



EMC TEST REPORT

Test Report No. : KES-EM-21T1081-R2
Date of Issue : Feb. 24, 2023
Product name : AUDIO SERVER
Model/Type No. : SPA-S1000
Variant Model : -
Applicant : Hanwha Vision Co., Ltd
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : Inter-M Corporation
Manufacturer Address : 73, Hwahap-ro 1402beon-gil, Yangju-si, Gyeonggi-do
Date of Receipt : May. 25, 2021
Test date : Jul. 04, 2021 ~ Jul. 09, 2021
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Jun Soo, Jung
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
Nov. 10, 2021	KES-EM-21T1081	Issued
Jan. 27, 2023	KES-EM-21T1081-R1	Change Manufacturer
Feb. 24, 2023	KES-EM-21T1081-R2	Change the Applicant at the request of the customer

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1.0 General Product Description

Main Specifications of EUT are:

WISEnet AMS	Specification	SPA-S1000
Product	Type	Network Audio Server
MIC Input	Input Sensitivity	
	Frequency Response	
	Output Level	
Line Output	Frequency Response	
	THD + N Ratio	-
	S/N Ratio (20Hz HPF, 20kHz LPF)	-
Power Amp	Output Power (8Ω, 1kHz Sine wave)	-
	Frequency Response (1W, 8Ω)	-
	S/N Ratio (20Hz HPF, 20kHz LPF)	-
Network	Ethernet	100/1000 Base-T
Memory	External Memory (Micro SD)	-
Contact	Contact Input	-
	Contact Output (Rating : 1A DC 30V, 0.3A AC 125V)	-
General	Operating Temperature	-10 ~ 40°C (14°F ~ 104°F)
	Operating Humidity	10~100% RH Non-condensing
	IP code	-
	Weight	3.02kg
	Size	482(W)×44(H)×280(D)mm
	Color	Black
	Certificate	EMC : KN 32/ 35, EN 55032/ 55035, FCC Part 15, Subpart B Safety : K 60950-1, EN 60950-1, CSA/UL 60950-1
Power	PoE PoE+	120-240V, 50/60Hz, 10W DC 24V, 350mA
Audio	Built-in microphone	-
	Audio Compression	-
Speaker	Speaker Component	-
	Max. Sound Pressure Level (PoE : 7 Watt)	-
	Max. Sound Pressure Level (PoE+ : 15 Watt)	-
	Max. Power (Peak)	-
	Frequency Response	-
	Sensitivity (1Watt)	-
	Coverage Pattern	-
Amplifier	Amplifier	-
Network	Security	Password protection : admin,setup,user,guest (sha-2, Digest authentication, User access log) Digest authentication, User access log
	Supported Protocols	IPv4, HTTP, Bonjour, DNS, NTP, TCP, UDP, DHCP, ARP, SSH, ICMP, Network Bonding
System Integration	API (Application Programming Interface)	Web Rest API
	Multi-source Dynamic PA control	TBD
	Voice Announcement	-
	VoIP	-
	TTS	-
	Intelligent Audio	-
	Event Triggers	-
	Functional Monitoring	Connection verification, Built-in system logging
	Supported OS	Windows : Windows 10 MAC : Catalina 10.15.4 ↑ , Big Sur 11.1 ↑
	Supported Web viewer	Chrome Version : 91.0.4472.114 ↑

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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.

☒ AC 230 V, 50 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
AUDIO SERVER	SPA-S1000	-	Inter-M Corporation	EUT

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1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC / DC Adapter	RQ-12024Fb	RQ6-43390	LOADUS	-
Notebook	P95G001	9JM8HT2	WINSTRON CORPORATION.	-
Notebook Adapter	LA65NS2-01	-	LITE-ON TECHNOLOGY(CHANGZ HOU)CO.,LTD.	-
PoE Switch	-	-	REPOTEC CO., LTD.	-
CEILING SPEAKER	SPA-C110B	-	Inter-M Corporation	-
CEILING SPEAKER	SPA-C100B	-	Inter-M Corporation	-
WALL SPEAKER	SPA-W100B	-	Inter-M Corporation	-
Speaker	E5	-	PreSonus®	-
Alarm	SIP-1201DD D0	-	SAMSUNG TECHWIN CO., LTD.	-
Alarm button	-	-	-	-

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1.6 External I/O Cabling

■ AC MODE

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
AUDIO SERVER (EUT)	RJ-45	PoE Switch	RJ-45	20.0	U
PoE Switch	RJ-45	Notebook	RJ-45	3.0	U
	RJ-45	CEILING SPEAKER	RJ-45	20.0	U
	RJ-45	CEILING SPEAKER	RJ-45	20.0	U
	RJ-45	WALL SPEAKER	RJ-45	20.0	U
CEILING SPEAKER	Alarm	Alarm	Alarm	3.0	U
	Alarm	Alarm button	Alarm	3.0	U
	2 pin	Speaker	XLR	3.0	U
Notebook	DC Jack	Notebook Adapter	Line Out	1.5	U

* Unshielded=U, Shielded=S

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■ AC / DC Adapter MODE

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
AUDIO SERVER (EUT)	DC IN	AC / DC Adapter	Line OUT	1.5	U
	RJ-45	PoE Switch	RJ-45	20.0	U
PoE Switch	RJ-45	Notebook	RJ-45	3.0	U
	RJ-45	CEILING SPEAKER	RJ-45	20.0	U
	RJ-45	CEILING SPEAKER	RJ-45	20.0	U
	RJ-45	WALL SPEAKER	RJ-45	20.0	U
CEILING SPEAKER	Alarm	Alarm	Alarm	3.0	U
	Alarm	Alarm button	Alarm	3.0	U
	2 pin	Speaker	XLR	3.0	U
Notebook	DC Jack	Notebook Adapter	Line Out	1.5	U

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

Test mode	operating
AC, AC / DC Adapter MODE	1. After placing the EUT and peripheral devices as shown in the layout below, run a PING test on a laptop connected to the EUT to check if it is connected normally. 2. After accessing the EUT's web page from the laptop, 1 kHz tone source was entered to verify that the speakers' sound was output properly.

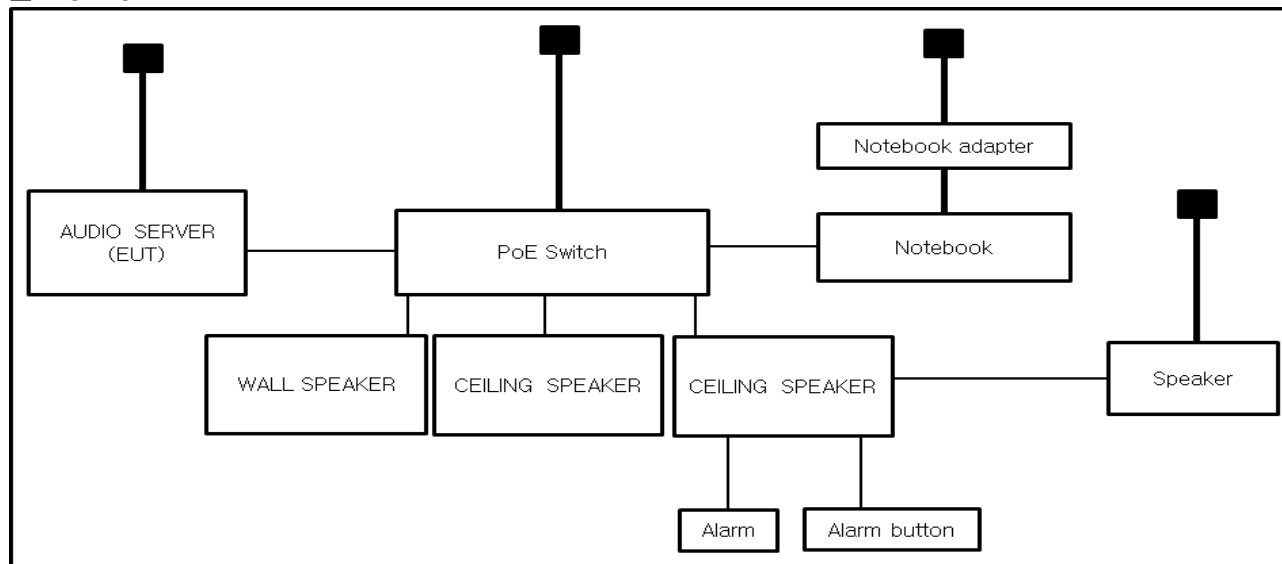
EUT Test operating S/W		
Name	Version	Manufacture Company
-	-	-

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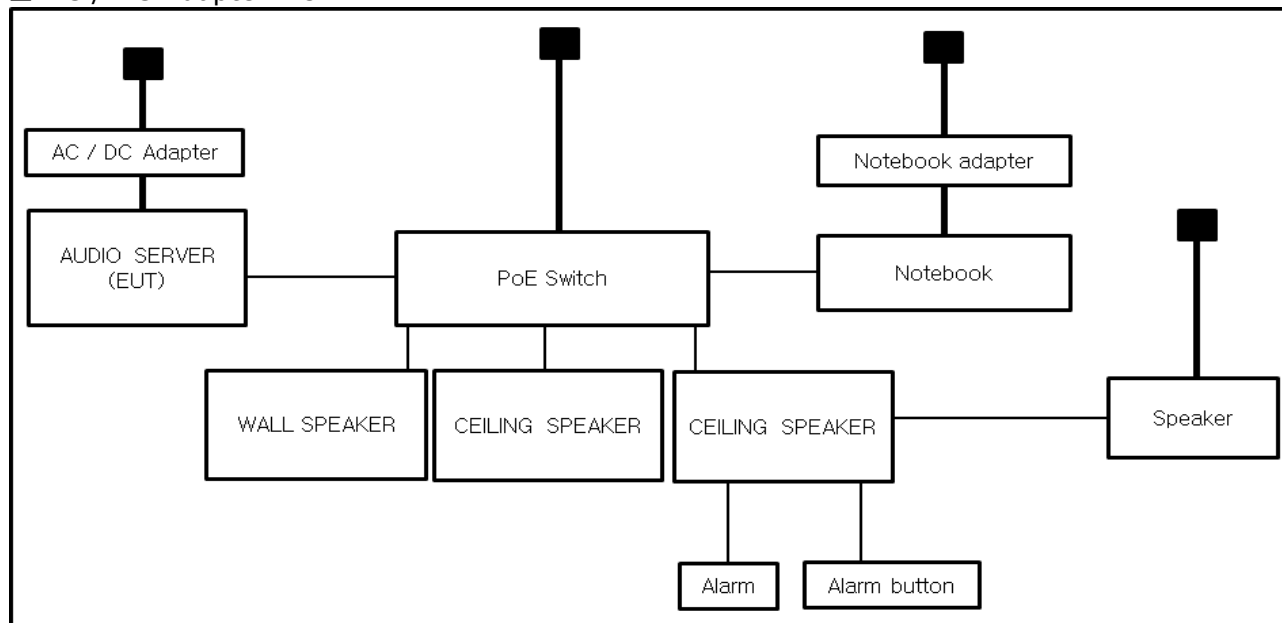
1.8 Configuration

■ AC Main
 □ DC Main

■ AC MODE



■ AC / DC Adapter 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**

☒ **EMC – Regulations 2016/1091**

☒ EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ BS EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011

☒ BS EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ BS EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☒ BS EN 61000-3-3:2013



2.1 Conducted Emissions at Mains Power Ports

Test Date

Jul. 04, 2021

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021

Test Conditions

Temperature: (24,9 ± 0,1) °C

Relative Humidity: (46,8 ± 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 Conducted Emissions at Telecommunication Ports

Test Date

Jul. 04, 2021

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021
<input checked="" type="checkbox"/>	8-WIRE ISN CAT3,5	ENY81	R & S	100174	12, 30, 2021
<input type="checkbox"/>	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	12, 30, 2021
<input type="checkbox"/>	CDN	CDNS502A	TESEQ	40431	12, 29, 2021

Test Conditions

Temperature: (24,9 ± 0,1) °C

Relative Humidity: (46,8 ± 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.- For Ethernet interfaces, measurements are required at the highest data rate supported by the interface.

