TEST REPORT

For

Espen Technology Inc.

12257 Florence Ave., Santa Fe Springs, CA, 90650, United States

Model Number:	VEKL8F/54-8T (38W/46W/54W)	
Report Type:	Electrical, Photometric and ISTMT tests according to the following standards and show the compliance to DLC Program SSL Technical Requirements V5.1	
Standards:	ANSI/IES LM-79-19: Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting ANSI/UL 1598-2008: Standard for Safety of Luminaires CIE 190:2010 Calculation and presentation of unified glare rating tables for indoor lighting luminaires IES TM-30-18★: IES Method for Evaluating Light Source Color Rendition	
Project Engineer:	Bay Wang	Bay Wang
Report Number:	PKS230328058-10	
Sample Size:	One sample was received on 2022-12-08 and used for testing.	
Test Date:	2023-01-12 to 2023-01-13	
Report Date:	2023-03-28	
Reviewed By:	Seven Xia/ EE Engineer	Seven Xia
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan). No. 248 Chenghu Road, Kunshan, Jiangsu, People's Republic of China Tel: +86-0512-86175000 Fax: +86-0512-88934268	

1. Product Information and Description

Product Primary Use:	Retrofit Kits for Direct Linear Ambient Luminaires
Voltage and Frequency:	120-277VAC, 50/60Hz
LED Source Manufacturer:	Seoul Semiconductor Co., LTD
LED Source Model:	STW8A2PD-XX
Driver Model:	SIF50-I1200 120-277 W D1 F-S1S2
Luminaire length:	8ft
Auxiliary Ballast Model:	NA
Auxiliary Housing Model:	Lithonia TC2 32 MVOLT GEB10IS
White Tunable:	Yes
Field-Adjustable Light Output:	Yes

Note:

1. The applicant Espen Technology Inc. declared that their products are the same to the product in report# RKSB221208007-10-M1 and is authorized by original applicant to use their test data.
2. All the data in previous report (RKSB221208007-10-M1) is shared in report.

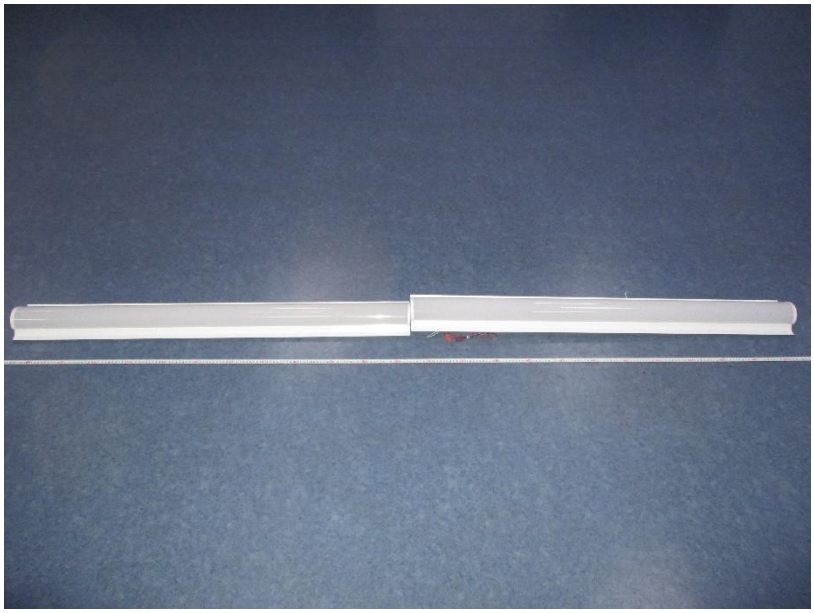
2. Product Rated Values#

Test Model	CCT(K)	Light Output (lm)	Power(W)	Luminous Efficacy (lm/W)
VEKL8F/54-8T (38W/46W/54W)	3500	7236	54	134
		6256	46	136
		5320	38	140
	4000	7776	54	144
		6716	46	146
		5700	38	150
	5000	7344	54	136
		6348	46	138
		5396	38	142

3. Test List

Test Model	CCT(K)	Power(W)	Test Item			
			Goniophotometer Test	Integrating Sphere Test	THDi and PF Test	In-Situ Temperature Measurement Test
VEKL8F/54-8T (38W/46W/54W)	3500	54	NA	Yes	Yes	Yes
		46	NA	Yes	Yes	NA
		38	NA	Yes	Yes	NA
	4000	54	NA	Yes	Yes	NA
	5000	54	NA	Yes	Yes	NA

4. Product Photo



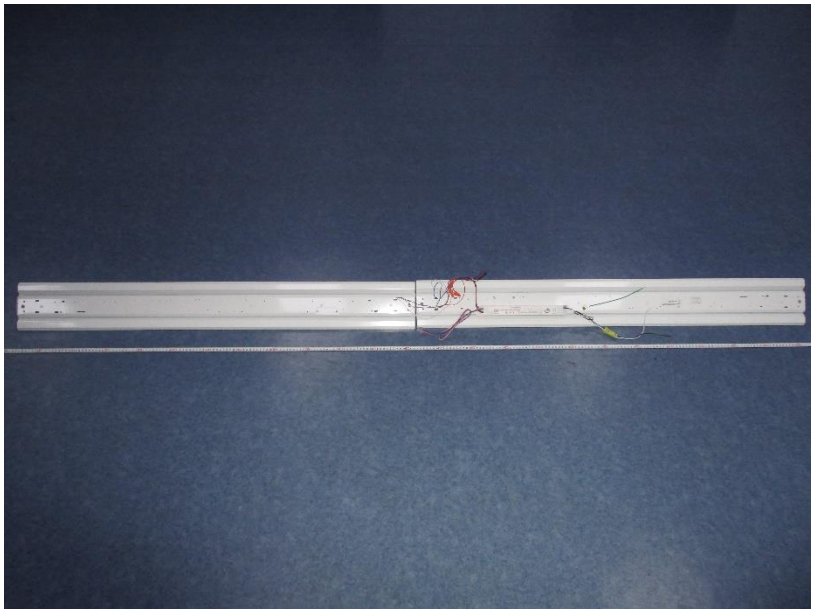
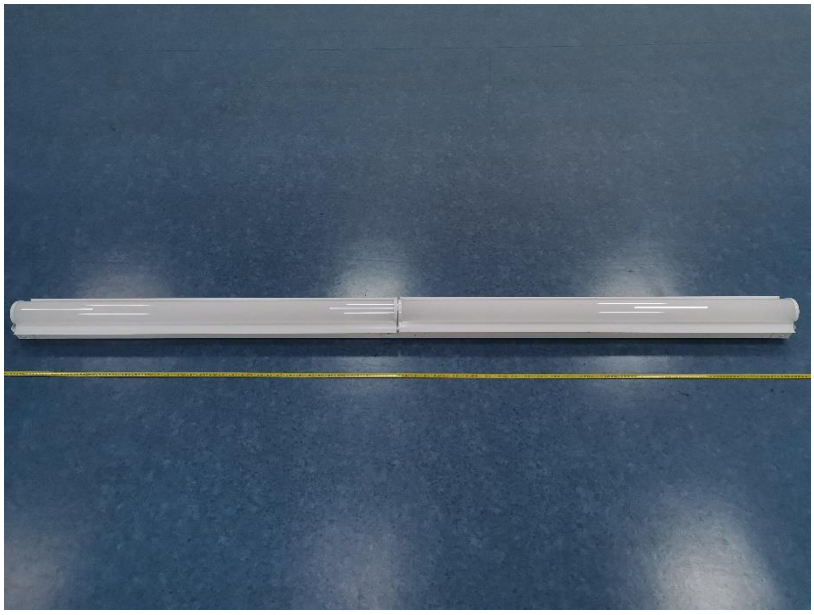
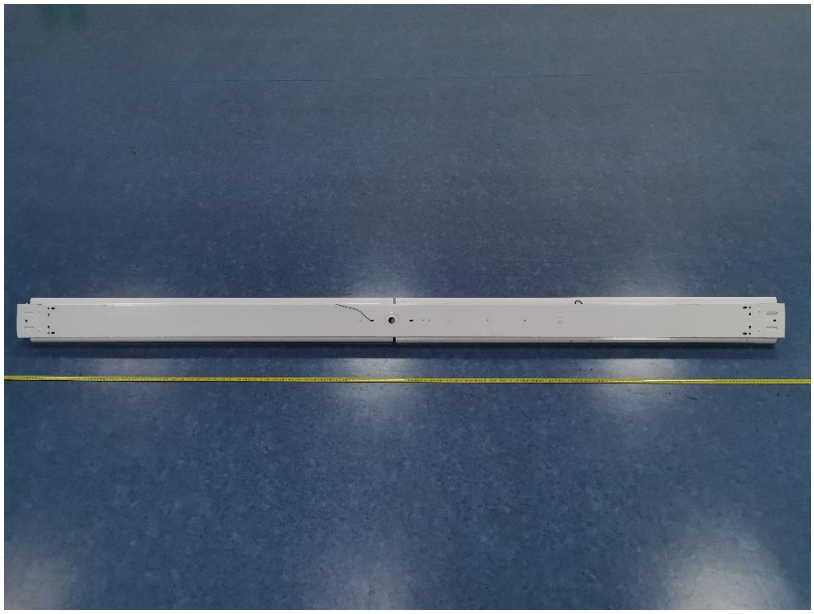


Photo of Product Installed in the Fixture





LED Driver Photo

5. Test Result

Test Model: VEKL8F/54-8T (38W/46W/54W)
Control Setting: 3500K/ 54W

Integrating Sphere Test; Orientation: Downward; Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances only)	Conclusion
Light Output(lm)	7228.7	≥3000	≥2700	Pass
Power(W)	53.9	None.	None.	N/A
Total Efficacy(lm/W)	134.11	≥115	≥111.55	Pass
CCT(K)	3486	None [i]	None.	N/A
Duv	-0.00096	None [i]	None.	N/A
IES R_f	85	70	69	Pass
IES R_g	95	89	88	
IES Rcs,h1	-11%	-12%~23%	-13%~24%	
R_a	84.9	≥80	≥79	
R_9	16	≥0	≥-1	

Note:
i. White-tunable products are not required to meet the chromaticity requirements in DLC V5.1.

