Abstract Submitted
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Plasma Formation During Operation of a Diode Pumped Alkali Laser (DPAL) in Cs[1] NATALIA YU. BABAEVA[2], University of Michigan, OLEG ZATSARINNY, KLAUS BARTSCHAT, Drake University, MARK J. KUSHNER, University of Michigan — Diode pumped Alkali Lasers (DPALs) produce laser action on the resonant lines of alkali atoms. Diode lasers resonantly pump the $^2P_{3/2}$ state of the alkali atom which is collisionally relaxed to the $^2P_{3/2}$ state which then lases to the ground state $^2S_{1/2}$. The low optical quality of high power semiconductor diode lasers is converted into high optical quality laser radiation from the alkali vapor. The Cs DPAL system using $Ar/Cs/C_2H_6$ mixtures has shown promising results. (C_2H_6 is the collisional relaxant.) In other studies, resonant excitation of alkali vapor by low power lasers has been used to produce highly ionized channels, initiated through associative ionization and superelastic electron heating. The issue then arises if plasma formation occurs during DPAL by similar mechanisms which would be detrimental to laser performance. In this paper, we report on results from a computational study of a DPAL using Cs vapor. The global model addresses quasi-cw pumping of the Cs($^2P_{3/2}$) state by laser diodes, and includes a full accounting of the resulting electron kinetics. To enable this study, the B-spline R-matrix (BSR) with pseudostates method was employed to calculate electron impact cross sections for Cs. We found that for pump rates of many to 10 kW/cm^2, plasma densities approaching 10^{13} cm^{-3} occur during laser oscillation with higher values in the absence of laser oscillation.

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