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Magnetohydrodynamic duct flow at $Re = 10^5$ and strong magnetic field[1] OLEG ZIKANOV, University of Michigan - Dearborn, DMITRY KRASNOV, THOMAS BOECK, Ilmenau University of Technology — We present the results of high-resolution DNS of the magnetohydrodynamic flows in a duct of square cross-section. The walls of the duct are electrically insulating and the imposed magnetic field is constant, uniform, and parallel to one set of walls. The simulations are performed at the Reynolds number based on the mean velocity and duct half-width $Re = 10^5$ and the Hartmann number Ha varying from 0 to 400, i.e. in the range of parameters never before addressed in computational analysis. The numerical model is based on a conservative finite-difference scheme and uses the grid consisting of up to 2048×768^2 points. The results show a sequence of flow regimes that appear with increasing Ha: a turbulent flow with suppressed momentum transfer in the sidewall (parallel to the magnetic field) boundary layers, a flow with laminar core and turbulent sidewall layers, a flow with laminar core and quasi-two-dimensional structures in the sidewall layers, and, at Ha=400, a completely laminarized flow.

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