

# TIVOLI, LCC

# TEST REPORT

**STATEMENT OF LIMITATION:** This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

**SCOPE OF WORK**  
Electrical and Photometric tests as required to the IESNA test standard.

**MODEL NUMBER**  
ECL-06-30-1

**PROJECT NUMBER**  
G104384354

**REPORT NUMBER**  
104384354LAX-001

**ISSUE DATE**  
July 9, 2020

**REVISION DATE**  
None



TEST REPORT

REPORT NO.: 104384354LAX-001

REPORT DATE: July 9,2020

## TEST OF (1) LED LUMINAIRE - ECLIPSE 3000K 1 FT, 6" OC

MODEL NO. ECL-06-30-1

## RENDERED TO:

TIVOLI, LCC  
15602 MOSHER AVENUE  
TUSTIN, CA 92780

## AUTHORIZATION

The testing performed was authorized by signed quote number Qu-01090954-1.

## STANDARDS USED

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting

ANSI NEMA ANSLG C78.377: 2015: Specifications of the Chromaticity of Solid State Lighting Products

## SAMPLE INFORMATION

| CONTROL NO.            | MODEL/SERIAL NO. | DESCRIPTION                                  | TYPE       | RECEIVED |
|------------------------|------------------|--|------------|----------|
| LAN2007081356-001, 002 | ECL-06-30-1      | LED Luminaire - Eclipse<br>3000K 1 ft, 6" OC | production | 7/8/2020 |

## DATE OF TESTS

July 9,2020

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

**TEST RESULTS SUMMARY**

|                     |   |
|---------------------|---|
| <b>MODEL NO:</b>    | ECL-06-30-1                               |
| <b>DESCRIPTION:</b> | LED Luminaire - Eclipse 3000K 1 ft, 6" OC |

| CRITERIA                         | RESULTS            |                 |
|----------------------------------|--------------------|-----------------|
|                                  | INTEGRATING SPHERE | GONIOPHOTOMETER |
| Lumen Output (lumens)            | 19.5               | 19.3            |
| Input Power (W) @ 120 VAC        | 3.68               | 3.69            |
| Lumen Efficacy (lm/W)            | 5.3                | 5.2             |
| Input Power Factor ( ) @ 120 VAC | 0.532              | 0.534           |

| CRITERIA                         | RESULTS |
|----------------------------------|---------|
| Input Current ATHD (%) @ 120 VAC | 34.17   |
| Correlated Color Temperature (K) | 2965    |
| Color Rendering Index - Ra ( )   | 82.3    |
| Color Rendering - R9 ( )         | 13.5    |
| DUV ( )                          | 0.0007  |
| Chromaticity Coordinate (x)      | 0.439   |
| Chromaticity Coordinate (y)      | 0.403   |
| Chromaticity Coordinate (u')     | 0.252   |
| Chromaticity Coordinate (v')     | 0.521   |

**EQUIPMENT LIST**

| EQUIPMENT USED            | MODEL NUMBER    | CONTROL NO. | CAL DUE DATE | DATE USED |
|---------------------------|-----------------|-------------|--------------|-----------|
| Goniophotometer           | 6440T           | 000943      | VBU          | 07/09/20  |
| AC Source                 | CW1251P         | 000944      | VBU          | 07/09/20  |
| Power Analyzer            | WT210           | 000945      | 10/02/20     | 07/09/20  |
| Tape Measure              | 33-428          | 001491      | VBU          | 07/09/20  |
| Magnetic Level            | 581-9           | 001610      | 10/11/20     | 07/09/20  |
| Temp. & RH Meter          | Testo 622       | 001912      | 04/22/21     | 07/09/20  |
| Thermometer               | DPI8-C24        | 001782      | 10/15/20     | 07/09/20  |
| 2m Sphere                 | LMS760          | 000835      | VBU          | 07/09/20  |
| Spectrometer              | CDS-3020-T      | 000838      | VBU          | 07/09/20  |
| DC Power Supply           | LPS-100-0833    | 000836      | 07/22/20     | 07/09/20  |
| Power Supply (AC 3P / DC) | CSW5550-208-LAN | 001339      | VBU          | 07/09/20  |
| Power Meter               | WT310           | 001360      | 10/02/20     | 07/09/20  |
| Temp. & RH Meter          | Testo 622       | 001910      | 04/15/21     | 07/09/20  |

**TEST METHODS****SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS**

No seasoning was performed in accordance with IESNA LM-79.

**PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD**

A Spectroradiometer and integrating sphere were used to measure light output, correlated color temperature, chromaticity coordinates, color rendering index, and the spectral distribution for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

**PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD**

A Type C Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

Some graphics were created with Photometrics Pro and Cooper Photometric Toolbox software.

## TEST RESULTS

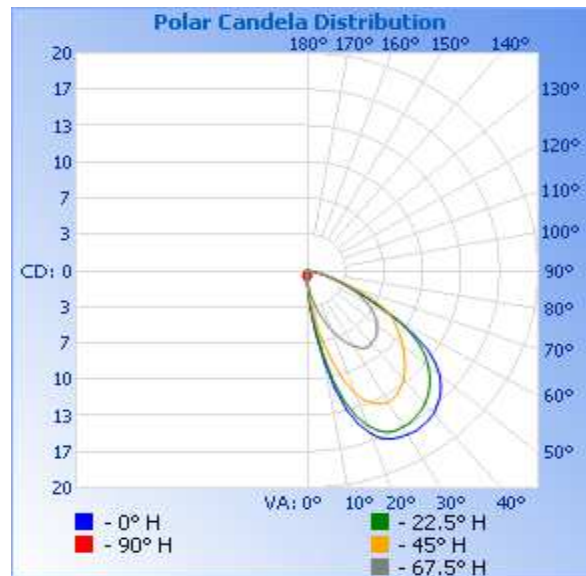
### PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)

| INTERTEK CONTROL NO. | BASE POSITION | INPUT VOLTAGE VAC | INPUT CURRENT (mA) | INPUT POWER (W) | INPUT POWER FACTOR ( ) | LIGHT OUTPUT (lm) | LUMEN EFFICACY (lm/W) |
|----------------------|---------------|-------------------|--------------------|-----------------|------------------------|-------------------|-----------------------|
| LAN2002041000-001    | Base Up       | 120.05            | 57.5               | 3.69            | 0.534                  | 19.3              | 5.2                   |

### INTENSITY SUMMARY - CANDELAS

| Angle | 0  | 22.5 | 45 | 67.5 | 90 |
|-------|----|------|----|------|----|
| 0     | 1  | 1    | 1  | 1    | 1  |
| 5     | 4  | 3    | 2  | 2    | 1  |
| 10    | 8  | 8    | 6  | 3    | 1  |
| 15    | 13 | 12   | 9  | 4    | 1  |
| 20    | 16 | 15   | 12 | 6    | 1  |
| 25    | 17 | 16   | 14 | 7    | 1  |
| 30    | 17 | 17   | 14 | 8    | 1  |
| 35    | 17 | 16   | 14 | 9    | 1  |
| 40    | 17 | 16   | 13 | 9    | 0  |
| 45    | 16 | 15   | 12 | 8    | 0  |
| 50    | 15 | 14   | 11 | 8    | 0  |
| 55    | 13 | 12   | 10 | 7    | 0  |
| 60    | 9  | 9    | 8  | 6    | 0  |
| 65    | 5  | 5    | 6  | 5    | 0  |
| 70    | 3  | 3    | 4  | 3    | 0  |
| 75    | 2  | 2    | 2  | 2    | 0  |
| 80    | 1  | 1    | 1  | 0    | 0  |
| 85    | 0  | 0    | 0  | 0    | 0  |
| 90    | 0  | 0    | 0  | 0    | 0  |
| 95    | 0  | 0    | 0  | 0    | 0  |
| 100   | 0  | 0    | 0  | 0    | 0  |
| 105   | 0  | 0    | 0  | 0    | 0  |
| 110   | 0  | 0    | 0  | 0    | 0  |
| 115   | 0  | 0    | 0  | 0    | 0  |
| 120   | 0  | 0    | 0  | 0    | 0  |
| 125   | 0  | 0    | 0  | 0    | 0  |
| 130   | 0  | 0    | 0  | 0    | 0  |
| 135   | 0  | 0    | 0  | 0    | 0  |
| 140   | 0  | 0    | 0  | 0    | 0  |
| 145   | 0  | 0    | 0  | 0    | 0  |
| 150   | 0  | 0    | 0  | 0    | 0  |
| 155   | 0  | 0    | 0  | 0    | 0  |
| 160   | 0  | 0    | 0  | 0    | 0  |
| 165   | 0  | 0    | 0  | 0    | 0  |
| 170   | 0  | 0    | 0  | 0    | 0  |
| 178   | 0  | 0    | 0  | 0    | 0  |
| 180   | 0  | 0    | 0  | 0    | 0  |

