



# First $d^2\sigma/dp_T dy$ measurement of $D^0$ photoproduction in PbPb UPCs

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**BALAZS CSABA KOVACS (ELTE, MIT) ON BEHALF OF THE CMS COLLABORATION  
POSTER SESSION, DIFFRACTION AND LOW-X WORKSHOP,  
8-14 SEPT. 2024, PALERMO**

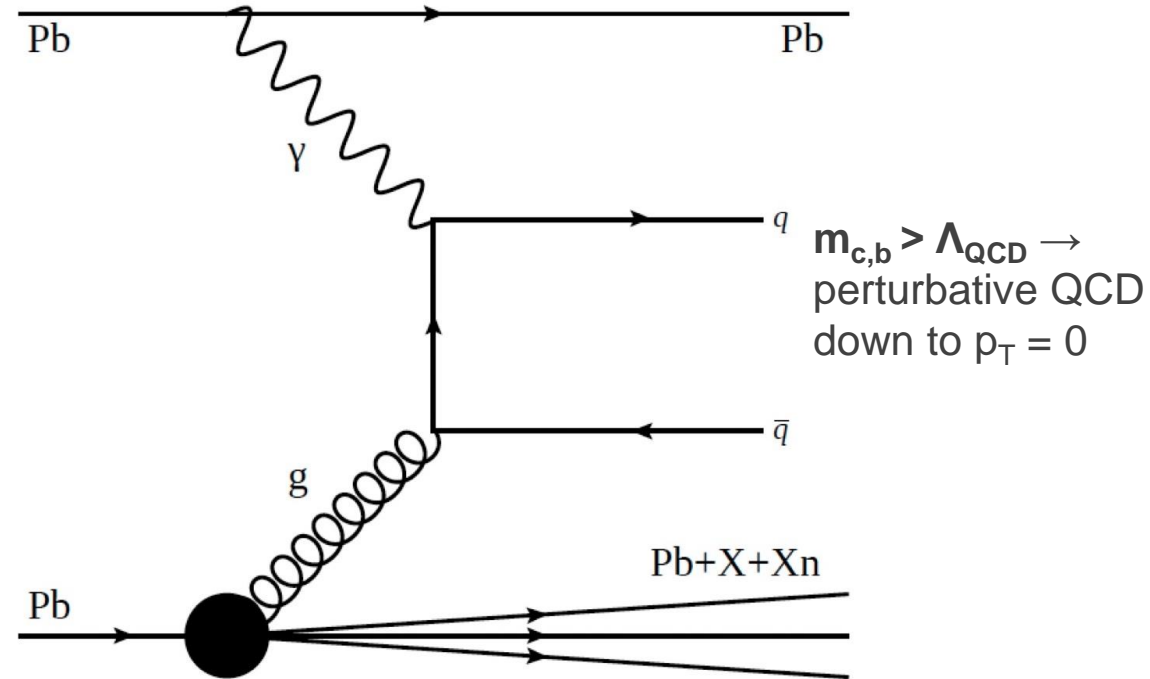


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# Why study charm photoproduction in UPCs?

- Constraints on the nuclear parton-distribution functions (nPDFs) of gluons in a wide region of  $(x, Q^2)$  space
- Clean experimental environment

