



TEST REPORT



Report No. : KES-EM251646-R1

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KES Co., Ltd.

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1. Client

Applicant : Hanwha Vision Co., Ltd

Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

2. Sample Description

Product name : LED MODULE

Model/Type No. : SPI-BWN0

Variant Model : SPI-BWM0, SPI-BWM1, SPI-BWW0

Manufacturer : 1. HANWHA VISION VIETNAM COMPANY LIMITED
2. D-TECH CO.,LTD.

Manufacturer Address : 1. Lot O-2, Que Vo Industrial Zone extended Area, Nam Son Ward, Bac Ninh Province, Vietnam
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea (Suwon Industrial Complex)

3. Date of Receipt : Aug. 12, 2025

4. Test date : May. 18, 2025

5. Date of Issue : Aug. 18, 2025

6. Test Results : In Compliance

Tested by

Reviewed by

Eun Gu, Jeon
EMC Test Engineer

Dong Hun, Jang
EMC Technical Manager

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

KES-QP16-F01(00-23-01-01)

KES Co., Ltd.

The authenticity of this test report can be found on the verification page of our website (www.kes.co.kr)



REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Jun. 05, 2025	KES-EM251646	Issued
Aug. 18, 2025	KES-EM251646-R1	Reissuance of modifications due to addition of derivative model name

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1.0 General Product Description

Main Specifications of EUT are:

Division		Specificity
Internal highest operating frequency		120 Hz
Power	DC 24 V	DC 24 V
	Test Power	AC 120 V, 60 Hz
Ports	I/O Port	LED DRIVER 1 EA
	Unused Port	N/A
Components		Main Body 1 EA

Electrical Input	24 VDC $\pm$ 10%
Max. Power Consumption	6.9 W
Color temperature	6,500 K $\pm$ 10%
LED Quantity	16EA
Angle	FWHM : 12° 10-% : 32°
Operation Temperature / Humidity	-40°C~+55°C / 0~95% RH
Storage Temperature / Humidity	-40°C ~ +60°C / Less than 95% RH
Dimension	W101.2 x D53.8 x H78.2
Weight	200g
Certification	FCC, UL, CE, KC, IEC 62471



1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

☒ AC 120 V, 60 Hz

1.2 Variant Model Differences

Differences between base model and derivative: Only LED Lens with different light emission angle specifications differ / Same electronics/instruments

- Basic model: SPI-BWN0 / Light dissipation angle 12°

- Derivatives: SPI-BWM0 / Light divergence angle 25°, SPI-BWM1 / Light divergence angle 43°, SPI-BWW0 / Light divergence angle 60°

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
LED MODULE	SPI-BWN0	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC/DC Adapter	WTS-2405N(120W)	-	Sun Electronics Co., Ltd.	-
BARCODE READER	TNS-7000M		HANWHA VISION VIETNAM COMPANY LIMITED	-
Laptop	P95G001	9JM8HT2	DELL INC.	-
Laptop AC/DC Adapter	HA65NM130	-	Chicony Power Technology(Suzhou)Co.,Ltd.	-
Micro SD Card	-	-	Sandisk	8 GB



1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
LED MODULE (EUT)	LED DRIVER	BARCODE READER	LED DRIVER	-	-
BARCODE READER (EUT)	8 Pin	AC/DC Adapter	Line	2.8	U
	Micro SD Slot	Micro SD Card	Micro SD Slot	-	-
	12 Pin	Laptop	RJ-45	5.0	S
Laptop	DC Jack	Laptop Adapter	Line	1.5	U

* Unshielded=U, Shielded=S

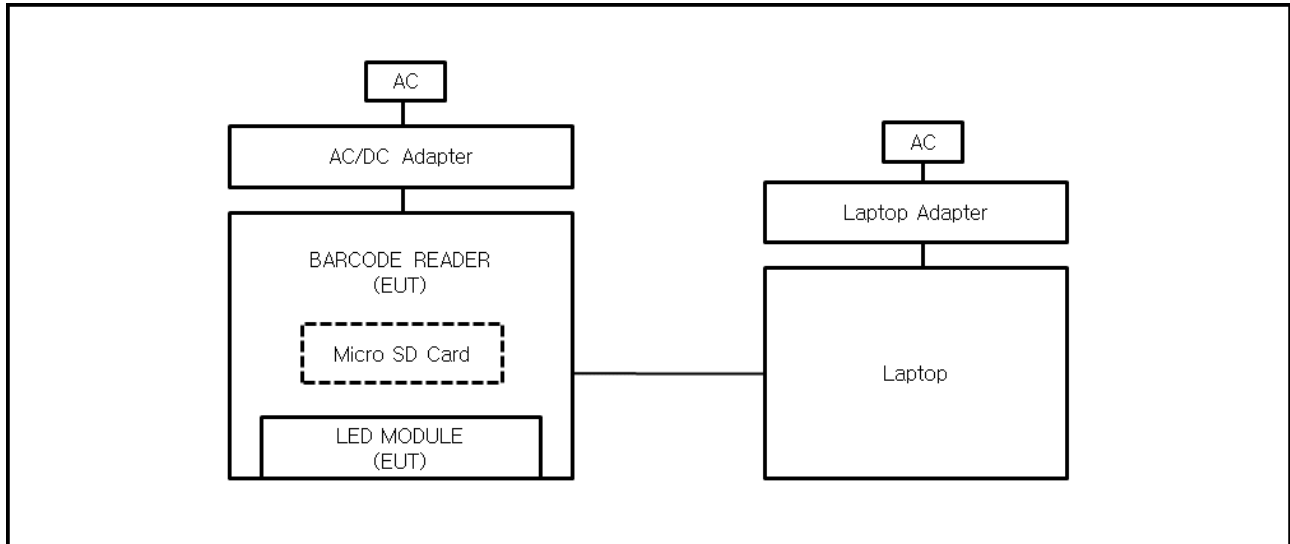
1.7 EUT Operating Mode(s)

