# Reductions of Vlasov-Maxwell equations using Dirac's theory of constrained Hamiltonian systems

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Dirac's theory of constrained Hamiltonian systems allows for reductions of the dynamics in a Hamiltonian framework. Starting from an appropriate set of constraints on the dynamics, Dirac's theory provides a bracket for the reduced dynamics. After a brief introduction of Dirac's theory, I will illustrate the approach on the reduction from Vlasov-Maxwell to Vlasov-Poisson equations. The first constraint is the freezing of the magnetic field. The second one is the curl of the electric field. I will show that this reduction corresponds to a critical case in which the usual Dirac procedure cannot be performed, but still a Dirac bracket can be computed. Finally I will discuss the conditions under which the Dirac bracket can be constructed and is a Poisson bracket.

## References

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