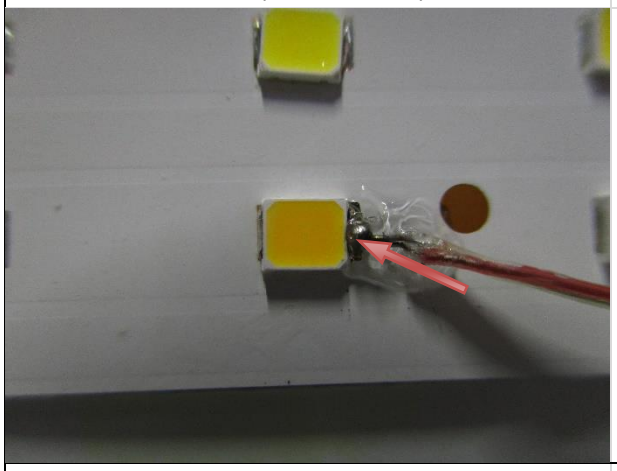
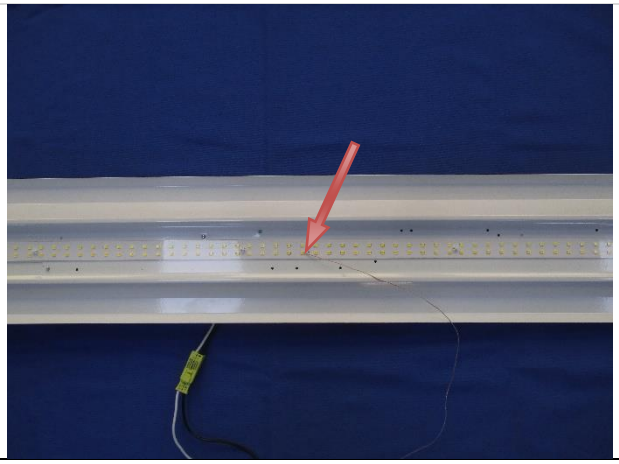
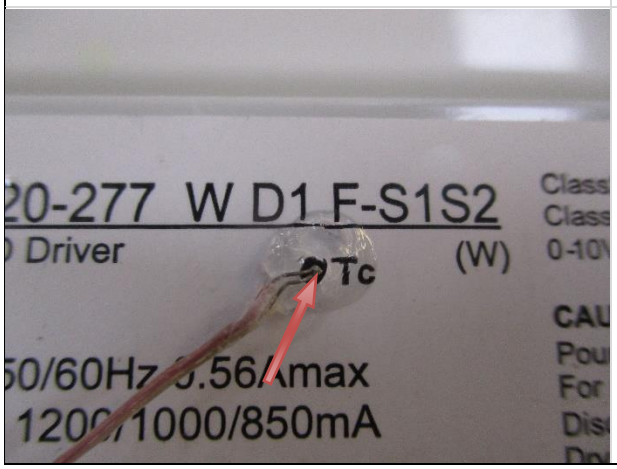
Integrating Sphere THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9945	≥0.9	≥0.87	Pass
120	THDi	6.55%	≤20%	≤25%	Pass
277	Power Factor	0.9651	≥0.9	≥0.87	Pass
277	THDi	10.95%	≤20%	≤25%	Pass

In-Situ Temperature Measurement Test: Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
TMP_{LED}(°C)	35.5	≤105	With tolerance of ≤ 1.1°C or 0.4%, whichever is greater due to thermocouple tolerance	Pass
TMP_c(°C)	50.8	≤90	With tolerance of ≤ 1.1°C or 0.4%, whichever is greater due to thermocouple tolerance	Pass
Drive Current/Individual LED source(mA)	99.8	≤200	With +5% tolerance	Pass
L_{70} Lumen Maintenance Life (Hours)	>54000	≥50000	None.	Pass
Color Maintenance	0.0018	≤0.004	≤0.0044	Pass

Note:
1. The test results were measured directly from the test equipment.
2. The DLC requirements were listed according to DLC Technical Requirements V5.1.
3. The conclusion is for reference only. Test report that indicate product performance meets DLC Technical Requirements do not represent official DLC product qualification. All decisions regarding product qualification are made by the DLC.

TMP_{LED}(Zoomed-in View)	TMP_{LED}(Bird's-eye View)
	
TMP_c(Zoomed-in View)	TMP_c (Bird's-eye View)
	

Test Data

[Integrating Sphere System]

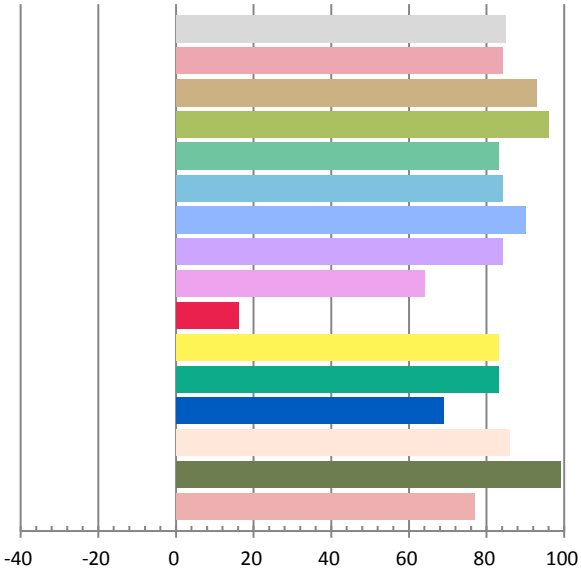
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4517	53.9	0.9944	7228.7	134.11

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
21.971	3486	-0.00096	0.4051	0.3884	0.2365	0.5103

Color Rendering Index

Ra			
84.9			
R1	R2	R3	R4
84	93	96	83
R5	R6	R7	R8
84	90	84	64
R9	R10	R11	R12
16	83	83	69
R13	R14	R15	
86	99	77	



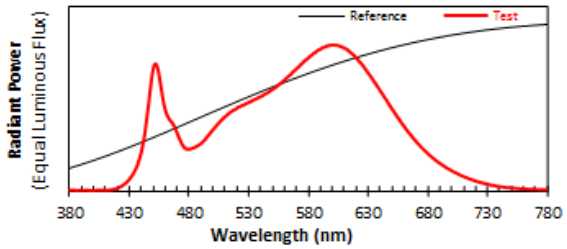
ANSI/IES TM-30-18 Color Rendition Report

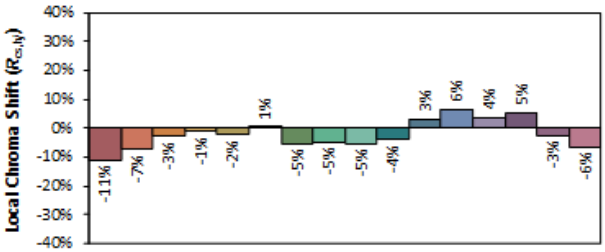
Source: User SPD

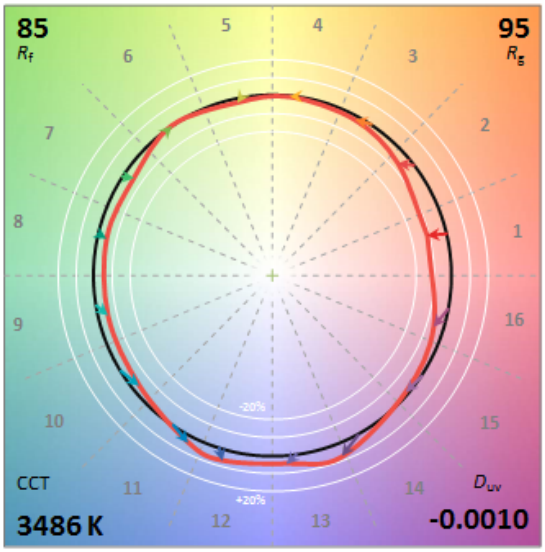
Manufacturer: Espen Technology Inc.

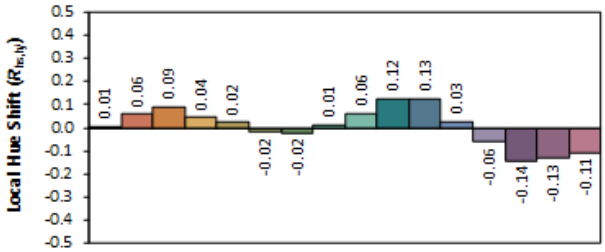
Date: 2023/1/12

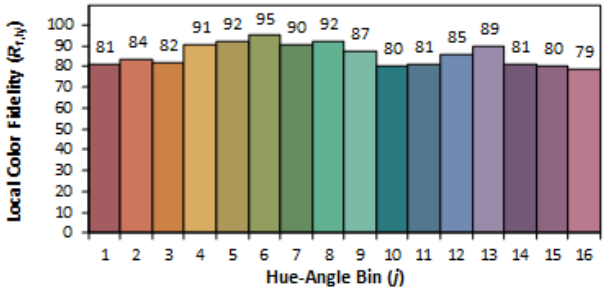
Model: VEKL8F/54-8T (38W/46W/54W)