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2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Jul. 04, 2021

Test Location

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	R & S	100551	04, 01, 2022
<input checked="" type="checkbox"/>	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2021
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	32173	03, 10, 2022

Test Conditions

Temperature: (24,6 ± 0,1) °C

Relative Humidity: (47,2 ± 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.

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2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Jul. 06, 2021

Test Location

SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR7	R & S	101190	08, 03, 2022
<input checked="" type="checkbox"/>	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 07, 2022
<input type="checkbox"/>	ATTENUATOR	8491A	HP	35496	03, 10, 2022
<input checked="" type="checkbox"/>	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 11, 2022

Test Conditions

Temperature: (24,7 ± 0,1) °C

Relative Humidity: (46,9 ± 0,2) % 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

RemarksSee Appendix A for test data.

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2.5 Harmonic Current Emissions

Test Date

Jul. 09, 2021

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	net.control	EM TEST	2.1.4	-
<input checked="" type="checkbox"/>	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2022
<input checked="" type="checkbox"/>	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,2 ± 0,1) °C

Relative Humidity: (48,1 ± 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.



2.6 Voltage Fluctuations and Flicker

Test Date

Jul. 09, 2021

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	net.control	EM TEST	2.1.4	-
<input checked="" type="checkbox"/>	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2022
<input checked="" type="checkbox"/>	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,2 ± 0,1) °C
Relative Humidity: (48,1 ± 0,1) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

3.0 Criteria for compliance

General performance criteria

General performance criteria are defined in 8.2, 8.3 and 8.4. These criteria shall be used during the testing of primary functions where no relevant annex is applicable.

When assessing the impact of a disturbance on a function, the assessment should take into consideration the function's performance prior to the application of the disturbance and only identify as failures those changes in performance that are a result of the disturbance.

Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion B

During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment 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), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009
BS EN 61000-4-2:2009

Test Date

Jul. 09, 2021

Test Location

EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	02, 01, 2022
<input checked="" type="checkbox"/>	HCP	-	KES	-	-
<input checked="" type="checkbox"/>	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: (25,1 ± 0,2) °C
Relative Humidity: (47,0 ± 0,1) % R.H.
Atmospheric Pressure: (99,2 ± 0,1) 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 <input type="checkbox"/> 2 kV <input checked="" type="checkbox"/> 4 kV <input type="checkbox"/> 6 kV <input type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV	Air <input checked="" type="checkbox"/> 2 kV <input checked="" type="checkbox"/> 4 kV <input type="checkbox"/> 6 kV <input checked="" type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV	HCP <input type="checkbox"/> 2 kV <input checked="" type="checkbox"/> 4 kV <input type="checkbox"/> 6 kV <input type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV	VCP <input type="checkbox"/> 2 kV <input checked="" type="checkbox"/> 4 kV <input type="checkbox"/> 6 kV <input type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV
--------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Notes: HCP: Horizontal coupling plane

VCP: Vertical coupling plane

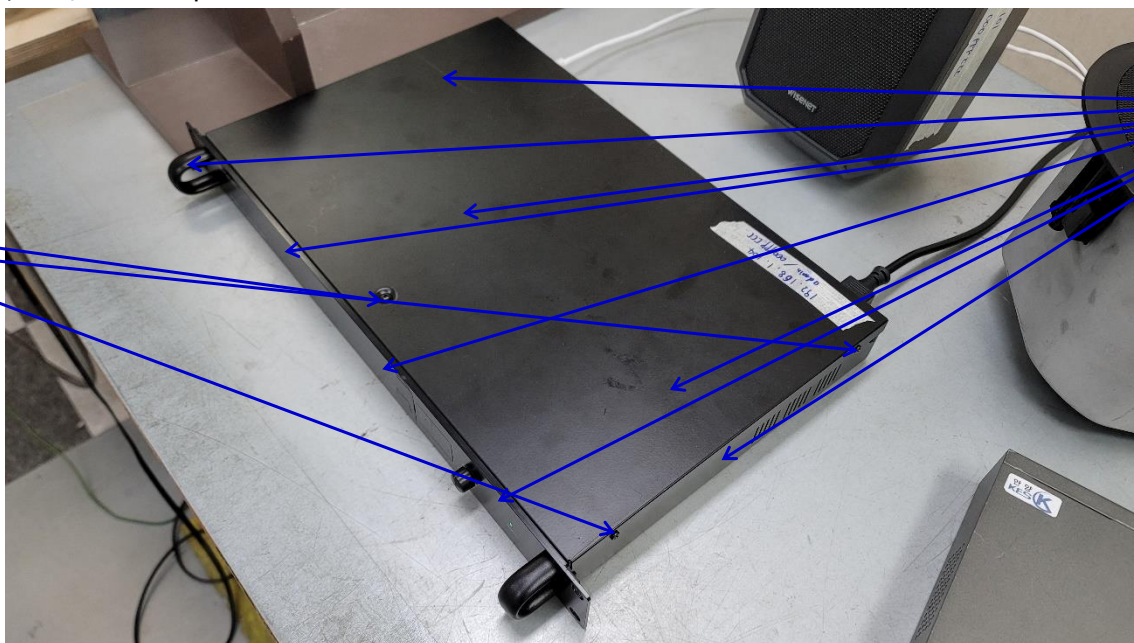
Required Performance Criteria: ☒ B

Location of Discharge:

Air
Contact

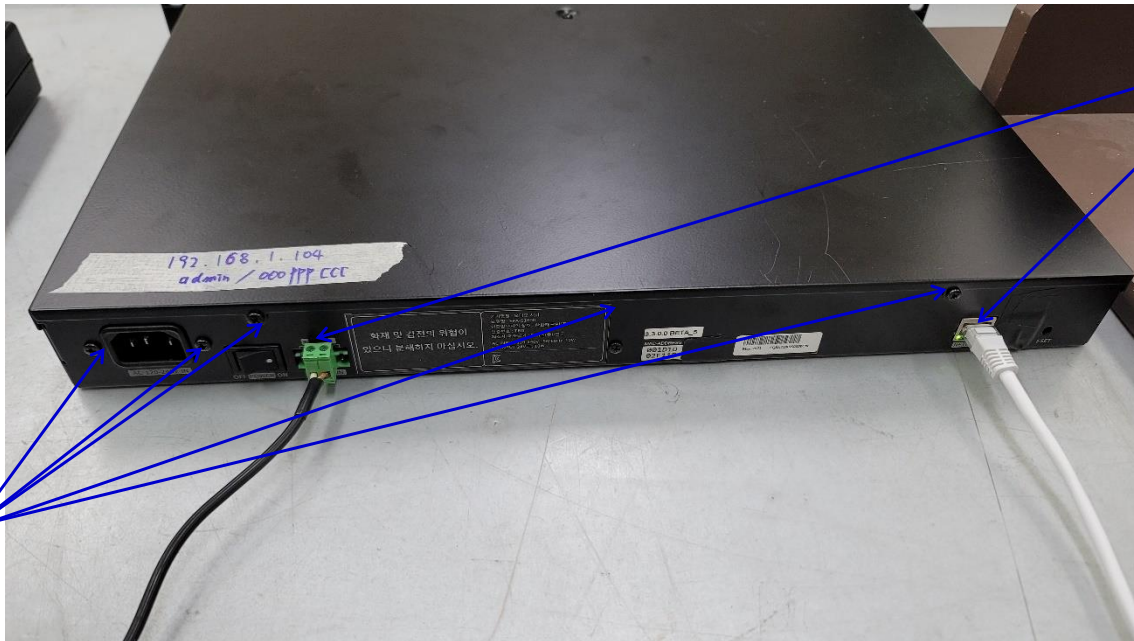


■ AC, AC / DC Adapter MODE



■ AC MODE



■ AC / DC Adapter MODE

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Test Data**■ AC MODE**

No.	Test Point	Discharge Method	Performance		Remarks
			Criteria	Results	
1	HCP Contact	Contact Discharge	B	A	-
2	VCP Contact	Contact Discharge	B	A	-

Direct Discharge

No.	Test Point	Discharge Method	Performance		Remarks
			Criteria	Results	
1	Enclosure	Contact Discharge	B	A	-
2	Screw	Contact Discharge	B	A	-
3	Around the port	Contact Discharge	B	A	-

■ AC / DC Adapter MODE

No.	Test Point	Discharge Method	Performance		Remarks
			Criteria	Results	
1	HCP Contact	Contact Discharge	B	A	-
2	VCP Contact	Contact Discharge	B	A	-

Direct Discharge

No.	Test Point	Discharge Method	Performance		Remarks
			Criteria	Results	
1	Enclosure	Contact Discharge	B	A	-
2	Screw	Contact Discharge	B	A	-
3	Around the port	Contact Discharge	B	A	-

Note: "Blank" = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**N/A

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3.2 Radiated Electric Field Immunity

Reference Standard

EN 61000-4-3:2006 +A2:2010
BS EN 61000-4-3:2006 +A2:2010

Test Date

Jul. 05, 2021

Test Location

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	EMC32	R & S	10.10.02	-
<input checked="" type="checkbox"/>	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 03, 2022
<input checked="" type="checkbox"/>	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
<input checked="" type="checkbox"/>	POWER METER	E4419B	Agilent	GB40203000	04, 01, 2022
<input checked="" type="checkbox"/>	CW POWER SENSOR	E4412A	Agilent	US38488240	04, 01, 2022
<input checked="" type="checkbox"/>	CW POWER SENSOR	E4412A	Agilent	MY41501662	04, 01, 2022
<input checked="" type="checkbox"/>	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
<input checked="" type="checkbox"/>	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 11, 2022

Test Conditions

Temperature: (24,5 ± 0,2) °C
Relative Humidity: (46,7 ± 0,3) % R.H.
Atmospheric Pressure: (99,5 ± 0,1) 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 (swept test) ☐ 1,4 GHz to 2,7 GHz
☒ 1.8 GHz , 2.6 GHz , 3.5 GHz , 5 GHz ($\pm 1\%$) (spot test)

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: ☒ A

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Test Data
■ AC MODE

Side Exposed	Performance Criteria	Results	
		Horizontal	Vertical
Front	A	A	A
Right	A	A	A
Back	A	A	A
Left	A	A	A

[Audio output function]

☐ Electrical Measurements / ☐ Acoustic Measurements

Measured parts	Test method	Level (dB)		Performance criteria	Observations	
		Criteria	Measured		Horizontal	Vertical
-	-	-	-	-	-	-

* The SOUND ACOUSTIC TESTER mark characteristics indicate low if less than 50 dB.

■ AC / DC Adapter MODE

Side Exposed	Performance Criteria	Results	
		Horizontal	Vertical
Front	A	A	A
Right	A	A	A
Back	A	A	A
Left	A	A	A

[Audio output function]

☐ Electrical Measurements / ☐ Acoustic Measurements

Measured parts	Test method	Level (dB)		Performance criteria	Observations	
		Criteria	Measured		Horizontal	Vertical
-	-	-	-	-	-	-

* The SOUND ACOUSTIC TESTER mark characteristics indicate low if less than 50 dB.

