

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Topological Charge Screening in Disordered Aharonov-Bohm Wavefunctions ALEXANDER HOUSTON, JOHN HANNAY, ALEXANDER TAYLOR, MARK DENNIS, University of Bristol — Free electrical charges are typically subject to screening relations. For example, in ionic fluids and Coulomb gases there is screening (both global and local) of the electrical charges, described by the first and second Stillinger-Lovett sum rules [1]. A topological analogy governs the statistical behaviour of the nodal points in Gaussian random superpositions of plane waves. These nodal points are integer topological charges, i.e. vortices and antivortices of the complex wavefunction, whose sign is that of the phase circulation. Such superpositions are known to model high energy eigenfunctions in the presence of wave chaos [2], and display topological charge screening in the bulk [3]. We investigate how these screening relations are affected by the introduction of a magnetic flux line [4], which may be fractional in strength. We find that the global screening relation is broken, with the average total topological charge of the vortices given by the flux strength, and that the local screening of the flux itself shows unexpected features. [1] F. H. Stillinger and R. Lovett, *J. Chem. Phys.* 49, 1991-94 (1968) [2] M. V. Berry, *J. Phys. A* 10, 2083-91 (1977) [3] M. V. Berry and M. R. Dennis, *Proc. R. Soc. A* 456, 2059-79 (2000) [4] Y. Aharonov and D. Bohm, *Phys. Rev.* 115, 485-91 (1959)

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Date submitted: 06 Nov 2015

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