Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

**Plasma chemistry modeling of an argon fluoride laser** TZVETELINA PETROVA, MATTHEW WOLFORD, GEORGE PETROV, MATTHEW MYERS, JOHN GIULIANI, United States Naval Research Laboratory, MALCOLM MCGEOCH, PLEX LLC, ANDREW SCHMITT, STEVE OBENSCHAIN, United States Naval Research Laboratory — An argon fluoride, 193 nm laser utilizing the Electra electron beam facility is under development at the U.S. Naval Research Laboratory (NRL). We are using both numerical modeling and experiments to study and predict the laser characteristics as well as understand the non-equilibrium plasma media. The model includes coupled non-equilibrium electron kinetics based on numerical solution of the electron energy Boltzmann equation [1], a time-dependent 1D hydro model for the species transport and 3D model for the emitted and amplified radiation in argon-fluoride e-beam generated plasma (ArF Orestes model). The plasma chemistry module includes reactions with thermal and beam electrons, neutral two- and three-body reactions, ion-ion, and ion-neutral reactions. In this work we study a double pass amplifier and oscillator configurations. Small signal gain, non-saturable absorption, saturation intensity, laser yield and efficiency of ArF* were measured for code validation and building predictive capabilities for advancing design of large-scale ArF lasers with short wavelength, broad bandwidth, and high efficiency, optimized for inertial confinement fusion applications [2]. [1] G. M. Petrov, *et. al.,* JAP 122 (2017) 133301. [2] M. Wolford, *et. al.,* IFSA-2019. * Work supported by the NRL Base Program.

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Date submitted: 03 Jul 2019 Electronic form version 1.4