



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

Test Laboratory Address:

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Catalog Number

VTR-24-MU-45-9TW-A

Project Number

4790617185

Report Number

4790617185_10

Test Date

2022-11-25~2022-11-26

Issue Date

2022-11-28

Revision Date

N/A

Prepared By

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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 | ≥3000 | -10% | 4526.91 |
| Minimum Luminaire Efficacy (lm/W)-Luminaires | IES LM-79-2008 | ≥125 | -3% | 122.52 |
| Spacing Criteria (0-180°) | IES LM-79-2008 | 1.0-2.0 | ±0.1 | 1.24 |
| Spacing Criteria (90-270°) | IES LM-79-2008 | 1.0-2.0 | ±0.1 | 1.28 |
| Zonal Lumen Requirement 1(0°-60°) | IES LM-79-2008 | ≥75% | -3% | 76.00% |
| Allowable CCT (3500K) | IES LM-79-2008/ANSI C78.377-2015 | 3465±245 | N/A | 3544 |
| Allowable CCT (4000K) | IES LM-79-2008/ANSI C78.377-2015 | 3985±275 | N/A | 4163 |
| Allowable CCT (5000K) | IES LM-79-2008/ANSI C78.377-2015 | 5029±283 | N/A | 4971 |
| Allowable CCT (3500K) | IES LM-79-2008/ANSI C78.377-2015 | 3465±245 | N/A | 3542 |
| Allowable CCT (3500K) | IES LM-79-2008/ANSI C78.377-2015 | 3465±245 | N/A | 3542 |
| Minimum CRI | IES LM-79-2008/CIE 13.3-1995 | ≥80 | -1 | 92 |
| Minimum R9 | IES LM-79-2008 | ≥0 | -1 | 67.0 |
| Minimum Rg | IES LM-79-2008 | ≥89 | -1 | 100 |
| Minimum Rf | IES LM-79-2008 | ≥70 | -1 | 88 |
| Rcs,h1 | IES LM-79-2008 | -12%-23% | -1% | -3% |
| Unified Glare Rating (UGR) | IES LM-79-2008 | ≤22 | N/A | 21.8 |
| 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 | 0.9600 |
| Total Harmonic Distortion (A%) | ANSI C82.77-10-2014 | ≤20% | 5% | 12.34% |
| In-Situ Temperature Measurement Test for LED 1 (°C) | UL1598-2008 | ≤105 | N/A | 47.4 |
| In-Situ Temperature Measurement Test for Driver 1 (°C) | UL1598-2008 | ≤90 | N/A | 58.5 |
| Max Chromaticity Shift (1000-6000h) | N/A | ≤0.004 | 0.0004 | 0.0014 |
| 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 | 2022-11-26 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| Integrating Sphere Test | 2022-11-26 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| Integrating Sphere Test | 2022-11-26 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| Integrating Sphere Test | 2022-11-26 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| Integrating Sphere Test | 2022-11-26 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| Goniophotometer Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| Goniophotometer Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| THD and PF Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| THD and PF Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| THD and PF Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| THD and PF Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| THD and PF Test | 2022-11-25 | VTR-24-MU-45-9TW-A | Yang, Gavin X |
| In-Situ Temperature Measurement Test | 2022-11-26 | VTR-24-MU-45-9TW-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 2x4 Luminaires

Model Number: VTR-24-MU-45-9TW-A

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

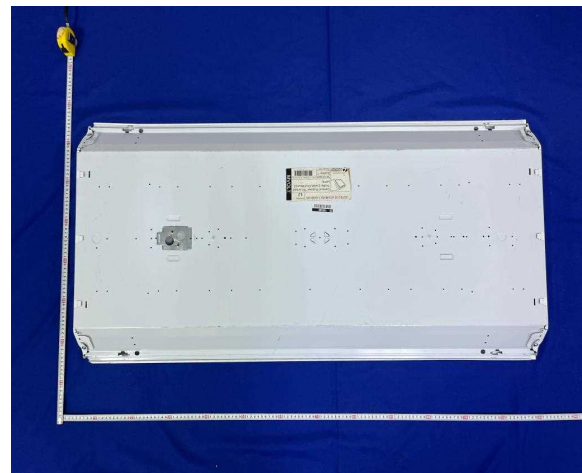
LED Package: BXFN-(A)G-11L-3A

Dimming Information: Continuous dimming capability

Remark: Housing model: Lithonia 2GT8 lensed 2X4

Products Scaled Value

| Model Number | CCT | Luminous Flux | Power | Luminous Efficacy |
|--------------------|-------|---------------|-------|-------------------|
| VTR-24-MU-45-9TW-A | 3500K | 5580 | 45 | 124 |
| VTR-24-MU-45-9TW-A | 4000K | 6030 | 45 | 134 |
| VTR-24-MU-45-9TW-A | 5000K | 5670 | 45 | 126 |
| VTR-24-MU-45-9TW-A | 3500K | 4902 | 38 | 129 |
| VTR-24-MU-45-9TW-A | 4000K | 5282 | 38 | 139 |
| VTR-24-MU-45-9TW-A | 5000K | 4978 | 38 | 131 |
| VTR-24-MU-45-9TW-A | 3500K | 4522 | 34 | 133 |
| VTR-24-MU-45-9TW-A | 4000K | 4862 | 34 | 143 |
| VTR-24-MU-45-9TW-A | 5000K | 4590 | 34 | 135 |





Integrating Sphere Test

| | | | | |
|---------------------|--------------------|---------------------------|------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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.

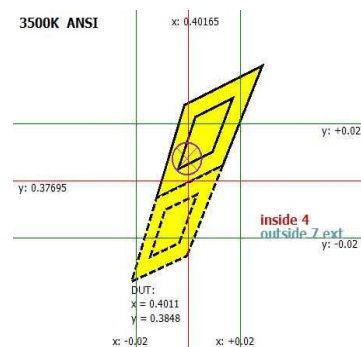
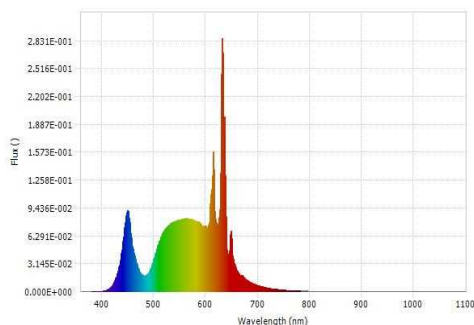
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 | 119.91 | 60 | 0.3786 | 45.03 | 0.9918 | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | R9 | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Efficacy(lm/ft) |
|---------|----------|------|---------|-----------|--------------------------|-----------------|
| 3544 | 92 | 84.0 | -0.0017 | 5599.79 | 124.36 | N/A |



| | | | |
|--------------------|---------|--------------------------|---------|
| Luminous Flux (lm) | 5599.79 | Chrom x | 0.4011 |
| Chrom y | 0.3848 | Chrom u | 0.2355 |
| Chrom v | 0.3388 | Duv | -0.0017 |
| Chrom u' | 0.2355 | Chrom v' | 0.5081 |
| CCT (K) | 3544 | Luminous Efficacy (lm/W) | 124.36 |
| Ra | 92 | R1 | 98.0 |
| R2 | 93.0 | R3 | 84.0 |
| R4 | 91.0 | R5 | 95.0 |
| R6 | 90.0 | R7 | 92.0 |
| R8 | 94.0 | R9 | 84.0 |
| R10 | 79.0 | R11 | 90.0 |
| R12 | 72.0 | R13 | 96.0 |
| R14 | 89.0 | R15 | 97.0 |
| Rf | 88 | Rg | 105 |
| Rcs,h1 | -3% | | |



Integrating Sphere Test (Cont'd)