Test mode	Normal operating	Test Voltages
Operating	- Check the operation of BARCODE READER through the laptop's web viewer and check the LED operation of EUT.	AC 120 V, 60 Hz

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



1.8 Configuration





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 Measurement Procedure

- Conducted Emissions

The conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP".

- Radiated Electric Field Emissions

The test was done at a SEMI ANECHOIC CHAMBER with quasi-peak detector. The final test data was measured using a Quasi-Peak detector below 1 GHz at 10 m or 3 m distance and a Peak and Average detector above 1 GHz at 3 m distance. Test was proceeded worst case test mode and cable configuration.

Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency.

Measurement procedures was In accordance with ANSI C63.4-2014 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2



1.13 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 0008



2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **47 CFR Part 15, Subpart B**

☐ CISPR 22:2009 +A1:2010

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B

☒ **IC Regulation ICES-003 Issue 7**

☐ CAN/CSA-CISPR 32:17

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B





2.1 Conducted Emissions at Mains Power Ports

Test Date

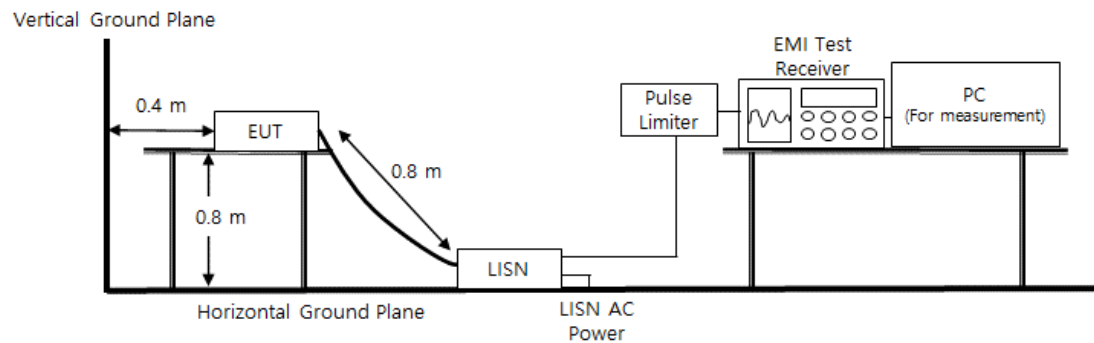
May. 18, 2025

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EMC32	R & S	9.12.00	-	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	11, 06, 2025	1 Year
☒	LISN	ENV216	R & S	101786	01, 09, 2026	1 Year
☒	ARTIFICIAL MAINS NETWORK	ESH2-Z5	R & S	100450	11, 06, 2025	1 Year
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 06, 2025	1 Year

Diagram of test setup



Test Conditions

Temperature: (23,1 ± 0,1) °C
Relative Humidity: (46,4 ± 0,1) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

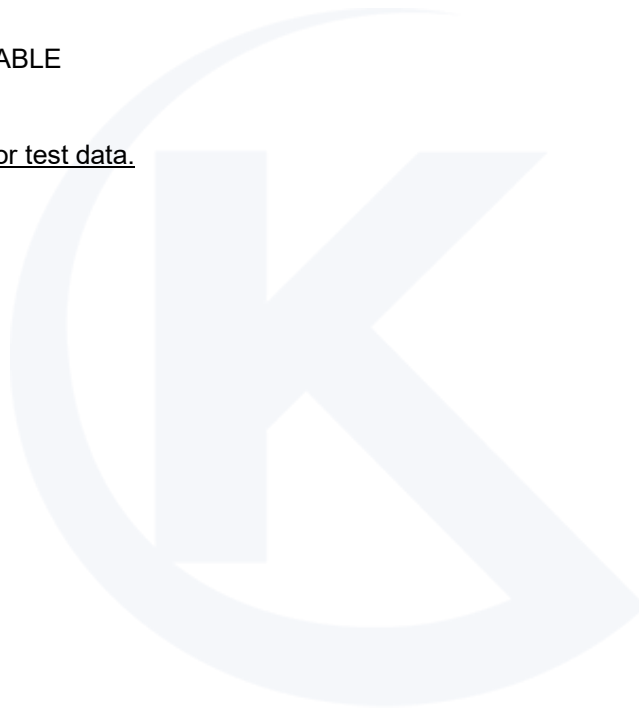
Test Results

The requirements are:

- ☒ PASS
- ☐ NOT PASS
- ☐ NOT APPLICABLE

Remarks

See Appendix A for test data.





