



EMC TEST REPORT

Test Report No. : KES-EM-23T0062-R1
Date of Issue : Jun. 12, 2023
Product name : USB JOYSTICK CONTROLLER
Model/Type No. : SPC-2001
Variant Model : -
Applicant : Hanwha Vision Co., Ltd
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : WONWOO Engineering Co.,Ltd.
Manufacturer Address : 81, Magokjungang 6-ro, Gangseo-gu, Seoul, Republic of Korea
Date of Receipt : Dec. 28, 2022
Test date : Jan. 02, 2023 ~ Jan. 04, 2023
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

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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 No.:
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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Jan. 25, 2023	KES-EM-23T0062	Issued
Jun. 12, 2023	KES-EM-23T0062-R1	Change the Applicant and manufacturer at the request of the customer

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1.0 General Product Description

Main Specifications of EUT are:

Model Name		SPC-2001
Joystick		
Axis		Hall-effect 3 Axis
Button		12ea
Performance		
Range of Movement	X/Y-Axis	$\pm 18^\circ$
	Z Axis	$\pm 28^\circ$
Center		Two Spring, Two Directions
Minimum Power		0.109 [N·m]
Operating Power		0.151 [N·m]
Maximum Power		0.169 [N·m]
Materials		
Housing		ABS
Handle		Poly Carbonate
Cover		Rubber (Button)
Shaft		SUM24L + Ni plating
Interface		
Port		4-pin USB Type A
Software		
Drivers		Standard DirectX Drivers (DirectInput)
Electric Features		
Operating Voltage		(DC 5 [V]), Vdd = 5 [V] (± 0.5 [V]) via USB
Operating Current		30 [mA]
Operating Environment		
Temperature		0°C to +40°C (20% ~ 85% RH)
Miscellaneous		2 [m]
Size(WxDxH)		182 X 182 X 106 [mm]

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 (USB)

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
USB JOYSTICK CONTROLLER	SPC-2001	-	WONWOO Engineering Co.,Ltd.	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	P95G001	9JM8HT2	DELL INC.	-
Notebook Adaptor	LA65NS2-01	-	LITE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	-

1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
USB JOYSTICK CONTROLLER (EUT)	USB	Notebook	USB	1.8	U
Notebook	JACK	Notebook Adaptor	JACK	1.7	U

* Unshielded=U, Shielded=S

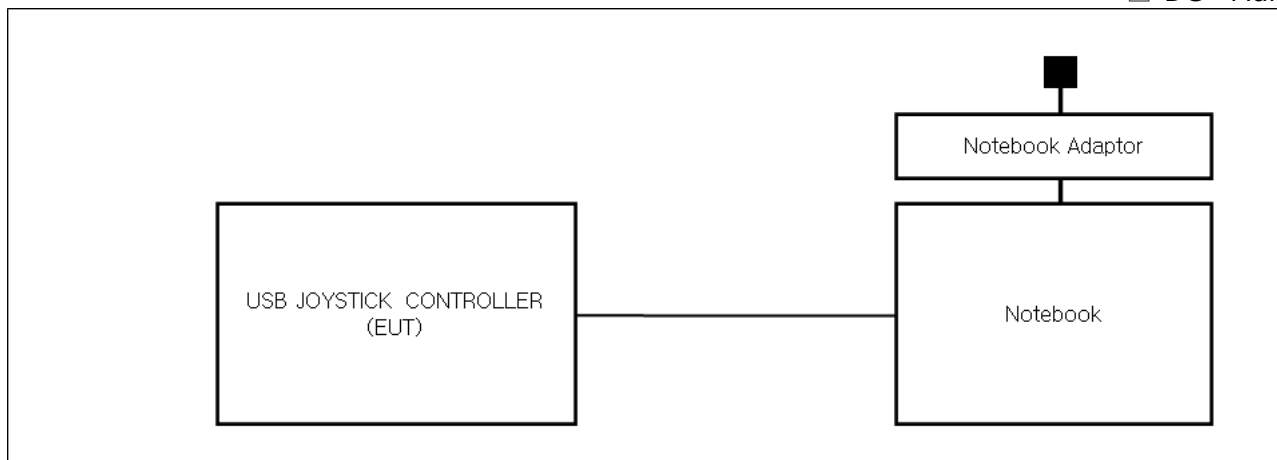
1.7 EUT Operating Mode(s)

Test Mode	operating
Operate	-After arranging the test equipment and peripherals as shown in the layout diagram below, 1. After running the device manager, check the device recognition 2. After running the USB controller confirmation window, check the operation of the joystick and the operation of the buttons

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

1.8 Configuration

☒ AC Main
☐ DC Main



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 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☒ **EMC – Regulations 2016**

☒ EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

2.1 Conducted Emissions at Mains Power Ports

Test Date

Jan. 02, 2023

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
☒	LISN	ENV216	R & S	101787	11, 10, 2023
☐	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 10, 2023

Test Conditions

Temperature: (22,5 ± 0,1) °C

Relative Humidity: (45,5 ± 0,1) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date

N/A

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMI Test S/W	EMC32	R & S	9.12.00	-
☐	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
☐	LISN	ENV216	R & S	101787	11, 10, 2023
☐	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
☐	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 10, 2023
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	11, 22, 2023

Test Conditions

Temperature: (±) °C

Relative Humidity: (±) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☐ PASS
☐ NOT PASS
☒ NOT APPLICABLE

RemarksNot tested because there is no communication port.

2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Jan. 02, 2023

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	03, 31, 2023
☒	AMPLIFIER	SCU 01	R & S	100603	11, 10, 2023
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 17, 2024
☒	ATTENUATOR	8491A	HP	32173	03, 08, 2023

Test Conditions

Temperature: (22,3 ± 0,1) °C

Relative Humidity: (44,6 ± 0,1) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE**Remarks**See Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Jan. 02, 2023

Test Location

SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESR7	R & S	101190	08, 01, 2023
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 01, 2023
☒	ATTENUATOR	8491A	HP	35496	03, 08, 2023
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 03, 2023

Test Conditions

Temperature: (22,6 ± 0,1) °C

Relative Humidity: (45,0 ± 0,1) % R.H.

Frequency Range of Measurement

1 GHz to 6 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

2.5 Harmonic Current Emissions

Test Date

Jan. 02, 2023

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2023
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (22,2 ± 0,4) °C

Relative Humidity: (46,0 ± 0,4) % 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

Jan. 02, 2023

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2023
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (22,2 ± 0,6) °C

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

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 Alarm systems-Part 4: Electromagnetic compatibility Product family
standard: Immunity requirements for components of fire, intruder and social alarm systems

The variety and the diversity of the apparatus within the scope of this document makes it difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance by the manufacture and noted in the test report, based on the following criteria:

Electrostatic discharge

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

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

Radiated electromagnetic fields

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

Flickering of an indicator during the application of discharge is permissible, providing which could be interpreted by associated equipment as a change, and no such

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

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

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

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

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

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

Fast transient burst / slow high energy voltage surge

There shall be no damage, malfunction or change of status due to the conditioning.
Flickering of an indicator during the application of discharge is permissible, providing
That there is no residual is permissible, providing that there is no residual change in the EUT or
any
change in outputs, which could be interpreted by associated equipment as a change.

