Cascade group meeting

Conferences & new papers

- EPS conference: https://indico.desy.de/event/34916/
  - Abstract deadline: 2 June 2023
  - Proposals:
    - back-to-back correlations (multijet and Zjet)
    - intrinsic kt determination
    - Global fits for PB TMDs
    - what else can be presented as a group ?

News

- xfitter meeting last week (see link)
  - Sara showed new results (link)
    - discussion on contribution from very soft gluons $z_M \to 1$
    - remark by Valerio Bertone:
      - if in evolution z_M different from 1, then different factorization scheme needed (with different coefficient functions to cover this).

QCD&MC lecture4: Jet Cross Sections in O(α_s)

S. Schilling desy-thesis-00-040

- From differential x-section

$$\frac{d\sigma(\gamma g \to q\bar{q})}{dx\,dz\,d\hat{t}} = K \sum_{\text{quarks } a} e_a^2 \frac{\alpha_s(Q^2)}{4\pi^2} \frac{2z}{Q^2} z f_g(\frac{x}{z}, Q^2) \times$$

$$\times \left\{ \frac{1}{4} \left(\frac{\hat{u}}{\hat{t}} + \frac{\hat{t}}{\hat{u}} - 2\frac{\hat{s}Q^2}{\hat{u}\hat{t}} + 4\frac{\hat{s}Q^2}{(\hat{s}+Q^2)^2} \right) \right\}$$

➔ obtain:

J. Collins JHEP 0005:004,2000

$$\frac{d\sigma(\gamma g \to q\bar{q})}{dx\,dz\,d\cos\theta} = K \sum_{\text{quarks } a} e_a^2 \frac{\alpha_s(Q^2)}{4\pi^2} z f_g(\frac{x}{z}, Q^2) \times$$

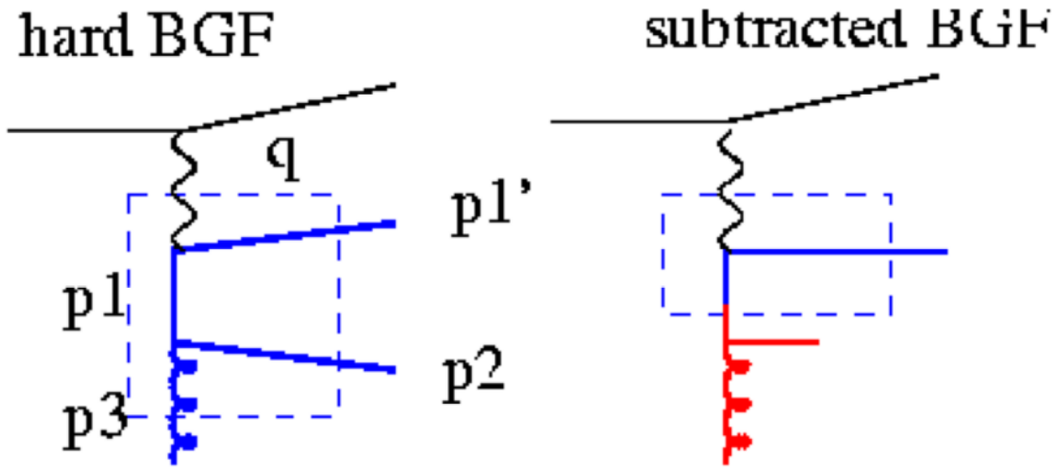
$$\times \left\{ P(z) \left[\frac{1}{1-\cos\theta} + \frac{1}{1+\cos\theta} \right] - \frac{1}{2} + 3z(1-z) \right\},$$

QCD&MC lecture4: BGF - LO and subtraction

$$z = \frac{p_3 q}{pq}$$

$$u = \frac{-Q^2(1+cos\theta)z}{2x}$$

- and obtain singular piece separately:



$$\frac{d\sigma^{\text{subtract}}(\gamma g \to q\bar{q})}{dx\,dy\,dz\,d\cos\theta} = K \sum_{\text{quarks } a} e_a^2 \frac{\alpha_s(Q^2)}{4\pi^2} z f_g(\frac{x}{z}, Q^2) P(z) \left[\frac{1}{1-\cos\theta} + \frac{1}{1+\cos\theta}\right]$$

➔ problem: kinematics ... avoid to subtract too much

$$\frac{d\sigma_{\text{hard}}}{dx\,dy\,dz\,d\cos\theta} = K \sum_{\text{quarks } a} e_a^2 \frac{\alpha_s(Q^2)}{4\pi^2} z f_g(\frac{x}{z}, Q^2) \times$$

$$\times \left\{ \frac{P(z)(1-C(-t))}{1-\cos\theta} + \frac{P(z)(1-C(-u))}{1+\cos\theta} - \frac{1}{2} + 3z(1-z) \right\}$$

