## Effect of fringing magnetic field on magnetohydrodynamic

## flow in rectangular duct

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For liquid metal blankets, the motion of liquid metal in fusion reactor strong magnetic field cause serious magnetohydrodynamic(MHD) effects, which have dramatic impacts on velocity distribution, heat transfer characteristics, pressure drop and the required pumping power for the cooling system. Therefore, Liquid metal Magnetohydrodynamics (MHD) effect is a key issue, and quite often a constraint, in the development of liquid metal fusion blanket.

In this work, a 3D MHD code was used to simulate and analyse the MHD flow in fringing magnetic field in the rectangular duct. In the code, the current density conservative scheme was employed for calculation of the induced current and the Lorentz force, and the consistent projection method was employed for solving the incompressible Navier-Stokes equations with the Lorentz force included as a source term. The formation mechanism of 3D MHD phenomenon at fringing magnetic field has been studied, and the pressure drop and flow distribution are evaluated and discussed. The simulation results showed that along the flow axis, the pressure decreases sharply and the flow characteristics were dramatically influenced by the fringing field.

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