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Shock Waves in Weakly Collisional Plasmas SCOTT WILKS, PETER AMENDT, CLAUDIO BELLEI, FREDERICO FIUZA, Lawrence Livermore National Laboratory — Shock waves in plasmas have been intensively investigated in the past, but a close examination of the literature reveals that the majority of the studies are in either one of two limits: the highly collisional limit or the collisionless limit. Interestingly, a large number of experiments are in an intermediate regime, where the shock is set up due to ion-ion collisions, but at the same time the plasma is sufficiently collisionless such that the presence of an electric field associated with the shock wave cannot be neglected. We present the results of detailed fluid and kinetic simulations that elucidate several key features of plasma shock waves in this relatively unexplored regime, and compare these results to analytic solutions. In particular, it is found that for low plasma densities and high Mach numbers, the kinetic simulations predict a significant population of reflected ions upstream of the shock, not captured in fluid simulations. LLNL-ABS-640279 This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and LDRD 11-ERD-075.

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