

Abstract Submitted
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Exact energy-momentum conservation laws for the symplectic gyrokinetic Vlasov-Maxwell equations¹ ALAIN BRIZARD, Saint Michael's College — A new representation of electromagnetic gyrokinetic Vlasov-Maxwell theory is presented in which the gyrocenter equations of motion are expressed solely in terms of the perturbed electric and magnetic fields. In this representation, the gyrocenter symplectic (Poisson-bracket) structure and the gyrocenter Jacobian contain electric and magnetic perturbation terms associated with the standard first-order gyrocenter polarization and magnetization terms that traditionally appear in the gyrokinetic Maxwell equations. In addition, the gyrocenter polarization drift now appears explicitly in the gyrocenter velocity. The self-consistent symplectic gyrokinetic Vlasov-Maxwell equations are derived from a variational principle, which yields exact energy-momentum conservation laws (through the Noether method) that are verified explicitly. An exact toroidal canonical angular momentum conservation law is also derived explicitly under the assumption of an axisymmetric background magnetic field.

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Alain Brizard
Saint Michael's College

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