Formation of Magnetic Fields on Grand Scale Distances*

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The emergence of significant magnetic fields in cosmic plasmas over large scale distances is an important issue to deal with as known and potentially applicable theories, such as those based on the Weibel instability, suffers from the difficulty of involving unrealistically small distances (e.g. c/ω_{pe}). The presently proposed theory, to avoid this difficulty, starts from considering the electron density and temperature fluctuations [1] which can be excited in circumbinary disks sustained by pairs of black holes. These low frequency fluctuations can drive a "magneto-thermal alternator" of the kind introduced in Ref. [2] which can produce a slowly varyingly and sheared magnetic field structure. The shearing component of this field can then be amplified by a magneto-thermal reconnection process [2] up to more significant amplitudes. This however requires an event that would produce a strong local electron pressure gradient. An important feature of magneto-thermal reconnection is that the width of the layer where reconnection takes place can grow with the involved macroscopic distances [2] unlike the case of the collisionless tearing mode whose analysis was given in Ref. [3]. *Sponsored by the Kavli Foundation and CNR.

[1] B. Coppi, *Fundamental Pl. Phys*., 100007 (2023).
[2] B. Coppi, and B. Basu, *Phys. Lett. A*, **397**, 127265 (2021).
[3] B. Coppi, L. Sugiyama, J. Mark and G. Bertin, *Ann. Phys*. **119**, 2 (1979).