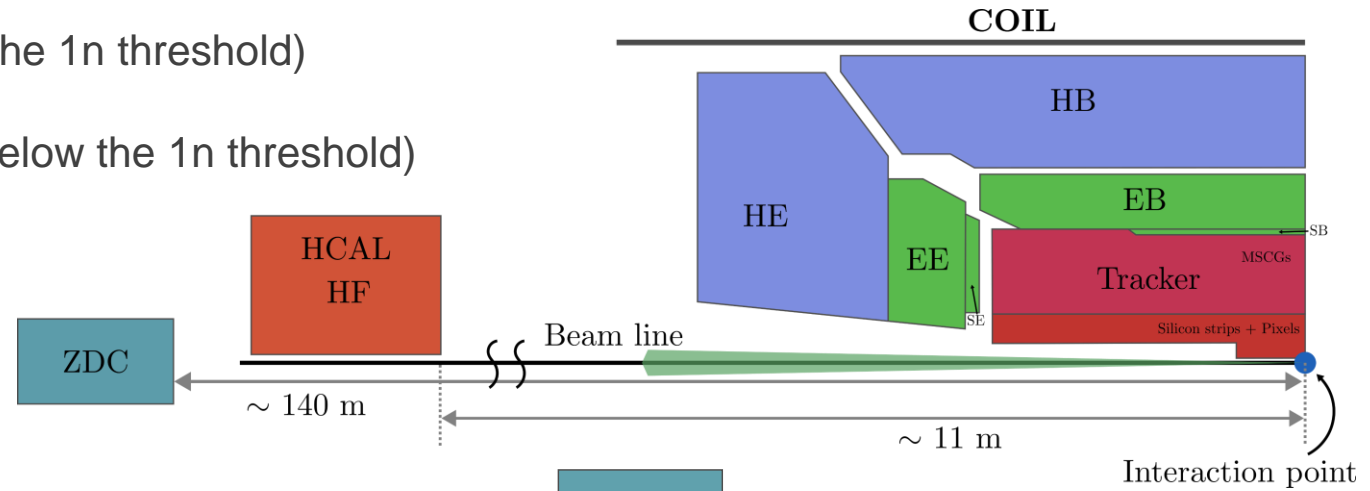


- $D^0$  mesons produced in scatterings of **quasi-real photons** emitted by one nucleus with **partons** from the other colliding nucleus
- Decay channel:  $D^0 \rightarrow K^- \pi^+$  (and charge conj.)



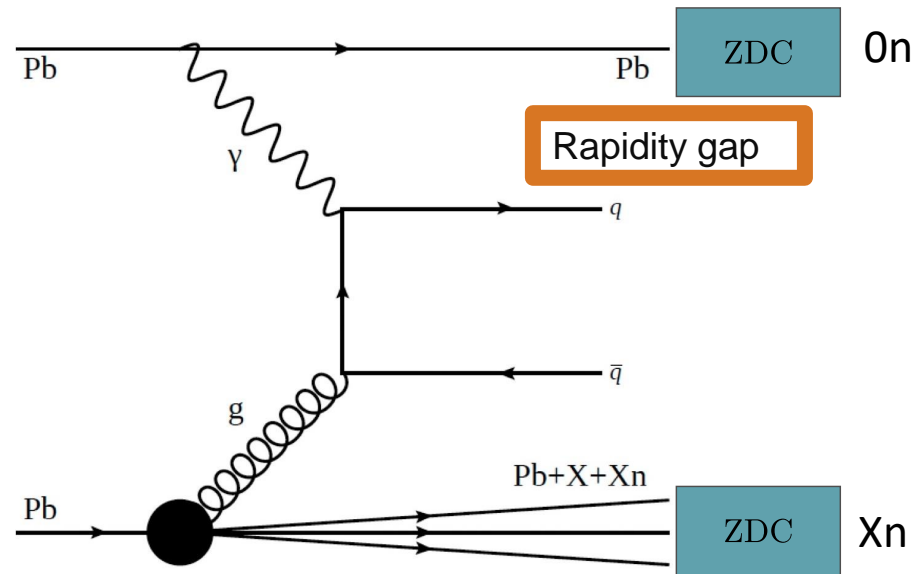
# New trigger strategy for photoproduction

- New Level-1 triggers that use **both ZDC and HCAL/ECAL** information to maximize the statistics of  $D^0$  photonuclear events
- $D^0$   $p_T$  dependent trigger use:
  - **High  $p_T$   $D^0 \rightarrow$  ZDC XOR** (exactly one ZDC above the 1n threshold)  
+ Jet trigger
  - **Low  $p_T$   $D^0 \rightarrow$  ZDC OR trigger** (at least one ZDC below the 1n threshold)



