Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Two-dimensional simulation of magnetorotational instability with a large Reynolds number T. TATSUNO, U. Maryland, W. DORLAND, W.A. TILLOTSON — Magnetorotational instability (MRI) is a likely mechanism for enhanced angular momentum transport in accretion disks, whose test has been recently proposed or started in laboratory experiments [1,2]. However, the magnetic Prandtl number (ratio of kinematic viscosity to resistivity) is tiny in those liquid-metal experiments ($10^{-5} - 10^{-6}$) while it is supposed of order unity in accretion disks. It is desired to understand the consequence of the disparate magnetic Prandtl number for the interpretation of experimental results. Small Prandtl number, however, leads to extremely high Reynolds number, which has been inhibited the access of direct numerical simulation of the experimental devices. Here we approach realistic values of the Reynolds number by making a two-dimensional spectral simulation in cylindrical geometry with automatic resolution adjustment. By a proper adjustment of the magnetic Reynolds number, we may access the wide range of magnetic Prandtl number from order unity to 10^{-4}. We explore the relation of small Prandtl number and profile relaxation effect to the low saturation level observed in the experiment. Comparison to parasitic instability theory [3] will be also made in the presentation.
*This work supported in part by the CMPD, DOE grant DEFC0204ER54784.
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Date submitted: 31 Jul 2006

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