Note: "Blank" = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results
☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

N/A

3.3 Electrical Fast Transients/Bursts

Reference Standard

EN 61000-4-4:2012
BS EN 61000-4-4:2012

Test Date

Jul. 08, 2021

Test Location

EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021
<input checked="" type="checkbox"/>	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 26, 2021

Test Conditions

Temperature: (25,0 ± 0,2) °C
Relative Humidity: (46,8 ± 0,2) % R.H.
Atmospheric Pressure: (99,8 ± 0,1) kPa

Test Specifications

Pulse Amplitude & Polarity:
(Power Lines) ☒ ± 1.0 kV ☐ ± 2.0 kV
☐ ± 4.0 kV

Pulse Amplitude & Polarity:
(Signal Lines) ☒ ± 0.5 kV ☐ ± 1.0 kV
☐ ± 2.0 kV

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☒ 5 kHz ☐ 100 kHz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ B

Test Data
■ AC MODE
☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
L	B	A	A
N	B	A	A
PE	B	A	A
L – N	B	A	A
L – PE	B	A	A
N – PE	B	A	A
L – N – PE	B	A	A

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

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
-	B	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
RJ-45	B	A	A

■ AC / DC Adapter MODE
☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
L	B	A	A
N	B	A	A
PE	B	A	A
L – N	B	A	A
L – PE	B	A	A
N – PE	B	A	A
L – N – PE	B	A	A

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

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
-	B	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
RJ-45	B	A	A

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results
☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks
N/A

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3.4 Surge

Reference Standard

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

BS EN 61000-4-5:2014

Test Date

Jul. 08, 2021

Test Location

EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021

Test Conditions

Temperature: (25,0 ± 0,1) °C

Relative Humidity: (46,8 ± 0,1) % R.H.

Atmospheric Pressure: (99,8 ± 0,1) 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:

☒ 90°, 270° (input a.c. power port)

Polarity:

☒ Positive & Negative

Repetition Rate:

☒ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☒ B

Signal Lines

Source Impedance:

42 ohm for common mode

Surge Amplitude:

Common 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

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Test Data

■ AC MODE

☒ Line to Line – Differential Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
L – N	B	A	A

☒ Line to Earth – Common Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
L – PE	B	A	A
N – PE	B	A	A

Signal Lines☐ Line to Earth – Common Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
-	B	-	-

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■ AC / DC Adapter MODE☒ Line to Line – Differential Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
L – N	B	A	A

☒ Line to Earth – Common Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
L – PE	B	A	A
N – PE	B	A	A

Signal Lines☐ Line to Earth – Common Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
-	B	-	-

Note: "Blank" = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**N/A

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3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

BS EN 61000-4-6:2014

Test Date

Jul. 07, 2021

Test Location

EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	icd.control	EM TEST	5.3.12	-
<input checked="" type="checkbox"/>	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 25, 2021
<input checked="" type="checkbox"/>	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 25, 2021
<input checked="" type="checkbox"/>	CDN	CDN M016	TESEQ	43694	11, 25, 2021
<input checked="" type="checkbox"/>	CDN	CDN M016	TESEQ	43697	11, 25, 2021
<input checked="" type="checkbox"/>	CDN	CDN T800	TESEQ	42800	11, 25, 2021
<input type="checkbox"/>	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 26, 2021

Test Conditions

Temperature: (24,9 ± 0,2) °C

Relative Humidity: (46,8 ± 0,2) % R.H.

Atmospheric Pressure: (99,9 ± 0,1) kPa



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Test Specifications

Frequency range:

☐ 150 kHz to 100 MHz

☒ 150 kHz to 80 MHz

Voltage Level:

☒ 3 Vrms (150 kHz to 10 MHz)

☒ 3 Vrms to 1Vrms (10 MHz to 30 MHz)

☒ 1 Vrms (30 MHz to 80 MHz)

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

Required Performance Criteria: ☒ A

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Test Data
■ AC MODE
☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
L – N – PE	CDN	A	A

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
-	-	A	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
RJ-45	CDN	A	A

[Audio output function]

☐ Electrical Measurements / ☐ Acoustic Measurements

Measured parts	Test method	Level (dB)		Performance criteria	Observations	
		Criteria	Measured		Horizontal	Vertical
-	-	-	-	-	-	-

* The SOUND ACOUSTIC TESTER mark characteristics indicate low if less than 50 dB.

■ AC / DC Adapter MODE
☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
L - N - PE	CDN	A	A

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
-	-	A	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
RJ-45	CDN	A	A

[Audio output function]

☐ Electrical Measurements / ☐ Acoustic Measurements

Measured parts	Test method	Level (dB)		Performance criteria	Observations	
		Criteria	Measured		Horizontal	Vertical
-	-	-	-	-	-	-

* The SOUND ACOUSTIC TESTER mark characteristics indicate low if less than 50 dB.

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

Results:

A - No degradation of function

B - Distortion/Error of function (self-recoverable)

C - Loss of function

Test Results
☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

N/A

3.6 Power Frequency Magnetic Field Immunity

Reference Standard

EN 61000-4-8:2010
BS EN 61000-4-8:2010

Test Date

N/A

Test Location

EMS-Magnetic: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021
<input type="checkbox"/>	MAGNETIC FIELD COIL	MS 100N	EM TEST	P1536163691	11, 26, 2021
<input type="checkbox"/>	CURRENT TRANSFORMER	MC 2630	EM TEST	P1629182219	01, 04, 2022

Test Conditions

Temperature: °C
Relative Humidity: % R.H.
Atmospheric Pressure: kPa

Test Specifications

Field Strength: ☐ 1 A/m ☐ 3 A/m
☐ 30 A/m
Frequency: ☐ 50 Hz ☐ 60 Hz
Required Performance Criteria: ☐ A

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Test Data☐ Immersion method

Coil orientation	Performance Criteria	Results
X - axis	-	-
Y - axis	-	-
Z - axis	-	-

Note: "blank" = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results

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

RemarksNot affected by magnetic fields.

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3.7 Voltage Dips and Short Interruptions

Reference Standard

EN 61000-4-11:2004+A1:2017

BS EN 61000-4-11:2004+A1:2017

Test Date

Jul. 08, 2021

Test Location

EMS-Voltage dip: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021

Test Conditions

Temperature: (25,0 ± 0,1) °C

Relative Humidity: (46,8 ± 0,2) % R.H.

Atmospheric Pressure: (99,8 ± 0,1) kPa

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Test Data**■ AC MODE**

NO	Depth	Duration	Performance		Remarks
			Criteria	Results	
1	95 %	0.5	B	A	-
2	30 %	25	C	A	-
3	95 %	250	C	B	-

■ AC / DC Adapter MODE

NO	Depth	Duration	Performance		Remarks
			Criteria	Results	
1	95 %	0.5	B	A	-
2	30 %	25	C	A	-
3	95 %	250	C	B	-

Results:

- 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

Unit shuts down then automatically restarts when full voltage is restored or Loss of function.

APPENDIX A – TEST DATA

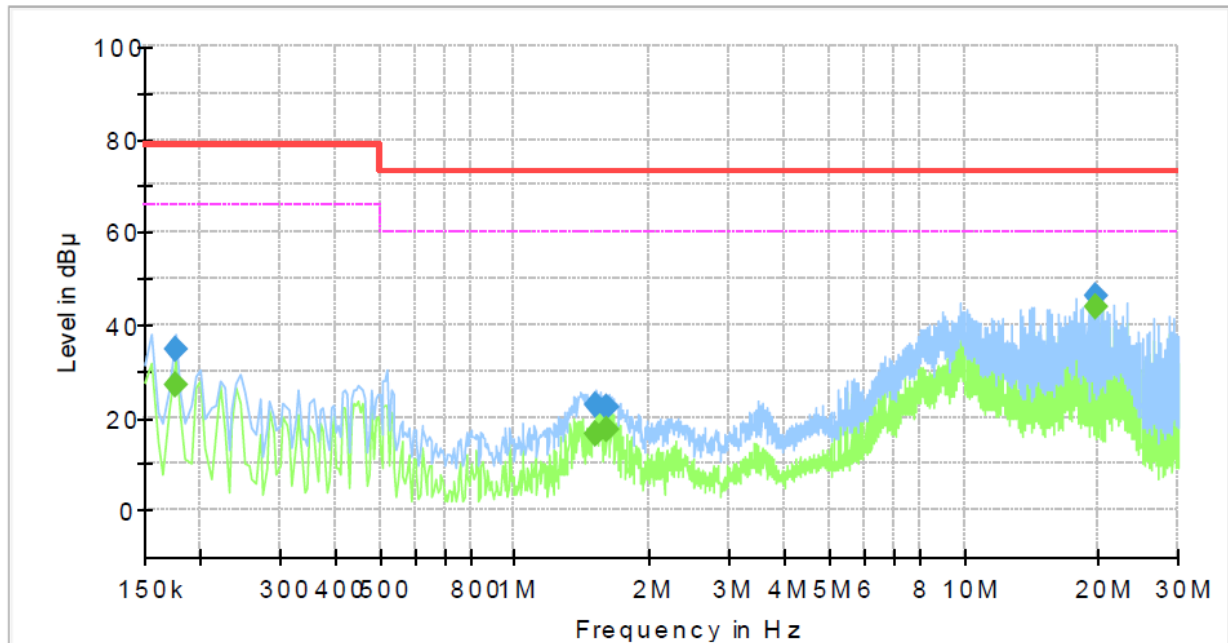
Conducted Emissions at Mains Power Ports

■ AC MODE

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	SPA-S1000
Phase:	L1
Mode:	AC
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.175000	---	27.07	66.00	38.93	1000.0	9.000	L1	19.4
0.175000	34.57	---	79.00	44.43	1000.0	9.000	L1	19.4
1.520000	---	16.52	60.00	43.48	1000.0	9.000	L1	20.2
1.520000	22.49	---	73.00	50.51	1000.0	9.000	L1	20.2
1.605000	---	17.30	60.00	42.70	1000.0	9.000	L1	20.2
1.605000	22.17	---	73.00	50.83	1000.0	9.000	L1	20.2
19.710000	---	44.00	60.00	16.00	1000.0	9.000	L1	20.1
19.710000	46.19	---	73.00	26.81	1000.0	9.000	L1	20.1

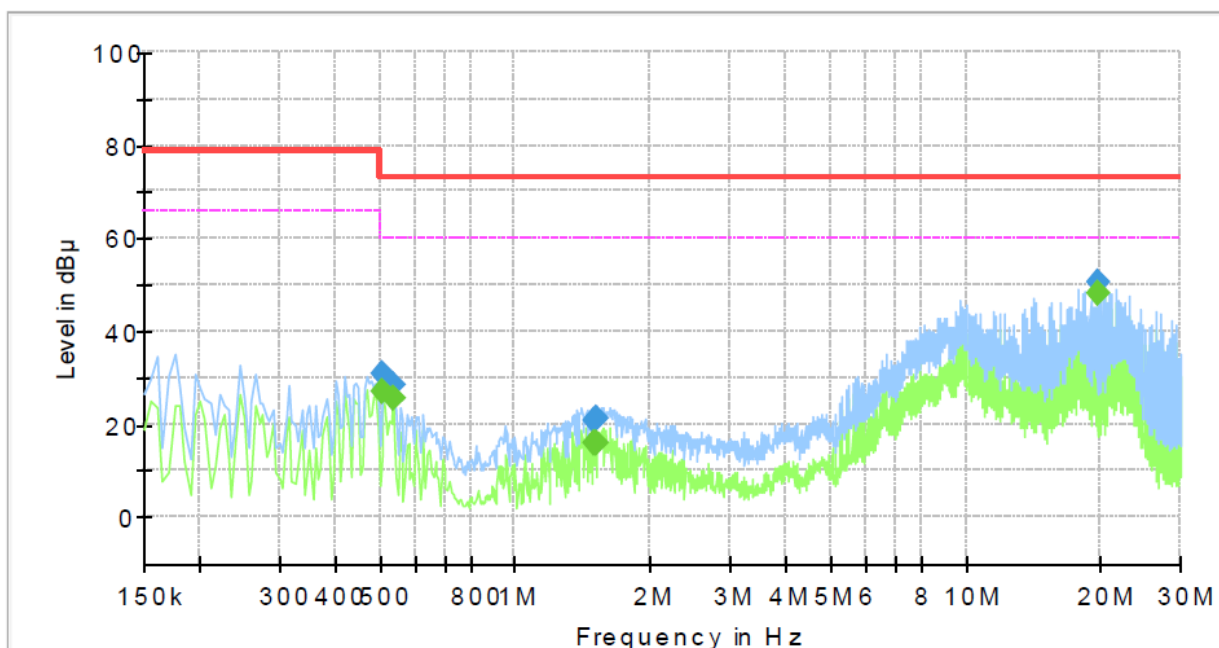
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[NEUTRAL]
Common Information

