



DesignLights Consortium Test Report

Reference Standards

UL1598-2008

ANSI C82.77-10-2014

IES LM-79-2008

Prepared For

Fulham Co., Inc.

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Test Laboratory:

UL-CCIC Company Limited

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Catalog Number

VTR-22-MU-30-9TW-A

Project Number

4790617185

Report Number

4790617185_6

Test Date

2022-11-13~2022-11-16

Issue Date

2022-11-21

Revision Date

N/A

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Approved By

Maxine Zhou

Zhou, Maxine

The results contained in this report pertain only to the tested sample.

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Test Summary

DLC Technical Requirements V5.1- issued 2020-02-14

Requirement Category	Test Method	Requirements	Tolerance	Test Result
Minimum Light Output (lm)-Luminaires	IES LM-79-2008	≥2000	-10%	2568.66
Minimum Luminaire Efficacy (lm/W)-Luminaires	IES LM-79-2008	≥125	-3%	123.45
Spacing Criteria (0-180°)	IES LM-79-2008	1.0-2.0	±0.1	1.12
Spacing Criteria (90-270°)	IES LM-79-2008	1.0-2.0	±0.1	1.16
Zonal Lumen Requirement 1(0°-60°)	IES LM-79-2008	≥75%	-3%	83.20%
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3398
Allowable CCT (4000K)	IES LM-79-2008/ANSI C78.377-2015	3985±275	N/A	4085
Allowable CCT (5000K)	IES LM-79-2008/ANSI C78.377-2015	5029±283	N/A	4918
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3396
Allowable CCT (3500K)	IES LM-79-2008/ANSI C78.377-2015	3465±245	N/A	3392
Minimum CRI	IES LM-79-2008/CIE 13.3-1995	≥80	-1	92
Minimum R9	IES LM-79-2008	≥0	-1	70.0
Minimum Rg	IES LM-79-2008	≥89	-1	100
Minimum Rf	IES LM-79-2008	≥70	-1	89
Rcs,h1	IES LM-79-2008	-12%-23%	-1%	-2%
Unified Glare Rating (UGR)	IES LM-79-2008	≤22	N/A	21.5
L70 Lumen maintenance (Hours)	N/A	≥50000	N/A	≥50000
L90 Lumen maintenance (Hours)	N/A	≥36000	N/A	≥36000
Power Factor	ANSI C82.77-10-2014	≥0.9	-0.03	0.9315
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	5%	15.57%
In-Situ Temperature Measurement Test for LED 1 (°C)	UL1598-2008	≤105	N/A	46.3
In-Situ Temperature Measurement Test for Driver 1 (°C)	UL1598-2008	≤90	N/A	51.4
Max Chromaticity Shift (1000-6000h)	N/A	≤0.004	0.0004	0.002
Minimum Luminaire Warranty (Years)	N/A	≥5	N/A	≥5



Test List

Sample Received Date: 2022-10-27

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2022-11-14	VTR-22-MU-30-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-14	VTR-22-MU-30-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-14	VTR-22-MU-30-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-14	VTR-22-MU-30-9TW-A	Yang, Gavin X
Integrating Sphere Test	2022-11-14	VTR-22-MU-30-9TW-A	Yang, Gavin X
Goniophotometer Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
Goniophotometer Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
THD and PF Test	2022-11-13	VTR-22-MU-30-9TW-A	Yang, Gavin X
In-Situ Temperature Measurement Test	2022-11-16	VTR-22-MU-30-9TW-A	Yang, Gavin X

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
2. The accuracy method decision rule is applied when the compliance or verdict is made to the results of this report.



Product Description

Lamp/Luminaire Description: Integrated Retrofit Kits for 2x2 Luminaires

Model Number: VTR-22-MU-30-9TW-A

Electrical Parameter: 120-277V, 50/60Hz

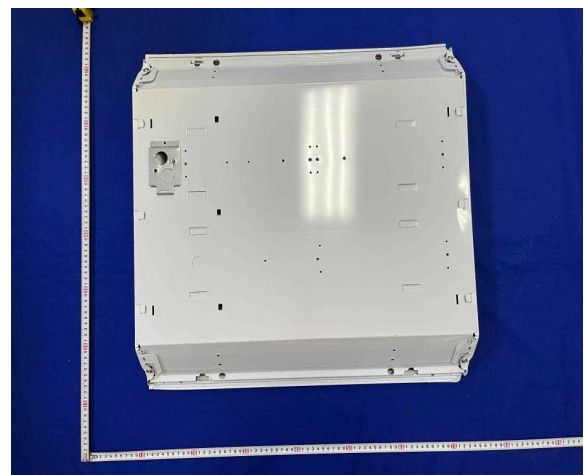
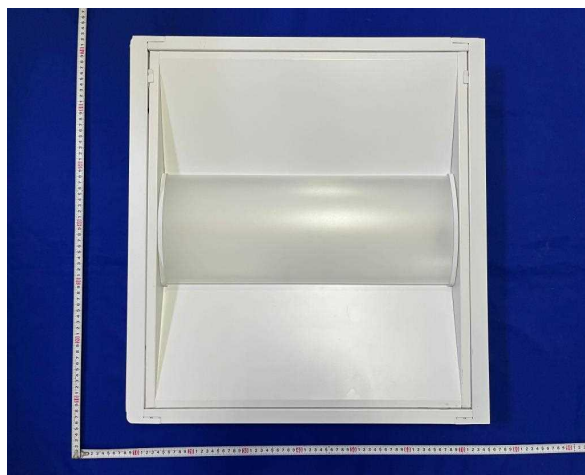
LED Package: BxFN-(A)G-11L-3A

Dimming Information: Continuous dimming capability

Remark: Housing model: 2GT8-2-17-A12-MVOLT-GEB10IS

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
VTR-22-MU-30-9TW-A	3500K	3690	30	123
VTR-22-MU-30-9TW-A	4000K	3990	30	133
VTR-22-MU-30-9TW-A	5000K	3750	30	125
VTR-22-MU-30-9TW-A	3500K	3125	25	125
VTR-22-MU-30-9TW-A	4000K	3375	25	135
VTR-22-MU-30-9TW-A	5000K	3175	25	127
VTR-22-MU-30-9TW-A	3500K	2560	20	128
VTR-22-MU-30-9TW-A	4000K	2760	20	138
VTR-22-MU-30-9TW-A	5000K	2600	20	130





