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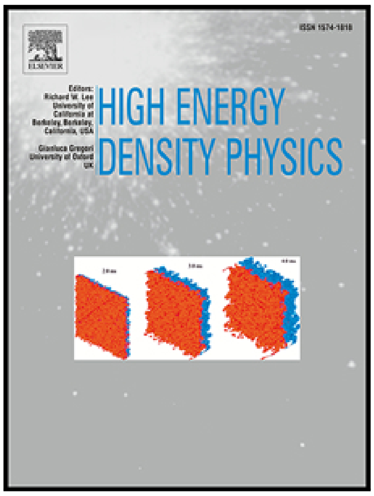


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# Measurement and simulation of the temperature evolution of a short pulse laser heated buried layer target☆

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**Abstract**

Short pulse laser heated buried layers experiments have been performed on the Orion laser facility to study the time-resolved emission characteristics of plasmas with mass densities ≥1 g/cc and electron temperatures >500 eV. Our streak camera measurements focused on the K-shell emission lines of He-like and H-like aluminum from a buried aluminum layer. The data were analyzed by comparison to synthetic spectra generated with the non-local thermodynamic equilibrium (NLTE) radiation transfer code Cretin, which yielded maximum temperatures of nearly 800 eV at near solid density. The time precise history of the temperature evolution was reproduced with a 1-D radiation hydrodynamic code; however, the known effect of lateral transport of energy out of the focal spot made exacting agree with theory difficult. Thus, we have observed densities of ≥ 1g/cc and temperatures of >500 eV using the 1-D analysis, which supports the idea that the aluminum plasma is locally hotter than inferred from our spatially integrating measurements and that modeling requires the inclusion of 2-dimensional effects.

*Keywords:* High-density plasma, Short pulse laser, X-ray spectroscopy

## 1. Introduction

Experimental platforms for generating uniform, high temperature (∼ 1keV), solid density plasmas have long been a goal of high energy density plasma research [1, 2, 3]. The development of short pulse laser heated buried layers has made great strides in approaching this goal [4, 5, 6]. These experiments have achieve aluminum plasmas with densities as high as about 10 g/cc at temperatures above 500 eV [6].

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