TM-30 Report

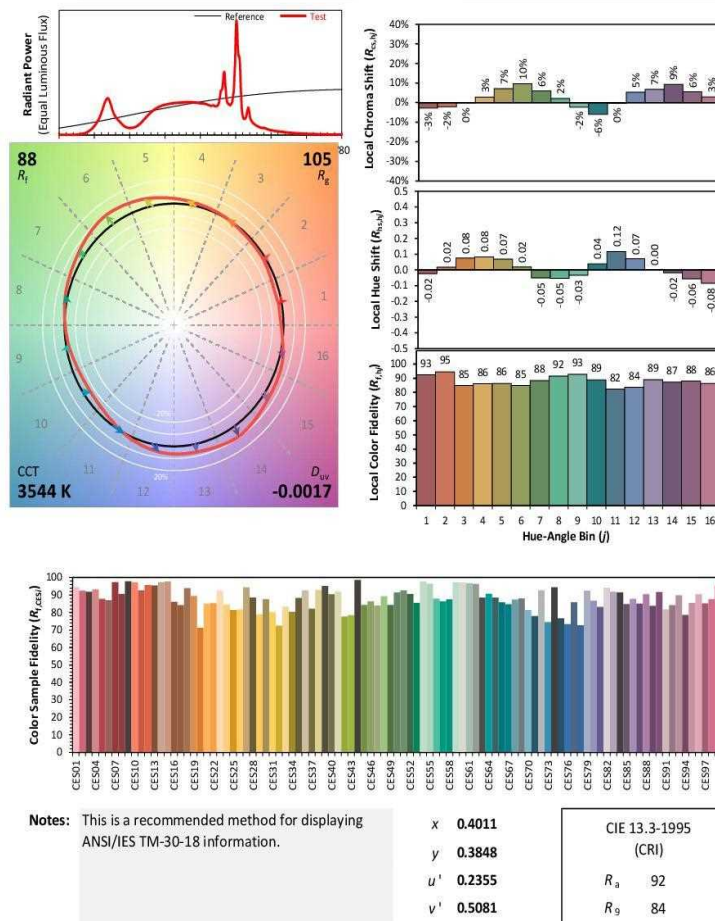
ANSI/IES TM-30-18 Color Rendition Report

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

Manufacturer: Fulham Co., Inc.

Date: 11/26/2022

Model: VTR-24-MU-45-9TW-A



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



Integrating Sphere Test

| | | | |
|----------------------------|--------------------|----------------------------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | Sample ID. | 5475176 |
| 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.

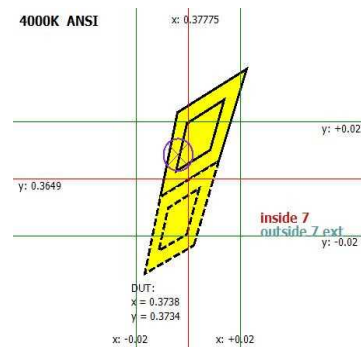
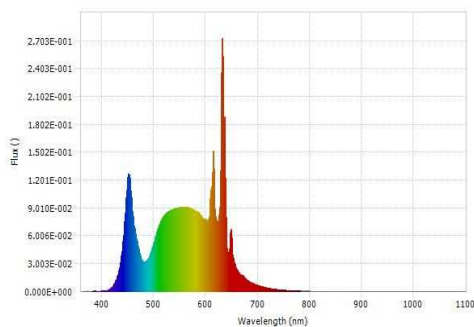
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 | 119.94 | 60 | 0.3564 | 42.421 | 0.9925 | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | R9 | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Efficacy(lm/ft) |
|---------|----------|------|--------|-----------|--------------------------|-----------------|
| 4163 | 94 | 84.0 | 0.0004 | 6188.69 | 145.89 | N/A |



| | | | |
|--------------------|---------|--------------------------|--------|
| Luminous Flux (lm) | 6188.69 | Chrom x | 0.3738 |
| Chrom y | 0.3734 | Chrom u | 0.2220 |
| Chrom v | 0.3327 | Duv | 0.0004 |
| Chrom u' | 0.2220 | Chrom v' | 0.4991 |
| CCT (K) | 4163 | Luminous Efficacy (lm/W) | 145.89 |
| Ra | 94 | R1 | 97.0 |
| R2 | 94.0 | R3 | 88.0 |
| R4 | 95.0 | R5 | 95.0 |
| R6 | 91.0 | R7 | 96.0 |
| R8 | 96.0 | R9 | 84.0 |
| R10 | 83.0 | R11 | 93.0 |
| R12 | 68.0 | R13 | 96.0 |
| R14 | 92.0 | R15 | 96.0 |
| Rf | 90 | Rg | 102 |
| Rcs,h1 | -3% | | |



Integrating Sphere Test (Cont'd)

TM-30 Report

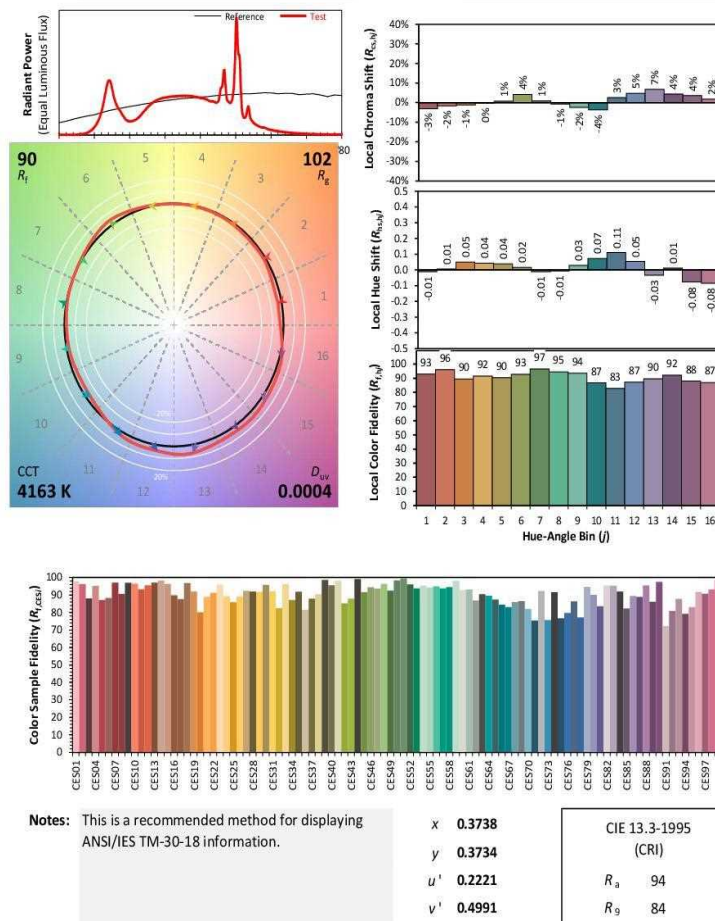
ANSI/IES TM-30-18 Color Rendition Report

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

Manufacturer: Fulham Co., Inc.

Date: 11/26/2022

Model: VTR-24-MU-45-9TW-A



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Integrating Sphere Test

| | | | |
|----------------------------|--------------------|----------------------------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | Sample ID. | 5475176 |
| 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.

