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Plasma Kinetics Modeling of an e-beam Pumped ArF Laser TZVETELINA PETROVA, MATTHEW WOLFORD, MATTHEW MYERS, GEORGE PETROV, United States Naval Research Laboratory, JOHN GIULIANI, Retired, United States Naval Research Laboratory, MALCOLM MCGEOCH, Plex LLC, Fall River, MA, ANDREW SCHMITT, STEVE OBENSCHAIN, United States Naval Research Laboratory — The plasma kinetics of an e-beam pumped 193 nm ArF laser is modeled and compared against results from the U.S. NRL Electra facility (1,2). Model development is based on the Orestes excimer laser code that includes 1D plasma chemistry, 1D lasing amplification, and 3D radiation transport. It includes coupled electron kinetics and plasma chemistry for atomic, molecular, and ion species. A 0D Boltzmann code provides rates for all reactions involving electrons: collisional excitation and de-excitation, attachment and detachment of electrons to fluorine atoms and molecules as a function of two parameters: reduced beam power and gas composition (3). Time- and axial dependent species densities were obtained which are used to study the collisional and radiative processes responsible for ArF* formation and destruction. Laser parameters such as time-dependent laser intensity, amplified and spontaneous emission are studied over a range of gas pressure, peak power and composition. The calculated peak power laser efficiency is compared with experiments. * Work supported by 6.1 Base Program. (1) M. F. Wolford et al., HEDP 20 (2020) 30061-6. (2) M. C. Myers et al, 2019 IEEE Pulsed Power and Plasma Sci. Conf., pp. 1-4. (3) G. M. Petrov et al., JAP 122 (2017) 133301. DISTRIBUTION A. Approved for public release: distribution unlimited.

Tzvetelina Petrova
United States Naval Research Laboratory

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