

Beyond Force-free Electrodynamics: Effective Field Theory and Bosonization

Samuel E. Gralla

Department of Physics, University of Arizona

Abstract

Force-free electrodynamics (FFE) is a closed set of equations for the electromagnetic field of a magnetically dominated plasma. There are strong arguments for the existence of force-free plasmas near pulsars and active black holes, but FFE alone cannot account for the observational signatures, such as coherent radio emission and relativistic jets and winds. I will describe a systematic, effective field theory framework for correcting FFE wherein the magnetic field lines are taken as fundamental degrees of freedom. I will also discuss an alternative, “top down” approach based on bosonization on the lowest Landau level. The resulting equations may be solved (presumably numerically) to explore phenomenological consequences for pulsars and active black holes.