# CEC Title 24 Test Report

2016 REFERENCE APPENDICES FOR THE BUILDING ENERGY EFFICIENCY STANDARDS - JA8 and JA10

**Prepared For**

## RP Lighting + Fans

**4931 Paseo Del Norte NE,**
**Albuquerque, NM 87113**

**Ceiling Fan with Light Kit Catalog Number**
**1005LED, 1006LED, 1007LED, 1008LED, 1009LED,**
**1025LED, 1041LED, 1042LED, 1043LED, 1044LED,**
**1045LED, 1049LED, 1078LED, 1079LED, 1097LED**

**LED Module Catalog Number**
**LKLED-C100-DOB**

**Project Number**
4788977969.1.1

**Report Number**
4788977969.1-1a

**Test Date**
2019-05-28 - 2019-06-04

Tested By

Scott Chou

Scott Chou

**Issue Date**
2019-06-10

Approved By

Key Hung

Key Hung

## 1.0 Test Summary

**2016 REFERENCE APPENDICES FOR THE BUILDING ENERGY EFFICIENCY STANDARDS - JA8 and JA10**

| Requirement Category | Test Method | Reqiurement | Reported Test Value | Results (Pass/Fail) |
|---|---|---|---|---|
| **Efficacy (lm/W)** | JA8.3.1 | $\geq$ 45 | 51.7 | Pass |
| **Power Factor** | JA8.3.2 | $\geq$ 0.9 | 0.987 | Pass |
| **Source Start Time (ms)** | JA8.3.3 | $\leq$ 500 | 4 | Pass |
| **CCT (K)** | JA8.3.4 | $\leq$ 4000K | 2959 | Pass |
| **Duv** | JA8.3.4 | $\geq$ -0.0033 and $\leq$ +0.0033 | -0.0013 | Pass |
| **CRI** | JA8.3.4 | $\geq$ 90 | 94 | Pass |
| **$R_9$** | JA8.3.4 | $\geq$ 50 | 68 | Pass |
| **Lumen Maintenance & Light Source Life (hours)** | JA8.3.5 | $L_{70} \geq$ 25,000 hours | 54,000 | Pass |
| **LED Tc Temperature ($^{o}$C)** | JA8.3.5 | Within the highest test temperature in LM-80 report | 68.9 | Pass |
| **Rated life (hours)** | JA8.4.5 | $\geq$ 15,000 hours | 54,000 | Pass |
| **Dimming control compatibility** | JA8.3.7 | Forward Phase cut control, reverse phase cut, powerline carrier, digital, 0-10 VDC, other. | Validated | Pass |
| **Dimming: Range** | JA8.3.7 | $\leq$ 10% | 1.2% | Pass |
| **Dimming: Noise (dBA)** | JA8.3.7 | 24 dBA at 1 meter under 100% and 20% light output | 22.2 | Pass |
| **Dimming: Flicker (%)** | JA10 | Percent flicker < 30% for frequencies of 200 Hz or below, at 100% and 20% light output | 17.45% | Pass |
| **Marking** | JA8.5 | Light sources meeting the requirements of this Appendix shall be marked with “JA8-2016” to indicate their compliance with the criteria of this Appendix | Validated | Pass |

## 2.0 Test List

| Test Item | Test | Test Date | Test Model | Tests Conducted By |
|---|---|---|---|---|
| 1 | Integrating Sphere Test | 2019-05-28 | 1008LED-WW | Scott Chou |
| 2 | Source Start Time | 2019-05-30 | 1008LED-WW | Scott Chou |
| 3 | Dimming Level, Flicker, and Audible Noise Test | 2019-05-29 ~ 2019-06-04 | 1008LED-WW | Scott Chou |
| 4 | In-Situ Temperature Measurement Test | 2019-05-29 | 1008LED-WW | Scott Chou |

