



EMC TEST REPORT

Test Report No. : KES-EM-21T0732-R1
Date of Issue : Feb. 24, 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)
Equipment authorization : **Supplier's Declaration of Conformity**
Date of Receipt : Jul. 21, 2021
Test date : Aug. 04, 2021 ~ Aug. 05, 2021
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Tae Yeon, Kim
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

Tested by Ki Man, Kim
(Retired person)
Proxy signature : Tae Yeon, Kim

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

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



REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Aug. 24, 2021	KES-EM-21T0732	Issued
Feb. 24, 2023	KES-EM-21T0732-R1	Change the Applicant and manufacturer at the request of the customer.

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



TABLE OF CONTENTS

1.0	General Product Description.....	4
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	Support Equipments	7
1.6	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	15
2.2	Radiated Electric Field Emissions(Below 1 GHz)	16
2.3	Radiated Electric Field Emissions(Above 1 GHz)	17
APPENDIX A – TEST DATA.....		18
Conducted Emissions at Mains Power Ports.....		18
Radiated Electric Field Emissions(Below 1 GHz)		22
Radiated Electric Field Emissions(Above 1 GHz)		26
Test Setup Photos and Configuration		28
Conducted Emissions at Mains Power Ports.....		28
Radiated Electric Field Emissions(Below 1 GHz)		30
Radiated Electric Field Emissions(Above 1 GHz)		32
EUT External Photographs		34
EUT Internal Photographs		35



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-21T0732-R1

Page (4) of (37)

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
Video Quality Adjustment	-
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 & Recorder	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)
Video	
Input Channel	4CH BNC, 1.0 Vp-p / 75Ω composite NTSC/PAL

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-21T0732-R1

Page (5) of (37)

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 10/100/1000 Base-T
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
Video Quality Adjustment	-
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 & Recorder	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)
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

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 120 V, 60 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 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Adaptor	2ACB022F	-	Channel Well Technology (Guangzhou) Co., Ltd.	-
CAMERA	SCD-6083RN	-	HANWHA VISION VIETNAM COMPANY LIMITED	-
CAMERA Adaptor	JH10099-15001	-	KOREA Power	-
Monitor	SMT-2232	C95V67VF900025B	Weihai Daewoo Electronics Co., Ltd.	-
PoE Adaptor	PSE156G 4-Pair,Hi-Power	-	-	-
Notebook	P95G001	8KM8HT2	DELL	-
Notebook Adaptor	LA65NS2-01	-	LITE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	-
Video distributor	-	-	HANWHA VISION VIETNAM COMPANY LIMITED	-
Video distributor Adaptor	2ACB022F	-	Channel Well Technology (Guangzhou) Co., Ltd.	-
Alarm1	-	-	-	-
Alarm2	-	-	-	-
Speaker	BR10000A CUVE	-	BEIJING EDIFIER HI-TECH GROUP.	-
MIC1	CMK-303	-	CAMAC	-
MIC2	MP1000	-	-	-
MIC3	MP1000	-	-	-
MIC4	MP1000	-	-	-
Controller	SPC-1010	C50E67WG10100F	SamSung Techwin Co.,Ltd.	-
Controller Adaptor	RS-AB1000	-	Dongguan Jinhuaasheng Power Technology Co.,Ltd.	-

1.6 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)	3.0	U
	HDMI	Monitor	HDMI	1.6	S
	RCA	MIC1	RCA	1.6	U
	RCA	MIC2	RCA	1.7	U
	RCA	MIC3	RCA	1.7	U
	RCA	MIC4	RCA	1.7	U
	RCA	Speaker	RCA	1.6	U
	2 Pin	Alarm1	2 Pin	3.0	U
	2 Pin	Alarm2	2 Pin	3.0	U
	RS-485	Controller	RS-485	3.0	U
	2 Pin	Adaptor	2 Pin	1.6	U
	BNC	Video distributor	BNC	0.5	S
	BNC		BNC	0.5	S
	BNC		BNC	0.5	S
	BNC		BNC	0.5	S
Video distributor	BNC	CAMERA	BNC	3.0	S
	2 Pin	Video distributor Adaptor	2 Pin	1.6	U
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

* 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)	3.0	U
	HDMI	Monitor	HDMI	1.6	S
	RCA	MIC1	RCA	1.6	U
	RCA	MIC2	RCA	1.7	U
	RCA	MIC3	RCA	1.7	U
	RCA	MIC4	RCA	1.7	U
	RCA	Speaker	RCA	1.6	U
	2 Pin	Alarm1	2 Pin	3.0	U
	2 Pin	Alarm2	2 Pin	3.0	U
	RS-485	Controller	RS-485	3.0	U
	BNC	Video distributor	BNC	0.5	S
	BNC		BNC	0.5	S
	BNC		BNC	0.5	S
	BNC		BNC	0.5	S
Video distributor	BNC	CAMERA	BNC	3.0	S
	2 Pin	Video distributor Adaptor	2 Pin	1.6	U
CAMERA	2 Pin	CAMERA Adaptor	2 Pin	1.6	U
Controller	DC Jack	Controller Adaptor	DC Jack	1.5	U
Notebook	RJ-45 (LAN)	PoE Adaptor	RJ-45 (LAN)	3.0	U
	DC Jack	Notebook Adaptor	DC Jack	1.7	U

* Unshielded=U, Shielded=S

**KES Co., Ltd.**

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

Report No.:

KES-EM-21T0732-R1

Page (10) of (37)

1.7 EUT Operating Mode(s)

Test Mode	operating
DC Mode	EUT Monitoring, Ping Test
PoE Mode	

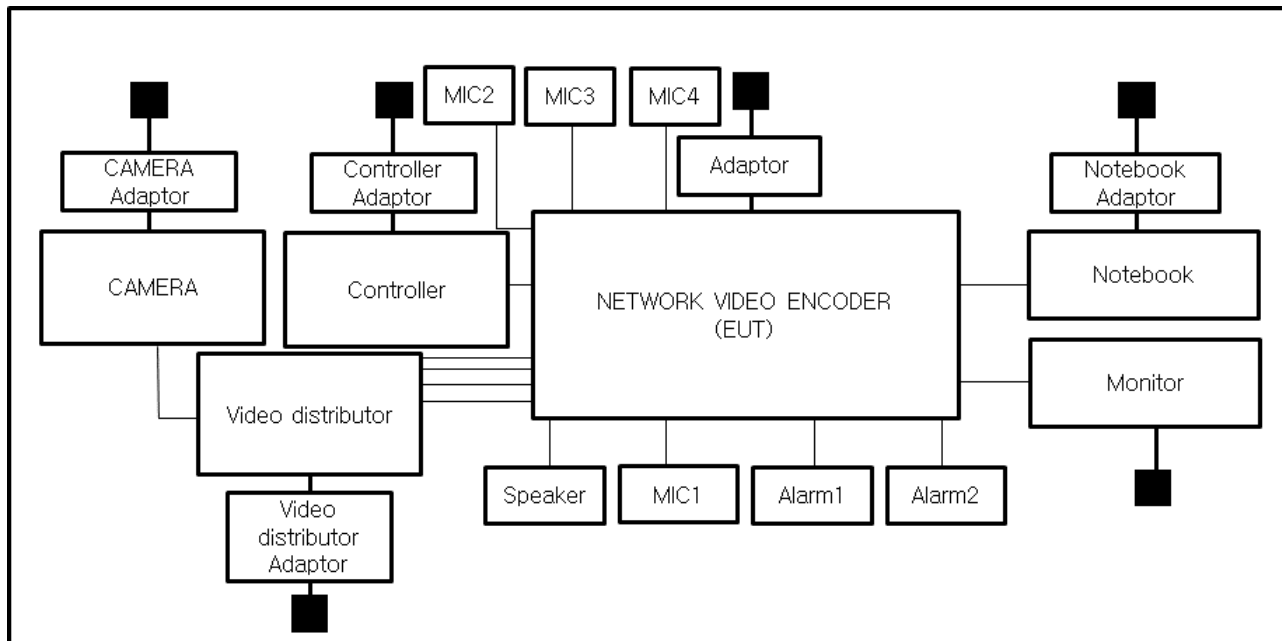
EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Vision Co., Ltd

