



Report No.:GZE141129-A

NVLAP LAB CODE 201011-0

## LM-79-08 Test Report

For

**SHENZHEN SUNPER OPTO CO.,LTD**

**(Brand Name: SUNPER)**

5/F,BLOK C,SANMIN INDUSTRIAL PARK,SHIYAN STREET,  
BAO'AN DISTRICT,SHENZHEN 518108,GUANGDONG,CHINA

**Low-Bay Luminaires for Commercial and Industrial buildings**

Model name(s):SP-HB-100WA

Representative (Tested) Model: SP-HB-100WA(4000K)  
SP-HB-100WA(5700K)

Model Different: All construction and rating are the same, except CCT

Test & Report By:

*Sean Zhuo*

Engineer: Sean Zhuo

Date: Dec.17,2014

Review By:

*Tommy Liang*

Manager: Tommy Liang

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Laboratory: Standard-Tech Co. Ltd Testing Center**

**NVLAP CODE: 201011-0**

Report Format Number STD/QR4909-A/2

Address: 8th floor, Block B, No. 11 Caipin Road, Guangzhou Science City, Tianhe, Guangzhou 510663, China

Tel: 8620-3229 0320

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<http://www.standard-tech.com>

U.S. Department of Energy

**Lighting Facts™ Uniform LM-79 Reporting Template**
**Laboratory Information:**

|                         |                       |
|-------------------------|-----------------------|
| Name of Test Laboratory | Standard-Tech Co. Ltd |
| Date of Test Report     | Dec.17,2014           |
| Test Report No.         | GZE141129-A           |
| Laboratory Contact Name | Tommy Liang           |

**Product Information:**

|   |  |     |  |
|---|--|-----|--|
| Organization Name   | SHENZHEN SUNPER OPTO CO.,LTD                               |     |  |
| Brand Name  | SUNPER   |     |  |
| Model Number  | SP-HB-100WA(4000K)   |     |  |
| SKU (if available)  | N/A  |     |  |
| Type of Luminaire<br>(for integral lamps, list base type and lamp type) | Low-Bay Luminaires for Commercial and Industrial buildings |     |  |
| Luminaire Aperture (for downlights)                                     | --   | in. |  |
| Luminaire Length  | --   | mm  |  |
| Luminaires Width  | --   | mm  |  |
| Number of Units (modular products)                                      | N/A  | s   |  |

**Integrating Sphere**
**Goniophotometer**
**Electrical Measurements:**
**Output**
**Output**

|                    |    |        |   |
|--------------------|----|--------|---|
| Input Wattage      | -- | 96.88  | W |
| Input Current      | -- | 0.8196 | A |
| Input Voltage (ac) | -- | 120.1  | V |
| Power Factor       | -- | 0.9842 |   |
| Off-State Power    | -- | 0      | W |

**Photometric Characteristics**

|   |         |        |      |
|---|---------|--------|------|
| Total Initial Lumen Output              | --      | 7699.4 | lm   |
| Initial Lumen Efficacy                  | --      | 79.47  | lm/w |
| Correlated color temperature / CCT      | 4243    | --     | K    |
| Color rendering index / CRI             | 74.6    | --     |      |
| R9 Value                                | 0       | --     |      |
| Duv                                     | -0.0024 | --     |      |
| <b>Luminous Intensity Distribution</b>  |         |        |      |
| Center beam candlepower (if applicable) |         | 5020   | cd   |
| Beam angle (if applicable)              |         | 67.5   | °    |
| Zonal lumens in the 0°-60° zone         |         | 96.1   | %    |
| Zonal lumens in the 60°-90° zone        | -----   | 3.8    | %    |
| Zonal lumens in the 90°-120° zone       |         | 0      | %    |
| Zonal lumens in the 120°-180° zone      |         | 0.1    | %    |

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**Laboratory Information:**

|                         |                       |
|-------------------------|-----------------------|
| Name of Test Laboratory | Standard-Tech Co. Ltd |
| Date of Test Report     | Dec.17,2014           |
| Test Report No.         | GZE141129-A           |
| Laboratory Contact Name | Tommy Liang           |

**Product Information:**

|   |  |     |  |
|---|--|-----|--|
| Organization Name   | SHENZHEN SUNPER OPTO CO.,LTD                               |     |  |
| Brand Name  | SUNPER   |     |  |
| Model Number  | SP-HB-100WA(5700K)   |     |  |
| SKU (if available)  | N/A  |     |  |
| Type of Luminaire<br>(for integral lamps, list base type and lamp type) | Low-Bay Luminaires for Commercial and Industrial buildings |     |  |
| Luminaire Aperture (for downlights)                                     | --   | in. |  |
| Luminaire Length  | --   | mm  |  |
| Luminaires Width  | --   | mm  |  |
| Number of Units (modular products)                                      | N/A  | s   |  |

**Integrating Sphere**
**Goniophotometer**
**Electrical Measurements:**
**Output**
**Output**

|                    |        |    |   |
|--------------------|--------|----|---|
| Input Wattage      | 98.37  | -- | W |
| Input Current      | 0.8226 | -- | A |
| Input Voltage (ac) | 120.0  | -- | V |
| Power Factor       | 0.9965 | -- |   |
| Off-State Power    | 0      | -- | W |

