Abstract Submitted for the Forty-Sixth Annual Meeting
Division of Plasma Physics
November 15–19, Savannah, Georgia

Category Number and Subject: 7.1.3. Magnetic Confinement Technology; Plasma Fueling

[**x**] Theory [ ] Experiment

Fueling ITER: Pellet Launch from the Transformer Core,*
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– Plans call for fueling ITER by injection of frozen DT pellets. Several experiments have shown that toroidal effects induce a drift of the ablated pellet plasma to larger values of the major radius (i.e. inward for plasma ablated on the high-field-side of a magnetic surface). These experiments support plasma fueling of ITER by pellets launched from the inside midplane with a high velocity normal to the flux surface (1-3 km/s). ITER is the first plasma that is sufficiently large so that a pellet injector can be placed in the bore of the ohmic transformer (diameter = 2.4 m). Since pellet trajectories will be straight, breakup resulting from guide tube curvature will be avoided. Ablation calculations for plasmas with an H-mode edge pedestal find a penetration length linear in velocity. For other launcher positions, guide- tubes must bend the pellet trajectories by 90 deg which causes internal pressure changes $P = \rho V^2 h/R$ well above the yield stress of 0.2 MPa. This justifies a fluid model and predicts an expansion along its motion limited by inertia. This flow in turn is unstable and will cause the pellet material to emerge from the guide-tube as a series of droplets each on the same trajectory.

*Supported by U.S. DOE under DE-AC02-76CH03073, DE-AC05-00OR22725, and DE-FG03-95ER54309.