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

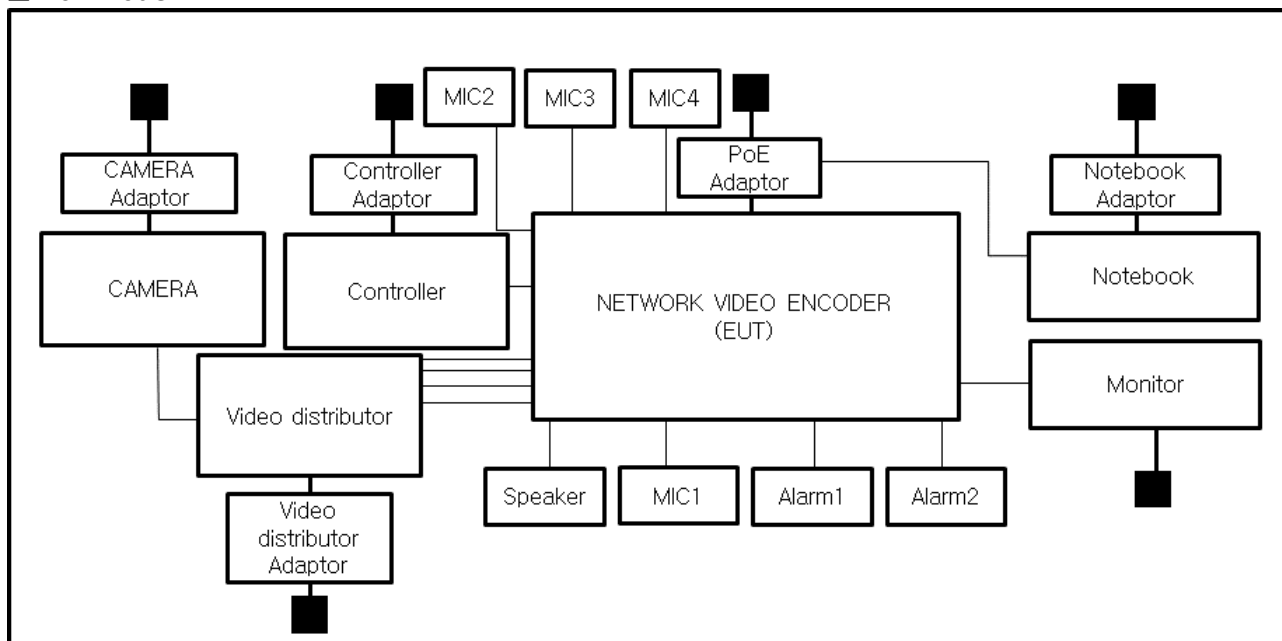
1.8 Configuration

■ AC Main
 □ DC Main

■ DC Mode



■ PoE Mode



1.9 Remarks when standards applied

N/A

1.10 Calibration Details of Equipment Used for Measurement

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

1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, 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 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 55032:2015

☐ Class A

☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013

-
- | | | |
|---|---|----------------------------------|
| ☐ 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 C63.4-2017 | ☒ Class A | ☐ Class B |
| ☒ IC Regulation ICES-003 Issue 7 | | |
| ☒ CAN/CSA CISPR 32-17 | ☒ Class A | ☐ Class B |
| ☐ ANSI C63.4-2017 | ☐ Class A | ☐ Class B |
| ☐ 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 | | |

2.1 Conducted Emissions at Mains Power Ports

Test Date

Aug. 04, 2021

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	01, 15, 2022
☒	LISN	ENV216	R & S	101787	12, 29, 2021
☒	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021

Test Conditions

Temperature: (24,9 ± 0,1) °C

Relative Humidity: (47,3 ± 0,2) % 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 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Aug. 05, 2021

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, 01, 2022
☒	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2021
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
☒	ATTENUATOR	8491A	HP	32173	03, 10, 2022

Test Conditions

Temperature: (24,8 ± 0,2) °C

Relative Humidity: (47,0 ± 0,2) % 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.

2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Aug. 05, 2021

Test Location

SEMI ANECHOIC CHAMBER #5

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.120	-
☒	EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	04, 01, 2022
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	12, 14, 2021
☒	PREAMPLIFIER	8449B	HP	3008A00538	06, 21, 2022

Test Conditions

Temperature: (24,5 ± 0,2) °C

Relative Humidity: (46,6 ± 0,3) % R.H.

Frequency Range of Measurement

1 GHz to 5 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

☒ PASS

☐ NOT PASS

☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

APPENDIX A – TEST DATA

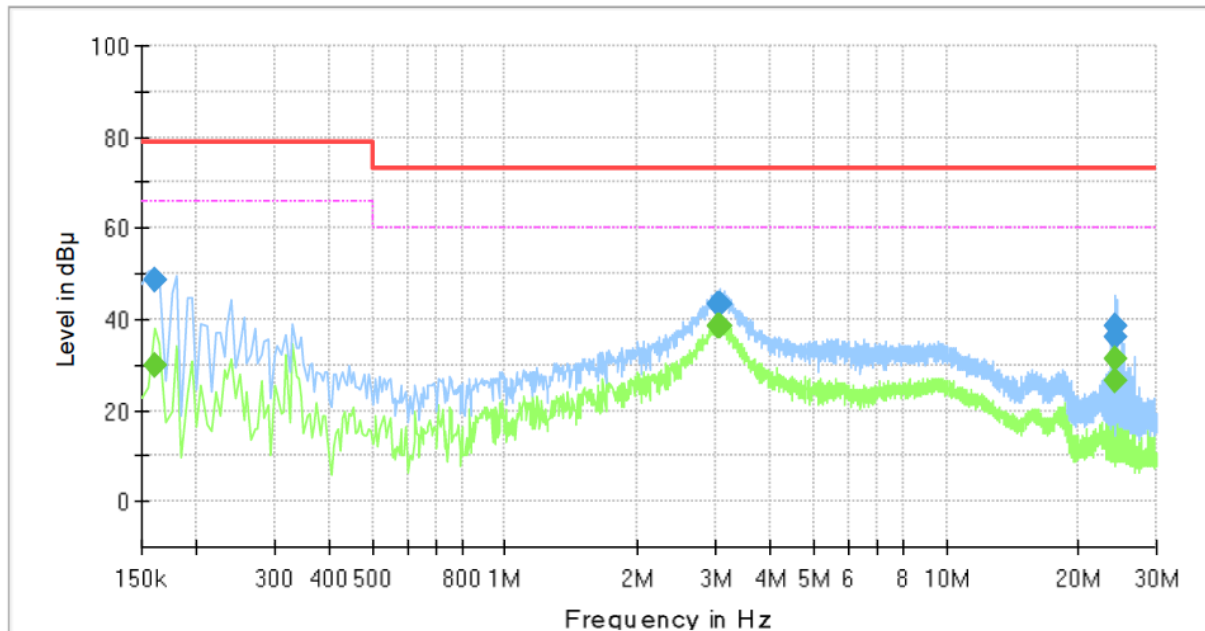
Conducted Emissions at Mains Power Ports

■ DC Mode

HOT LINE

Common Information

Test Description:	Conducted Emission
Model No.:	SPE-420
Phase:	L1
Mode:	DC
Operator Name:	KES



