Cascade group meeting

Conferences

- EPS conference Aug 21 – 25, 2023: https://indico.desy.de/event/34916/
  - talks accepted:
    - back-to-back correlations (multijet and Zjet) (Luis Ignacio)
    - intrinsic kt determination (Sara)

  - We will have rehearsals middle of Aug

Future CASCADE group meetings

- Today is the last meeting before summer break !

- Sara has kindly agreed to organize and chair the meetings after the summer !
    - Thanks a lot, Sara, this is really great !

    - Please join me welcoming Sara for taking over this task

- Please contact Sara, if you have something to present at the group meetings

Intrinsic kt determination - paper

- Laurent Favart kindly agreed to take over the coordination of the paper and to bring it to publication.
  - Thanks a lot Laurent

- Please address all comments and further questions to him

New PB TMDs for heavy bosons

- Heavy Boson parton densities and vector boson fusion
  - W and Z parton densities (and TMD densities) can be determined with PB approach.

- References
  - Bauer, C. W., Ferland, N., and Webber, B. R. (2018). Combining initial-state resummation with fixed-order calculations of electroweak corrections, JHEP, 04(), 125, arXiv 1712.07147
  - Fornal, B., Manohar, A. V., and Waalewijn, W. J. (2018). Electroweak Gauge Boson Parton Distribution Functions, JHEP, 05(), 106 arXiv 1803.06347
  - Bauer, C. W., Ferland, N., and Webber, B. R. (2017). Standard Model Parton Distributions at Very High Energies, JHEP, 08(), 036 arXiv 1703.08562
  - Kunszt, Z. and Soper, D. E. (1988). On the Validity of the Effective W Approximation, Nucl. Phys. B, 296(), 253--289
  - Dawson, S. (1985). The Effective W Approximation, Nucl. Phys. B, 249(), 42--60
  - Kane, G. L., Repko, W. W., and Rolnick, W. B. (1984). The Effective W+-, Z0 Approximation for High-Energy Collisions, Phys. Lett. B, 148(), 367--372

Electroweak TMDs

- Already existing: photon TMDs and PDFs from PB approach (Jung, H., Monfared, S. T., and Wening, T. Determination of collinear and TMD photon densities using the Parton Branching method, Physics Letters B, 817(2021), 136299, arXiv2102.01494

- Extend this approach to Z0,W+,W- bosons
  - no intrinsic distribution, all is generated perturbatively.

- Splitting functions including the moment only transverse polarization (as for photon)

