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Characteristics and Estimates of Double Parton Scattering at the Large Hadron Collider

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We evaluate the kinematic distributions in phase space of 4-parton final-state subprocesses produced by double parton scattering, and we contrast these with the final-state distributions that originate from conventional single parton scattering. Our goal is to establish the distinct topologies of events that arise from these two sources and to provide a methodology for experimental determination of the relative magnitude of the double parton and single parton contributions at Large Hadron Collider energies. We examine two cases in detail, the $b\text{-}\bar{b}$ -jet-jet and the 4 jet final states. After full parton-level simulations, we identify a few variables that separate the two contributions remarkably well, and we suggest their use experimentally for an empirical measurement of the relative cross section. We show that the double parton contribution falls off significantly more rapidly with the transverse momentum of the leading jet, but, up to issues of the relative normalization, may be dominant at modest values of this transverse momentum.

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