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Four-jet and three-jet plus gamma DPS production in pp and pA collisions at the LHC

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In spite of the recent progress in both theoretical and experimental studies many aspects of *multiple parton interactions* (MPI) still require a detail investigation. In particular, *double parton scattering* (DPS) processes can play a dominant role for some specific kinematic regions of multi-jet production, especially in *proton-nucleus* (pA) collisions where the total DPS cross section is approximately $\sim 3A$ times bigger as the corresponding total DPS cross section in *proton-proton* (pp) collisions.

In this talk I will discuss the DPS in four-jet and three-jet plus gamma production processes in pp and pA collisions, and specifically the impact of parton shower effects on predictions for DPS sensitive observables, the role of nuclear effects and the dependence of the DPS cross sections on different kinematical cuts and phenomenological assumptions. Additionally I will consider two different approaches to model *double parton distribution functions*, namely double DGLAP evolution equations and MPI formalism of Pythia event generator, and present a quantitative study of differences and similarities between both approaches.

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