



EMC TEST REPORT For RCM

Test Report No. : KES-EM-23T0064-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 : Jun. 08, 2023
Test date : Jan. 02, 2023
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Jae Won, Lee
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.:

KES-EM-23T0064-R1

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Jan. 25, 2023	KES-EM-23T0064	Issued
Jun. 12, 2023	KES-EM-23T0064-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 240 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

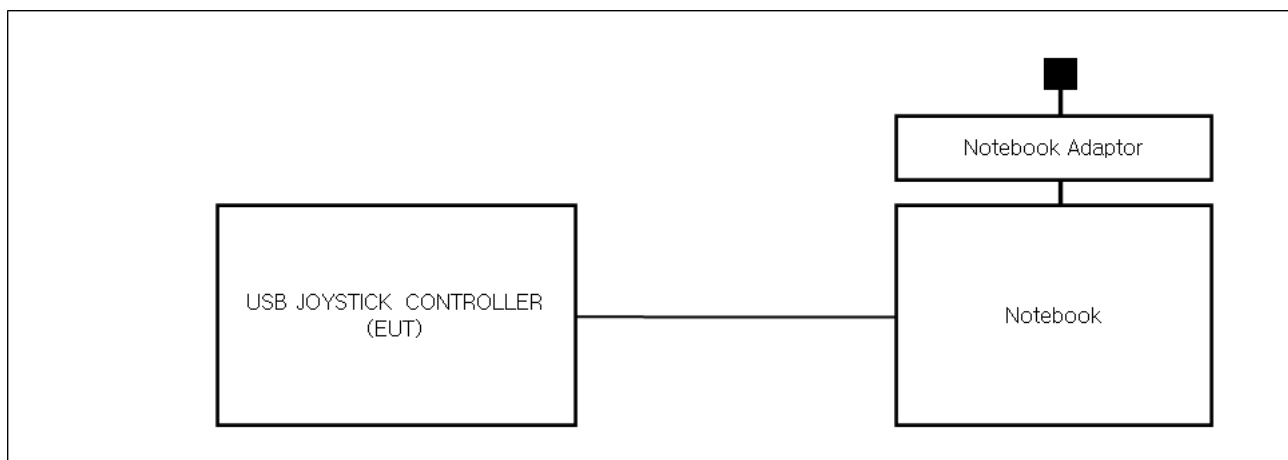
1.7 EUT Operating Mode(s)

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



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2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **AS/NZS CISPR 32:2015 AMD 1:2020**

☒ Class A

☐ Class B

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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

Remarks

See 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

Remarks

Not 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.

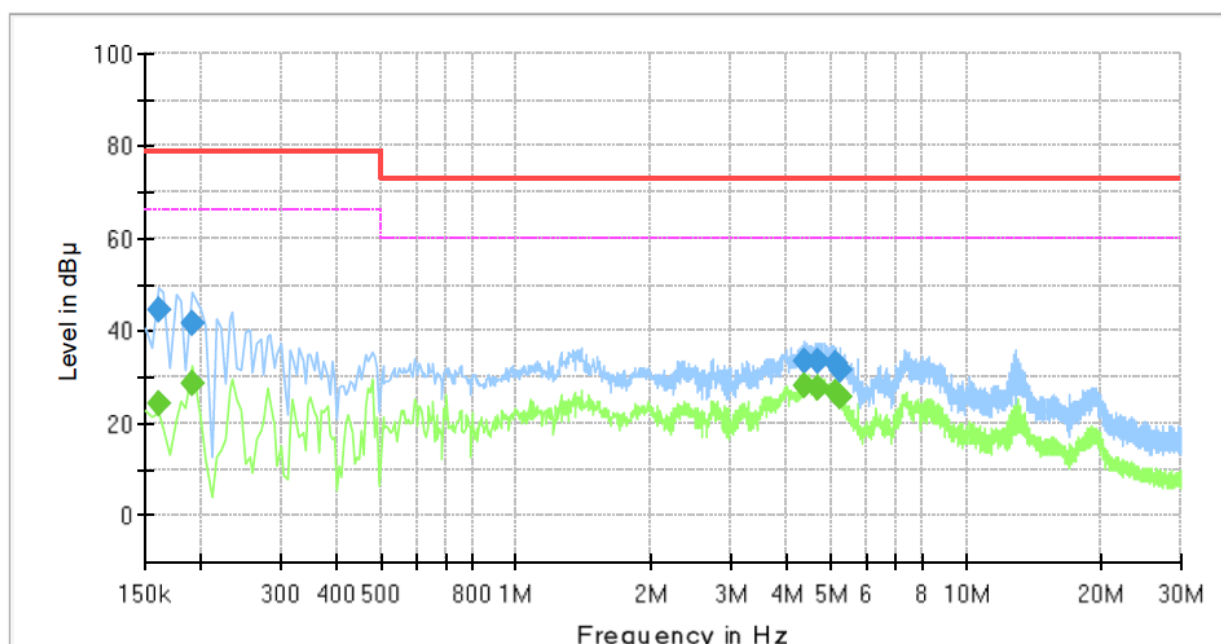
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

