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Simulation of turbulent MHD channel flow with spanwise magnetic field[1] THOMAS BOECK, DMITRY KRASNOV, Mech. Eng., TU Ilmenau, Germany, OLEG ZIKANOV, Mech. Eng. U Michigan - Dearborn — We study the effect of a homogeneous magnetic field on turbulent plane Poiseuille flow of an electrically conducting fluid. The field is oriented in the spanwise direction and does not modify the critical Reynolds number for linear instability of Poiseuille flow. Simulations are performed for super-critical Reynolds numbers with a pseudospectral Fourier-Chebyshev method either as direct simulations or as LES. As the Lorentz force tends to suppress motion in the spanwise direction, the flow eventually becomes two-dimensional when the applied magnetic field is sufficiently strong. For weaker magnetic fields three-dimensional turbulence can be sustained, but the anisotropy due to the Lorentz force leads to qualitative changes in the velocity and Reynolds stress profiles. As in the case of homogeneous MHD turbulence, the essential features of this anisotropic turbulence are well predicted by the LES with either classical or dynamic Smagorinsky model.

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