**Photometric Characteristics**

|   |        |    |      |
|---|--------|----|------|
| Total Initial Lumen Output              | 8402   | -- | lm   |
| Initial Lumen Efficacy                  | 85.41  | -- | lm/w |
| Correlated color temperature / CCT      | 5525   | -- | K    |
| Color rendering index / CRI             | 72.0   | -- |      |
| R9 Value                                | 0      | -- |      |
| Duv                                     | 0.0029 | -- |      |
| <b>Luminous Intensity Distribution</b>  |        |    |      |
| Center beam candlepower (if applicable) |        | -- | cd   |
| Beam angle (if applicable)              |        | -- | °    |
| Zonal lumens in the 0°-60° zone         |        | -- | %    |
| Zonal lumens in the 60°-90° zone        | -----  | -- | %    |
| Zonal lumens in the 90°-120° zone       |        | -- | %    |
| Zonal lumens in the 120°-180° zone      |        | -- | %    |

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|                            |  |
|----------------------------|--|
| Test Specifications:       |  |
| Date of Receipt            | : Dec.08,2014  |
| Date of Test               | : Dec.10,2014  |
| Test item                  | : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters   |
| Reference Standard         | IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products<br>ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products<br>CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources<br>CIE 15-2004 Technical Report Colorimetry<br>IESNA LM-16-93 Practical Guide to Colorimetry of Light Source<br>IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems |
| Reference Work Instruction | QD25   |

### Test Methods

#### 1. Photometric and Electrical measurements – Light Distribution Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at  $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ , measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at  $1\text{ }^{\circ}$  vertical intervals and  $22.5\text{ }^{\circ}$  horizontal intervals.

#### 2. Photometric and Electrical Measurements – Integrating Sphere Method:

Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ . 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, 60Hz. 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 least 5 nm intervals over the range of 380 to 780 nm.

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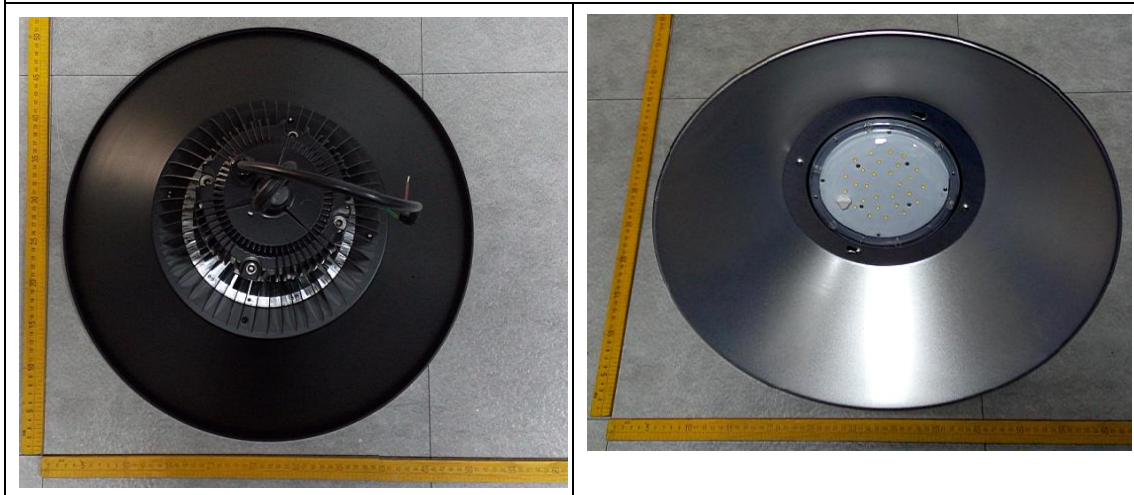
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**1. Product Information:**

|                           |  |
|---------------------------|--|
| Brand Name                | SUNPER   |
| Model Number              | SP-HB-100WA  |
| Luminaire Type            | Low-Bay Luminaires for Commercial and Industrial buildings |
| Rated Voltage / Frequency | 100 ~ 277Vac, 50/60 Hz                                     |
| Nominal Power             | 100W   |
| Rated Initial Lamp Lumen  | --   |
| Declared CCT              | 4000K,4500K,5000K,5700K                                    |
| LED Manufacturer          | CREE   |
| LED Model                 | Xlamp XT-E   |
| Sample Receipt Date       | Dec.08,2014  |
| Sample Number             | 141129-1(4000K),-2(5700K)                                  |

**Photo**



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|  |                       |
|--|-----------------------|
| <b>2.1 Electrical, Photometric and Chromaticity Measurements</b><br>(Refer to Work Instruction QD25) | <b>IES LM-79 2008</b> |
|--|-----------------------|

|                         |                    |                                 |         |
|-------------------------|--------------------|---------------------------------|---------|
| <b>Test date</b>        | 2014-12-10         | <b>Test Ambient:</b>            | 25.2 °C |
| <b>Test Orientation</b> | As intended        | <b>Stabilization Time (min)</b> | 90      |
| <b>Model Number</b>     | SP-HB-100WA(4000K) |                                 |         |

### Electrical Measurement:

| Sample No. | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | THD % |
|------------|---------------|----------------|-------------|-----------|--------------|-------|
| 141129-1   | 120.0         | 60             | 0.8196      | 96.88     | 0.9842       | 7.33  |
|            | 277.0         | 60             | 0.3611      | 96.82     | 0.9680       | 11.12 |

