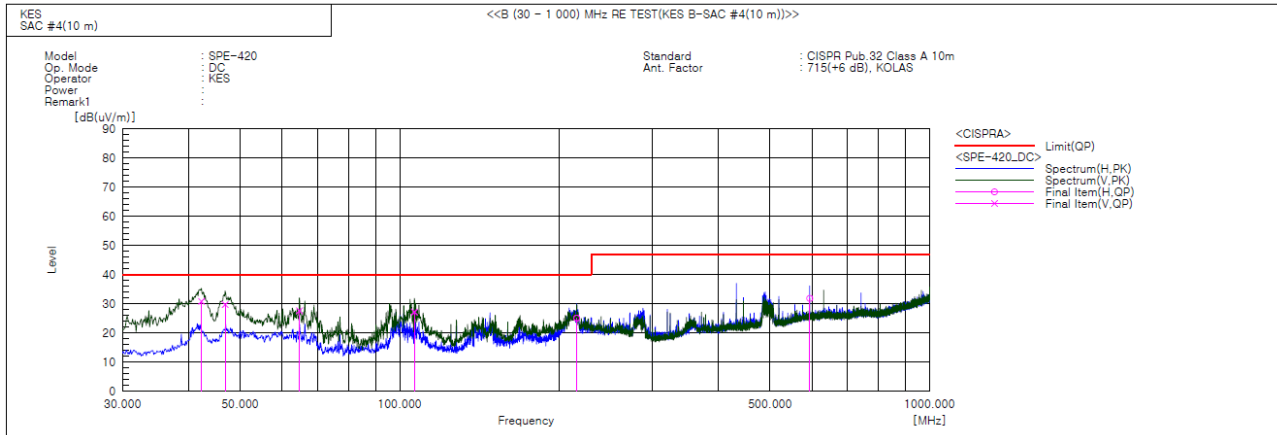
KES Co., Ltd.

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-EM-23T0300
Page (47) of (75)

Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



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	42.246	V	52.4	-21.6	30.8	40.0	9.2	396.0	322.0	
2	46.854	V	50.5	-20.8	29.7	40.0	10.3	145.0	126.0	
3	64.678	V	50.6	-23.0	27.6	40.0	12.4	112.0	223.0	
4	106.630	V	49.8	-22.6	27.2	40.0	12.8	100.0	271.0	
5	215.876	H	45.2	-20.1	25.1	40.0	14.9	396.0	188.0	
6	594.055	H	40.1	-8.3	31.8	47.0	15.2	195.0	29.0	

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

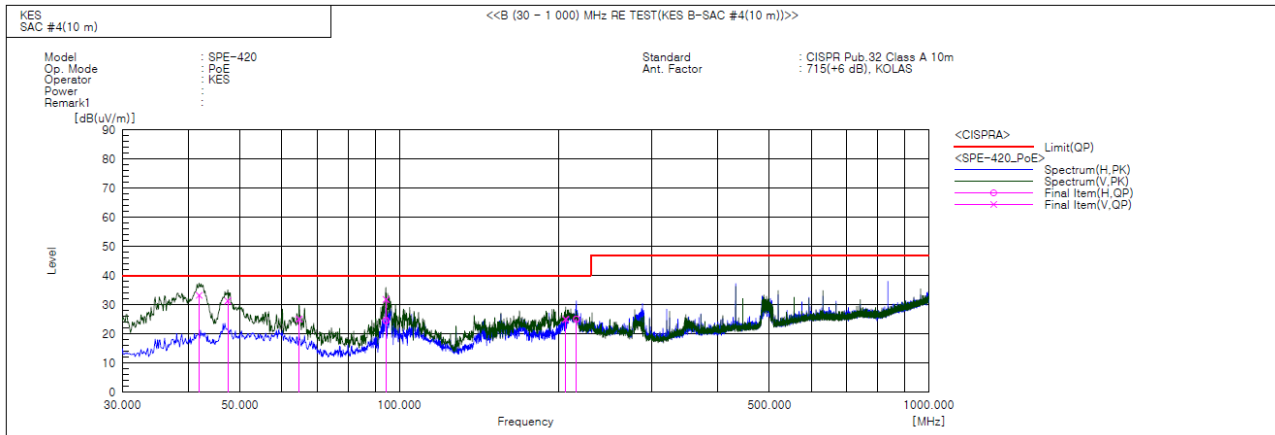


KES Co., Ltd.