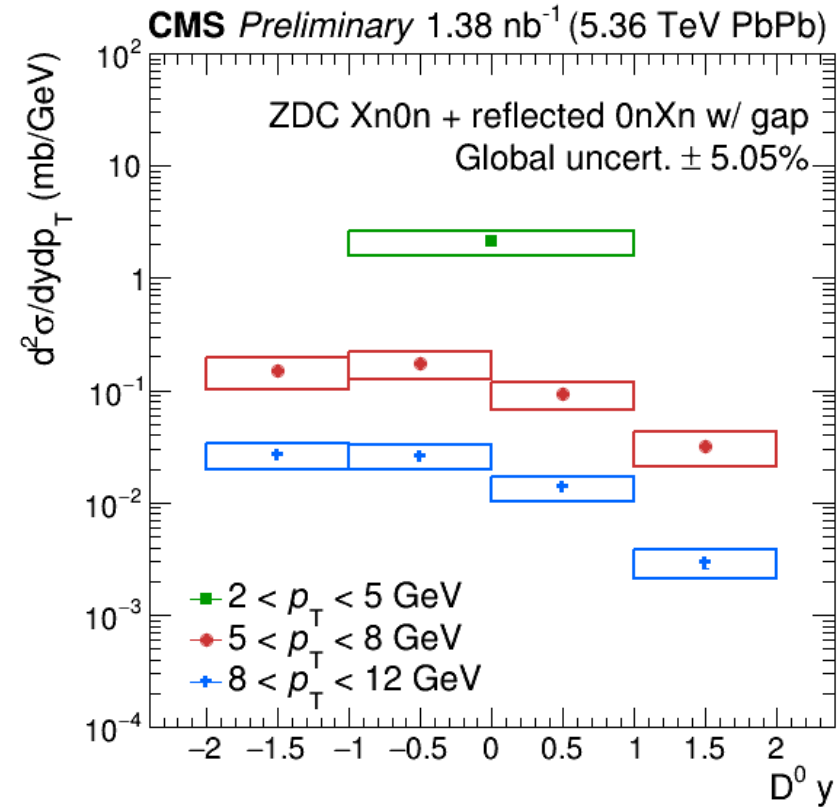
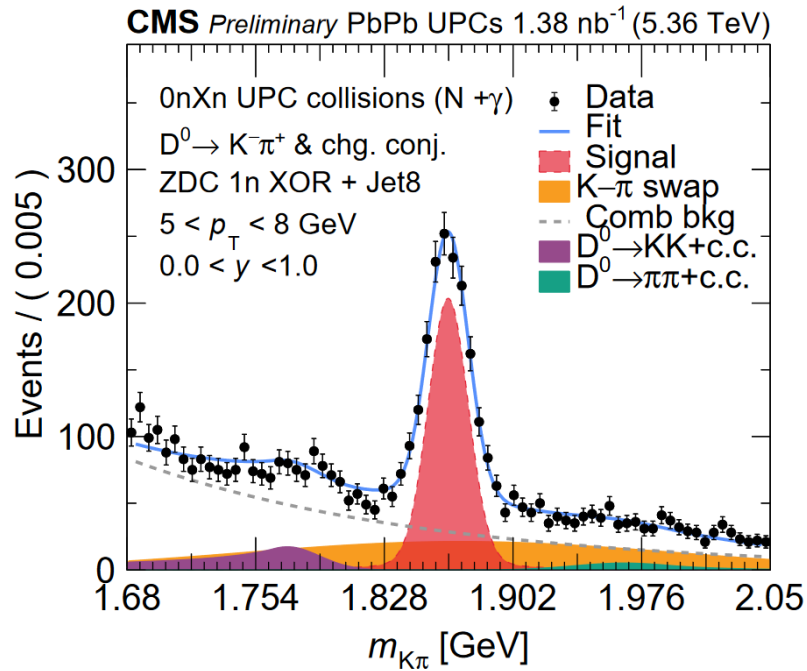
## Main offline event selections

- **ZDC selection:**  $X_n 0_n$  or  $0_n X_n$
- **Rapidity gap** on the side of „empty” ZDC



# Final cross sections

$$\frac{d^2\sigma}{dp_T dy}(D^0 p_T, D^0 y) = \frac{1}{2} \frac{1}{\mathcal{L}\mathcal{B}} \frac{N_{D^0}^{\text{raw}}}{\epsilon_{\text{evt}} \epsilon_{\text{trigger}} P_{\text{prescale}} (\alpha \epsilon_{D^0}) \epsilon_{\text{EM,pileup}}}$$



- **Conclusions:**

- New constraints on nuclear matter with open charmed hadrons in UPCs in a large region of x and Q<sup>2</sup>
- Future: improved (x, Q<sup>2</sup>) reach with lower p<sub>T</sub> measurements, heavy-flavour jets, correlations

**More details on my poster and on Wednesday from Gian Michele Innocenti**



# Thank you for your attention!

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