"Double Parton Scattering studies, legacy and priorities"

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This short document aims at briefly summarizing the status of the art of Double Parton Scattering (DPS) studies considering the theoretical and experimental progress made with respect to the former edition of the workshop and giving advice on the next steps.

AIMS

1) DPS is a unique probe of correlations in the proton. To unravel these effects a close collaboration between theory-phenomenology and experimental communities is needed.

2) DPS can represent a sizable background to several channels of interest (Higgs + W in the b b-bar decay channel; W^+W^+ plus jets; Z + n jets ...).

ACTUAL ACHIEVEMENTS

1) Recent progress at the present stage from the experimental side: new measurements of sigma_eff in various processes. DPS is the dominant effect in several LHC final states with multiple heavy flavors in the final state (ALICE, LHCb). Studies with extra-jets (ATLAS,CMS) are more difficult due to the uncertainties in the description of the Single Parton Scattering (SPS) backgrounds. The limited precision of these measurements still doesn't allow to infer the possible sqrt(s) dependency of sigma_eff. The inclusion of sophisticated SPS backgrounds in the most recent analyses tends to produce slightly higher values of sigma_eff closer to the ones characterizing the MC tunes describing also other soft QCD observables (Minimium Bias multiplicities, Underlying Event, etc).

2) From the theory side: a lot of effort is being spent to gain a better understanding of the DPS interaction mechanism. Progress in Monte Carlo programs leads to a better agreement with data, but does not have a clear physical interpretation. On the other hand, studies with a more rigorous starting point have to make considerable assumptions to make contact with experiment. To figure out which approximations are justified and obtain the relevant nonperturbative input, one would need:

- Improved understanding of how to separate DPS from other effects and a better characterization of DPS
- Dependence of sigma_eff on kinematic variables (momentum fractions of incoming partons, total transverse energy, ...)
- More precise values of sigma_eff in different reaction channels (WJJ, Wbbbar, JJJJ, ...)
- Measure DPS in pA collisions