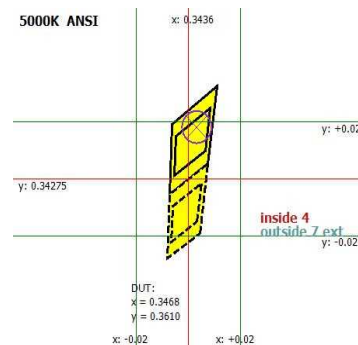
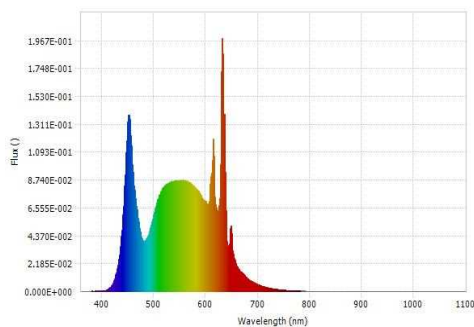
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 | 119.92 | 60 | 0.3781 | 44.973 | 0.9919 | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | R9 | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Efficacy(lm/ft) |
|---------|----------|------|--------|-----------|--------------------------|-----------------|
| 4971 | 92 | 67.0 | 0.0040 | 5839.36 | 129.84 | N/A |



| | | | |
|--------------------|---------|--------------------------|--------|
| Luminous Flux (lm) | 5839.36 | Chrom x | 0.3468 |
| Chrom y | 0.3610 | Chrom u | 0.2090 |
| Chrom v | 0.3263 | Duv | 0.0040 |
| Chrom u' | 0.2090 | Chrom v' | 0.4894 |
| CCT (K) | 4971 | Luminous Efficacy (lm/W) | 129.84 |
| Ra | 92 | R1 | 92.0 |
| R2 | 93.0 | R3 | 91.0 |
| R4 | 93.0 | R5 | 90.0 |
| R6 | 89.0 | R7 | 96.0 |
| R8 | 89.0 | R9 | 67.0 |
| R10 | 80.0 | R11 | 91.0 |
| R12 | 64.0 | R13 | 92.0 |
| R14 | 95.0 | R15 | 90.0 |
| Rf | 90 | Rg | 100 |
| Rcs,h1 | -5% | | |



Integrating Sphere Test (Cont'd)

TM-30 Report

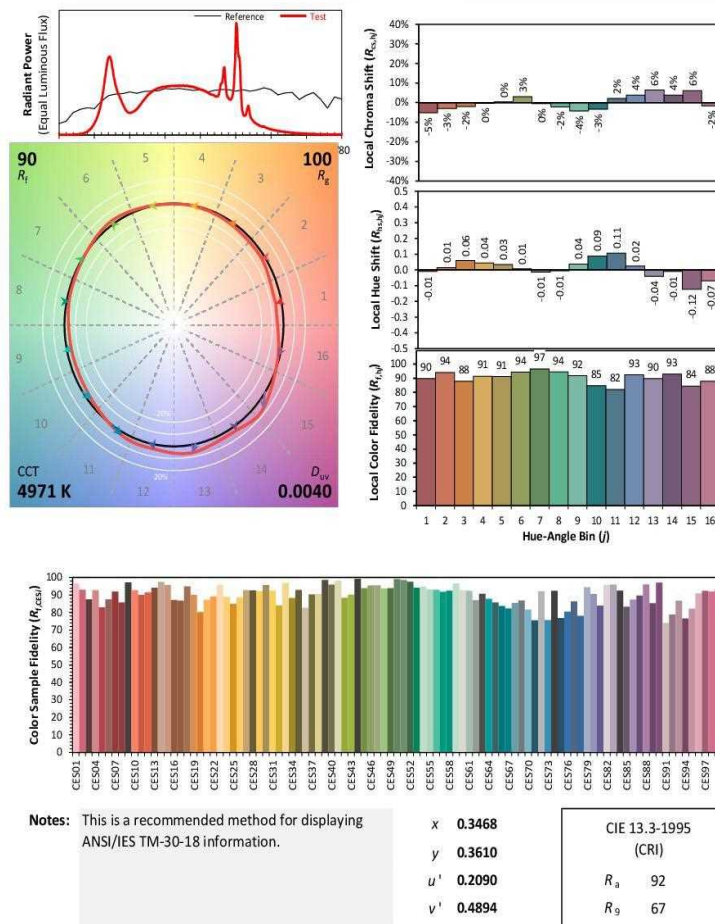
ANSI/IES TM-30-18 Color Rendition Report

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

Manufacturer: Fulham Co., Inc.

Date: 11/26/2022

Model: VTR-24-MU-45-9TW-A



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Integrating Sphere Test

| | | | | |
|---------------------|--------------------|---------------------------|------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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.

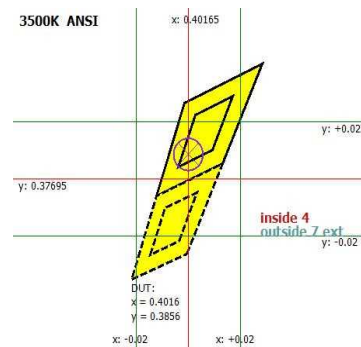
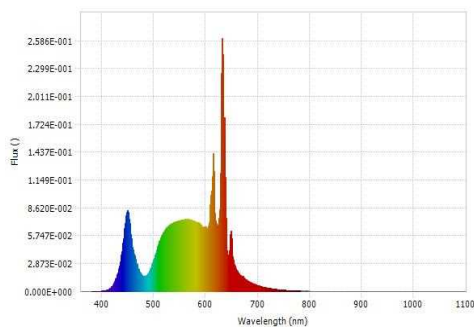
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 | 119.93 | 60 | 0.3300 | 39.177 | 0.9899 | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | R9 | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Efficacy(lm/ft) |
|---------|----------|------|---------|-----------|--------------------------|-----------------|
| 3542 | 92 | 85.0 | -0.0014 | 5060.79 | 129.18 | N/A |



| | | | |
|--------------------|---------|--------------------------|---------|
| Luminous Flux (lm) | 5060.79 | Chrom x | 0.4016 |
| Chrom y | 0.3856 | Chrom u | 0.2354 |
| Chrom v | 0.3390 | Duv | -0.0014 |
| Chrom u' | 0.2354 | Chrom v' | 0.5085 |
| CCT (K) | 3542 | Luminous Efficacy (lm/W) | 129.18 |
| Ra | 92 | R1 | 98.0 |
| R2 | 93.0 | R3 | 84.0 |
| R4 | 91.0 | R5 | 95.0 |
| R6 | 90.0 | R7 | 92.0 |
| R8 | 94.0 | R9 | 85.0 |
| R10 | 79.0 | R11 | 90.0 |
| R12 | 72.0 | R13 | 96.0 |
| R14 | 89.0 | R15 | 97.0 |
| Rf | 88 | Rg | 105 |
| Rcs,h1 | -3% | | |



Integrating Sphere Test (Cont'd)

TM-30 Report

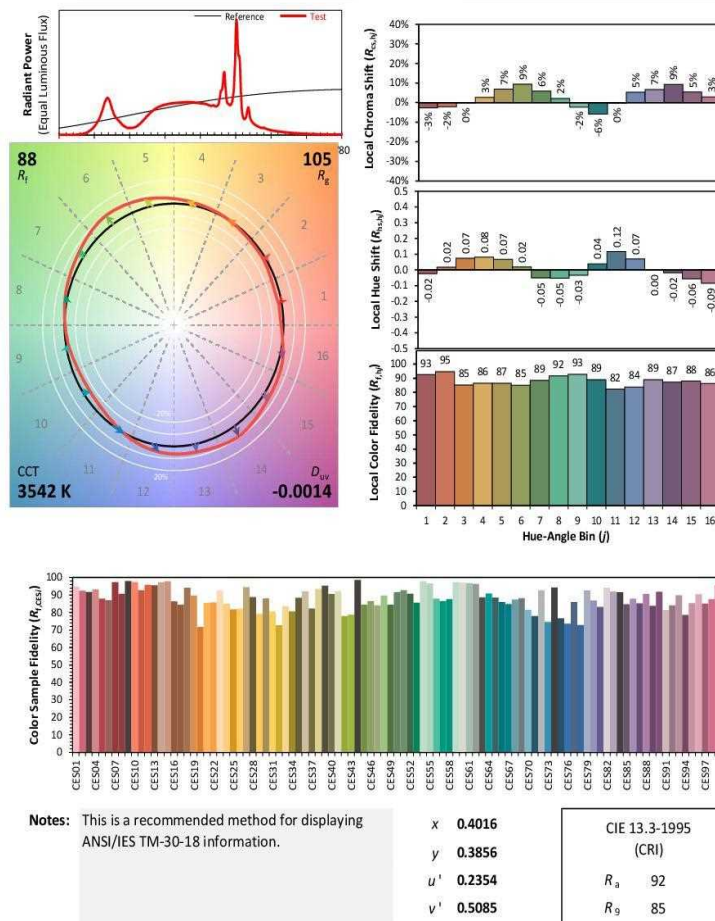
ANSI/IES TM-30-18 Color Rendition Report

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

Manufacturer: Fulham Co., Inc.

