

Magnetic field line bending and colliding plasma jet dynamics

T.P. Intrator, X. Sun, L. Dorf

Los Alamos National Lab

We show for the first time in a linear experimental device that two mutually attracting flux ropes may bounce back instead of merging together. There is a competition between attraction forces due to parallel flux rope currents and repulsion from field line bending of in plane magnetic field B_f , with curvature radius a of the flux rope, elastic plasma compression, and field line bending of the out of plane magnetic field B_z with curvature radius R_c . We show that bouncing dynamics occur if the line bending force density from out of plane $B_z^2/(m_0 R_c)$ exceeds that due to in plane $B_f^2/(m_0 a)$. Otherwise the ropes merge. Further reduction in field line bending force results in violently erratic magnetic states.