"Alternator" Involving Reconnected Magnetic Field Structures in the Presence of Electron Temperature and Density Gradients*

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The generation of magnetic field structures over macroscopic scale distances is an issue of well recognized importance in astrophysics and for laboratory experiments. A relevant process is identified [1] involving a plasma, imbedded in a pre-existing sheared magnetic structure, with a significant gradient of the longitudinal (to the stationary component of the magnetic field) electron temperature. A periodic emergence of a reconnected magnetic structure is the basic feature of this process that is likened to an "alternator". The oscillations amplitude can be amplified in the presence of a density gradient (aligned with the electron temperature gradient) and a non-negligible particle diffusion. Regimes where the longitudinal electron thermal conductivities are large relative to the associated transverse conductivities are considered, a two-fluid description being adopted as a start. The introduced process differs substantially from the stationary Biermann Battery concept that depends on misaligned.

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[1] B. Coppi and B. Basu, Phys. Lett. A **397,** 127265 (2021).