## 2.1 Test Site

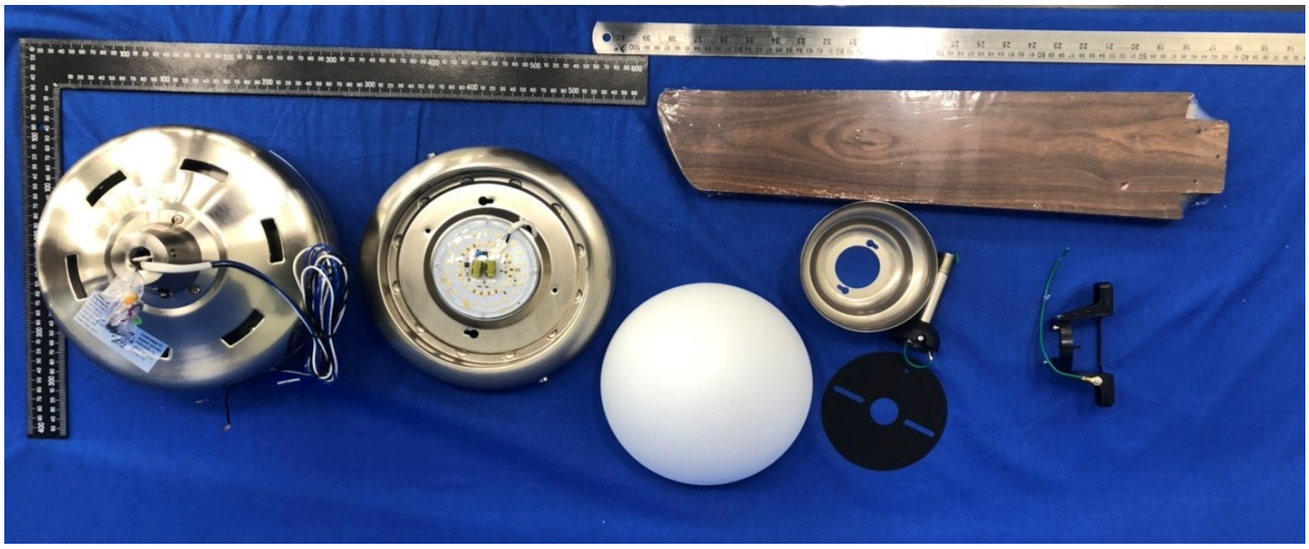
| | |
|---|---|
| Company Name | Underwriters Laboratories Taiwan Co., Ltd. |
| Address | 1st, 2nd, 4th & 5th Fl., No. 35, Sec. 2, ChungYang S. Road, Peitou, Taipei City 112, Taiwan |

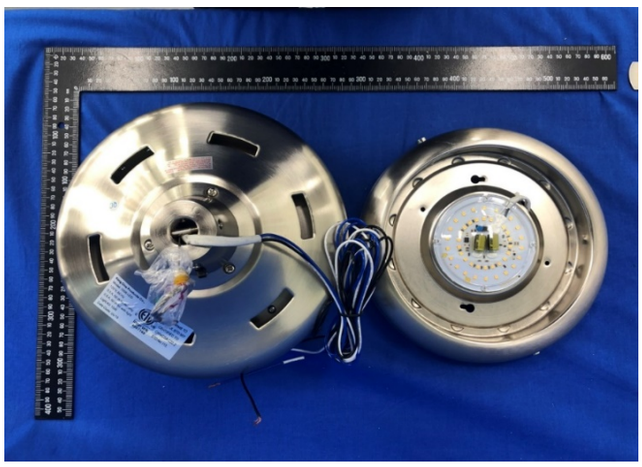
**Remark**

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
2. For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

## 3.0 Production Description

**Ceiling Fan with Light Kit Model Number:** 1005LED, 1006LED, 1007LED, 1008LED, 1009LED, 1025LED, 1041LED, 1042LED, 1043LED, 1044LED, 1045LED, 1049LED, 1078LED, 1079LED, 1097LED
**LED Module Model Number:** LKLED-C100-DOB
**Electrical Rated:** 120 Vac, 60 Hz, 16 W
**Light Source:** SSL, Cree, Inc., Cat. No. JE2835 9-V Value
**Nominal CCT:** 3000K
**LED Driver:** Driver on board
**Representative (tested) Model:** 1008LED-WW
**Family Model and Variation:** All models are similar except for finish color.
**Sample Received Date:** 2019-05-24





## 4.0 Integrating Sphere Test

| Model No. | 1008LED-WW | Sample No. | 2308307-1, 2308307-2, 2308307-3 | Ambient Temperature (°C) | 25.2 |
|---|---|---|---|---|---|
| Opreate time (Min.) | 95 | Stabilization time (Min.) | 90 | | |

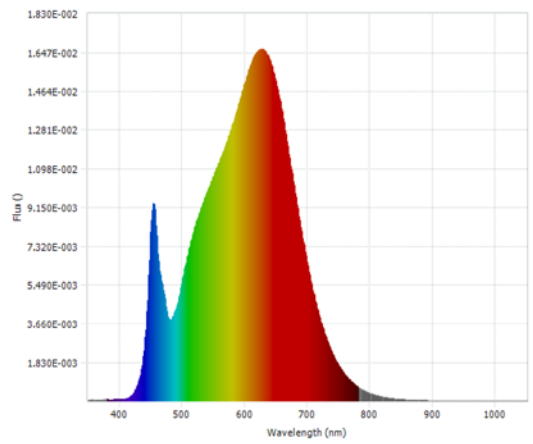
**Test Method**

1. The sample was tested according to the IES LM-79-08.
2. Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature inside the sphere was maintained at 25°C ± 1°C.
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. The sample was operated at 120 Volts AC, 60 Hz. It was stabilized before measurement was made. 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 nm to 780 nm.

