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Numerical Study of the Interaction of Turbulent Liquid Metal Flow with an Inhomogeneous Magnetic Field[1] GAUTAM PULUGUNDLA, CHRISTIANE HEINICKE, CHRISTIAN KARCHER, Institute of Thermodynamics and Fluid Mechanics, Ilmenau University of Technology — In this work, we present the numerical analysis of a turbulent liquid metal flow in the inhomogeneous magnetic field of a permanent magnet. The study is motivated by Lorentz Force Velocimetry (LFV), a non-contact technique for flow rate measurement of conducting fluids using complex magnet systems producing non-uniform and localised magnetic fields. As a simplified case, we consider the flow of liquid metal in a straight square duct with electrically insulating walls. For this configuration, numerical simulations are performed by coupling the commercial finite volume solver FLUENT and finite element solver COMSOL Multiphysics. Parametric analyses are performed with different flow Reynolds numbers and magnet positions. Furthermore, the numerical results are validated with experimental studies performed in the liquid metal laboratory at Ilmenau University of Technology. The analyses provide good reference results for the numerical calibration of LFV.

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