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Gyrokinetic Models for Edge Plasmas[1] A.M. DIMITS, R.H. COHEN, X.Q. XU, LLNL, AND THE ESL TEAM — We have developed practical system of electromagnetic gyrokinetic equations for MFE edge simulations. This system 1) allows for large amplitude perturbations, 2) is consistent with energy conservation, and 3) minimizes the number of (difficult to implement) second-order terms needed. Because the relative perturbation amplitudes may be large, the operator in the gyrokinetic Poisson equation evolves with time, and the gyrocenter equations of motion used must retain specific second-order terms in order to maintain energy conservation. Methods for implementing the second-order terms in the equations of motion, and a useful finite-element discretization of the gyrokinetic Poisson equation have been developed. The latter results from a Galerkin approximation to Brizard's action variational principle. Because the magnetic field inhomogeneity scales are much longer than the radial plasma profile scales in the edge region, only the standard leading order terms (parallel streaming and magnetic drifts) need to be kept in the equilibrium portion of the gyrocenter equations of motion.

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