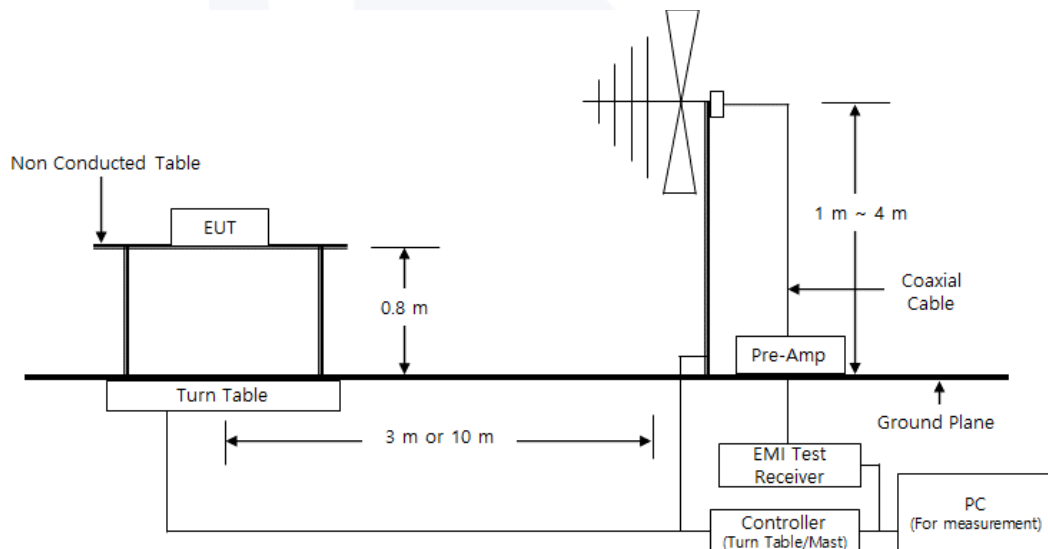
2.2 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

May. 18, 2025

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

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-	-
☒	EMI TEST RECEIVER	ESW8	R & S	101319	03, 24, 2026	1 Year
☒	AMPLIFIER	SCU 01	R & S	100603	11, 06, 2025	1 Year
☒	BILOG ANTENNA	VULB 9168	SCHWARZBECK	9168-461	05, 09, 2026	2 Year
☒	ATTENUATOR	6806.17.A	HUBER+SUHNER	-	02, 13, 2026	1 Year

Diagram of test setup



Test Conditions

Temperature: $(23,4 \pm 0,1) ^\circ\text{C}$
Relative Humidity: $(47,6 \pm 0,1) \% \text{ R.H.}$

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

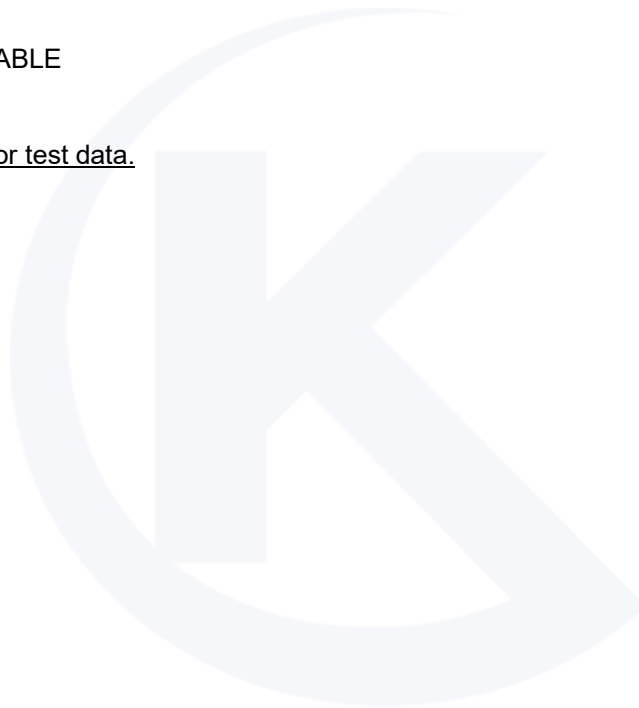
Test Results

The requirements are:

- ☒ PASS
- ☐ NOT PASS
- ☐ NOT APPLICABLE

Remarks

See Appendix A for test data.