Conducted RF immunity

There shall be no damage, malfunction or change of status due to the conditioning.
Flickering of an indicator during the application of discharge is permissible, providing
That there is no residual is permissible, providing that there is no residual change in the EUT or
any
change in outputs, which could be interpreted by associated equipment as a change,
and no such flickering of indicators oeuvres at $U = 130 \text{ dB}\mu\text{V}$.
For component of CCTV systems, where the status is monitored by observing the TV picture,
then deterioration of the picture is allowed at $U = 140 \text{ dB}\mu\text{V}$, providing:
(a) there is no permanent damage or change to the EUT
(e.g. no corruption of memory or changes to programmable settings etc.)
(b) at $U = 130 \text{ dB}\mu\text{V}$, any deterioration of the picture is so minor that the system could
still be used; and
(c) there in no observable deterioration of the picture at $U = 120 \text{ dB}\mu\text{V}$.

Voltage dip/interruption / Voltage variation

There shall be no damage, malfunction or change of status due to the conditioning.
Flickering of an indicator during the conditioning is permissible, providing that there is no
residual
change in the EUT or any change in outputs, which could be interpreted by associated
equipment
as a change. The EUT shall meet the acceptance criteria for the functional test, after the
conditioning.

3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Jan. 04, 2023

Test Location

EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	02, 24, 2023
☒	HCP	-	KES	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: (22,5 ± 0,1) °C
Relative Humidity: (45,1 ± 0,1) % R.H.
Atmospheric Pressure: (100,5 ± 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

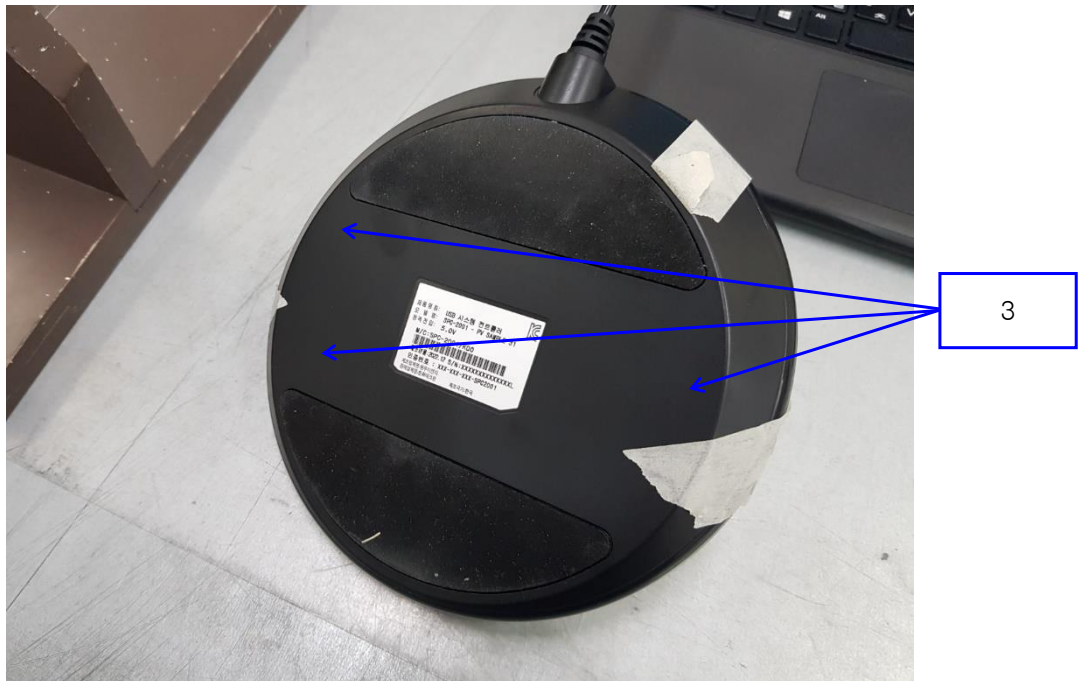
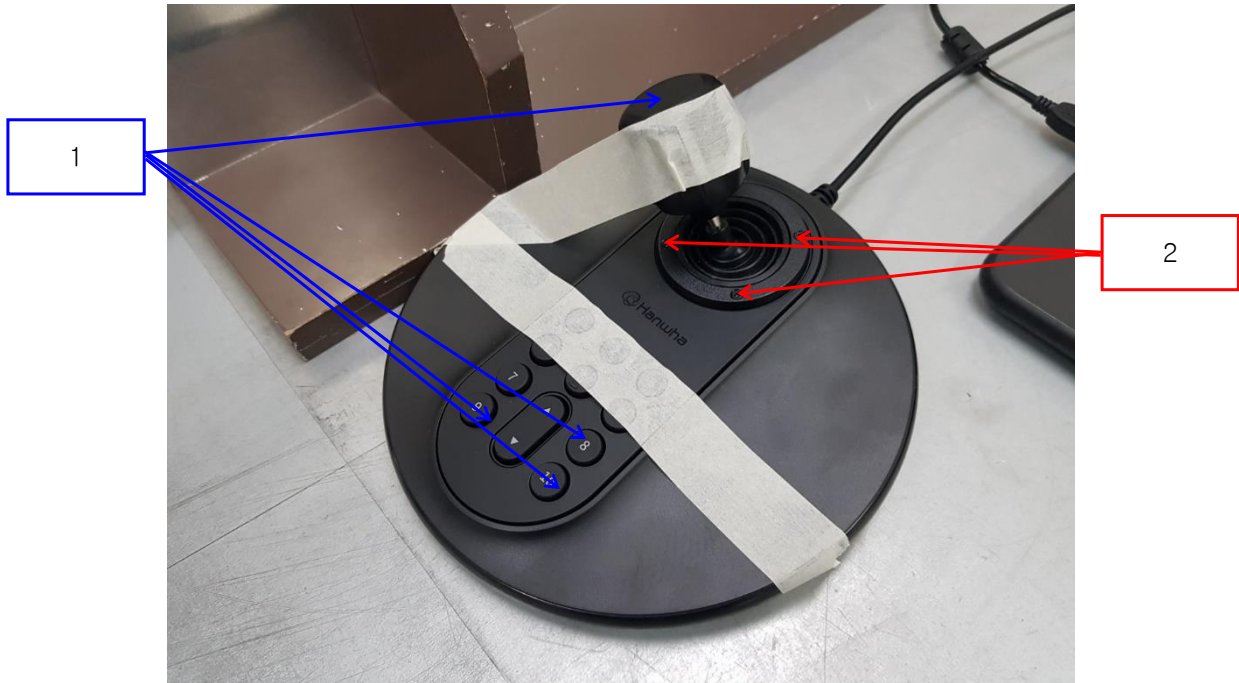
Discharge Voltage:	Contact ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV	Air ☒ 2 kV ☒ 4 kV ☐ 6 kV ☒ 8 kV ☐ 15 kV	HCP ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV	VCP ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV
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Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

