Task 3 TMDs at small

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Involved people from Krakow:

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Next year Victor Villa will join.

ITMD for Tri-jets*

- Advancement of ITMD to ITMD * for three jets. Result for initial state low x gluons and high x quarks and gluons.
- New TMD densities appear as compared to ITMD for dijets.
- Construction of transverse momentum related observables that have great potential to be sensitive to saturation.
- Numerical results for cross section for p-p and p-Pb.

The ITMD* does not account for the linearly-polarized gluons in unpolarized target.

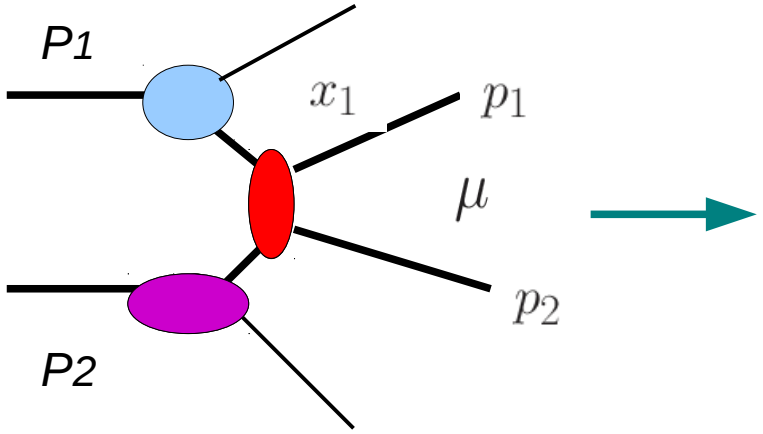
Forward trijet production in p-p and p-Pb collisions at LHC
Marcin Bury, Andreas van Hameren, Piotr Kotko, Krzysztof Kutak
To appear in JHEP

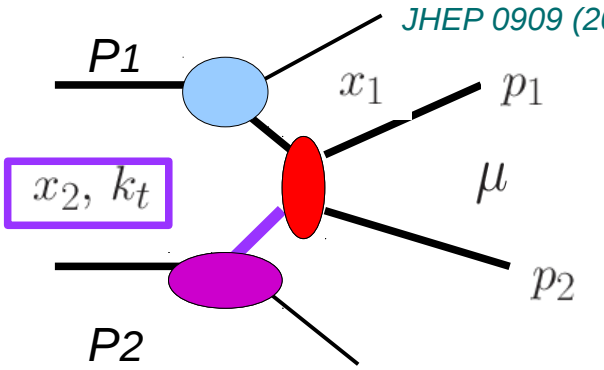
Time spent on the project: approximately 14 months

See also:
Tolga Altinoluk, Renaud Boussarie, Cyrille Marquet, Pieter Taels
10.1007/JHEP07(2020)143

Improved Transversal Momentum Dependent Factorization

$$\frac{d\sigma^{P_1P_2\to\text{dijets}+X}_{\text{SPS}}}{dy_1dy_2dp_{1t}dp_{2t}d\Delta\phi} = \frac{p_{1t}p_{2t}}{8\pi^2(x_1x_2s)^2}\sum_{a,c,d} x_1 f_{a/P_1}(x_1,\mu^2)\,|\overline{\mathcal{M}_{ag^*\to cd}}|^2 \quad \mathcal{F}_{g/P_2}(x_2,k_t^2)\frac{1}{1+\delta_{cd}}$$





A, Dumitru, A. Hayashigaki J. Jalilian-Marian Nucl.Phys. A765 (2006) 464-482M. Deak, F. Hautmann, H. Jung, K. Kutak JHEP 0909 (2009) 121

Generalization of hybrid formula but no k_t in ME

Fabio Dominguez, Bo-Wen Xiao, Feng Yuan Phys.Rev.Lett. 106 (2011) 022301

F. Dominguez, C. Marquet, Bo-Wen Xiao, F. Yuan Phys.Rev. D83 (2011) 105005

Appropriate in back-to-back configuration

Using HEF motivated sum over polarization for low x gluons we included k_t in ME

Conjecture P. Kotko K. Kutak , C. Marquet , E. Petreska , S. Sapeta, A. van Hameren, JHEP 1509 (2015) 106

