

VISUAL COMFORT GROUP TEST REPORT

SCOPE OF WORK

Electrical and Photometric tests as required to the IESNA LM-79 test standard.

MODEL NUMBER
700KLE6xx-LED930

REPORT NUMBER
104203293CHI-004

ISSUE DATE
January 7, 2020

REVISION DATE
None

DOCUMENT CONTROL NUMBER
TBD
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REPORT NO.: 104203293CHI-004

REPORT DATE: January 7, 2020

TEST REPORT

TEST OF ONE KLEE 6-LIGHT CHANDELIER

MODEL NO. 700KLE6XX-LED930
LED MODEL NO. SAMSUNG SPMWH1228FD5WWS2
DRIVER MODEL NO. LTF DA45W1200C2036-3001

RENDERED TO:

VISUAL COMFORT GROUP
7400 LINDER AVE.
SKOKIE IL 60077

AUTHORIZATION

The testing performed was authorized by signed quote number Qu-00981438-2.

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

DESCRIPTION OF SAMPLE

The client submitted one production sample of model number 700KLE6xx-LED930. The sample was received by Intertek on December 23, 2019 in undamaged condition and one sample was tested as received. The sample designation was AH12232019065911-004.

DATE OF TESTS

January 3, 2020

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REPORT DATE: January 7, 2020

TEST REPORT

SUMMARY

| | |
|---------------------|-------------------------|
| MODEL NO: | 700KLE6xx-LED930 |
| DESCRIPTION: | Klee 6-Light Chandelier |

| CRITERIA | RESULTS | |
|--------------------------------|--------------------|-----------------|
| | INTEGRATING SPHERE | GONIOPHOTOMETER |
| Lumen Output (lumens) | 3490.3 | 3339.7 |
| Input Power (W) @ 120 (VAC) | 45.57 | 45.56 |
| Lumen Efficacy (lm/W) | 76.6 | 73.3 |
| Input Power Factor @ 120 (VAC) | 0.992 | 0.996 |

| CRITERIA | RESULTS |
|------------------------------------|---------|
| Input Current ATHD (%) @ 120 (VAC) | 12.77 |
| Correlated Color Temperature (K) | 2931 |
| Color Rendering Index - Ra | 94.0 |
| Color Rendering - R9 | 63.9 |
| DUV | -0.0015 |
| Chromaticity Coordinate (x) | 0.440 |
| Chromaticity Coordinate (y) | 0.401 |
| Chromaticity Coordinate (u') | 0.254 |
| Chromaticity Coordinate (v') | 0.521 |

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EQUIPMENT LIST

| EQUIPMENT USED | MODEL NO. | CONTROL NO. | LAST CAL DATE | CAL DUE DATE |
|----------------------------------|------------------|--------------------|----------------------|---------------------|
| Yokogawa Power Meter | WT210 | 146919 | 7/1/2019 | 7/1/2020 |
| Omega Thermometer | DPI8-C24 | 146920 | 10/3/2019 | 10/3/2020 |
| LSI High Speed Mirror Goniometer | 6440T | 146928 | VBU | VBU |
| Newport Thermohygrometer | iServer | 146956 | 10/11/2019 | 10/11/2020 |
| Elgar, AC Power Supply | CW1251 | 146111 | VBU | VBU |
| Labsphere Spectroradiometer | CDS1100 | CHI0091 | VBU | VBU |
| 3 Meter Sphere | SPR600 | CHI0088 | VBU | VBU |
| Elgar AC Power Supply | CW1251 | 146112 | VBU | VBU |
| Sorenson DC Power Supply | XFR150-8 | 146846 | VBU | VBU |
| Newport Humidity Recorder | iTHX-SD | 146382 | 4/17/2019 | 4/17/2020 |
| Yokogawa Power Meter | WT1600 | 146769 | 4/3/2019 | 4/3/2020 |
| Extech K Temperature Meter | SD200 | CHI0207 | 4/3/2019 | 4/3/2020 |

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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 was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index 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.

