

Simulation of argon cluster expansion and resonance line emission upon its interaction with femtosecond relativistic laser pulse

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The study of the interaction of superintense laser radiation with cluster targets is of great interest, primarily for obtaining high-energy ion beams [1]. accelerated ions are formed as a result of the Coulomb expansion of the cluster, after the laser pulse removes most of the electrons. In this paper, we present the results of a numerical study of the ionization composition of argon clusters and its dependence on the laser radiation intensity, as well as on the cluster size and density. We use 3D version of the EPOCH PIC code [2] with improved collision module to count both collisional and field ionization. We plan to use the data obtained to study the possibility of using cluster targets to determine the intensity of the incident laser radiation. This concept is based on detecting the presence of highly charged plasma ions by the emission of resonance lines (He and Ly).

- [1] Jinno S, Kanasaki M, Uno M, Matsui R, Uesaka M, Kishimoto Y and Fukuda Y 2018 *Plasma Physics and Controlled Fusion* **60** 044021
- [2] Arber T D, Bennett K, Brady C S, Lawrence-Douglas A, Ramsay M G, Sircombe N J, Gillies P, Evans R G, Schmitz H, Bell A R and Ridgers C P 2015 *Plasma Physics and Controlled Fusion* **57** 113001