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**Design of laboratory experiments to study photoionization fronts**[1]

R.P. DRAKE, Univ of Michigan - Ann Arbor, G. HAZAK, Retired, P.A. KEITER, J.S. DAVIS, C.R. PATTERSON, Univ of Michigan - Ann Arbor, A. FRANK, E. BLACKMAN, University of Rochester, M. BUSQUET, Ecole Polytechnique — This paper analyzes the requirements of a photoionization-front experiment that could be driven in the laboratory, using thermal sources to produce the necessary flux of ionizing photons. It reports several associated conclusions. Such experiments will need to employ the largest available facilities, capable of delivering many kJ to MJ of energy to an x-ray source. They will use this source to irradiate a volume of neutral gas, likely of N, on a scale of a few mm to a few cm, increasing with source energy. For a gas pressure of several to ten atmospheres at room temperature, and a source temperature near 100 eV, one will be able to drive a photoionization front through a system of tens to hundreds of photon mean free paths. The front should make the familiar transition from the so-called R-Type to D-Type as the radiation flux diminishes with distance. The N is likely to reach the He-like state. Preheating from the energetic photons appears unlikely to become large enough to alter the essential dynamics of the front beyond some layer near the surface. For well-chosen experimental conditions, competing energy transport mechanisms are small.

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