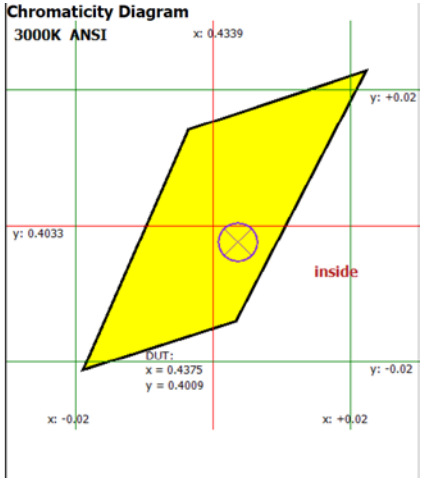
**Integrating Sphere Conditions and Results**

| Sample ID. | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | CCT (K) | Duv | CRI ($R_a$) | $R_9$ | $R_f$ | $R_g$ | Luminous Flux (lm) | Luminous Efficacy (lm/W) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2308307-1 | 120.06 | 60 | 0.134 | 15.89 | 0.987 | 2963 | -0.0013 | 93.8 | 68.7 | 91 | 100 | 825.1 | 51.9 |
| 2308307-2 | 120.08 | 60 | 0.135 | 15.93 | 0.987 | 2974 | -0.0014 | 93.7 | 68.5 | 90 | 100 | 825.0 | 51.8 |
| 2308307-3 | 120.08 | 60 | 0.135 | 15.94 | 0.987 | 2939 | -0.0012 | 93.7 | 68.2 | 91 | 99 | 818.5 | 51.4 |
| **Average** | **120.07** | **60** | **0.134** | **15.92** | **0.987** | **2959** | **-0.0013** | **93.7** | **68.5** | **91** | **100** | **822.9** | **51.7** |

**Spectral Flux Graph**




**Chromaticity Diagram**




**Spectral Result**

| | | | |
|---|---|---|---|
| Radiant Flux Φ | 2.99676 (W) | Luminous Flux Φ(v) | 825.148 (lm) |
| Φ(v') | 1163.12 (lm') | Chrom x | 0.4375 |
| Chrom y | 0.4009 | Chrom u | 0.2523 |
| Chrom v | 0.3468 | Duv | -0.0013 |
| Chrom u' | 0.2523 | Chrom v' | 0.5202 |
| λ (peak) | 625.4 (nm) | λ (center) | 604.8 (nm) |
| λ (centroid) | 598.8 (nm) | λ (dom) | 583.5 (nm) |
| FWHM | 167.0 (nm) | Purity | 51.7 (%) |
| CCT | 2963.0 (K) | SDCM | N/A |
| Ra | 93.79 | R1 | 94.4 |
| R2 | 97.1 | R3 | 97.5 |
| R4 | 93.3 | R5 | 93.6 |
| R6 | 95.4 | R7 | 93.3 |
| R8 | 85.8 | R9 | 68.7 |
| R10 | 91.6 | R11 | 93.4 |
| R12 | 79.5 | R13 | 95.3 |
| R14 | 97.9 | R15 | 91.8 |
| Rf | 91 | Rg | 100 |

