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Stability of MHD channel flow with spanwise magnetic field THOMAS BOECK, DMITRY KRASNOV, Mech. Eng., TU Ilmenau, Germany, MAURICE ROSSI, LMM, Univ. Paris VI, France , OLEG ZIKANOV, Mech. Eng., U Michigan, Dearborn — We study the effect of a homogeneous magnetic field on the subcritial instability and transition to turbulence in plane Poiseuille flow of an electrically conducting fluid. The field is oriented in the spanwise direction. The transition to turbulence depends on the transient growth of non-modal linear perturbations, which are characterized by their stream- and spanwise wavenumbers. In the non-magnetic case, the most amplified perturbations are purely streamwise rolls. As the Lorentz force tends to suppress motion in the spanwise direction, the most amplified perturbations change from streamwise rolls to oblique rolls as the magnetic field increases. For sufficiently strong fields, motion in the spanwise direction is strongly damped and only the two-dimensional Tollmien-Schlichting waves aligned with the magnetic field provide transient amplification. The consequences of this damping effect on the transition to turbulence are studied through direct simulations. TB and DK are supported by the Deutsche Forschungsgemeinschaft (grant Bo 1668/2-2), and OZ by the Dept. of Energy (grant DE FG02 03ER46062). The cooperation between TU Ilmenau and UM Dearborn is supported by DAAD and NSF (grant OISE 0338713).

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