UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-0001

REPORT OF CALIBRATION

39045C Spectral Irradiance of Quartz-Halogen Lamp

for

One Osram Sylvania 1000-Watt Quartz-Halogen Lamp
Model # T6, Serial # F-455

Submitted by:

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(See your Purchase Order No. 77.06.2829 dated December 15, 1995)

1. Description of Calibration Item

One Osram Sylvania 1000-watt, quartz-halogen lamp with a coiled-coil tungsten filament was calibrated by the National Institute of Standards and Technology (NIST) as a standard of spectral irradiance from 250 nm to 2400 nm. The lamp is a T6 modified FEL type lamp with a medium bi-post base. The serial number, F-455, is located on the rear of the lamp base opposite the side viewed by the spectroradiometer.

2. Description of Calibration

The lamp was calibrated in the NIST Facility for Automated Spectroradiometric Calibrations (FASCAL) using the equipment and procedures described in Ref. [1]. The test lamp was spectrally compared to the following working standards: F-210, F-234, and F-302 to determine its spectral irradiance. The spectral irradiance values for this standard lamp were assigned relative to the International Temperature Scale of 1990 (ITS-90) [2].

Laboratory Environment:
Temperature: 23 °C ± 1 °C
Relative Humidity: 35% ± 5%

Calibration Date: February 27, 1997
NIST Test No: 844/257096-96-1

NIST

3. Results of Calibration

Table 1 gives the spectral irradiance of the test lamp.

Table 2 gives the calibration uncertainities in percent relative to the International System of Units (SI Units). The relative expanded uncertainties (coverage factor k=2) are two standard deviation estimates. Details on the estimation of these uncertainties are given in Ref. [1]. The NIST policy on uncertainty statements is described in Ref. [3].

4. General Information

To maintain the highest accuracy, keep the lamp envelope clean and have the lamp recalibrated periodically. Appropriate calibration schedules vary with lamp and application and are best determined by the user.

The lamp is operated on DC power. The lamp polarity is indicated on the lamp base identification plate.

The results of this calibration apply only to the lamp referenced in this report. This report shall not be reproduced, except in full, without the written approval of the Spectroradiometric Source Measurements Calibration Service.

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References

[1] J. H. Walker, R. D. Saunders, J. K. Jackson, and D. A. McSparron, *Spectral Irradiance Calibrations*, NBS Special Publication **250-20** (1987).

[2] K. D. Mielenz, R. D. Saunders, A. C. Parr, and J. J. Hsia, "The 1990 NIST Scales of Thermal Radiometry," J. Res. Natl. Inst. Stand. Technol., **95**, 621-629, (1990).

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of the NIST Measurement Results*, NIST Technical Note **1297** (1994).

TABLE 1
Spectral Irradiance of Lamp F-455 at 8.200 A DC

Wavelength [nm]	Spectral Irradiance at 50 cm [W/cm^3]
250	0.202
260	0.353
270	0.582
280	0.909
290	1.366
300	1.978
310	2.793
320	3.820
330	5.098
340	6.662
350	8.539
360	10.71
370	13.25
380	16.15
390	19.39
400	23.00
450	46.24
500	76.25
555	112.7
600	142.0
654.6	173.5
700	195.3
800	226.0
900	236.0
1050	223.2
1150	204.9
1200	195.3
1300	173.2
1540	125.5
1600	117.7
1700	101.4
2000	67.0
2100	59.5
2300	44.7
2400	38.9

For reference only: The voltage drop across the lamp during calibration was 109.4 V.

TABLE 2
Spectral Irradiance Calibration Uncertainties

SOURCE OF UNCERTAINTY	Wavelength [nm] 250	350	654.6	900	1300	1600	2000	2400
I. Spectral radiance measurement of integrating sphere source								
a. With respect to SI units	0.91	0.65	0.37	0.33	0.29	0.31	0.48	0.78
b. NIST long-term reproducibility	0.54	0.39	0.23	0.27	0.25	0.29	0.47	0.78
II. Radiance to irradiance transfer								
a. Systematic errors	0.36	0.31	0.27	0.26	0.26	0.25	0.25	0.25
b. Random errors	0.30	0.10	0.06	0.56	0.57	0.97	1.73	3.82
c. Model error	1.38	0.80	0.78	0.77	0.77	0.82	1.00	1.20
III. Test lamp irradiance transfer								
a. Systematic errors	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
b. Random errors	0.59	0.16	0.11	0.28	0.45	0.48	1.06	1.73
IV. Relative expanded uncertainty: $U=ku_c(E_\lambda)$, where $k=2$								
a. With respect to SI units	1.82	1.09	0.91	1.08	1.13	1.42	2.33	4.44
b. NIST long term reproducibility	1.66	0.96	0.87	1.06	1.12	1.41	2.33	4.44