Integrating Sphere Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

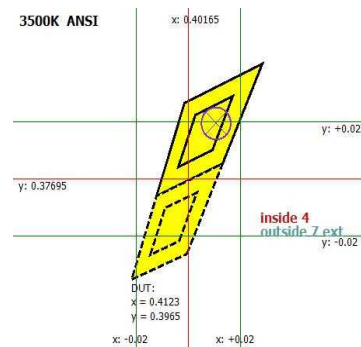
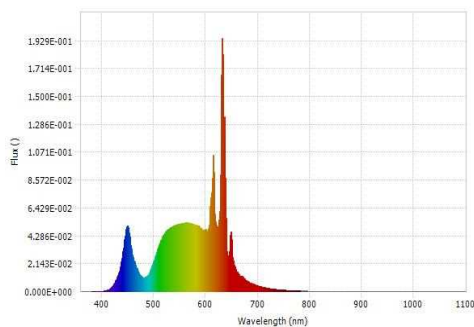
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.7	120.02	60	0.2490	29.506	0.9874	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3398	92	84.0	0.0010	3665.83	124.24	N/A



Luminous Flux (lm)	3665.83	Chrom x	0.4123
Chrom y	0.3965	Chrom u	0.2379
Chrom v	0.3431	Duv	0.0010
Chrom u'	0.2379	Chrom v'	0.5147
CCT (K)	3398	Luminous Efficacy (lm/W)	124.24
Ra	92	R1	98.0
R2	92.0	R3	84.0
R4	91.0	R5	95.0
R6	90.0	R7	93.0
R8	95.0	R9	84.0
R10	79.0	R11	91.0
R12	72.0	R13	96.0
R14	89.0	R15	97.0
Rf	89	Rg	105
Rcs,h1	-3%		



Integrating Sphere Test (Cont'd)

TM-30 Report

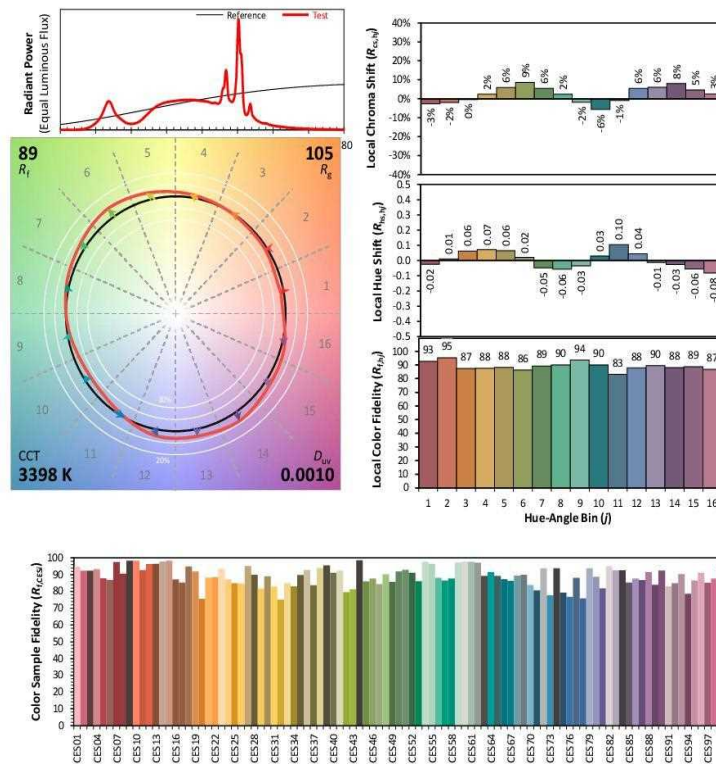
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-11L-3A

Manufacturer: Fulham Co., Inc.

Date: 11/14/2022

Model: VTR-22-MU-30-9TW-A



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

x 0.4123
y 0.3965
u' 0.2379
v' 0.5147

CIE 13.3-1995
(CRI)

R_a 92
R_g 84

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Integrating Sphere Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

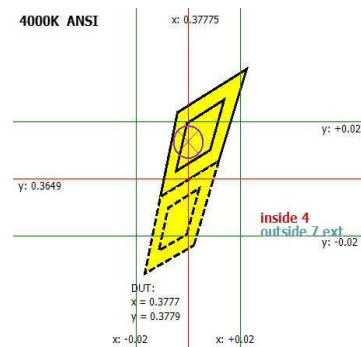
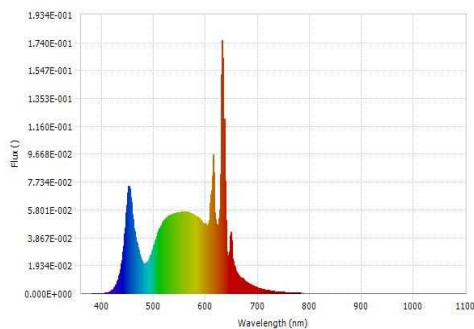
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.7	120.03	60	0.2353	27.891	0.9876	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4085	95	85.0	0.0013	3909.67	140.18	N/A



Luminous Flux (lm)	3909.67	Chrom x	0.3777
Chrom y	0.3779	Chrom u	0.2228
Chrom v	0.3344	Duv	0.0013
Chrom u'	0.2228	Chrom v'	0.5017
CCT (K)	4085	Luminous Efficacy (lm/W)	140.18
Ra	95	R1	98.0
R2	95.0	R3	89.0
R4	96.0	R5	95.0
R6	92.0	R7	97.0
R8	96.0	R9	85.0
R10	84.0	R11	94.0
R12	69.0	R13	96.0
R14	93.0	R15	97.0
Rf	91	Rg	101
Rcs,h1	-3%		



Integrating Sphere Test (Cont'd)