### Sphere-Spectroradiometer Method:

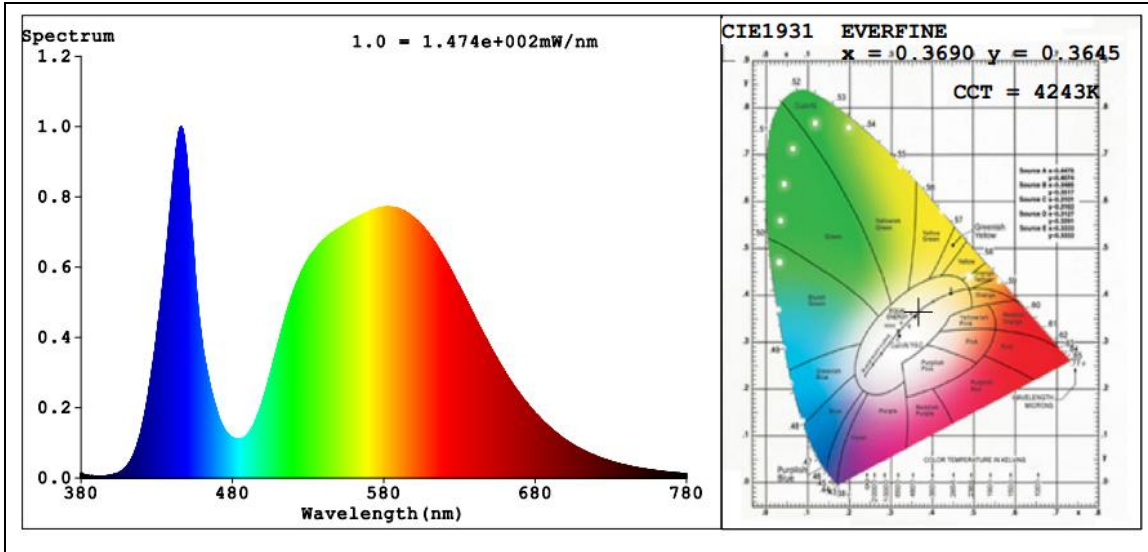
| Parameter                   | Result              |
|-----------------------------|---------------------|
| Test Voltage (V)            | 120.1               |
| Frequency (Hz)              | 60                  |
| Color Rendering Index (CRI) | 74.6                |
| R9                          | 0                   |
| CCT (K)                     | 4243                |
| Chromaticity (x, y)         | x=0.3690 y=0.3645   |
| Chromaticity (u', v')       | u'=0.2225 v'=0.4943 |
| Duv                         | -0.0024             |

| Special Color Rendering Indices |    |     |    |
|---------------------------------|----|-----|----|
| R1                              | 74 | R9  | 0  |
| R2                              | 79 | R10 | 48 |
| R3                              | 81 | R11 | 72 |
| R4                              | 76 | R12 | 46 |
| R5                              | 73 | R13 | 74 |
| R6                              | 70 | R14 | 89 |
| R7                              | 82 | R15 | 70 |
| R8                              | 62 | --  | -- |

### Goniophotometer Method:

| Parameter                     | Result |
|-------------------------------|--------|
| Test Voltage (V)              | 120.1  |
| Frequency (Hz)                | 60     |
| Total Luminous (lm)           | 7699.4 |
| Luminous Efficacy (lm/W)      | 79.47  |
| Beam Angle °                  | 67.5   |
| Center Beam Candle Power (cd) | 5020   |
| S/MH(C0/180)                  | 1.00   |
| S/MH(C90/270)                 | 1.05   |

**Spectral Power Distribution Chromaticity Diagram**



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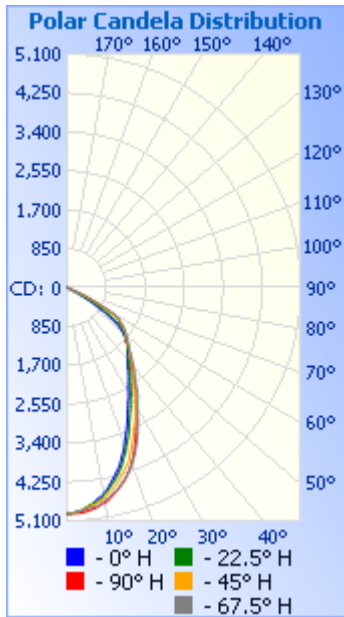
**Zonal Lumen Tabulation**

| Zonal Lumen Summary |         |        |             |
|---------------------|---------|--------|-------------|
| Zone                | Lumens  | % Lamp | % Luminaire |
| 0-30                | 3,235.9 | 42%    | 42%         |
| 0-40                | 4,771.1 | 62%    | 62%         |
| 0-60                | 7,396.6 | 96.1%  | 96.1%       |
| 60-90               | 292.4   | 3.8%   | 3.8%        |
| 70-100              | 7.8     | 0.1%   | 0.1%        |
| 90-120              | 0.4     | 0%     | 0%          |
| 0-90                | 7,689.0 | 99.9%  | 99.9%       |
| 90-180              | 9.0     | 0.1%   | 0.1%        |
| 0-180               | 7,698.0 | 100%   | 100%        |

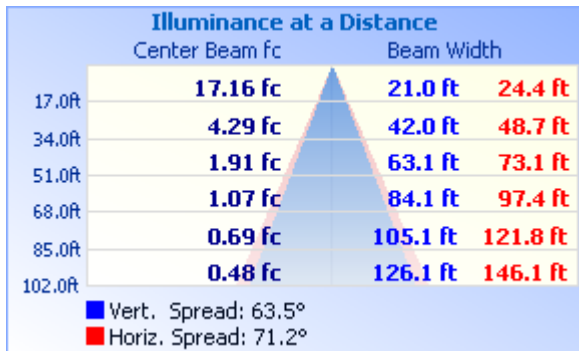
| Lumens Per Zone |         |         |         |        |         |
|-----------------|---------|---------|---------|--------|---------|
| Zone            | Lumens  | % Total | Zone    | Lumens | % Total |
| 0-10            | 463.9   | 6.0%    | 90-100  | 0.0    | 0%      |
| 10-20           | 1,229.7 | 16.0%   | 100-110 | 0.0    | 0%      |
| 20-30           | 1,542.3 | 20.0%   | 110-120 | 0.4    | 0%      |
| 30-40           | 1,535.2 | 19.9%   | 120-130 | 0.9    | 0%      |
| 40-50           | 1,440.3 | 18.7%   | 130-140 | 1.5    | 0%      |
| 50-60           | 1,185.2 | 15.4%   | 140-150 | 1.9    | 0%      |
| 60-70           | 284.6   | 3.7%    | 150-160 | 2.1    | 0%      |
| 70-80           | 6.0     | 0.1%    | 160-170 | 1.7    | 0%      |
| 80-90           | 1.9     | 0.0%    | 170-180 | 0.6    | 0%      |