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



Final Result

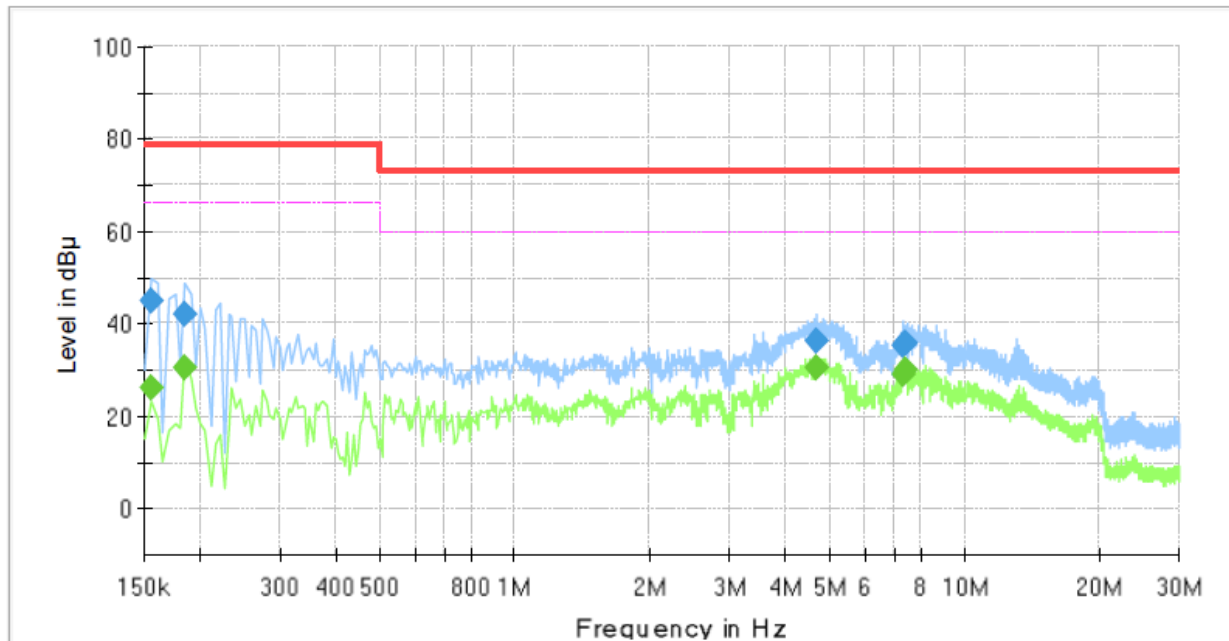
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	24.44	66.00	41.56	1000.0	9.000	L1	19.5
0.160000	44.29	---	79.00	34.71	1000.0	9.000	L1	19.5
0.190000	---	28.76	66.00	37.24	1000.0	9.000	L1	19.5
0.190000	41.48	---	79.00	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 LINE