Date: 11/26/2022

Model: VTR-24-MU-45-9TW-A



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Integrating Sphere Test

| | | | | |
|---------------------|--------------------|---------------------------|------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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.

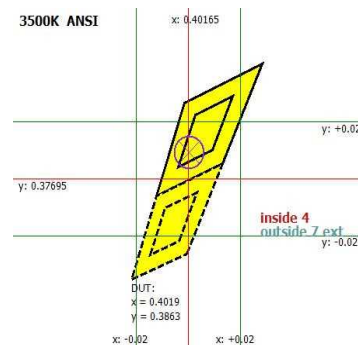
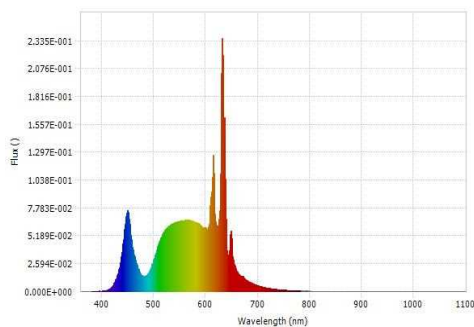
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption 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 | 119.98 | 60 | 0.2855 | 33.821 | 0.9872 | Horizontal |

Test Results

| CCT (K) | CRI (Ra) | R9 | Duv | Flux (lm) | Luminous Efficacy (lm/W) | Efficacy(lm/ft) |
|---------|----------|------|---------|-----------|--------------------------|-----------------|
| 3542 | 92 | 85.0 | -0.0014 | 4526.91 | 133.85 | N/A |



| | | | |
|--------------------|---------|--------------------------|---------|
| Luminous Flux (lm) | 4526.91 | Chrom x | 0.4019 |
| Chrom y | 0.3863 | Chrom u | 0.2353 |
| Chrom v | 0.3393 | Duv | -0.0014 |
| Chrom u' | 0.2353 | Chrom v' | 0.5089 |
| CCT (K) | 3542 | Luminous Efficacy (lm/W) | 133.85 |
| Ra | 92 | R1 | 98.0 |
| R2 | 93.0 | R3 | 84.0 |
| R4 | 91.0 | R5 | 95.0 |
| R6 | 90.0 | R7 | 92.0 |
| R8 | 94.0 | R9 | 85.0 |
| R10 | 79.0 | R11 | 91.0 |
| R12 | 71.0 | R13 | 96.0 |
| R14 | 89.0 | R15 | 97.0 |
| Rf | 88 | Rg | 105 |
| Rcs,h1 | -3% | | |



Integrating Sphere Test (Cont'd)

TM-30 Report

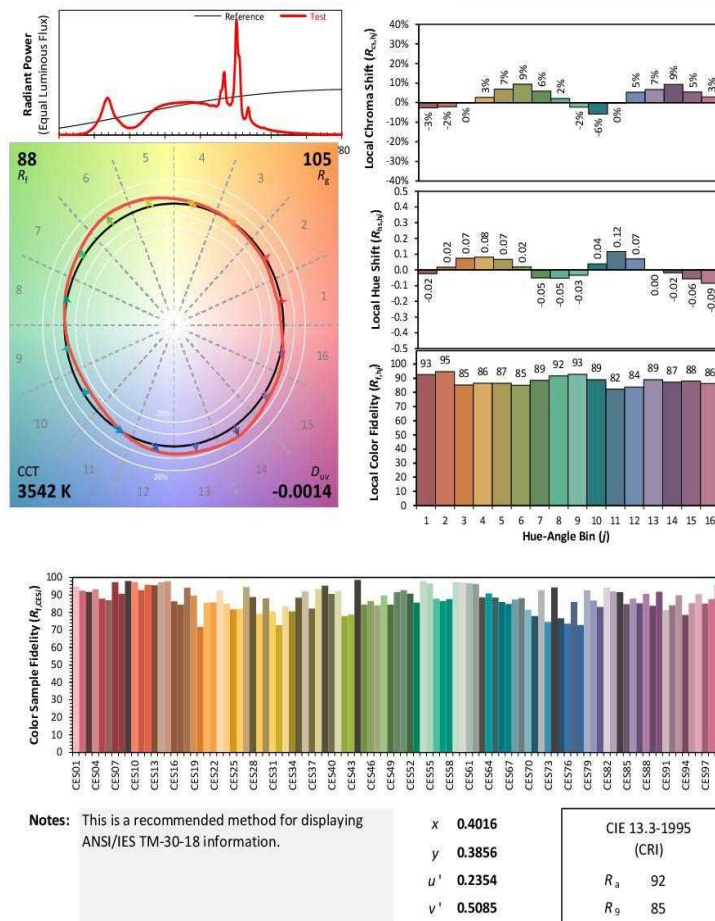
ANSI/IES TM-30-18 Color Rendition Report

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

Manufacturer: Fulham Co., Inc.

Date: 11/26/2022

Model: VTR-24-MU-45-9TW-A





Goniophotometer Test

| | | | |
|----------------------------|--------------------|----------------------------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | Sample ID. | 5475176 |
| 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.6 | 120.08 | 60 | 0.3779 | 45.04 | 0.9927 | 10.01% | 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 | |
| 5518.1 | 76.10% | N/A | 117.2 | 106.9 | 122.52 |

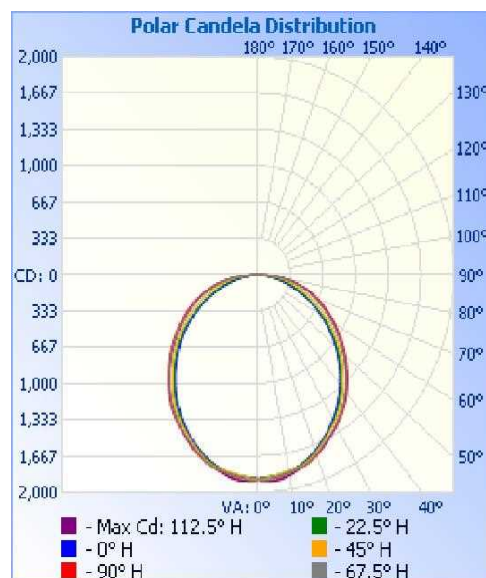
| Backlight | Uplight | Glare |
|-----------|---------|-------|
| N/A | N/A | N/A |

| UGR | | Spacing Criteria (0 - 180°) | Spacing Criteria (90° - 270°) |
|-----------|---------|--|---|
| Crosswise | Endwise | | |
| 19.3 | 21.8 | 1.22 | 1.28 |