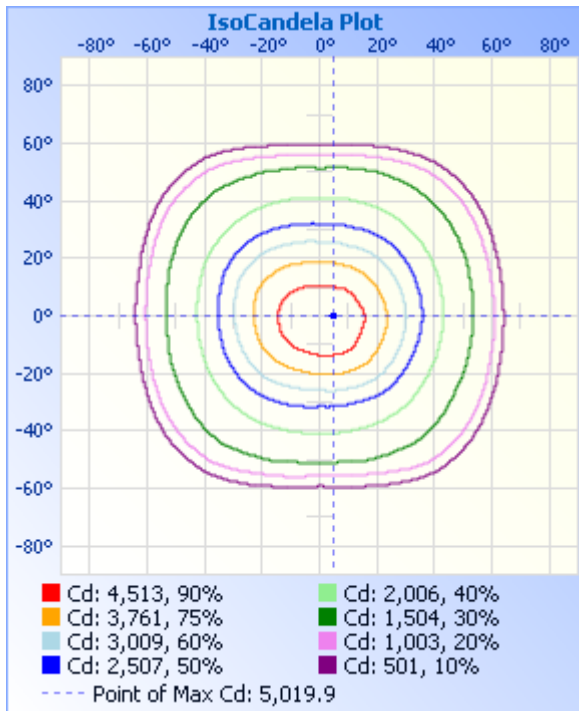
### Photometric Data



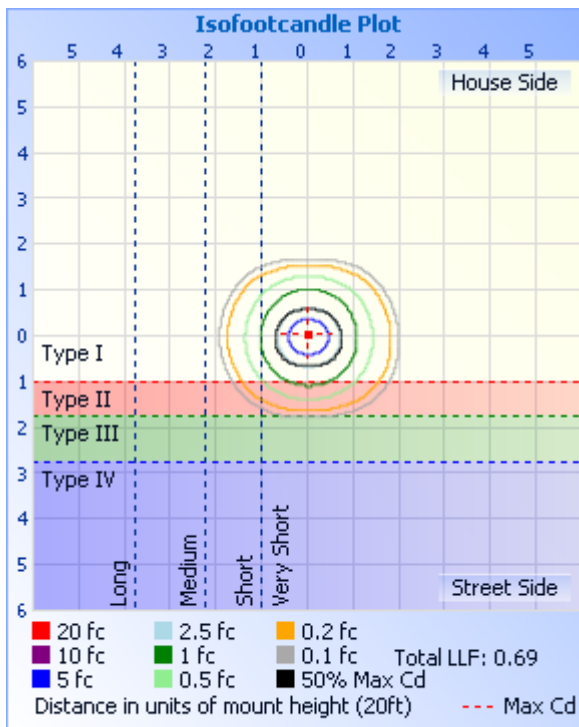
### Illuminance Plots



### ISOCANDELA DIAGRAM



### ISOLUX DIAGRAM



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**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  | 4959 | 4959 | 4959 | 4959 | 4959 | 4959  | 4959 | 4959  | 4959 | 4959  | 4959 | 4959  | 4959 | 4959  | 4959 | 4959  | 4959 |
| 1  | 4948 | 4947 | 4942 | 4959 | 4954 | 4956  | 4984 | 4971  | 4982 | 4977  | 4976 | 4967  | 4970 | 4958  | 4973 | 4957  | 4948 |
| 2  | 4934 | 4934 | 4952 | 4943 | 4955 | 4946  | 4980 | 4967  | 4972 | 4970  | 4965 | 4966  | 4978 | 4960  | 4979 | 4938  | 4934 |
| 3  | 4924 | 4921 | 4924 | 4912 | 4956 | 4928  | 4973 | 4957  | 4974 | 4965  | 4964 | 4960  | 5007 | 4962  | 4976 | 4908  | 4924 |
| 4  | 4898 | 4886 | 4880 | 4885 | 4950 | 4936  | 4947 | 4942  | 4981 | 4971  | 4976 | 4964  | 5020 | 4962  | 4958 | 4892  | 4898 |
| 5  | 4864 | 4831 | 4850 | 4867 | 4928 | 4911  | 4931 | 4902  | 4949 | 4948  | 4968 | 4947  | 5014 | 4961  | 4931 | 4862  | 4864 |
| 6  | 4809 | 4795 | 4814 | 4856 | 4900 | 4893  | 4888 | 4887  | 4903 | 4947  | 4958 | 4944  | 4978 | 4945  | 4887 | 4825  | 4809 |
| 7  | 4760 | 4760 | 4792 | 4844 | 4886 | 4851  | 4867 | 4875  | 4879 | 4899  | 4945 | 4923  | 4954 | 4922  | 4842 | 4793  | 4760 |
| 8  | 4692 | 4748 | 4771 | 4840 | 4853 | 4838  | 4839 | 4842  | 4864 | 4867  | 4932 | 4906  | 4912 | 4891  | 4807 | 4740  | 4692 |
| 9  | 4648 | 4700 | 4723 | 4795 | 4813 | 4809  | 4800 | 4806  | 4812 | 4827  | 4899 | 4863  | 4880 | 4837  | 4771 | 4682  | 4648 |
| 10 | 4595 | 4614 | 4681 | 4740 | 4787 | 4767  | 4760 | 4749  | 4752 | 4796  | 4856 | 4811  | 4827 | 4786  | 4733 | 4621  | 4595 |
| 11 | 4524 | 4555 | 4636 | 4707 | 4743 | 4733  | 4720 | 4670  | 4695 | 4740  | 4807 | 4789  | 4794 | 4733  | 4676 | 4527  | 4524 |
| 12 | 4435 | 4489 | 4572 | 4650 | 4685 | 4688  | 4647 | 4599  | 4620 | 4665  | 4763 | 4726  | 4760 | 4647  | 4630 | 4448  | 4435 |
| 13 | 4351 | 4405 | 4517 | 4602 | 4627 | 4626  | 4582 | 4518  | 4550 | 4592  | 4698 | 4656  | 4706 | 4589  | 4535 | 4382  | 4351 |