Final_Result

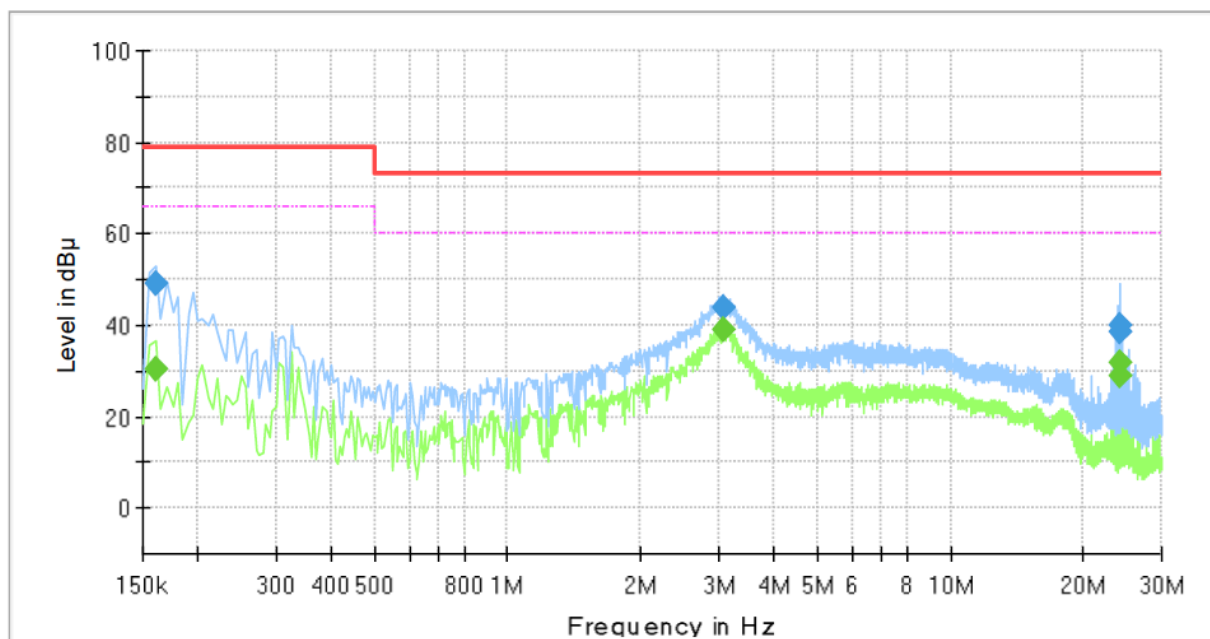
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	29.98	66.00	36.02	1000.0	9.000	L1	19.5
0.160000	48.75	---	79.00	30.25	1000.0	9.000	L1	19.5
3.030000	---	38.63	60.00	21.37	1000.0	9.000	L1	20.2
3.030000	43.37	---	73.00	29.63	1000.0	9.000	L1	20.2
3.080000	---	38.69	60.00	21.31	1000.0	9.000	L1	20.2
3.080000	43.51	---	73.00	29.49	1000.0	9.000	L1	20.2
24.115000	---	31.25	60.00	28.75	1000.0	9.000	L1	20.2
24.115000	38.36	---	73.00	34.64	1000.0	9.000	L1	20.2
24.120000	---	26.40	60.00	33.60	1000.0	9.000	L1	20.2
24.120000	36.21	---	73.00	36.79	1000.0	9.000	L1	20.2

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 LINE

Common Information

Test Description:	Conducted Emission
Model No.:	SPE-420
Phase:	N
Mode:	DC
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	---	30.22	66.00	35.78	1000.0	9.000	N	19.4
0.160000	48.96	---	79.00	30.04	1000.0	9.000	N	19.4
3.065000	---	38.79	60.00	21.21	1000.0	9.000	N	20.2
3.065000	43.69	---	73.00	29.31	1000.0	9.000	N	20.2
24.115000	---	31.62	60.00	28.38	1000.0	9.000	N	20.2
24.115000	38.53	---	73.00	34.47	1000.0	9.000	N	20.2
24.220000	---	29.04	60.00	30.96	1000.0	9.000	N	20.2
24.220000	39.98	---	73.00	33.02	1000.0	9.000	N	20.2

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
HOT LINE
Common Information

Test Description:

Model No.:

Phase:

Mode:

Operator Name:

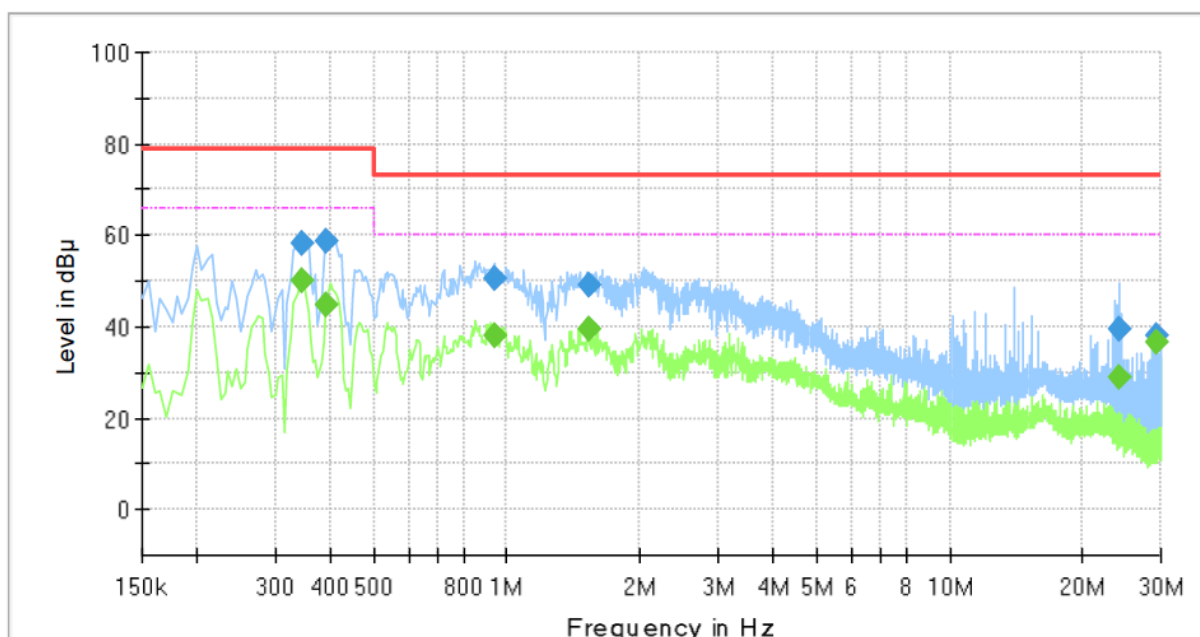
Conducted Emission

SPE-420

L1

PoE

KES


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.345000	---	49.98	66.00	16.02	1000.0	9.000	L1	19.6
0.345000	58.28	---	79.00	20.72	1000.0	9.000	L1	19.6
0.390000	---	44.75	66.00	21.25	1000.0	9.000	L1	19.6
0.390000	58.46	---	79.00	20.54	1000.0	9.000	L1	19.6
0.935000	---	38.06	60.00	21.94	1000.0	9.000	L1	20.1
0.935000	50.67	---	73.00	22.33	1000.0	9.000	L1	20.1
1.525000	---	39.69	60.00	20.31	1000.0	9.000	L1	20.2
1.525000	49.16	---	73.00	23.84	1000.0	9.000	L1	20.2
24.220000	---	28.82	60.00	31.18	1000.0	9.000	L1	20.2
24.220000	39.54	---	73.00	33.46	1000.0	9.000	L1	20.2
29.235000	---	36.80	60.00	23.20	1000.0	9.000	L1	20.4
29.235000	38.25	---	73.00	34.75	1000.0	9.000	L1	20.4