2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

N/A

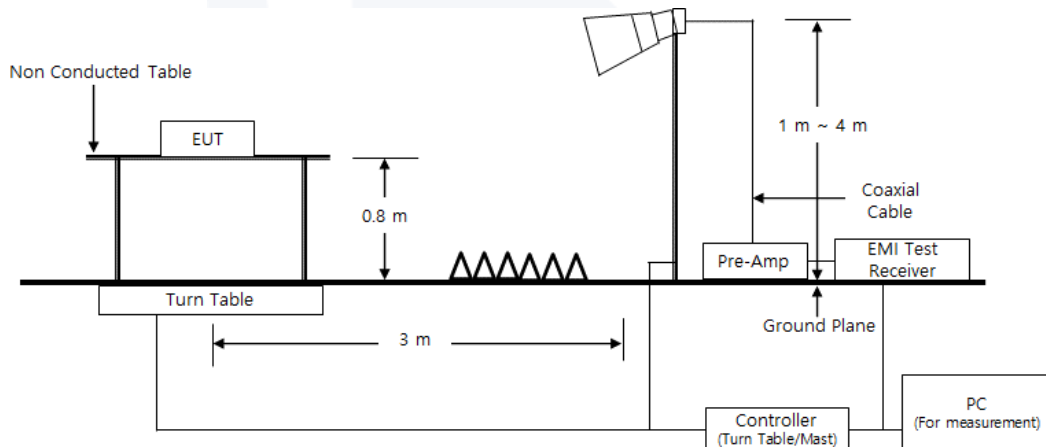
Test Location

SEMI ANECHOIC CHAMBER #5

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☐	EMI Test S/W	ES10/RE	TOYO Corporation	2022.01.000	-	-
☐	EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	02, 13, 2026	1 Year
☐	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	11, 04, 2025	1 Year
☐	PREAMPLIFIER	8449B	HP	3008A00899	03, 05, 2026	1 Year
☐	ATTENUATOR	8491B	HP	23094	02, 13, 2026	1 Year

Diagram of test setup





Test Conditions

Temperature: °C
Relative Humidity: % R.H.

Frequency Range of Measurement

1 GHz to 5 GHz

Instrument Settings

IF Band Width: 1 MHz

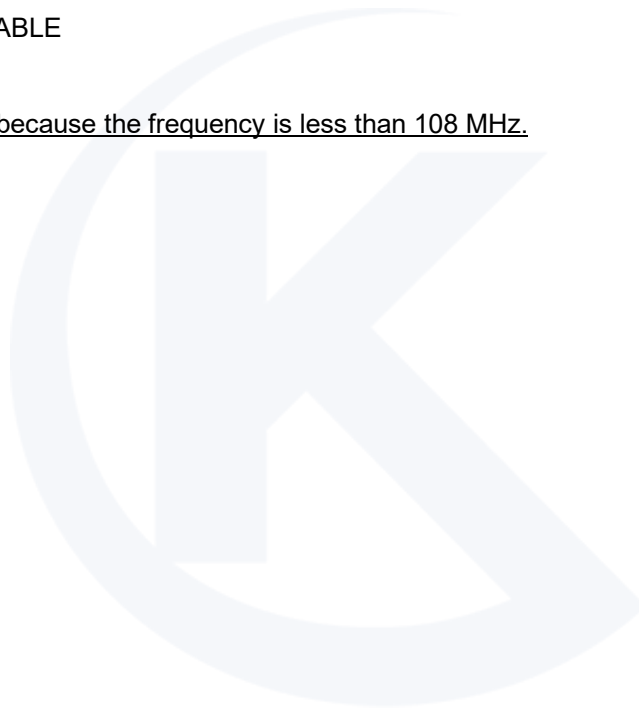
Test Results

The requirements are:

- ☐ PASS
- ☐ NOT PASS
- ☒ NOT APPLICABLE

Remarks

It does not apply because the frequency is less than 108 MHz.





