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Simulations of Multiphase Flow in a T-junction and Distributor Header[1] JEREMY HORWITZ, Member, PURUSHOTAM KUMAR, None, PRATAP VANKA, Member — Multiphase flow is widely encountered in industrial applications including air conditioning and refrigeration systems. In this study, we simulate multiphase flow in complex micro-channels using two approaches: a multiphase Lattice Boltzmann Method (LBM) and a finite volume Volume of Fluid (VOF) method. In LBM, fluids are represented on a mesoscopic scale by particle distribution functions which evolve via a discretized Boltzmann equation. Macroscopic flow variables such as density and velocity are related to the moments of the distribution functions. In contrast, VOF calculates flow variables via three coupled equations: the continuity equation, the Navier-Stokes equation, and the volume-fraction transport equation which tracks the interface between disparate phases. An emphasis is placed on comparison of these schemes to determine their respective advantages in calculation of multiphase flow for these geometries. The principle geometries are a T-junction and multi-branch distributor header. We study bubble-laden flow and immiscible liquid-liquid flow and explore the effect of Reynolds number, buoyancy, and density ratio on the flow physics. Simulation results are compared with experiments.

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