TM-30 Report

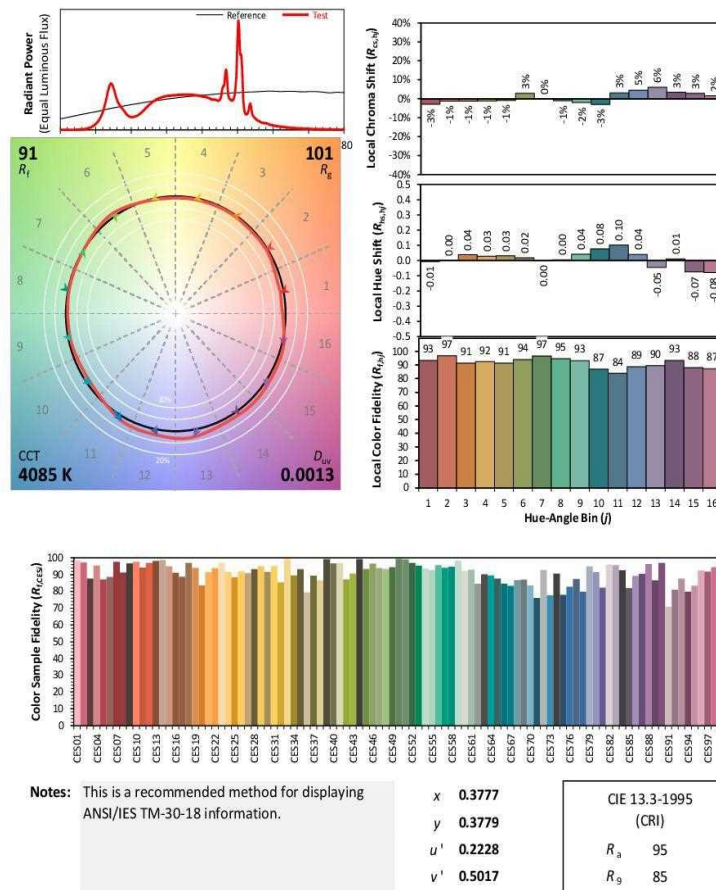
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-11L-3A

Manufacturer: Fulham Co., Inc.

Date: 11/14/2022

Model: VTR-22-MU-30-9TW-A



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Integrating Sphere Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

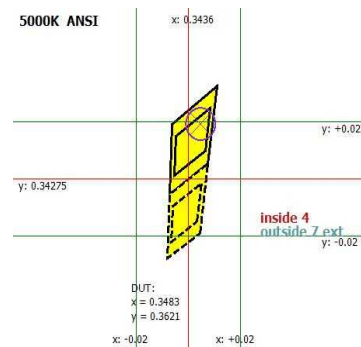
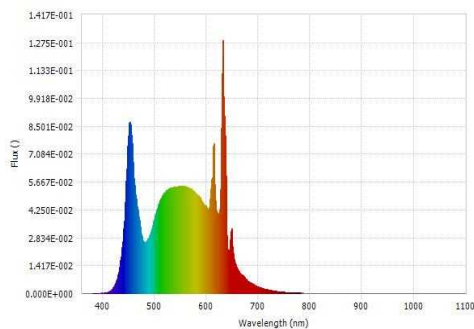
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.7	120	60	0.2463	29.191	0.9875	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4918	93	70.0	0.0039	3706.81	126.98	N/A



Luminous Flux (lm)	3706.81	Chrom x	0.3483
Chrom y	0.3621	Chrom u	0.2096
Chrom v	0.3268	Duv	0.0039
Chrom u'	0.2096	Chrom v'	0.4902
CCT (K)	4918	Luminous Efficacy (lm/W)	126.98
Ra	93	R1	93.0
R2	94.0	R3	92.0
R4	93.0	R5	91.0
R6	90.0	R7	97.0
R8	90.0	R9	70.0
R10	83.0	R11	92.0
R12	64.0	R13	93.0
R14	95.0	R15	91.0
Rf	90	Rg	100
Rcs,h1	-5%		



Integrating Sphere Test (Cont'd)

TM-30 Report

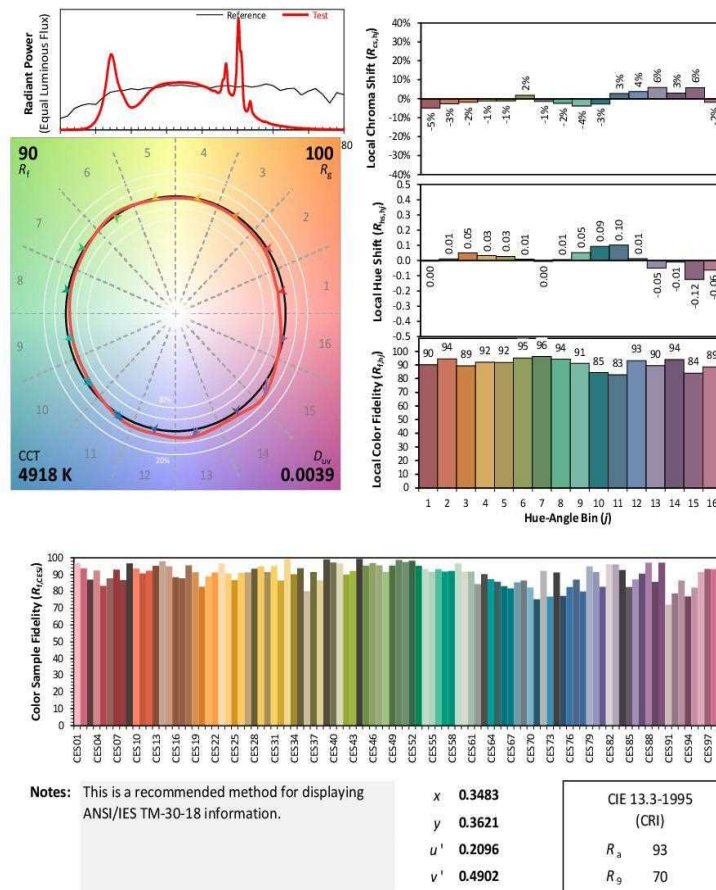
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Source: BXFN-(A)G-11L-3A

Manufacturer: Fulham Co., Inc.

