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First insight into transverse-momentum-dependent fragmentation physics at photon-photon colliders

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Future planned lepton colliders, both in the circular and linear configurations, can effectively work as virtual and quasi-real photon-photon colliders and are expected to stimulate an intense physics program in the next few years. In this paper, we suggest to consider photon-photon scattering as a useful source of information on transverse momentum dependent fragmentation functions (TMD FFs), complementing semi-inclusive deep inelastic scattering and e^+e^- annihilation processes, which provide most of the present phenomenological information on TMD FFs. As a first illustrative example, we study two-hadron azimuthal asymmetries around the jet thrust-axis in the process $\ell^+\ell^- \rightarrow \gamma^*\gamma \rightarrow q\bar{q} \rightarrow h_1h_2 + X$, in which in a circular lepton collider one tagged, deeply-virtual photon scatters off an untagged quasi-real photon, both originating from the initial lepton beams, producing inclusively an almost back-to-back light-hadron pair with large transverse momentum, in the $\gamma^*\gamma$ center of mass frame. Similar processes, in a more complicated environment due to the presence of initial hadronic states, can also be studied in ultraperipheral collisions at the LHC and the planned future hadron colliders.

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