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Dynamical bunching and density peaks in expanding Coulomb clouds[1] BRANDON ZERBE, XUKUN XIANG, CHONG-YU RUAN, STEVE LUND, PHIL DUXBURY, Michigan State Univ — Expansion dynamics of single-species, non-neutral clouds, such as electron bunches used in ultrafast electron microscopy, show novel behavior due to high acceleration of particles in the cloud interior. This often leads to electron bunching and dynamical formation of a density shock in the outer regions of the bunch. We develop analytic fluid models to capture these effects, and the analytic predictions are validated by PIC and N-particle simulations. In the space-charge dominated regime, two and three dimensional systems with Gaussian initial densities show bunching and a strong shock response, while one dimensional systems do not.

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