Test Description:	Conducted Emission
Model No.:	SPA-S1000
Phase:	N
Mode:	AC
Operator Name:	KES


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.510000	---	26.84	60.00	33.16	1000.0	9.000	N	19.7
0.510000	30.88	---	73.00	42.12	1000.0	9.000	N	19.7
0.535000	---	25.75	60.00	34.25	1000.0	9.000	N	19.7
0.535000	28.52	---	73.00	44.48	1000.0	9.000	N	19.7
1.495000	---	15.95	60.00	44.05	1000.0	9.000	N	20.2
1.495000	20.74	---	73.00	52.26	1000.0	9.000	N	20.2
1.520000	---	16.03	60.00	43.97	1000.0	9.000	N	20.2
1.520000	21.00	---	73.00	52.00	1000.0	9.000	N	20.2
19.710000	---	48.16	60.00	11.84	1000.0	9.000	N	20.1
19.710000	50.32	---	73.00	22.68	1000.0	9.000	N	20.1

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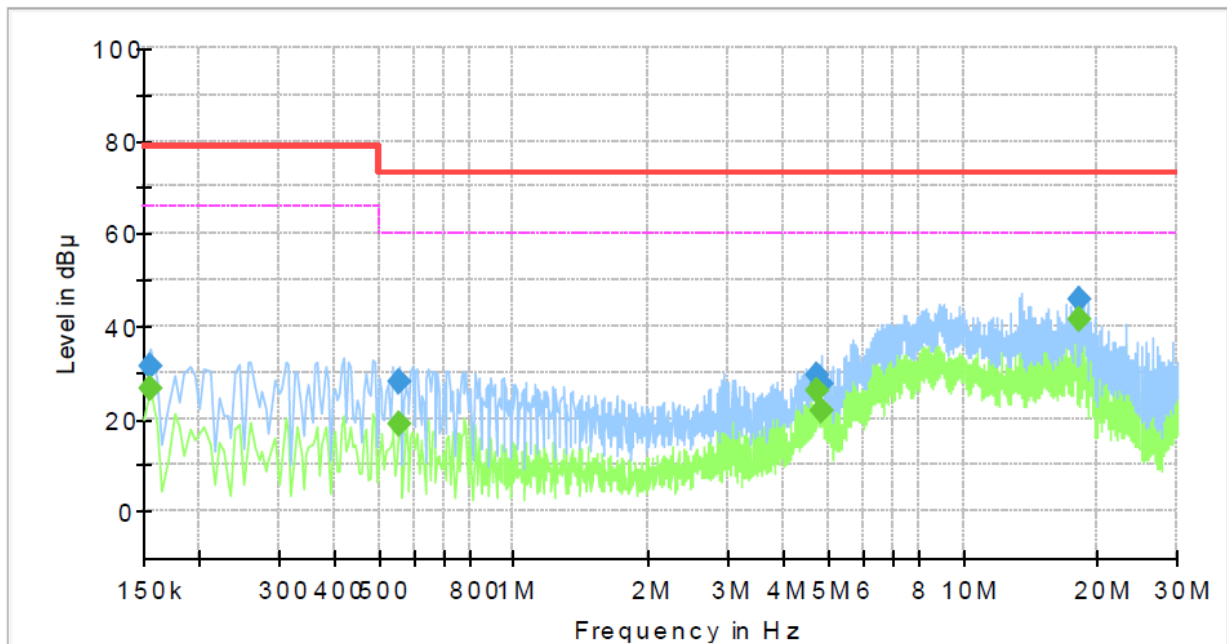
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■ AC / DC Adapter MODE

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	SPA-S1000
Phase:	L1
Mode:	AC / DC Adapter
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.155000	---	26.63	66.00	39.37	1000.0	9.000	L1	19.4
0.155000	31.43	---	79.00	47.57	1000.0	9.000	L1	19.4
0.555000	---	18.72	60.00	41.28	1000.0	9.000	L1	19.8
0.555000	27.89	---	73.00	45.11	1000.0	9.000	L1	19.8
4.730000	---	26.09	60.00	33.91	1000.0	9.000	L1	19.7
4.730000	29.54	---	73.00	43.46	1000.0	9.000	L1	19.7
4.830000	---	21.94	60.00	38.06	1000.0	9.000	L1	19.7
4.830000	27.60	---	73.00	45.40	1000.0	9.000	L1	19.7
18.245000	---	41.61	60.00	18.39	1000.0	9.000	L1	20.0
18.245000	45.72	---	73.00	27.28	1000.0	9.000	L1	20.0

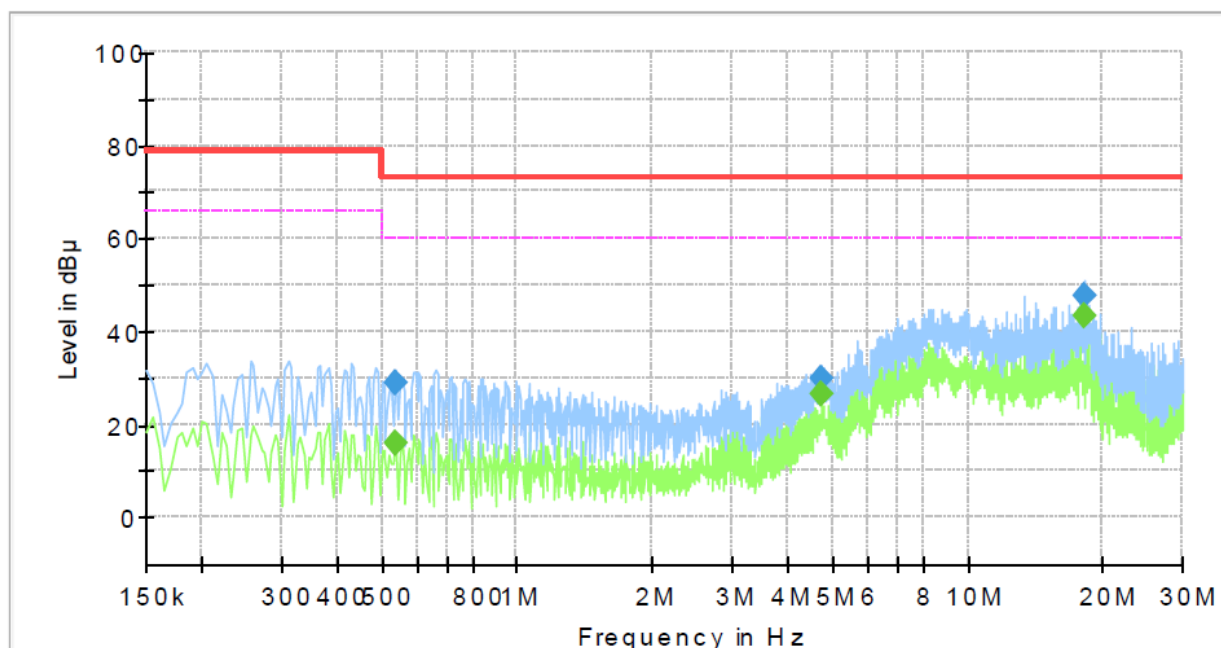
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[NEUTRAL]
Common Information

Test Description:	Conducted Emission
Model No.:	SPA-S1000
Phase:	N
Mode:	AC / DC Adapter
Operator Name:	KES


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.535000	---	15.90	60.00	44.10	1000.0	9.000	N	19.7
0.535000	29.10	---	73.00	43.90	1000.0	9.000	N	19.7
4.730000	---	26.63	60.00	33.37	1000.0	9.000	N	19.7
4.730000	30.08	---	73.00	42.92	1000.0	9.000	N	19.7
18.245000	---	43.18	60.00	16.82	1000.0	9.000	N	20.0
18.245000	47.55	---	73.00	25.45	1000.0	9.000	N	20.0

◆ 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))

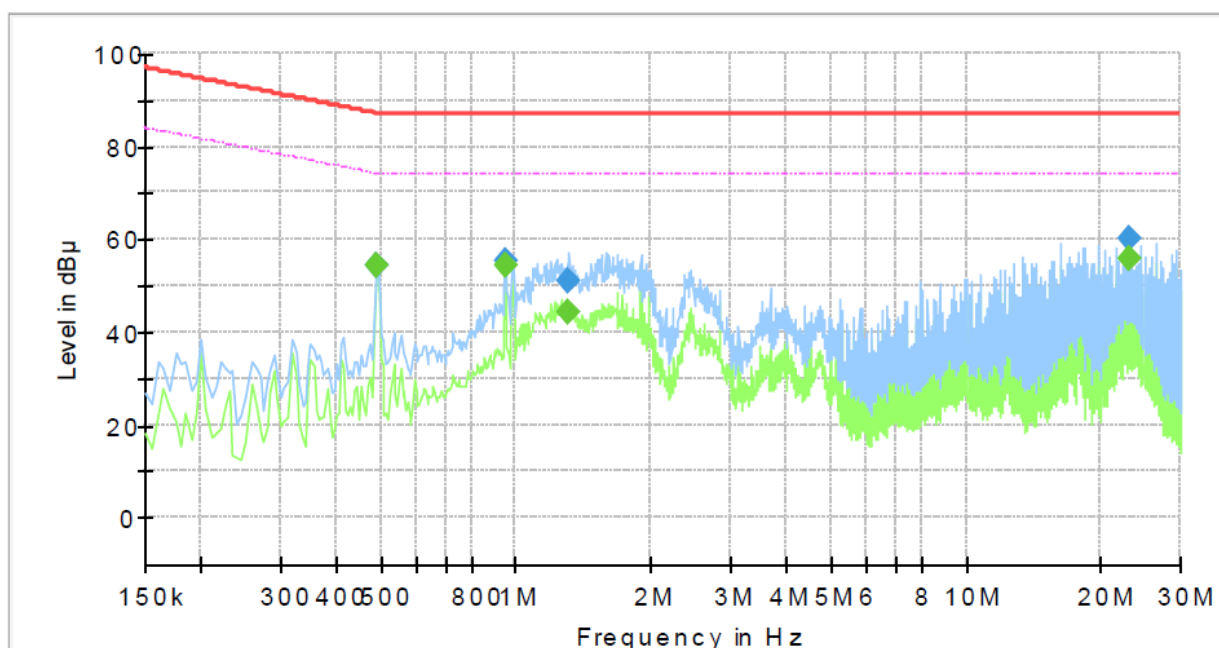
Conducted Emissions at Telecommunication Ports

■ AC MODE

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	SPA-S1000
Mode :	AC
Speed :	100 Mbps
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.490000	---	54.33	74.17	19.84	1000.0	9.000	Single Line	19.8
0.490000	54.45	---	87.17	32.72	1000.0	9.000	Single Line	19.8
0.945000	---	54.27	74.00	19.73	1000.0	9.000	Single Line	20.0
0.945000	55.45	---	87.00	31.55	1000.0	9.000	Single Line	20.0
1.310000	---	44.17	74.00	29.83	1000.0	9.000	Single Line	20.1
1.310000	51.20	---	87.00	35.80	1000.0	9.000	Single Line	20.1
23.130000	---	55.89	74.00	18.11	1000.0	9.000	Single Line	20.1
23.130000	59.91	---	87.00	27.09	1000.0	9.000	Single Line	20.1