### POLAR CANDELA PLOT

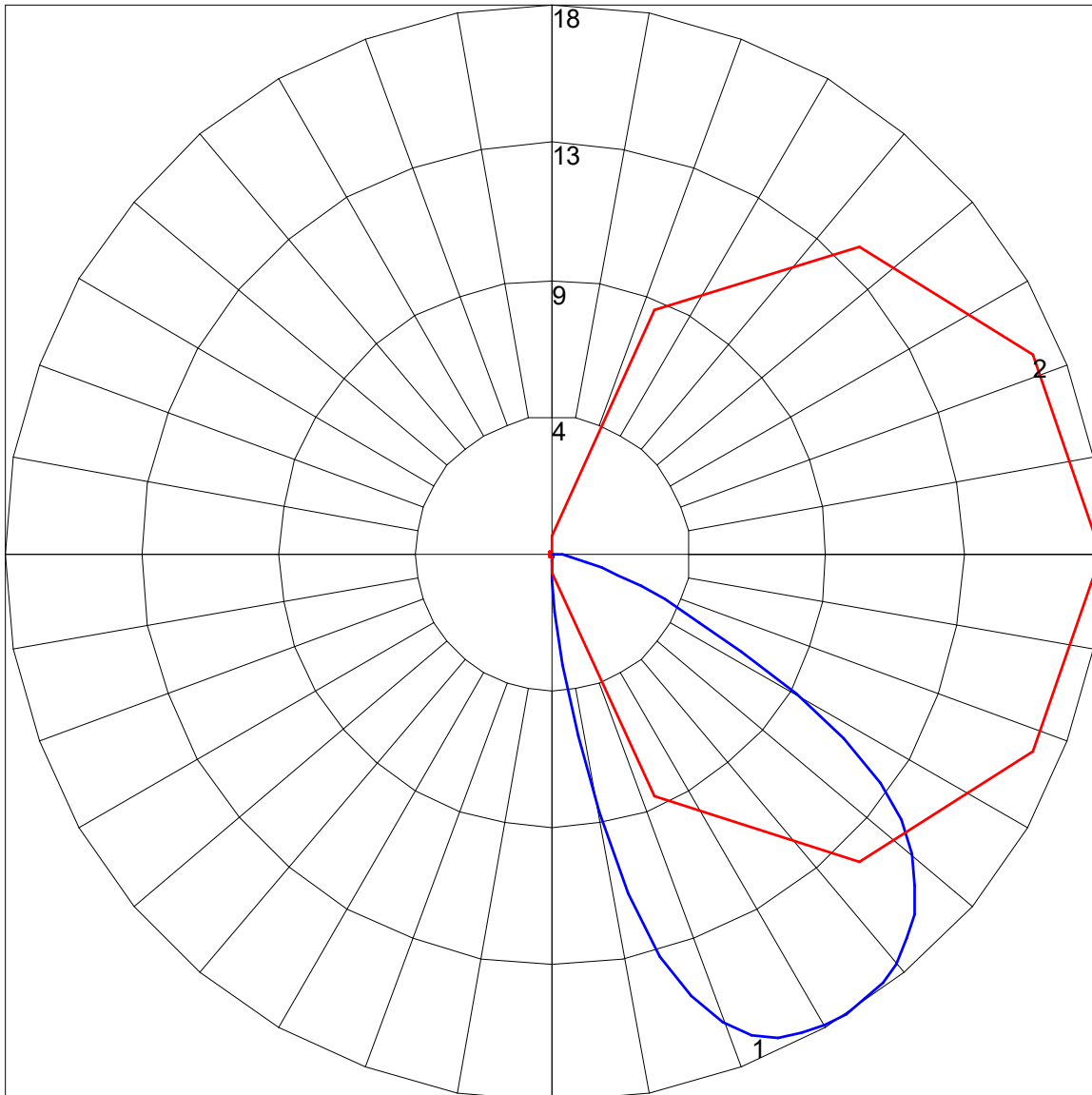


**TEST RESULTS (cont'd)**

**PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)**

**POLAR GRAPH AND MAXIMUM CANDELA INTENSITY**

| Maximum Candela | Location - Horizontal Angle | Location - Vertical Angle |
|-----------------|-----------------------------|---------------------------|
| 17.5            | 0                           | 32.5                      |



Maximum Candela = 17.5 Located At Horizontal Angle = 0, Vertical Angle = 32.5

# 1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)

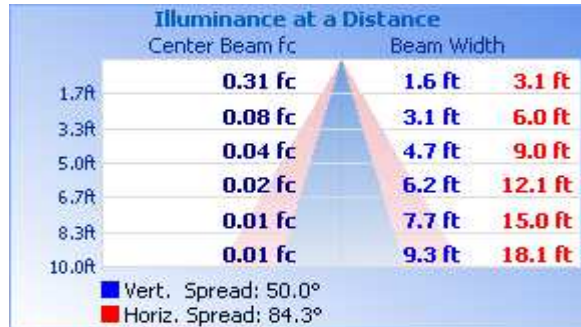
# 2 - Horizontal Cone Through Vertical Angle (32.5) (Through Max. Cd.)

