

## TEST REPORT

Report No. 181150886SHA-009 A1

Date: Jan. 08, 2020

Applicant : SATCO/NUVO  
Address : 110 Heartland Blvd.Brentwood,NY USA11717  
Product : LED Recessed luminaire  
Brand Name : SATCO  
Model Number : S11712;S11713;S11714  
Electrical Rating : 120 V; 60 Hz; 9W

TEST: Electrical and Photometric as required to the test standard of CEC TITLE 24 JA8 and JA10 (2019 Standard).

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

LABORATORY NOTE: The laboratory that conducted the testing detailed in this report has been Qualified, Verified, and Recognized for LM-79 Testing by NVLAP program.

STANDARDS USED: The following standards or test guides were used in part or totally to test each specimen:

|                        |  |
|------------------------|--|
| Energy Star Lamps V1.1 | Program Requirements for Lamps                             |
| Energy Star Lamps V2.0 | Program Requirements for Lamps                             |
| Appendix JA8           | Qualification Requirements for High Efficacy Light Sources |

DESCRIPTION OF SAMPLE: The client submitted three samples of model S11712;S11713;S11714. The samples were received by Intertek on December 30, 2018, in undamaged condition, and one sample was tested as received.

DATES OF TESTS: 30-Dec-2018~05-Feb-2019

ISSUED BY: Intertek Testing Services Shanghai

TEST LOCATION: 7 floor, No.51, 1089 Qinzhou Road (North),Shanghai, China 200233

**Amendment 1: Update standard version, Jan. 08, 2020.**

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## Summary of testing Result:

According to Table JA-8

| Required Information  | Permissible Answers   | Information / Report value        | Verdict |
|---|---|-----------------------------------|---------|
| Light Source Type   | LED, OLED, Fluorescent, HID, Incandescent, Other (Induction)  | LED                               | Y       |
| Product type  | Omnidirectional lamp, Directional lamp, Decorative lamp, LED light engine, Inseparable SSL luminaire  | Inseparable SSL luminaire         | Y       |
| Connection type   | Direct Wired, Edison Screw Base, GU Base, Pin Base, Quick Connect   | Direct Wired                      | Y       |
| Initial Efficacy  | $\geq 45$ lumens/Watt   | Min: 89.56 lm/W                   | Y       |
| Power Factor at Full Rated Power  | $\geq 0.90$   | Min: 0.9474                       | Y       |
| Start time  | $\leq 0.5$ sec  | Max: 118 ms                       | Y       |
| Correlated Color Temperature (CCT)  | $\leq 4000$ Kelvin.   | Inseparable SSL luminaires, 2700K | Y       |
| Duv   | $\geq -0.0033$ and $\leq +0.0033$   | 0.0010                            | Y       |
| Color Rendering Index (CRI)   | $\geq 90$   | 91                                | Y       |
| Color Rendering R9 (red)  | $\geq 50$   | 52                                | Y       |
| Ambient or elevated temperature test for rated life, lumen maintenance, and survival rate | Ambient or Elevated:<br>"Ambient" allowed only for<br>– omnidirectional lamps < 10 W, and<br>– decorative lamps,<br>– or labeled "not for use in enclosed fixtures",<br>– lamps and light engines that are labeled "not for use in recessed fixtures"<br>– and "inseparable SSL luminaire".<br>All others must report "Elevated". | Inseparable SSL luminaires        | N/A     |
| 6,000 hour lumen maintenance  | $\geq 86.7\%$ or<br>NA for integral luminaires providing TM-21 L70 projections based on light source LM80 data  | --                                | N/A     |
| LM-80 and TM-21 Projected Time to L70   | $\geq 25,000$ hours, or<br>N/A for light sources providing 6,000 hour lumen maintenance testing   | L70>80000 hours                   | Y       |
| Rated life  | $\geq 15,000$ hours   | 36000 hours                       | Y       |
| 6,000 hour survival rate  | $\geq 90\%$ or<br>NA for integral luminaires whose lumen maintenance/rated life is evaluated using light source LM-80 data.   | --                                | N/A     |

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Tel: 86 21 61278200 Fax: 86 21 54262361 Website: [www.intertek-etlsemko.com](http://www.intertek-etlsemko.com)