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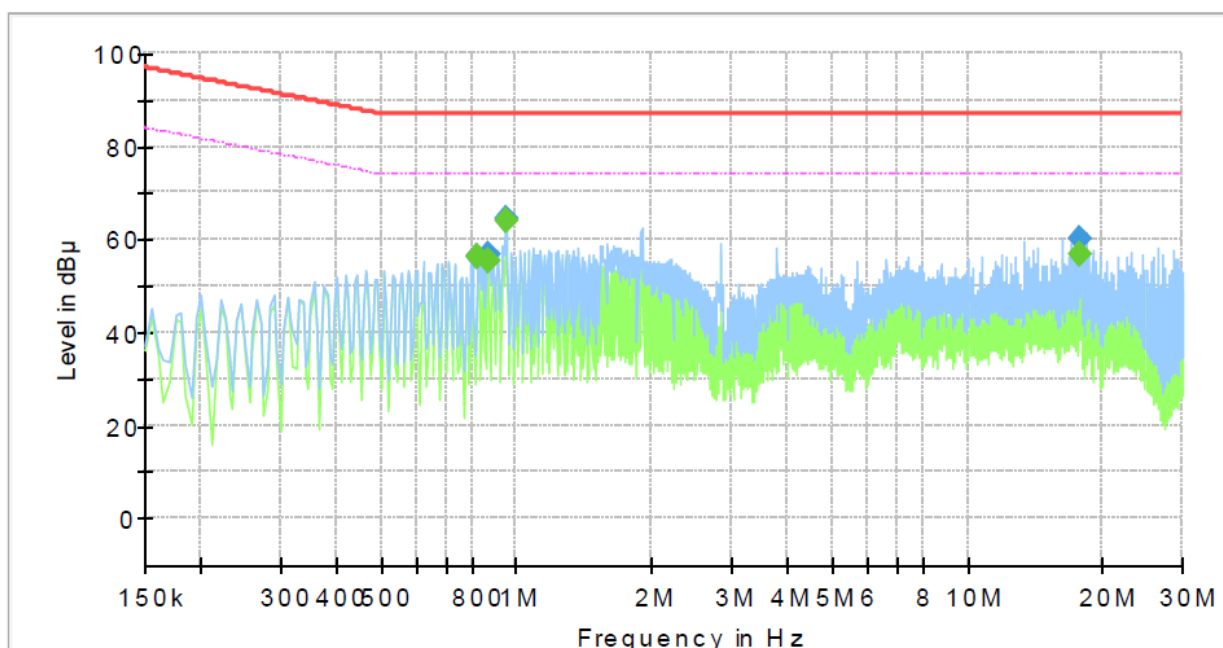
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AC / DC Adapter MODE

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	SPA-S1000
Mode :	AC / DC Adapter
Speed :	100 Mbps
Operator Name:	KES



Final_Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.820000	---	56.36	74.00	17.64	1000.0	9.000	Single Line	20.0
0.820000	56.48	---	87.00	30.52	1000.0	9.000	Single Line	20.0
0.865000	---	55.42	74.00	18.58	1000.0	9.000	Single Line	20.0
0.865000	56.70	---	87.00	30.30	1000.0	9.000	Single Line	20.0
0.945000	---	64.19	74.00	9.81	1000.0	9.000	Single Line	20.0
0.945000	64.59	---	87.00	22.41	1000.0	9.000	Single Line	20.0
17.695000	---	56.82	74.00	17.18	1000.0	9.000	Single Line	19.8
17.695000	60.28	---	87.00	26.72	1000.0	9.000	Single Line	19.8

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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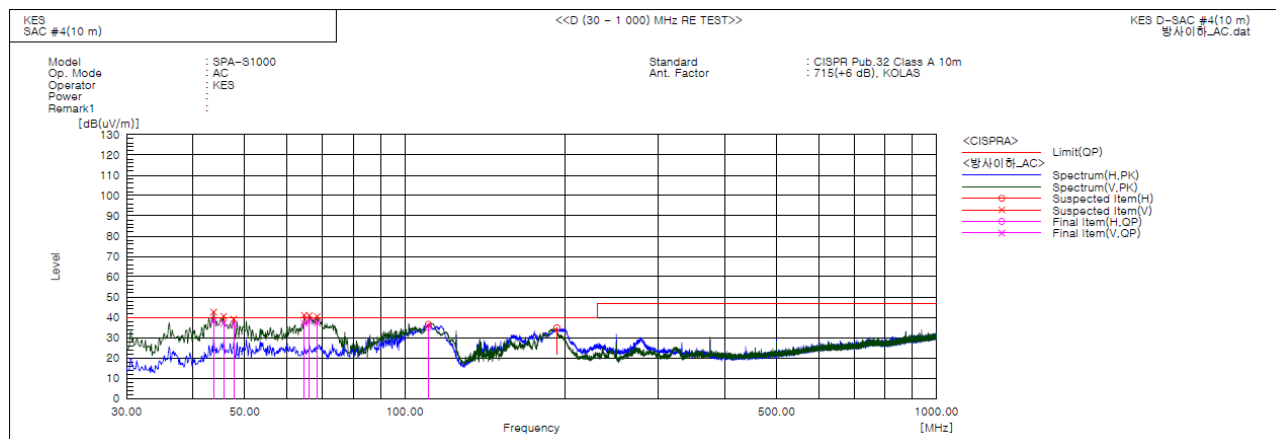
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Radiated Electric Field Emissions(Below 1 GHz)

AC 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	43.701	V	59.8	-21.6	38.2	40.0	1.8	102.0	122.0	
2	45.641	V	58.4	-21.4	37.0	40.0	3.0	108.0	44.0	
3	47.703	V	57.8	-21.2	36.6	40.0	3.4	100.0	92.0	
4	64.678	V	60.3	-23.2	37.1	40.0	2.9	102.0	122.0	
5	66.133	V	61.5	-23.6	37.9	40.0	2.1	143.0	161.0	
6	68.436	V	61.5	-24.3	37.2	40.0	2.8	109.0	157.0	
7	110.753	H	57.3	-22.3	35.0	40.0	5.0	400.0	16.0	

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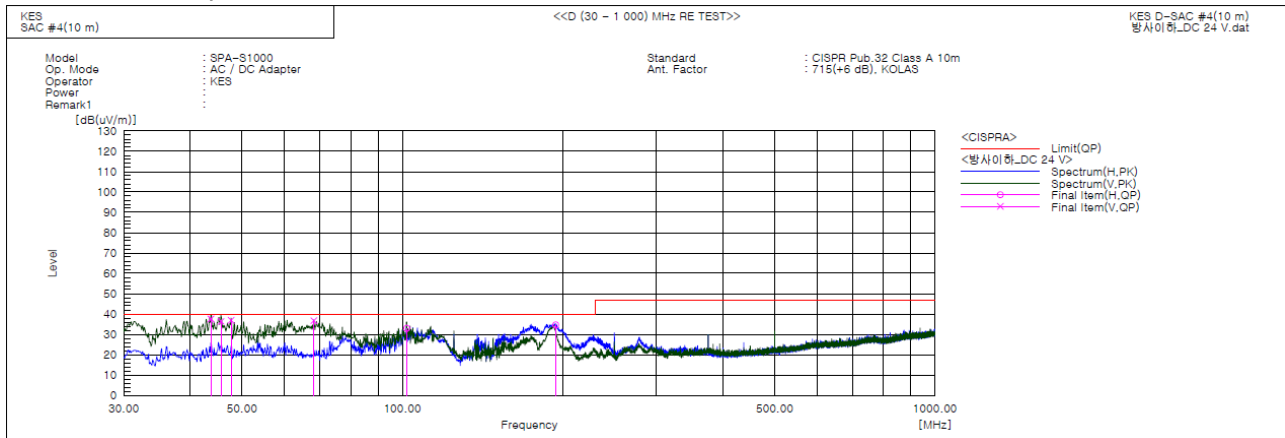
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■ AC / DC Adapter MODE



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	43.701	V	59.2	-21.6	37.6	40.0	2.4	100.0	45.0	
2	45.641	V	57.8	-21.4	36.4	40.0	3.6	107.0	295.0	
3	47.703	V	58.2	-21.2	37.0	40.0	3.0	102.0	157.0	
4	68.194	V	61.0	-24.2	36.8	40.0	3.2	104.0	112.0	
5	101.901	H	55.5	-22.5	33.0	40.0	7.0	400.0	284.0	
6	194.051	H	56.0	-21.3	34.7	40.0	5.3	398.0	356.0	

◆ Calculation – SAC #4(10 m)

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

Margin(QP)[dB] = Limit[dB(μ V/m)] - Result(QP) [dB(μ V/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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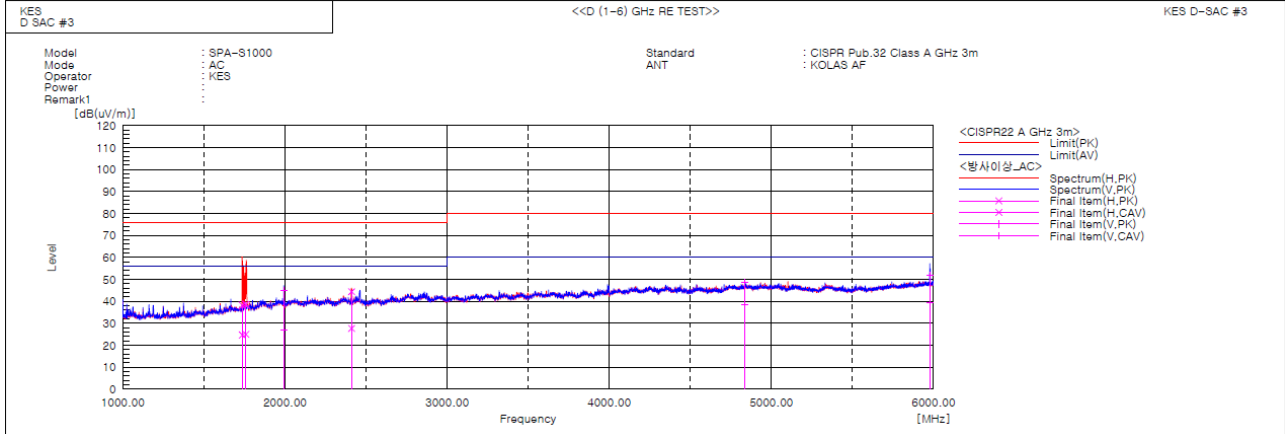
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Radiated Electric Field Emissions(Above 1 GHz)

■ AC 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	1737.365	H	41.9	28.4	-3.7	38.2	24.7	76.0	56.0	37.8	31.3	100.0	325.1	
2	1758.695	H	42.0	28.4	-3.4	38.6	25.0	76.0	56.0	37.4	31.0	100.0	2.8	
3	1993.392	V	45.7	28.0	-0.9	44.8	27.1	76.0	56.0	31.2	28.9	100.0	204.4	
4	2411.173	H	44.2	27.5	0.2	44.4	27.7	76.0	56.0	31.6	28.3	100.0	290.8	
5	4836.603	V	40.0	29.9	8.6	48.6	38.5	80.0	60.0	31.4	21.5	100.0	357.4	
6	5977.095	V	41.1	28.8	10.8	51.9	39.6	80.0	60.0	28.1	20.4	100.0	71.6	