Calibration Date: February 27, 1997
NIST Test No: 844/257096-96-1

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REPORT OF CALIBRATION

39045C Spectral Irradiance of Quartz-Halogen Lamp

for

One Osram Sylvania 1000-Watt Quartz-Halogen Lamp
Model # T6, Serial # F-456

Submitted by:

Freidrich Trebstein
Carl Zeiss
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D-73446 Oberkochen
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(See your Purchase Order No. 77.06.2829 dated December 15, 1995)

1. Description of Calibration Item

One Osram Sylvania 1000-watt, quartz-halogen lamp with a coiled-coil tungsten filament was calibrated by the National Institute of Standards and Technology (NIST) as a standard of spectral irradiance from 250 nm to 2400 nm. The lamp is a T6 modified FEL type lamp with a medium bi-post base. The serial number, F-456, is located on the rear of the lamp base opposite the side viewed by the spectroradiometer.

2. Description of Calibration

The lamp was calibrated in the NIST Facility for Automated Spectroradiometric Calibrations (FASCAL) using the equipment and procedures described in Ref. [1]. The test lamp was spectrally compared to the following working standards: F-210, F-234, and F-302 to determine its spectral irradiance. The spectral irradiance values for this standard lamp were assigned relative to the International Temperature Scale of 1990 (ITS-90) [2].

Laboratory Environment:
Temperature: 23 °C ± 1 °C
Relative Humidity: 35% ± 5%

Calibration Date: February 27, 1997
NIST Test No: 844/257096-96-2

NIST

3. Results of Calibration

Table 1 gives the spectral irradiance of the test lamp.

Table 2 gives the calibration uncertainities in percent relative to the International System of Units (SI Units). The relative expanded uncertainties (coverage factor k=2) are two standard deviation estimates. Details on the estimation of these uncertainties are given in Ref. [1]. The NIST policy on uncertainty statements is described in Ref. [3].

4. General Information

To maintain the highest accuracy, keep the lamp envelope clean and have the lamp recalibrated periodically. Appropriate calibration schedules vary with lamp and application and are best determined by the user.

The lamp is operated on DC power. The lamp polarity is indicated on the lamp base identification plate.

The results of this calibration apply only to the lamp referenced in this report. This report shall not be reproduced, except in full, without the written approval of the Spectroradiometric Source Measurements Calibration Service.

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[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of the NIST Measurement Results*, NIST Technical Note **1297** (1994).

TABLE 1
Spectral Irradiance of Lamp F-456 at 8.200 A DC

Wavelength [nm]	Spectral Irradiance at 50 cm [W/cm^3]
250	0.203
260	0.356
270	0.587
280	0.918
290	1.380
300	1.998
310	2.819
320	3.857
330	5.141
340	6.722
350	8.612
360	10.79
370	13.35
380	16.28
390	19.53
400	23.18
450	46.54
500	76.64
555	113.1
600	142.5
654.6	173.9
700	195.6
800	226.4
900	235.8
1050	223.2
1150	204.5
1200	194.4
1300	172.9
1540	125.8
1600	117.4
1700	101.2
2000	66.4
2100	59.5
2300	44.7
2400	39.0

For reference only: The voltage drop across the lamp during calibration was 109.8 V.

TABLE 2
Spectral Irradiance Calibration Uncertainties

SOURCE OF UNCERTAINTY	Wavelength [nm] 250	350	654.6	900	1300	1600	2000	2400
I. Spectral radiance measurement of integrating sphere source								
a. With respect to SI units	0.91	0.65	0.37	0.33	0.29	0.31	0.48	0.78
b. NIST long-term reproducibility	0.54	0.39	0.23	0.27	0.25	0.29	0.47	0.78
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Calibration Date: February 27, 1997
NIST Test No: 844/257096-96-2