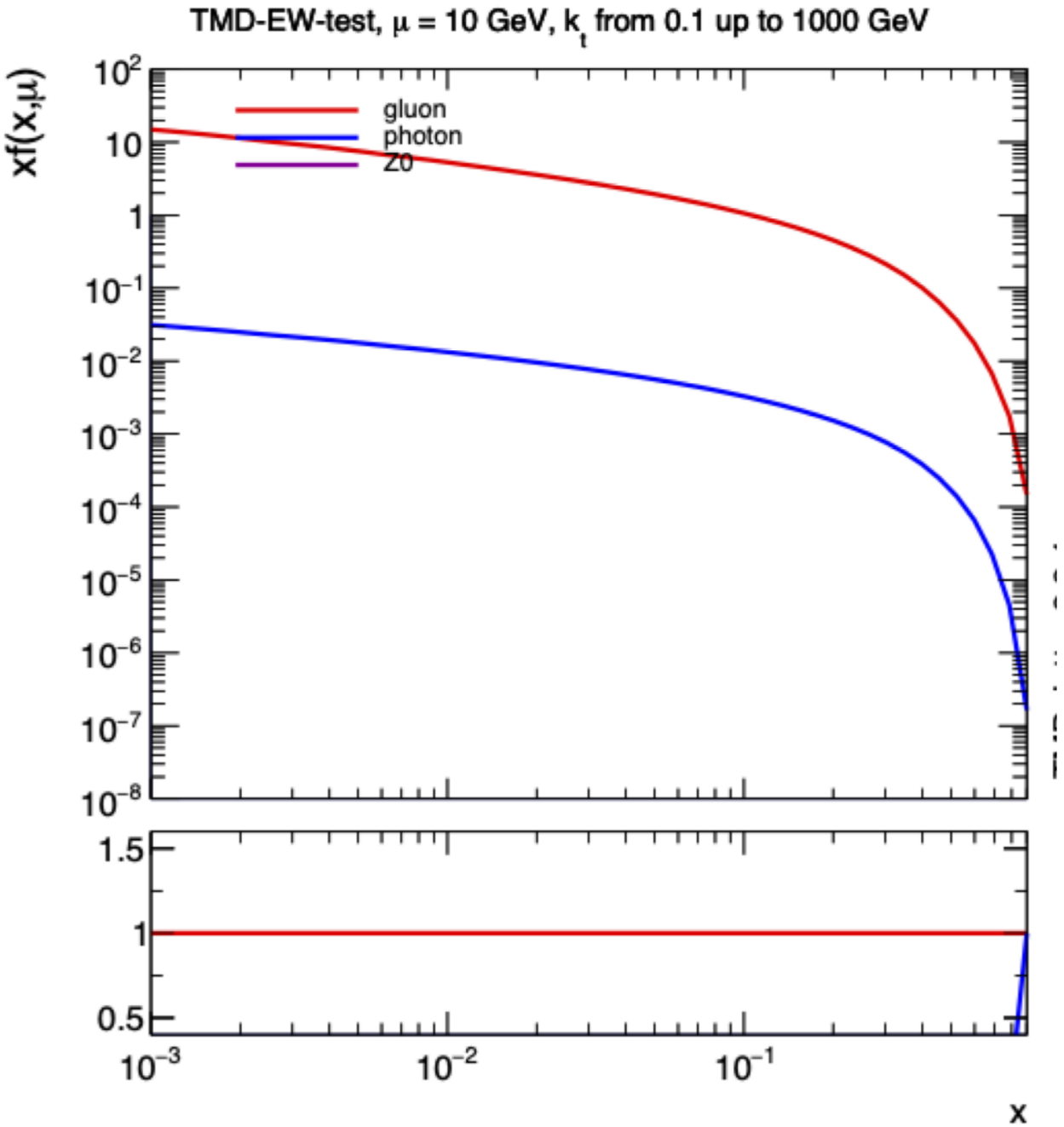
- Coupling:

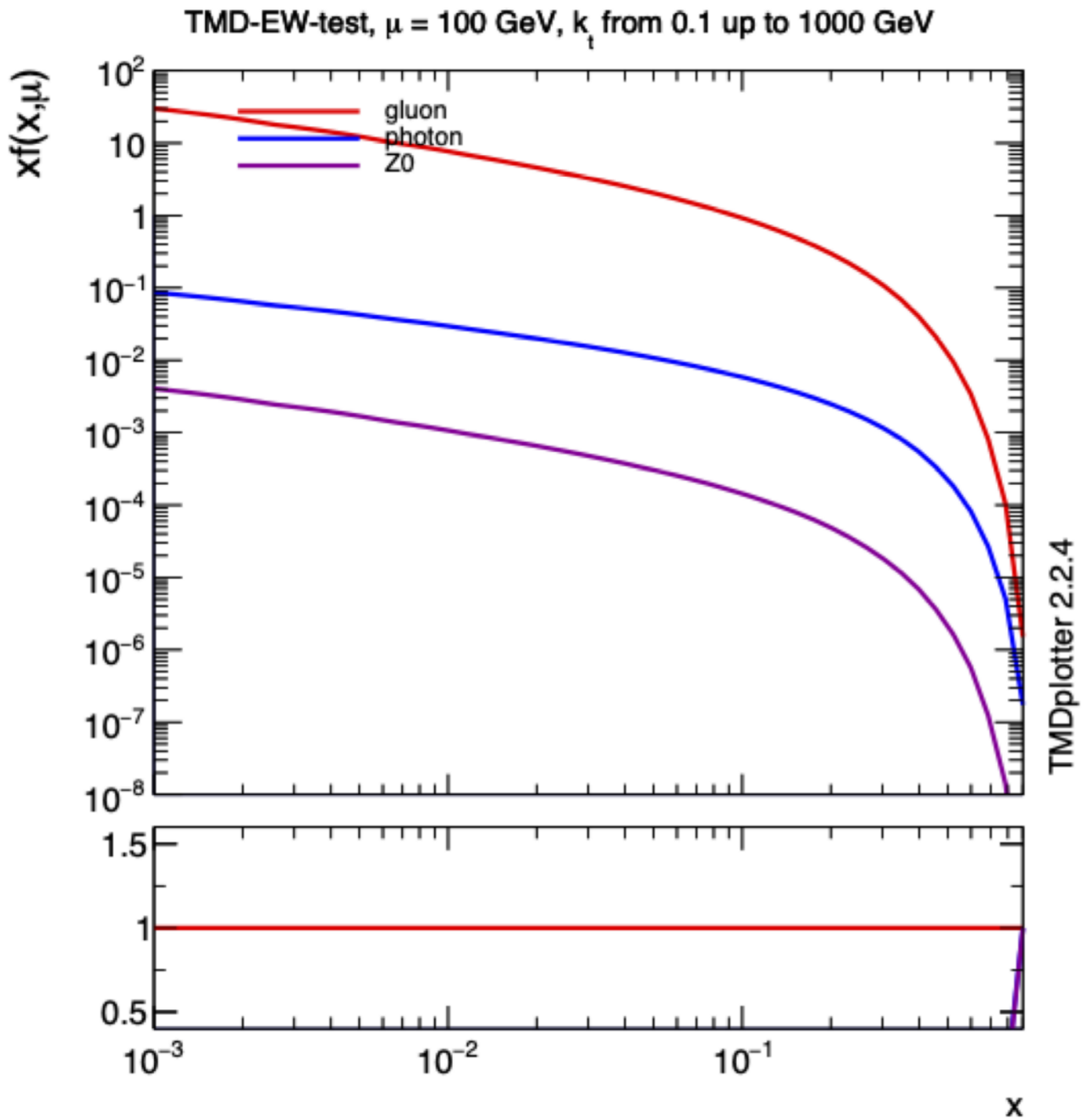
$$\text{for } \mathrm{W}^{\pm}\ \alpha \quad \rightarrow \quad \frac{1}{8}\frac{\alpha}{\sin^2\theta_W}$$

