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Lecture I: Spin-to-orbital conversion of the angular momentum of light.

The angular momentum of light can be split into a spin and an orbital component (SAM and OAM). Only recently several optical processes involving a conversion of angular momentum from one form to another were conceived and experimentally demonstrated. We will briefly review these processes, and then focus our attention on the specific case of the phenomena taking place when light propagates in a singularly patterned spatially variant birefringent plate, also known as “q-plate”. Finally, we will discuss the connection of the q-plate approach to generating optical beams carrying OAM and the more general topic of polarization holography.

Lecture II: q-plates: some classical and quantum applications.

This lecture will start from the q-plate concept already introduced in the previous lecture and will move on to discuss some recently demonstrated applications of this device. In particular, the possibility of creating a physical one-to-one mapping between the polarization Poincaré sphere and an OAM subspace will be discussed. The quantum applications of such mapping can be described in terms of “qubit transfer devices” between polarization and OAM, devices that have been experimentally demonstrated in single photon and biphoton experiments.