

MAGNETIC AND THERMAL CHARACTERIZATION OF AN ELM SIMULATING PLASMA (ESP) WITH HELICON PRE-IONIZATION

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Edge Localized Modes (ELMs) continue to be an obstacle in magnetic confinement fusion. The simulation of such ELM events using a conical theta pinch serves as a means to explore methods to manage these events in future experiments. For the purposes of pre-ionization before the pinch, a 100 - 200 W helicon source, (at pressures between 5 - 100 mTorr, in either hydrogen or argon) is employed. Plasma pinching is the result of pulsed current through a single turn conical copper coil from discharge of high voltage capacitors. Direction of current flow around the coil and hence the magnetic field direction from pinching, as compared to the steady state magnetic field, is such that the system lends itself to a field reversed configuration (FRC). Axial magnetic field measurements during the theta pinch at the location of the coil as well as at a target downstream are accomplished using a B-dot probe array. Steady state magnetic field topology was configured in order to optimize the transfer of the pinched plasma from the pinch coil to the target, as well as to simulate tokamak-level magnetic field strengths. Thermal heating of a small target by the RF and pinched plasmas as a means of measuring plasma energy deposition augments data taken using other diagnostics. This heating is observed using an RF-compensated in-situ thermocouple probe attached to the target assembly. Power and energy densities are estimated. RF power and capacitor discharge voltage are varied to illustrate target heating parameters. Optical spectroscopy is used for atomic line spectra measurements. The results of these experiments with the imposed conditions are discussed.