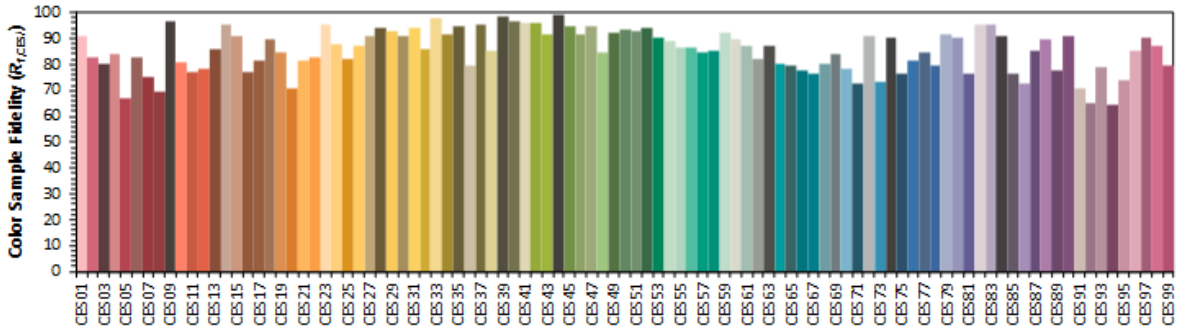












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

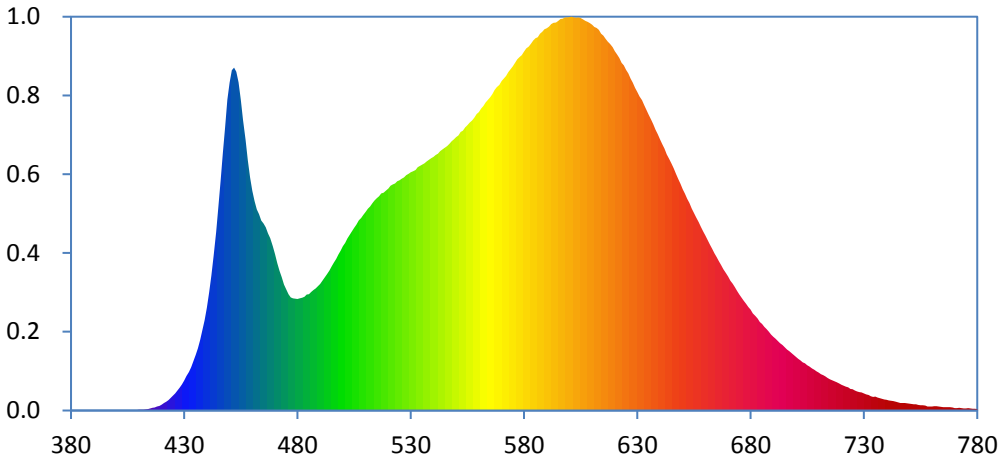
x	**0.4051**
y	**0.3884**
u'	**0.2365**
v'	**0.5103**

CIE 13.3-1995 (CRI)

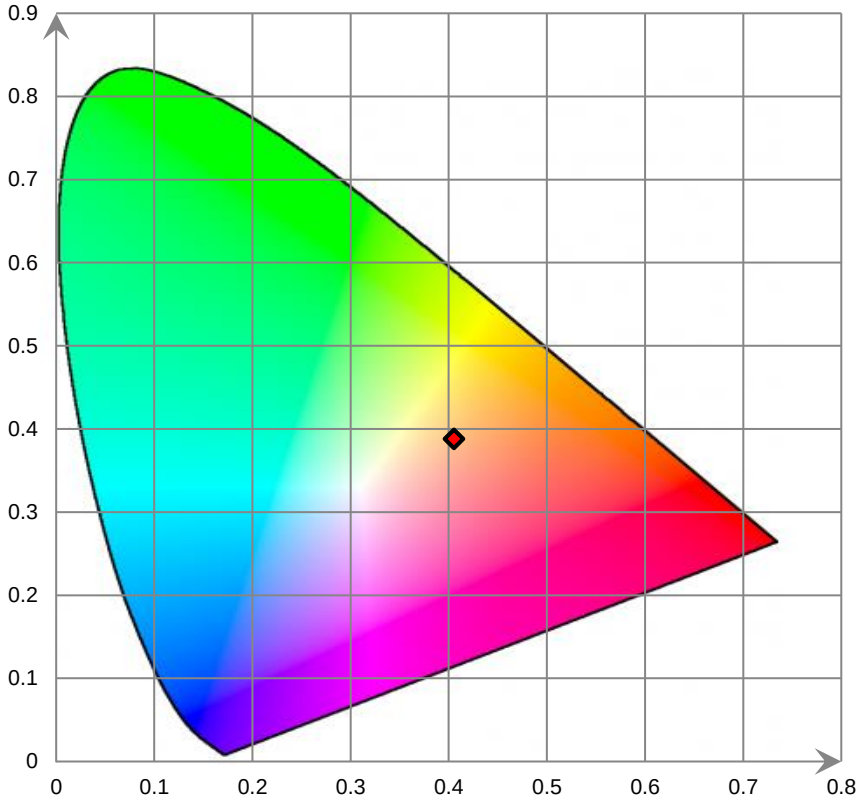
R_a	85
R_9	16

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

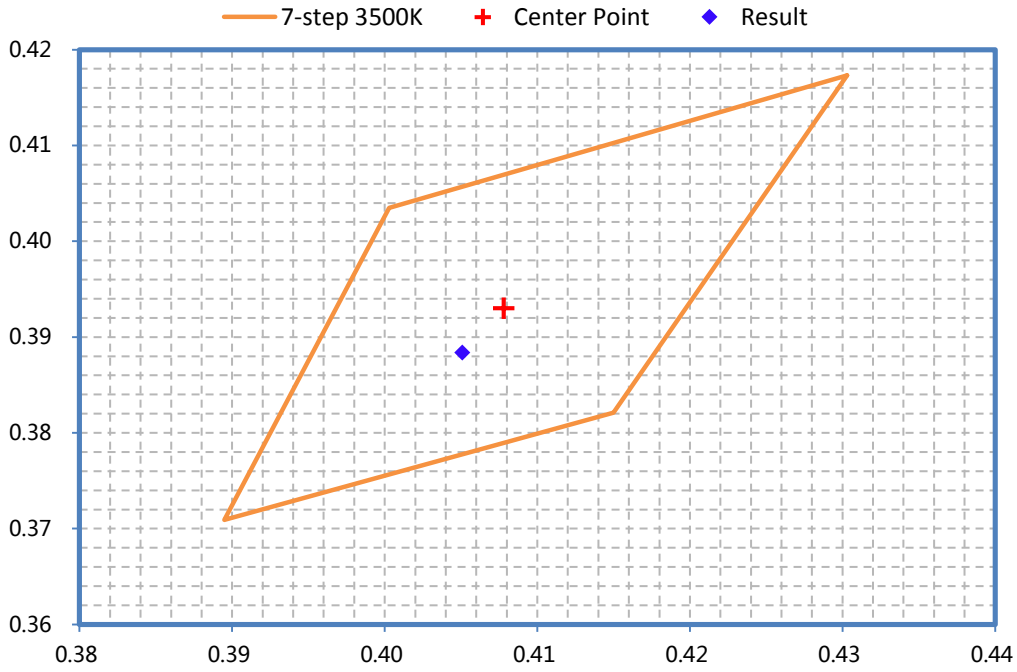
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



Test Model: VEKL8F/54-8T (38W/46W/54W)
Control Setting: 3500K/ 46W

THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9931	≥0.9	≥0.87	Pass
120	THDi	7.24%	≤20%	≤25%	Pass
277	Power Factor	0.9589	≥0.9	≥0.87	Pass
277	THDi	10.59%	≤20%	≤25%	Pass

Note:
1. The test results were measured directly from the test equipment.
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Test Data

[Integrating Sphere System]

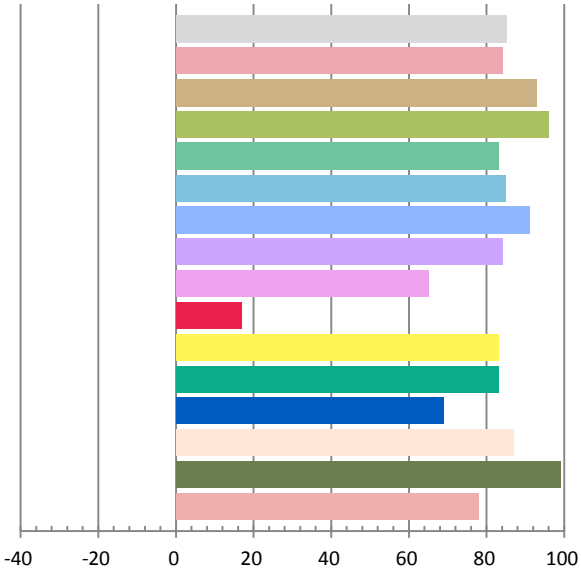
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.3863	46.04	0.9931	6389.8	138.79

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
19.467	3477	-0.00102	0.4055	0.3885	0.2368	0.5104

Color Rendering Index

Ra			
85.2			
R1	R2	R3	R4
84	93	96	83
R5	R6	R7	R8
85	91	84	65
R9	R10	R11	R12
17	83	83	69
R13	R14	R15	
87	99	78	



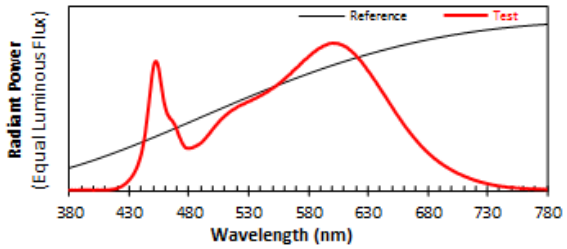
ANSI/IES TM-30-18 Color Rendition Report

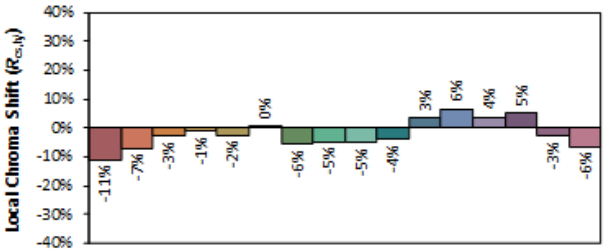
Source: User SPD

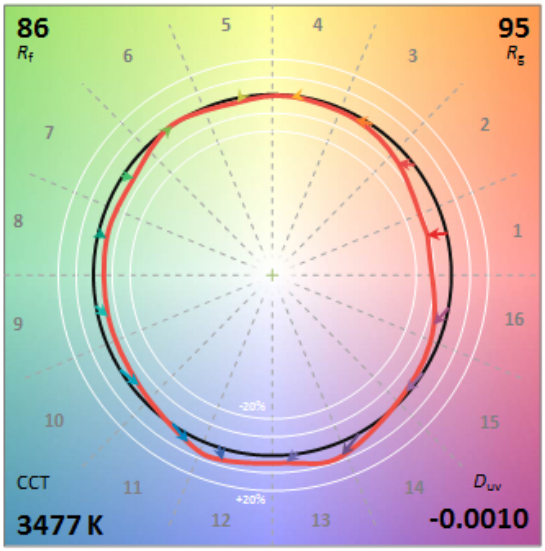
Manufacturer: Espen Technology Inc.