### Summary of testing Result (continued):

According to Table JA-8 (continued)

| Required Information  | Permissible Answers   | Information / Report value  | Verdict |
|---|---|---|---------|
| Minimum dimming level   | ≤ 10%   | 10%   | Y       |
| Dimming control compatible  | -Forward Phase cut control,<br>-Reverse phase cut,<br>-Powerline carrier,<br>-Direct Digital control,<br>-0-10 VDC (At least one type must be listed) | Direct Digital control.<br>Dimmer brand: Lutron.<br>Dimmer model: DV-103P | Y       |
| NEMA SSL 7A compatible?   | Yes/No<br>If compatible with forward phase cut dimmer control, "Yes". If not, "No".   | Yes   | Y       |
| <b>Flicker:</b>   |   |   |         |
| See JA10 Table 10-1 for flicker data requirements and permissible answers | < 30% for frequencies of 200 Hz or below,<br>at 100% and 20% light output   | See below   | Y       |
| <b>Audible Noise</b>  |   |   |         |
| 100% light output: Audible Noise  | ≤ 24 dBA  | 20.3 dBA  | Y       |
| 20% light output: Audible Noise   | ≤ 24 dBA  | 21.5 dBA  | Y       |
| <b>Marking</b>  |   |   |         |
| Marked in accordance with JA8.5   | Yes.<br>"No" allowed only for lamps and LED light engines with diameter less than 1.0" and decorative lamps with a diameter less than 2.0"            | Marked with "JA8-2019"  | Y       |

| Tested lighting system component: |                         |  |
|-----------------------------------|-------------------------|--|
| Lighting source                   | Model No.               | STWxA12D-xx                            |
|                                   | Manufacturer/brand name | Seoul Semiconductor Co.,Ltd.           |
| Ballast or Driver                 | Model No.               | --                                     |
|                                   | Manufacturer/brand name | IMIGY LIGHTING ELECTRIC CO.,LTD/ IMIGY |

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## Summary of testing Result (continued):

### Flicker according to JA10 table JA-10-1

| Required Information   | Units/Format  | Report value | Verdict |
|--|---|--------------|---------|
| Recording interval   | seconds (no greater than 0.00005 seconds)   | 0.000001     | Y       |
| Equipment Measurement Period   | seconds (no less than 1 second)   | 2 s          | Y       |
| Fraction of rated light output integrated over measurement period at 100%, 20% and minimum fraction of light output. |   |              | Y       |
| Amplitude modulation unfiltered  | calculated percent amplitude modulation unfiltered for each dimming level (100%)  |              | NA      |
|  | calculated percent amplitude modulation unfiltered for each dimming level (20%)   |              | NA      |
|  | calculated percent amplitude modulation unfiltered for each dimming level (minimum fraction of light output)  |              | NA      |
| Percent amplitude modulation with 1,000 Hz cut-off   | calculated percent amplitude modulation, data filtered with a 1,000 Hz cut-off frequency for each dimming level: (100%)                             |              | NA      |
|  | calculated percent amplitude modulation, data filtered with a 1,000 Hz cut-off frequency for each dimming level: (20%)                              |              | NA      |
|  | calculated percent amplitude modulation, data filtered with a 1,000 Hz cut-off frequency for each dimming level: (minimum fraction of light output) |              | NA      |
| Percent amplitude modulation with 400 Hz cut-off   | calculated percent amplitude modulation, data filtered with a 400 Hz cut-off frequency for each dimming level: (100%,)                              |              | NA      |
|  | calculated percent amplitude modulation, data filtered with a 400 Hz cut-off frequency for each dimming level: (20%)                                |              | NA      |
|  | calculated percent amplitude modulation, data filtered with a 400 Hz cut-off frequency for each dimming level: (minimum fraction of light output)   |              | NA      |
| Percent amplitude modulation with 200 Hz cut-off   | calculated percent amplitude modulation, data filtered with a 200 Hz cut-off frequency for each dimming level: (100%)                               | 20.36%       | Y       |
|  | calculated percent amplitude modulation, data filtered with a 200 Hz cut-off frequency for each dimming level: (20%)                                | 19.25%       | Y       |
|  | calculated percent amplitude modulation, data filtered with a 200 Hz cut-off frequency for each dimming level: (minimum fraction of light output)   | 10.54%       | Y       |
| Percent amplitude modulation with 90 Hz cut-off  | calculated percent amplitude modulation, data filtered with a 90 Hz cut-off frequency for each dimming level: (100%)                                | 0.41%        | Y       |
|  | calculated percent amplitude modulation, data filtered with a 90 Hz cut-off frequency for each dimming level: (20%)                                 | 0.95%        | Y       |
|  | calculated percent amplitude modulation, data filtered with a 90 Hz cut-off frequency for each dimming level: (minimum fraction of light output)    | 1.56%        | Y       |
| Percent amplitude modulation with 40 Hz cut-off  | calculated percent amplitude modulation, data filtered with a 40 Hz cut-off frequency for each dimming level: (100%)                                | 0.54%        | Y       |
|  | calculated percent amplitude modulation, data filtered with a 40 Hz cut-off frequency for each dimming level: (20%)                                 | 0.71%        | Y       |
|  | calculated percent amplitude modulation, data filtered with a 40 Hz cut-off frequency for each dimming level: (minimum fraction of light output)    | 1.52%        | Y       |