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

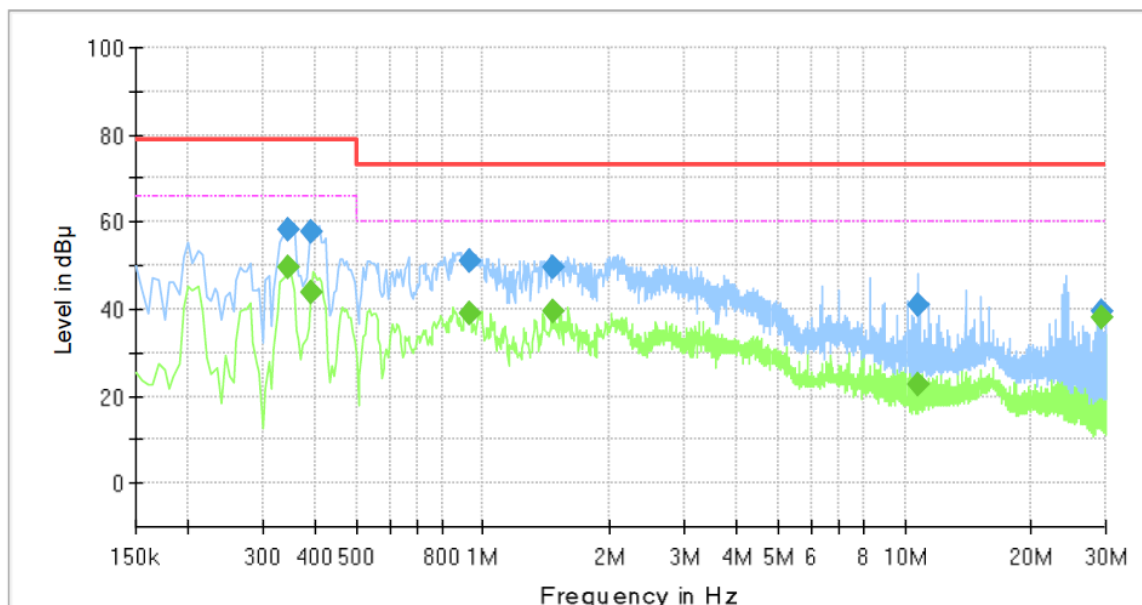
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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

NEUTRAL LINE

Common Information

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



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.345000	---	49.69	66.00	16.31	1000.0	9.000	N	19.6
0.345000	58.15	---	79.00	20.85	1000.0	9.000	N	19.6
0.390000	---	43.96	66.00	22.04	1000.0	9.000	N	19.6
0.390000	57.66	---	79.00	21.34	1000.0	9.000	N	19.6
0.930000	---	39.10	60.00	20.90	1000.0	9.000	N	20.1
0.930000	50.98	---	73.00	22.02	1000.0	9.000	N	20.1
1.460000	---	39.65	60.00	20.35	1000.0	9.000	N	20.2
1.460000	49.55	---	73.00	23.45	1000.0	9.000	N	20.2
10.800000	---	22.62	60.00	37.38	1000.0	9.000	N	20.0
10.800000	40.75	---	73.00	32.25	1000.0	9.000	N	20.0
29.235000	---	37.80	60.00	22.20	1000.0	9.000	N	20.4
29.235000	39.29	---	73.00	33.71	1000.0	9.000	N	20.4

◆ Calculation

$$\text{QuasiPeak [dBuV]} / \text{CAverage [dBuV]} = \text{Reading Value [dBuV]} + \text{Corr. [dB]}$$

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.

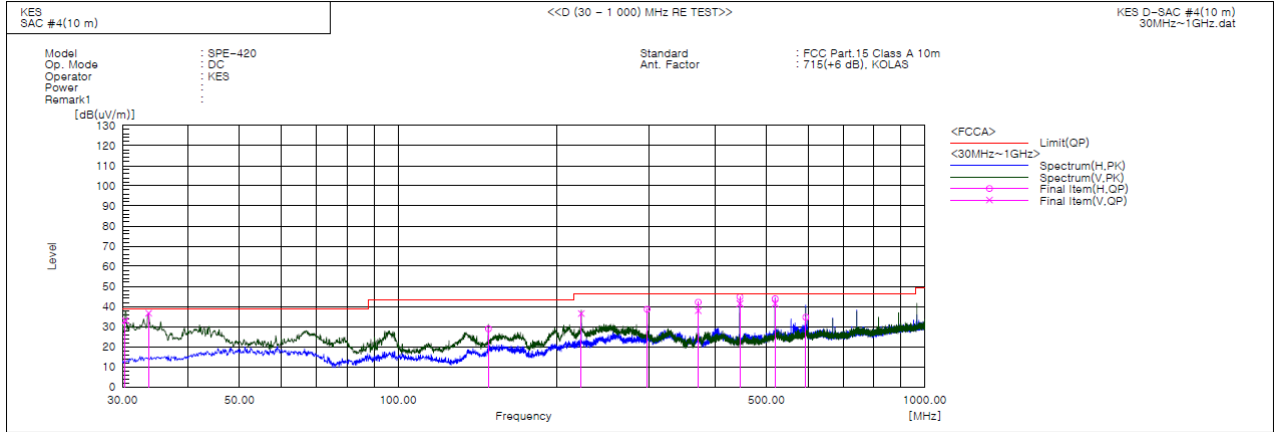
The authenticity of the test report, contact kes@kes.co.kr



Radiated Electric Field Emissions(Below 1 GHz)

- 47 CFR Part 15, Subpart B

■ DC Mode



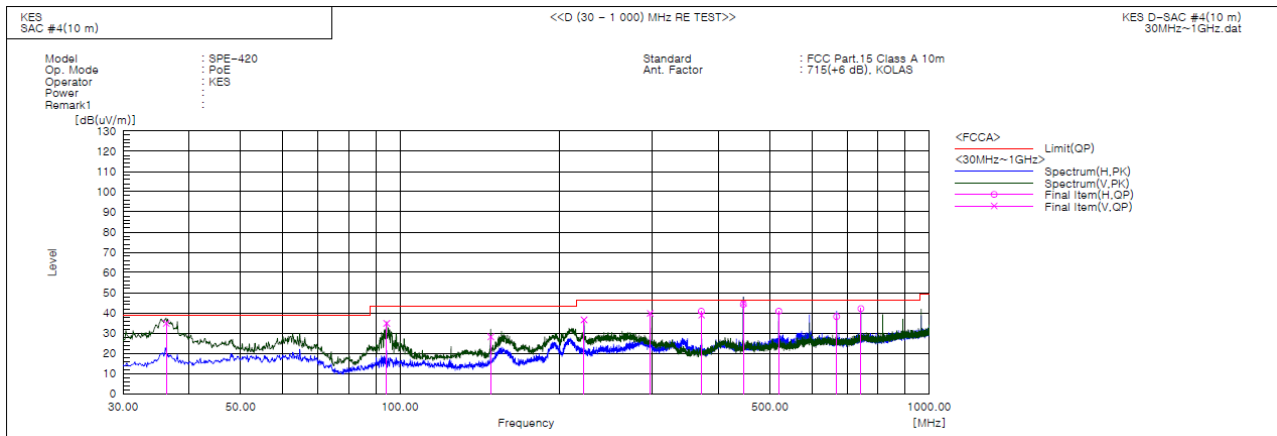
Final Result

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	30.364	V	58.3	-25.3	33.0	39.0	6.0	193.0	179.0	
2	33.638	V	61.5	-24.8	36.7	39.0	2.3	142.0	202.0	
3	148.461	H	54.0	-25.1	28.9	43.5	14.6	215.0	152.0	
4	222.666	V	56.6	-20.1	36.5	46.5	10.0	135.0	347.0	
5	296.993	H	56.6	-18.0	38.6	46.5	7.9	378.0	356.0	
6	371.198	V	52.9	-14.9	38.0	46.5	8.5	400.0	308.0	
7	371.319	H	57.0	-14.9	42.1	46.5	4.4	216.0	211.0	
8	445.503	H	58.0	-13.2	44.8	46.5	1.7	200.0	105.0	
9	445.524	V	54.7	-13.2	41.5	46.5	5.0	142.0	104.0	
10	519.707	V	52.6	-11.1	41.5	46.5	5.0	142.0	209.0	
11	519.729	H	55.0	-11.1	43.9	46.5	2.6	268.0	113.0	
12	594.055	H	43.2	-8.5	34.7	46.5	11.8	317.0	342.0	

