

Abstract Submitted
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Predictions and Explanations for the I-Regime: Relevant Heavy Particle Modes* TIANCHUN ZHOU, BRUNO COPPI, MIT — The excitation of a new heavy particle mode [1,2] at the plasma edge is considered as the signature of the I-Regime [3]. The outward impurity transport produced by this mode is consistent with the observation that impurities are expelled from the main body of the plasma. The predicted mode phase velocity, in the electron diamagnetic velocity direction, has been confirmed by the experiments [4]. The plasma “spontaneous rotation” in the direction of the ion diamagnetic velocity is also consistent with the mode phase velocity direction, according to the “Accretion Theory” [5] of this phenomenon. Another feature of the mode consistent with the theory is that the I-Regime exhibits a temperature knee at the plasma edge but not that of the plasma density as the mode excitation involves relatively large values of η_i ($\eta_i \equiv d \ln T_i / d \ln n_i$). The plasma current density appearing in the saturation stage of the mode evolution is associated with the observed poloidal magnetic field fluctuations accompanying the density fluctuations. The theoretical implications of the significant electron temperature fluctuations observed are discussed. *Sponsored in part by the U.S. DOE.

[1] B. Coppi, et al., Phys. Rev. Lett. **17**, 377 (1966). [2] B. Coppi and T. Zhou, MIT(LNS) Report HEP 09/04 (2009), published in Phys. Lett. A. (2011). [3] A. Hubbard, et al., Phys. Plas. **18**, 056115 (2011). [4] I. Cziegler, Private communication (2010). [5] B. Coppi, Nucl. Fusion **42** 1 (2002).

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