| 14 | 4267 | 4340 | 4441 | 4570 | 4572 | 4576  | 4515 | 4419  | 4456 | 4528  | 4640 | 4584  | 4626 | 4535  | 4435 | 4310  | 4267 |
| 15 | 4181 | 4251 | 4368 | 4495 | 4503 | 4488  | 4438 | 4352  | 4351 | 4437  | 4552 | 4507  | 4561 | 4441  | 4340 | 4244  | 4181 |
| 16 | 4104 | 4175 | 4291 | 4418 | 4448 | 4414  | 4361 | 4245  | 4237 | 4351  | 4471 | 4436  | 4447 | 4364  | 4263 | 4156  | 4104 |
| 17 | 3999 | 4080 | 4226 | 4359 | 4379 | 4341  | 4267 | 4119  | 4128 | 4240  | 4386 | 4365  | 4363 | 4292  | 4165 | 4044  | 3999 |
| 18 | 3885 | 3975 | 4148 | 4293 | 4298 | 4256  | 4150 | 3994  | 4009 | 4113  | 4270 | 4286  | 4276 | 4188  | 4065 | 3935  | 3885 |
| 19 | 3783 | 3860 | 4079 | 4216 | 4199 | 4169  | 4043 | 3863  | 3867 | 3990  | 4166 | 4198  | 4180 | 4093  | 3966 | 3824  | 3783 |
| 20 | 3666 | 3755 | 3979 | 4138 | 4112 | 4079  | 3940 | 3732  | 3723 | 3870  | 4045 | 4096  | 4087 | 4003  | 3872 | 3713  | 3666 |
| 21 | 3544 | 3651 | 3863 | 4037 | 4007 | 3976  | 3824 | 3615  | 3583 | 3736  | 3933 | 3982  | 4010 | 3895  | 3771 | 3602  | 3544 |
| 22 | 3439 | 3555 | 3750 | 3940 | 3909 | 3869  | 3707 | 3498  | 3448 | 3587  | 3819 | 3862  | 3905 | 3792  | 3672 | 3502  | 3439 |
| 23 | 3335 | 3453 | 3654 | 3845 | 3777 | 3725  | 3596 | 3371  | 3335 | 3441  | 3686 | 3738  | 3800 | 3685  | 3540 | 3408  | 3335 |
| 24 | 3229 | 3336 | 3554 | 3738 | 3674 | 3608  | 3472 | 3255  | 3198 | 3318  | 3559 | 3616  | 3674 | 3555  | 3444 | 3304  | 3229 |
| 25 | 3123 | 3231 | 3449 | 3630 | 3567 | 3485  | 3357 | 3138  | 3061 | 3201  | 3436 | 3499  | 3561 | 3432  | 3324 | 3191  | 3123 |
| 26 | 3015 | 3134 | 3357 | 3524 | 3447 | 3356  | 3249 | 3022  | 2925 | 3084  | 3301 | 3390  | 3430 | 3317  | 3236 | 3072  | 3015 |
| 27 | 2926 | 3044 | 3266 | 3403 | 3343 | 3250  | 3141 | 2928  | 2830 | 2967  | 3180 | 3280  | 3294 | 3216  | 3128 | 2972  | 2926 |
| 28 | 2837 | 2958 | 3177 | 3305 | 3231 | 3143  | 3033 | 2832  | 2759 | 2853  | 3059 | 3159  | 3197 | 3117  | 3029 | 2885  | 2837 |
| 29 | 2777 | 2866 | 3071 | 3181 | 3118 | 3037  | 2929 | 2749  | 2674 | 2742  | 2939 | 3039  | 3086 | 3014  | 2955 | 2809  | 2777 |