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-EM-23T0300
Page (48) of (75)

PoE Mode



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	41.883	V	54.9	-21.7	33.2	40.0	6.8	106.0	254.0	
2	47.460	V	52.0	-20.7	31.3	40.0	8.7	142.0	117.0	
3	64.678	V	48.1	-23.0	25.1	40.0	14.9	111.0	328.0	
4	94.384	V	54.7	-22.9	31.8	40.0	8.2	112.0	284.0	
5	94.384	H	47.5	-22.9	24.6	40.0	15.4	388.0	162.0	
6	206.176	V	45.8	-20.8	25.0	40.0	15.0	145.0	282.0	
7	215.998	H	45.2	-20.1	25.1	40.0	14.9	395.0	181.0	

◆ Calculation - SAC #4(10 m)

Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/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

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



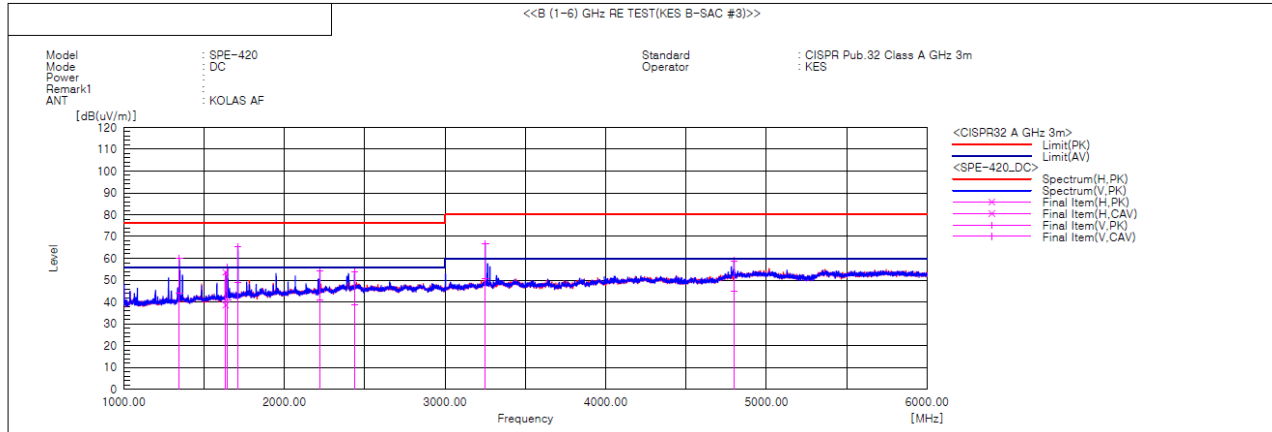
KES Co., Ltd.

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-EM-23T0300
Page (49) of (75)

Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode



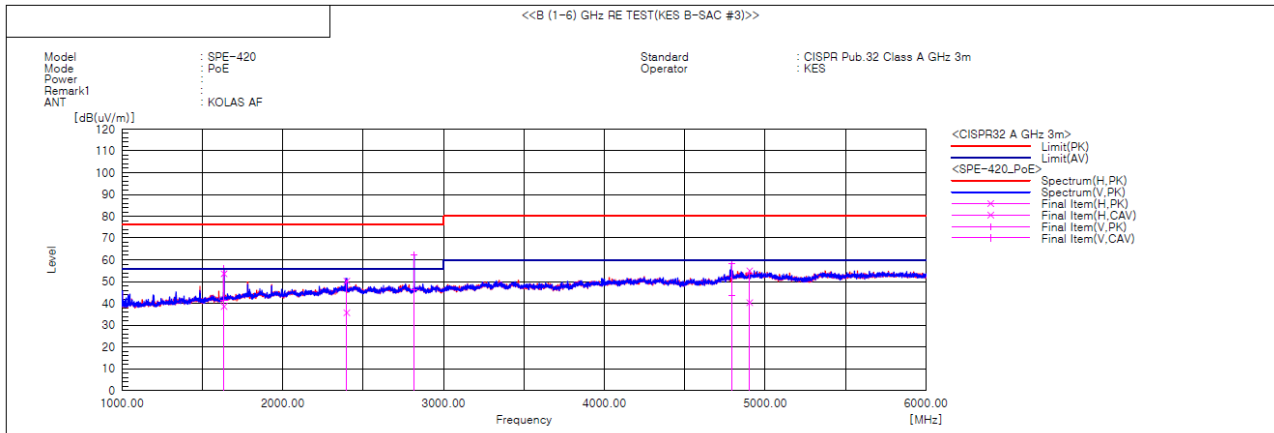
Final Result

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	1346.074	V	60.8	45.1	-1.0	59.8	44.1	76.0	56.0	16.2	11.9	100.0	127.6	
2	1634.673	H	52.8	37.8	0.8	53.6	38.6	76.0	56.0	22.4	17.4	100.0	206.5	
3	1647.575	V	54.8	40.1	1.0	55.8	41.1	76.0	56.0	20.2	14.9	100.0	232.9	
4	1710.531	V	63.5	47.0	1.8	65.3	48.8	76.0	56.0	10.7	7.2	100.0	236.5	
5	2221.645	V	49.5	36.1	4.7	54.2	40.8	76.0	56.0	21.8	15.2	100.0	127.6	
6	2437.885	V	47.7	32.5	6.1	53.8	38.6	76.0	56.0	22.2	17.4	100.0	230.0	
7	3250.246	V	58.1	42.0	8.5	66.6	50.5	80.0	60.0	13.4	9.5	100.0	118.2	
8	4798.758	V	45.1	30.9	13.8	58.9	44.7	80.0	60.0	21.1	15.3	100.0	175.5	

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



PoE Mode



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	1634.052	V	55.2	40.5	0.8	56.0	41.3	76.0	56.0	20.0	14.7	100.0	26.2	
2	1634.757	H	52.8	37.8	0.8	53.6	38.6	76.0	56.0	22.4	17.4	100.0	208.0	
3	2397.756	H	44.1	29.6	6.1	50.2	35.7	76.0	56.0	25.8	20.3	100.0	121.0	
4	2817.344	V	54.8	38.9	7.2	62.0	46.1	76.0	56.0	14.0	9.9	100.0	148.8	
5	4791.756	V	44.8	30.0	13.7	58.5	43.7	80.0	60.0	21.5	16.3	100.0	16.7	
6	4903.133	H	40.2	25.6	14.8	55.0	40.4	80.0	60.0	25.0	19.6	100.0	316.0	

Calculation

Over Limit [dB] = (Read Level [dB μ V] + Ant Factor [dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line [dB μ V]

Over Limit : Margin, Read Level : Reading value, Ant Factor : ANT Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