Date: 11/14/2022

Model: VTR-22-MU-30-9TW-A



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Integrating Sphere Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

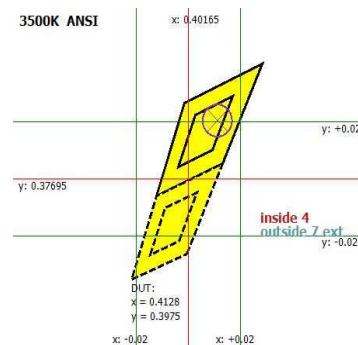
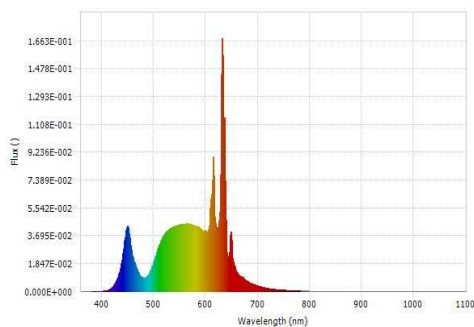
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.7	120.07	60	0.2036	24.033	0.9832	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3396	92	85.0	0.0014	3120.52	129.84	N/A



Luminous Flux (lm)	3120.52	Chrom x	0.4128
Chrom y	0.3975	Chrom u	0.2378
Chrom v	0.3435	Duv	0.0014
Chrom u'	0.2378	Chrom v'	0.5152
CCT (K)	3396	Luminous Efficacy (lm/W)	129.84
Ra	92	R1	98.0
R2	92.0	R3	84.0
R4	92.0	R5	95.0
R6	90.0	R7	93.0
R8	95.0	R9	85.0
R10	79.0	R11	91.0
R12	71.0	R13	96.0
R14	89.0	R15	97.0
Rf	89	Rg	105
Rcs,h1	-3%		



Integrating Sphere Test (Cont'd)

TM-30 Report

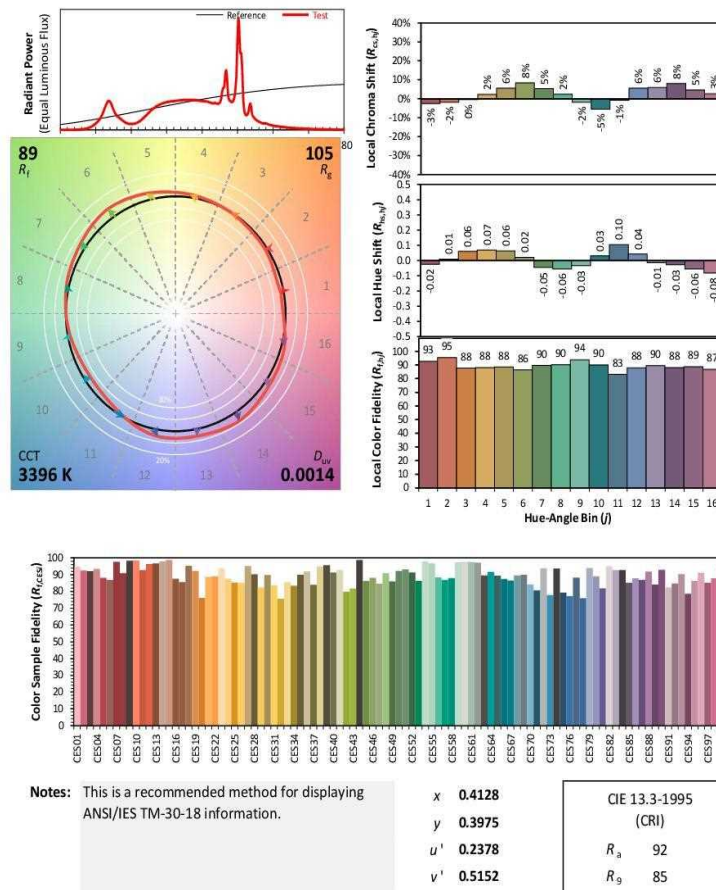
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Manufacturer: Fulham Co., Inc.

Date: 11/14/2022

Model: VTR-22-MU-30-9TW-A



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Integrating Sphere Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

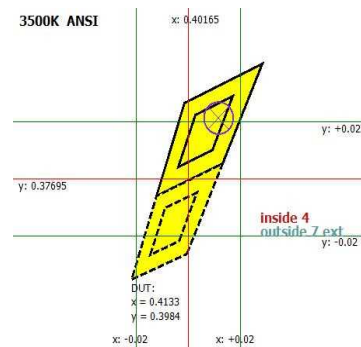
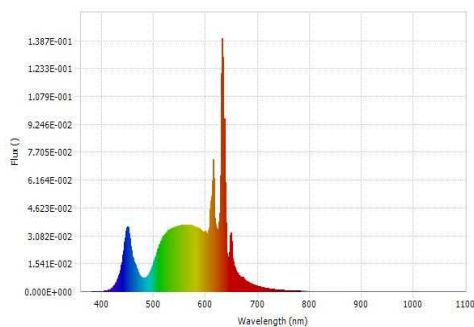
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.7	120.12	60	0.1621	19.033	0.9778	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
3392	92	85.0	0.0016	2568.66	134.96	N/A



Luminous Flux (lm)	2568.66	Chrom x	0.4133
Chrom y	0.3984	Chrom u	0.2377
Chrom v	0.3437	Duv	0.0016
Chrom u'	0.2377	Chrom v'	0.5156
CCT (K)	3392	Luminous Efficacy (lm/W)	134.96
Ra	92	R1	98.0
R2	93.0	R3	84.0
R4	92.0	R5	95.0
R6	90.0	R7	93.0
R8	95.0	R9	85.0
R10	79.0	R11	91.0
R12	71.0	R13	96.0
R14	89.0	R15	97.0
Rf	90	Rg	104
Rcs,h1	-2%		



Integrating Sphere Test (Cont'd)