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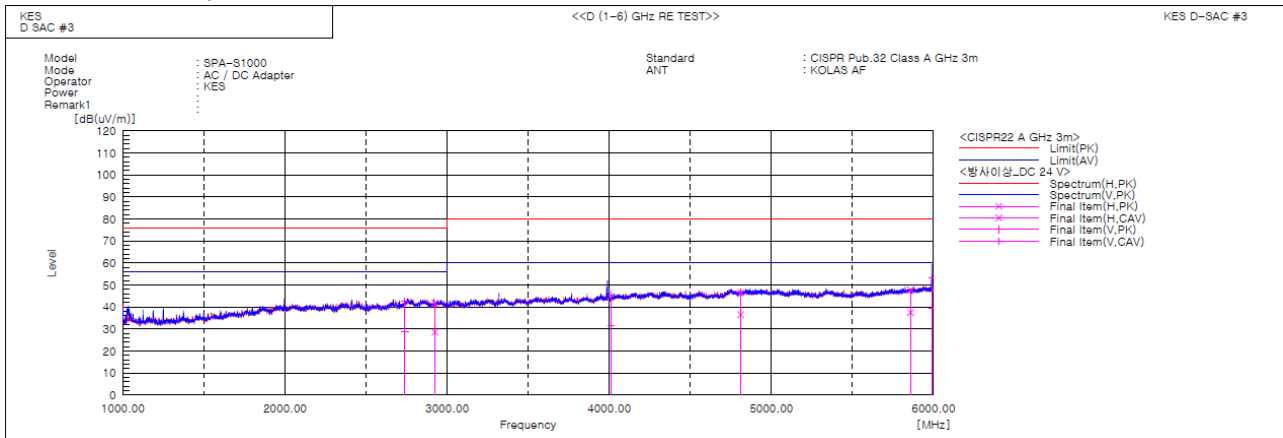
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AC / DC Adapter MODE



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	2740.443	V	40.8	27.1	1.9	42.7	29.0	76.0	56.0	33.3	27.0	100.0	169.2	
2	2925.776	H	39.8	26.6	2.0	41.8	28.6	76.0	56.0	34.2	27.4	100.0	108.3	
3	4010.386	V	39.6	25.9	5.7	45.3	31.6	80.0	60.0	34.7	28.4	100.0	183.7	
4	4810.593	H	38.0	27.9	8.6	46.6	36.5	80.0	60.0	33.4	23.5	100.0	357.9	
5	5859.113	H	37.6	27.3	10.2	47.8	37.5	80.0	60.0	32.2	22.5	100.0	118.4	
6	5990.766	V	42.5	28.6	10.8	53.3	39.4	80.0	60.0	26.7	20.6	100.0	25.2	

◆ Calculation

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

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

■ AC MODE

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	0.052			
2	0.001	0.101	1.080	n/a
3	0.018	0.803	2.300	PASS
4	0.001	0.271	0.430	n/a
5	0.018	1.538	1.140	PASS
6	0.001	0.396	0.300	n/a
7	0.017	2.226	0.770	PASS
8	0.001	0.400	0.230	n/a
9	0.016	4.061	0.400	PASS
10	0.001	0.693	0.184	n/a
11	0.015	4.622	0.330	PASS
12	0.001	0.606	0.153	n/a
13	0.015	6.939	0.210	PASS
14	0.001	0.677	0.131	n/a
15	0.013	8.646	0.150	PASS
16	0.001	0.842	0.115	n/a
17	0.011	8.508	0.132	PASS
18	0.001	1.043	0.102	n/a
19	0.010	8.833	0.118	PASS
20	0.001	0.726	0.092	n/a
21	0.010	6.119	0.161	PASS
22	0.001	0.967	0.084	n/a
23	0.009	5.989	0.147	PASS
24	0.001	0.955	0.077	n/a
25	0.007	5.245	0.135	PASS
26	0.001	0.842	0.071	n/a
27	0.006	4.438	0.125	PASS
28	0.001	0.935	0.066	n/a
29	0.004	3.652	0.116	n/a
30	0.001	0.955	0.061	n/a
31	0.003	2.904	0.109	n/a
32	0.001	1.045	0.058	n/a
33	0.002	2.412	0.102	n/a
34	0.001	1.213	0.054	n/a
35	0.002	1.889	0.096	n/a
36	0.001	1.214	0.051	n/a
37	0.001	1.118	0.091	n/a
38	0.001	1.272	0.048	n/a
39	0.001	0.945	0.087	n/a
40	0.001	1.389	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.

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Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.053			
2	0.001	0.079	1.620	n/a
3	0.019	0.546	3.450	PASS
4	0.001	0.207	0.645	n/a
5	0.018	1.044	1.710	PASS
6	0.001	0.321	0.450	n/a
7	0.017	1.512	1.155	PASS
8	0.001	0.307	0.345	n/a
9	0.017	2.755	0.600	PASS
10	0.002	0.620	0.276	n/a
11	0.016	3.133	0.495	PASS
12	0.001	0.460	0.230	n/a
13	0.015	4.709	0.315	PASS
14	0.001	0.503	0.197	n/a
15	0.013	5.868	0.225	PASS
16	0.001	0.823	0.173	n/a
17	0.012	5.933	0.199	PASS
18	0.001	0.972	0.153	n/a
19	0.011	6.064	0.178	PASS
20	0.001	0.557	0.138	n/a
21	0.010	6.280	0.161	PASS
22	0.001	1.048	0.125	n/a
23	0.009	6.105	0.147	PASS
24	0.001	0.833	0.115	n/a
25	0.007	5.362	0.135	PASS
26	0.001	0.629	0.106	n/a
27	0.006	4.534	0.125	PASS
28	0.001	0.688	0.099	n/a
29	0.005	3.868	0.116	n/a
30	0.001	0.755	0.092	n/a
31	0.003	3.021	0.109	n/a
32	0.001	0.785	0.086	n/a
33	0.003	2.505	0.102	n/a
34	0.001	0.892	0.081	n/a
35	0.002	1.994	0.096	n/a
36	0.001	0.992	0.077	n/a
37	0.001	1.234	0.091	n/a
38	0.001	0.961	0.073	n/a
39	0.001	1.113	0.087	n/a
40	0.001	1.071	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.

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■ AC / DC Adapter MODE

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	0.051			
2	0.001	0.099	1.080	n/a
3	0.018	0.783	2.300	PASS
4	0.001	0.347	0.430	n/a
5	0.017	1.522	1.140	PASS
6	0.001	0.395	0.300	n/a
7	0.017	2.195	0.770	PASS
8	0.001	0.507	0.230	n/a
9	0.016	4.030	0.400	PASS
10	0.001	0.783	0.184	n/a
11	0.016	4.708	0.330	PASS
12	0.001	0.682	0.153	n/a
13	0.015	7.006	0.210	PASS
14	0.001	0.775	0.131	n/a
15	0.013	8.820	0.150	PASS
16	0.001	1.136	0.115	n/a
17	0.012	9.122	0.132	PASS
18	0.001	1.131	0.102	n/a
19	0.011	9.583	0.118	PASS
20	0.001	0.840	0.092	n/a
21	0.011	6.639	0.161	PASS
22	0.001	0.872	0.084	n/a
23	0.010	6.534	0.147	PASS
24	0.001	0.990	0.077	n/a
25	0.008	5.972	0.135	PASS
26	0.001	0.887	0.071	n/a
27	0.007	5.321	0.125	PASS
28	0.001	0.857	0.066	n/a
29	0.005	4.704	0.116	PASS
30	0.001	0.997	0.061	n/a
31	0.004	4.108	0.109	n/a
32	0.001	0.961	0.058	n/a
33	0.004	3.622	0.102	n/a
34	0.001	1.086	0.054	n/a
35	0.003	2.922	0.096	n/a
36	0.001	1.106	0.051	n/a
37	0.002	2.133	0.091	n/a
38	0.001	1.222	0.048	n/a
39	0.001	1.679	0.087	n/a
40	0.001	1.258	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.

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Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.052			
2	0.001	0.078	1.620	n/a
3	0.018	0.533	3.450	PASS
4	0.002	0.294	0.645	n/a
5	0.018	1.032	1.710	PASS
6	0.001	0.305	0.450	n/a
7	0.017	1.490	1.155	PASS
8	0.001	0.387	0.345	n/a
9	0.016	2.734	0.600	PASS
10	0.002	0.729	0.276	n/a
11	0.016	3.191	0.495	PASS
12	0.001	0.525	0.230	n/a
13	0.015	4.745	0.315	PASS
14	0.001	0.592	0.197	n/a
15	0.014	6.005	0.225	PASS
16	0.002	1.135	0.173	n/a
17	0.013	6.383	0.199	PASS
18	0.002	0.985	0.153	n/a
19	0.012	6.535	0.178	PASS
20	0.001	0.629	0.138	n/a
21	0.011	6.741	0.161	PASS
22	0.001	0.859	0.125	n/a
23	0.010	6.608	0.147	PASS
24	0.001	0.854	0.115	n/a
25	0.008	6.054	0.135	PASS
26	0.001	0.672	0.106	n/a
27	0.007	5.391	0.125	PASS
28	0.001	0.644	0.099	n/a
29	0.006	5.069	0.116	PASS
30	0.001	0.761	0.092	n/a
31	0.005	4.209	0.109	n/a
32	0.001	0.739	0.086	n/a
33	0.004	3.730	0.102	n/a
34	0.001	0.832	0.081	n/a
35	0.003	3.084	0.096	n/a
36	0.001	0.960	0.077	n/a
37	0.002	2.254	0.091	n/a
38	0.001	0.952	0.073	n/a
39	0.002	1.923	0.087	n/a
40	0.001	0.946	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.**

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Test Data - Voltage Fluctuations**■ AC MODE**

Flicker Measurements					
	P_{It}	Max P_{st}	Max D_c	Max D_{max}	Max T_{max}
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

■ AC / DC Adapter MODE

Flicker Measurements					
	P_{It}	Max P_{st}	Max D_c	Max D_{max}	Max T_{max}
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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APPENDIX B – Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ AC MODE



