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Hard X-ray Bursts Observed in Association with Magnetic Reconnection in a Solar-Relevant Lab Experiment RYAN S. MARSHALL, PAUL M. BELLAN, Caltech — Measurements by a plastic scintillator show transient emission of a sub-microsecond pulse of 6 keV X-rays by a cold, dense MHD-driven plasma jet having a collision mean free path much shorter than the jet dimensions so that acceleration of any particles to high energy was not expected. The X-ray pulse occurs when the jet undergoes a kink instability which accelerates the jet laterally so that a fast-growing secondary Rayleigh-Taylor instability is triggered that then breaks the jet. It is proposed that despite the short collision mean free path, an inductive electric field associated with this breaking accelerates a certain subgroup of electrons to 6 keV energy without any of these electrons undergoing collisions. It is further proposed that after being accelerated to high energy, the fast electrons are suddenly decelerated via collisions and radiate X-rays. Extrapolation to both the solar corona and chromosphere predicts the acceleration of a small subset of electrons to very large super-thermal energies by sub-Dreicer electric fields.

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