

Generalized Spin Density Matrix for Absorption of Twisted Light

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For the light that carries an orbital angular momentum, or the twisted light, the polarization states are described by eight independent parameters, as opposed to three Stokes parameters for plane waves. We use a parameterization of the spin-density matrix of the twisted light in terms of vector and tensor polarization, in analogy with massive spin-1 particles, and derive formulae that define atom's response to specific polarization components of the twisted light. We demonstrate evolution of the octet of polarization parameters when the twisted light is absorbed via high-multipole interactions, or field gradients.