Harmonic Current Emissions and Voltage Fluctuations and Flicker

Average harmonic current results				
Hn	leff [A]	% of Limit	Limit [A]	Result
1	0.024			
2	0.002	0.139	1.080	n/a
3	0.015	0.640	2.300	PASS
4	0.002	0.389	0.430	n/a
5	0.016	1.373	1.140	PASS
6	0.001	0.462	0.300	n/a
7	0.016	2.069	0.770	PASS
8	0.001	0.619	0.230	n/a
9	0.015	3.671	0.400	PASS
10	0.001	0.803	0.184	n/a
11	0.014	4.356	0.330	PASS
12	0.001	0.915	0.153	n/a
13	0.014	6.714	0.210	PASS
14	0.002	1.177	0.131	n/a
15	0.013	8.939	0.150	PASS
16	0.001	1.200	0.115	n/a
17	0.013	9.865	0.132	PASS
18	0.001	1.317	0.102	n/a
19	0.012	10.551	0.118	PASS
20	0.001	1.470	0.092	n/a
21	0.012	7.281	0.161	PASS
22	0.001	1.500	0.084	n/a
23	0.011	7.635	0.147	PASS
24	0.001	1.679	0.077	n/a
25	0.011	7.802	0.135	PASS
26	0.001	1.688	0.071	n/a
27	0.010	7.875	0.125	PASS
28	0.001	1.730	0.066	n/a
29	0.009	7.785	0.116	PASS
30	0.001	1.791	0.061	n/a
31	0.008	7.660	0.109	PASS
32	0.001	1.737	0.058	n/a
33	0.008	7.582	0.102	PASS
34	0.001	1.932	0.054	n/a
35	0.007	7.048	0.096	PASS
36	0.001	1.795	0.051	n/a
37	0.006	6.782	0.091	PASS
38	0.001	1.857	0.048	n/a
39	0.006	6.453	0.087	PASS
40	0.001	1.943	0.046	n/a

Note: 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.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.



Test Data - Harmonics (continued)

Maximum harmonic current results				
Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.024			
2	0.002	0.134	1.620	n/a
3	0.015	0.441	3.450	PASS
4	0.002	0.323	0.645	n/a
5	0.016	0.922	1.710	PASS
6	0.002	0.364	0.450	n/a
7	0.016	1.393	1.155	PASS
8	0.002	0.466	0.345	n/a
9	0.015	2.496	0.600	PASS
10	0.002	0.621	0.276	n/a
11	0.014	2.923	0.495	PASS
12	0.002	0.702	0.230	n/a
13	0.014	4.518	0.315	PASS
14	0.002	0.889	0.197	n/a
15	0.014	6.012	0.225	PASS
16	0.002	0.927	0.173	n/a
17	0.013	6.624	0.199	PASS
18	0.002	1.023	0.153	n/a
19	0.013	7.094	0.178	PASS
20	0.002	1.105	0.138	n/a
21	0.012	7.340	0.161	PASS
22	0.001	1.142	0.125	n/a
23	0.011	7.704	0.147	PASS
24	0.001	1.297	0.115	n/a
25	0.011	7.875	0.135	PASS
26	0.001	1.330	0.106	n/a
27	0.010	7.963	0.125	PASS
28	0.001	1.382	0.099	n/a
29	0.009	7.882	0.116	PASS
30	0.001	1.372	0.092	n/a
31	0.008	7.740	0.109	PASS
32	0.001	1.381	0.086	n/a
33	0.008	7.703	0.102	PASS
34	0.001	1.560	0.081	n/a
35	0.007	7.135	0.096	PASS
36	0.001	1.395	0.077	n/a
37	0.006	6.880	0.091	PASS
38	0.001	1.445	0.073	n/a
39	0.006	6.579	0.087	PASS
40	0.001	1.496	0.069	n/a

Note: 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.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.