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## TEST METHOD

### Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79

### Light Distribution and Output Measurements

Light Distribution and total light output (luminous flux) were measured using a Go-R5000 Type-C Rotating Mirror Goniophotometer. Temperature 25°C and relative humidity of 60% was measured at a position in the testing laboratory.

The lamp rotates only around the fixed vertical axle in the prescribed burning position. The lamp and mirror permit the measurement of luminous intensity at the direction of any horizontal or vertical angle without tilting the lamp. The lamp was allowed to stabilize before measurements were made.

### Chromaticity Measurements

Chromaticity was measured using a 2 meters integrating sphere spectral lamp measurement system. Temperature was measured at a position inside the sphere shielded from direct light. Relative humidity of 65% was measured at a position in the testing laboratory.

Spectral radiant flux measurements were made using spectroradiometer attached to the detector port of the integrating sphere. Each lamp was allowed to stabilise before measurements were made. The calibration of the integrating sphere spectroradiometer system is by the reference/standard lamps which are traceable to National Institute of Metrology P.R. CHINA. Lamp efficacy (lumens per watt) for each lamp model was then computed based on the luminous flux result. Electrical measurements including voltage, power and power factor were measured using YOKOGAWA - Digital Power Meter., model WT210.

Standard lamp used:

Model: Labsphere SCL-1400

Current: 2.679A

| Equipment Used  | Model Number  | Control Number |
|---|---------------|----------------|
| Fluke Temperature Meter                                 | 52            | EC2357         |
| Everfine- DC Power Supply                               | WY12010       | EC4753-7       |
| Everfine- AC power source for Integrating Sphere System | VPS1010 PWM   | EC4760-12      |
| Everfine - AC power source for Goniophotometer System   | VPS1060 PWM   | EC4753-8       |
| Two meter integrating sphere unit                       | Everfine – 2M | EC4760         |
| Everfine - Digital Power Meter                          | PF2010A       | EC4760-10      |
| YOKOGAWA - Digital Power Meter                          | WT210         | EC4553         |
| Everfine – Goniophotometer                              | Go-R5000      | EC4753         |

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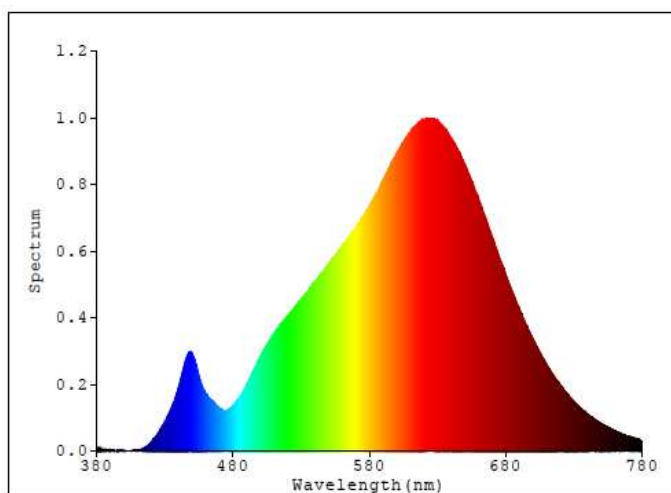
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## RESULTS OF TESTS