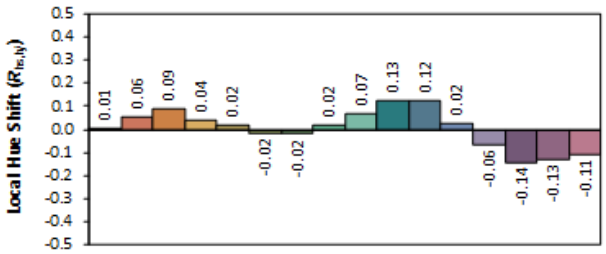
Date: 2023/1/12

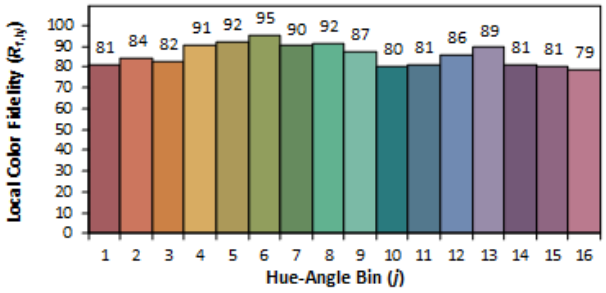
Model: VEKL8F/54-8T (38W/46W/54W)

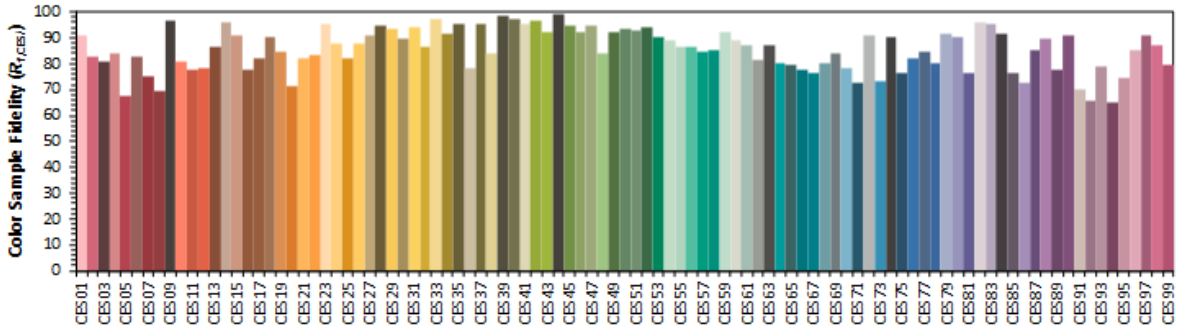












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

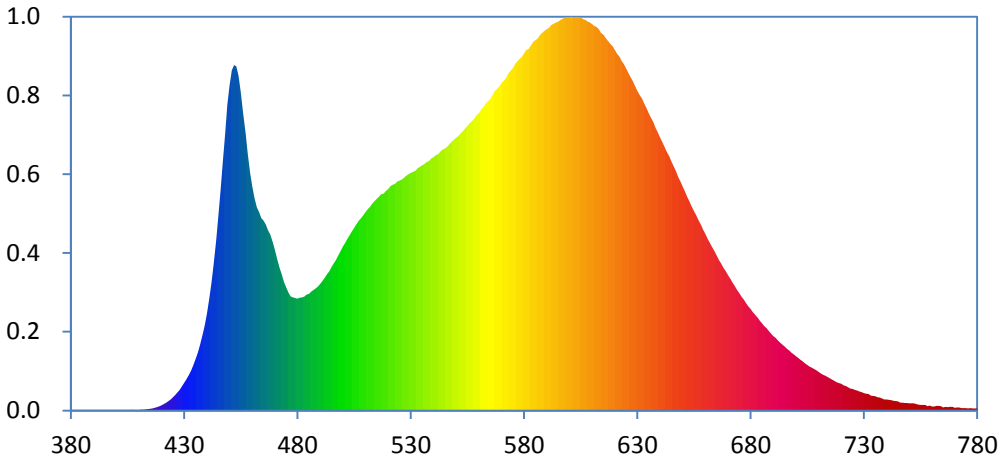
x	**0.4055**
y	**0.3885**
u'	**0.2368**
v'	**0.5104**

CIE 13.3-1995 (CRI)

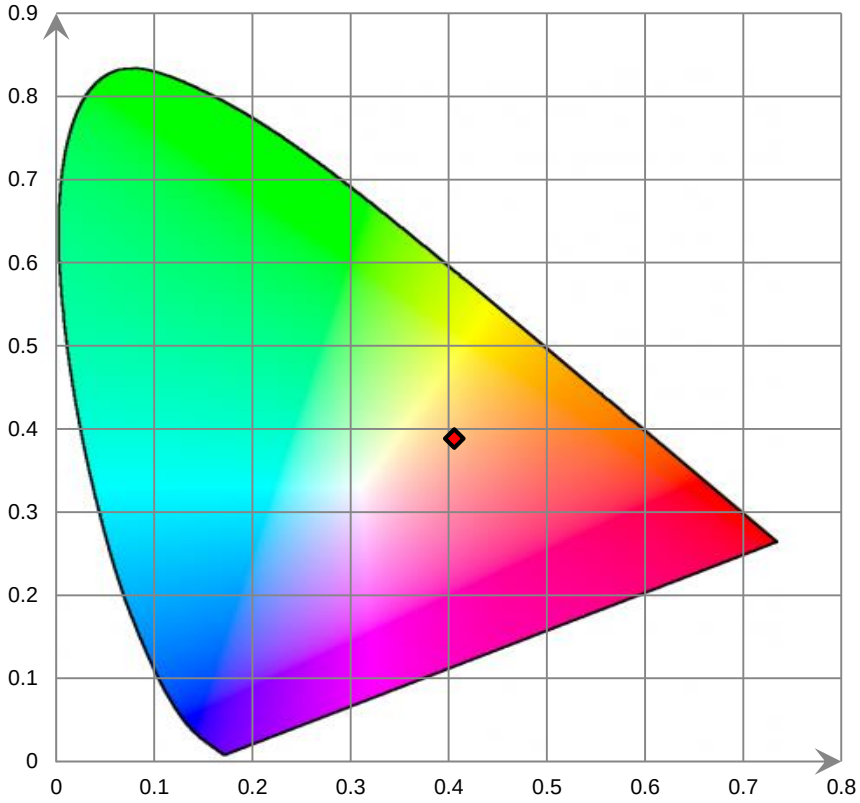
R_a	85
R_9	18

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

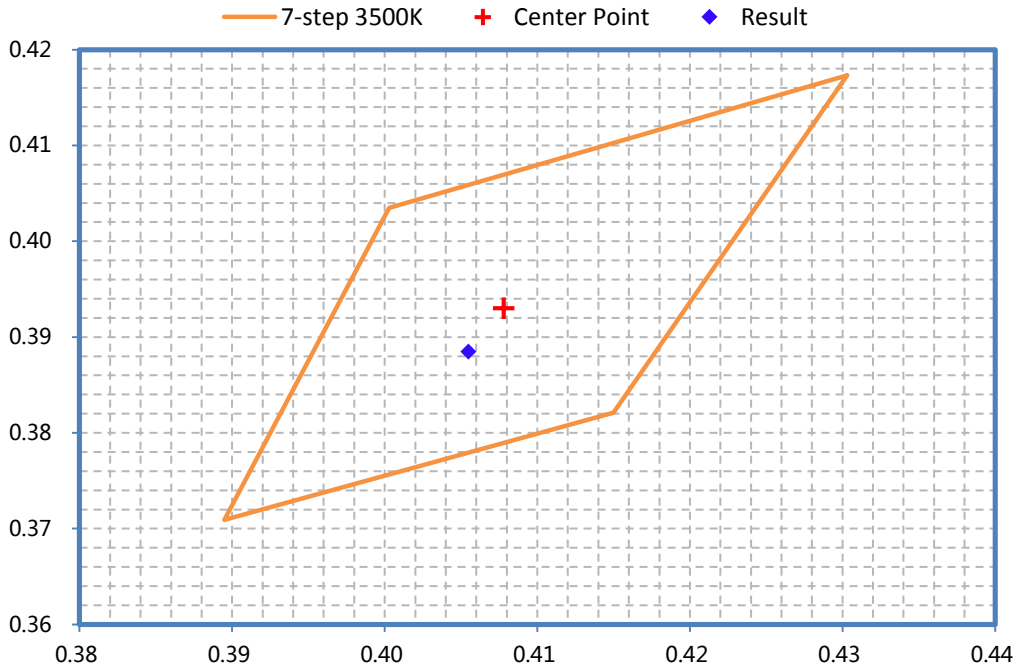
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



Test Model: VEKL8F/54-8T (38W/46W/54W)
Control Setting: 3500K/ 38W

THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9903	≥0.9	≥0.87	Pass
120	THDi	8.66%	≤20%	≤25%	Pass
277	Power Factor	0.9476	≥0.9	≥0.87	Pass
277	THDi	10.85%	≤20%	≤25%	Pass

Note:
1. The test results were measured directly from the test equipment.
2. The DLC requirements were listed according to DLC Technical Requirements V5.1.
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Test Data

[Integrating Sphere System]

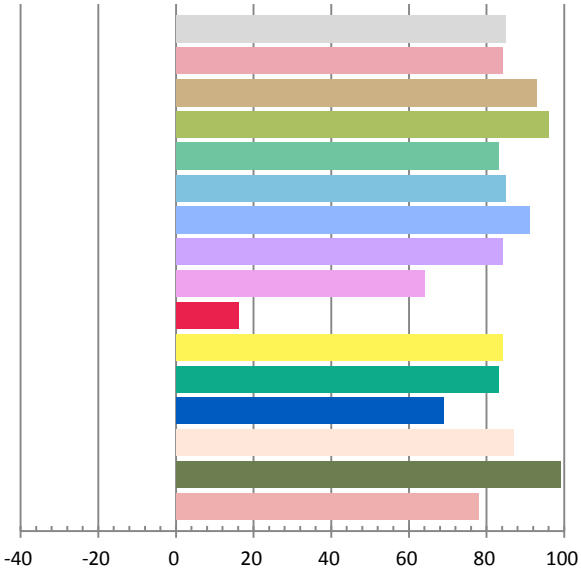
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.3146	37.38	0.9901	5366.2	143.56