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



PoE Mode



Final Result

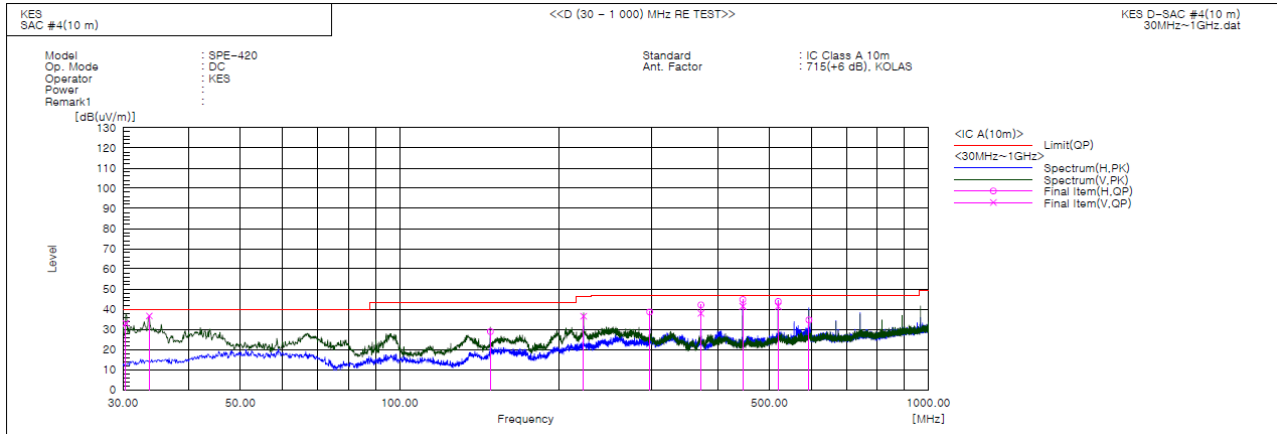
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	36.184	V	59.3	-24.5	34.8	39.0	4.2	167.0	216.0	
2	94.384	V	58.4	-23.6	34.8	43.5	8.7	256.0	298.0	
3	148.461	V	53.2	-25.1	28.1	43.5	15.4	216.0	164.0	
4	222.666	V	56.7	-20.1	36.6	46.5	9.9	332.0	178.0	
5	296.993	V	57.8	-18.0	39.8	46.5	6.7	400.0	231.0	
6	371.121	H	55.7	-14.9	40.8	46.5	5.7	316.0	53.0	
7	371.198	V	53.8	-14.9	38.9	46.5	7.6	226.0	354.0	
8	445.409	V	58.1	-13.2	44.9	46.5	1.6	112.0	186.0	
9	445.524	H	57.4	-13.2	44.2	46.5	2.3	156.0	2.0	
10	519.729	H	51.9	-11.1	40.8	46.5	5.7	189.0	316.0	
11	668.260	H	45.9	-7.7	38.2	46.5	8.3	221.0	187.0	
12	742.465	H	47.9	-5.8	42.1	46.5	4.4	199.0	75.0	

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



- IC Regulation ICES-003 Issue 7

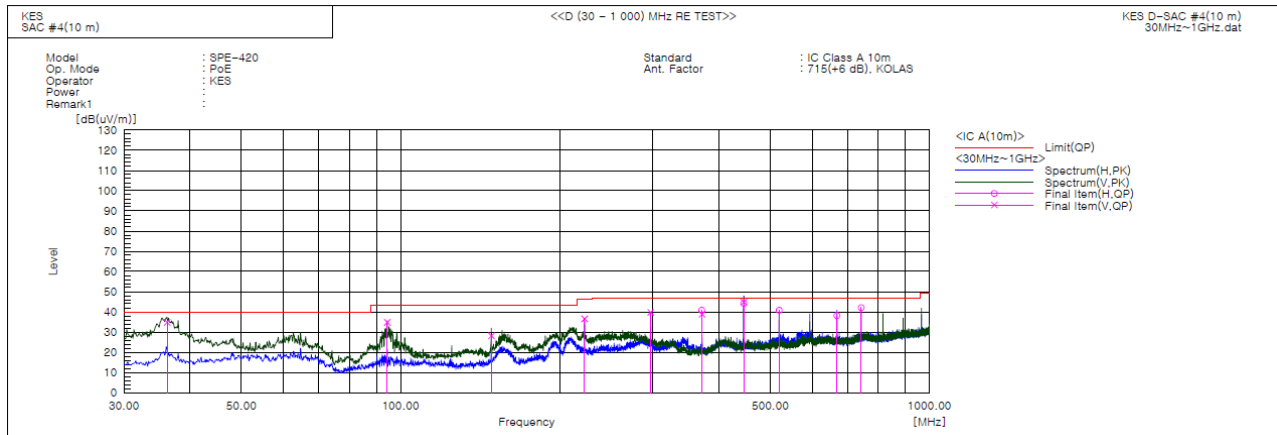
■ DC Mode



Final Result

No.	Frequency	(P)	Reading	c.f	Result	Limit	Margin	Height	Angle	Remark
	[MHz]		QP		QP	QP	QP			
			[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]	
1	30.364	V	58.3	-25.3	33.0	40.0	7.0	193.0	179.0	
2	33.638	V	61.5	-24.8	36.7	40.0	3.3	142.0	202.0	
3	148.461	H	54.0	-25.1	28.9	43.5	14.6	215.0	152.0	
4	222.666	V	56.6	-20.1	36.5	46.4	9.9	135.0	347.0	
5	296.993	H	56.6	-18.0	38.6	47.0	8.4	378.0	356.0	
6	371.198	V	52.9	-14.9	38.0	47.0	9.0	400.0	308.0	
7	371.319	H	57.0	-14.9	42.1	47.0	4.9	216.0	211.0	
8	445.503	H	58.0	-13.2	44.8	47.0	2.2	200.0	105.0	
9	445.524	V	54.7	-13.2	41.5	47.0	5.5	142.0	104.0	
10	519.707	V	52.6	-11.1	41.5	47.0	5.5	142.0	209.0	
11	519.729	H	55.0	-11.1	43.9	47.0	3.1	268.0	113.0	
12	594.055	H	43.2	-8.5	34.7	47.0	12.3	317.0	342.0	

■ 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	36.184	V	59.3	-24.5	34.8	40.0	5.2	167.0	216.0	
2	94.384	V	58.4	-23.6	34.8	43.5	8.7	256.0	298.0	
3	148.461	V	53.2	-25.1	28.1	43.5	15.4	216.0	164.0	
4	222.666	V	56.7	-20.1	36.6	46.4	9.8	332.0	178.0	
5	296.993	V	57.8	-18.0	39.8	47.0	7.2	400.0	231.0	
6	371.121	H	55.7	-14.9	40.8	47.0	6.2	316.0	53.0	
7	371.198	V	53.8	-14.9	38.9	47.0	8.1	226.0	354.0	
8	445.409	V	58.1	-13.2	44.9	47.0	2.1	112.0	186.0	
9	445.524	H	57.4	-13.2	44.2	47.0	2.8	156.0	2.0	
10	519.729	H	51.9	-11.1	40.8	47.0	6.2	189.0	316.0	
11	668.260	H	45.9	-7.7	38.2	47.0	8.8	221.0	187.0	
12	742.465	H	47.9	-5.8	42.1	47.0	4.9	199.0	75.0	

