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The hidden interference pattern

Young's double slit experiment is often referenced when studying the concept of interference of light. To see an interference pattern in the intensity distribution, the two interfering beams must be coherent, that is they must have the same polarization. Polarisation describes the time variation of the electric field in the plane orthogonal to the plane of propagation of the beam. Polarisation maps are often used to characterize the polarisation state of a field. When beams that have different polarisations are interfered, the resulting field has a polarisation map that varies spatially across the field. In this work we investigate the concept of interference more closely and show that interference can be observed in other degrees of freedom of light. We illustrate that when beams with orthogonal polarisations are interfered, a fringe pattern can be observed in the polarisation map of the resulting field. We provide a simple and easily replicable experiment to be conducted in undergraduate laboratories to assist the study of light and its different degrees of freedom.

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