### Initial Photometric and Electrical Measurements at 25°C

| Sample No.         | Base Orientation | Input Voltage (Vac) | Input Current (mA) | Input Power (Watts) | Input Power Factor | Luminous Flux (Lumens) | Lumen Efficacy (lm/W) | Start Time (ms) | CCT (K) | Duv     | CRI (Ra) | R9 | x      | y      |
|--------------------|------------------|---------------------|--------------------|---------------------|--------------------|------------------------|-----------------------|-----------------|---------|---------|----------|----|--------|--------|
| Test Model: S11712 |                  |                     |                    |                     |                    |                        |                       |                 |         |         |          |    |        |        |
| 0181230-09-025     | N/A              | 120                 | 72.1               | 8.22                | 0.9506             | 720.00                 | 87.57                 | 120             | 2635    | 0.00119 | 90.9     | 53 | 0.4674 | 0.4154 |
| 0181230-09-026     | N/A              | 120                 | 73.6               | 8.37                | 0.9484             | 719.55                 | 85.91                 | 118             | 2632    | 0.00117 | 91.1     | 54 | 0.4676 | 0.4154 |
| 0181230-09-027     | N/A              | 120                 | 70.1               | 7.93                | 0.9432             | 755.29                 | 95.21                 | 116             | 2737    | 0.00068 | 90.4     | 50 | 0.4581 | 0.4120 |
| Avg.               | --               | --                  | --                 | 8.17                | 0.9474             | 731.61                 | 89.56                 | 118             | 2668    | 0.00101 | 90.8     | 52 | --     | --     |

### Spectral Distribution

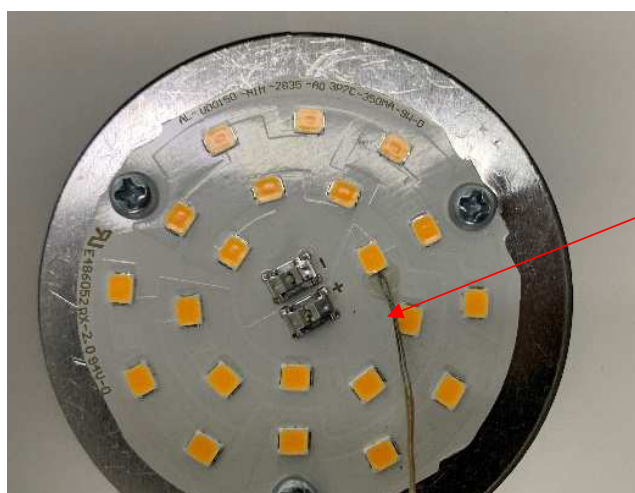


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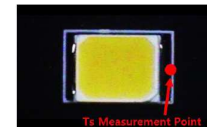
## RESULTS OF TESTS (cont'd)

### In-Situ Maximum Measured LED Source Point Temperature

Input Voltage : 120VAC; 60Hz  
 Ambient temperature : 25±1°C  
 Relative Humidity : 65%  
 LED Model : STWxA12D-xx  
 LED Manufacturer : Seoul Semiconductor Co.,Ltd.  
 LM-80 report : I-150612-31-K-04 provided by Seoul Semiconductor Testing Laboratory



TMP of LM80 report



Test result:


| Sample No.     | Model no. | Maximum Measured Source Temperature(°C) | Maximum Rated Source Temperature(°C) |
|----------------|-----------|---|--------------------------------------|
| 0181230-09-026 | S11712    | 74°C                                    | 106.5C                               |

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## RESULTS OF TESTS (cont'd)

### Lumen Maintenance Life Projection

The Calculation is based on the Illumination Engineering Society's TM-21-11: Projecting Long Term Lumen Maintenance of LED Light Sources.



### TM-21 Inputs

**Instructions**

Yellow fields are completed by the user. Fields not used should be left blank. Cyan fields are calculated based on user entries.

First, enter a description of the LED light source tested. Then complete the fields labeled "LM-80 Testing Details". Test duration must be at least 6,000 hours. If only one case temperature data set is to be used (no interpolation), complete only "Tested case temperature 1". For only two case temperature data sets, complete 1 and 2.

Next, further to the right, in the corresponding box(es) for each tested case temperature, enter the test data along with the time (in hours) at which each measurement was taken. Data entered must be normalized then averaged measured data (per TM-21 sections 5.2.1 and 5.2.2). If case temperatures have different test durations, enter data up to the lowest of the test durations for all of the case temperatures.

Enter drive current, *in-situ* temperature data and the percentage of initial lumens to project to in the fields labeled "*In-Situ* Inputs".

Results can be tailored to estimate lumen maintenance at a specific time by entering a value (t) in the yellow field. A complete TM-21 report will appear on the next tab labeled "Report".

