Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Infrared Continuum Radiation from Metal Halide HID Lamps
T.M. HERD, J.E. LAWLER, University of Wisconsin — Lighting consumes 25% of all electrical power. Improving the efficiency of the widely used MH-HID lamps would have a significant impact on power consumption. We are studying the near IR continuum from MH-HID lamps. Near IR radiation from typical MH-HID lamps includes a continuum (>50%), atomic lines (<50%), and very weak molecular features. Analysis of the near IR is complicated due to the de-mixing of additives. Additive densities are determined by a balance between de-mixing from radial and axial cataphoresis and mixing from free convection and diffusion. The Hg produces most of the arc density and pressure while the additives contribute most of the free electron (e^-) density and much of the radiation. The line width of the resonance broadened Hg 1014 nm transition is used to find the arc core Hg density. Absolute radiance measurements on optically thin, near IR Hg lines are Abel inverted to find the temperature as a function of radius. The electron density is determined from Dy I and Dy II lines using a Saha analysis. Our absolute near IR continuum measurements are compared to radiation transport simulations using the measured Hg density, temperature data, and e^- density as inputs. Results to date indicate that the near IR of MH-HID lamps is primarily e^- + Hg atom Bremsstrahlung.

James Lawler
Univ. of Wisconsin

Date submitted: 16 Jun 2006 Electronic form version 1.4