TEST REPORT

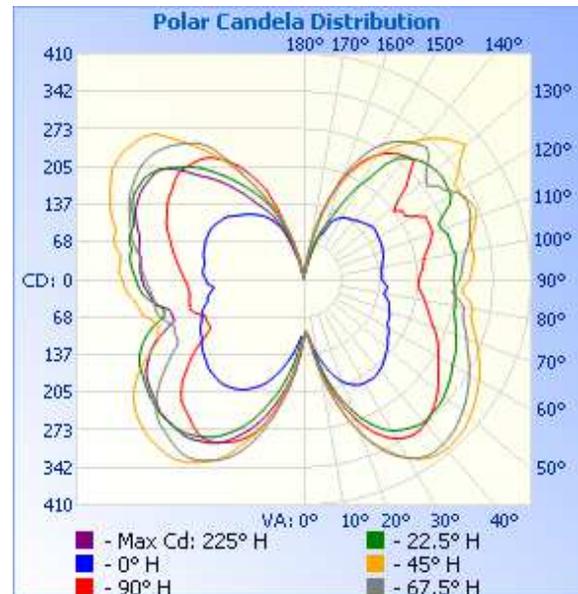
RESULTS OF TESTS

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) |
|----------------------|---------------|---------------------|--------------------|-----------------|--------------------|-------------------|-----------------------|
| AH12232019065911-004 | Select One | 120.0 | 381.0 | 45.56 | 0.996 | 3339.7 | 73.3 |

INTENSITY SUMMARY - CANDELAS

| Angle | 0 | 22.5 | 45 | 67.5 | 90 |
|-------|-----|------|-----|------|-----|
| 0 | 104 | 104 | 104 | 104 | 104 |
| 5 | 110 | 110 | 112 | 110 | 104 |
| 10 | 139 | 156 | 173 | 172 | 160 |
| 15 | 170 | 207 | 236 | 235 | 218 |
| 20 | 196 | 253 | 292 | 297 | 268 |
| 25 | 211 | 291 | 340 | 344 | 309 |
| 30 | 218 | 317 | 374 | 375 | 334 |
| 35 | 219 | 330 | 396 | 391 | 345 |
| 40 | 214 | 337 | 402 | 391 | 342 |
| 45 | 205 | 335 | 399 | 386 | 331 |
| 50 | 196 | 330 | 391 | 374 | 316 |
| 55 | 185 | 321 | 379 | 360 | 297 |
| 60 | 176 | 310 | 365 | 345 | 280 |
| 65 | 170 | 303 | 349 | 328 | 266 |
| 70 | 164 | 292 | 332 | 313 | 249 |
| 75 | 159 | 283 | 316 | 299 | 233 |
| 80 | 147 | 278 | 310 | 293 | 222 |
| 85 | 151 | 274 | 288 | 269 | 210 |
| 90 | 141 | 270 | 300 | 282 | 208 |
| 95 | 141 | 274 | 306 | 288 | 215 |
| 100 | 144 | 277 | 310 | 296 | 220 |
| 105 | 149 | 274 | 314 | 310 | 233 |
| 110 | 152 | 265 | 331 | 321 | 247 |
| 115 | 154 | 277 | 333 | 327 | 248 |
| 120 | 155 | 306 | 324 | 318 | 230 |
| 125 | 157 | 311 | 342 | 296 | 217 |
| 130 | 154 | 310 | 381 | 288 | 219 |
| 135 | 148 | 303 | 362 | 320 | 269 |
| 140 | 141 | 289 | 333 | 321 | 291 |
| 145 | 136 | 255 | 299 | 306 | 280 |
| 150 | 129 | 196 | 259 | 284 | 261 |
| 155 | 115 | 137 | 223 | 246 | 230 |
| 160 | 88 | 96 | 177 | 192 | 187 |
| 165 | 58 | 46 | 112 | 126 | 122 |
| 170 | 17 | 20 | 34 | 58 | 48 |
| 175 | 2 | 2 | 2 | 2 | 2 |
| 180 | 2 | 2 | 2 | 2 | 2 |