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|    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 30 | 2693 | 2777 | 2972 | 3087 | 3005 | 2938 | 2830 | 2685 | 2586 | 2668 | 2838 | 2919 | 2989 | 2930 | 2868 | 2720 | 2693 |
| 31 | 2603 | 2713 | 2888 | 2999 | 2905 | 2829 | 2740 | 2603 | 2511 | 2582 | 2751 | 2804 | 2894 | 2847 | 2786 | 2634 | 2603 |
| 32 | 2530 | 2625 | 2807 | 2909 | 2799 | 2739 | 2660 | 2531 | 2438 | 2480 | 2653 | 2694 | 2792 | 2755 | 2704 | 2573 | 2530 |
| 33 | 2465 | 2546 | 2727 | 2841 | 2724 | 2658 | 2590 | 2448 | 2367 | 2411 | 2568 | 2592 | 2715 | 2664 | 2622 | 2523 | 2465 |
| 34 | 2407 | 2469 | 2627 | 2740 | 2647 | 2586 | 2523 | 2394 | 2300 | 2356 | 2491 | 2517 | 2619 | 2580 | 2558 | 2453 | 2407 |
| 35 | 2343 | 2407 | 2553 | 2637 | 2570 | 2508 | 2460 | 2327 | 2260 | 2308 | 2417 | 2445 | 2543 | 2519 | 2489 | 2367 | 2343 |
| 36 | 2284 | 2352 | 2481 | 2543 | 2486 | 2451 | 2400 | 2261 | 2215 | 2250 | 2355 | 2384 | 2477 | 2439 | 2424 | 2308 | 2284 |
| 37 | 2206 | 2265 | 2417 | 2465 | 2401 | 2387 | 2329 | 2195 | 2167 | 2206 | 2286 | 2306 | 2401 | 2357 | 2362 | 2247 | 2206 |
| 38 | 2160 | 2196 | 2344 | 2395 | 2312 | 2304 | 2255 | 2143 | 2123 | 2147 | 2220 | 2244 | 2327 | 2291 | 2304 | 2188 | 2160 |
| 39 | 2107 | 2138 | 2273 | 2333 | 2242 | 2228 | 2193 | 2087 | 2071 | 2095 | 2172 | 2177 | 2249 | 2215 | 2230 | 2134 | 2107 |
| 40 | 2062 | 2097 | 2208 | 2264 | 2178 | 2167 | 2137 | 2044 | 2025 | 2046 | 2114 | 2110 | 2168 | 2170 | 2156 | 2084 | 2062 |
| 41 | 2032 | 2053 | 2135 | 2192 | 2125 | 2101 | 2080 | 2001 | 1980 | 1992 | 2053 | 2053 | 2123 | 2112 | 2089 | 2049 | 2032 |
| 42 | 1983 | 2012 | 2057 | 2118 | 2068 | 2033 | 2010 | 1962 | 1936 | 1929 | 1978 | 1993 | 2064 | 2057 | 2029 | 2002 | 1983 |
| 43 | 1942 | 1971 | 2005 | 2055 | 2003 | 1976 | 1939 | 1921 | 1901 | 1880 | 1914 | 1922 | 1992 | 1992 | 1963 | 1958 | 1942 |
| 44 | 1907 | 1928 | 1964 | 1986 | 1947 | 1906 | 1894 | 1867 | 1865 | 1833 | 1848 | 1865 | 1926 | 1928 | 1913 | 1917 | 1907 |
| 45 | 1873 | 1880 | 1905 | 1927 | 1891 | 1852 | 1838 | 1802 | 1827 | 1808 | 1787 | 1820 | 1856 | 1863 | 1872 | 1862 | 1873 |
| 46 | 1833 | 1838 | 1861 | 1872 | 1834 | 1794 | 1806 | 1767 | 1800 | 1781 | 1751 | 1777 | 1813 | 1823 | 1836 | 1818 | 1833 |
| 47 | 1793 | 1807 | 1835 | 1826 | 1770 | 1755 | 1771 | 1723 | 1727 | 1727 | 1714 | 1730 | 1762 | 1775 | 1803 | 1788 | 1793 |
| 48 | 1762 | 1762 | 1787 | 1785 | 1735 | 1736 | 1711 | 1692 | 1659 | 1680 | 1649 | 1697 | 1728 | 1735 | 1759 | 1722 | 1762 |
| 49 | 1707 | 1706 | 1725 | 1746 | 1692 | 1707 | 1654 | 1645 | 1623 | 1639 | 1614 | 1650 | 1678 | 1694 | 1691 | 1687 | 1707 |
| 50 | 1637 | 1661 | 1686 | 1712 | 1652 | 1649 | 1628 | 1607 | 1564 | 1587 | 1595 | 1589 | 1642 | 1657 | 1642 | 1653 | 1637 |
| 51 | 1567 | 1616 | 1652 | 1672 | 1620 | 1596 | 1622 | 1562 | 1459 | 1548 | 1565 | 1542 | 1605 | 1620 | 1593 | 1620 | 1567 |
| 52 | 1496 | 1571 | 1619 | 1631 | 1582 | 1548 | 1576 | 1516 | 1350 | 1508 | 1531 | 1502 | 1554 | 1583 | 1558 | 1586 | 1496 |
| 53 | 1418 | 1533 | 1571 | 1590 | 1536 | 1508 | 1525 | 1449 | 1254 | 1420 | 1492 | 1473 | 1505 | 1534 | 1510 | 1542 | 1418 |
| 54 | 1303 | 1429 | 1521 | 1548 | 1506 | 1488 | 1480 | 1329 | 1159 | 1302 | 1438 | 1434 | 1458 | 1471 | 1474 | 1452 | 1303 |
| 55 | 1166 | 1347 | 1484 | 1504 | 1440 | 1467 | 1449 | 1238 | 1002 | 1201 | 1410 | 1399 | 1445 | 1423 | 1461 | 1328 | 1166 |
| 56 | 1082 | 1260 | 1462 | 1442 | 1392 | 1426 | 1399 | 1129 | 908  | 1085 | 1357 | 1325 | 1395 | 1387 | 1446 | 1250 | 1082 |
| 57 | 876  | 1077 | 1397 | 1376 | 1358 | 1374 | 1336 | 985  | 712  | 936  | 1308 | 1279 | 1330 | 1341 | 1394 | 1096 | 876  |
| 58 | 711  | 991  | 1361 | 1335 | 1350 | 1319 | 1215 | 880  | 626  | 837  | 1235 | 1258 | 1292 | 1263 | 1241 | 981  | 711  |
| 59 | 640  | 815  | 1284 | 1295 | 1294 | 1148 | 1144 | 680  | 508  | 647  | 1135 | 1179 | 1200 | 1194 | 1127 | 834  | 640  |
| 60 | 482  | 684  | 1132 | 1219 | 1169 | 1064 | 973  | 573  | 330  | 569  | 970  | 1022 | 1114 | 1009 | 981  | 685  | 482  |
| 61 | 326  | 597  | 950  | 1126 | 988  | 924  | 803  | 468  | 254  | 459  | 791  | 891  | 914  | 871  | 807  | 606  | 326  |