TM-30 Report

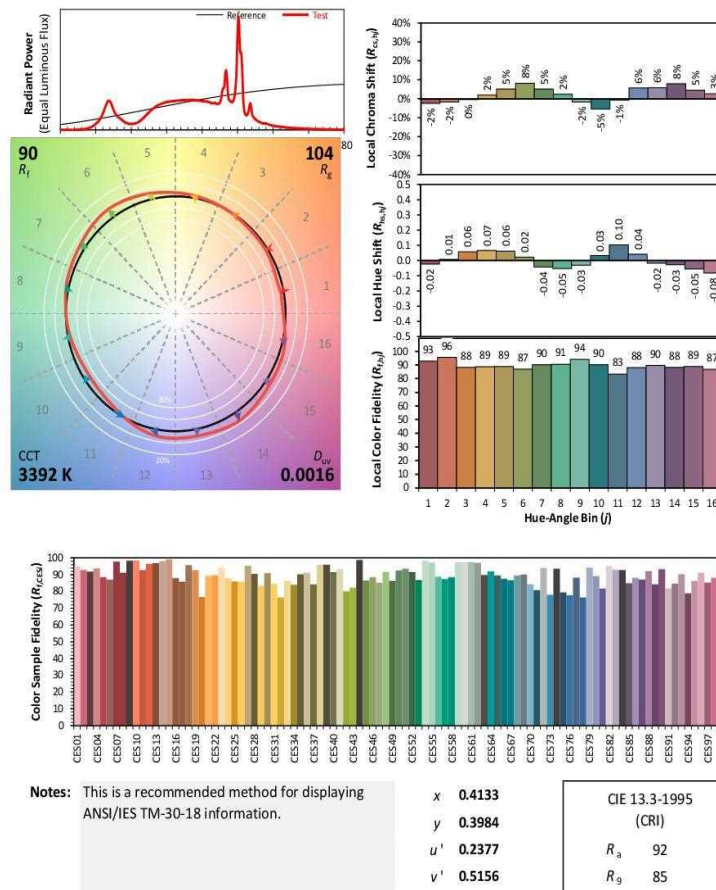
ANSI/IES TM-30-18 Color Rendition Report

Source: BXFN-(A)G-11L-3A

Manufacturer: Fulham Co., Inc.

Date: 11/14/2022

Model: VTR-22-MU-30-9TW-A



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Goniophotometer Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 2.Photometric parameters were measured using a type C goniophotometer and software.
- 3.The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
- 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.5	119.97	60	0.2488	29.514	0.9889	12.49%	Horizontal

Test Results

Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0° - 60°	N/A	Horizontal Spread	Vertical Spread	
3643.4	83.20%	N/A	97.7	82.7	123.45

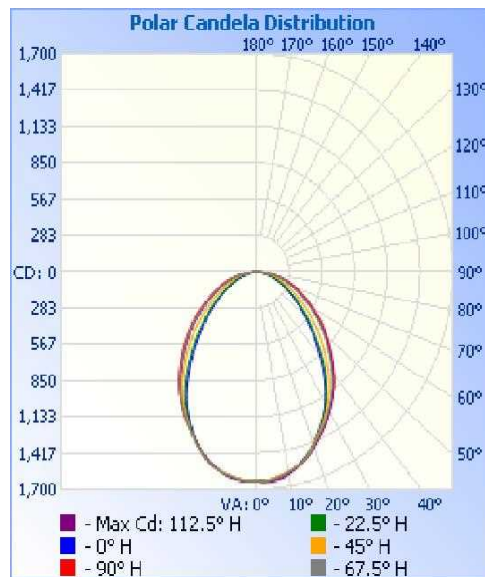
Backlight	Uplight	Glare
N/A	N/A	N/A

UGR		Spacing Criteria (0 - 180°)	Spacing Criteria (90° - 270°)
Crosswise	Endwise		
17.7	21.5	1.12	1.18

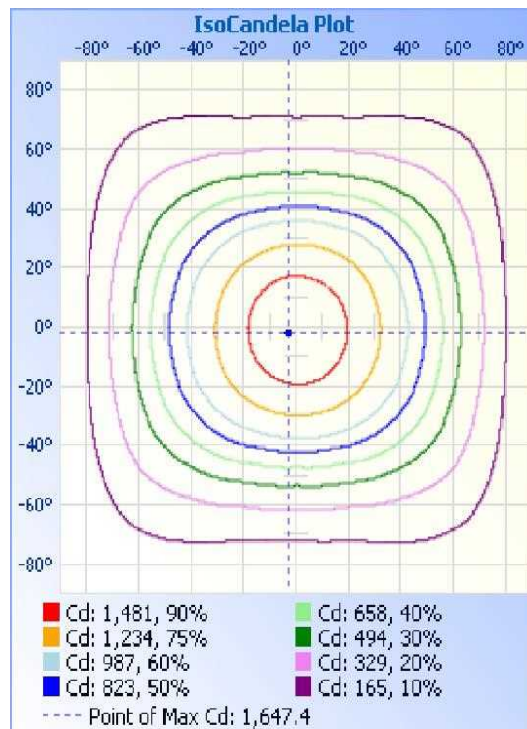


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1208.1	33.20%
0-40	1898.6	52.10%
0-60	3030.0	83.20%
60-90	602.2	16.50%
70-100	259.1	7.10%
90-120	2.9	0.10%
0-90	3632.2	99.70%
90-180	11.2	0.30%
0-180	3643.4	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	39.1	1.10%	90-95	0.7	0.00%
5-10	115.5	3.20%	95-100	0.6	0.00%
10-15	186.3	5.10%	100-105	0.5	0.00%
15-20	247.0	6.80%	105-110	0.4	0.00%
20-25	293.2	8.00%	110-115	0.3	0.00%
25-30	327.0	9.00%	115-120	0.5	0.00%
30-35	345.3	9.50%	120-125	0.6	0.00%
35-40	345.3	9.50%	125-130	0.7	0.00%
40-45	328.6	9.00%	130-135	0.8	0.00%
45-50	302.4	8.30%	135-140	0.8	0.00%
50-55	269.3	7.40%	140-145	0.9	0.00%
55-60	231.1	6.30%	145-150	0.9	0.00%
60-65	191.1	5.20%	150-155	0.8	0.00%
65-70	153.2	4.20%	155-160	0.8	0.00%
70-75	118.6	3.30%	160-165	0.7	0.00%
75-80	83.2	2.30%	165-170	0.6	0.00%
80-85	44.8	1.20%	170-175	0.4	0.00%
85-90	11.2	0.30%	175-180	0.1	0.00%



Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C																	
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631	1631
1	1627	1634	1638	1644	1641	1643	1637	1627	1630	1630	1631	1638	1636	1636	1631	1624	1627
2	1629	1635	1636	1644	1643	1646	1642	1632	1633	1632	1634	1640	1639	1641	1636	1627	1629
3	1629	1632	1632	1642	1642	1647	1645	1634	1634	1633	1634	1639	1638	1640	1638	1629	1629
4	1628	1628	1627	1636	1640	1646	1646	1636	1632	1632	1630	1636	1636	1641	1639	1629	1628
5	1624	1622	1619	1628	1632	1643	1643	1636	1630	1627	1625	1630	1632	1638	1638	1628	1624
6	1618	1614	1611	1621	1627	1639	1640	1632	1627	1623	1620	1624	1627	1635	1634	1622	1618
7	1612	1608	1602	1612	1619	1633	1636	1628	1622	1616	1612	1619	1623	1630	1628	1616	1612
8	1606	1601	1596	1605	1612	1626	1628	1622	1616	1612	1607	1613	1618	1623	1622	1610	1606
9	1599	1595	1590	1597	1605	1617	1619	1615	1610	1607	1602	1607	1612	1617	1614	1603	1599
10	1590	1588	1582	1589	1595	1605	1608	1604	1604	1600	1596	1601	1604	1607	1605	1594	1590
11	1581	1580	1575	1580	1584	1592	1597	1594	1596	1593	1590	1595	1594	1596	1592	1582	1581
12	1569	1569	1566	1570	1571	1580	1585	1583	1587	1586	1585	1586	1584	1583	1579	1568	1569
13	1556	1559	1556	1560	1560	1568	1572	1571	1574	1578	1578	1579	1572	1570	1565	1554	1556
14	1541	1546	1546	1550	1549	1555	1559	1558	1561	1568	1568	1569	1562	1557	1551	1539	1541
15	1526	1531	1534	1539	1537	1543	1544	1542	1547	1555	1556	1558	1551	1544	1535	1524	1526
16	1511	1515	1519	1526	1525	1528	1528	1526	1532	1541	1542	1545	1537	1530	1521	1507	1511
17	1493	1498	1501	1510	1512	1513	1512	1509	1515	1524	1526	1530	1524	1516	1505	1491	1493
18	1473	1478	1483	1493	1496	1495	1494	1491	1499	1506	1509	1511	1508	1499	1487	1473	1473
19	1453	1457	1461	1472	1476	1479	1478	1474	1481	1487	1488	1491	1487	1480	1468	1454	1453
20	1430	1434	1437	1449	1456	1459	1460	1454	1461	1466	1469	1470	1466	1460	1448	1433	1430
25	1314	1320	1329	1345	1356	1362	1358	1346	1343	1354	1362	1368	1368	1358	1344	1322	1314
30	1187	1197	1220	1247	1262	1262	1250	1225	1217	1232	1255	1272	1274	1262	1236	1202	1187
35	1025	1049	1096	1137	1157	1152	1123	1075	1055	1088	1132	1165	1168	1146	1105	1051	1025
40	853	883	954	1015	1040	1031	980	906	877	914	986	1036	1049	1023	965	887	853
45	692	721	809	887	917	902	834	746	716	748	837	904	922	892	818	727	692
50	554	583	674	763	797	775	695	604	575	605	697	777	797	765	677	587	554
55	437	462	547	643	680	656	564	477	452	480	564	654	676	639	546	463	437
60	337	357	430	524	561	537	445	369	351	370	443	532	555	517	427	358	337
65	252	268	330	416	453	426	343	279	264	278	341	420	443	409	329	269	252
70	181	196	251	327	360	335	260	202	188	204	259	332	354	321	248	196	181
75	116	133	185	244	273	253	192	139	122	139	192	251	267	240	183	133	116
80	64	81	120	155	169	159	126	84	67	85	126	156	161	150	118	80	64
85	23	33	50	65	70	66	51	34	24	35	50	64	66	61	48	33	23
90	2	1	2	2	1	2	2	1	1	1	1	1	2	2	1	1	2
95	1	0	1	2	1	2	1	0	1	1	1	1	2	1	1	1	1
100	0	1	1	1	2	1	1	1	1	0	1	1	2	1	0	1	0
105	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
110	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0
115	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0
120	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1
125	1	1	2	1	2	1	1	1	1	2	2	1	2	2	2	2	1
130	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	1	2
135	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
140	2	3	2	3	2	3	2	2	2	2	3	2	2	3	2	2	2
145	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3	3	3
150	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
155	4	4	4	4	3	4	4	4	3	3	3	3	4	4	4	3	4
160	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
165	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5
170	6	6	5	6	6	6	6	6	6	6	6	6	5	6	6	6	6
175	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6
180	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6



Goniophotometer Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 2.Photometric parameters were measured using a type C goniophotometer and software.
- 3.The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
- 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.6	119.97	60	0.2459	29.177	0.9889	12.40%	Horizontal

Test Results

Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	0° - 60°	N/A	Horizontal Spread	Vertical Spread	
3672.8	83.30%	N/A	97.8	82.6	125.88

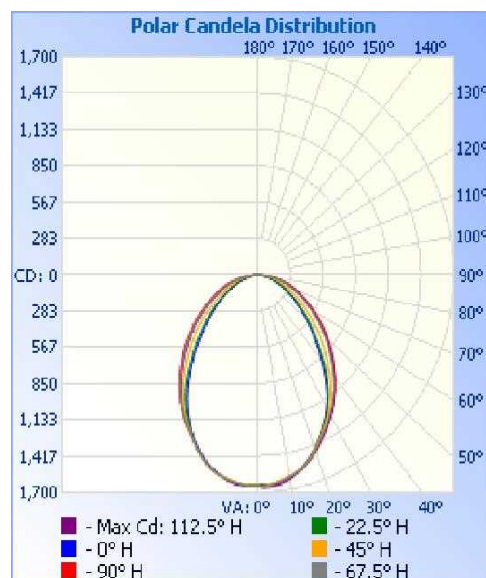
Backlight	Uplight	Glare
N/A	N/A	N/A

UGR		Spacing Criteria (0 - 180°)	Spacing Criteria (90° - 270°)
Crosswise	Endwise		
17.7	21.5	1.12	1.16

