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Oblique Plasmoid Instabilities[1] S.D. BAALRUD, A. BHATTACHARJEE, Y.-M. HUANG, University of New Hampshire, W. DAUGHTON, Los Alamos National Laboratory — Plasmoids are secondary instabilities of thin current sheets that can initiate fast reconnection in astrophysical and laboratory (including fusion) plasmas. In 3D guide field geometries, a spectrum of plasmoids are excited at resonant surfaces across the layer, rather than just the null surface of the poloidal field, which is the only resonant surface in 2D or in the absence of a guide field. Modes on each resonant surface have a unique angle, $\theta = \arctan(k_z/k_y)$, with respect to the conventional 2D geometry. The spectrum of unstable modes has important consequences for particle acceleration theories by contracting magnetic islands, as well as turbulence generated by overlapping islands. We calculate the linear dispersion relation for oblique plasmoid instabilites from resistive MHD and collisionless kinetic theory for a Harris current sheet. In MHD, a broad spectrum of modes is excited spanning the current sheet. In kinetic theory, the spectrum is much narrower. Previous boundary layer theories did not capture the narrow spectrum in the kinetic regime due to neglect of large Δ' effects as well as neglect of the phase of the vector potential in the inner layer. Correcting these gives results in agreement with recent PIC and linear Vlasov-Maxwell simulations.

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