TEST REPORT

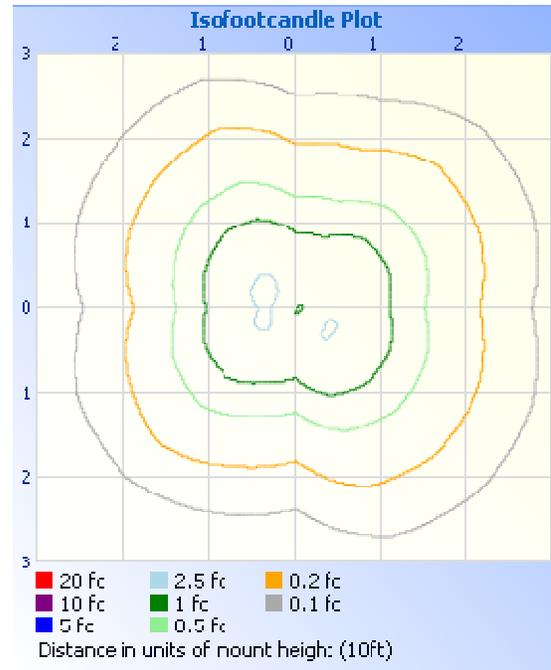
RESULTS OF TESTS

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

MOUNTING HEIGHT: 10ft

| | |
|------------------------------------|-----------------------------|
| ILLUMINANCE - CONE OF LIGHT | ISOILLUMINATION PLOT |
|------------------------------------|-----------------------------|

| Illuminance at a Distance | | |
|---------------------------|----------------|------------|
| | Center Beam fc | Beam Width |
| 1.7ft | 36.0 fc | |
| 3.3ft | 9.54 fc | |
| 5.0ft | 4.16 fc | |
| 6.7ft | 2.31 fc | |
| 8.3ft | 1.51 fc | |
| 10.0ft | 1.04 fc | |



ZONAL LUMEN SUMMARY AND PERCENTAGES

| ZONE | LUMENS | % LUMINAIRE |
|--------|--------|-------------|
| 0-30 | 216.1 | 6.5 |
| 0-40 | 423.2 | 12.7 |
| 0-60 | 951.7 | 28.5 |
| 60-90 | 814.9 | 24.4 |
| 70-100 | 827.2 | 24.8 |
| 90-120 | 857.1 | 25.7 |
| 0-90 | 1766.6 | 52.9 |
| 90-180 | 1573.1 | 47.1 |
| 0-180 | 3339.7 | 100.0 |

| ZONE | LUMENS | % LUMINAIRE |
|---------|--------|-------------|
| 0-10 | 13.9 | 0.4 |
| 10-20 | 64.4 | 1.9 |
| 20-30 | 137.7 | 4.1 |
| 30-40 | 207.1 | 6.2 |
| 40-50 | 254.2 | 7.6 |
| 50-60 | 274.3 | 8.2 |
| 60-70 | 271.8 | 8.1 |
| 70-80 | 269.3 | 8.1 |
| 80-90 | 273.8 | 8.2 |
| 90-100 | 284.1 | 8.5 |
| 100-110 | 288.7 | 8.6 |
| 110-120 | 284.3 | 8.5 |
| 120-130 | 258.4 | 7.7 |
| 130-140 | 215.2 | 6.4 |
| 140-150 | 146.9 | 4.4 |
| 150-160 | 74.4 | 2.2 |
| 160-170 | 20.4 | 0.6 |
| 170-180 | 0.8 | 0.0 |

