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Production of W^+W^- and $t\bar{t}$ pairs via photon-photon processes in proton-proton scattering and corresponding gap survival factor

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Photon-induced processes in proton-proton interactions have become recently very topical. The large energy at the LHC, when combined with relatively large luminosity at run II, allows starting the exploration of such processes.

We discuss the production of W^+W^- pairs and $t\bar{t}$ quark-antiquark pairs in proton-proton collisions induced by two-photon fusion including, for a first time, transverse momenta of incoming photons. The unintegrated inelastic fluxes (related to proton dissociation) of photons are calculated based on modern parametrizations of deep inelastic structure functions in a broad range of x and Q^2.

We focus on processes with single and double proton dissociation. Highly excited remnant systems hadronize producing particles that can be vetoed in the calorimeter. We calculate associated effective gap survival factors. The gap survival factors depend on the process, mass of the remnant system and collision energy. The rapidity gap survival factor due to remnant fragmentation for double
dissociative (DD) collisions is smaller than that for single dissociative (SD) process. We observe approximate factorisation: $S_{R,DD} \approx S^2_{R,SD}$ when imposing rapidity veto. For the W^+W^- final state, the remnant fragmentation leads to a taming of the cross section when the rapidity gap requirement is imposed. Also for $t\bar{t}$ quark-antiquark pairs, such a condition reverses the hierarchy observed for the case when such condition is taken into account.

Our results imply that for the production of such heavy objects as t quark and $\bar{t}$ antiquark the virtuality of the photons attached to the dissociative system are very large ($Q^2 < 10^4$ GeV^2). A similar effect was observed for the W^+W^- system.

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