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

N/A

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

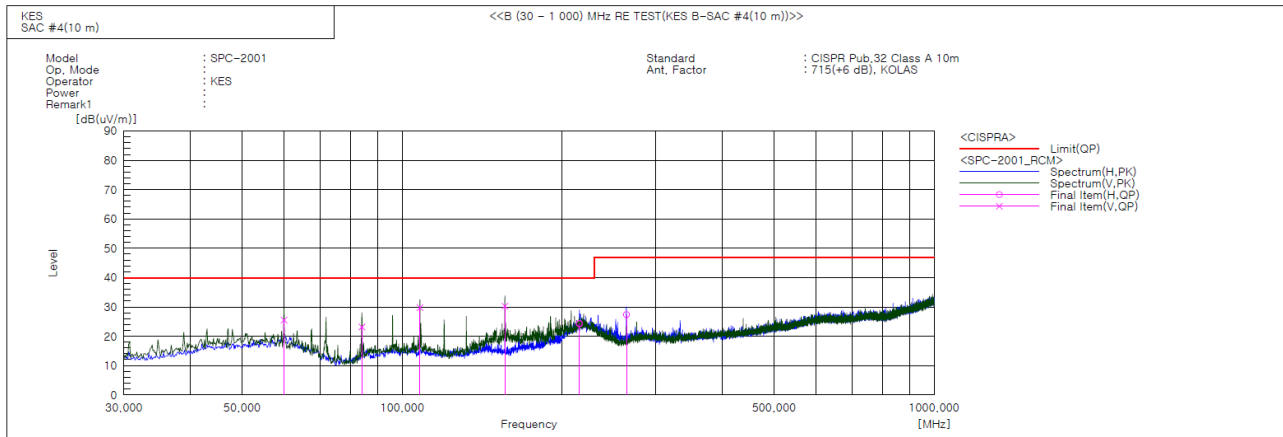
Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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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

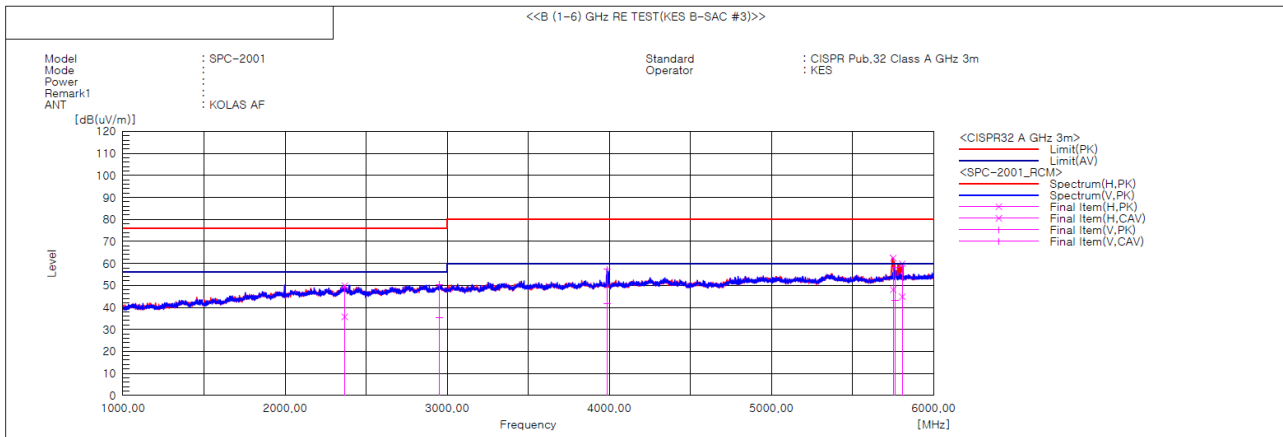
Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

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

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



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Conducted Emissions at Telecommunication Ports