## TEST RESULTS (cont'd)

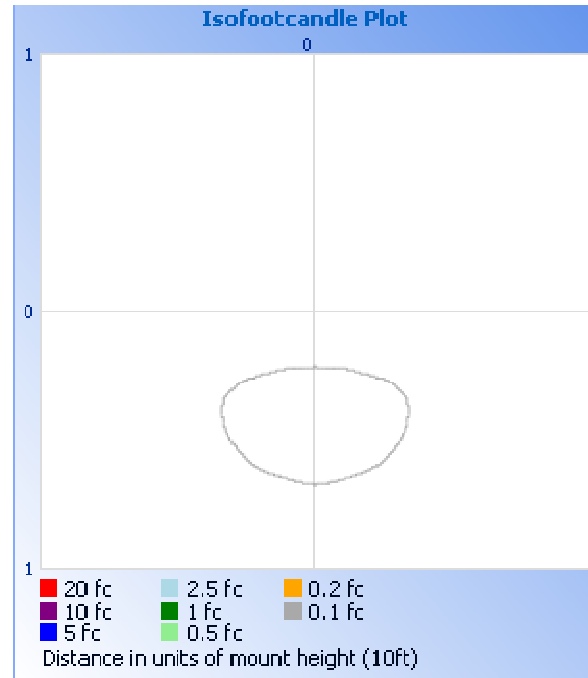
### PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)

#### MOUNTING HEIGHT: 10ft

#### ILLUMINANCE - CONE OF LIGHT



#### ISOILLUMINATION PLOT



## ZONAL LUMEN SUMMARY AND PERCENTAGES

| ZONE   | LUMENS | % LUMINAIRE |
|--------|--------|-------------|
| 0-30   | 4.0    | 21.0        |
| 0-40   | 7.8    | 40.6        |
| 0-60   | 16.0   | 83.0        |
| 60-90  | 3.3    | 17.0        |
| 0-90   | 19.3   | 100.0       |
| 90-180 | 0.0    | 0.0         |
| 0-180  | 19.3   | 100.0       |

| ZONE    | LUMENS | % LUMINAIRE |
|---------|--------|-------------|
| 0-10    | 0.2    | 1.0         |
| 10-20   | 1.2    | 6.2         |
| 20-30   | 2.7    | 13.8        |
| 30-40   | 3.8    | 19.6        |
| 40-50   | 4.3    | 22.1        |
| 50-60   | 3.9    | 20.3        |
| 60-70   | 2.4    | 12.3        |
| 70-80   | 0.8    | 4.2         |
| 80-90   | 0.1    | 0.5         |
| 90-100  | 0.0    | 0.0         |
| 100-110 | 0.0    | 0.0         |
| 110-120 | 0.0    | 0.0         |
| 120-130 | 0.0    | 0.0         |
| 130-140 | 0.0    | 0.0         |
| 140-150 | 0.0    | 0.0         |
| 150-160 | 0.0    | 0.0         |
| 160-170 | 0.0    | 0.0         |
| 170-180 | 0.0    | 0.0         |