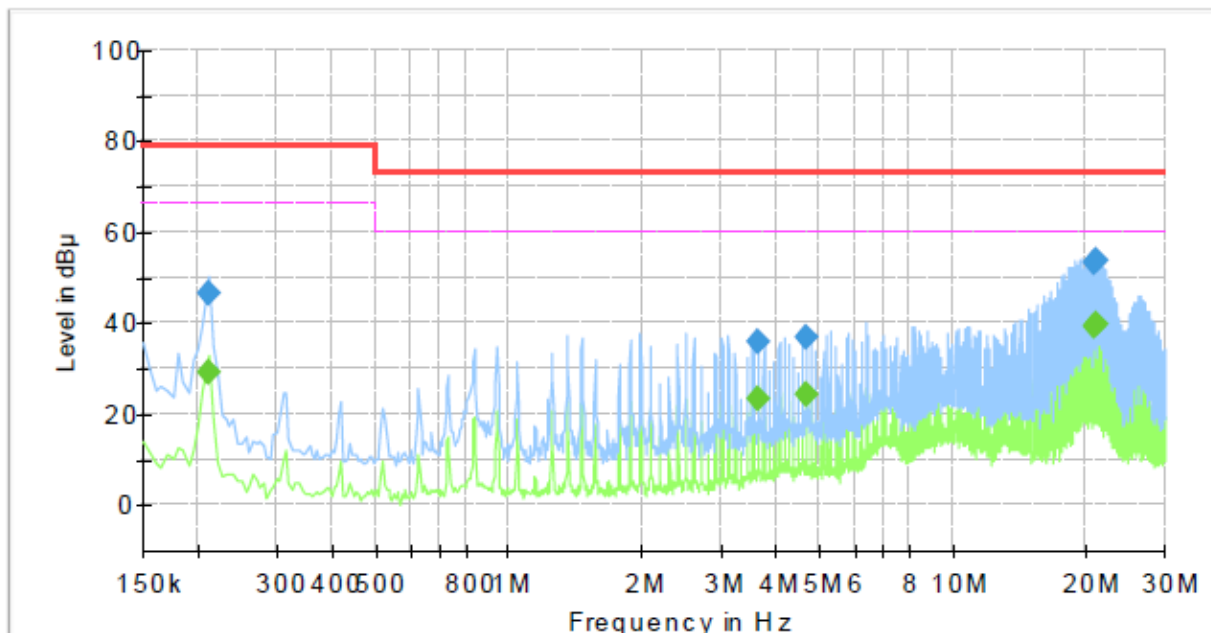
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

Test Description: Conducted Emission
Job No.: KES-EM251646
Phase: L
Mode:
Operator Name: KES



Final Result

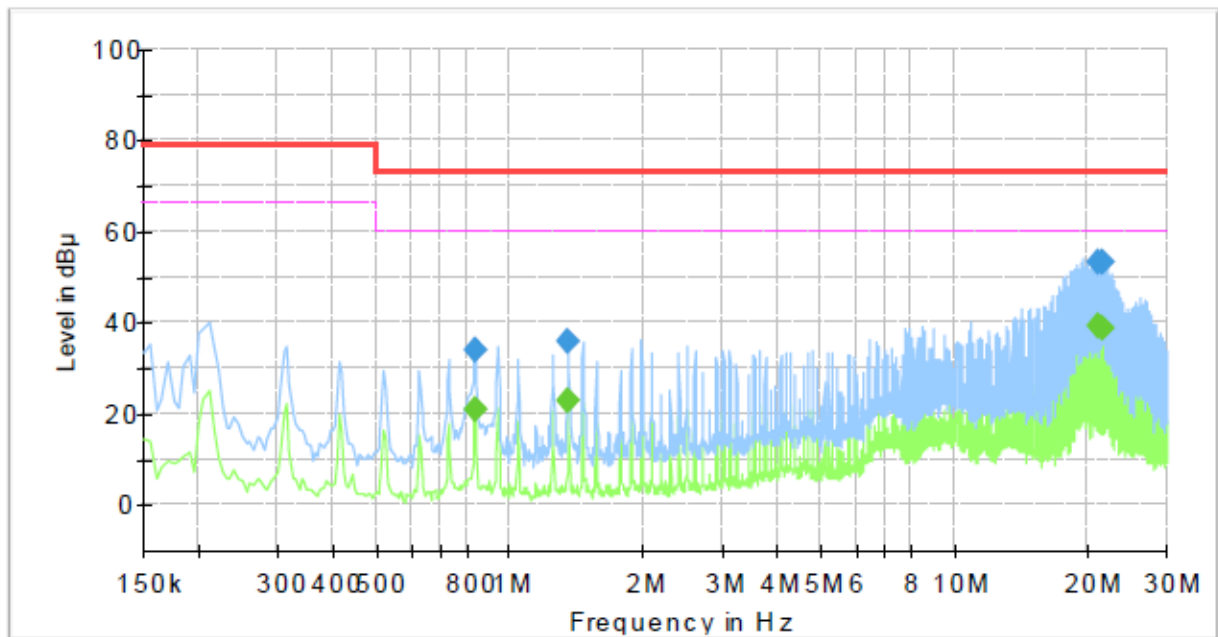
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.210000	—	29.12	66.00	36.88	1000.0	9.000	L1	19.5
0.210000	46.33	—	79.00	32.67	1000.0	9.000	L1	19.5
3.645000	—	23.41	60.00	36.59	1000.0	9.000	L1	19.8
3.645000	36.05	—	73.00	36.95	1000.0	9.000	L1	19.8
4.690000	—	24.09	60.00	35.91	1000.0	9.000	L1	19.9
4.690000	36.70	—	73.00	36.30	1000.0	9.000	L1	19.9
20.940000	—	39.14	60.00	20.86	1000.0	9.000	L1	20.4
20.940000	53.34	—	73.00	19.66	1000.0	9.000	L1	20.4
21.045000	—	39.69	60.00	20.31	1000.0	9.000	L1	20.4
21.045000	53.71	—	73.00	19.29	1000.0	9.000	L1	20.4



