Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Simulations of photoionization fronts on the Z-machine using a well-characterized radiation flux input[1] HEATH LEFEVRE, WILLIAM GRAY, University of Michigan, ROBERTO MANCINI, University of Nevada Reno, GUILLAUME LOISEL, Sandia National Laboratories, JOSH DAVIS, University of Michigan, PAUL KEITER, Los Alamos National Laboratory, CAROLYN KURANZ, PAUL DRAKE, University of Michigan — In the early universe at the end of the dark ages, the first galaxies and stars started forming. This introduced a sustained ionizing photon flux into the intergalactic medium (IGN) in photoionization (PI) fronts, re-ionizing the universe. PI fronts are heat fronts where PI dominates the energy deposition at the interface. The Z-machine at Sandia is a very bright source of x-rays, emitting over 1 MJ of soft x-ray energy. This is an attractive platform to make measurements of photoionization fronts. We discuss a study performed with the Helios-CR code for a N gas cell for a potential Z experiment. The radiation-hydrodynamic simulations included inline, self-consistent non-equilibrium atomic physics and photon-energy resolved radiation transport. They were driven with the time-history of a spectrally resolved x-ray flux obtained from VISRAD view factor modeling of the Z radiation environment constrained with power and monochromatic image measurements of the z-pinch. A parameter study over gas pressure and atomic model complexity explores the front propagation with Z as a driving source. A resolution study shows the importance of capturing the photon mean free path in PI front calculations.

[1]This work is funded by the U.S. DoE NNSA Center of Excellence under grant number DE-NA0003869.

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Date submitted: 03 Jul 2019 Electronic form version 1.4