A Geometrical Version of the Maxwell-Vlasov Hamiltonian Structure

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We present a geometrization of the Hamiltonian approach of classical electrodynamics, via (non-canonical) Poisson structures. This relativistic Hamiltonian framework (introduced by Morrison, Marsden, Weinstein) is a field theory written in terms of differential forms, independently of the gauge potentials. This algebraic and geometric description of the Vlasov kinetics is well suited for a perturbation theory, in a strong inhomogeneous magnetic field (expansion in $1/|B|$, with all the curvature terms...), like in magnetically confined plasmas, and in any coordinates, for instance adapted to a Tokamak (toroidal coordinates, or else...).