## 5.0 Source Start Time

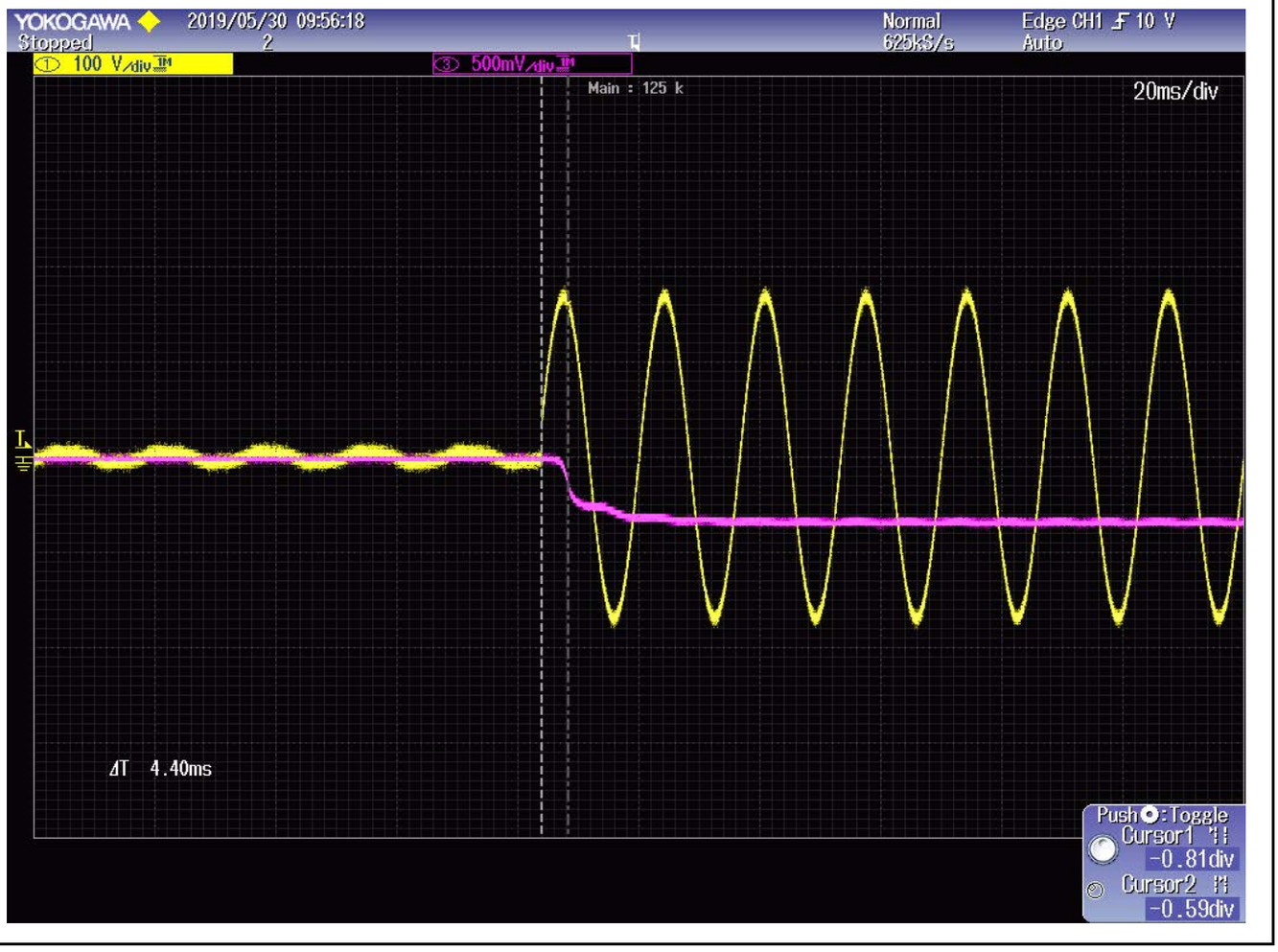
| Model No. | 1008LED-WW | Sample No. | 2308307-1 |
|---|---|---|---|

**Test Method**

1. The sample was tested according to ENERGY STAR Start Time Test Method.
2. The sample was operated in its designated orientation at rated input voltage in a 25 °C ± 1 °C ambient . A photodetector is used to monitor the luminaire light output. Start Time was recorded when the point where the light source is continuously illuminated, and the light output is either constant or increasing.

**Test Results**

| Temperature (°C) | Voltage (Vac) | Frequency (Hz) | Start Time (ms) |
|---|---|---|---|
| 25.2 | 120.00 | 60 | 4.4 |



## 6.0 Dimming Test

**Test Information**

| Model No. | Sample No. | Dimmer | | Ambient Temperature (°C) |
|---|---|---|---|---|
| 1008LED-WW | 2308307-1 | Manufacture | Lutron | 24.9 |
| | | Model Number | DVCL-153P | |

**Test Method**

1. The test was performed using a relative photometry method, according to JA8, JA10 and Light Source FlickerENERGY STAR Recommended Practice - Noise.
2. The measurement was taken one test sample combined with the dimmers. The sample was tested at the rated electrical parameter, and allowed to stabilize and verify by taking light output measurements every minute with interval 0.00004 seconds and equipment period 2 seconds, until consecutive measurements are no more than 0.5% apart.