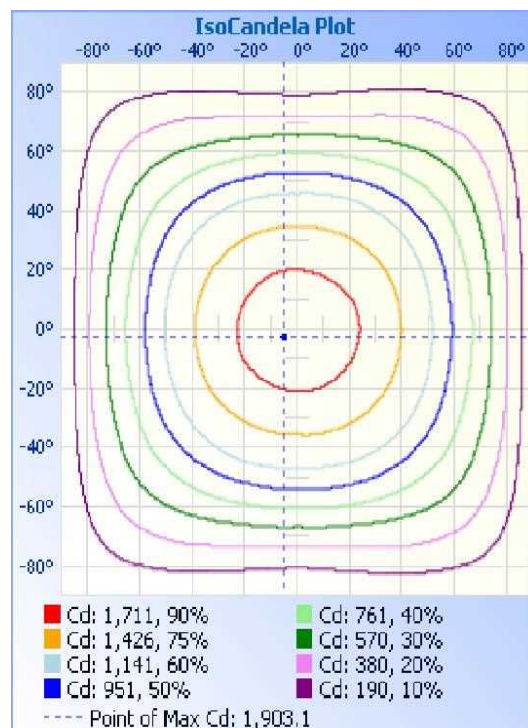


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

| Zonal Lumen Summary | | |
|---------------------|--------|-------------|
| Zone | Lumens | % Luminaire |
| 0-30 | 1452.4 | 26.30% |
| 0-40 | 2373.8 | 43.00% |
| 0-60 | 4199.3 | 76.10% |
| 60-90 | 1302.8 | 23.60% |
| 70-100 | 616.6 | 11.20% |
| 90-120 | 6.5 | 0.10% |
| 0-90 | 5502.1 | 99.70% |
| 90-180 | 16.0 | 0.30% |
| 0-180 | 5518.1 | 100.00% |

Lumens Per Zone

| Lumens Per Zone | | | | | |
|-----------------|--------|--------|---------|--------|--------|
| Zone | Lumens | %Total | Zone | Lumens | %Total |
| 0-5 | 45.0 | 0.80% | 90-95 | 1.9 | 0.00% |
| 5-10 | 133.5 | 2.40% | 95-100 | 1.2 | 0.00% |
| 10-15 | 217.0 | 3.90% | 100-105 | 1.0 | 0.00% |
| 15-20 | 292.1 | 5.30% | 105-110 | 0.9 | 0.00% |
| 20-25 | 356.2 | 6.50% | 110-115 | 0.8 | 0.00% |
| 25-30 | 408.6 | 7.40% | 115-120 | 0.8 | 0.00% |
| 30-35 | 448.5 | 8.10% | 120-125 | 0.8 | 0.00% |
| 35-40 | 473.0 | 8.60% | 125-130 | 0.8 | 0.00% |
| 40-45 | 480.6 | 8.70% | 130-135 | 0.9 | 0.00% |
| 45-50 | 473.9 | 8.60% | 135-140 | 1.0 | 0.00% |
| 50-55 | 453.0 | 8.20% | 140-145 | 1.0 | 0.00% |
| 55-60 | 418.0 | 7.60% | 145-150 | 1.0 | 0.00% |
| 60-65 | 371.7 | 6.70% | 150-155 | 0.9 | 0.00% |
| 65-70 | 317.6 | 5.80% | 155-160 | 0.9 | 0.00% |
| 70-75 | 258.1 | 4.70% | 160-165 | 0.8 | 0.00% |
| 75-80 | 192.4 | 3.50% | 165-170 | 0.7 | 0.00% |
| 80-85 | 119.9 | 2.20% | 170-175 | 0.4 | 0.00% |
| 85-90 | 43.1 | 0.80% | 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 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 | 1877 |
| 1 | 1866 | 1870 | 1872 | 1890 | 1896 | 1887 | 1876 | 1871 | 1869 | 1869 | 1877 | 1893 | 1900 | 1887 | 1877 | 1870 | 1866 |
| 2 | 1869 | 1865 | 1873 | 1890 | 1900 | 1894 | 1884 | 1877 | 1870 | 1866 | 1872 | 1892 | 1899 | 1893 | 1883 | 1876 | 1869 |
| 3 | 1868 | 1859 | 1868 | 1888 | 1900 | 1899 | 1891 | 1880 | 1868 | 1863 | 1868 | 1889 | 1901 | 1899 | 1892 | 1881 | 1868 |
| 4 | 1866 | 1856 | 1862 | 1881 | 1897 | 1903 | 1896 | 1885 | 1868 | 1859 | 1860 | 1880 | 1897 | 1901 | 1897 | 1883 | 1866 |
| 5 | 1867 | 1854 | 1854 | 1876 | 1894 | 1903 | 1898 | 1884 | 1866 | 1855 | 1854 | 1877 | 1894 | 1903 | 1897 | 1885 | 1867 |
| 6 | 1866 | 1851 | 1849 | 1869 | 1890 | 1902 | 1897 | 1882 | 1863 | 1853 | 1848 | 1872 | 1888 | 1900 | 1895 | 1884 | 1866 |
| 7 | 1861 | 1847 | 1843 | 1865 | 1884 | 1897 | 1894 | 1879 | 1861 | 1851 | 1843 | 1866 | 1883 | 1895 | 1891 | 1880 | 1861 |
| 8 | 1855 | 1844 | 1836 | 1858 | 1879 | 1889 | 1890 | 1875 | 1856 | 1847 | 1838 | 1859 | 1881 | 1890 | 1887 | 1875 | 1855 |
| 9 | 1851 | 1838 | 1829 | 1850 | 1873 | 1882 | 1880 | 1868 | 1852 | 1843 | 1836 | 1851 | 1874 | 1882 | 1881 | 1866 | 1851 |
| 10 | 1841 | 1834 | 1829 | 1846 | 1864 | 1870 | 1869 | 1858 | 1844 | 1840 | 1832 | 1848 | 1864 | 1870 | 1869 | 1859 | 1841 |
| 11 | 1833 | 1828 | 1824 | 1838 | 1859 | 1862 | 1860 | 1850 | 1834 | 1832 | 1830 | 1842 | 1856 | 1859 | 1858 | 1847 | 1833 |
| 12 | 1823 | 1821 | 1823 | 1834 | 1848 | 1846 | 1846 | 1836 | 1824 | 1824 | 1827 | 1838 | 1852 | 1849 | 1845 | 1836 | 1823 |
| 13 | 1811 | 1812 | 1817 | 1828 | 1841 | 1836 | 1833 | 1827 | 1813 | 1816 | 1826 | 1833 | 1841 | 1838 | 1833 | 1825 | 1811 |
| 14 | 1802 | 1804 | 1814 | 1826 | 1829 | 1826 | 1820 | 1813 | 1803 | 1806 | 1817 | 1831 | 1833 | 1825 | 1815 | 1810 | 1802 |
| 15 | 1788 | 1791 | 1806 | 1819 | 1821 | 1813 | 1804 | 1797 | 1790 | 1796 | 1811 | 1825 | 1824 | 1814 | 1803 | 1795 | 1788 |
| 16 | 1773 | 1779 | 1794 | 1812 | 1813 | 1800 | 1789 | 1780 | 1777 | 1785 | 1801 | 1816 | 1813 | 1802 | 1788 | 1778 | 1773 |
| 17 | 1760 | 1765 | 1781 | 1804 | 1803 | 1787 | 1774 | 1765 | 1765 | 1773 | 1787 | 1807 | 1803 | 1787 | 1771 | 1764 | 1760 |
| 18 | 1746 | 1752 | 1768 | 1788 | 1792 | 1777 | 1761 | 1751 | 1749 | 1758 | 1771 | 1793 | 1794 | 1775 | 1757 | 1750 | 1746 |
| 19 | 1732 | 1738 | 1753 | 1774 | 1779 | 1766 | 1745 | 1737 | 1734 | 1744 | 1755 | 1778 | 1783 | 1763 | 1744 | 1733 | 1732 |
| 20 | 1715 | 1725 | 1736 | 1758 | 1768 | 1752 | 1732 | 1722 | 1719 | 1727 | 1739 | 1760 | 1768 | 1752 | 1728 | 1717 | 1715 |
| 25 | 1629 | 1639 | 1648 | 1670 | 1685 | 1682 | 1660 | 1642 | 1635 | 1646 | 1655 | 1676 | 1689 | 1683 | 1659 | 1638 | 1629 |
| 30 | 1532 | 1546 | 1565 | 1594 | 1606 | 1596 | 1573 | 1549 | 1537 | 1552 | 1573 | 1598 | 1607 | 1596 | 1573 | 1546 | 1532 |
| 35 | 1424 | 1441 | 1472 | 1506 | 1518 | 1503 | 1470 | 1445 | 1432 | 1451 | 1482 | 1513 | 1522 | 1503 | 1470 | 1438 | 1424 |
| 40 | 1305 | 1321 | 1350 | 1391 | 1412 | 1399 | 1362 | 1329 | 1314 | 1330 | 1360 | 1398 | 1415 | 1399 | 1359 | 1322 | 1305 |
| 45 | 1177 | 1192 | 1227 | 1269 | 1292 | 1276 | 1240 | 1207 | 1184 | 1202 | 1237 | 1278 | 1294 | 1278 | 1239 | 1200 | 1177 |
| 50 | 1042 | 1062 | 1103 | 1149 | 1168 | 1147 | 1105 | 1071 | 1052 | 1076 | 1119 | 1163 | 1176 | 1152 | 1104 | 1064 | 1042 |
| 55 | 898 | 919 | 966 | 1019 | 1042 | 1019 | 967 | 926 | 914 | 941 | 986 | 1035 | 1053 | 1024 | 966 | 918 | 898 |
| 60 | 747 | 770 | 825 | 885 | 912 | 888 | 832 | 782 | 761 | 790 | 844 | 901 | 923 | 895 | 832 | 774 | 747 |
| 65 | 593 | 617 | 680 | 752 | 784 | 757 | 691 | 634 | 612 | 639 | 703 | 774 | 800 | 769 | 695 | 627 | 593 |
| 70 | 443 | 469 | 545 | 624 | 657 | 632 | 560 | 489 | 465 | 496 | 571 | 649 | 676 | 645 | 564 | 481 | 443 |
| 75 | 302 | 334 | 420 | 492 | 521 | 501 | 434 | 353 | 320 | 358 | 446 | 517 | 541 | 513 | 440 | 346 | 302 |
| 80 | 172 | 212 | 287 | 345 | 371 | 354 | 301 | 229 | 190 | 235 | 316 | 372 | 390 | 365 | 303 | 221 | 172 |
| 85 | 59 | 97 | 144 | 185 | 204 | 194 | 160 | 114 | 74 | 120 | 169 | 204 | 215 | 196 | 154 | 104 | 59 |
| 90 | 3 | 2 | 5 | 10 | 17 | 19 | 16 | 9 | 4 | 9 | 16 | 18 | 17 | 11 | 6 | 3 | 3 |
| 95 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 |
| 100 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| 105 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| 110 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 |
| 115 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 1 |
| 120 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 |
| 125 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 130 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 135 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| 140 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 145 | 3 | 3 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 150 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 4 |
| 155 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 160 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 5 |
| 165 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 6 | 6 | 5 | 5 | 5 | 6 |
| 170 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 6 |
| 175 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 7 | 7 | 6 | 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-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.5 | 120.09 | 60 | 0.3774 | 45.01 | 0.9928 | 9.96% | 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 | |
| 5773.8 | 76.00% | N/A | 117.4 | 107.2 | 128.28 |