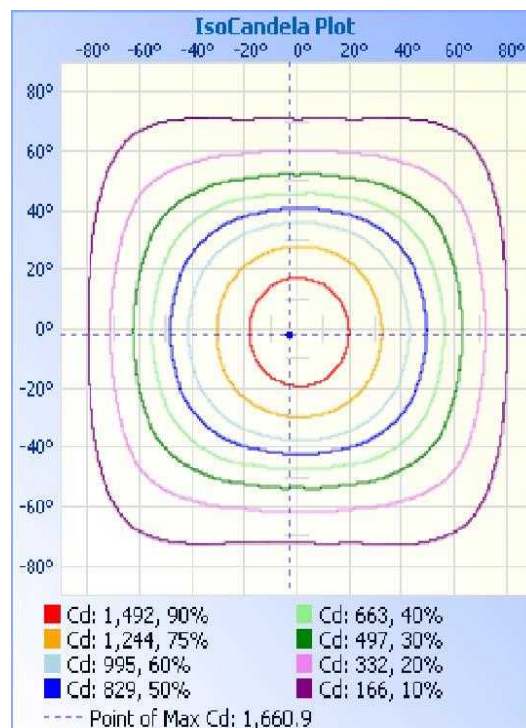


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1218.0	33.20%
0-40	1913.4	52.10%
0-60	3052.9	83.10%
60-90	608.6	16.60%
70-100	261.8	7.10%
90-120	3.0	0.10%
0-90	3661.5	99.70%
90-180	11.4	0.30%
0-180	3672.8	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	39.4	1.10%	90-95	0.7	0.00%
5-10	116.5	3.20%	95-100	0.5	0.00%
10-15	187.9	5.10%	100-105	0.5	0.00%
15-20	249.1	6.80%	105-110	0.5	0.00%
20-25	295.8	8.10%	110-115	0.4	0.00%
25-30	329.4	9.00%	115-120	0.5	0.00%
30-35	347.8	9.50%	120-125	0.6	0.00%
35-40	347.5	9.50%	125-130	0.7	0.00%
40-45	330.8	9.00%	130-135	0.8	0.00%
45-50	304.8	8.30%	135-140	0.8	0.00%
50-55	271.2	7.40%	140-145	0.9	0.00%
55-60	232.7	6.30%	145-150	0.9	0.00%
60-65	193.2	5.30%	150-155	0.8	0.00%
65-70	154.7	4.20%	155-160	0.8	0.00%
70-75	119.6	3.30%	160-165	0.7	0.00%
75-80	84.1	2.30%	165-170	0.6	0.00%
80-85	45.4	1.20%	170-175	0.4	0.00%
85-90	11.5	0.30%	175-180	0.1	0.00%



Goniophotometer Test (Cont'd)

Intensity Data(cd)

Candela Table - Type C																	
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643
1	1641	1648	1650	1659	1655	1656	1650	1639	1643	1643	1646	1652	1650	1650	1645	1638	1641
2	1644	1648	1651	1658	1657	1660	1655	1644	1645	1646	1647	1654	1653	1654	1650	1640	1644
3	1643	1647	1646	1656	1656	1661	1657	1649	1646	1648	1647	1653	1653	1654	1653	1643	1643
4	1642	1642	1640	1650	1653	1659	1660	1649	1646	1645	1643	1650	1651	1654	1653	1642	1642
5	1639	1635	1633	1641	1646	1656	1656	1648	1644	1641	1638	1644	1647	1652	1652	1639	1639
6	1632	1629	1624	1633	1640	1652	1654	1646	1640	1637	1633	1639	1642	1650	1651	1637	1632
7	1628	1622	1617	1626	1632	1646	1650	1641	1635	1632	1627	1633	1637	1647	1644	1632	1628
8	1620	1615	1609	1617	1625	1638	1643	1635	1629	1628	1622	1627	1632	1641	1638	1625	1620
9	1612	1607	1601	1609	1616	1628	1632	1626	1624	1620	1616	1623	1627	1632	1630	1617	1612
10	1604	1600	1594	1600	1605	1616	1621	1617	1616	1613	1611	1615	1618	1621	1619	1607	1604
11	1593	1593	1586	1592	1595	1604	1609	1606	1607	1607	1605	1610	1609	1612	1608	1596	1593
12	1583	1584	1578	1582	1583	1592	1597	1594	1596	1600	1599	1602	1599	1600	1596	1584	1583
13	1570	1572	1569	1573	1572	1580	1584	1582	1586	1591	1592	1594	1589	1588	1583	1570	1570
14	1557	1561	1559	1562	1561	1568	1571	1570	1573	1582	1582	1584	1577	1574	1568	1556	1557
15	1542	1546	1545	1550	1548	1554	1556	1555	1561	1570	1571	1572	1564	1559	1552	1540	1542
16	1524	1529	1530	1536	1535	1538	1540	1538	1546	1556	1557	1560	1551	1545	1535	1523	1524
17	1505	1510	1512	1520	1520	1523	1523	1521	1530	1539	1541	1544	1535	1529	1519	1504	1505
18	1486	1490	1494	1502	1504	1507	1506	1502	1510	1519	1522	1526	1520	1512	1501	1486	1486
19	1465	1469	1472	1482	1486	1488	1487	1484	1489	1499	1501	1506	1502	1494	1482	1467	1465
20	1444	1447	1449	1460	1466	1470	1469	1464	1469	1477	1481	1486	1481	1474	1464	1447	1444
25	1327	1330	1338	1353	1362	1369	1366	1357	1356	1366	1372	1381	1380	1372	1357	1335	1327
30	1198	1206	1229	1253	1267	1268	1256	1230	1223	1241	1265	1284	1286	1274	1248	1214	1198
35	1035	1058	1102	1143	1161	1155	1127	1082	1062	1096	1142	1173	1177	1158	1117	1063	1035
40	858	889	958	1019	1044	1033	983	911	884	921	993	1046	1058	1032	973	894	858
45	698	727	813	891	922	906	838	748	716	754	843	915	933	903	827	735	698
50	561	588	677	768	802	780	698	607	575	608	703	788	808	775	685	593	561
55	440	464	548	644	680	656	564	479	456	484	569	659	682	646	551	467	440
60	341	359	434	527	564	539	447	372	355	374	448	537	562	525	434	361	341
65	256	270	333	419	456	430	346	281	264	280	346	428	452	416	334	273	256
70	182	197	251	327	360	337	261	205	189	206	262	336	359	325	251	198	182
75	118	134	185	246	274	253	193	139	124	142	195	253	271	245	185	135	118
80	65	81	121	156	170	161	126	84	67	86	127	159	164	154	119	81	65
85	24	33	50	66	71	67	52	35	25	35	51	65	67	62	48	33	24
90	2	2	2	2	1	1	1	1	1	2	1	1	1	1	1	1	2
95	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1
100	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1
105	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
115	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
120	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1
125	1	1	1	1	2	2	2	1	1	1	2	2	2	1	1	1	1
130	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2
135	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2
140	2	3	2	3	2	3	3	2	2	2	2	3	2	3	2	2	2
145	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
150	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
155	3	4	3	4	3	4	4	4	4	3	4	4	4	4	3	4	3
160	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
165	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
170	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6
175	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6
180	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6