TEST REPORT

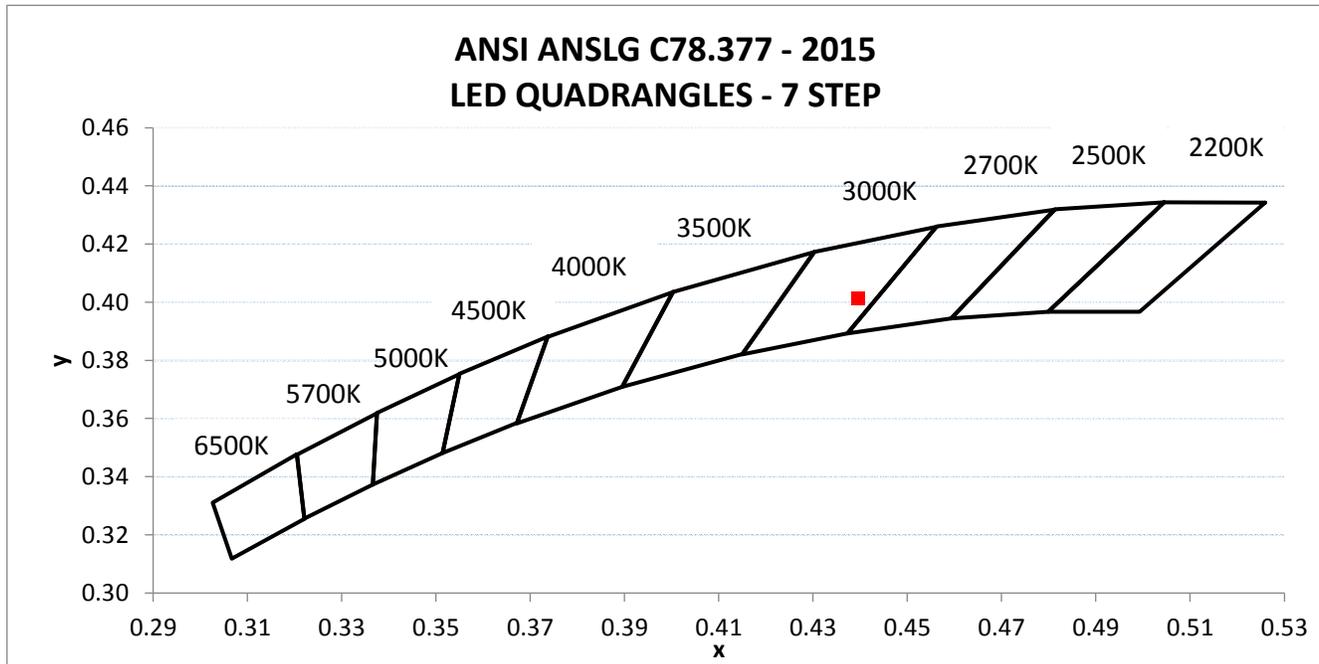
RESULTS OF TESTS

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 (%) |
|----------------------|---------------|---------------------|--------------------|-----------------|------------------------|------------------------|
| AH12232019065911-004 | Select One | 120.02 | 382.90 | 45.57 | 0.992 | 12.77 |

| LIGHT OUTPUT (lm) | LUMEN EFFICACY (lm/W) | CORRELATED COLOR TEMPERATURE - CCT (K) | CRI - Ra | CRI - R9 | DUV |
|-------------------|-----------------------|----------------------------------------|----------|----------|---------|
| 3490.3 | 76.6 | 2931 | 94.0 | 63.9 | -0.0015 |

| CIE 1931 CHROMATICITY COORDINATE (x) | CIE 1931 CHROMATICITY COORDINATE (y) | CIE 1976 CHROMATICITY COORDINATE (u') | CIE 1976 CHROMATICITY COORDINATE (v') |
|--------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|
| 0.440 | 0.401 | 0.254 | 0.521 |