NEUTRAL LINE

Common Information

Test Description: Conducted Emission
Job No.: KES-EM251646
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)
0.835000	—	20.74	60.00	39.26	1000.0	9.000	N	19.6
0.835000	33.68	—	73.00	39.32	1000.0	9.000	N	19.6
1.355000	—	22.82	60.00	37.18	1000.0	9.000	N	19.6
1.355000	35.77	—	73.00	37.23	1000.0	9.000	N	19.6
21.045000	—	39.20	60.00	20.80	1000.0	9.000	N	20.4
21.045000	53.28	—	73.00	19.72	1000.0	9.000	N	20.4
21.465000	—	38.94	60.00	21.06	1000.0	9.000	N	20.4
21.465000	53.10	—	73.00	19.90	1000.0	9.000	N	20.4

◆ Calculation

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

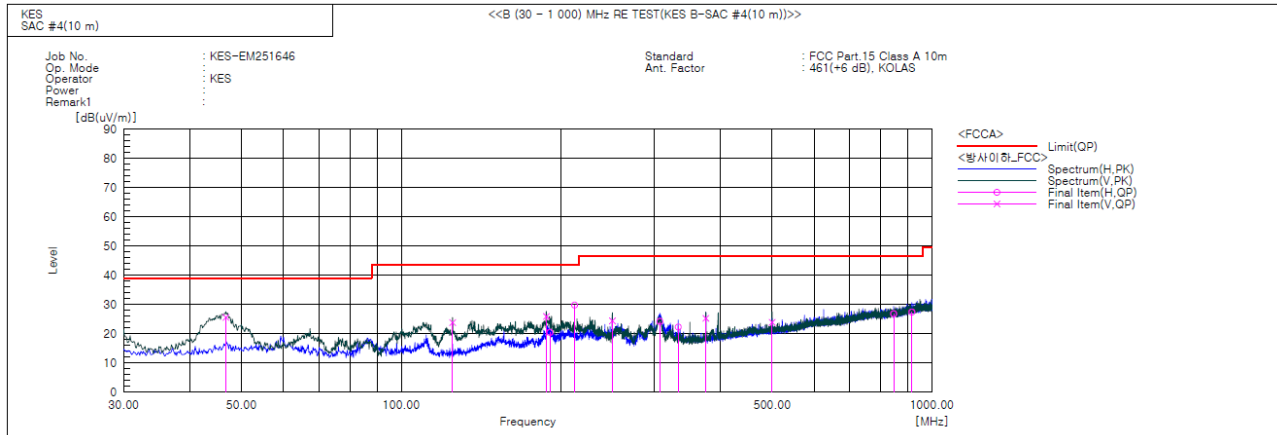
QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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



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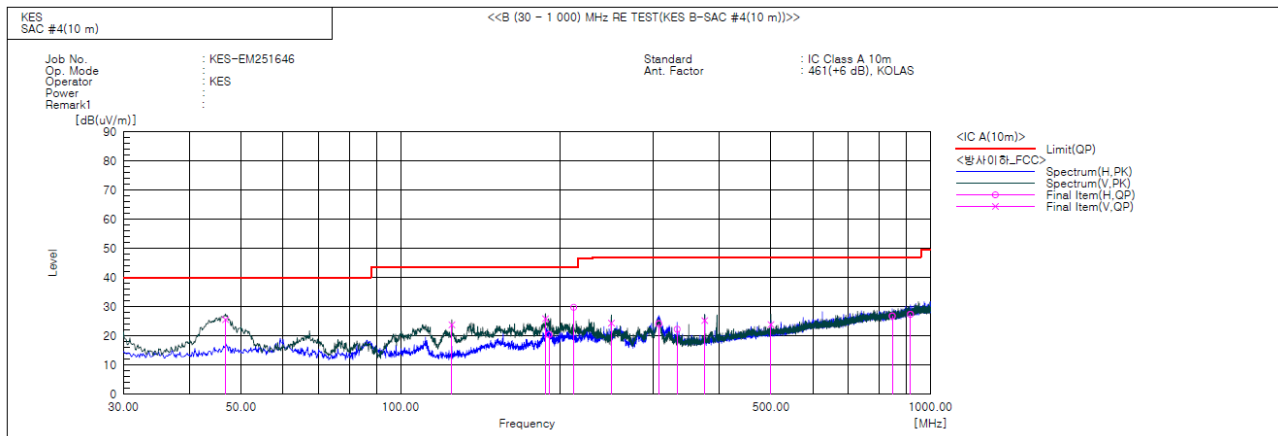
Radiated Electric Field Emissions(Below 1 GHz)**- 47 CFR Part 15, Subpart B****Final Result**

