Abstract Submitted
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Astrophysical jet dynamos based on spheromak, dusty plasma, and Hamiltonian concepts[1] PAUL BELLAN, Caltech — Experiments at Caltech demonstrate that spheromak formation physics and astrophysical jets are closely related [1] as both involve toroidal magnetic field pressure inflating poloidal flux surfaces. The use of capacitor banks to power the lab magnetic fields raises the question of what powers the magnetic fields in the astrophysical situation where gravity is presumably the ultimate power source. In answer to this question, the dust grain mass accretion rate is shown to be much greater than previously assumed [2]. Then, by considering Hamiltonian trajectories of charged dust grains in combined gravitational–magnetic fields, dynamos suitable for powering toroidal and poloidal magnetic fields are demonstrated. The toroidal field dynamo is powered by gravitational power liberated by dust grains having zero canonical momentum; these have spiral trajectories towards the central object [3]. The poloidal field dynamo results from dust grains with Speiser-type trajectories; these grains meander back and forth across a toroidal magnetic axis [3]. Supported in part by USDOE
[1] P. M. Bellan et al, J. Fusion Energy 10.1007/s10894-006-9048-z (2006)
[2] P. M. Bellan, ApJ 678, 1099 (2008)
[3] P. M. Bellan, ApJ (in press), http://arxiv.org/abs/0807.1373

[1]Supported in part by USDOE

Paul Bellan
Caltech

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