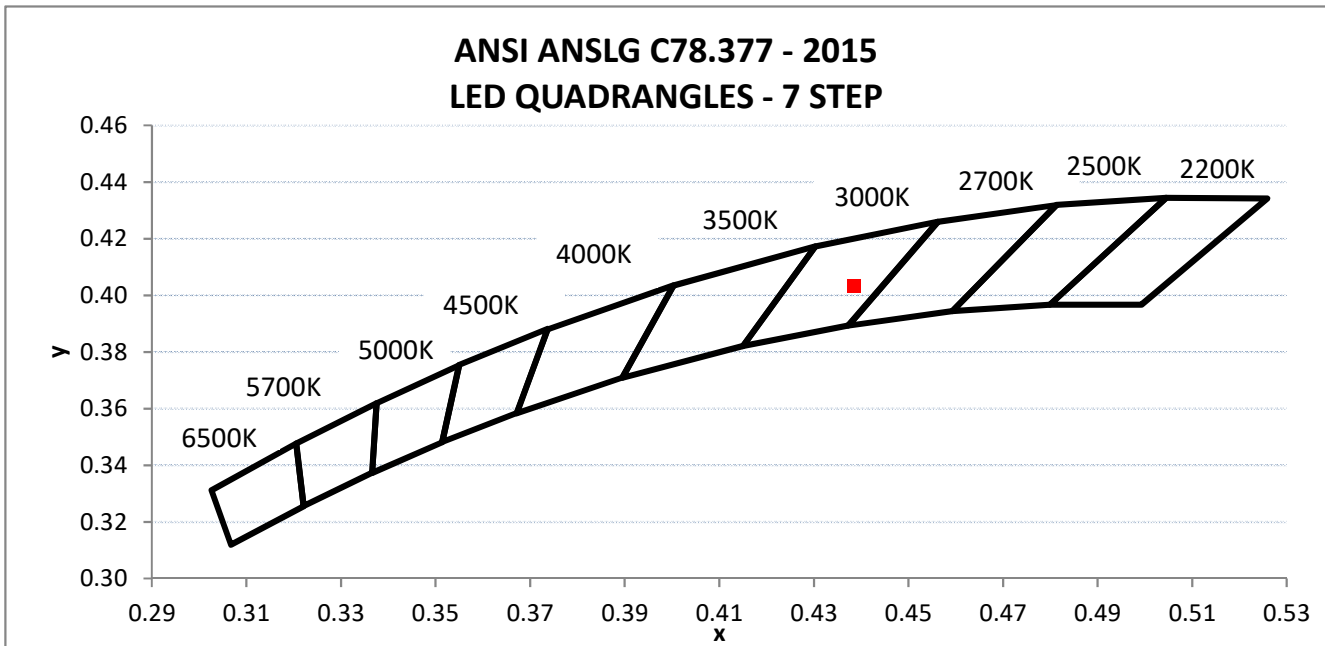
**TEST RESULTS (cont'd)**

**PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD (25°C +/- 1°C)**

| INTERTEK CONTROL NO. | BASE POSITION | INPUT VOLTAGE VAC | INPUT CURRENT (mA) | INPUT POWER (W) | INPUT POWER FACTOR ( ) | INPUT CURRENT ATHD (%) |
|----------------------|---------------|-------------------|--------------------|-----------------|------------------------|------------------------|
| LAN2002041000-001    | Base Up       | 120.03            | 57.7               | 3.68            | 0.532                  | 34.17                  |

| LIGHT OUTPUT (lm) | LUMEN EFFICACY (lm/W) | CORRELATED COLOR TEMPERATURE - CCT (K) | CRI - Ra ( ) | CRI - R9 ( ) | DUV ( ) |
|-------------------|-----------------------|--|--------------|--------------|---------|
| 19.5              | 5.3                   | 2965                                   | 82.3         | 13.5         | 0.0007  |

| CIE 1931 CHROMATICITY COORDINATE (x) | CIE 1931 CHROMATICITY COORDINATE (y) | CIE 1976 CHROMATICITY COORDINATE (u') | CIE 1976 CHROMATICITY COORDINATE (v') |
|--------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|
| 0.439                                | 0.403                                | 0.252                                 | 0.521                                 |