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	46.733	V	46.7	-21.1	25.6	39.0	13.4	156.0	245.0	
2	124.939	V	45.6	-21.8	23.8	43.5	19.7	133.0	127.0	
3	187.746	V	47.3	-21.4	25.9	43.5	17.6	121.0	100.0	
4	190.656	H	42.0	-21.6	20.4	43.5	23.1	377.0	131.0	
5	212.239	H	51.4	-21.6	29.8	43.5	13.7	355.0	92.0	
6	249.948	V	43.8	-19.4	24.4	46.5	22.1	152.0	135.0	
7	307.178	H	40.9	-16.7	24.2	46.5	22.3	385.0	76.0	
8	332.640	H	38.3	-16.0	22.3	46.5	24.2	328.0	139.0	
9	374.956	V	39.9	-14.6	25.3	46.5	21.2	100.0	167.0	
10	499.965	V	34.0	-10.1	23.9	46.5	22.6	100.0	167.0	
11	846.983	H	29.6	-2.8	26.8	46.5	19.7	344.0	190.0	
12	916.338	H	28.7	-1.3	27.4	46.5	19.1	395.0	49.0	



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- IC Regulation ICES-003 Issue 7



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	46.733	V	46.7	-21.1	25.6	40.0	14.4	156.0	245.0	
2	124.939	V	45.6	-21.8	23.8	43.5	19.7	133.0	127.0	
3	187.746	V	47.3	-21.4	25.9	43.5	17.6	121.0	100.0	
4	190.656	H	42.0	-21.6	20.4	43.5	23.1	377.0	131.0	
5	212.239	H	51.4	-21.6	29.8	43.5	13.7	355.0	92.0	
6	249.948	V	43.8	-19.4	24.4	47.0	22.6	152.0	135.0	
7	307.178	H	40.9	-16.7	24.2	47.0	22.8	385.0	76.0	
8	332.640	H	38.3	-16.0	22.3	47.0	24.7	328.0	139.0	
9	374.956	V	39.9	-14.6	25.3	47.0	21.7	100.0	167.0	
10	499.965	V	34.0	-10.1	23.9	47.0	23.1	100.0	167.0	
11	846.983	H	29.6	-2.8	26.8	47.0	20.2	344.0	190.0	
12	916.338	H	28.7	-1.3	27.4	47.0	19.6	395.0	49.0	

◆ Calculation

$$\text{Result(QP)} [\text{dB}(\mu\text{V/m})] = (\text{Reading(QP)} [\text{dB}(\mu\text{V})] + \text{c.f} [\text{dB}(1/\text{m})])$$
$$\text{Margin(QP)} [\text{dB}] = \text{Limit} [\text{dB}(\mu\text{V/m})] - \text{Result(QP)} [\text{dB}(\mu\text{V/m})]$$

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



Radiated Electric Field Emissions(Above 1 GHz)

N/A

◆ Calculation

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

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

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

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



Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports





Radiated Electric Field Emissions(Below 1 GHz)





Radiated Electric Field Emissions(Above 1 GHz)

N/A



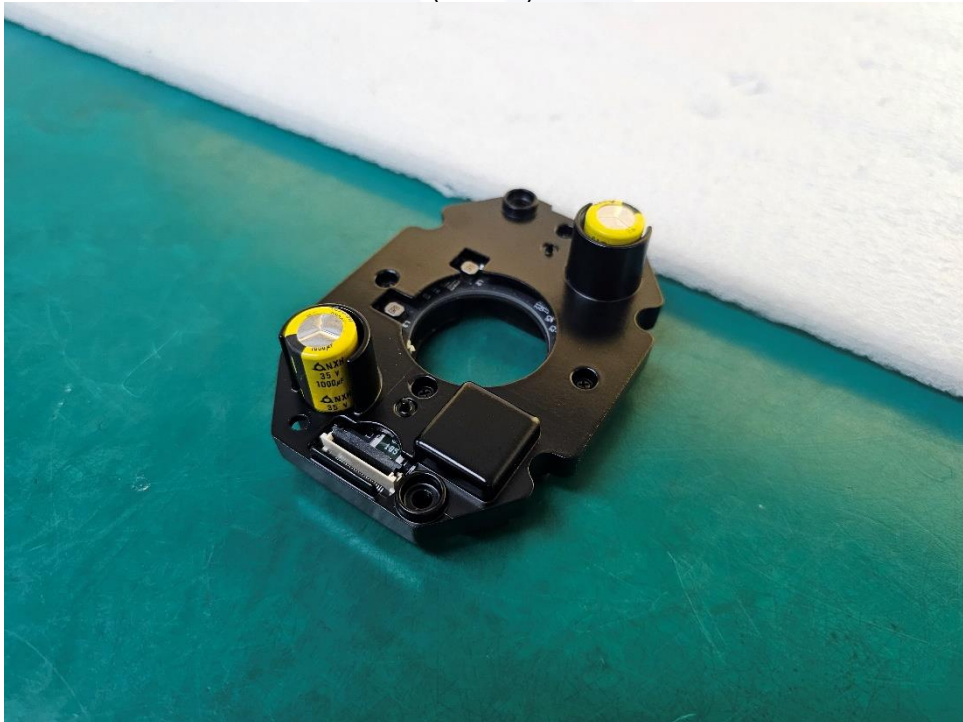


EUT External Photographs

(Top)



