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Moments method based analysis of QPS plasma flows and currents DONALD SPONG, Oak Ridge National Laboratory, ANDREW WARE, University of Montana, LEE BERRY, STEVE HIRSHMAN, JIM LYON, Oak Ridge National Laboratory — The Quasi-Poloidal Stellarator (QPS) achieves approximate poloidal symmetry in magnetic coordinates at low aspect ratio through numerically determined three-dimensional shaping. This symmetry results in a number of novel characteristics with respect to neoclassical plasma flows and currents. To analyze these, a moments based analysis has been developed that utilizes the DKES (Drift Kinetic Equation Solver) code to generate a data base of transport coefficients that relate plasma fluxes, parallel flows, Ohmic and bootstrap currents to thermodynamic forces and electric fields. This analysis has indicated that poloidal flows dominate in most regimes, in contrast to the case in toroidally symmetric devices where toroidal flows dominate. Bootstrap currents are suppressed from their axisymmetric levels and have been checked against asymptotic low collisionality predictions. Parameters and profiles are chosen that lead to unique ion/electron root self-consistent ambipolar electric field solutions over the minor radius. Electric field bifurcations are observed at low densities when the electron temperature >> ion temperature.
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Donald Spong
Oak Ridge National Laboratory

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