◆ 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



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

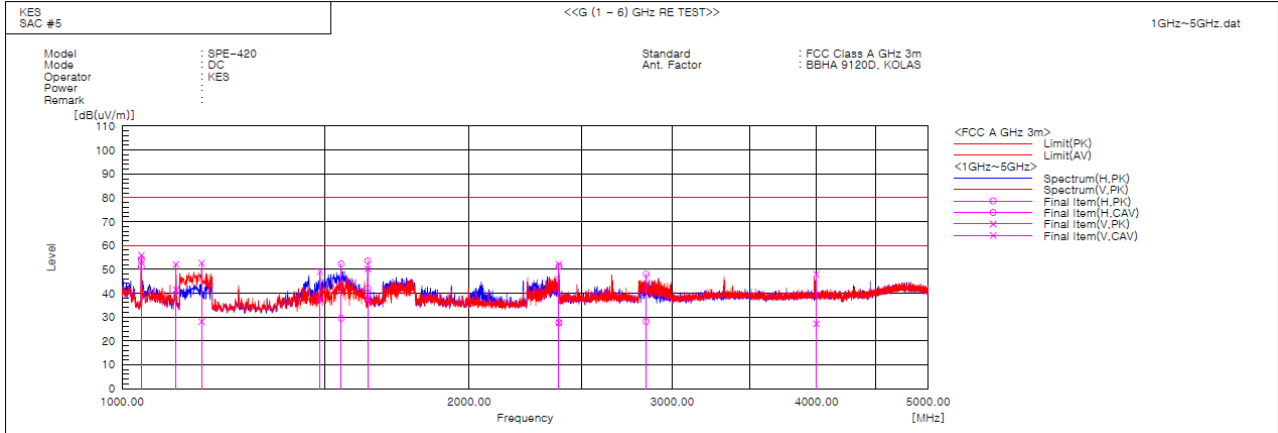
Report No.:

KES-EM-21T0732-R1

Page (26) of (37)

Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode



Final Result

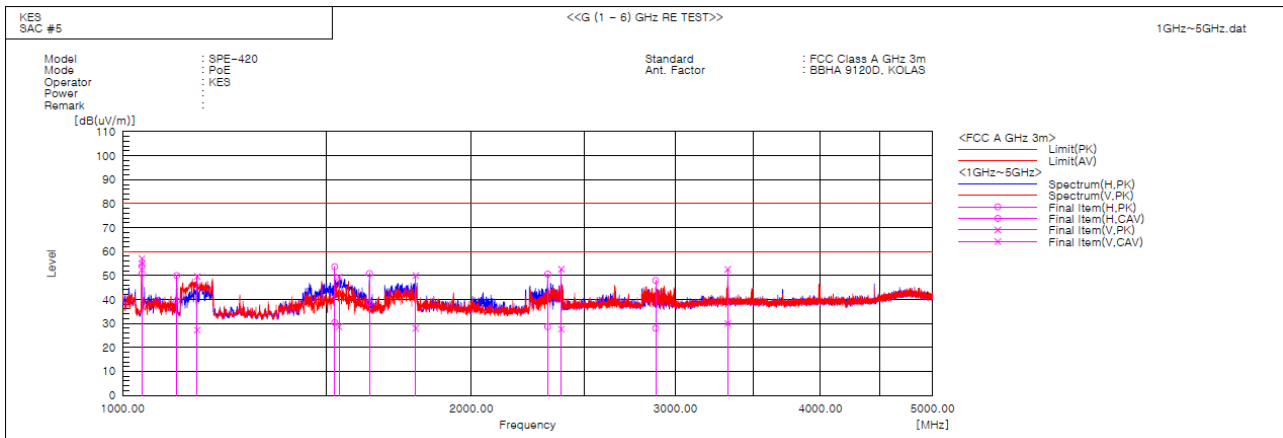
No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1039.375	V	63.6	61.5	-7.7	55.9	53.8	80.0	60.0	24.1	6.2	152.0	186.2	
2	1039.375	H	61.8	58.8	-7.7	54.1	51.1	80.0	60.0	25.9	8.9	211.0	319.8	
3	1113.750	V	59.4	48.8	-7.3	52.1	41.5	80.0	60.0	27.9	18.5	316.0	348.1	
4	1171.875	V	59.7	35.1	-7.0	52.7	28.1	80.0	60.0	27.3	31.9	356.0	19.2	
5	1484.375	V	54.4	42.8	-5.4	49.0	37.4	80.0	60.0	31.0	22.6	100.0	2.7	
6	1549.375	H	57.4	34.6	-5.1	52.3	29.5	80.0	60.0	27.7	30.5	163.0	357.8	
7	1633.125	V	55.0	42.3	-4.8	50.2	37.5	80.0	60.0	29.8	22.5	271.0	1.9	
8	1633.125	H	58.3	46.8	-4.8	53.5	42.0	80.0	60.0	26.5	18.0	400.0	343.3	
9	2391.875	V	54.3	29.8	-2.1	52.2	27.7	80.0	60.0	27.8	32.3	315.0	24.5	
10	2391.875	H	53.4	29.8	-2.1	51.3	27.7	80.0	60.0	28.7	32.3	378.0	10.1	
11	2846.875	H	48.1	28.3	-0.1	48.0	28.2	80.0	60.0	32.0	31.8	108.0	51.3	
12	3998.625	V	45.8	25.1	2.1	47.9	27.2	80.0	60.0	32.1	32.8	161.0	241.3	

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



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	1039.375	V	64.8	62.7	-7.7	57.1	55.0	80.0	60.0	22.9	5.0	214.0	185.3	
2	1039.375	H	61.6	58.5	-7.7	53.9	50.8	80.0	60.0	26.1	9.2	108.0	318.5	
3	1113.750	H	57.3	46.8	-7.3	50.0	39.5	80.0	60.0	30.0	20.5	400.0	142.7	
4	1160.000	V	56.7	34.4	-7.1	49.6	27.3	80.0	60.0	30.4	32.7	315.0	3.5	
5	1524.375	H	59.0	35.7	-5.3	53.7	30.4	80.0	60.0	26.3	29.6	254.0	17.7	
6	1536.875	V	54.6	33.8	-5.2	49.4	28.6	80.0	60.0	30.6	31.4	311.0	45.8	
7	1633.125	H	55.6	43.5	-4.8	50.8	38.7	80.0	60.0	29.2	21.3	112.0	354.1	
8	1790.000	V	54.1	32.1	-4.1	50.0	28.0	80.0	60.0	30.0	32.0	178.0	18.1	
9	2327.500	H	52.9	30.9	-2.3	50.6	28.6	80.0	60.0	29.4	31.4	257.0	50.9	
10	2391.250	V	54.8	29.8	-2.1	52.7	27.7	80.0	60.0	27.3	32.3	400.0	23.4	
11	2884.375	H	48.0	28.0	0.0	48.0	28.0	80.0	60.0	32.0	32.0	100.0	52.2	
12	3328.125	V	51.9	29.3	0.7	52.6	30.0	80.0	60.0	27.4	30.0	211.0	193.0	

Calculation

Result(PK/CAV) [dB(uV/m)] = (Reading(PK/CAV)[dB(uV)] + c.f[dB(1/m)]

Margin(PK/CAV)[dB] = Limit[dB(uV/m)] - Result(PK/CAV) [dB(uV/m)]