(Bottom)





EUT Internal Photographs

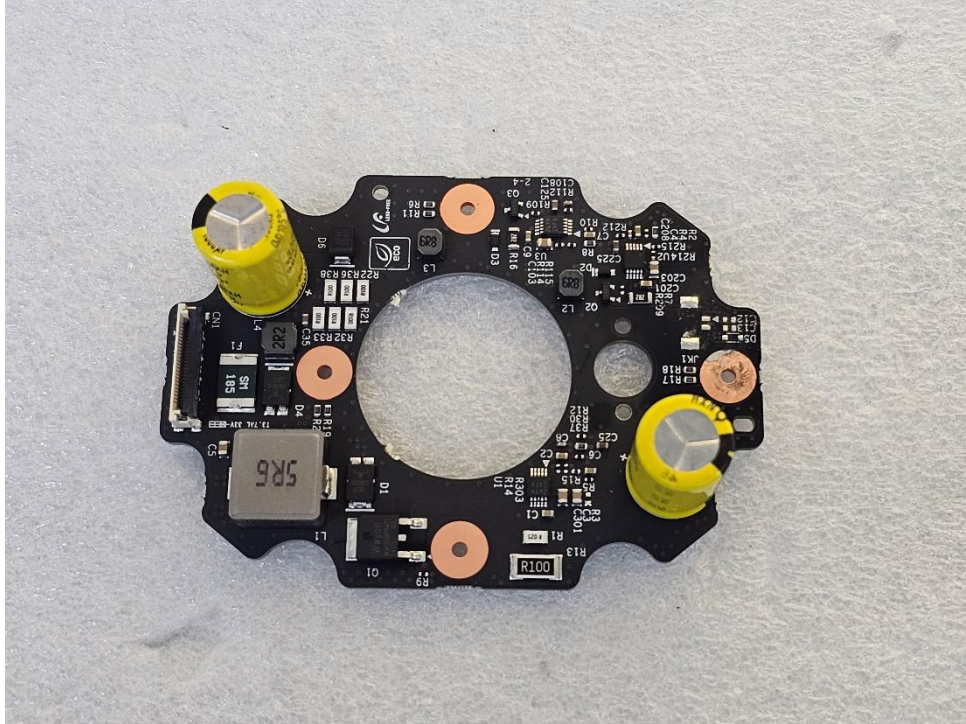
(Internal View)



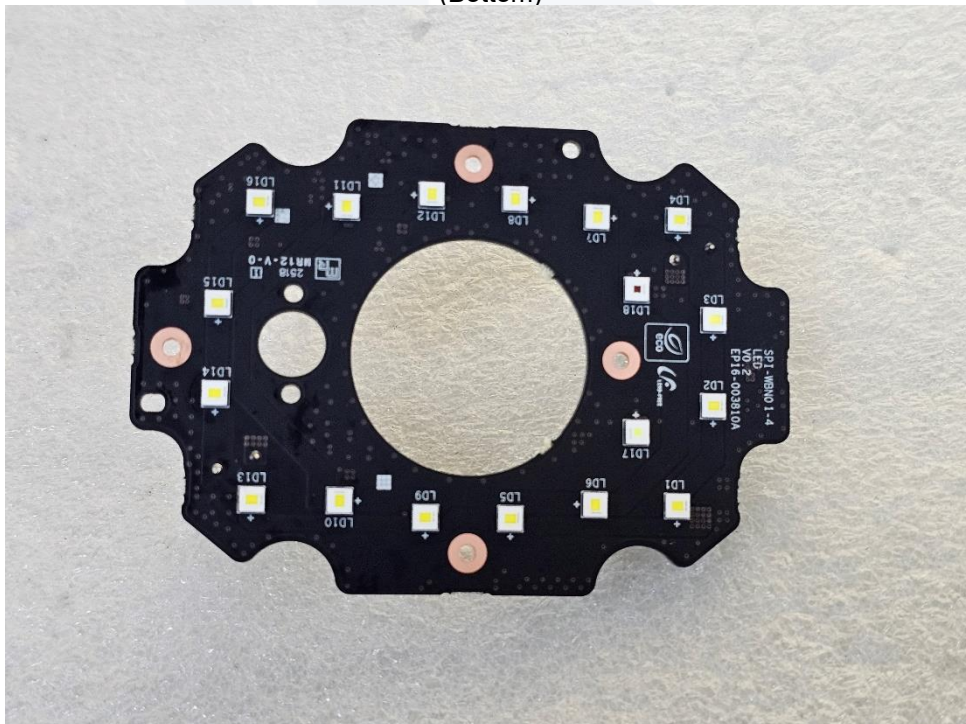


EUT Internal View – Board

(Top)



(Bottom)





Label Photographs

FCC Label



LED MODULE

SPI-BWN0

IC Label

CAN ICES-003(A) / NMB-003(A)

This device complies with ICES-003 Canada Rules Operation is subject to the following two conditions:
(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

The End.