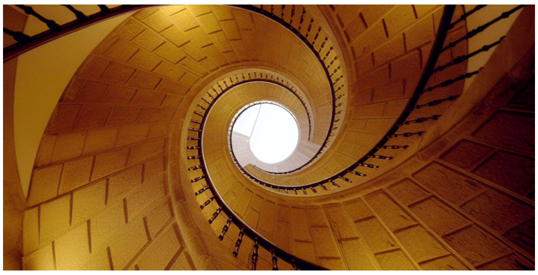

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Light-matter entanglement in above-threshold ionization processes in atoms

Light-matter entanglement plays a fundamental role in many applications of quantum information science. Thus, finding processes where it can be observed is an important task. Here, we address this matter by theoretically investigating the entanglement between light, and electrons generated in above-threshold ionization (ATI) process, where an input strong-laser field rips out an electron from its parent atom, such that its found later on in the continuum with a given kinetic energy. The study is based on the back-action of the ATI process on the quantum optical state of the system, and its dependence on the kinetic energy and direction of the emitted photoelectrons. Taking into account the dynamics of the process, we demonstrate the creation of hybrid entangled states, that is, entangled states between light and matter. The amount of entanglement has been studied in terms of the entropy of entanglement. Additionally, we use the Wigner function of the driving field mode to motivate the entanglement characterization when considering electrons propagating in opposite directions.

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