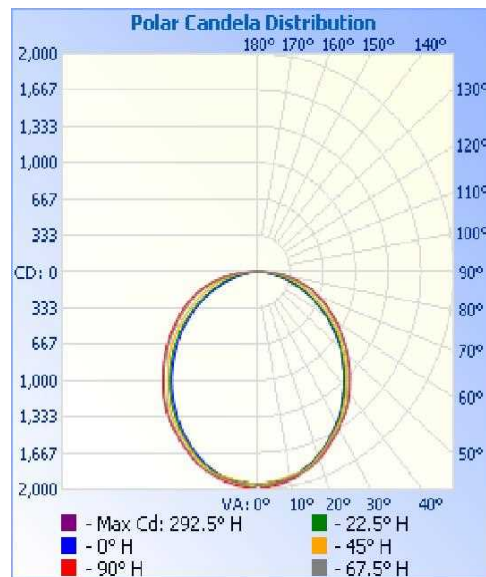
| Backlight | Uplight | Glare |
|-----------|---------|-------|
| N/A | N/A | N/A |

| UGR | | Spacing Criteria (0 - 180°) | Spacing Criteria (90° - 270°) |
|-----------|---------|--|---|
| Crosswise | Endwise | | |
| 19.8 | 21.8 | 1.24 | 1.28 |

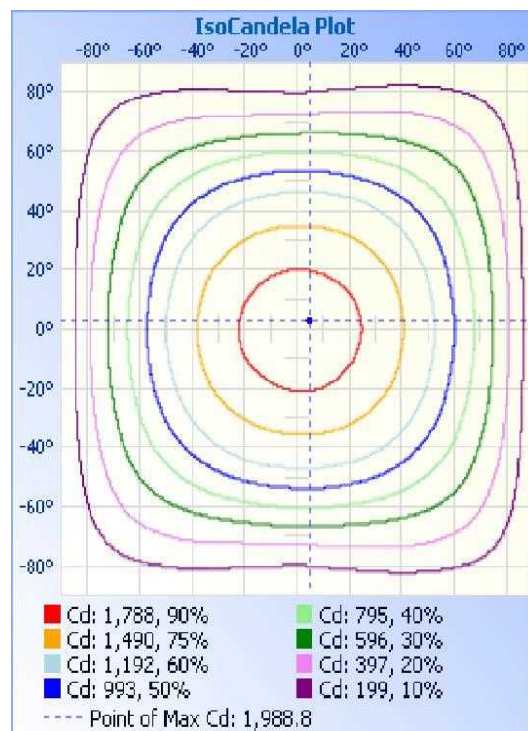


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)

Zonal Lumen Summary

| Zonal Lumen Summary | | |
|---------------------|--------|-------------|
| Zone | Lumens | % Luminaire |
| 0-30 | 1516.7 | 26.30% |
| 0-40 | 2479.9 | 43.00% |
| 0-60 | 4390.1 | 76.00% |
| 60-90 | 1366.9 | 23.70% |
| 70-100 | 648.5 | 11.20% |
| 90-120 | 6.9 | 0.10% |
| 0-90 | 5757.0 | 99.70% |
| 90-180 | 16.8 | 0.30% |
| 0-180 | 5773.8 | 100.00% |

