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Spin and Orbital Angular Momentum Separation for Light Beams and spin-orbit coupling

Spin, orbital and total AM of light may be measured by means of different techniques. Many detection apparatuses yield the ratio between the angular momentum per unit length and the energy density per unit length. Typical examples thereof are Stokes parameter measurements in paraxial polarization optics (the third Stokes parameter, usually denoted s_3 , gives a measure of the helicity of the beam) and interferometric methods in single photon AM detection. In all these cases, the energy density of light per unit length is measured by means of commonplace photo-detectors as CCD cameras, photographic plates, photoresists, etc. In this talk we show that the textbook expression for the angular momentum per unit length of a beam of light, containing a spin and an orbital part solely, is not complete and that a third part must be included. We call this new term the surface angular momentum (SuAM). This quantity is derived considering the virtually infinite extent of the beam along the direction of propagation.