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Heavy Particle Mode: I-Regime, Magnetic Fluctuations and Toroidal Geometry Effects* T. MA, B. COPPI, T. GOLFINOPOULOS, T. ZHOU, MIT — The "signature" mode excited in the I-Regime [1] involves both density and magnetic field fluctuations. Referring to a plane geometry, the "heavy particle" mode [2] that we propose as the candidate to explain the mode features has a longitudinal phase velocity $v_{thI}^2 \sim \omega^2 \Big/ k_\parallel^2 < v_{thi}^2 < v_{the}^2$ where $v_{thI}^2 = 2T_I/m_I$ and m_I is the heavy particle (impurity) mass [3]. The main mode driving factor is the impurity pressure gradient near the edge of the plasma column combined with a significant ion temperature gradient[3]. Thus, the mode can be triggered by a heat pulse emitted from the central region. The theory has predicted correctly the direction (electron diamagnetic velocity) of the mode transverse phase velocity and the resulting transport of impurities toward the edge region of the plasma column. A theoretical formulation [4] based on a toroidal geometry is necessary to include the important effects, on the mode, of the curvature and the gradient of the magnetic field. *Sponsored in part by the U.S. D.O.E. [1] E. Marmar *et al. Bull. Am. Phys. Soc.* **54**, 97 (2009). [2] B. Coppi, H.P. Furth, M.N. Rosenbluth and R.Z. Sagdeev, *Phys. Rev. Lett.* **17**, 377 (1966). [3] B. Coppi and T.C. Zhou, MIT-LNS H.E.P. Report 09/04 (2009). [4] B. Coppi, *Phys. Rev. Lett.* **39**, 939 (1977).

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