Lumens Per Zone

| Lumens Per Zone | | | | | |
|-----------------|--------|--------|---------|--------|--------|
| Zone | Lumens | %Total | Zone | Lumens | %Total |
| 0-5 | 46.9 | 0.80% | 90-95 | 2.1 | 0.00% |
| 5-10 | 139.3 | 2.40% | 95-100 | 1.3 | 0.00% |
| 10-15 | 226.5 | 3.90% | 100-105 | 1.1 | 0.00% |
| 15-20 | 305.0 | 5.30% | 105-110 | 0.8 | 0.00% |
| 20-25 | 372.0 | 6.40% | 110-115 | 0.8 | 0.00% |
| 25-30 | 427.0 | 7.40% | 115-120 | 0.8 | 0.00% |
| 30-35 | 468.7 | 8.10% | 120-125 | 0.9 | 0.00% |
| 35-40 | 494.5 | 8.60% | 125-130 | 0.9 | 0.00% |
| 40-45 | 502.6 | 8.70% | 130-135 | 0.9 | 0.00% |
| 45-50 | 495.6 | 8.60% | 135-140 | 1.0 | 0.00% |
| 50-55 | 474.1 | 8.20% | 140-145 | 1.1 | 0.00% |
| 55-60 | 437.8 | 7.60% | 145-150 | 1.0 | 0.00% |
| 60-65 | 389.2 | 6.70% | 150-155 | 1.0 | 0.00% |
| 65-70 | 332.6 | 5.80% | 155-160 | 0.9 | 0.00% |
| 70-75 | 270.7 | 4.70% | 160-165 | 0.8 | 0.00% |
| 75-80 | 202.2 | 3.50% | 165-170 | 0.7 | 0.00% |
| 80-85 | 126.2 | 2.20% | 170-175 | 0.5 | 0.00% |
| 85-90 | 46.1 | 0.80% | 175-180 | 0.2 | 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 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 | 1957 |
| 1 | 1949 | 1949 | 1957 | 1970 | 1983 | 1967 | 1955 | 1951 | 1945 | 1950 | 1953 | 1975 | 1982 | 1967 | 1959 | 1953 | 1947 | 1947 | 1947 |
| 2 | 1951 | 1946 | 1951 | 1972 | 1981 | 1975 | 1962 | 1955 | 1945 | 1947 | 1953 | 1975 | 1983 | 1974 | 1967 | 1957 | 1947 | 1947 | 1947 |
| 3 | 1952 | 1942 | 1949 | 1968 | 1982 | 1977 | 1968 | 1959 | 1947 | 1943 | 1950 | 1971 | 1985 | 1981 | 1974 | 1962 | 1951 | 1951 | 1951 |
| 4 | 1949 | 1937 | 1940 | 1959 | 1975 | 1982 | 1977 | 1961 | 1948 | 1939 | 1946 | 1964 | 1982 | 1985 | 1981 | 1968 | 1950 | 1950 | 1950 |
| 5 | 1950 | 1934 | 1932 | 1954 | 1972 | 1984 | 1979 | 1964 | 1948 | 1934 | 1938 | 1960 | 1978 | 1989 | 1982 | 1968 | 1948 | 1948 | 1948 |
| 6 | 1944 | 1932 | 1925 | 1949 | 1969 | 1979 | 1978 | 1963 | 1945 | 1934 | 1931 | 1956 | 1977 | 1988 | 1980 | 1965 | 1946 | 1946 | 1946 |
| 7 | 1940 | 1928 | 1919 | 1943 | 1963 | 1973 | 1973 | 1961 | 1942 | 1931 | 1926 | 1947 | 1972 | 1983 | 1979 | 1963 | 1944 | 1944 | 1944 |
| 8 | 1936 | 1924 | 1913 | 1934 | 1956 | 1966 | 1967 | 1955 | 1936 | 1927 | 1919 | 1944 | 1966 | 1976 | 1974 | 1959 | 1937 | 1937 | 1937 |
| 9 | 1932 | 1920 | 1907 | 1926 | 1947 | 1957 | 1958 | 1947 | 1930 | 1923 | 1914 | 1938 | 1960 | 1967 | 1966 | 1948 | 1932 | 1932 | 1932 |
| 10 | 1924 | 1915 | 1906 | 1922 | 1941 | 1945 | 1949 | 1940 | 1921 | 1917 | 1915 | 1931 | 1955 | 1959 | 1953 | 1942 | 1924 | 1924 | 1924 |
| 11 | 1914 | 1906 | 1901 | 1914 | 1932 | 1935 | 1935 | 1927 | 1914 | 1916 | 1913 | 1929 | 1945 | 1945 | 1942 | 1929 | 1915 | 1915 | 1915 |
| 12 | 1906 | 1900 | 1900 | 1910 | 1922 | 1923 | 1923 | 1916 | 1903 | 1908 | 1909 | 1923 | 1940 | 1938 | 1933 | 1920 | 1904 | 1904 | 1904 |
| 13 | 1892 | 1890 | 1892 | 1905 | 1912 | 1911 | 1906 | 1903 | 1893 | 1897 | 1907 | 1921 | 1930 | 1924 | 1918 | 1904 | 1892 | 1892 | 1892 |
| 14 | 1878 | 1878 | 1888 | 1897 | 1900 | 1899 | 1893 | 1886 | 1880 | 1888 | 1901 | 1914 | 1919 | 1913 | 1905 | 1893 | 1881 | 1881 | 1881 |
| 15 | 1867 | 1868 | 1882 | 1892 | 1892 | 1884 | 1874 | 1872 | 1867 | 1878 | 1893 | 1910 | 1910 | 1902 | 1889 | 1878 | 1869 | 1869 | 1869 |
| 16 | 1853 | 1857 | 1868 | 1885 | 1883 | 1871 | 1859 | 1858 | 1856 | 1862 | 1881 | 1904 | 1903 | 1887 | 1873 | 1862 | 1853 | 1853 | 1853 |
| 17 | 1838 | 1843 | 1854 | 1873 | 1871 | 1855 | 1843 | 1840 | 1840 | 1851 | 1870 | 1894 | 1895 | 1874 | 1857 | 1846 | 1838 | 1838 | 1838 |
| 18 | 1824 | 1829 | 1839 | 1859 | 1858 | 1844 | 1828 | 1822 | 1824 | 1839 | 1857 | 1878 | 1884 | 1864 | 1844 | 1832 | 1826 | 1826 | 1826 |
| 19 | 1811 | 1812 | 1823 | 1842 | 1848 | 1831 | 1814 | 1806 | 1809 | 1826 | 1843 | 1865 | 1874 | 1854 | 1831 | 1815 | 1810 | 1810 | 1810 |
| 20 | 1796 | 1797 | 1806 | 1825 | 1836 | 1818 | 1798 | 1792 | 1793 | 1810 | 1826 | 1848 | 1860 | 1841 | 1817 | 1799 | 1796 | 1796 | 1796 |
| 25 | 1704 | 1711 | 1717 | 1735 | 1748 | 1742 | 1723 | 1704 | 1705 | 1720 | 1736 | 1764 | 1778 | 1768 | 1746 | 1718 | 1706 | 1706 | 1706 |
| 30 | 1605 | 1612 | 1627 | 1651 | 1662 | 1650 | 1631 | 1610 | 1605 | 1626 | 1654 | 1684 | 1698 | 1683 | 1656 | 1626 | 1607 | 1607 | 1607 |
| 35 | 1494 | 1505 | 1532 | 1560 | 1568 | 1550 | 1522 | 1497 | 1491 | 1519 | 1557 | 1594 | 1607 | 1590 | 1550 | 1514 | 1493 | 1493 | 1493 |
| 40 | 1373 | 1380 | 1403 | 1440 | 1457 | 1444 | 1406 | 1376 | 1368 | 1394 | 1433 | 1478 | 1501 | 1485 | 1438 | 1397 | 1373 | 1373 | 1373 |
| 45 | 1241 | 1245 | 1273 | 1312 | 1329 | 1314 | 1278 | 1247 | 1233 | 1262 | 1304 | 1353 | 1374 | 1356 | 1315 | 1269 | 1241 | 1241 | 1241 |
| 50 | 1102 | 1109 | 1145 | 1188 | 1202 | 1180 | 1136 | 1104 | 1093 | 1126 | 1179 | 1232 | 1249 | 1224 | 1174 | 1129 | 1102 | 1102 | 1102 |
| 55 | 953 | 967 | 1008 | 1053 | 1069 | 1045 | 992 | 951 | 941 | 978 | 1038 | 1096 | 1121 | 1094 | 1034 | 980 | 954 | 954 | 954 |
| 60 | 798 | 817 | 858 | 912 | 932 | 906 | 847 | 797 | 785 | 822 | 890 | 958 | 989 | 960 | 893 | 830 | 799 | 799 | 799 |
| 65 | 640 | 653 | 707 | 774 | 799 | 770 | 701 | 643 | 623 | 662 | 742 | 824 | 859 | 826 | 749 | 678 | 642 | 642 | 642 |
| 70 | 486 | 500 | 569 | 642 | 668 | 638 | 563 | 490 | 466 | 510 | 601 | 692 | 728 | 698 | 612 | 528 | 486 | 486 | 486 |
| 75 | 338 | 362 | 439 | 504 | 530 | 502 | 431 | 347 | 317 | 368 | 472 | 553 | 586 | 560 | 483 | 387 | 339 | 339 | 339 |
| 80 | 199 | 232 | 303 | 358 | 374 | 350 | 293 | 217 | 181 | 238 | 330 | 397 | 425 | 404 | 343 | 255 | 201 | 201 | 201 |
| 85 | 79 | 114 | 159 | 193 | 204 | 185 | 144 | 99 | 62 | 114 | 171 | 217 | 238 | 227 | 188 | 132 | 79 | 79 | 79 |
| 90 | 5 | 9 | 16 | 18 | 16 | 10 | 6 | 3 | 3 | 3 | 8 | 16 | 24 | 26 | 23 | 12 | 6 | 6 | 6 |
| 95 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 100 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| 105 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 110 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 |
| 115 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |
| 120 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 |
| 125 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 130 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 135 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| 140 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 145 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 150 | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 |
| 155 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 160 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 |
| 165 | 6 | 6 | 5 | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 6 | 6 |
| 170 | 7 | 6 | 6 | 7 | 6 | 7 | 7 | 7 | 6 | 6 | 7 | 7 | 6 | 6 | 6 | 7 | 6 | 6 | 6 |
| 175 | 6 | 6 | 6 | 6 | 7 | 7 | 6 | 6 | 7 | 6 | 7 | 7 | 6 | 6 | 7 | 7 | 7 | 7 | 7 |
| 180 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |



