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A novel experiment to measure ion self-helicity conservation SETTHIVOINE YOU, University of Washington, JENS VON DER LINDEN, LENNY PARITSKY, JAMES GEIER, STEWART JACOBS — A novel experiment is designed to test ion self-helicity conservation during plasma relaxation [1] with unique diagnostics for observing plasma jet collisions with compact toroids. A pair of conical theta pinches merge two compact toroids while another pair of planar coaxial guns shoot smaller plasma jets tangentially on to the compact torus to induce net bulk angular rotation. A large vacuum chamber, flexible gas injection arrangements and power supplies are designed to allow for a range of $S*; \beta$ values and ion flow velocities to explore regimes with two-fluid effects on compact toroid configurations. Two sequential ion flow maps in each shot can be reconstructed from 3D vector tomography of multichannel bulk ion Doppler spectroscopy [2]. With an insertable 3D array of B-dot probes, the ion self-helicity can be measured in the entire 3D volume twice in each discharge. A fast ion gauge measures time-resolved neutral gas profiles to optimize gas injection. A novel two-fluid plasma lattice Boltzmann numerical model [3] is being developed to support the interpretation of experimental measurements. [1] L.C. Steinhauer, A. Ishida, Phys. Plasmas, 5, 7, (1998) [2] S. You, H. Tanabe, Y. Ono, A.L. Balandin, J. Fusion Energy, 29 (2010) [3] J. von der Linden, S. You, Two-fluid Plasma Lattice Boltzmann model, this meeting.

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