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Magnetic Structure of the Maryland Centrifugal Experiment[1]
WILLIAM YOUNG, C.A. ROMERO-TALAMÁS, R. REID, R.F. ELLIS, A.B. HASSAM, University of Maryland, MCX TEAM — The Maryland Centrifugal Experiment (MCX) plasma confinement concept combines a magnetic mirror geometry with a radial electric field generated by a biased, axial electrode. The resulting ExB force drives a sheared rotation with a centrifugal force component along open field lines providing axial confinement. Several magnetic loop arrangements measure axial and azimuthal profiles of magnetic fields generated by the MCX plasma. Internal magnetic probes make local 3-axis magnetic measurements on a microsecond to millisecond timescale over a typical 5 ms discharge, providing insight into the coarse structure of currents within the MCX plasma. External loops measure the averaged magnetic fields on a millisecond timescale, limited by the time response of the vacuum vessel. Along with interferometric average density measurements, these axial profiles yield a 2D density profile, peak rotation velocity, and peak temperature, via ideal MHD equilibrium theory using a numeric, perturbative solution of the Grad-Shafranov equation including supersonic rotation. There is remarkable agreement between this solution and multichord impurity Doppler spectroscopy measurements. This comparison demonstrates the efficacy of centrifugal confinement.

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