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■ AC / DC Adapter MODE

Conducted Telecommunication Emissions

■ AC MODE

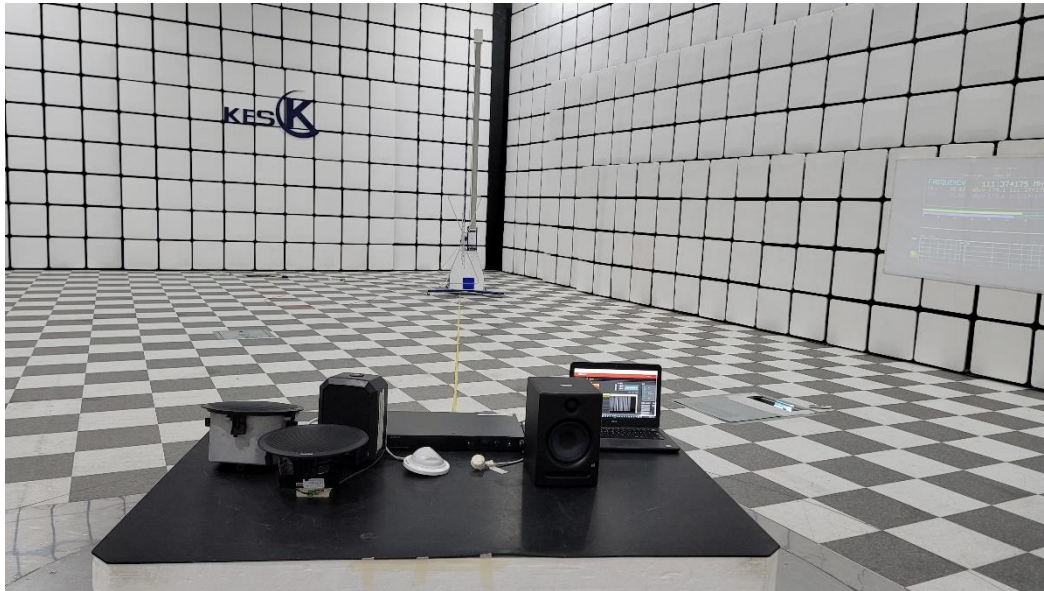


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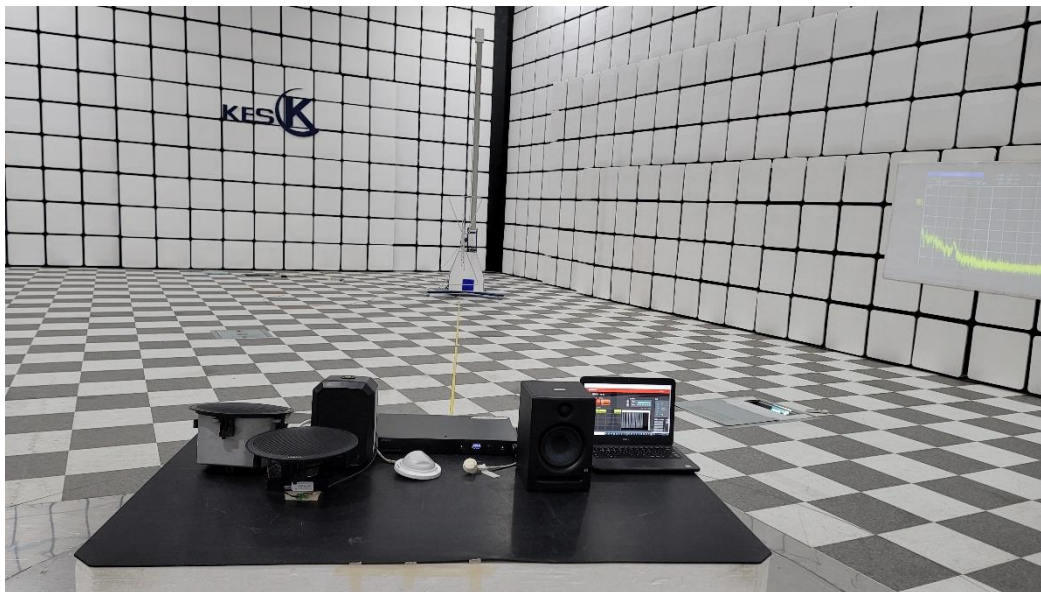
■ AC / DC Adapter MODE

Radiated Electric Field Emissions(Below 1 GHz)

■ AC MODE



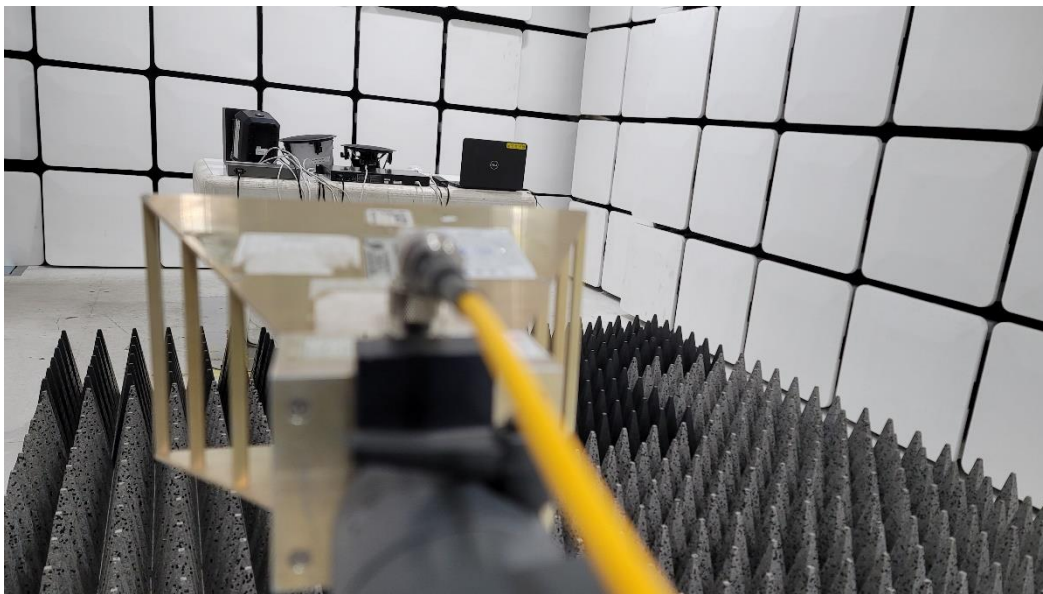
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■ AC / DC Adapter MODE

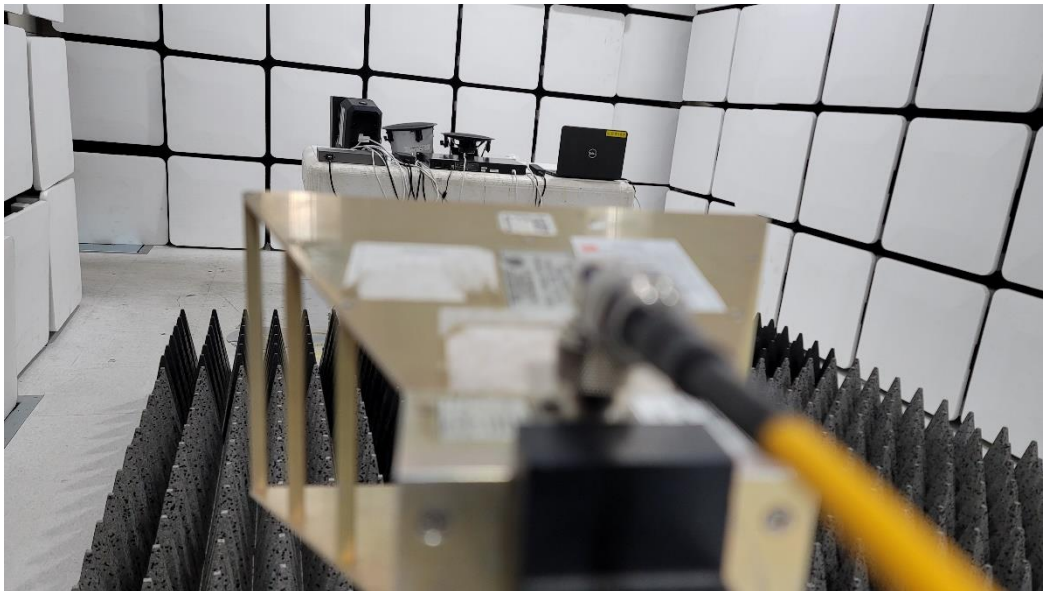
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Radiated Electric Field Emissions(Above 1 GHz)

■ AC MODE



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■ AC / DC Adapter MODE

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Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ AC MODE



■ AC / DC Adapter MODE



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Electrostatic Discharge

■ AC MODE



■ AC / DC Adapter MODE



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Radiated Electric Field Immunity

■ AC MODE



■ AC / DC Adapter MODE



Electrical Fast Transients/Bursts

■ AC MODE



■ AC / DC Adapter MODE



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Surge Transients

■ AC MODE



■ AC / DC Adapter MODE



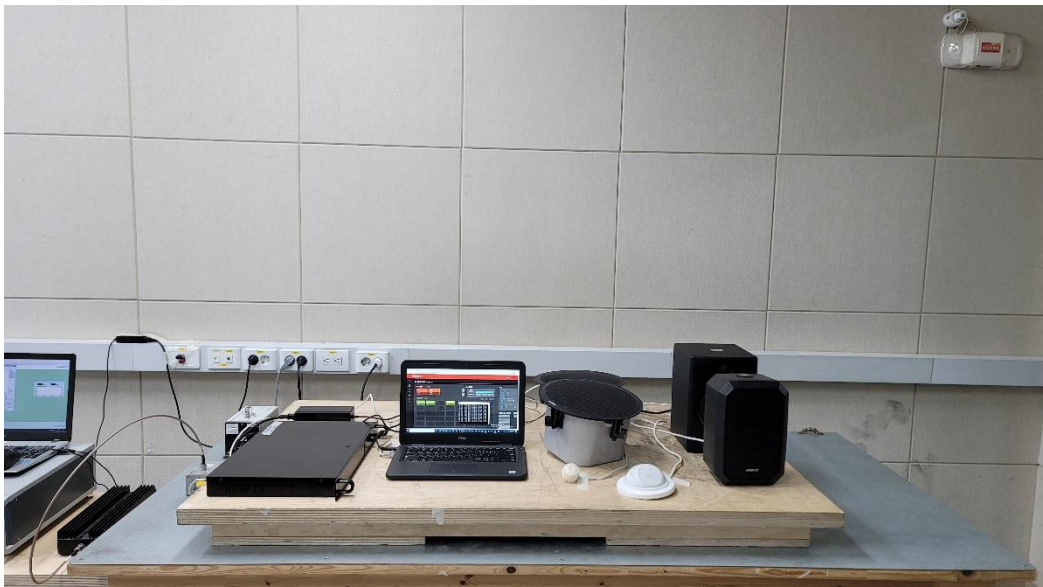
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Conducted Disturbance

■ AC MODE



■ AC / DC Adapter MODE



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Power Frequency Magnetic Field Immunity

N/A

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Voltage Dips and Short Interruptions

■ AC MODE



■ AC / DC Adapter MODE



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APPENDIX C – EUT Photographs

EUT External Photographs

(Top)



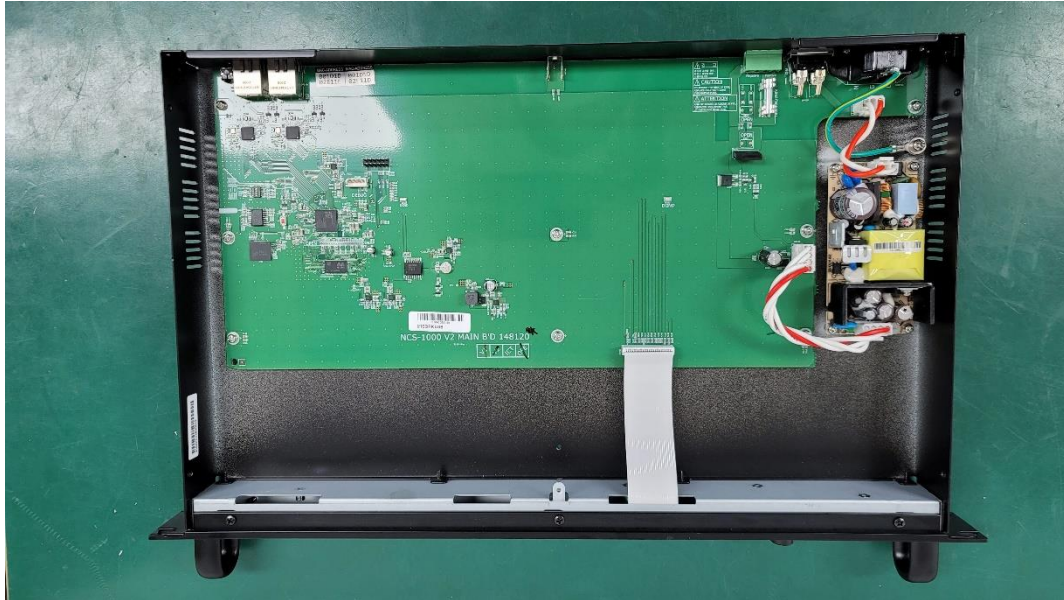
(Bottom)



