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Convective velocity profiles as a function of applied fields in a magnetic fluid JUN HUANG, Department of Physics, University of Central Florida, Orlando, TIANSHU LIU, Department of Mechanical and Aerospace Engineering, Western Michigan University, WEILI LUO, Department of Physics, University of Central Florida, Orlando — Natural convection occurs when there is a horizontal temperature gradient across a sample. We have found previously [1] that the convective flow in magnetic fluid responds to applied magnetic fields differently, depending on the relative direction of the gradient of temperature to that of the field. In this work we report the velocity profiles from these flows obtained from optical flow method based on images from temperature-sensitive-paint technique. Results from perturbation fields show the direction change of velocity vectors and crossover from two-dimensional to three-dimensional flow for higher fields. The streamline plots indicate formation of local flow structures that could explain the slowing down of the heat transfer when the temperature gradient is anti-parallel to the field gradient. We will discuss the different responses to the applied magnetic fields for two different sample configurations in terms of relative orientation of the temperature and field gradients. [1] Jun Huang and Weili Luo "Heat Transfer Through Convection in a Quasi-One-Dimensional Magnetic Fluid." Journal of Thermal Analysis and Calorimetry, 113, p449 (2013).

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