Appropriate in any configuration

gauge invariant amplitudes with k_t and TMDs

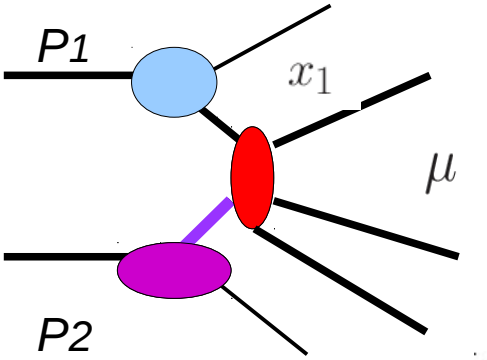
Can be obtained from CGC

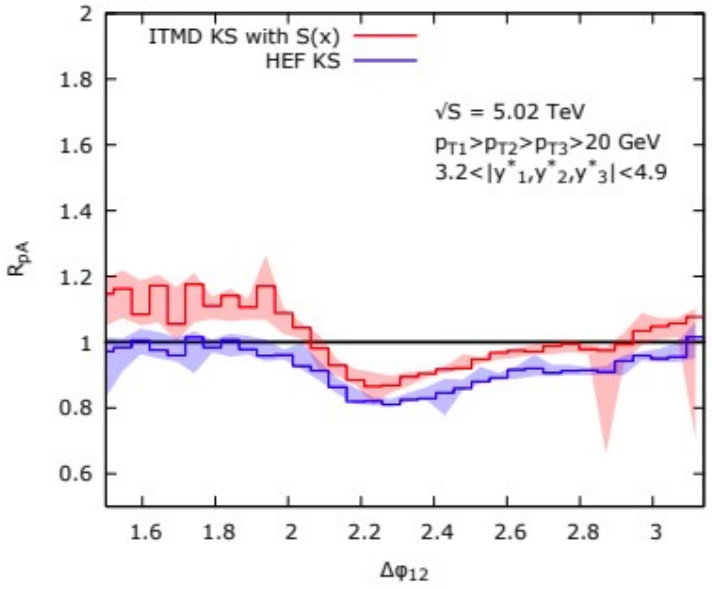
T. Altinoluk, R. Boussarie, Piotr Kotko JHEP 1905 (2019) 156

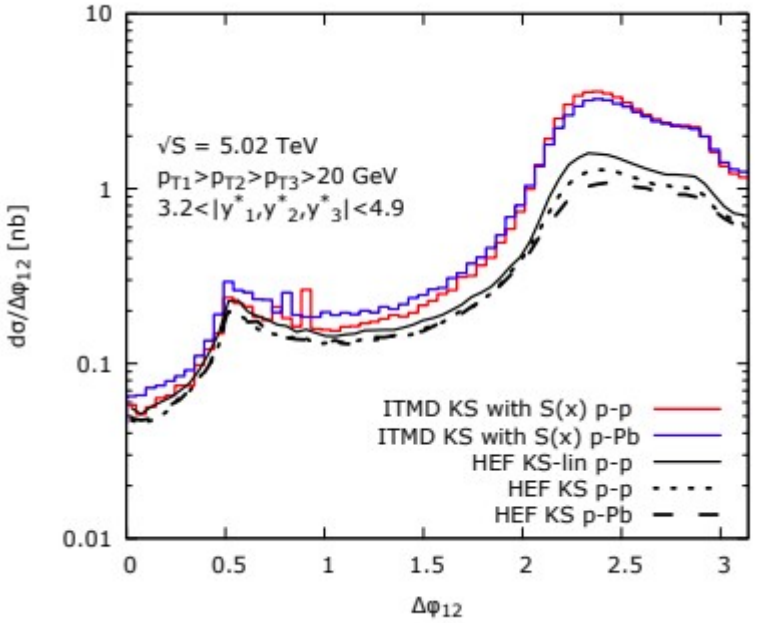
Example for g g → g g*

$$\frac{d\sigma^{pA\to ggX}}{d^2P_td^2k_tdy_1dy_2} = \frac{\alpha_s^2}{(x_1x_2s)^2}\, x_1 f_{g/p}(x_1,\mu^2)\sum_{i=1}^{6}\mathcal{F}_{gg}^{(i)}H_{gg\to gg}^{(i)}$$

ITMD*







Forward trijet production in p-p and p-Pb collisions at LHC
Marcin Bury, Andreas van Hameren, Piotr Kotko, Krzysztof Kutak
2006.13175

small – x gluons