Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Two Fluid Kelvin-Helmholtz Instability in a Tokamak Plasma
OMAR LOPEZ ORTIZ, LUCA GUAZZOTTO, Auburn Univ — For the study of equilibrium configurations of tokamak plasmas when toroidal and poloidal flows are present, single and two fluid models are available in the literature. In the two fluid description there appears a component of the poloidal velocity perpendicular to the magnetic flux surfaces, which does not occur in a single fluid description. As an illustration of the impact the normal velocity has on the stability of a plasma, we investigate its effect on a Kelvin-Helmholtz instability driven by a radial gradient in the toroidal flow. The analysis is performed by consistently using single and two fluid equations. The model considers an approximate high beta equilibrium configuration obtained by asymptotically expanding a functional for the single fluid Grad-Shafranov Bernoulli system of equations in terms of the inverse aspect ratio [1]. The normal component of the velocity comes from two fluid theory and it represents a small correction to the single fluid poloidal velocity. The equilibrium and stability analysis is pursued with an analytic approach.

[1] E. Hameiri, *Phys. Plasmas* **20**, 024504 (2013)

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Date submitted: 24 Jul 2015 Electronic form version 1.4