TEST REPORT

REPORT NO.: 104384354LAX-001

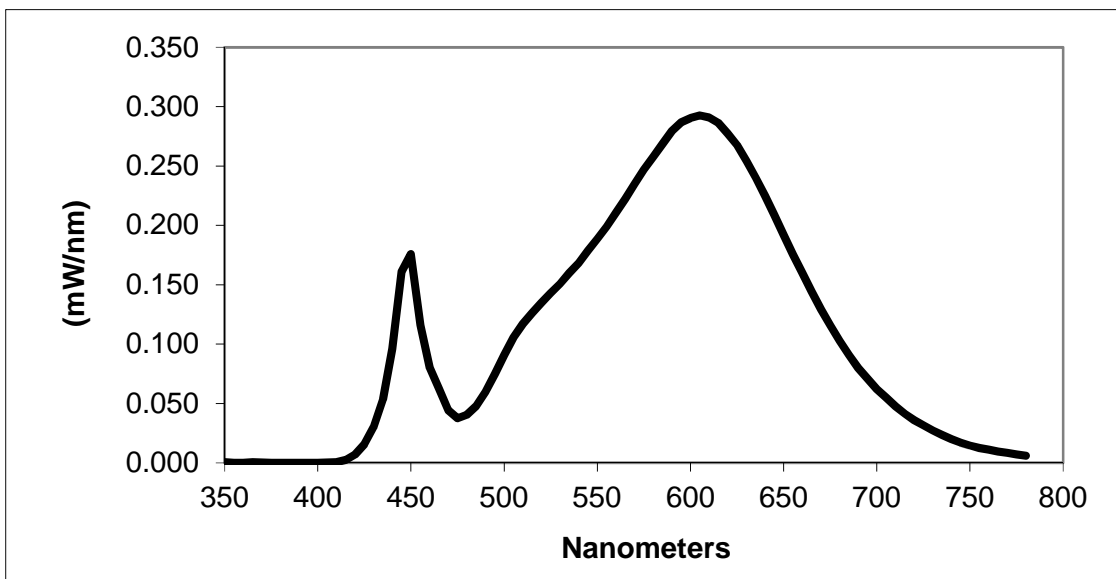
REPORT DATE: July 9,2020

**TEST RESULTS (cont'd)**

**PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD (25°C +/- 1°C)**

| SPECTRAL DISTRIBUTION OVER VISIBLE WAVELENGTHS* |       |     |       |     |       |     |       |
|---|-------|-----|-------|-----|-------|-----|-------|
| nm  | mW/nm | nm  | mW/nm | nm  | mW/nm | nm  | mW/nm |
| 350   | 0.000 | 460 | 0.080 | 570 | 0.235 | 680 | 0.103 |
| 355   | 0.000 | 465 | 0.062 | 575 | 0.247 | 685 | 0.091 |
| 360   | 0.000 | 470 | 0.044 | 580 | 0.258 | 690 | 0.080 |
| 365   | 0.001 | 475 | 0.038 | 585 | 0.269 | 695 | 0.071 |
| 370   | 0.000 | 480 | 0.040 | 590 | 0.280 | 700 | 0.062 |
| 375   | 0.000 | 485 | 0.048 | 595 | 0.287 | 705 | 0.055 |
| 380   | 0.000 | 490 | 0.060 | 600 | 0.290 | 710 | 0.047 |
| 385   | 0.000 | 495 | 0.075 | 605 | 0.293 | 715 | 0.041 |
| 390   | 0.000 | 500 | 0.091 | 610 | 0.291 | 720 | 0.036 |
| 395   | 0.000 | 505 | 0.106 | 615 | 0.286 | 725 | 0.032 |
| 400   | 0.000 | 510 | 0.117 | 620 | 0.277 | 730 | 0.027 |
| 405   | 0.000 | 515 | 0.126 | 625 | 0.267 | 735 | 0.023 |
| 410   | 0.001 | 520 | 0.135 | 630 | 0.254 | 740 | 0.020 |
| 415   | 0.002 | 525 | 0.143 | 635 | 0.240 | 745 | 0.017 |
| 420   | 0.007 | 530 | 0.151 | 640 | 0.225 | 750 | 0.015 |
| 425   | 0.016 | 535 | 0.160 | 645 | 0.209 | 755 | 0.013 |
| 430   | 0.030 | 540 | 0.168 | 650 | 0.192 | 760 | 0.011 |
| 435   | 0.053 | 545 | 0.179 | 655 | 0.176 | 765 | 0.009 |
| 440   | 0.096 | 550 | 0.189 | 660 | 0.160 | 770 | 0.008 |
| 445   | 0.161 | 555 | 0.199 | 665 | 0.145 | 775 | 0.007 |
| 450   | 0.176 | 560 | 0.210 | 670 | 0.129 | 780 | 0.006 |
| 455   | 0.116 | 565 | 0.222 | 675 | 0.116 |     |       |

\*Without correction of sample absorption.



**END OF TEST RESULTS**

TEST REPORT

REPORT NO.: 104384354LAX-001

REPORT DATE: July 9,2020

**PICTURES (not to scale)**



### CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Kellen Murakami  
Technician  
Lighting Division

Report Reviewed By:

Vladimir Kozak  
Engineering Supervisor  
Lighting Division

Attachments: IES file, TM-30 Report No. 104384354LAX-001T

### REVISION HISTORY

| JOB NUMBER | DATE OF REVISION | PROJECT | REVIEWED BY | REVISION NOTE |
|------------|------------------|---------|-------------|---------------|
| None       |                  |         |             |               |