**Test Results**

| Test Condition | Input Voltage (V) | Freq. (Hz) | Input Current (A) | Power (W) | Power Factor | THDi (%) | Light Output Value (lx) | MinLOR | Percent Flicker | Percent Flicker ≤40 Hz | Percent Flicker ≤90 Hz | Percent Flicker ≤200 Hz | Percent Flicker ≤400 Hz | Percent Flicker ≤1000 Hz | Peak Noise Reading (dBA) | Microphone Position at which the Peak Noise Reading occurs | Distance between the microphone and the UUT (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BLO** | 120.02 | 60 | 0.134 | 15.89 | 0.986 | 16.57 | 4032.6 | | 23.08% | 0.24% | 0.34% | 15.81% | 16.08% | 16.56% | 22.1 | | 100 |
| **MaxLO** | 120.02 | 60 | 0.126 | 14.18 | 0.935 | 33.76 | 3820.4 | | 26.22% | 0.25% | 0.32% | 17.45% | 18.63% | 20.08% | 22.2 | Near the driver | 100 |
| **20%LO** | 120.08 | 60 | 0.600 | 3.39 | 0.470 | 111.03 | 758.2 | | 20.28% | 0.50% | 0.69% | 12.76% | 16.14% | 17.03% | 22.2 | Near the driver | 100 |
| **MinLO** | 120.08 | 60 | 0.220 | 0.67 | 0.252 | 226.82 | 46.1 | 1.2% | 9.43% | 0.67% | 0.92% | 2.97% | 3.78% | 4.03% | 22.2 | Near the driver | 100 |
| **Maximum Reading** | | | | | | | | | **26.22%** | **0.67%** | **0.92%** | **17.45%** | **18.63%** | **20.08%** | **22.2** | | 100 |

## 7.0 In-Situ Temperature Measurement Test

| Model No. | 1008LED-WW | Sample No. | 2308307-1 |
|---|---|---|---|

**Test Method**

1. In-Situ Temperature Measurement Test is conducted according to the UL1598:2012 (Sections 19.7, 19.10-16).
2. The testing was conducted in a room with ambient temperature of 25 °C ± 5 °C. The apparatus construction followed those described in UL1598:2012 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. The temperature was recorded after the sample was operated by 3.5 hours in stability or by 7.5 hours.

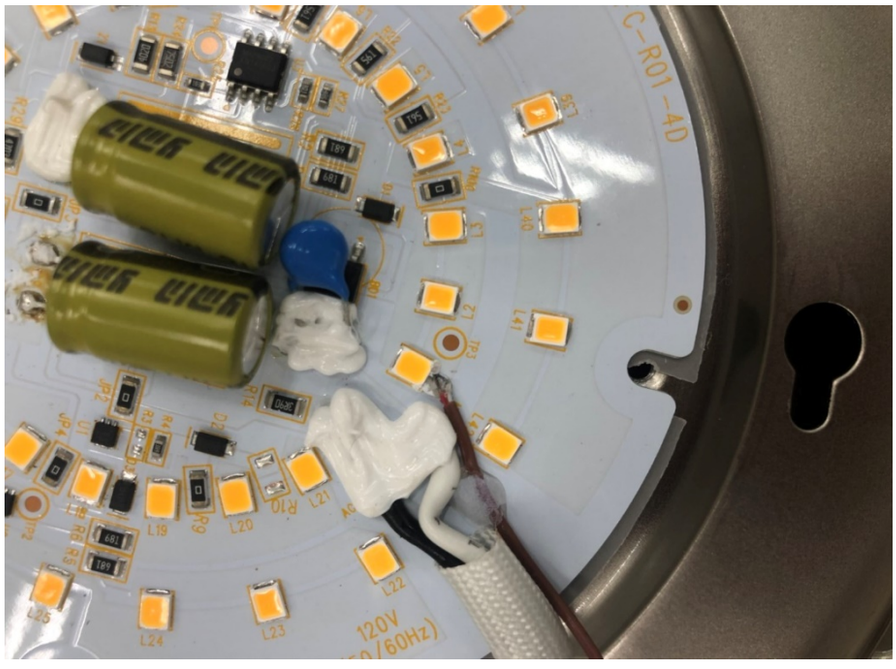
**In-Situ Temperature Measurement Test Conditions**

| Temperature (°C) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Orientation |
|---|---|---|---|---|---|---|
| 25.8 | 120.06 | 60 | 0.134 | 15.89 | 0.987 | Base up |

**Test Results**

| Thermocouple Location | Measured Temperature (°C) | | LED Model Number | Drive Current (mA) | LM-80 Limit Current (mA) | LM-80 Limit Temp. (°C) |
|---|---|---|---|---|---|---|
| | Test result | Test result (Correct to 25°C) | | | | |
| TMP of LED | 69.7 | 68.9 | JE2835 9-V Value | 85.5 | 200 | 85 |
| Ambient Temperature | 25.8 | 25.0 | | | | |

**Test Photos for TMP of LED**



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