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|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 62 | 194 | 401 | 859 | 916 | 809 | 775 | 659 | 315 | 117 | 274 | 675 | 715 | 709 | 726 | 663 | 384 | 194 |
| 63 | 91  | 282 | 657 | 764 | 656 | 578 | 502 | 246 | 34  | 192 | 500 | 565 | 613 | 554 | 488 | 278 | 91  |
| 64 | 28  | 157 | 578 | 602 | 500 | 482 | 403 | 107 | 25  | 91  | 391 | 383 | 460 | 444 | 374 | 145 | 28  |
| 65 | 20  | 76  | 375 | 473 | 444 | 287 | 214 | 28  | 20  | 25  | 248 | 295 | 341 | 257 | 203 | 58  | 20  |
| 66 | 16  | 22  | 252 | 321 | 231 | 193 | 107 | 21  | 18  | 18  | 124 | 159 | 163 | 120 | 97  | 21  | 16  |
| 67 | 14  | 15  | 137 | 203 | 99  | 78  | 25  | 16  | 16  | 15  | 68  | 59  | 76  | 44  | 24  | 15  | 14  |
| 68 | 12  | 12  | 42  | 82  | 27  | 19  | 17  | 14  | 14  | 12  | 16  | 15  | 19  | 16  | 15  | 12  | 12  |
| 69 | 11  | 10  | 14  | 17  | 13  | 13  | 13  | 12  | 13  | 11  | 11  | 11  | 11  | 10  | 11  | 10  | 11  |
| 70 | 10  | 8   | 9   | 10  | 9   | 10  | 10  | 11  | 13  | 10  | 9   | 8   | 8   | 8   | 9   | 9   | 10  |
| 71 | 10  | 8   | 7   | 7   | 7   | 8   | 9   | 10  | 12  | 9   | 7   | 6   | 6   | 6   | 7   | 8   | 10  |
| 72 | 9   | 7   | 6   | 6   | 6   | 7   | 8   | 10  | 11  | 9   | 6   | 5   | 5   | 5   | 6   | 8   | 9   |
| 73 | 9   | 7   | 5   | 4   | 5   | 6   | 7   | 9   | 11  | 8   | 6   | 4   | 4   | 5   | 6   | 7   | 9   |
| 74 | 8   | 6   | 4   | 4   | 4   | 5   | 6   | 8   | 10  | 8   | 5   | 4   | 3   | 4   | 5   | 7   | 8   |
| 75 | 8   | 6   | 4   | 3   | 4   | 5   | 6   | 8   | 9   | 7   | 5   | 3   | 3   | 4   | 5   | 6   | 8   |
| 76 | 7   | 5   | 4   | 3   | 3   | 4   | 5   | 7   | 9   | 7   | 5   | 3   | 3   | 3   | 5   | 6   | 7   |
| 77 | 7   | 5   | 3   | 3   | 3   | 4   | 5   | 7   | 8   | 6   | 4   | 3   | 2   | 3   | 4   | 6   | 7   |
| 78 | 7   | 5   | 6   | 2   | 2   | 3   | 4   | 6   | 8   | 6   | 4   | 2   | 2   | 3   | 4   | 5   | 7   |
| 79 | 6   | 4   | 3   | 2   | 2   | 3   | 4   | 6   | 7   | 6   | 3   | 2   | 1   | 2   | 3   | 5   | 6   |
| 80 | 6   | 4   | 3   | 2   | 2   | 2   | 4   | 5   | 7   | 5   | 3   | 2   | 1   | 2   | 3   | 5   | 6   |
| 81 | 6   | 4   | 2   | 2   | 1   | 2   | 3   | 5   | 7   | 5   | 3   | 1   | 1   | 2   | 3   | 4   | 6   |
| 82 | 5   | 3   | 2   | 1   | 1   | 2   | 3   | 4   | 6   | 5   | 2   | 1   | 1   | 1   | 2   | 4   | 5   |
| 83 | 5   | 3   | 2   | 1   | 1   | 1   | 2   | 4   | 6   | 4   | 2   | 1   | 0   | 1   | 2   | 4   | 5   |
| 84 | 5   | 3   | 2   | 1   | 0   | 1   | 2   | 4   | 5   | 4   | 2   | 1   | 0   | 1   | 2   | 3   | 5   |
| 85 | 4   | 3   | 1   | 1   | 0   | 1   | 2   | 3   | 4   | 3   | 1   | 0   | 0   | 1   | 1   | 3   | 4   |
| 86 | 4   | 2   | 1   | 0   | 0   | 0   | 1   | 3   | 4   | 2   | 1   | 0   | 0   | 0   | 1   | 3   | 4   |
| 87 | 2   | 2   | 1   | 0   | 0   | 0   | 1   | 2   | 2   | 1   | 0   | 0   | 0   | 0   | 1   | 2   | 2   |
| 88 | 2   | 1   | 0   | 0   | 0   | 0   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 2   |
| 89 | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   |
| 90 | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |

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|  |                       |
|--|-----------------------|
| <b>2.2 Electrical, Photometric and Chromaticity Measurements</b><br>(Refer to Work Instruction QD25) | <b>IES LM-79 2008</b> |
|--|-----------------------|

|                         |                    |                                 |         |
|-------------------------|--------------------|---------------------------------|---------|
| <b>Test date</b>        | 2014-12-10         | <b>Test Ambient:</b>            | 25.2 °C |
| <b>Test Orientation</b> | As intended        | <b>Stabilization Time (min)</b> | 90      |
| <b>Model Number</b>     | SP-HB-100WA(5700K) |                                 |         |

**Electrical Measurement:**

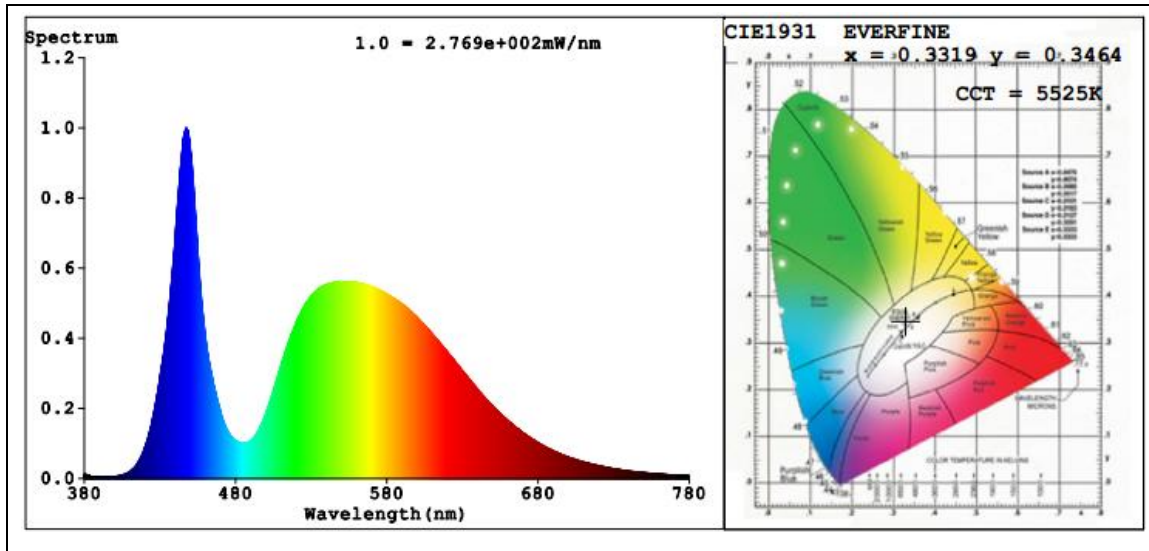
| Sample No. | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | THD % |
|------------|---------------|----------------|-------------|-----------|--------------|-------|
| 141129-2   | 120.0         | 60             | 0.8226      | 98.37     | 0.9965       | 7.13  |
|            | 277.0         | 60             | 0.3621      | 97.05     | 0.9679       | 10.80 |

**Sphere-Spectroradiometer Method:**

| Parameter                   | Result              |
|-----------------------------|---------------------|
| Test Voltage (V)            | 120.0               |
| Frequency (Hz)              | 60                  |
| Color Rendering Index (CRI) | 72.0                |
| R9                          | 0                   |
| CCT (K)                     | 5525                |
| Chromaticity (x, y)         | x=0.3319 y=0.3464   |
| Chromaticity (u', v')       | u'=0.2045 v'=0.4801 |
| Duv                         | 0.0029              |
| Total Luminous (lm)         | 8402                |
| Luminous Efficacy (lm/W)    | 85.41               |

| Special Color Rendering Indices |    |     |    |
|---------------------------------|----|-----|----|
| R1                              | 71 | R9  | 0  |
| R2                              | 75 | R10 | 39 |
| R3                              | 77 | R11 | 71 |
| R4                              | 74 | R12 | 42 |
| R5                              | 71 | R13 | 71 |
| R6                              | 66 | R14 | 87 |
| R7                              | 80 | R15 | 67 |
| R8                              | 62 | --  | -- |

**Spectral Power Distribution & Chromaticity Diagram**



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**3. Test Equipment**

| Equipment ID | Equipment Name                     | Last Calibration Date | Next Calibration Date |
|--------------|------------------------------------|-----------------------|-----------------------|
| ST-R-336     | 2 meter Integrating Sphere         | 2014-07-01            | 2015-06-30            |
| ST-R-331     | Spectral analysis system HAAS-2000 | 2014-07-01            | 2015-06-30            |
| D204         | Standard Lamp                      | 2014-07-01            | 2015-06-30            |
| PF2010       | Power Meter for Integrating Sphere | 2014-07-01            | 2015-06-30            |
| EE-09        | Goniophotometer system             | 2014-07-01            | 2015-06-30            |
| D908S        | Standard Lamp                      | 2014-07-01            | 2015-06-30            |
| PF210        | Power Meter for Goniophotometer    | 2014-07-01            | 2015-06-30            |
| ST-R-181A    | Temperature Tester                 | 2014-07-01            | 2015-06-30            |

**\*\*\*\*\* END OF DATASHEET PACKAGE \*\*\*\*\***