Abstract Submitted
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Measurements of the canonical helicity evolution of a gyrating kinked plasma column[1] JENS VON DER LINDEN, JASON SEARS, Lawrence Livermore National Laboratory, THOMAS INTRATOR[2], Los Alamos National Laboratory, SETTHIVOINE YOU, University of Tokyo — Conversions between kinetic and magnetic energy occur over a wide range of plasma scales as exhibited in astrophysical and solar dynamos, and reconnection in the solar corona and laboratory experiments. Canonical flux tubes present the distinct advantage of reconciling all plasma regimes — e.g. kinetic, two-fluid, and MHD — with the topological concept of helicity: twists, writhes, and linkages. This poster presents the first visualization and analysis of the 3D dynamics of canonical flux tubes and their relative helicity evolution from experimental measurements. Ion and electron canonical flux tubes are visualized from Mach, triple, and $\dot{B}$ probe measurements at over 10,000 spatial locations of a gyrating kinked plasma column. The flux tubes co-gyrate with the peak density and electron temperature in and out of a measurement volume. The electron and ion canonical flux tubes twist with opposite handedness and the ion flux tube writhes around the electron flux tube. The relative cross helicity between the magnetic and ion flow vorticity flux tubes dominates the relative ion canonical helicity and is anticorrelated with the relative magnetic helicity. The 3D nature of the kink and a reverse eddy current affect the helicity evolution.

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