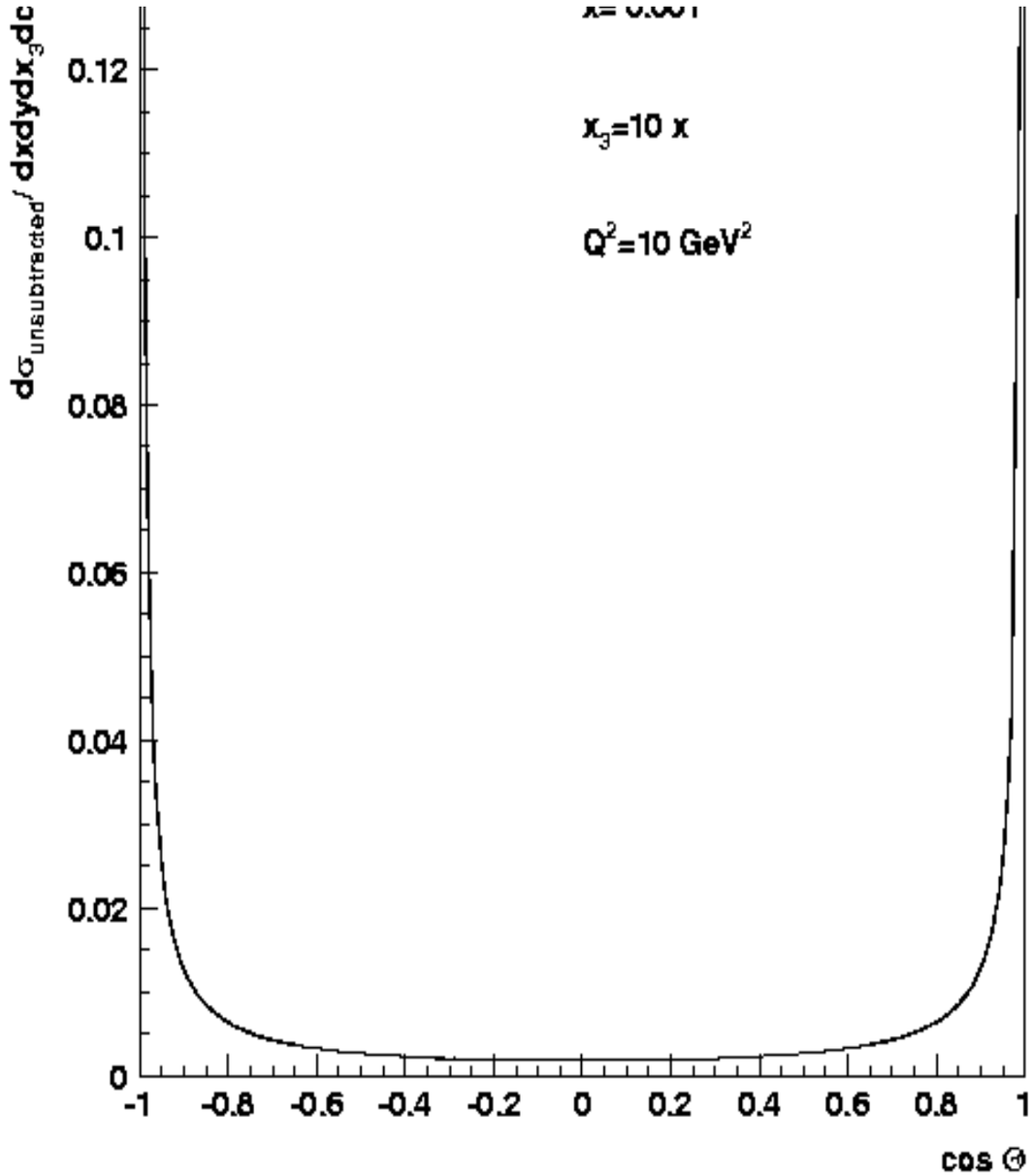
- with $C(a) = \Theta(Q^2 - a)$

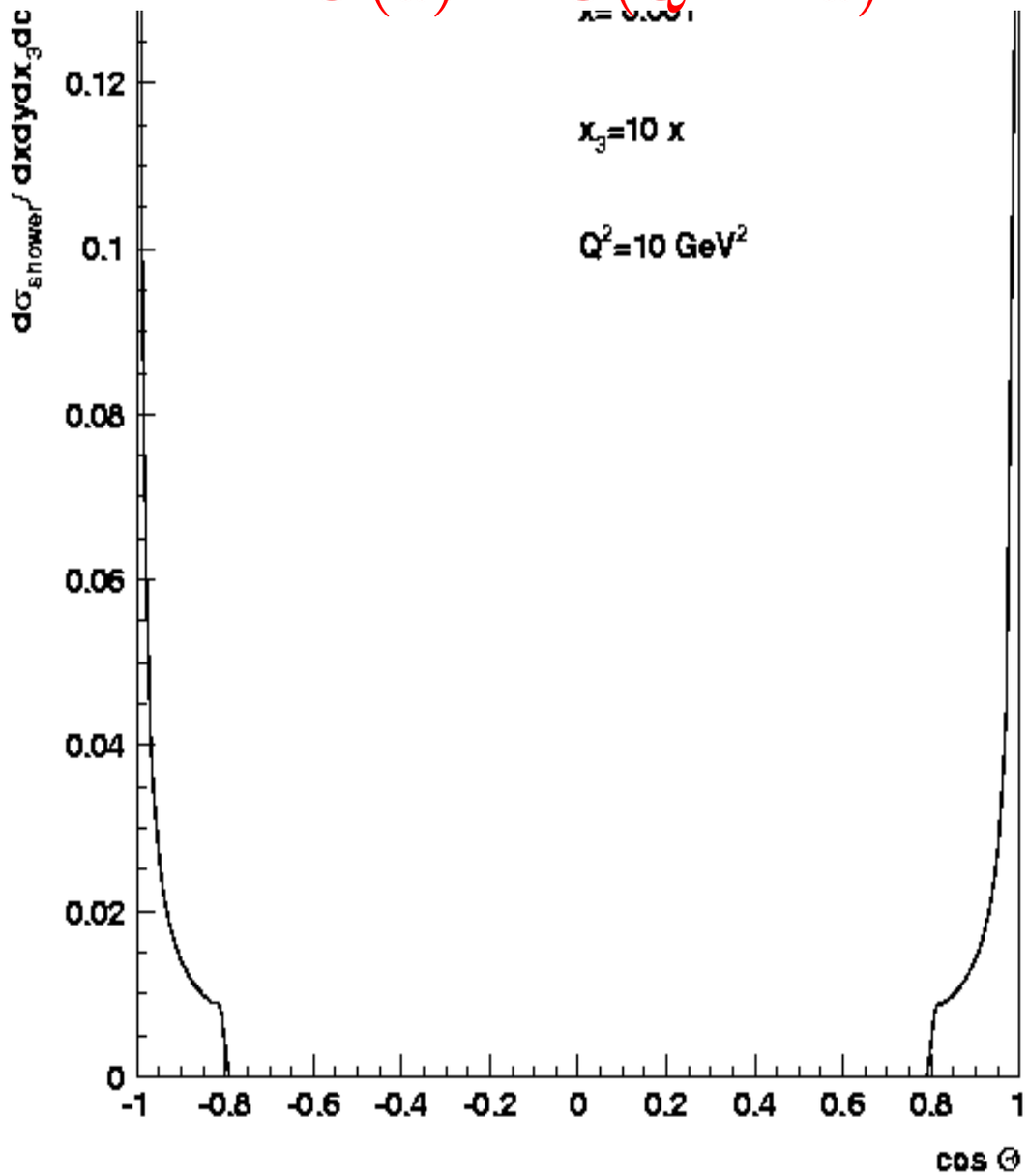
QCD&MC lecture4: BGF x-section

full BGF contribution

collinear contribution

$$C(a) = \Theta(Q^2 - a)$$





DY x-sections

- Mikel pointed out higher order corrections to DY x-section
  - calculations with FEWZ using PB-NLO_Set2: (for one lepton decay channel)
    - Leading Order Cross-Section with LO photon-induced Channel
    - NLO QCD Cross-Section with LO photon-induced Channel
    - NNLO QCD Cross-Section with LO photon-induced Channel
    - LO 1766.415 +- 0.104 0.872 (ratio to NLO)
    - NLO 2026.83 +- 0.383 1
    - NNLO 2014.54 +- 0.454 0.9939 (ratio to NLO)
  - calculation with MCatNLO (using PB-NLO Set2)
    - NLO: 2.023e+03 +- 2.2e+00 pb

➔ MCatNLO and FEWZ NLO calculations in very good agreement !

➔ correction from NNLO < 1 %

New papers

- The small kt region in DY production at NLO with the parton branching method
  - pheno applications, determination of intrinsic kt
  - determine qs as fct of m_DY at 13 TeV
  - determine qs at 8 TeV
  - determine qs at Tevatron
- paper draft is ready, will be circulated in the next days !
  - This paper is open and will stay open:
    - Please reply to me, if you want to be co-author, after reading and commenting

Agenda

CASCADE group meeting

Thursday 11 May 2023, 15:00 → 16:30 Europe/Berlin

Description

Please use this link to connect

15:00 → 15:05 **Intro** 5m

15:05 → 15:25 **Sudakov form factor** 20m

Speaker: Mees van Kampen (University of Antwerp)

15:25 → 15:45 **Intrinsic kt determination (part1)** 20m

Speaker: Itana Bubanja

15:45 → 16:05 **Intrinsic kt determination (part2)** 20m

Speaker: Sara Taheri Monfared (DESY)

16:05 → 16:25 **Dynamic z_M fits** 20m

Speaker: Aleksandra Lelek (UAntwerp)

AOB

- Further news ?