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Magnetorotational Instability of Electrically Driven Flow in Circular Channel: Spectral Analysis of Global Modes IVAN KHALZOV, ANDREI SMOLYAKOV, University of Saskatchewan, RRC "Kurchatov Institute", VICTOR ILGISONIS, RRC "Kurchatov Institute" — The spectral MHD stability of liquid metal differentially rotating in transverse magnetic field is studied numerically by solving the eigenvalue problem with rigid-wall boundary conditions. The equilibrium velocity profile used in calculations corresponds to the electrically driven flow in circular channel with the rotation law $\Omega(r) \propto 1/r^2$. This type of flow is planned to be used in new experimental device developed in RRC "Kurchstov institute" to test the magnetorotational instability (MRI) in laboratory. Our analysis includes calculations of the eigen-frequency spectra for both axisymmetric (with azimuthal wave-number $m = 0$) and non-axisymmetric ($m \neq 0$) modes. The dependence of MRI increments on mode wave-numbers is found numerically, the approximate analytical expression is obtained for marginal stability. It is shown that for the given parameters of the design the flow is unstable due to MRI with the fastest growth rate corresponding to the axisymmetric mode. For other parameters the axisymmetric MRI modes can be suppressed and the instability develops only for modes with $m \neq 0$.

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