Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

A new effect in the propulsion of chiral particles ELEFTHERIOS KIRKINIS, ANTON ANDREEV, BORIS SPIVAK, University of Washington, CONDENSED MATTER THEORY COLLABORATION — We study motion of small chiral ferromagnetic particles diluted in a classical liquid in the presence of d.c. magnetic field $\mathbf{H}$ and a.c. electric field $\mathbf{E}$. The time averaged drift velocity of the particle $\mathbf{V}$ has the following chiral contribution,

$$\mathbf{V} = \alpha \mathbf{H} \mathbf{E}^{\mathbf{2}} + \beta \mathbf{E} (\mathbf{H} \cdot \mathbf{E}), \tag{1}$$

where the coefficients α and β have opposite signs for particles of opposite chirality. Thus particles of opposite chirality move in opposite directions. We assume that the magnetic moment is frozen into the particle by the magnetic anisotropy. The chiral component of the drift velocity is caused by the spin torques exerted on the particle by the magnetized electrons. It vanishes in the approximation where the orbital moment of the magnetized electrons, $\mathbf{L_e} = -\mathbf{g} \frac{\mathbf{eh}}{\mathbf{mc}} \mathbf{M}$, with $\mathbf{M}$ being the magnetic moment of the particle, is neglected. Therefore $\alpha, \beta \propto \mathbf{L_e}$.

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Date submitted: 20 Nov 2009 Electronic form version 1.4