

## **Spectral Stray Light Effect on High-Temperature Measurements Using a Multi-Color Pyrometer**

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Non-contact optical measurements of high temperature objects are of great importance in applications. Optical pyrometry based on one-color or two-color measurements is well developed to determine surface or volume temperatures. As an improvement over one-color or two-color pyrometry, multi-color pyrometry has been used to determine temperatures which can greatly reduce the effect of the uncertainty in the spectral emissivity. It's well known that the spectral stray light is a major, non-negligible error source affecting spectral intensity measurements for optical instruments. The purpose of this study is to investigate the effects of spectral stray light on high-temperature measurements using a multi-color pyrometer. The spectral stray light corrections were measured using a pulsed tunable laser for wavelengths from 0.41  $\mu\text{m}$  to 2.63  $\mu\text{m}$ . The spectral response characteristics of the pyrometer were calibrated using a standard high-temperature blackbody source. The experimental results show that the spectral response characteristics are approximately identical for different calibration temperatures when the spectral stray light correction is used. The corrections for the spectral stray light significantly improve the accuracy of the multi-color pyrometer at a blackbody calibration temperature which gives a simplified accurate calibration procedure, unlike the temperature calibrations for general optical pyrometers. Temperature measurement tests using a multi-color pyrometer for standard high-temperature source further verified the measurement accuracy of the calibrated pyrometer which also illustrates the necessity of the spectral stray light corrections for the complex optical pyrometer and the applicability of the multi-color algorithm.