Location of Discharge:

Air
Contact



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Test Data

Indirect Discharge

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Buttons and Joystick	Air Discharge	Complied	-
2	Screw	Contact Discharge	Complied	-
3	Enclosure	Air Discharge	Complied	-
4	USB Port	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria

3.2 Radiated Electric Field Immunity

Reference Standard

EN IEC 61000-4-3:2020

Test Date

Jan. 02, 2023

Test Location

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	10.10.02	-
☒	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 01, 2023
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
☒	POWER METER	E4419B	Agilent	GB40203000	03, 31, 2023
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY52170007	04, 04, 2023
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY41498669	04, 04, 2023
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 03, 2023

Test Conditions

Temperature: (22,6 ± 0,6) °C
Relative Humidity: (45,0 ± 0,6) % R.H.
Atmospheric Pressure: (101,0 ± 0,0) kPa



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Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

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

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 1,4 GHz to 2,7 GHz
☒ 80 MHz to 2,7 GHz

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

Frequency step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

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Test Data

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

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

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

RemarksPASS Required Performance Criteria

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3.3 Electrical Fast Transients/Bursts

Reference Standard

EN 61000-4-4:2012

Test Date

Jan. 04, 2023

Test Location

EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 28, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 29, 2023
☐	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 28, 2023

Test Conditions

Temperature: (22,5 ± 0,1) °C
Relative Humidity: (45,1 ± 0,1) % R.H.
Atmospheric Pressure: (100,5 ± 0,0) kPa

Test Specifications

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

Pulse Amplitude & Polarity:
(Other supply / 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: ☒ Complied

Test Data

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

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

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

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

☐ Signal ports and telecommunication ports – Coupling Clamp used

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

Note: “Blank” = Not performed

Observations:

Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.4 Surge Transients

Reference Standard

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

Test Date

Jan. 04, 2023

Test Location

EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 28, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 29, 2023
☐	CDN	CNV 508N1	EM TEST	P1610176296	11, 29, 2023

Test Conditions

Temperature: (22,5 ± 0,4) °C
Relative Humidity: (45,1 ± 0,4) % R.H.
Atmospheric Pressure: (100,5 ± 0,0) kPa



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Test Specifications

AC Power Lines

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

Surge Amplitude :

Common Mode

☒ (0,5 / 1,0 / 2,0) kV

Differential Mode

☒ (0,5 / 1,0) kV

Number of Surges:

☒ 5 surges per angle

Angle:

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

Polarity:

☒ Positive & Negative

Repetition Rate:

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

Required Performance Criteria: ☒ Complied

Other supply / Signal Lines

Source Impedance:

42 ohm for common Mode

Surge Amplitude:

Common Mode

☐ (0,5 / 1,0) kV

Number of Surges:

☐ 5 Surges

Polarity:

☐ Positive & Negative

Repetition Rate:

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

Required Performance Criteria: ☐ Complied

Test Data

☒ Line to Line – Differential Mode

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

☒ Line to Earth – Common Mode

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

Signal Lines

☐ Line to Earth – Common Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
-	CDN	-	-
	LINE	-	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Jan. 03, 2023

Test Location

EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.12	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 10, 2023
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 10, 2023
☒	CDN	CDN M016	TESEQ	43694	11, 10, 2023
☐	CDN	CDN M016	TESEQ	43697	11, 10, 2023
☐	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 14, 2023

Test Conditions

Temperature: (22,6 ± 0,6) °C
Relative Humidity: (46,1 ± 0,6) % R.H.
Atmospheric Pressure: (101,1 ± 0,0) kPa



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Test Specifications

Frequency range:

☒ 150 kHz to 100 MHz

☐ 150 kHz to 80 MHz

Voltage Level:

☐ 1 Vrms

☐ 3 Vrms

☒ 10 Vrms

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: ☒ Complied

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Test Data☒ Input a.c. power ports

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

☐ Input d.c. power ports

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

☐ Signal ports and telecommunication ports

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

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

Observations:

Complied – No degradation of function

Test Results

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

RemarksPASS Required Performance Criteria

3.6 Voltage Dips and Short Interruptions

Reference Standard
EN IEC 61000-4-11:2020

Test Date
Jan. 04, 2023

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 29, 2023
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 29, 2023

Test Conditions

Temperature: (22,5 ± 0,1) °C
Relative Humidity: (45,1 ± 0,1) % R.H.
Atmospheric Pressure: (100,5 ± 0,0) kPa



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Test Specifications & Observations/Remarks

- Voltage Dips and Short Interruptions

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

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 195.5 V (ac)	<u>Complied</u>

Observations:

Complied – No degradation of function

Degradation - See "Remarks "

Test Results

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

Remarks

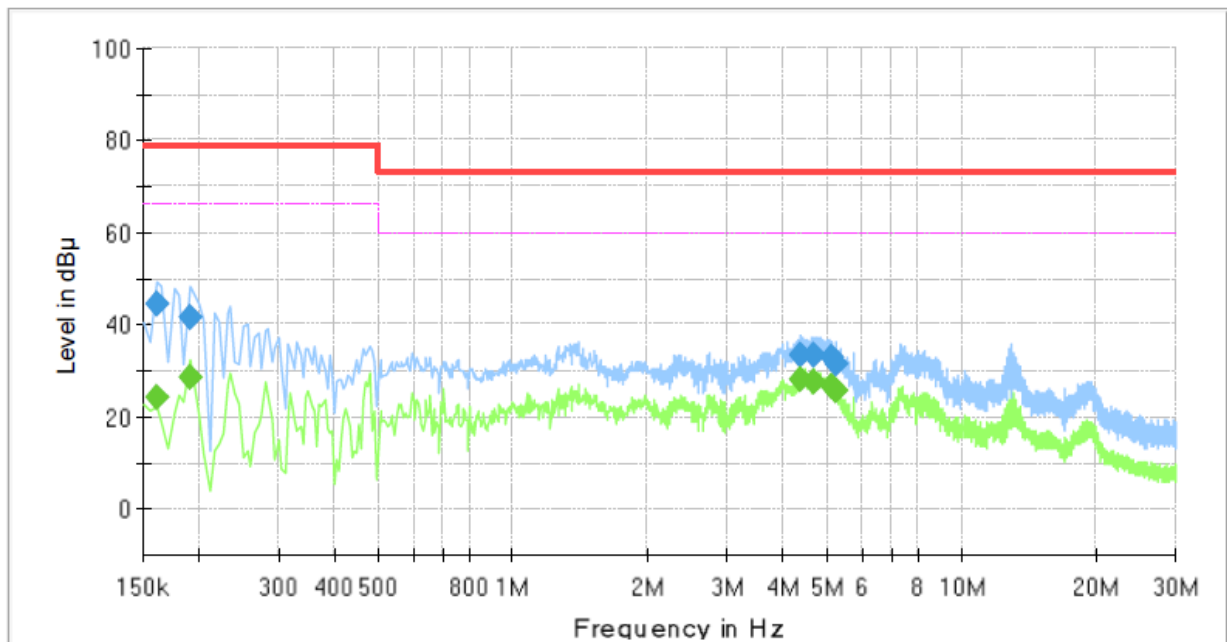
During the test(100%, 250cycle), EUT was turned off but after the test, it was recovered by no operator's intervention.

APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports [HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	SPC-2001
Phase:	L1
Mode:	
Operator Name:	KES



Final Result

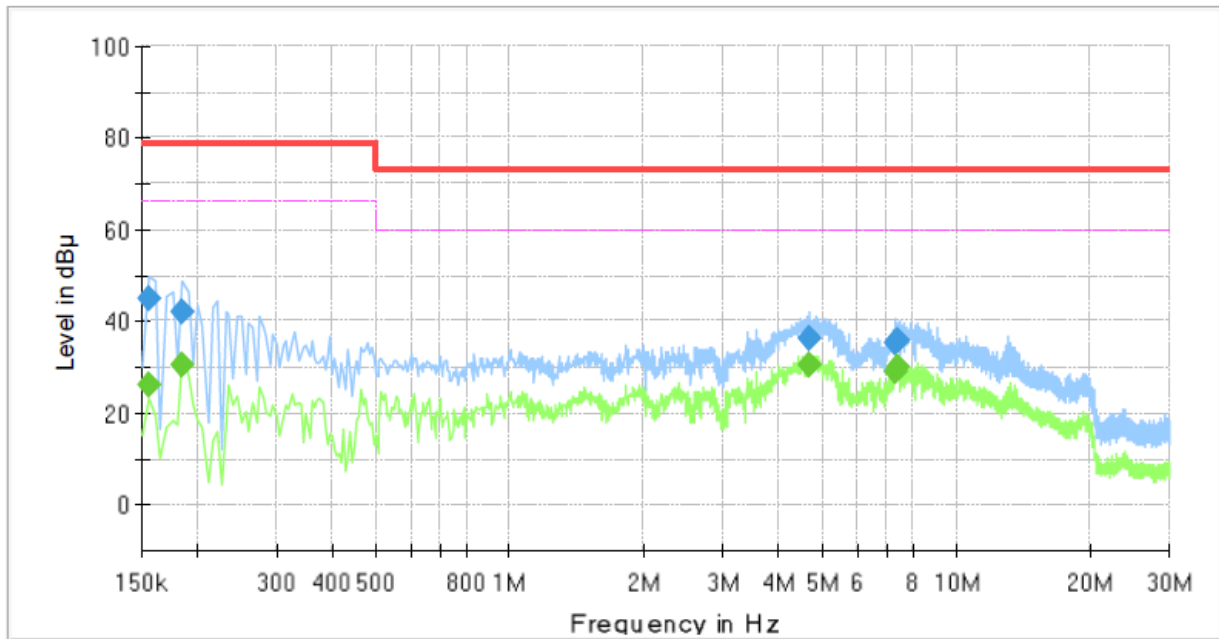
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	24.44	66.00	41.56	1000.0	9.000	L1	19.5
0.160000	44.29	---	79.00	34.71	1000.0	9.000	L1	19.5
0.190000	---	28.76	66.00	37.24	1000.0	9.000	L1	19.5
0.190000	41.48	---	79.00	37.52	1000.0	9.000	L1	19.5
4.365000	---	27.97	60.00	32.03	1000.0	9.000	L1	19.8
4.365000	33.39	---	73.00	39.61	1000.0	9.000	L1	19.8
4.675000	---	27.59	60.00	32.41	1000.0	9.000	L1	19.8
4.675000	33.30	---	73.00	39.70	1000.0	9.000	L1	19.8
5.130000	---	26.63	60.00	33.37	1000.0	9.000	L1	19.7
5.130000	32.75	---	73.00	40.25	1000.0	9.000	L1	19.7
5.250000	---	25.90	60.00	34.10	1000.0	9.000	L1	19.7
5.250000	31.57	---	73.00	41.43	1000.0	9.000	L1	19.7

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[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	SPC-2001
Phase:	N
Mode:	
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.155000	---	26.35	66.00	39.65	1000.0	9.000	N	19.4
0.155000	45.07	---	79.00	33.93	1000.0	9.000	N	19.4
0.185000	---	30.56	66.00	35.44	1000.0	9.000	N	19.5
0.185000	42.30	---	79.00	36.70	1000.0	9.000	N	19.5
4.670000	---	30.38	60.00	29.62	1000.0	9.000	N	19.8
4.670000	36.44	---	73.00	36.56	1000.0	9.000	N	19.8
7.290000	---	29.26	60.00	30.74	1000.0	9.000	N	19.6
7.290000	35.49	---	73.00	37.51	1000.0	9.000	N	19.6
7.365000	---	29.95	60.00	30.05	1000.0	9.000	N	19.6
7.365000	35.98	---	73.00	37.02	1000.0	9.000	N	19.6

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))



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Conducted Emissions at Telecommunication Ports

[1 000 Mbps]