**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-EM-23T0300
Page (53) of (75)

Test Data - Voltage Fluctuations

Maximum Flicker results

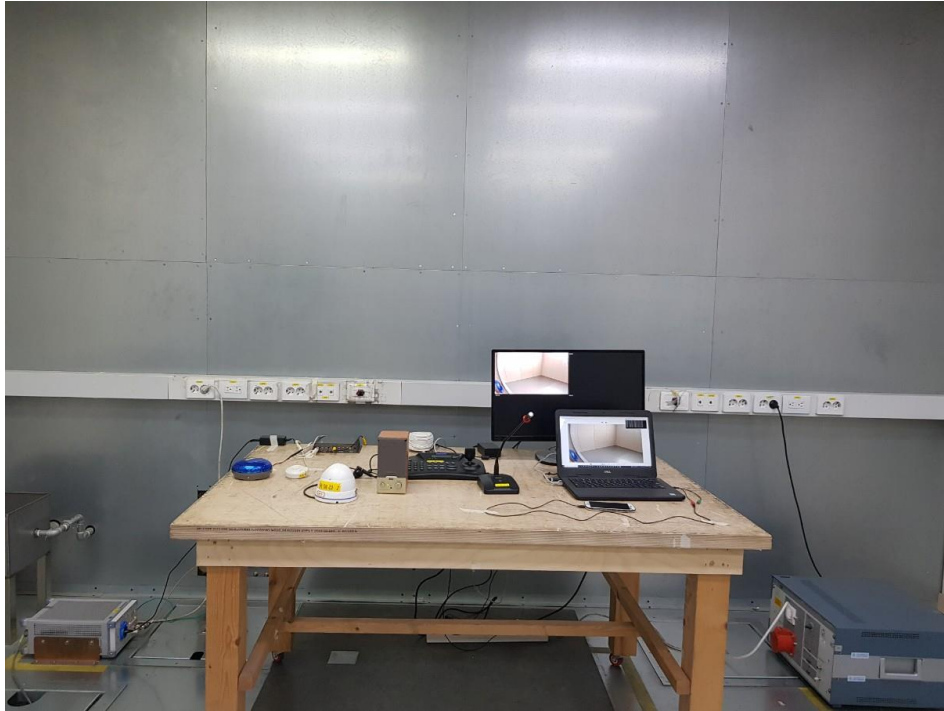
Flicker Measurements					
	Plt	Max Pst	Max Dc	Max Dmax	Max Tmax
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

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 Emissions at Mains Power Ports

■ DC 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

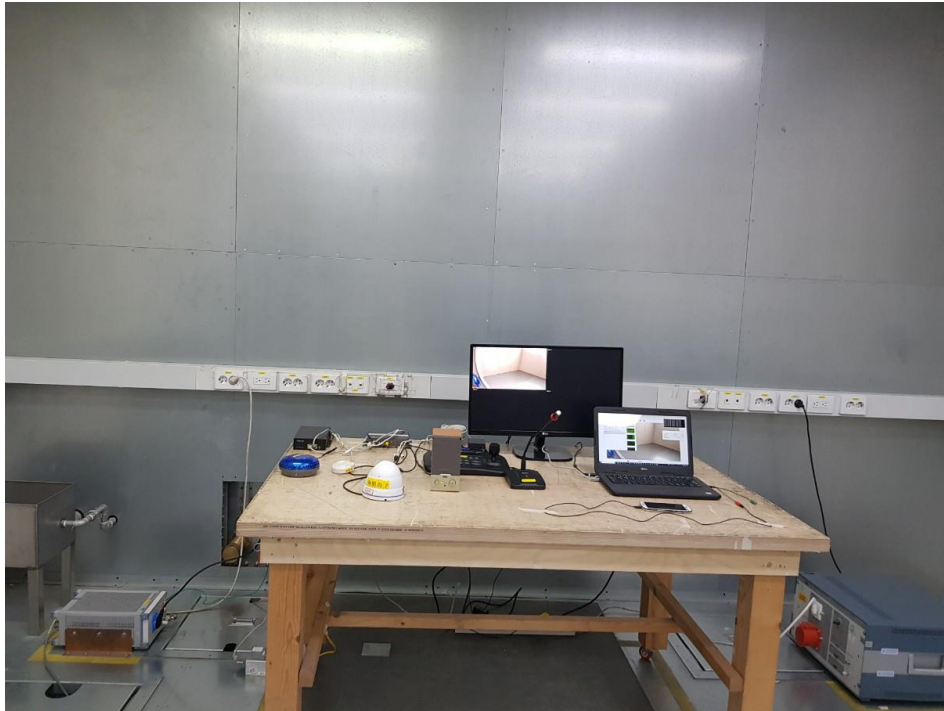
Conducted Emissions at Telecommunication Ports

■ DC 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

■ PoE Mode





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-EM-23T0300
Page (57) of (75)

Impulse Noise (click)

N/A

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)

