Abstract Submitted
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Towards Spectral Control of Laser-Driven Ion Beams Generated in the Relativistic Transparency Regime[1] JUAN C. FERNANDEZ, D.C. GAUTIER, C. HAMILTON, C. HUANG, S. PALANIYAPPAN, Los Alamos National Laboratory — Until recently, experiments on the LANL Trident laser in the relativistic transparency regime have demonstrated efficient, volumetric acceleration of the bulk target ions to high energies by the laser-plasma interaction, but with broad ion-energy distributions. That ion acceleration mechanism (Breakout Afterburner) is intrinsically capable of producing quasi-monoenergetic ion-energy distributions. However, there are processes responsible for energy spread, both during the laser-plasma interaction with present-day experimental conditions, as well as during the subsequent transport of the beam, driven by expansion of the co-moving hot-electron population. Strategies to counter such spread are discussed. Furthermore, our work to understand the recent observation of efficiently-generated, quasi-monoenergetic, $\approx$ 150 MeV Al-ion beams indicates that the dynamics immediately following the laser-plasma interaction can be quite important and beneficial. It has uncovered a new strategy, i.e., using plasma-electron dynamics to increase the ion energy and to decrease its spread. This presentation thus motivates and frames two companion talks on these laser-driven Al-ion beams by Palaniyappan et al. and Huang et al. in this conference.

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Juan C. Fernandez
Los Alamos National Laboratory

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