$$\text{for } \mathrm{Z}_0\ \alpha \quad \rightarrow \quad \frac{1}{4}\frac{\alpha}{\sin\theta_W\cos\theta_W} \qquad (2)$$

Electroweak PDFs

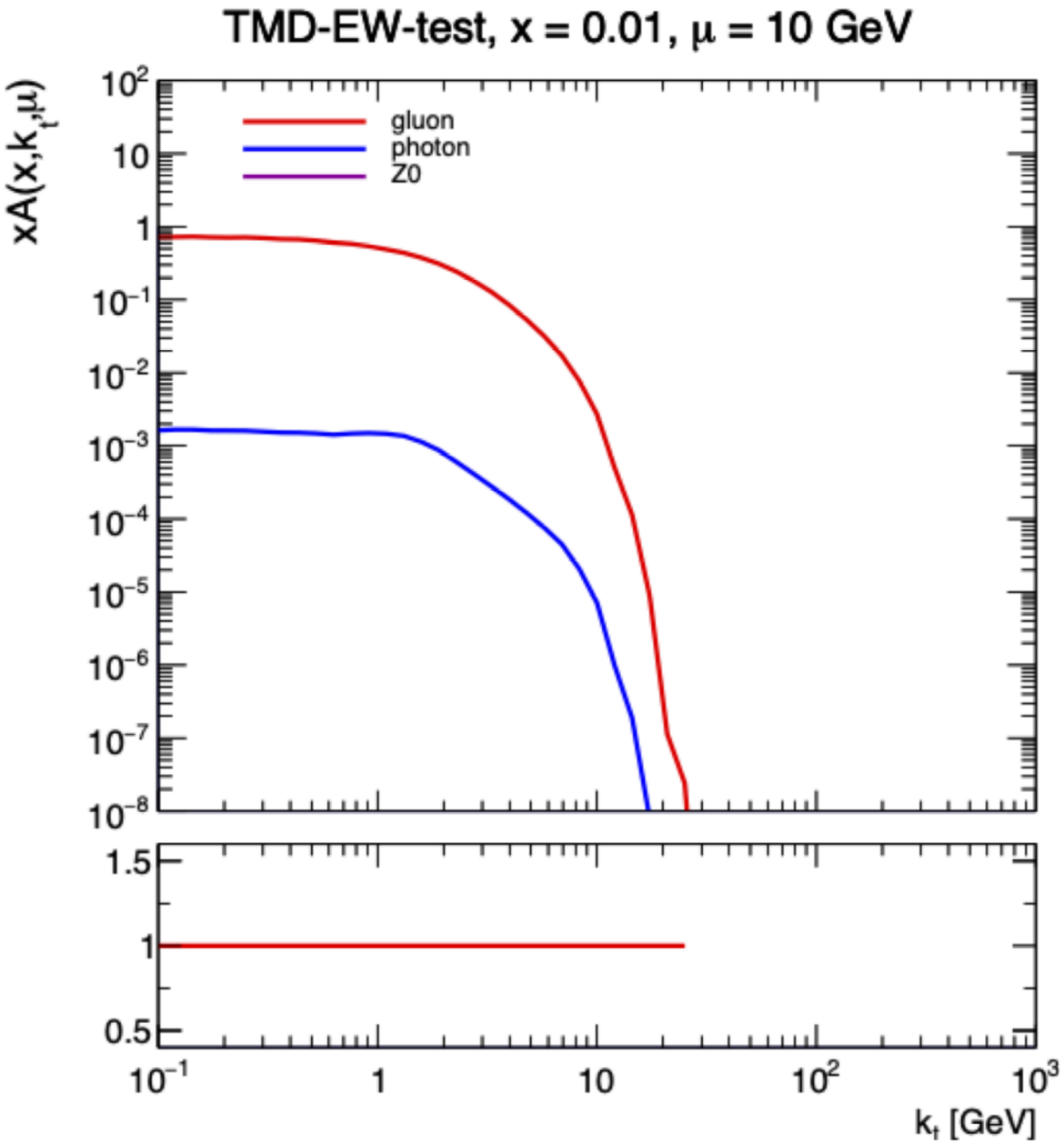
- Integrated PDFs from PB set2