N/A

N/A

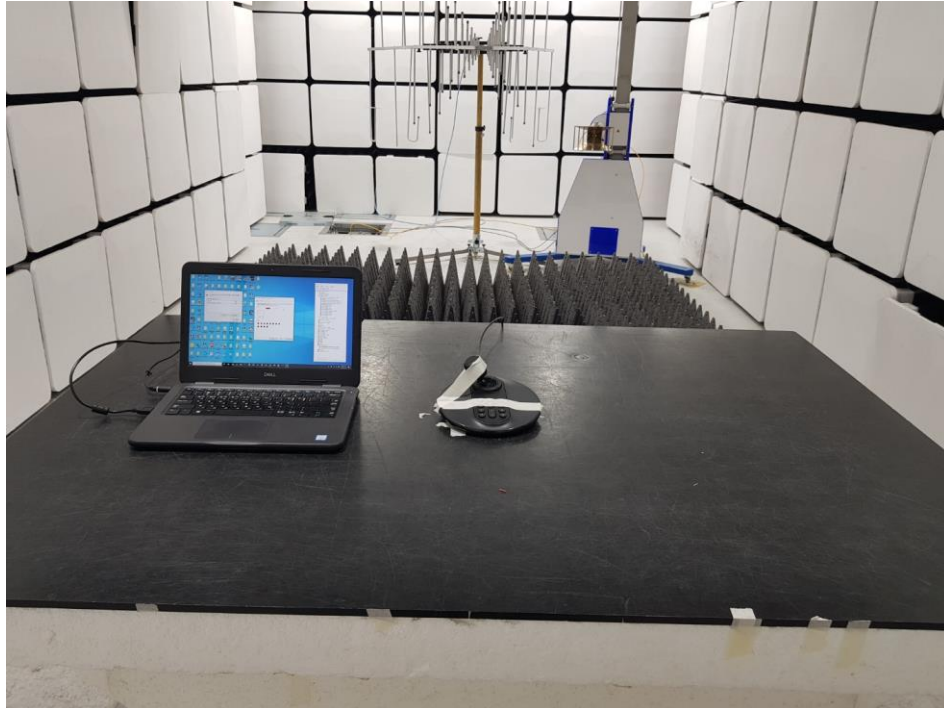
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Radiated Electric Field Emissions(Below 1 GHz)



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Radiated Electric Field Emissions(Above 1 GHz)



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EUT External Photographs

(Top)



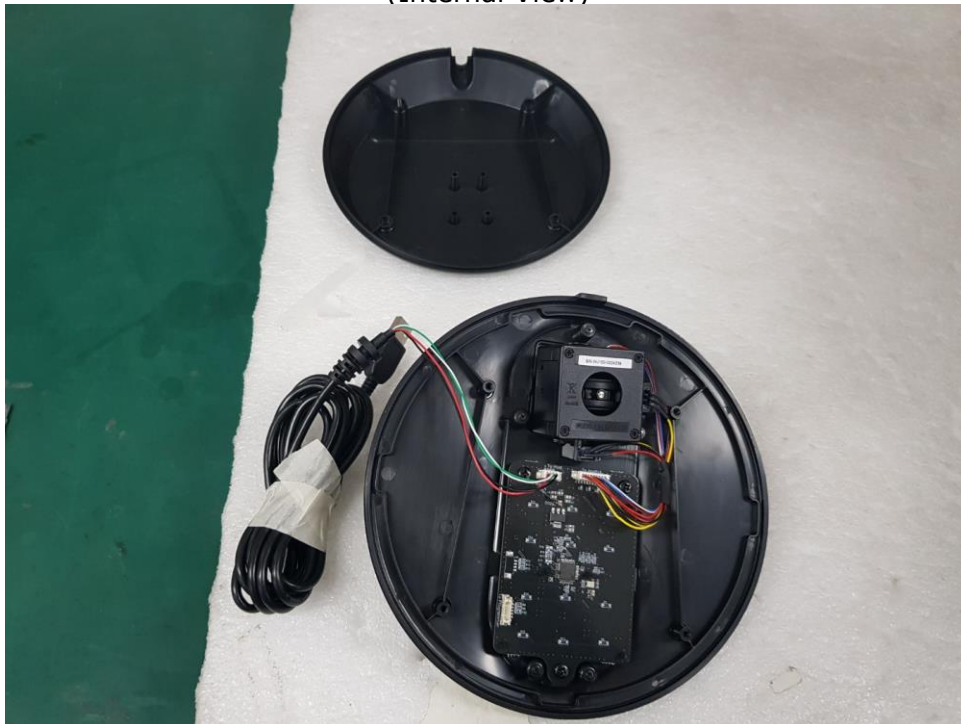
(Bottom)



