Laboratory Photoionization Fronts in Nitrogen Gas\textsuperscript{1} WILLIAM GRAY, PAUL KEITER, CODY PATTERSON, JOSHUA DAVIS, PAUL DRAKE, Univ of Michigan - Ann Arbor — Photoionization fronts play a dominant role in many astrophysical situations, but remain difficult to achieve in a laboratory experiment. We present the results from a computational parameter study evaluating the feasibility of the proposed laboratory experiments of Drake et al (2016). The nitrogen gas density and the Planckian radiation temperature of the source that generates the x-ray flux, define each simulation. Computational simulations modeled experiments in which the x-ray flux is generated by a laser-heated gold foil, suitable for experiments using many kJ or of laser energy, and also experiments in which the flux is generated by a “z-pinch” device, which implodes a cylindrical shell of conducting wires. The models are run using crash, our block-adaptive-mesh code for multi-material radiation hydrodynamics. The radiative transfer model uses multi-group flux limited diffusion with thirty radiation groups. In addition, electron heat conduction is modeled using a single-group, flux-limited diffusion. In the theory, a photoionization front can exist only when the ratios of the electron recombination to the photoionization flux and the electron collisional ionization rate to the recombination rate lie in certain range .

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