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
16.317	3465	-0.00109	0.4061	0.3887	0.2371	0.5105

Color Rendering Index

Ra			
85.0			
R1	R2	R3	R4
84	93	96	83
R5	R6	R7	R8
85	91	84	64
R9	R10	R11	R12
16	84	83	69
R13	R14	R15	
87	99	78	



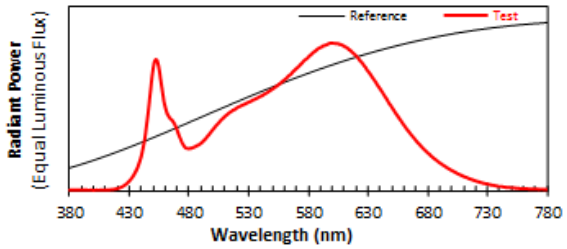
ANSI/IES TM-30-18 Color Rendition Report

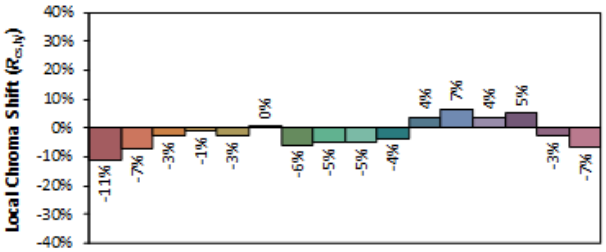
Source: User SPD

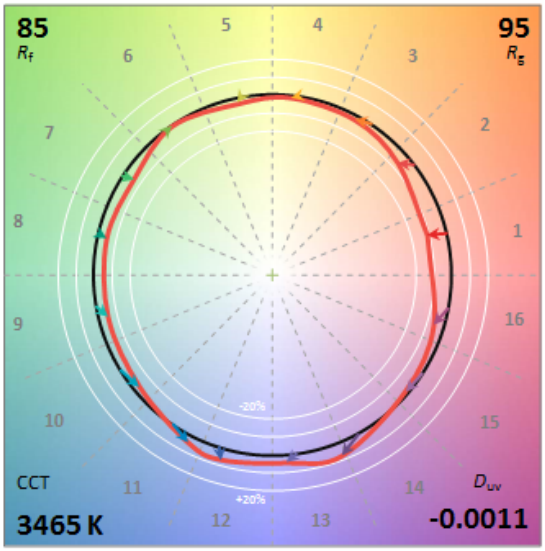
Manufacturer: Espen Technology Inc.

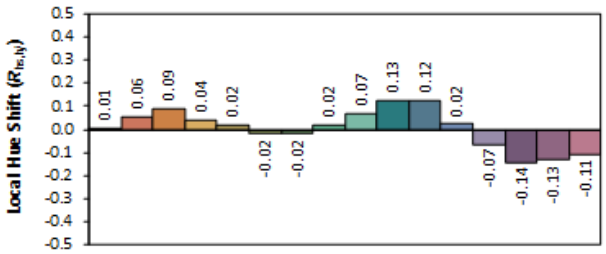
Date: 2023/1/12

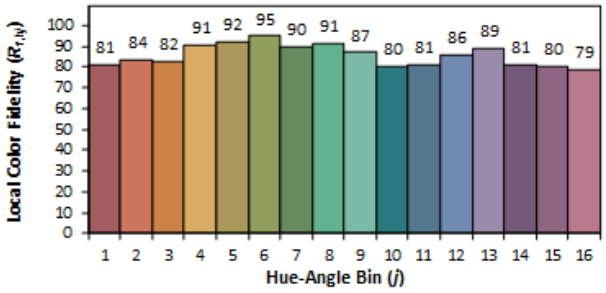
Model: VEKL8F/54-8T (38W/46W/54W)

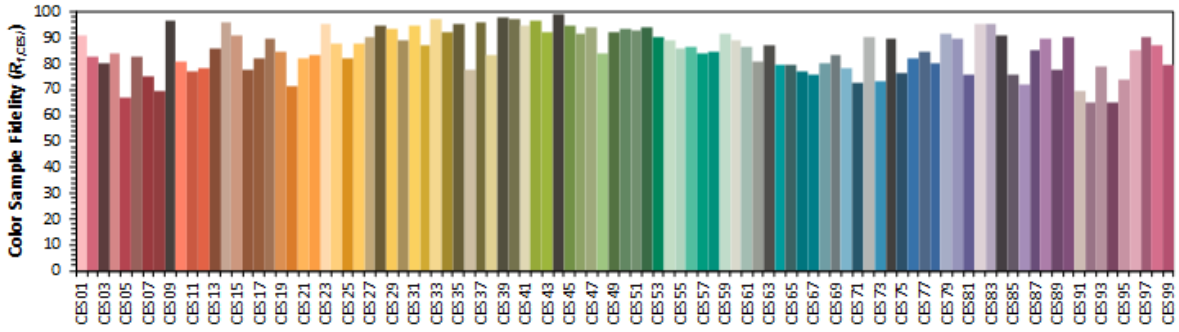












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

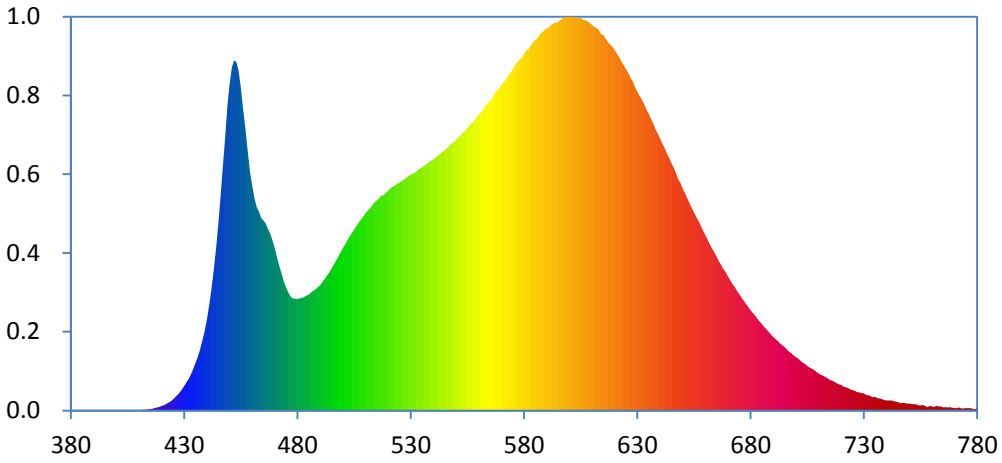
x	0.4061
y	0.3886
u'	0.2371
v'	0.5105

CIE 13.3-1995 (CRI)

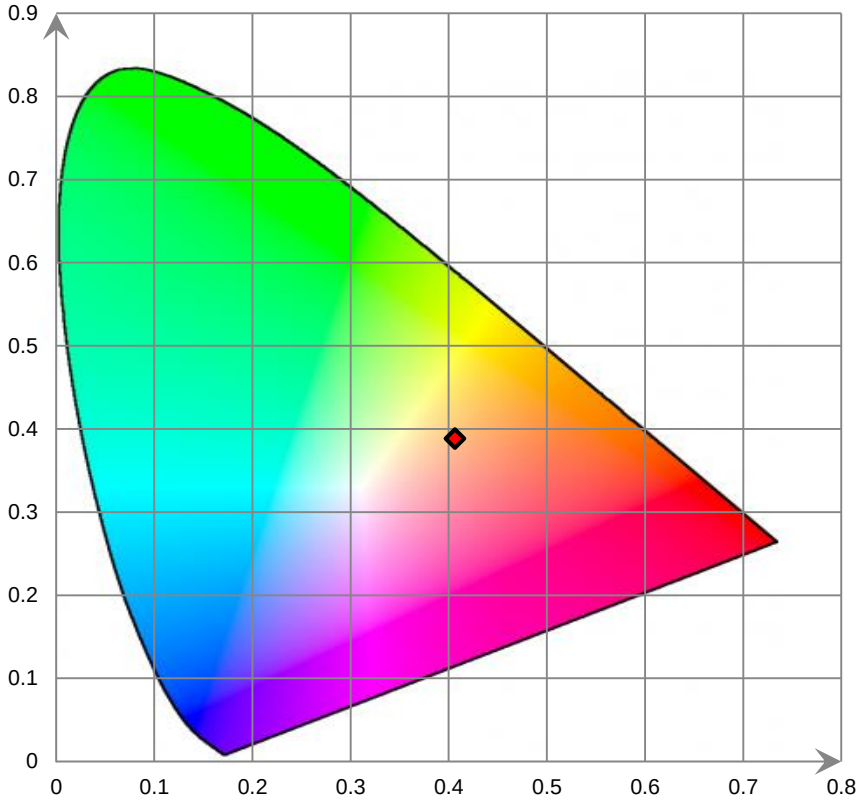
R_a	85
R_9	17

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

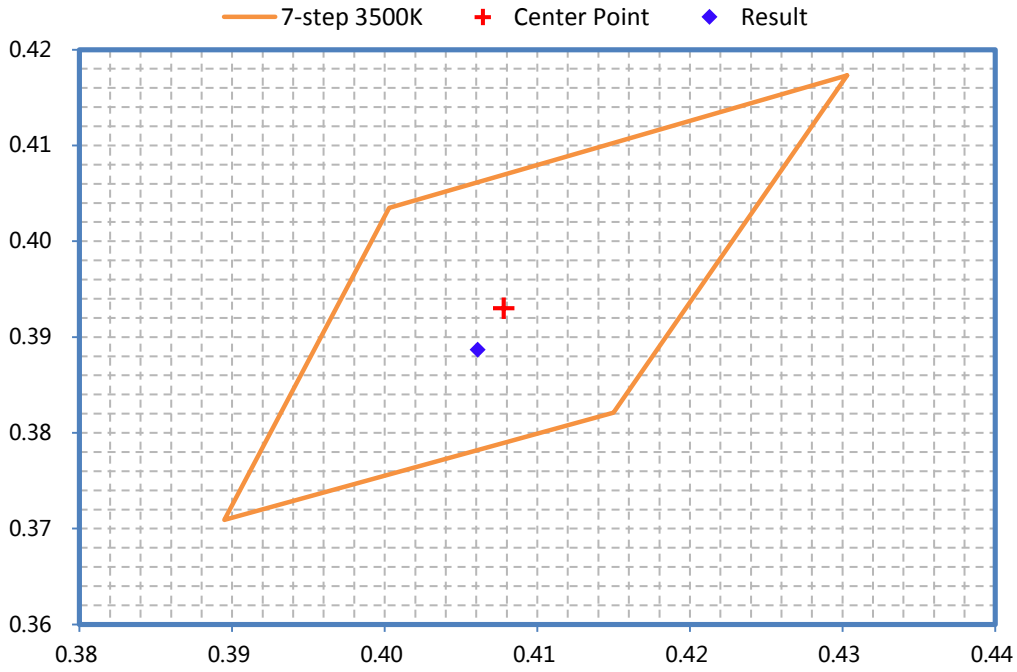
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



