nature portfolio

Peer Review File

Particle-like topologies in light

REVIEWERS' COMMENTS

Reviewer #1 (Remarks to the Author):

Qualitative features of vector fields on the plane and in three-dimensional space are an important part of the general theory of oscillations and waves. For example, in structured light, with amplitude, phase, and polarization spatially varying, these can be woven into loops, links and knots, and organize Möbius strips. Characterization of the topological properties of optical vector electromagnetic fields is an extremely difficult task. The article proposes an original idea and a new tool for the analysis of such fields, based on the construction of a three-dimensional skyrmion hopfion in polarization and phase diagram of a propagating light beam. The experiments and theory presented in the article demonstrate new topological invariants that are possible in a structured light. Overall, the paper is well written, and I recommend it for publication.

Reviewer #2 (Remarks to the Author):

Mark Dennis and coworkers report on creating 3D Hopfions of Skyrmions in 3D structured light. This manuscript is very topical and exciting and the results are extremely impressiv. The topic fits in the scope of Nature Communications and should be published.
The results are extremely clean and convincing, the paper is very logically structured and clearly written, and the additional information and the renderings (and movies) are beautiful.

The paper should be published in Nat Comm as is.