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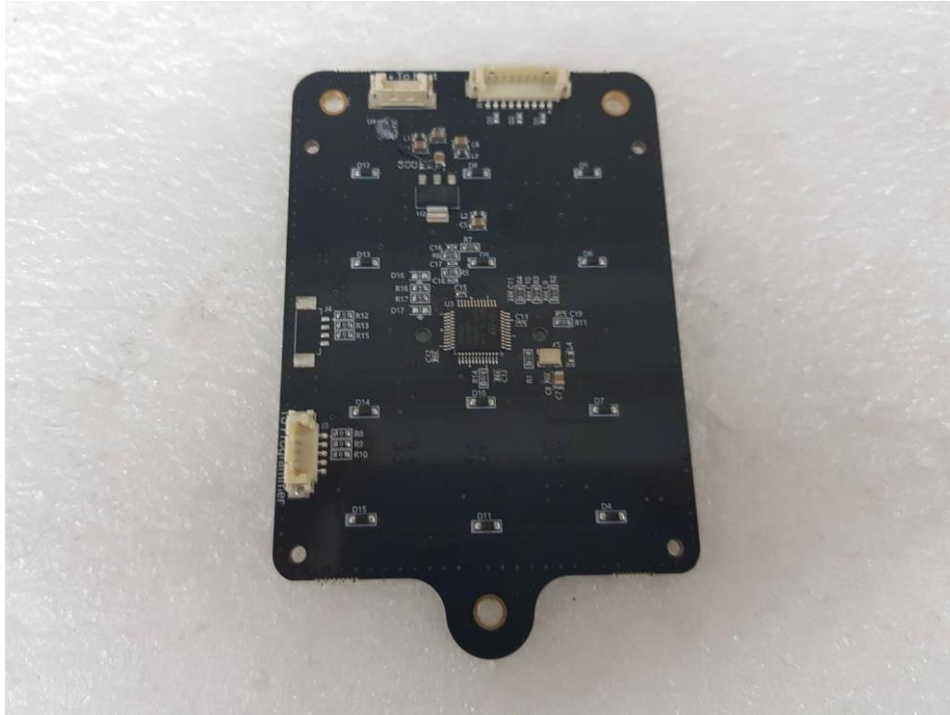
EUT Internal Photographs

(Internal View)

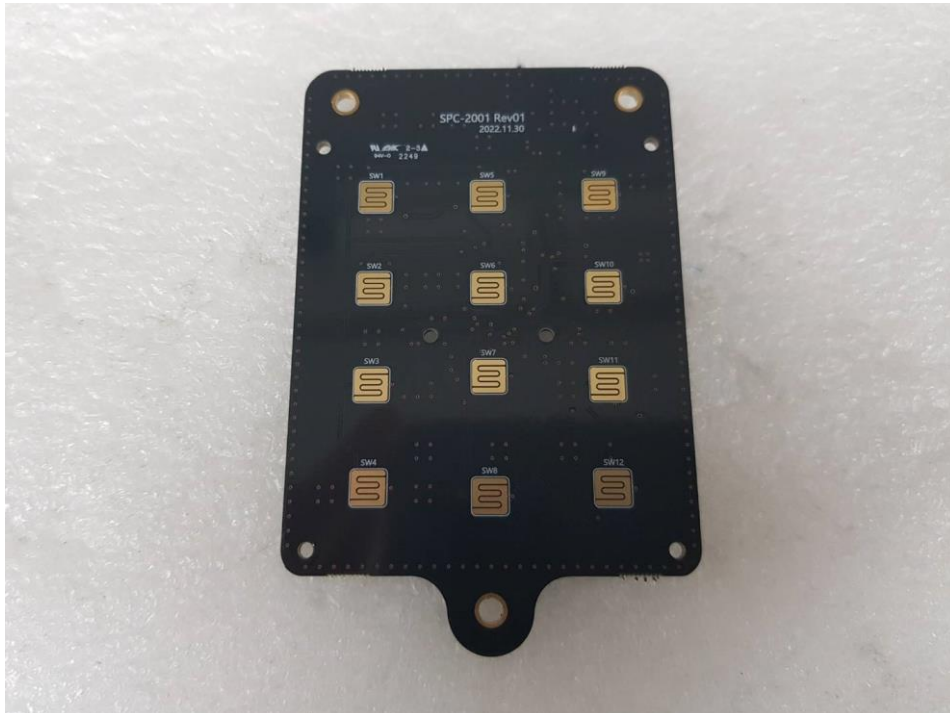


EUT Internal View – Main Board

(Top)



(Bottom)



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EUT Internal View – Sub Board

(Top)



(Bottom)



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