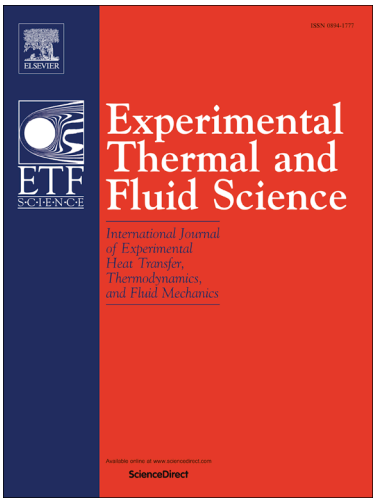

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Michael Mansour, Péter Kováts, Bernd Wunderlich, Dominique Thévenin

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Experimental Investigations of a Two-Phase Gas/Liquid Flow in a Diverging Horizontal Channel

Michael Mansour*, Péter Kováts, Bernd Wunderlich and Dominique Thévenin

Lab. of Fluid Dynamics & Technical Flows, Uni. of Magdeburg "Otto Von Guericke", Germany

Abstract

In the present study the flow properties of a turbulent two-phase (air/water) flow through a horizontal, diverging channel are investigated experimentally. The mixture flows from a rectangular channel of 40 x 44 mm through a diffuser to a rectangular channel of 100 x 44 mm, corresponding to a hydraulic diameter ratio of 1.45. The diffuser is designed with an increasing opening angle, ensuring flow separation within the studied range of flow conditions. The main objectives are 1) to investigate the possible gas accumulation due to flow separation, and 2) to deliver a complete experimental database allowing later validation of computational models. The superficial Reynolds number of water and air phases has been varied in the range of Re_L = 50,130 to 87,730, and Re_G= 3 to 18.5, respectively. The results show large gas accumulation even at very low air volume fraction (0.05%), which significantly affects the velocity field and the pressure recovery of the diffuser. When increasing Re_G, the accumulated gas always increases. However, when Re_L is increased, the accumulated gas first increases up to a certain limit, then decreases again. This can be explained by noticing that, at very high Re_L, the turbulence intensity in the liquid phase becomes very high, leading to a break-up of the large gas pocket into smaller bubbles that are transported away with the liquid phase; in this manner, the huge gas accumulation is prevented. The flow in such a divergent channel is somewhat

*Corresponding author
Email address: michael.mansour@ovgu.de (Michael Mansour)