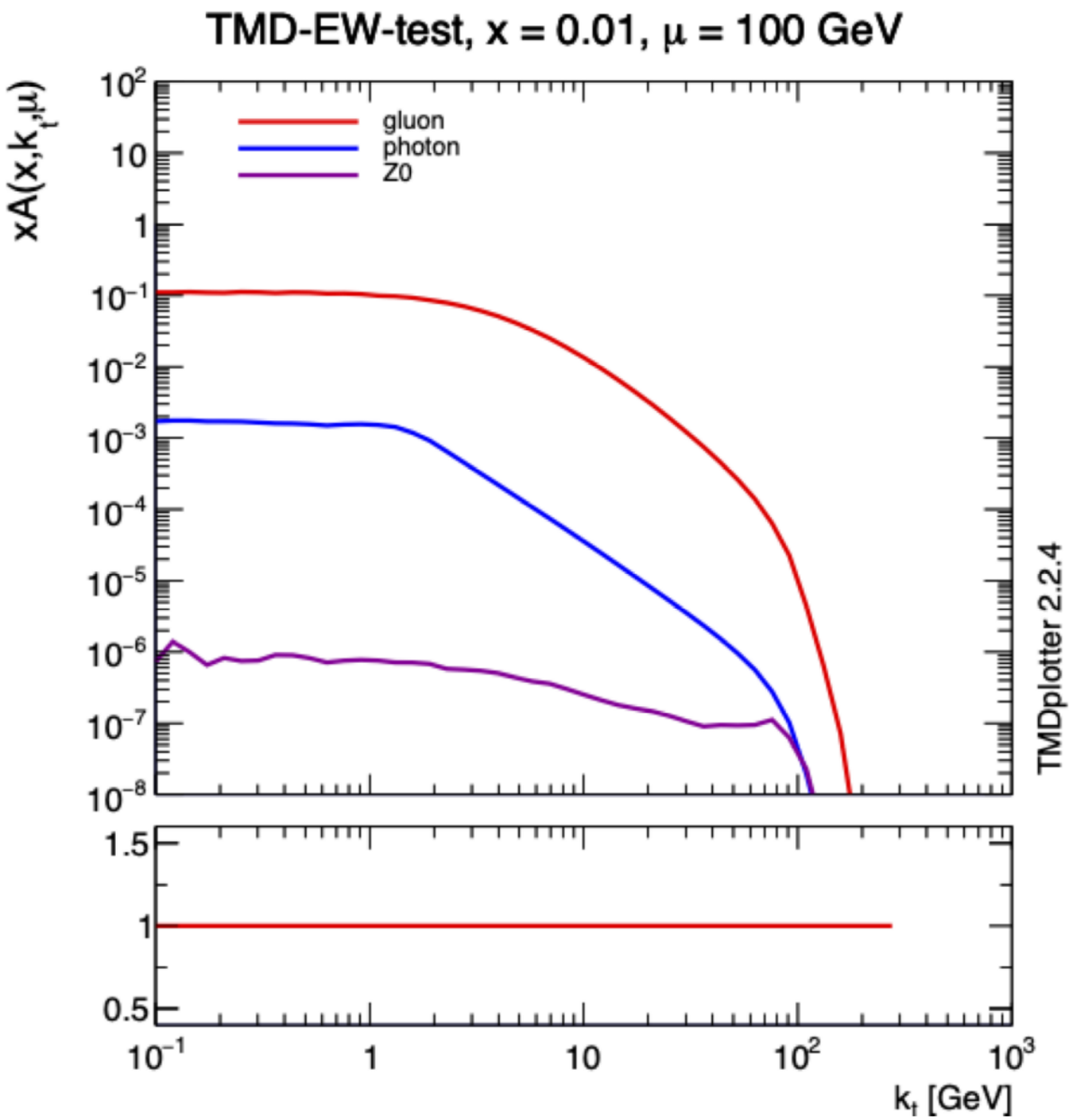




Electroweak TMDs

- Integrated TMDs from PB set2

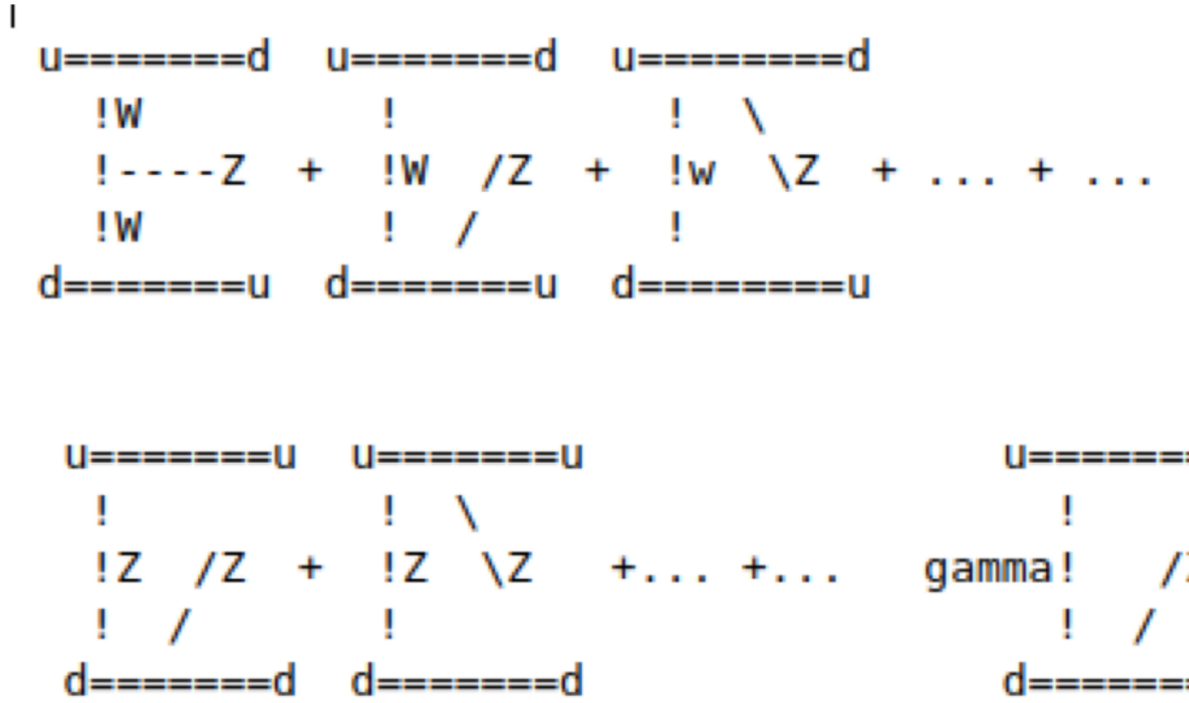




new processes in CASCADE

- new processes for Vector Boson Fusion
  - qq→ Z qq (via W-fusion exchange)

