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Numerical simulations of the Lorentz force flowmeter AXELLE VIRE, BERNARD KNAEPEN, Physique Statistique et des Plasmas, Universite Libre de Bruxelles, B-1050 Brussels, Belgium, ANDRE THESS, Fakultat fur Maschinenbau, Technische Universitat Ilmenau, P.O. Box 100565, 98684 Ilmenau, Germany
— We investigate the turbulent flow of a liquid metal in a circular pipe under the influence of a localized magnetic field. The magnetic system consists in one or several coils wrapped around the pipe. The electric current in the coils generates a magnetic field that interacts with the velocity of the flow. Eddy currents are thus induced in the flow, and create a Lorentz force. In previous works, we showed that the Lorentz force acting on a coil is proportional to the mean velocity of the flow. Therefore, the measurement of this force allows an accurate determination of the mean flow rate. Here, we consider complex distributions of the magnetic field by using multiple coils, and analyse their influence on the measurement. The influence of some parameters of the coils system, such as the coil radius, is also addressed. The results are based on numerical computations performed with a second-order collocated finite volume method.

Axelle Vire
Universite Libre de Bruxelles

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