Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Geometry and topology of tangled vortices in wave chaos

ALEXANDER TAYLOR, MARK DENNIS, University of Bristol — Linear waves in three-dimensional chaotic systems can contain complex vortex tangles that are difficult to describe analytically, even in non-dynamic systems such as solutions of the time-independent Schrödinger equation in which the vortices are zeros of a complex scalar wavefunction. Despite the linear nature of such eigenfunctions, the local geometry of their vortices leads to random conformations for which certain properties appear universal on large scales, even when compared to vortices in different physical systems such as superfluid turbulence or models of cosmic strings [1]. We numerically track vortex tangle in the random wave model of chaotic eigenfunctions in different systems with the same limiting behaviour at high energy [2]. While many quantities reveal only a common statistical scaling on the large scale, the topology—particularly the occurrence of knotted loops—discriminates between tangles arising from different systems. In fact, knotting seems to depend on the nature of the chaotic system, and can be surprisingly rare when compared to standard random walk models.

[1] A J Taylor and M R Dennis, *J Phys A* **47**, 465101 (2014)
[2] M V Berry and M R Dennis, *Proc R Soc A* **456**, 2059-79 (2000)

Alexander Taylor
University of Bristol

Date submitted: 14 Nov 2014 Electronic form version 1.4