

## azimuthal modulation in photon-induced processes

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Photon-induced processes in ultra-peripheral collisions have attracted considerable attention in recent years due to their potential to probe various aspects of nuclear and particle physics. A key feature of these processes is the azimuthal modulation of particle production, which provides critical insights into the underlying dynamics of interactions involving quasi-real photons. In this talk we will explore the mechanisms behind azimuthal asymmetries observed in photon-induced processes, with a particular focus on their dependence on kinematic variables such as transverse momentum and rapidity. Based on a series of our recent studies, we analyze the origins of azimuthal modulations in photon-induced reactions, present a unified framework for understanding how these asymmetries emerge from the linearly polarized photon, the final-state soft photon radiation, and the Fermi-scale double-slit interference effect. By examining a range of observables, including di-lepton production, di-jet production, vector meson production, and di-photon production, we either provide predictions for future experiments, or provide theoretical calculations consistent with current experimental measurements.

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