**LM-80 Test Inputs**

| Test Data for 55°C Case Temperature |                       | Test Data for 85°C Case Temperature |                       | Test Data for 105°C Case Temperature |                       |
|-------------------------------------|-----------------------|-------------------------------------|-----------------------|--------------------------------------|-----------------------|
| Time (hours)                        | Lumen Maintenance (%) | Time (hours)                        | Lumen Maintenance (%) | Time (hours)                         | Lumen Maintenance (%) |
| 0                                   | 100.00%               | 0                                   | 100.00%               | 0                                    | 100.00%               |
| 1000                                | 98.60%                | 1000                                | 99.00%                | 1000                                 | 98.50%                |
| 2000                                | 97.90%                | 2000                                | 98.60%                | 2000                                 | 98.40%                |
| 3000                                | 95.80%                | 3000                                | 96.70%                | 3000                                 | 96.30%                |
| 4000                                | 94.30%                | 4000                                | 95.40%                | 4000                                 | 94.60%                |
| 5000                                | 95.00%                | 5000                                | 96.20%                | 5000                                 | 94.90%                |
| 6000                                | 95.00%                | 6000                                | 96.20%                | 6000                                 | 95.00%                |
| 7000                                | 93.40%                | 7000                                | 94.80%                | 7000                                 | 93.80%                |
| 8000                                | 93.70%                | 8000                                | 93.90%                | 8000                                 | 93.00%                |
| 9000                                | 93.40%                | 9000                                | 94.30%                | 9000                                 | 92.00%                |

**In-Situ Inputs**

|   |     |
|---|-----|
| Drive current for each LED package/array/module (mA):                             | 110 |
| <i>In-situ</i> case temperature (T <sub>a</sub> , °C):                            | 74  |
| Percentage of initial lumens to project to (e.g. for L <sub>70</sub> , enter 70): | 70  |

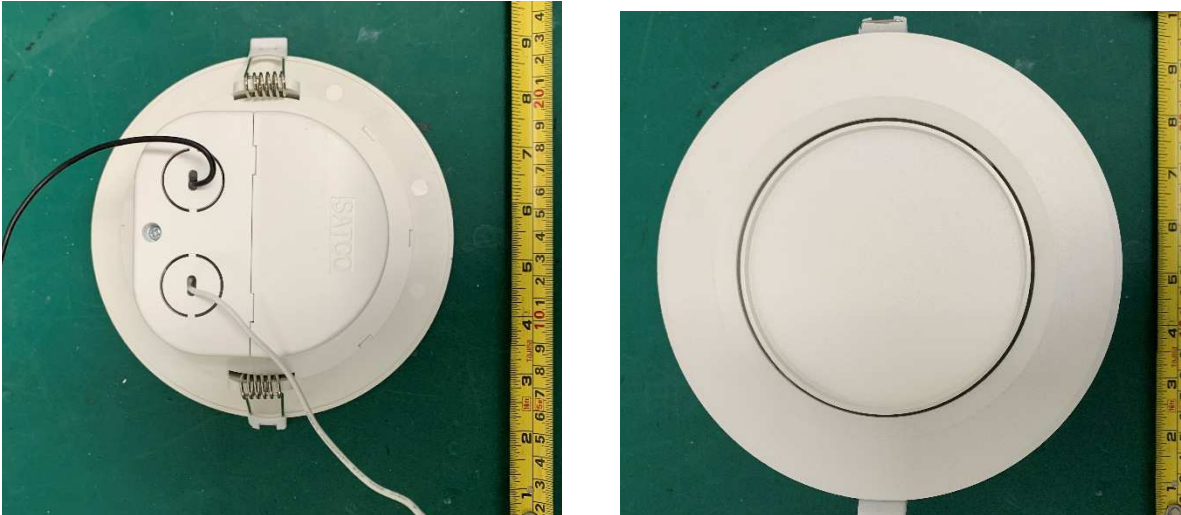
**Results**

|  |        |
|--|--------|
| Time (t) at which to estimate lumen maintenance (hours): | 80,000 |
| Lumen maintenance at time (t) (%):                       | 71.91% |
| Reported L <sub>70</sub> (hours):                        | >54000 |

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Product Picture (not to scale)



EXTERNAL VIEW

In Charge Of Tests:

Heven Liu  
Project Engineer  
Attachment: None

Report Reviewed By:

Jordan Rao  
Reviewer

\*\*\*\*\* End of Report \*\*\*\*\*