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Twisting photons: The role of POAM in Astrophysics

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Abstract content
   (Max 300 words)
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The total angular momentum of a photon field can be decomposed canonically into spin and an orbital parts. This decomposition is gauge invariant. Methods are now available for measuring the orbital angular momentum of light. These allow measurement the orbital angular momentum of a single photon, as well as of a beam. Little use has been made of the techniques in astrophysics. If used, they might unlock an as yet untapped source of information about distant sources.

Orbital angular momentum can be produced in a beam of light of known polarisation by passing the beam through a spiral phase plate in the direction of its with optical axis. It has been suggested that inhomogeneous media may produce orbital angular momentum in an analogous way. A simple spiral phase plate model may thus be useful in studying plasma vortices in cosmic structures such as astrophysical jets, AGN's, turbulent plasma in galaxies and galaxy clusters, and the vorticity field of the CMB. This paper discusses some general features of POAM, gives a mathematical description of the action of a spiral phase plate and shows how it might be used as a model in astrophysical studies.

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Main supervisor (name and email)
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