■ DC Mode

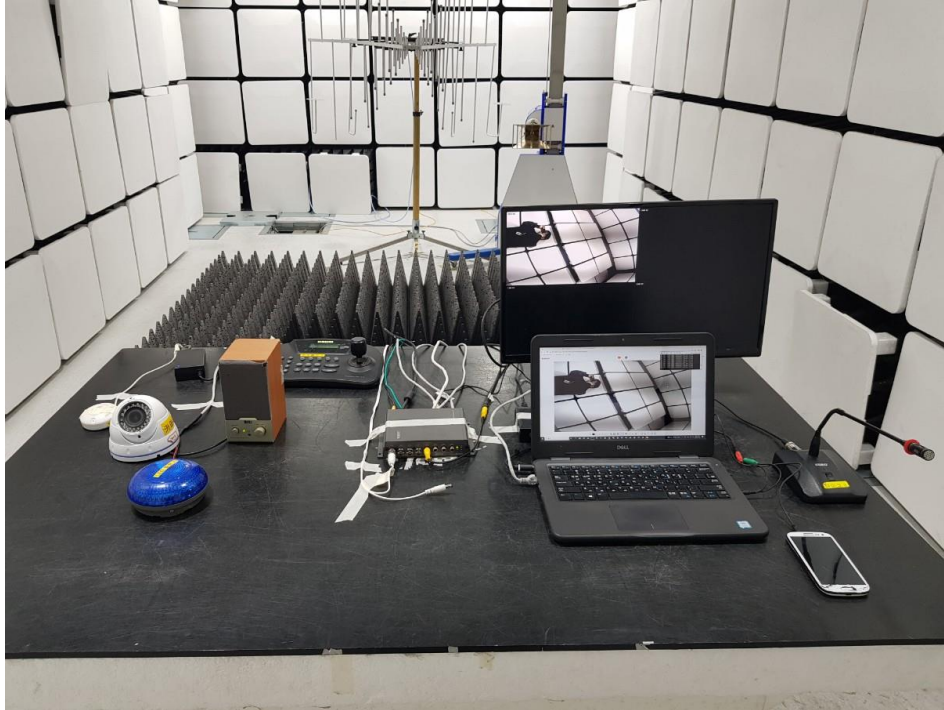


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode

Radiated Electric Field Emissions(Above 1 GHz)