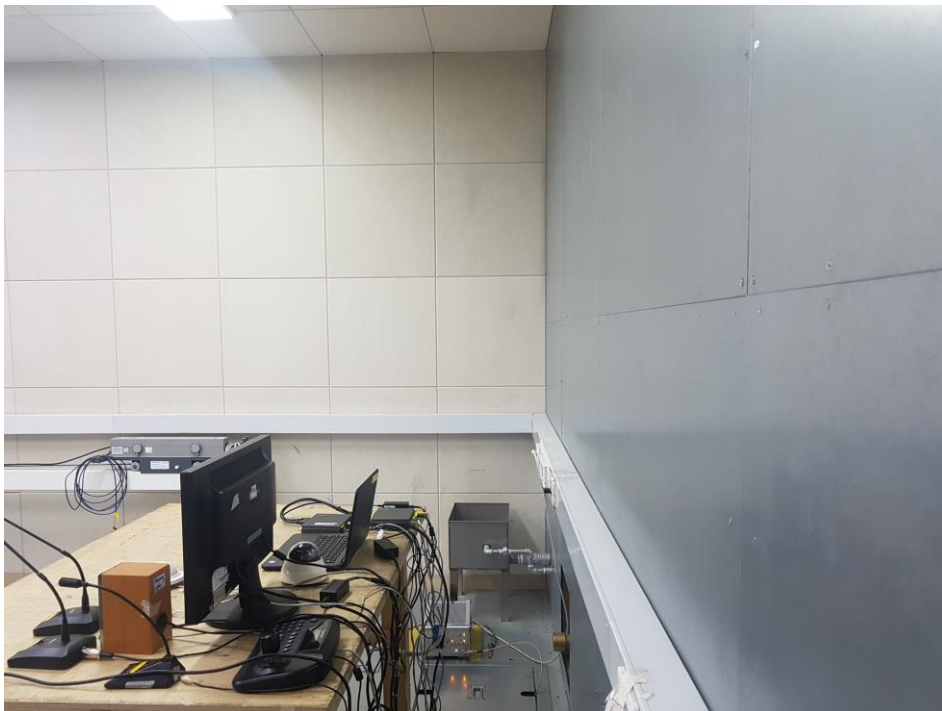
Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ DC Mode



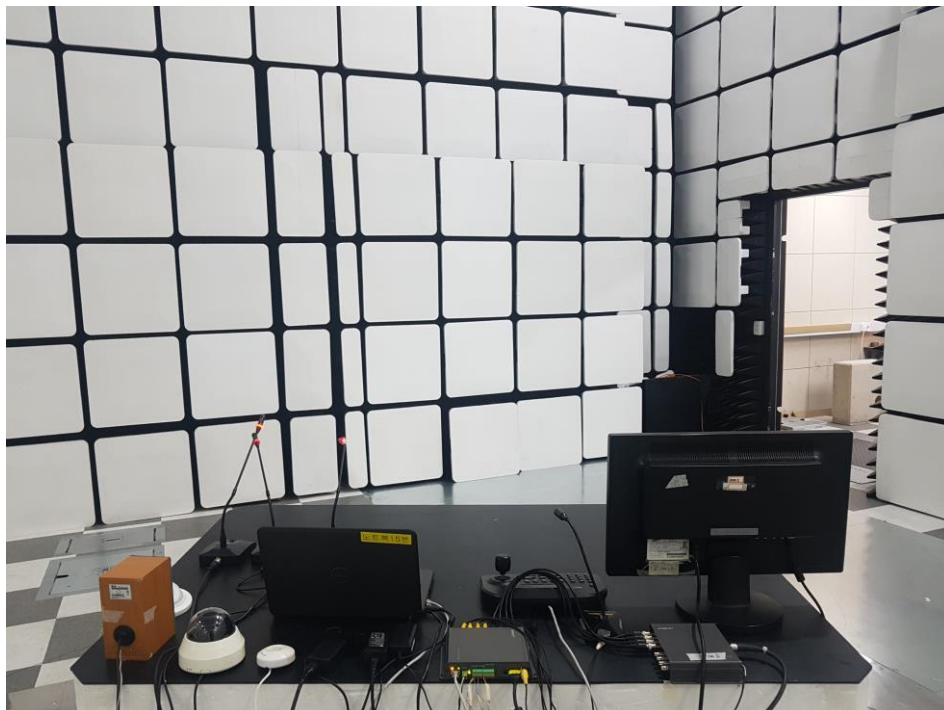
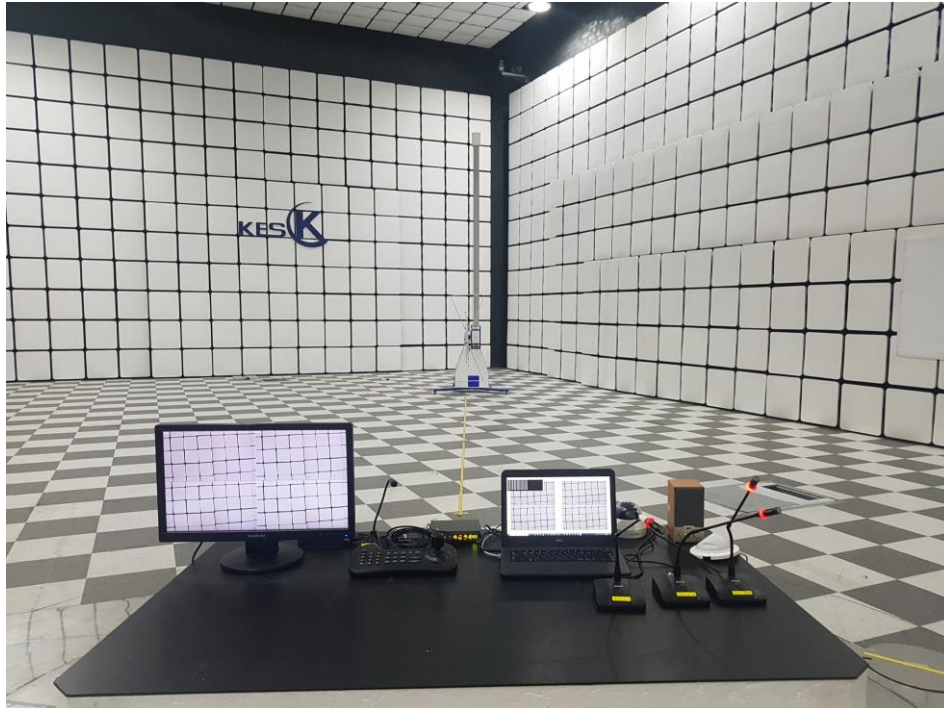
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode

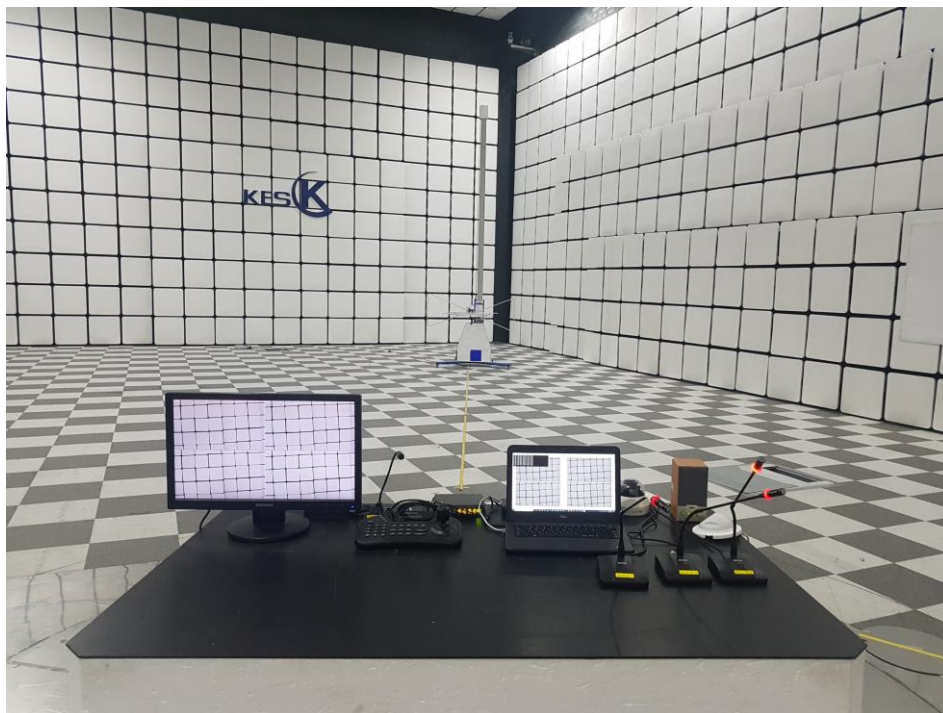
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



