Abstract Submitted
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Kinetic simulations of electron pre-energization by magnetized collisionless shocks in expanding laboratory plasmas[1] KIRILL LEZHNIN, Princeton University, WILL FOX, Princeton Plasma Physics Laboratory, DEREK SCHAEFFER, JACK MATTEUCCI, AMITAVA BHATTACHARJEE, ANATOLY SPITKOVSKY, Princeton University, KAI GERMASCHEWSKI, University of New Hampshire — Collisionless shocks are common features in space and astrophysical systems where supersonic plasma flows interact. Recently experimental capabilities and diagnostics evolved sufficiently to allow detailed laboratory investigations of high-Mach number shocks [1]. Magnetized collisionless shocks are known to be responsible for the generation of energetic particles due to Fermi process, given enough pre-energization to enter the diffusive acceleration stage. Using 1D and 2D PIC simulations, we investigate particle acceleration mechanisms relevant to laboratory magnetized collisionless shocks. We consider two geometries: two colliding quasi-1D slabs, which can be cross-validated with previous numerical studies, and an ablation model which mimics plasma profiles observed in the expanding plasma experiments. With a parametric scan over shock parameters, we obtain predictions for the magnitude of shock-accelerated electron populations in the upstream and shock layer and their dependence on shock and plasma parameters. Near-future experiments appear capable of reaching these conditions, which will allow laboratory study of particle acceleration by shocks. [1] D.B. Schaeffer et al., Phys. Rev. Lett. 122, 245001 (2019)

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