■ DC 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

■ PoE Mode



Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode

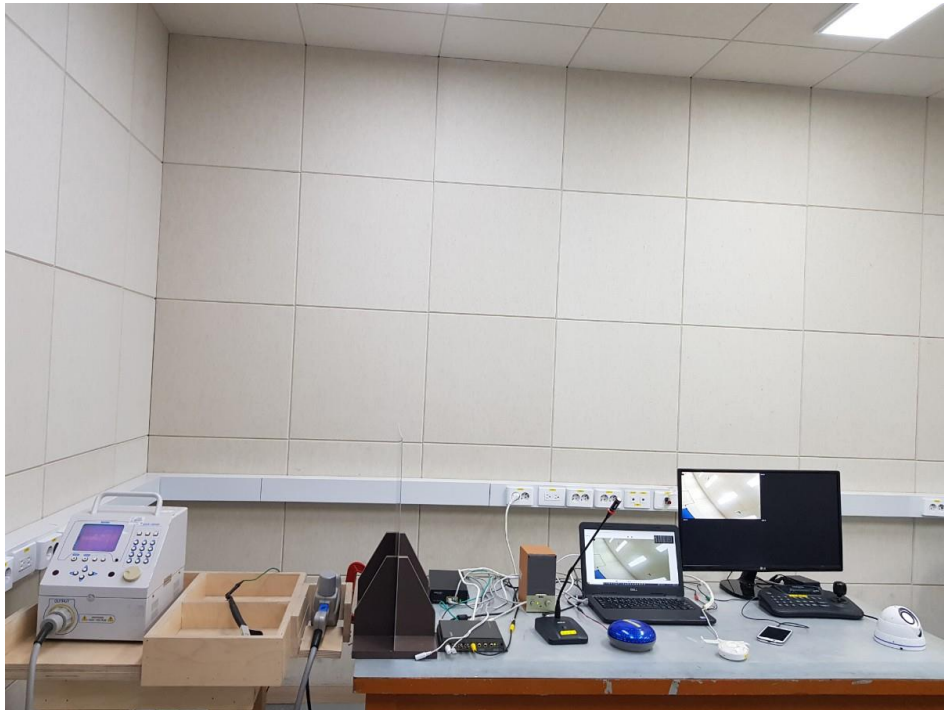


Electrostatic Discharge

■ DC Mode



■ PoE Mode



Radio-frequency Electromagnetic Field

■ DC Mode



■ PoE Mode



Fast Transients

■ DC Mode



■ PoE Mode



Surges

■ DC Mode



■ PoE Mode



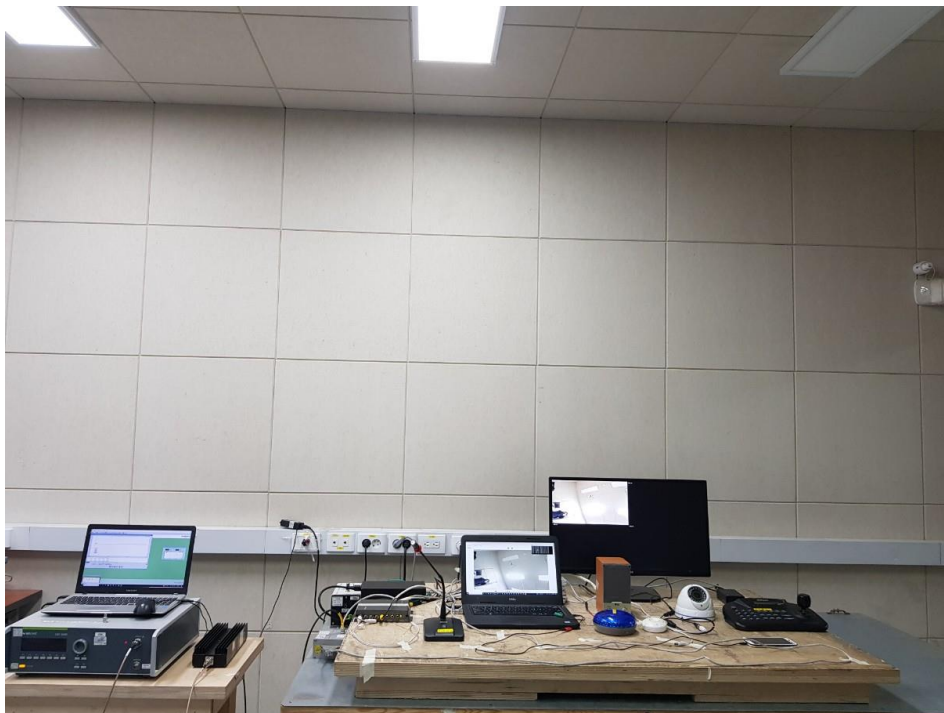
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Conducted Disturbance

■ DC Mode



■ PoE 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

Power Frequency Magnetic Field Immunity

■ DC Mode

[16.7 Hz (AC), 100 A/m]



[50 Hz (AC), 100 A/m]



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

[0 Hz (DC), 300 A/m]



■ PoE Mode

[16.7 Hz (AC), 100 A/m]



[50 Hz (AC), 100 A/m]



[0 Hz (DC), 300 A/m]



EUT Photographs

(Top)



(Bottom)



