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Self-consistent Simulation of Microparticle and Ion Wakefield Configuration[1] DUSTIN SANFORD, BEAU BROOKS, NAOKI ELLIS, LORIN MATTHEWS, TRUELL HYDE, CASPER, Baylor University — In a complex plasma, positively charged ions often have a directed flow with respect to the negatively charged dust grains. The resulting interaction between the dust and the flowing plasma creates an ion wakefield downstream from the dust particles, with the resulting positive space region modifying the interaction between the grains and contributing to the observed dynamics and equilibrium structure of the system. Here we present a proof of concept method that uses a molecular dynamics simulation to model the ion wakefield allowing the dynamics of the dust particles to be determined self-consistently. The trajectory of each ion is calculated including the forces from all other ions, which are treated as "Yukawa particles" and shielded from thermal electrons and the forces of the charged dust particles. Both the dust grain charge and the wakefield structure are also self-consistently determined for various particle configurations. The resultant wakefield potentials are then used to provide dynamic simulations of dust particle pairs. These results will be employed to analyze the formation and dynamics of field-aligned chains in CASPER's PK4 experiment onboard the International Space Station, allowing examination of extended dust chains without the masking force of gravity.

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