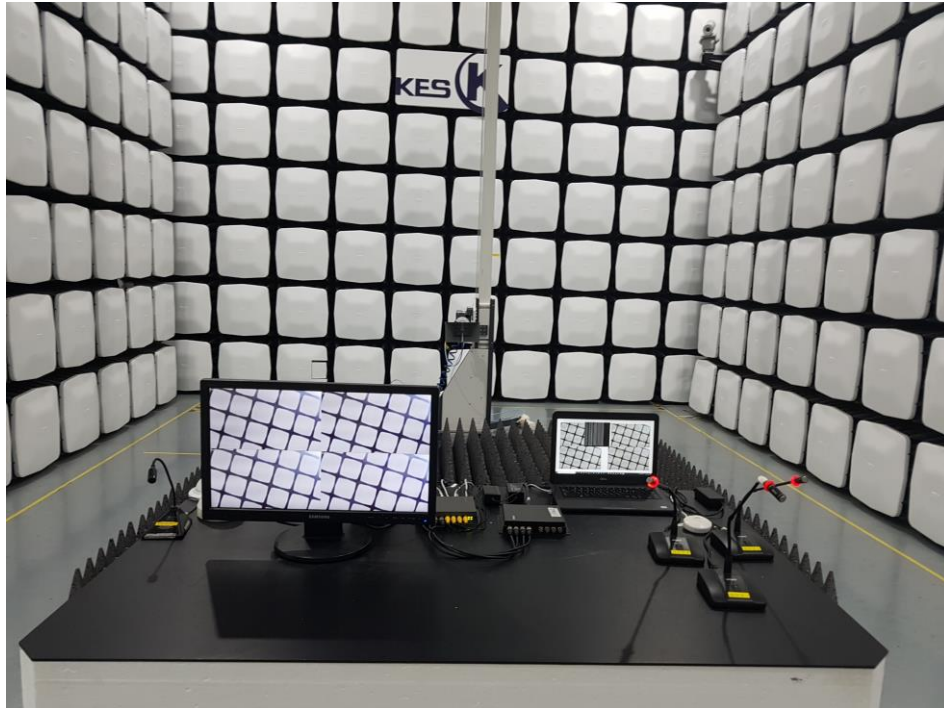
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode

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

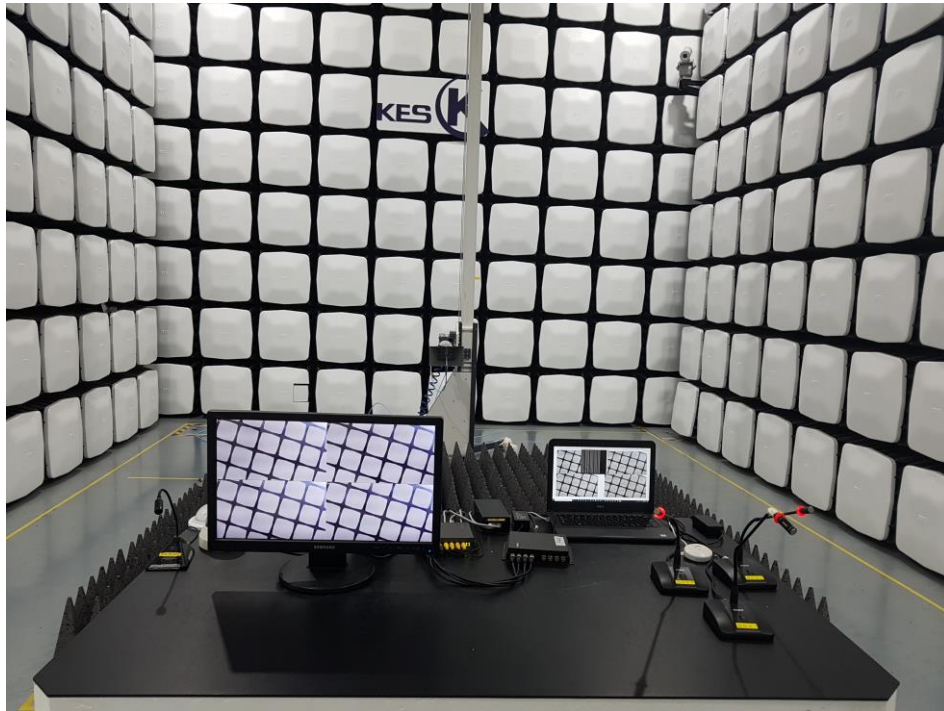
Radiated Electric Field Emissions(Above 1 GHz)

■ 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



EUT External Photographs

(Top)



(Bottom)



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

EUT Internal Photographs

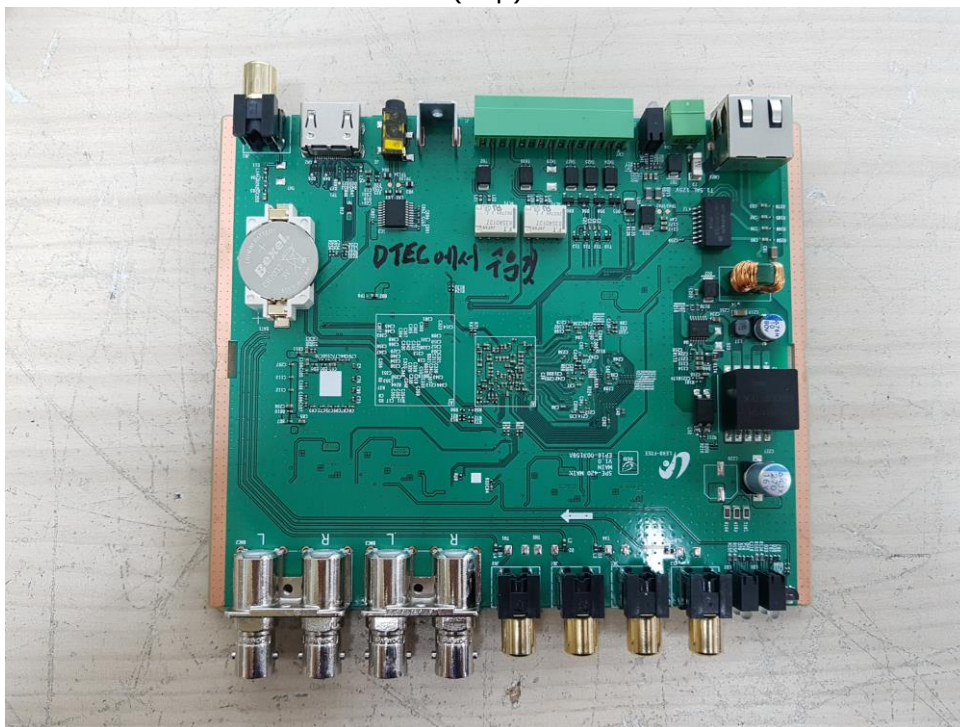
(Internal View)



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

EUT Internal View – Board

(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 Photographs



CAN ICES-3(A) / NMB-3(A)

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

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.