N/A

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

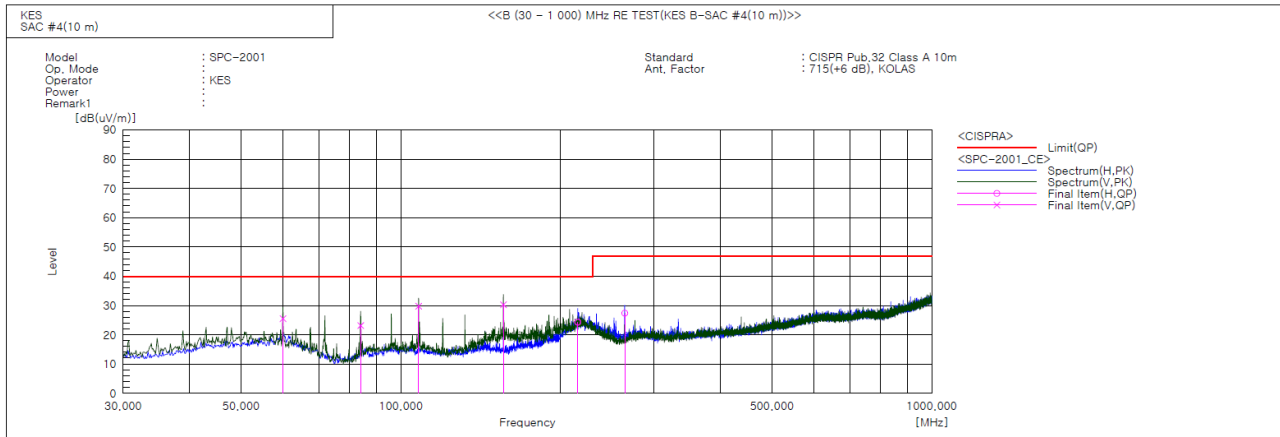
QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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Radiated Electric Field Emissions(Below 1 GHz)



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	59.949	V	47.1	-21.6	25.5	40.0	14.5	145.0	249.0	
2	83.956	V	49.6	-26.4	23.2	40.0	16.8	100.0	84.0	
3	107.964	V	52.2	-22.4	29.8	40.0	10.2	112.0	170.0	
4	155.979	V	55.1	-24.8	30.3	40.0	9.7	145.0	211.0	
5	215.391	H	44.1	-19.8	24.3	40.0	15.7	195.0	272.0	
6	264.013	H	45.9	-18.5	27.4	47.0	19.6	397.0	344.0	

◆ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)

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

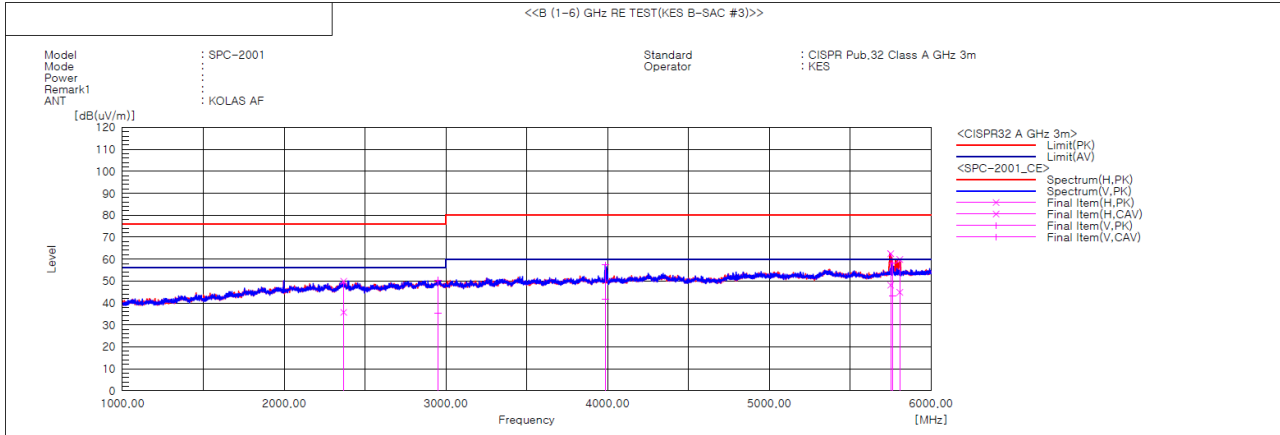
Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

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



Radiated Electric Field Emissions(Above 1 GHz)



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	2367.868	H	43.7	29.5	6.2	49.9	35.7	76.0	56.0	26.1	20.3	100.0	353.9	
2	2951.756	V	42.4	27.5	7.9	50.3	35.4	76.0	56.0	25.7	20.6	100.0	252.7	
3	3985.986	V	46.5	30.8	10.8	57.3	41.6	80.0	60.0	22.7	18.4	100.0	219.4	
4	5751.075	H	46.8	32.4	15.7	62.5	48.1	80.0	60.0	17.5	11.9	100.0	234.7	
5	5761.753	V	42.3	27.6	15.8	58.1	43.4	80.0	60.0	21.9	16.6	100.0	5.7	
6	5807.113	H	43.8	28.9	16.0	59.8	44.9	80.0	60.0	20.2	15.1	100.0	236.9	

◆ 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

Harmonic Current Emissions and Voltage Fluctuations and Flicker

Average harmonic current results				
Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.088			
2	0.003	0.262	1.080	n/a
3	0.078	3.390	2.300	PASS
4	0.005	1.084	0.430	n/a
5	0.077	6.718	1.140	PASS
6	0.004	1.238	0.300	n/a
7	0.075	9.748	0.770	PASS
8	0.004	1.644	0.230	n/a
9	0.072	18.073	0.400	PASS
10	0.004	2.212	0.184	n/a
11	0.070	21.141	0.330	PASS
12	0.004	2.469	0.153	n/a
13	0.067	31.775	0.210	PASS
14	0.004	3.190	0.131	n/a
15	0.063	42.046	0.150	PASS
16	0.004	3.460	0.115	n/a
17	0.059	44.791	0.132	PASS
18	0.004	3.673	0.102	n/a
19	0.055	46.332	0.118	PASS
20	0.004	3.823	0.092	n/a
21	0.050	31.288	0.161	PASS
22	0.003	4.125	0.084	n/a
23	0.046	31.262	0.147	PASS
24	0.003	4.418	0.077	n/a
25	0.041	30.721	0.135	PASS
26	0.003	4.721	0.071	n/a
27	0.037	29.552	0.125	PASS
28	0.003	5.116	0.066	n/a
29	0.032	27.631	0.116	PASS
30	0.003	4.898	0.061	n/a
31	0.028	25.665	0.109	PASS
32	0.003	4.856	0.058	n/a
33	0.024	23.280	0.102	PASS
34	0.003	4.753	0.054	n/a
35	0.020	20.323	0.096	PASS
36	0.002	4.138	0.051	n/a
37	0.016	17.605	0.091	PASS
38	0.002	4.207	0.048	n/a
39	0.013	14.479	0.087	PASS
40	0.002	3.870	0.046	n/a

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

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



Test Data - Harmonics (continued)

