Abstract Submitted
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Ideal and resistive Suydam-like modes driven by axial and poloidal flows in a cylinder[1] V.I. PARIEV, V.V. MIRNOV, S.C. PRAGER, University of Wisconsin-Madison, Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas — Experimental observation of magnetorotational instability (MRI) in high temperature lab plasmas is difficult because the strong magnetic field suppresses the MRI. However, in the vicinity of rational surfaces with $k_{\|} = 0$ magnetic perturbations are small, allowing for excitation of the modes similar to MRI. They are driven by the flow shear and stabilized by the magnetic shear that determines strong radial localization of perturbations. We consider a plasma cylinder with helical magnetic field and two different flows: pure axial flow $u_z(r)$ and pure poloidal (rotational) flow $u_\theta(r) = r\Omega(r)$. We reduce marginal stability criteria [1] for the case of the large flow gradient and find that $u_\theta(r)$ can drive both a resonant compressible mode, if $r^2|d\Omega/dr| \simeq c_s$, and an MRI-like mode, if $r^2|d\Omega/dr| \simeq v_A$, while axial flow can generate only compressible instability, when $r|du_z/dr| \simeq c_s$ (the unstable band is very narrow). These results suggest that the instability from axial flow can possibly be observed in the Madison Symmetric Torus (MST) experiment if flow is driven (for example by biased electrodes). We also report results on resistive analog of this instability that becomes important if the flow is ideally stable. [1] A. Bondeson, R. Iacono, and A. Bhattacharjee, Phys. Fluids, 30 (7), 2167 (1987).

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