Test Model: VEKL8F/54-8T (38W/46W/54W)
Control Setting: 4000K/ 54W

Integrating Sphere Test; Orientation: Downward; Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances only)	Conclusion
Light Output(lm)	7738.9	≥3000	≥2700	Pass
Power(W)	51.97	None.	None.	N/A
Total Efficacy(lm/W)	148.91	≥115	≥111.55	Pass
CCT(K)	4155	None [i]	None.	N/A
Duv	-0.0012	None [i]	None.	N/A
IES R_f	85	70	69	Pass
IES R_g	94	89	88	
IES Rcs,h1	-11%	-12%~23%	-13%~24%	
R_a	85.5	≥80	≥79	
R_9	19	≥0	≥-1	

Note:
i. White-tunable products are not required to meet the chromaticity requirements in DLC V5.1.

THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9945	≥0.9	≥0.87	Pass
120	THDi	6.31%	≤20%	≤25%	Pass
277	Power Factor	0.9629	≥0.9	≥0.87	Pass
277	THDi	11.27%	≤20%	≤25%	Pass

Note:
1. The test results were measured directly from the test equipment.
2. The DLC requirements were listed according to DLC Technical Requirements V5.1.
3. The conclusion is for reference only. Test report that indicate product performance meets DLC Technical Requirements do not represent official DLC product qualification. All decisions regarding product qualification are made by the DLC.

Test Data

[Integrating Sphere System]

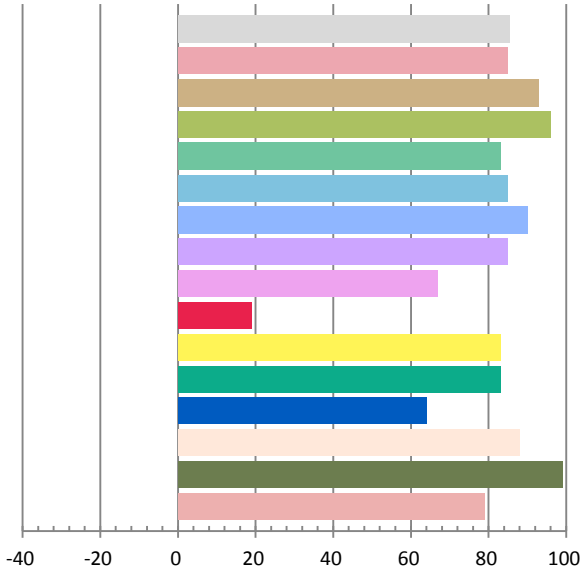
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4355	51.97	0.9945	7738.9	148.91

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
23.787	4155	-0.0012	0.3731	0.3696	0.2231	0.4973

Color Rendering Index

Ra			
85.5			
R1	R2	R3	R4
85	93	96	83
R5	R6	R7	R8
85	90	85	67
R9	R10	R11	R12
19	83	83	64
R13	R14	R15	
88	99	79	



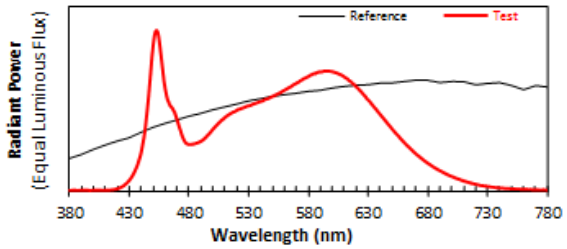
ANSI/IES TM-30-18 Color Rendition Report

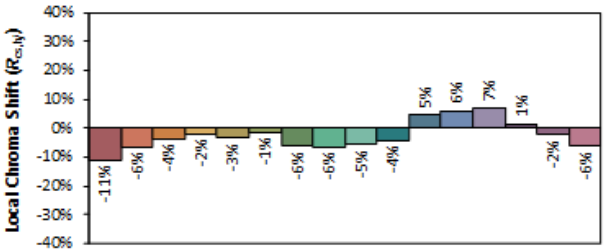
Source: User SPD

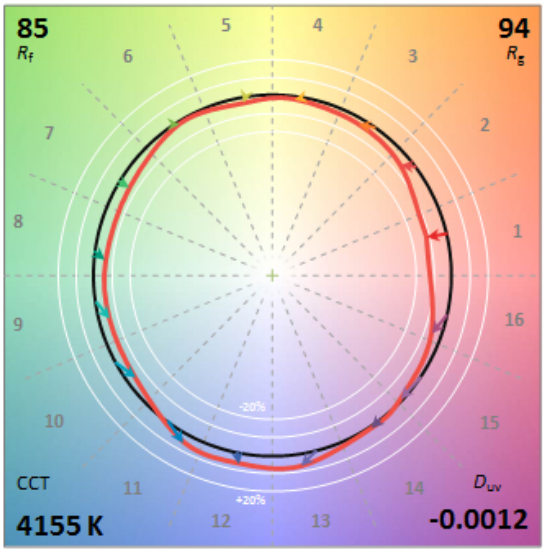
Manufacturer: Espen Technology Inc.

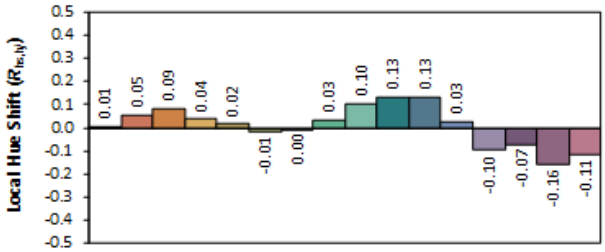
Date: 2023/1/12

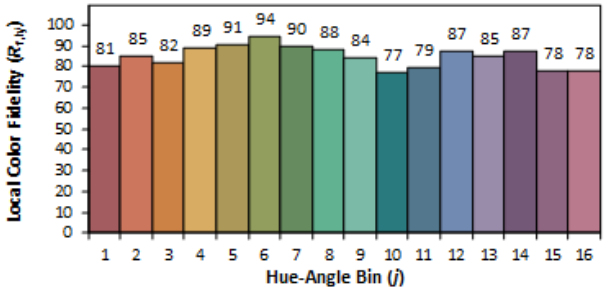
Model: VEKL8F/54-8T (38W/46W/54W)

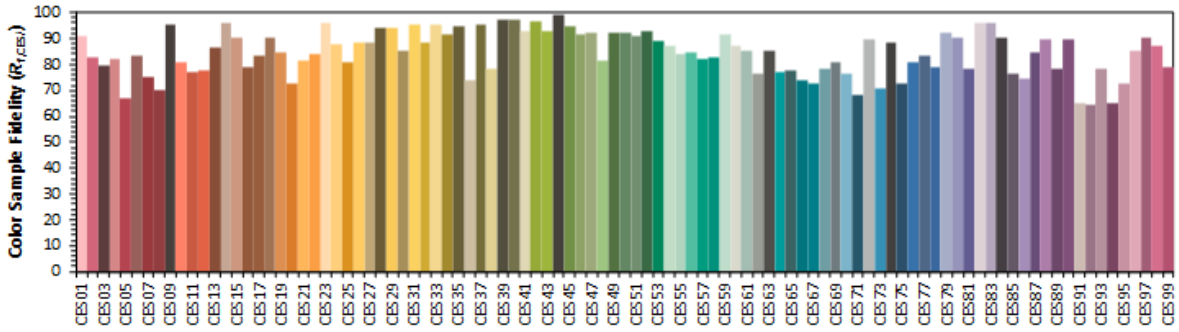












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

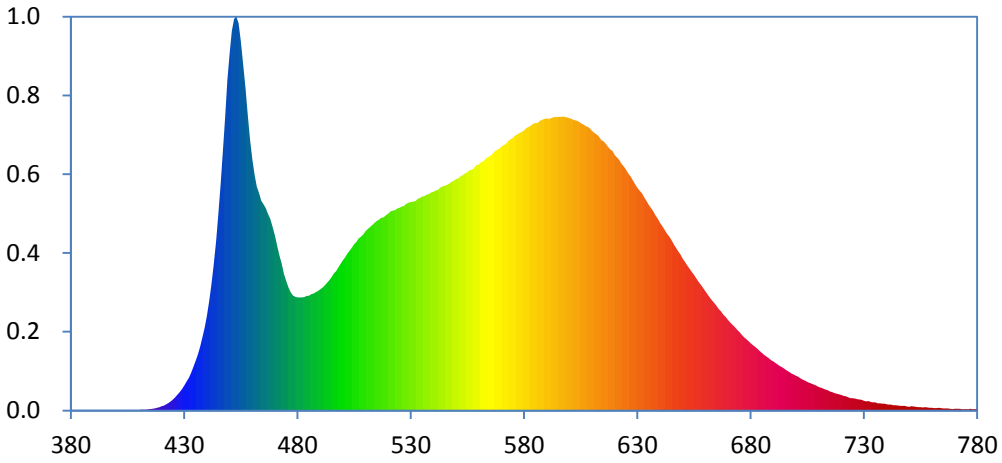
x	0.3731
y	0.3696
u'	0.2232
v'	0.4973

CIE 13.3-1995 (CRI)