THD and PF Test

| | | | | |
|---------------------|--------------------|---------------------------|------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.6 | 120.08 | 60 | 0.3779 | 45.04 | 0.9927 | 10.01% | Horizontal |
| 24.6 | 277.12 | 60 | 0.1681 | 45.41 | 0.9749 | 8.34% | Horizontal |



THD and PF Test

| | | | | |
|----------------------------|--------------------|----------------------------------|-------------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.6 | 120.08 | 60 | 0.3551 | 42.35 | 0.9932 | 9.32% | Horizontal |
| 24.6 | 277.08 | 60 | 0.1589 | 42.78 | 0.9717 | 8.61% | Horizontal |



THD and PF Test

| | | | | |
|----------------------------|--------------------|----------------------------------|-------------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.6 | 120.08 | 60 | 0.3774 | 45.01 | 0.9928 | 9.96% | Horizontal |
| 24.6 | 277.05 | 60 | 0.1676 | 45.26 | 0.9746 | 8.38% | Horizontal |



THD and PF Test

| | | | | |
|---------------------|--------------------|---------------------------|------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.6 | 120.09 | 60 | 0.3286 | 39.10 | 0.9909 | 11.13% | Horizontal |
| 24.6 | 277.06 | 60 | 0.1500 | 40.26 | 0.9686 | 8.84% | Vertical |



THD and PF Test

| | | | | |
|---------------------|--------------------|---------------------------|------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | | Sample ID. | 5475176 |
| 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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 24.6 | 119.97 | 60 | 0.2834 | 33.65 | 0.9885 | 12.34% | Horizontal |
| 24.6 | 277.06 | 60 | 0.1334 | 35.48 | 0.9600 | 9.72% | Horizontal |



In-Situ Temperature Measurement Test

| | | | |
|------------------|--------------------|-------------------|---------|
| Model No. | VTR-24-MU-45-9TW-A | Sample ID. | 5475176 |
|------------------|--------------------|-------------------|---------|

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 |
|------------------------------------|---------------|----------------|-------------|-----------|--------------|-------------|-------------|
| 23.2 | 120.08 | 60 | 0.3779 | 45.04 | 0.9927 | 10.01% | 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 | 23.2 | 25.0 | | | | |
| TMP of Location 1 | 120 | 45.6 | 47.4 | 0.0014 | BXFN-(A)G-11L-3A | 150 | 105 |

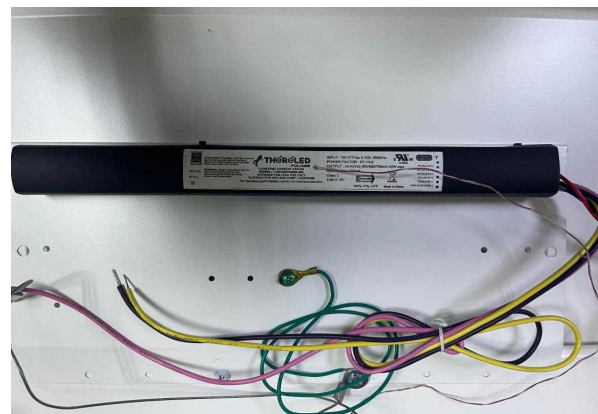
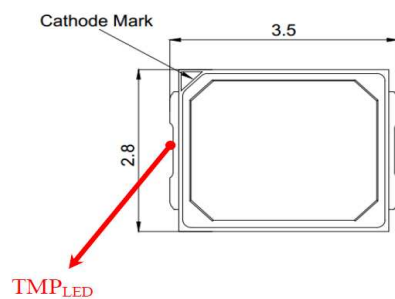
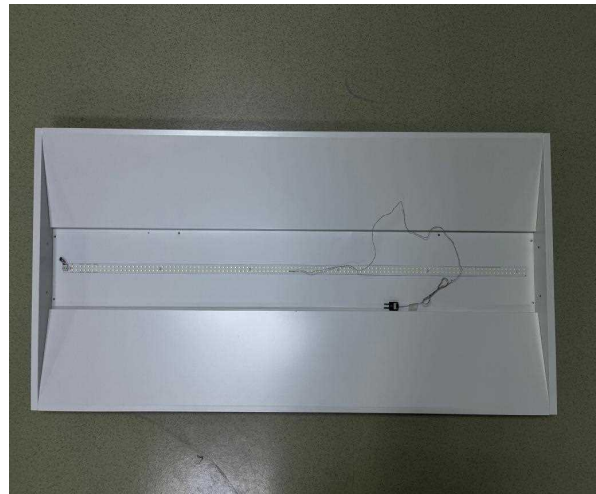
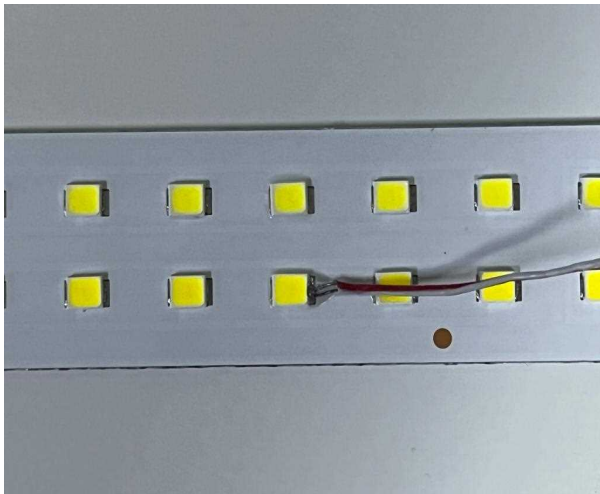
Test Results (Drivers)

| 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 | 23.2 | 25.0 | | |
| TMP of Location 1 | 56.7 | 58.5 | T1M1UNV095S-40L | 90 |



In-Situ Temperature Measurement Test (Cont'd)

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





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