

Abstract Submitted
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Measurement of Junction Temperature in High Brightness Light-Emitting Diodes LOGAN HANCOCK, MARK HOLTZ, Texas Tech University Dept. of Physics and Nano Tech Center — LEDs are becoming increasingly important due to the large energy consumption of residential and industrial lighting. This motivates the need for LEDs with high brightness capabilities, with higher electrical compliances than standard LEDs (upwards of 100V/5A), and with long lifetimes. Monitoring the junction temperature in these devices is a significant concern as self heating has effects on efficiency, peak wavelength, output power and overall device lifetime. However, due to the small size and encapsulation of the LED, direct measurement of the junction temperature is difficult and invasive. Spectroscopic methods for assessing the junction temperature suffer from competition between band filling and temperature-induced shifts, making extraction of the junction temperature approximate at best. We present a method involving a straightforward electrical measurement of the forward voltage and drive current. By controlling the ambient temperature of the junction during small pulsed currents, a calibration curve for V_f vs T_j can be established and used to determine the junction temperature during normal operation levels. The details of the measurement will be discussed as well as the effects of the junction temperature on the electroluminescence emission peak for various sample LEDs.

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