Abstract Submitted
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Characterization of Anomalous Ion Heating During Magnetic Reconnection Events using Neutron Flux Measurements[1] RICHARD MAGEE, GENNADY FIKSEL, BEN HUDSON, BRETT CHAPMAN, Department of Physics, University of WIsconsin - Madison; Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas, MADISON SYMMETRIC TORUS TEAM — Neutrons with energies of 2.45 MeV are products of the D-D fusion reaction whose cross section is sensitive to initial ion energy. An ion temperature measurement can therefore be inferred from a measured neutron flux. We apply this to sawtooth crashes, which occur quasi-periodically (T $\sim$ 2 – 5 ms) on the MST under standard conditions. Rapid ion heating at the time of the crash has been inferred in the past from other diagnostics (CHERS, Rutherford Scattering), but neutron detection is novel in this application on the RFP. The sawtooth crash is thought to be a plasma relaxation associated with magnetic reconnection, although the precise ion heating mechanism is poorly understood. A question currently under investigation is whether the mechanism heats the bulk plasma or generates a runaway distribution. At a sawtooth crash, the neutron flux is seen to rapidly increase in a short time interval ($\tau \sim 100$ μs) from zero to a value on the order of $10^{10}\mathrm{s}^{-1}$. The subsequent decay of the neutron flux indicates either the fast ion confinement time or the bulk ion energy confinement time.

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