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Propagator Description of Radiation Transport, Applied to Lighting Discharges CHONLARAT WICHAIDIT, WILLIAM N.G. HITCHON, Department of Electrical and Computer Engineering, University of Wisconsin, Madison, WI 53706, JAMES E. LAWLER, Department of Physics, University of Wisconsin, Madison, WI 53706, GRAEME G. LISTER, OSRAM SYLVANIA INC. —
Radiation transport calculations based on the use of propagators (or Green's functions) to describe photon transport are presented for the Hg I resonance at 254 nm in the Complete Frequency Redistribution (CFR) regime. This Hg I resonance dominates the power balance of fluorescent lamp discharges. Recent studies have suggested that transport modes above the fundamental are important in some lamp discharges. The probabilities of photons traveling from one cell of the simulation to another are found by integrating the fluxes due to a point source over the boundaries of each cell volume. Complete hyperfine and isotopic patterns with a Voigt profile for each component are used in our simulations. The Holstein transmittance function T(R) is determined at low opacity using numerical integration across the line profile, and at high opacity using an analytic approximation. A power series expansion of T(R) is then used in geometrical integrals needed to evaluate propagator matrix elements. A time dependent radiation transport equation is solved in a cylindrical geometry and compared to very detailed Monte Carlo simulations of radiation transport in a fluorescent lamp.

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