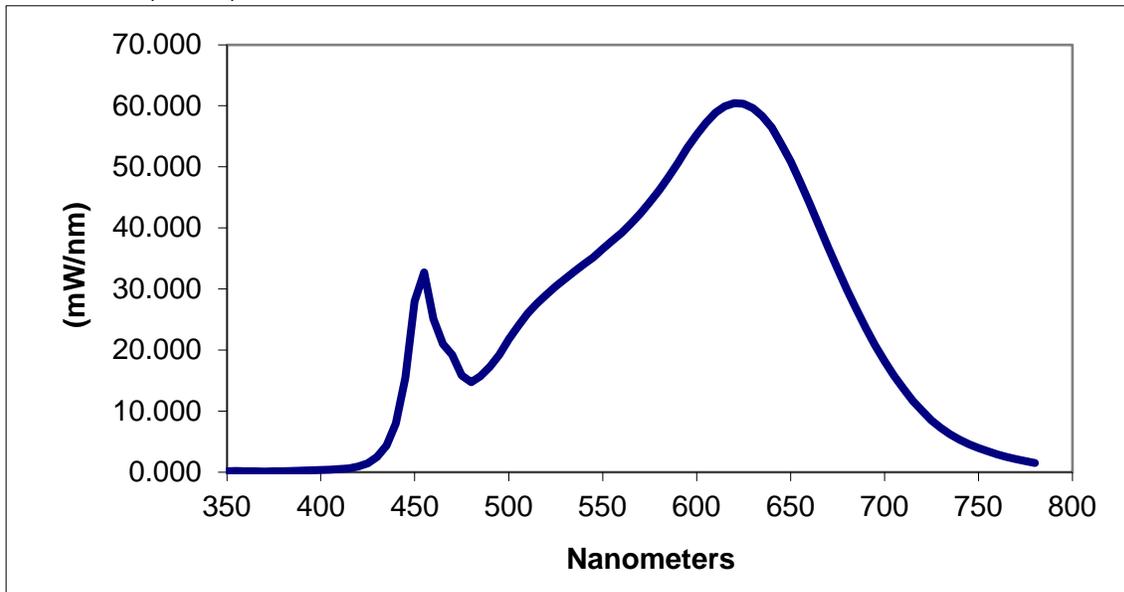
TEST REPORT

RESULTS OF TESTS

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 | 0.142 | 460 | 25.123 | 570 | 42.335 | 680 | 29.867 |
| 355 | 0.179 | 465 | 20.992 | 575 | 44.143 | 685 | 26.701 |
| 360 | 0.144 | 470 | 19.207 | 580 | 46.132 | 690 | 23.608 |
| 365 | 0.158 | 475 | 15.824 | 585 | 48.300 | 695 | 20.790 |
| 370 | 0.133 | 480 | 14.710 | 590 | 50.604 | 700 | 18.154 |
| 375 | 0.136 | 485 | 15.743 | 595 | 53.056 | 705 | 15.825 |
| 380 | 0.134 | 490 | 17.264 | 600 | 55.257 | 710 | 13.717 |
| 385 | 0.184 | 495 | 19.199 | 605 | 57.179 | 715 | 11.716 |
| 390 | 0.251 | 500 | 21.763 | 610 | 58.860 | 720 | 10.028 |
| 395 | 0.304 | 505 | 23.912 | 615 | 59.886 | 725 | 8.492 |
| 400 | 0.376 | 510 | 25.983 | 620 | 60.466 | 730 | 7.224 |
| 405 | 0.404 | 515 | 27.617 | 625 | 60.323 | 735 | 6.177 |
| 410 | 0.492 | 520 | 29.065 | 630 | 59.590 | 740 | 5.302 |
| 415 | 0.634 | 525 | 30.433 | 635 | 58.300 | 745 | 4.561 |
| 420 | 0.927 | 530 | 31.639 | 640 | 56.433 | 750 | 3.977 |
| 425 | 1.464 | 535 | 32.843 | 645 | 53.753 | 755 | 3.436 |
| 430 | 2.489 | 540 | 34.071 | 650 | 50.908 | 760 | 2.921 |
| 435 | 4.345 | 545 | 35.176 | 655 | 47.613 | 765 | 2.503 |
| 440 | 7.979 | 550 | 36.552 | 660 | 44.046 | 770 | 2.126 |
| 445 | 15.443 | 555 | 37.847 | 665 | 40.486 | 775 | 1.810 |
| 450 | 27.980 | 560 | 39.171 | 670 | 36.794 | 780 | 1.524 |
| 455 | 32.722 | 565 | 40.692 | 675 | 33.337 | | |

*Without correction of sample absorption.



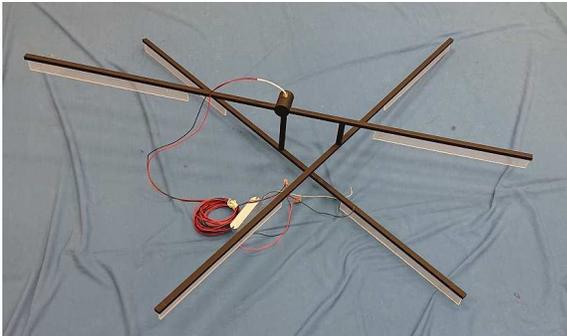
End Of Test Results

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TEST REPORT

PICTURES



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:

Timothy Quigley
Project Engineer
Lighting Division

Report Reviewed By:

Jeffrey Davis
N.A. Technical Lead
Lighting Division

Attachments: IES File

REVISION HISTORY

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