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Higgs production within k_t -factorization with unintegrated gluon distribution functions

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We calculate distribution of Higgs boson in rapidity and transverse momentum within k_t -factorization with different unintegrated gluon distribution functions from the literature (Kimber-Martin-Ryskin, Jung-Salam, Kutak-Stasto, Kwiecinski CCFM, Ivanov-Nikolaev) with leading order and next-to-leading order precision and with off-shell matrix elements.

Special attention is devoted to the Kimber-Martin-Ryskin distribution which is known to describe well gauge boson (W and Z) production, Drell-Yan processes and heavy quark production.

We discuss and quantify contributions from different regions of incoming gluon transverse momenta dividing the space into hard and soft regions. We discuss how these regions may be roughly related to fixed-order LO, NLO and NNLO calculations.

We include also the decay of the Higgs boson into photons and compare results with recent preliminary data of the ATLAS Collaboration for the Higgs boson transverse momentum and rapidity distributions. The lowest order k_t -factorization contribution gives similar shape for Higgs boson transverse momentum as the experimental one but underpredicts the new ATLAS data. We discuss that the lowest-order k_t -factorization result does not include e.g. NLO collinear-factorization contributions which are known to be large. We show k_t -factorization NLO contributions ($gg \rightarrow Hg$) for different UGDFs. For completeness we show also contribution of WW fusion.

In addition, we show distributions in azimuthal angle between photons and distributions in two-dimensional space of $p_{1t}xp_{2t}$ of transverse momenta of photons.

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