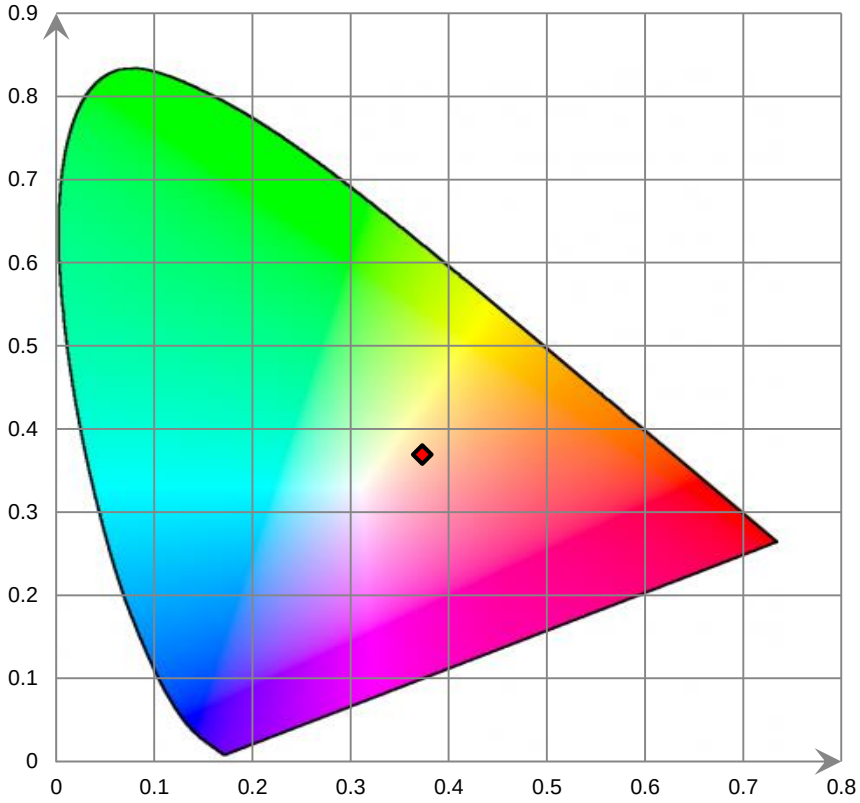
R_a	85
R_9	18

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

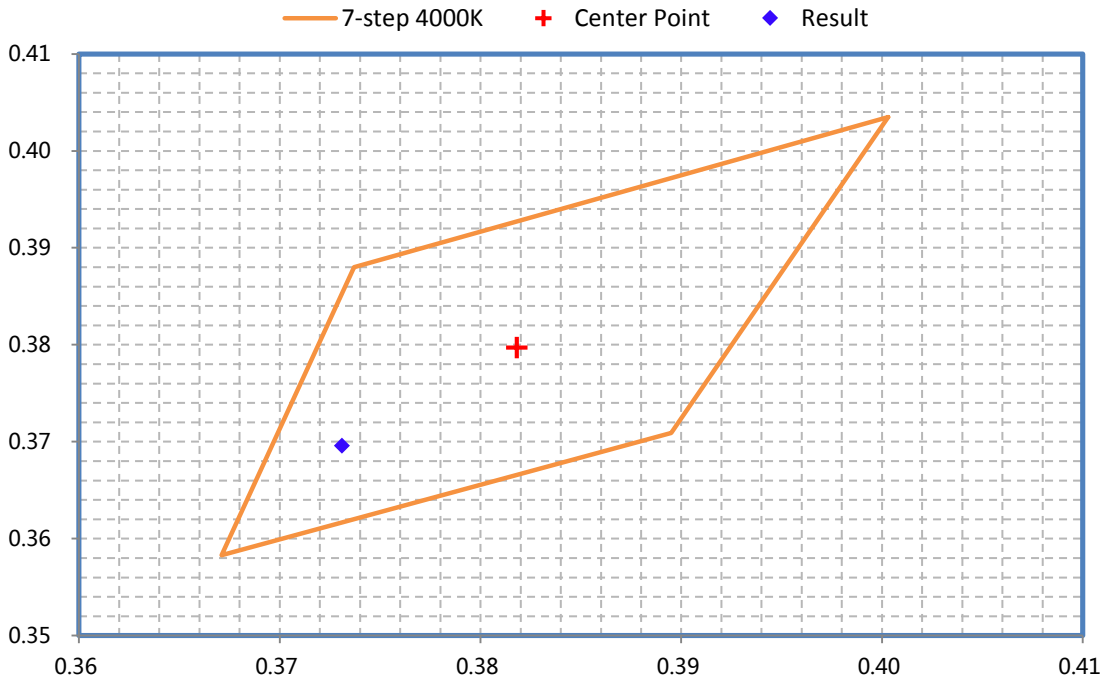
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



Test Model: VEKL8F/54-8T (38W/46W/54W)
Control Setting: 5000K/ 54W

Integrating Sphere Test; Orientation: Downward; Test Voltage: 120V 60Hz;

Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances only)	Conclusion
Light Output(lm)	7610.9	≥3000	≥2700	Pass
Power(W)	53.82	None.	None.	N/A
Total Efficacy(lm/W)	141.42	≥115	≥111.55	Pass
CCT(K)	5006	None [i]	None.	N/A
Duv	0.00148	None [i]	None.	N/A
IES R_f	84	70	69	Pass
IES R_g	95	89	88	
IES Rcs,h1	-12%	-12%~23%	-13%~24%	
R_a	84.1	≥80	≥79	
R_9	9	≥0	≥-1	

Note:
i. White-tunable products are not required to meet the chromaticity requirements in DLC V5.1.

Integrating Sphere THDi、PF Test; Orientation: Downward;

Test Voltage	Test Item	Test Result	DLC Requirements	DLC Requirements(With tolerances and/or allowances)	Conclusion
120	Power Factor	0.9945	≥0.9	≥0.87	Pass
120	THDi	6.57%	≤20%	≤25%	Pass
277	Power Factor	0.9648	≥0.9	≥0.87	Pass
277	THDi	10.91%	≤20%	≤25%	Pass

Note:
1. The test results were measured directly from the test equipment.
2. The DLC requirements were listed according to DLC Technical Requirements V5.1.
3. The conclusion is for reference only. Test report that indicate product performance meets DLC Technical Requirements do not represent official DLC product qualification. All decisions regarding product qualification are made by the DLC.

Test Data

[Integrating Sphere System]

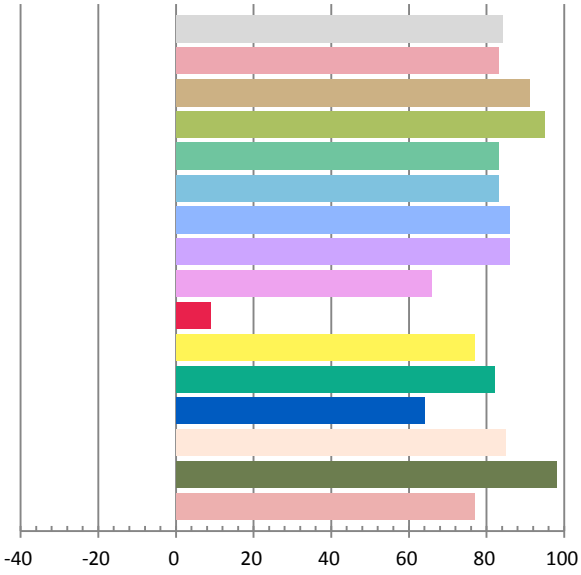
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4509	53.82	0.9945	7610.9	141.42

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
23.527	5006	0.00148	0.3452	0.3547	0.2103	0.4862

Color Rendering Index

Ra			
84.1			
R1	R2	R3	R4
83	91	95	83
R5	R6	R7	R8
83	86	86	66
R9	R10	R11	R12
9	77	82	64
R13	R14	R15	
85	98	77	



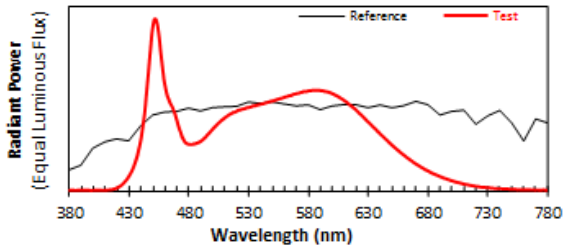
ANSI/IES TM-30-18 Color Rendition Report

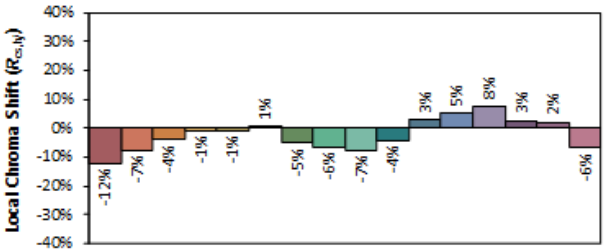
Source: User SPD

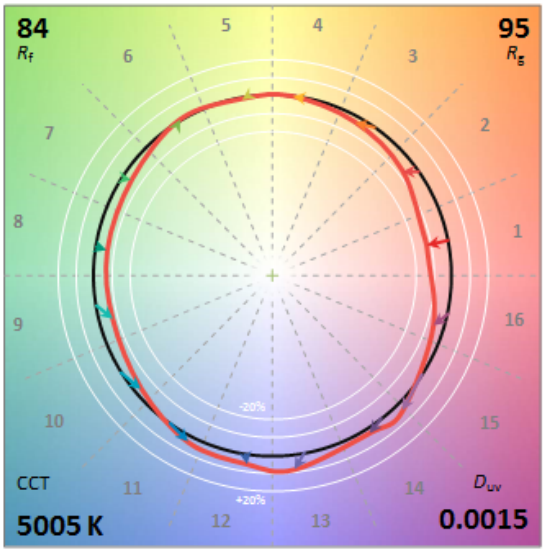
Manufacturer: Espen Technology Inc.