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EUT Internal Photographs

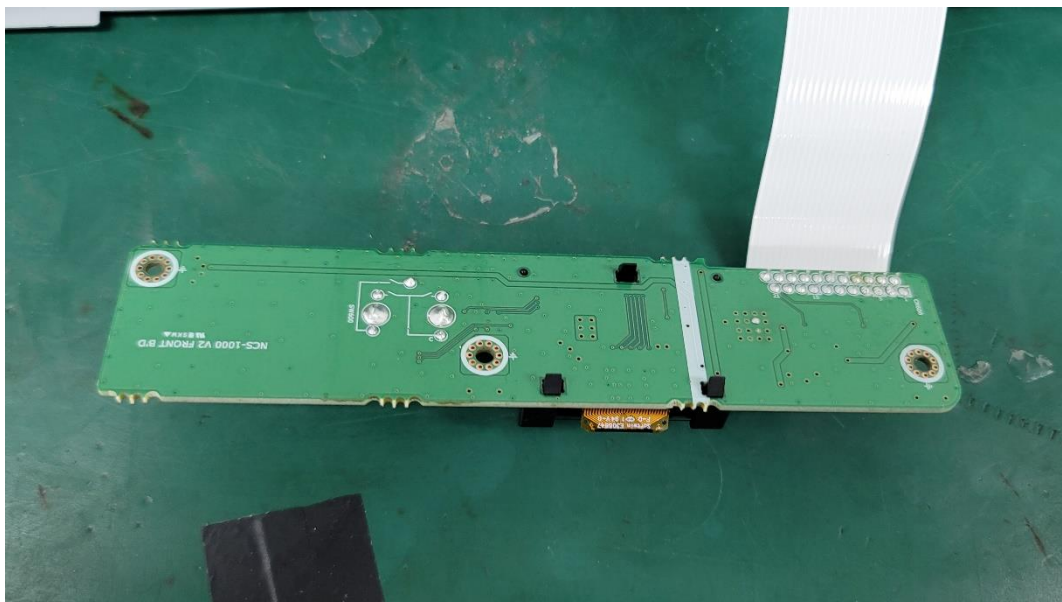
(Internal View)



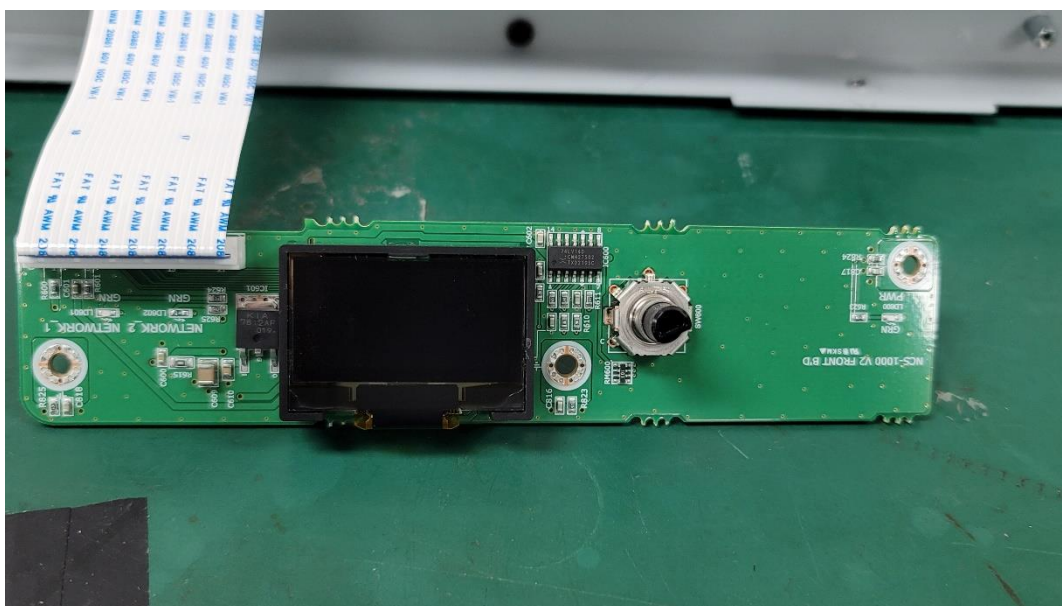
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EUT Internal View – Board 1

(Top)

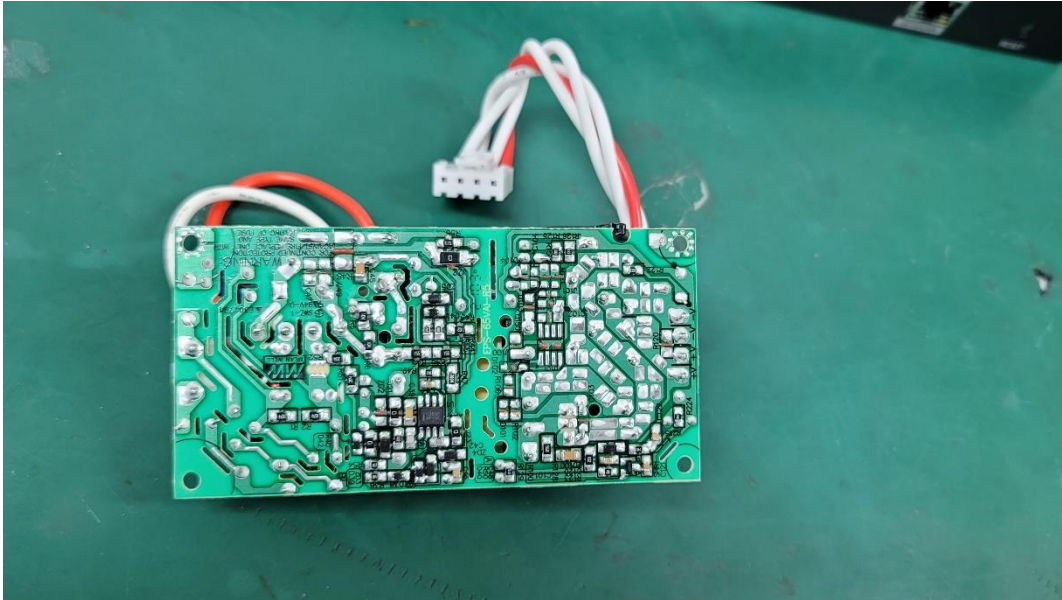


(Bottom)

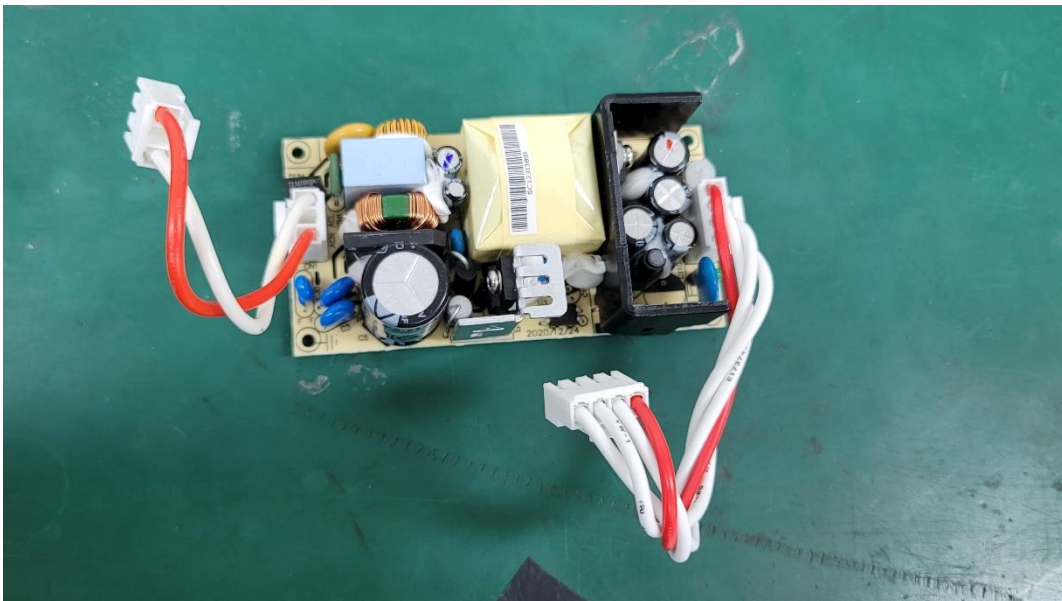


EUT Internal View – Board 2

(Top)



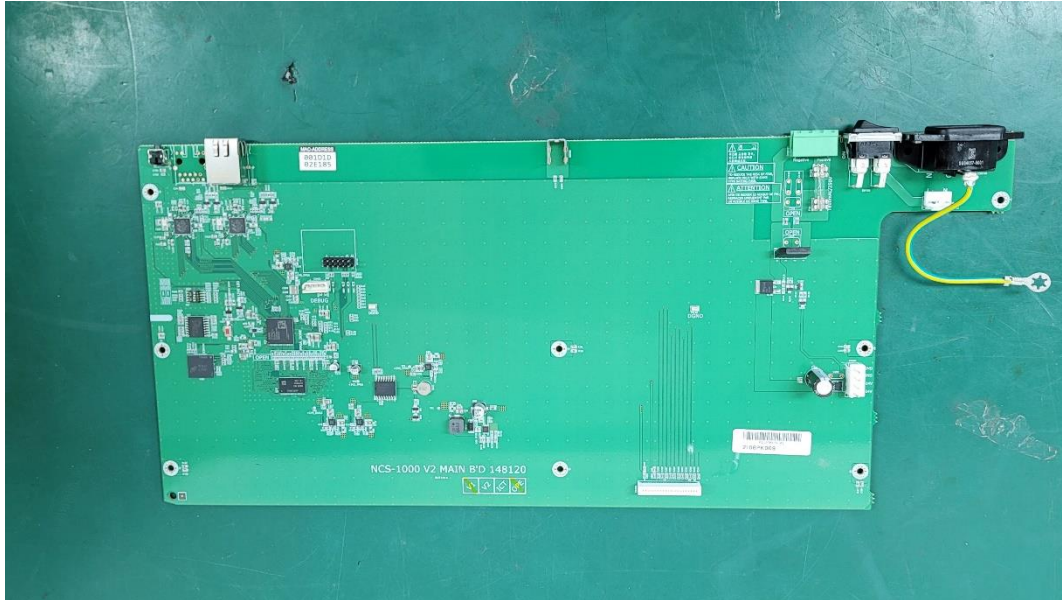
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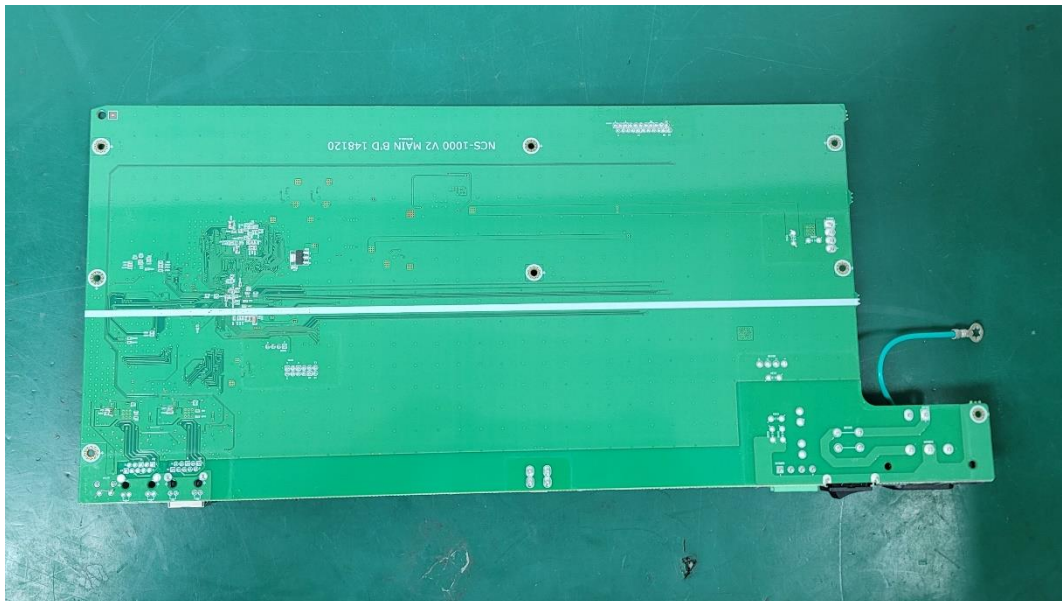
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EUT Internal View – Board 3

(Top)



(Bottom)



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Label and Location



AUDIO SERVER

Model No : SPA-S1000

Manufacturer : Inter-M Corporation

Made in Vietnam