THD and PF Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.5	119.97	60	0.2488	29.51	0.9889	12.49%	Horizontal
25.5	277.08	60	0.1106	29.59	0.9661	9.15%	Horizontal



THD and PF Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.5	119.97	60	0.2340	27.77	0.9892	12.01%	Horizontal
25.5	277.09	60	0.1051	28.03	0.9625	9.18%	Horizontal



THD and PF Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.5	119.97	60	0.2458	29.18	0.9889	12.39%	Horizontal
25.5	277.07	60	0.1096	29.31	0.9655	9.19%	Horizontal



THD and PF Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.5	119.99	60	0.2019	23.88	0.9852	14.01%	Horizontal
25.5	277.09	60	0.0944	24.88	0.9520	10.84%	Horizontal



THD and PF Test

Model No.	VTR-22-MU-30-9TW-A		Sample ID.	5475174
Operate time (Min.)	90	Stabilization time (Min.)	45	

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
25.5	120.03	60	0.1603	18.86	0.9799	15.57%	Horizontal
25.5	277.09	60	0.0794	20.47	0.9315	12.46%	Horizontal



In-Situ Temperature Measurement Test

Model No.	VTR-22-MU-30-9TW-A	Sample ID.	5475174
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Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL 1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. Thermocouples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 7.5 hours.
3. The data and photos in LM-80 test report is provided by the customer/ The data and photos in driver specification is provided by the customer.

In-Situ Temperature Measurement Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
23.3	119.97	60	0.2488	29.514	0.9889	12.49%	Horizontal

Test Results (LEDs)

Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source ($^{\circ}\text{C}$)		Max Chromaticity Shift (1000-6000h)	LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp ($^{\circ}\text{C}$)
		Test Result	Test Result (Correct to 25°C)				
Ambient TEMP	N/A	23.3	25.0				
TMP of Location 1	120	44.6	46.3	0.002	BXFN-(A)G-11L-3A	150	105

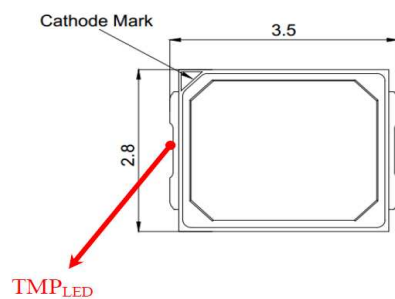
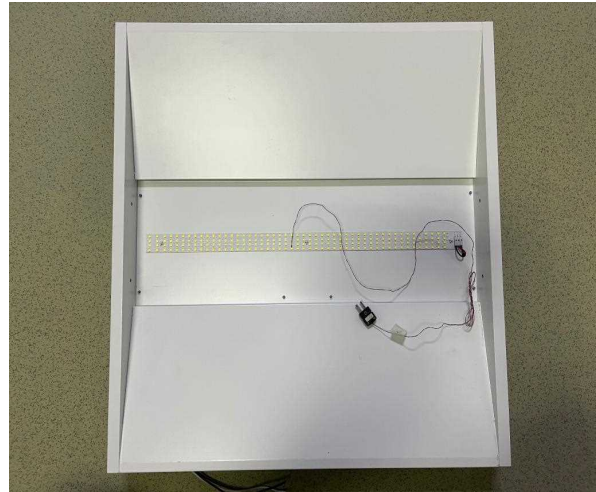
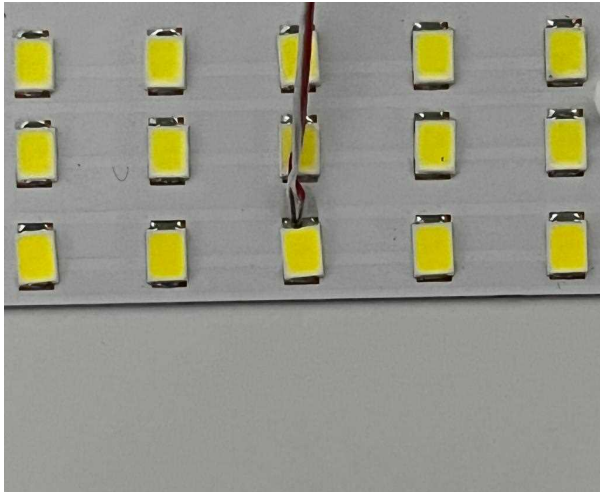
Test Results (Drivers)

Thermocouple Location	Temperature for Driver ($^{\circ}\text{C}$)		Driver Model Number	Driver Limit Temp ($^{\circ}\text{C}$)
	Test Result	Test Result (Correct to 25°C)		
Ambient TEMP	23.3	25.0		
TMP of Location 1	49.7	51.4	T1M1UNV065S-30L	90



In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of Light Sources & Tc Point of Drivers





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