Maximum harmonic current results				
Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.109			
2	0.004	0.228	1.620	n/a
3	0.100	2.899	3.450	PASS
4	0.006	0.870	0.645	PASS
5	0.098	5.724	1.710	PASS
6	0.005	1.078	0.450	n/a
7	0.096	8.273	1.155	PASS
8	0.005	1.420	0.345	n/a
9	0.091	15.220	0.600	PASS
10	0.005	1.790	0.276	n/a
11	0.087	17.639	0.495	PASS
12	0.005	2.124	0.230	n/a
13	0.083	26.345	0.315	PASS
14	0.005	2.741	0.197	PASS
15	0.078	34.530	0.225	PASS
16	0.005	2.986	0.173	PASS
17	0.072	36.147	0.199	PASS
18	0.005	3.088	0.153	n/a
19	0.065	36.829	0.178	PASS
20	0.005	3.305	0.138	n/a
21	0.059	36.761	0.161	PASS
22	0.005	3.593	0.125	n/a
23	0.053	35.929	0.147	PASS
24	0.004	3.789	0.115	n/a
25	0.047	34.568	0.135	PASS
26	0.004	4.021	0.106	n/a
27	0.041	32.470	0.125	PASS
28	0.004	4.314	0.099	n/a
29	0.035	29.715	0.116	PASS
30	0.004	4.172	0.092	n/a
31	0.029	26.711	0.109	PASS
32	0.004	4.126	0.086	n/a
33	0.024	23.493	0.102	PASS
34	0.003	3.963	0.081	n/a
35	0.020	20.504	0.096	PASS
36	0.003	3.676	0.077	n/a
37	0.017	18.177	0.091	PASS
38	0.003	3.444	0.073	n/a
39	0.013	15.241	0.087	PASS
40	0.002	3.046	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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Test Data - Voltage Fluctuations

Maximum Flicker results

Flicker Measurements					
	Plt	Max Pst	Max Dc	Max Dmax	Max Tmax
Line 1:	0.028	0.028	0.006	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

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Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports



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Conducted Emissions at Telecommunication Ports

N/A

N/A

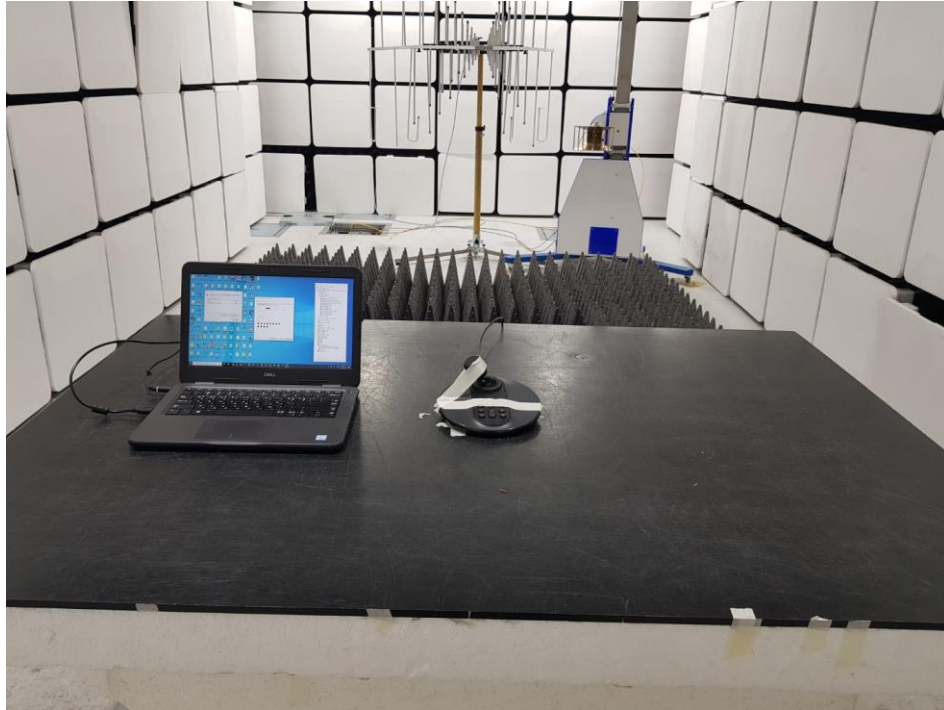
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Radiated Electric Field Emissions(Below 1 GHz)



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Radiated Electric Field Emissions(Above 1 GHz)



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Harmonic Current Emissions and Voltage Fluctuations and Flicker



