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Kinetic Simulations of Collisionless Shock Formation in the Dark Sector

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Historically, dark matter searches have primarily focused on hunting for effects from two-to-two scattering. However, given that the visible universe is primarily composed of plasmas governed by collective effects, there is great potential to explore similar effects in the dark sector. Recent semi-analytic work has shown that new areas of parameter space for dark U(1) and millicharged models can be probed through the observation of collisionless shock formation in astrophysical dark plasmas, a nonlinear process that requires simulation. Here, I will show results from simulating such warm, non-relativistic pair plasmas within the EPOCH framework, a fully-kinetic particle-in-cell plasma physics simulation suite.

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