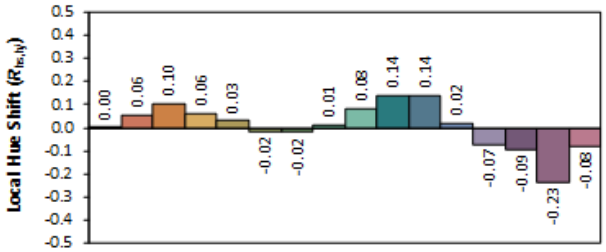
Date: 2023/1/12

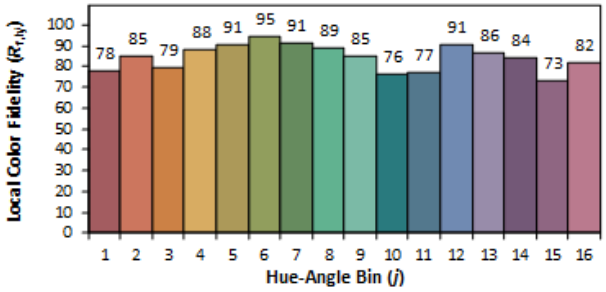
Model: VEKL8F/54-8T (38W/46W/54W)

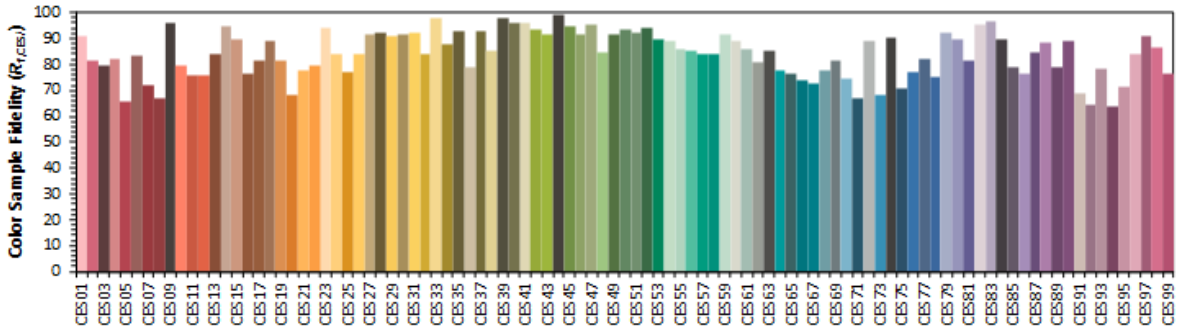












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

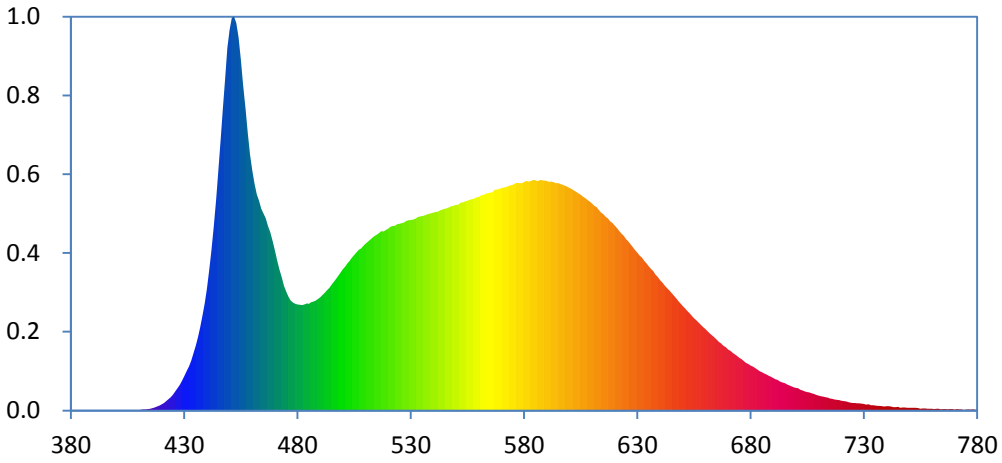
x	**0.3452**
y	**0.3547**
u'	**0.2103**
v'	**0.4862**

CIE 13.3-1995 (CRI)

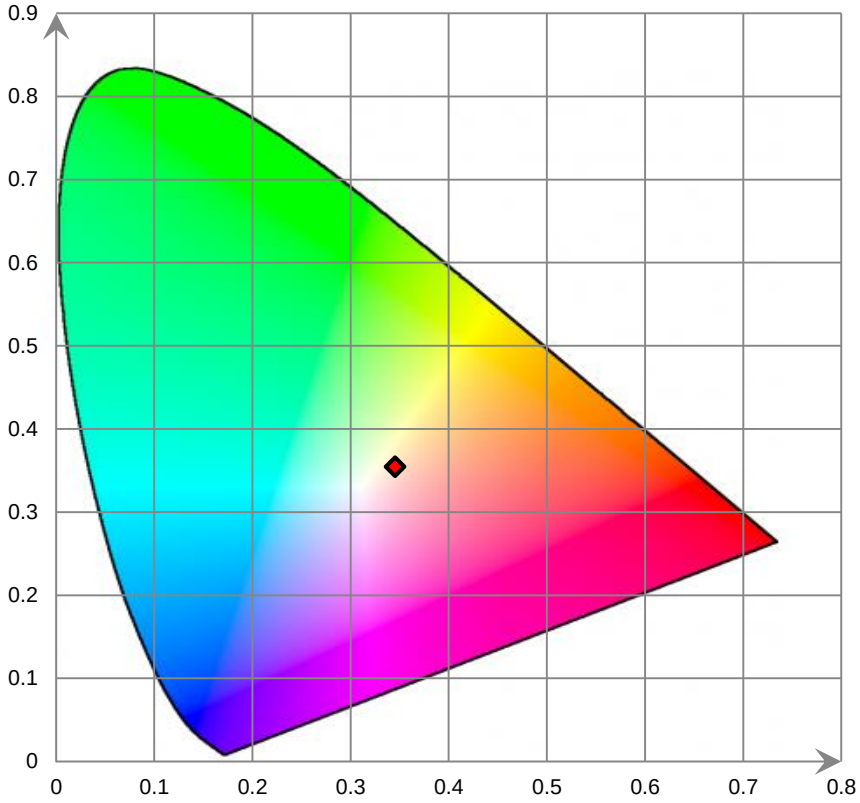
R_a	84
R_9	9

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

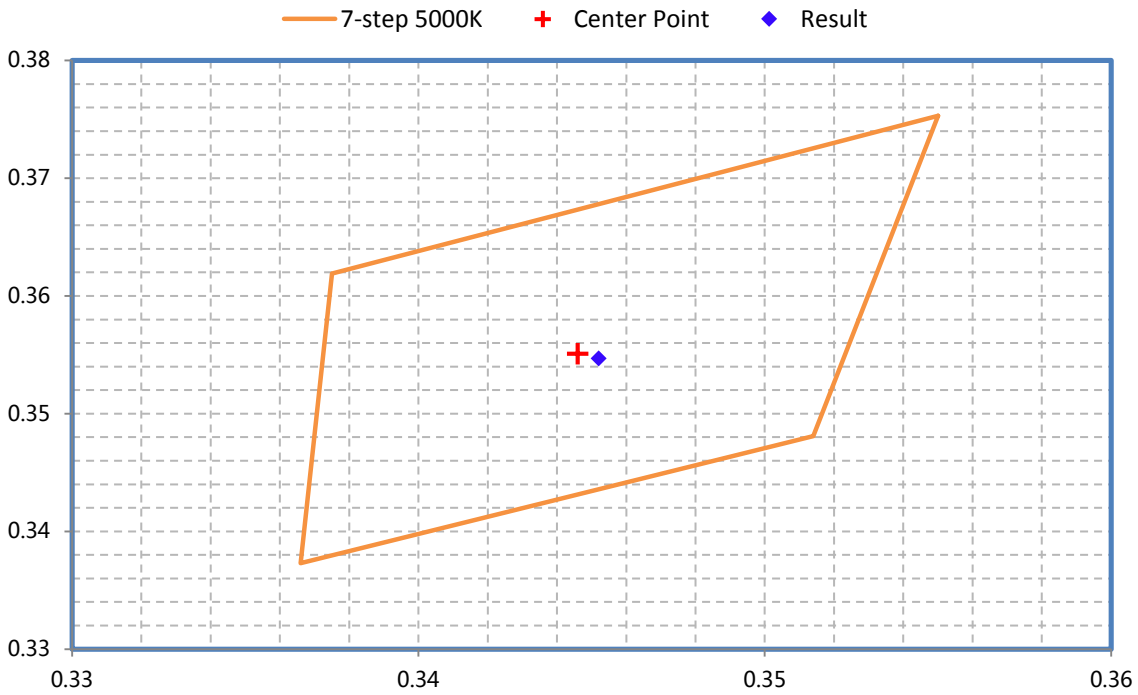
Relative Spectral Power Distribution



CIE 1931 x y Chromaticity Diagram



ANSI C78.377-2017 Chromaticity Quadrangles



6. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Integrating Sphere	INVENTFINE	Dia 1.5m	JWWCV090112	2022-06-21	2023-06-20
Power Meter	INVENTFINE	WT500	GSJWQ20009	2022-11-03	2023-11-02
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2022-06-21	2023-06-20
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2022-06-21	2023-06-20
Standard Light Source	Osram	24V/50W	JWWCR020104	2021-09-15	2023-09-14
Thermal Meter	ANYMETRE	TH-20E	N/A	2022-11-11	2023-11-10
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2022-06-21	2023-06-20
Digital Multimeter	FLUKE	115C	37840512WS	2022-06-22	2023-06-21
Hybrid Recorder	YOKOGAWA	DR230	47JH0903	2022-06-22	2023-06-21
Power Supply	SC	SC/BP-11003	1608110030553	2022-06-21	2023-06-20

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

7. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-19. The ambient temperature of the sample was maintained at 25°C±1°C during measurement. And relative humidity is less than 65%. The product was operated in its intended orientation in application during all testing.

Integrating Sphere System
The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement. 4π geometry was used during measurement.

ISTMT Test
The LED which has the highest temperature was measured at the location of LED case which is specified by LED source manufacturer and detailed by LM-80 report. The drive current of LED package/module/ array was calculated as the total output current of the driver measured by multimeter, divided by the number of branches in parallel of LEDs.

Directions

1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk "★".
3. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
4. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
5. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
6. This report cannot be reproduced except in full, without prior written approval of the Company.
7. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

**********END OF REPORT**********