Abstract Submitted
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Oscillatory kink instability of electron phase-space holes[1] I H HUTCHINSON, Massachusetts Institute of Technology — Electron holes (soliton-like BGK modes of positive potential) are routinely formed as a nonlinear result of beam-plasma instabilities, and widely observed in space. In a sufficiently strong magnetic field in the electron trapping direction ($\Omega > \omega_p$) their purely growing ($\gamma \sim 200\omega_p$) transverse instability is suppressed and they can survive for thousands of plasma periods. PIC simulations show they sometimes break up on this longer timescale because of an oscillatory kink instability, which couples to external waves. This talk will explain the kinematic physical mechanisms of the two regimes of oscillatory kinks: one* at moderate field $\Omega \sim \omega_p$ and one extending to infinite field; and will present analytic calculations of their dispersion relations, which agree with simulations. A remarkable feature is that the positive slope of the trapped particle distribution at bounce resonance contributes (contradicting prior theoretical claims) to *stabilizing* the kink, because the hole has negative inertia. The growth rate decreases rapidly as the hole potential is reduced, $\propto \phi^{3/2}$. Thus shallow holes can last a very long time, and holes of limited transverse extent can be fully stable. *I H Hutchinson Phys. Rev. E, 99, 053209 (2019)

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