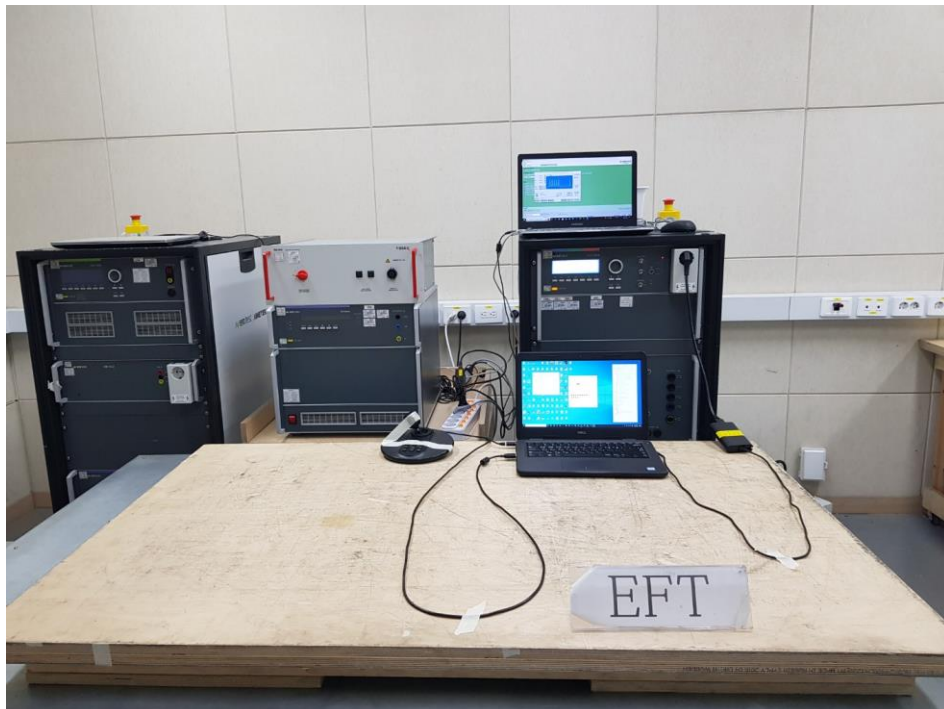
Electrostatic Discharge



Radiated Electric Field Immunity



Electrical Fast Transients/Bursts

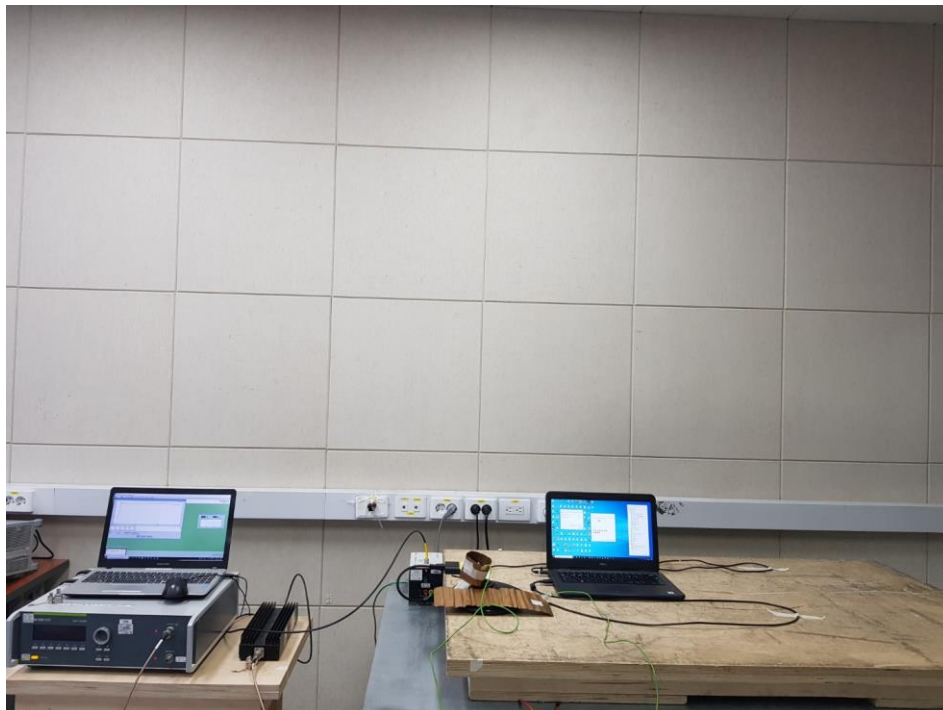


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Surge Transients

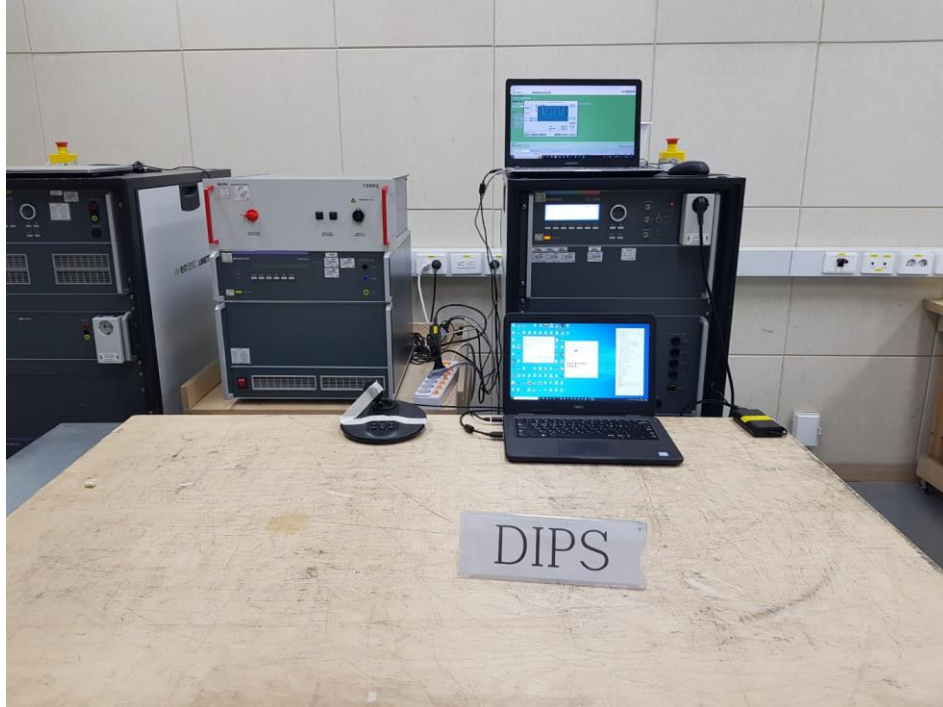


Conducted Disturbance



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Voltage Dips and Short Interruptions



EUT External Photographs

(Top)

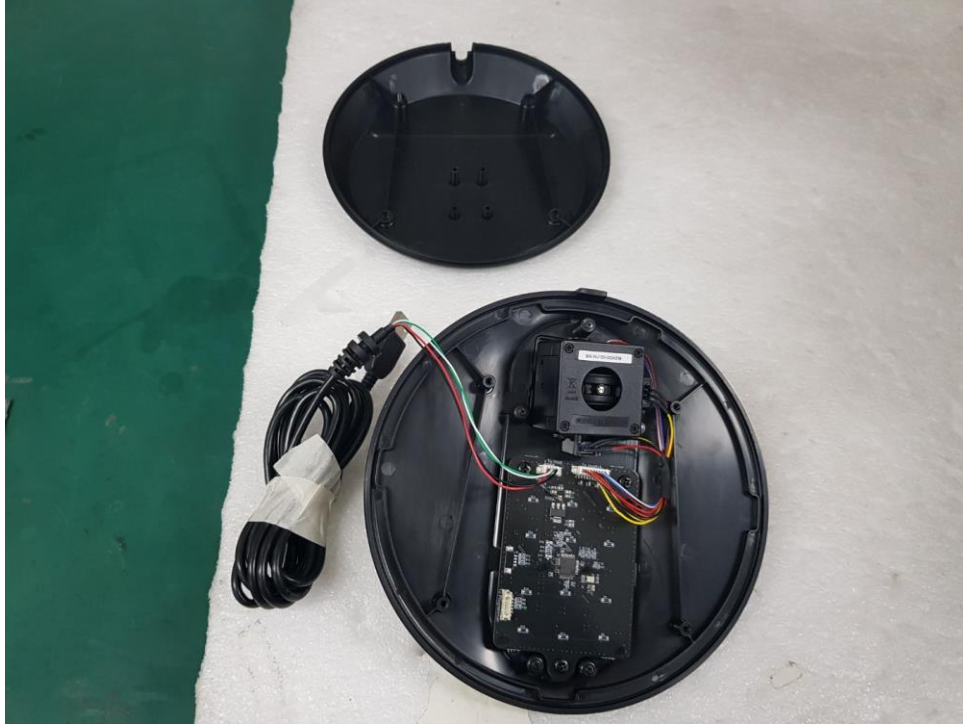


(Bottom)



