Abstract Submitted
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Ion acceleration by hot electrons in micro-clusters BORIS BREIZMAN, ALEXEY AREFIEV, Institute for Fusion Studies, The University of Texas at Austin — Neutron yield, observed in experiments with laser-irradiated deuterium clusters [1], is associated with fast multi-keV ions. Such ions are produced by large clusters that contain a population of stochastically heated electrons [2]. Our work deals with a first-principle theory of ion acceleration to multi-keV energies. We present a semi-analytical description for collisionless expansion of a fully ionized cluster with a two-component electron distribution function. The problem is solved for a "water-bag" distribution function of the hot electrons with self-consistent treatment of ion acceleration and electron cooling. The solution involves a cold core of the cluster, a thin double layer at the cluster edge, and a quasineutral flow with a rarefaction wave. The asymptotic energy spectrum of the accelerated ions contains a substantial number of particles with energies greater than the maximum electron energy.

[1] T. Ditmire et al., Nature **398**, 489 (1999).
[2] B. N. Breizman, A. V. Arefiev, and M. V. Fomyts'kyi, Phys. Plasmas **12**, 56706 (2005).

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