EUT Internal Layout Photographs

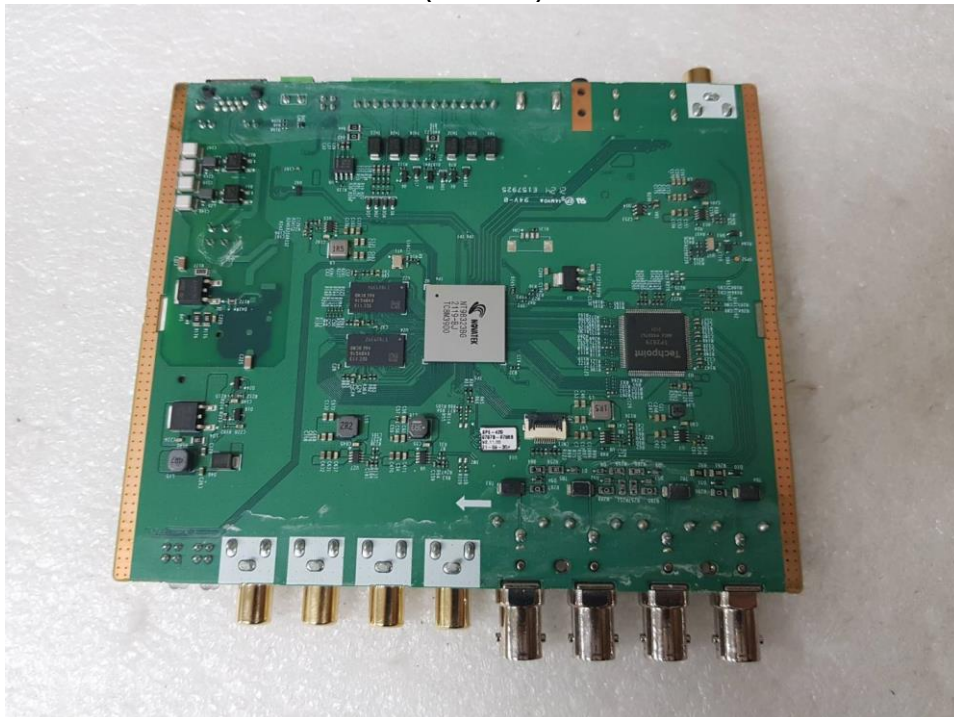


EUT Internal View – Main Board

(Top)

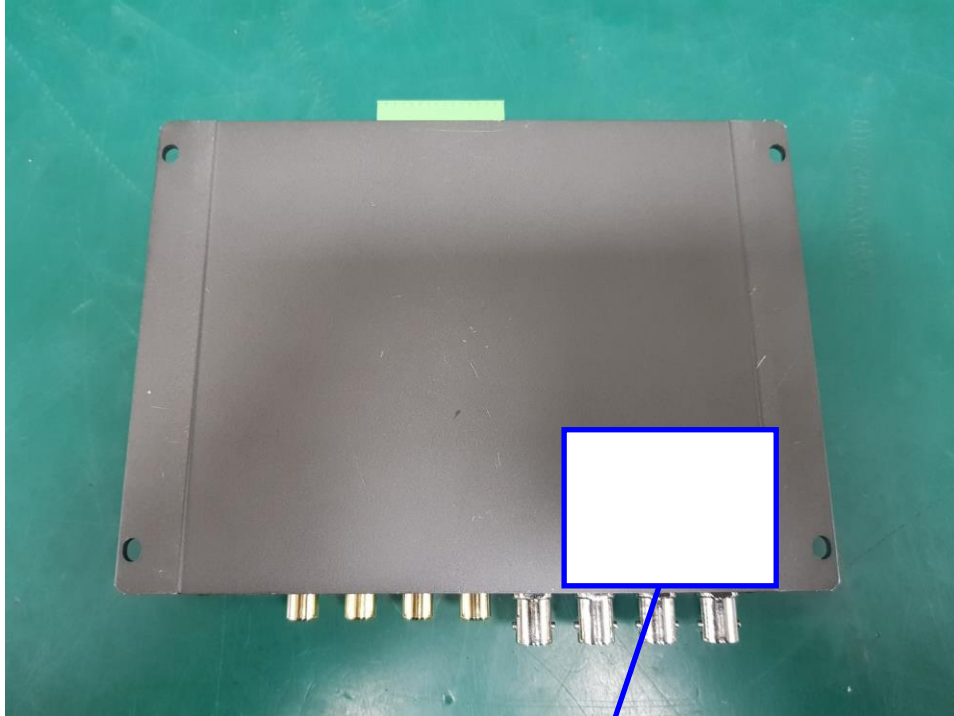


(Bottom)



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

Label and Location



NETWORK VIDEO ENCODER

Model No : SPE-420

Manufacturer : HANWHA VISION VIETNAM COMPANY LIMITED

Made in Vietnam

