MD

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Lecture I: Knotting optical vortices.

As lines in 3D space, it is natural to ask whether optical vortex loops can be knotted or linked. Indeed they can, and the presence of a knot affects the wavefront topology everywhere in 3D space not on the knot. In this lecture, I will explain the 3D topology of knotted singularities and the topology of wrapping wavefronts around them. I will also explain how knotted optical vortices can be realised in solutions of the paraxial wave equation, and how to synthesize them holographically.

Lecture II: Polarization singularity indices primer.

Optical singularities, and their numerous topological properties, are useful ways of expressing, with a small number of parameters, aspects of complicated interference patterns. Polarization singularities in fields of varying elliptic polarization are good examples, and I will explain the underlying geometry and useful representations of the indices of polarization singularities. I will especially discuss the 'Mobius strip' twist indices recently proposed by Freund, and explain how they are an example of an unusual kind of multi-index, whose value takes on a finite range of integer values beyond ±1. I will describe how to compute indices and multi-indices in general, using the Schur-Cohn algorithm from complex analysis.