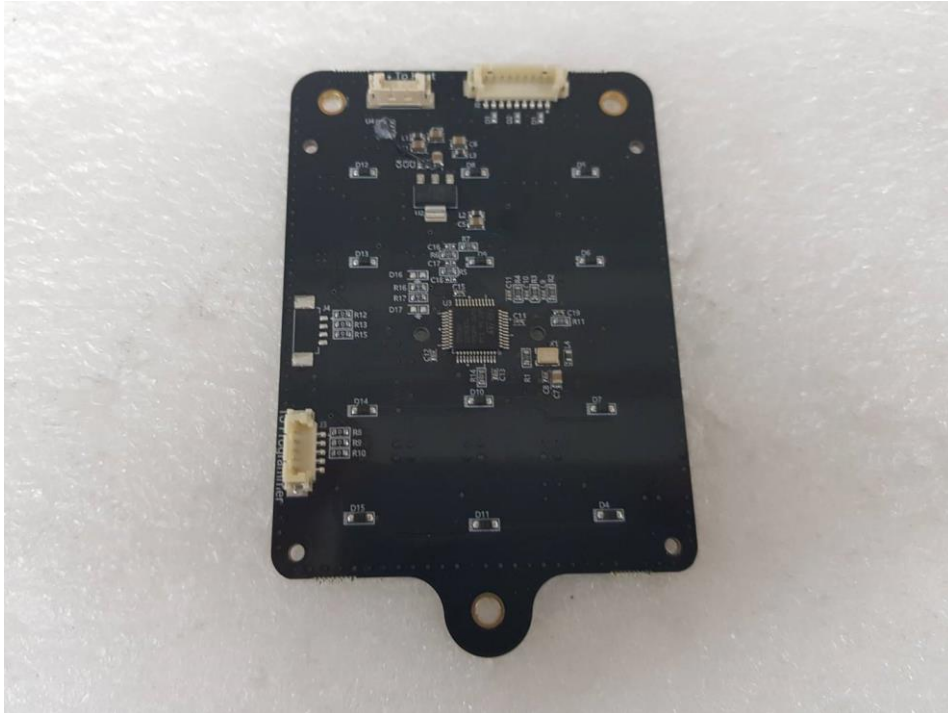
EUT Internal Photographs

(Internal View)

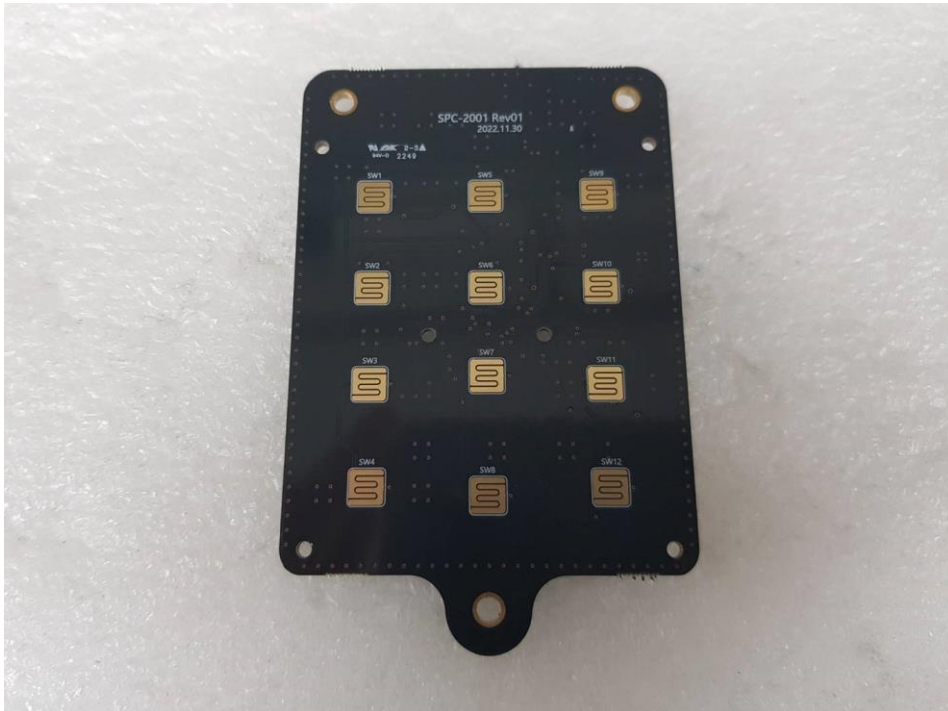


EUT Internal View – Main Board

(Top)



(Bottom)



EUT Internal View – Sub Board

(Top)

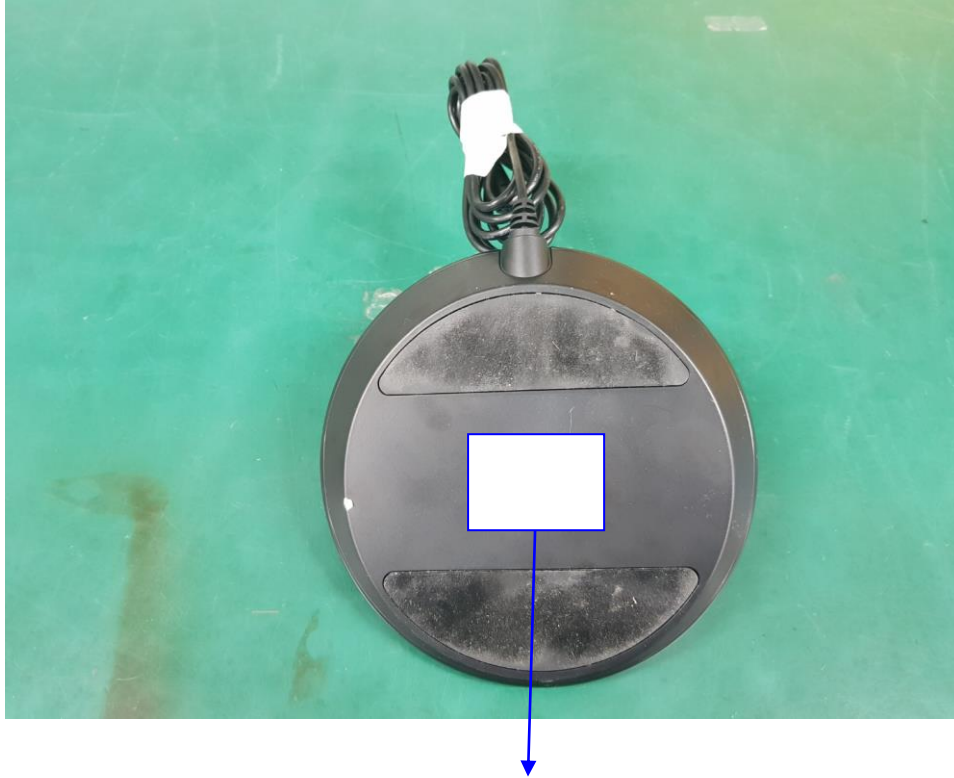


(Bottom)



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Label and Location



USB JOYSTICK CONTROLLER

Model No : SPC-2001

Manufacturer : WONWOO Engineering Co.,Ltd.

Made in Korea