    Matrix elements calculated by Serguei Baranov and Alsu Bagdatova



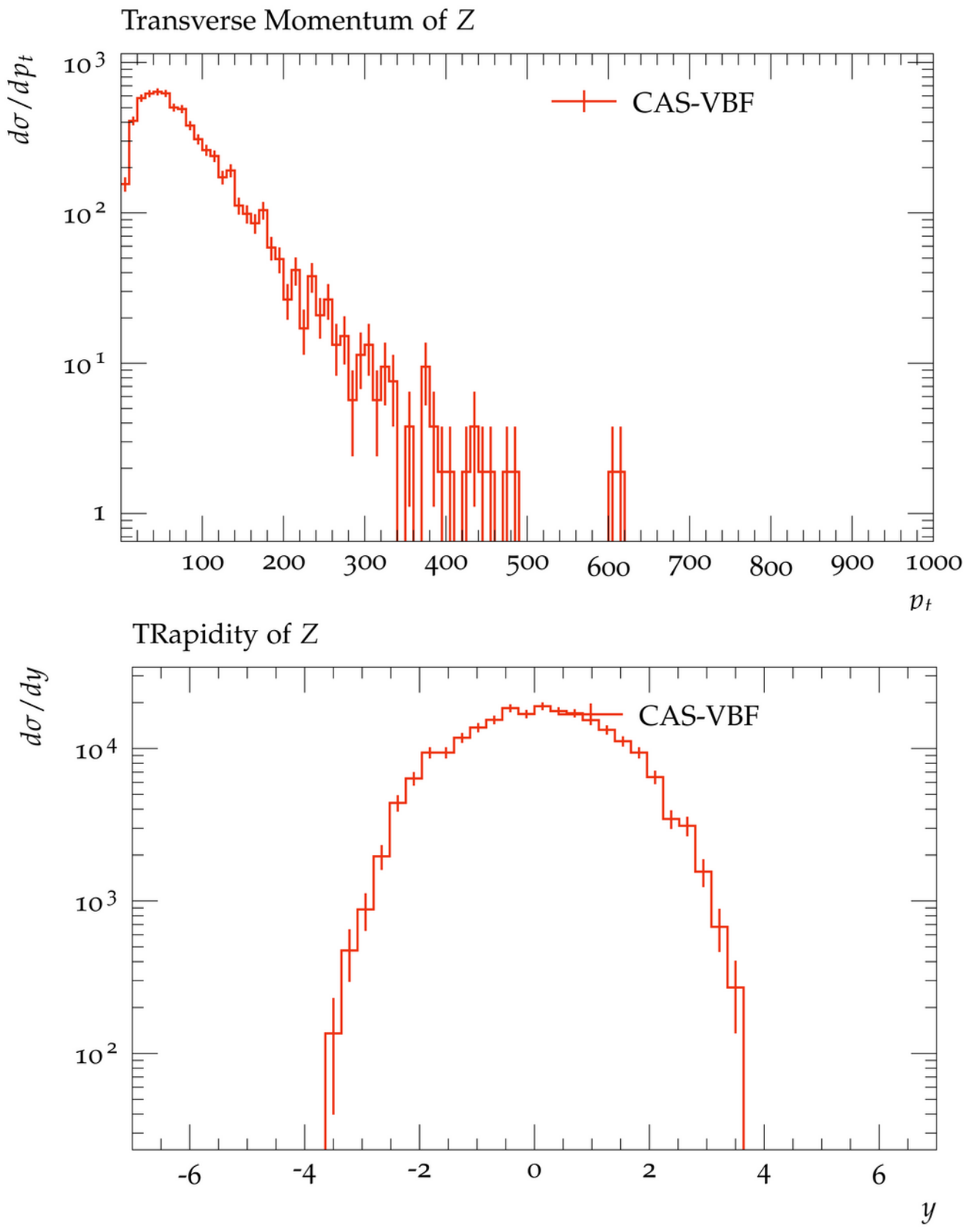
- WW → Z (using W- TMDs)

  calculation of Matrix element done by Serguei Baranov

First results from $qq \to Z_0\, q\, q$

- qq→ Z qq (W fusion)
  - principle works
  - can be used to compare with simulation of WWZ using W-TMD distributions
    - are longitudinal W's important ?

- Further studies and results in presentation of school-intern Moritz Gillen (next talk)



AOB

- Further news ?