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On Hall magnetohydrodynamics equilibria[1] GEORGE THROUMOULOPOULOS, University of Ioannina, Greece, HENRI TASSO, Max-Planck-Institut fuer Plasmaphsyik, Euratom Association, Germany — Steady states are studied in the framework of ideal Hall magnetohydrodynamics (HMHD) model in arbitrary and axisymmetric geometries. In arbitrary geometry, conditions are found under which certain magnetohydrodynamics (MHD) equilibrium solutions can also satisfy the HMHD equations. For axisymmetric plasmas reduced equations are derived for uniform electron temperatures on magnetic surfaces and either barotropic ions or incompressible ion flows. The Hall and electron pressure gradient terms result in a deviation of the magnetic from the ion velocity surfaces and consequently the axisymmetric equilibria obey a set of coupled partial differential equations, one for the poloidal magnetic flux function and the other for a flux function labeling the ion velocity surfaces. Furthermore, the characteristics of certain particular axisymmetric steady states with side conditions, as flows parallel to the magnetic field or purely poloidal incompressible flows, are identified and compared with respective MHD equilibria. Unlike in the frame of MHD, steady states with parallel axisymetric flows must be incompressible and equilibria with purely poloidal incompressible flows are possible. Certain analytic axisymmetric solutions are also constructed.

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