Search for elliptic azimuthal anisotropies in photon-proton and pomeron-Pb interactions with ultraperipheral pPb collisions with the CMS experiment

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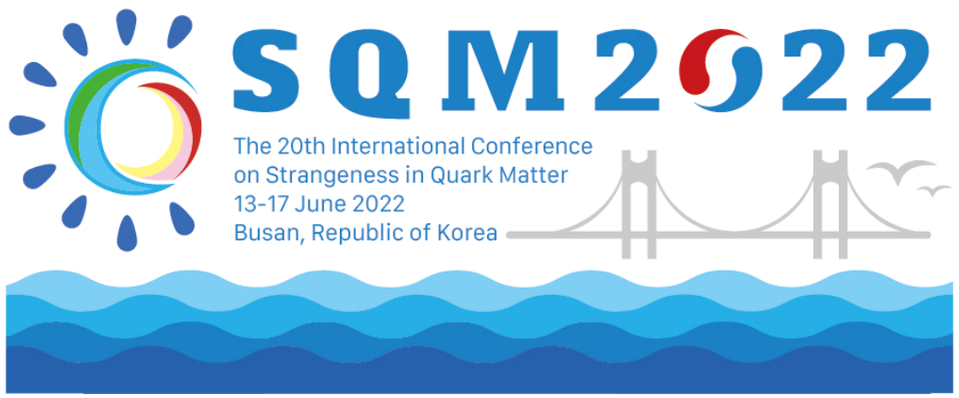
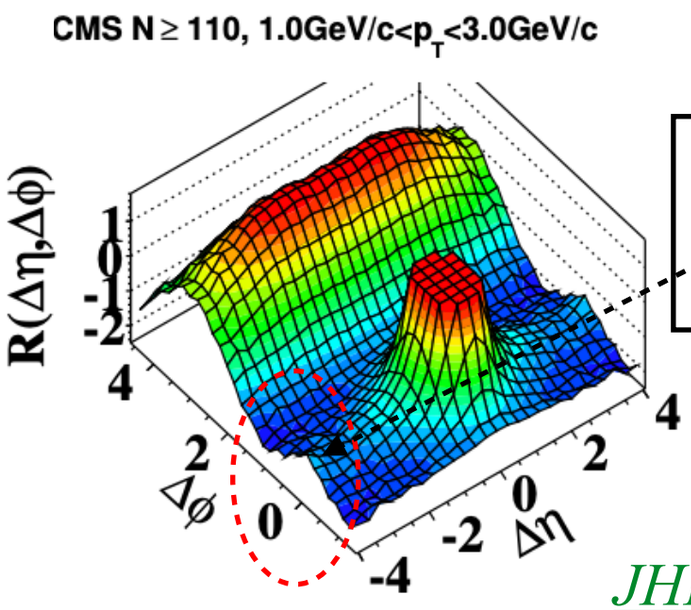
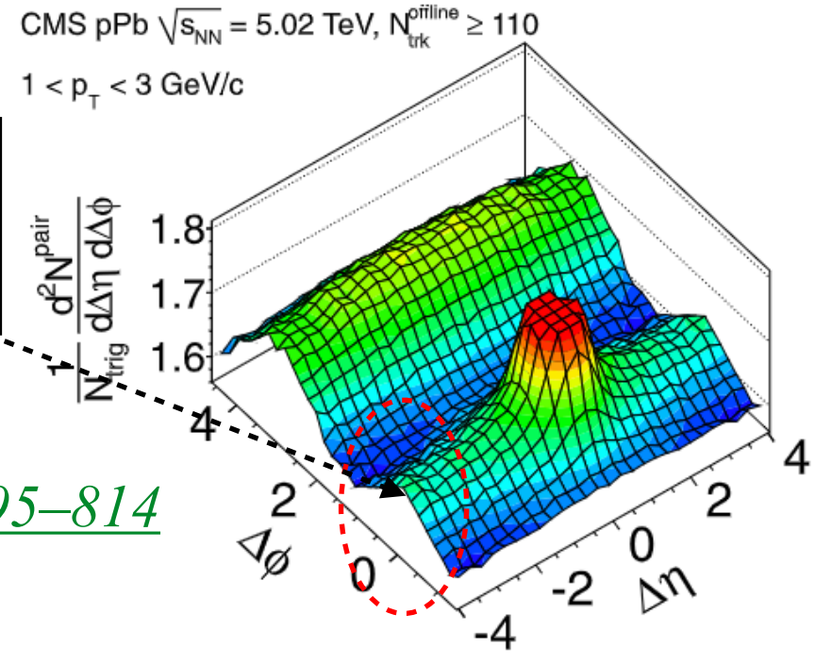


Introduction



Evidence of collectivity in high multiplicity pPb and pp collisions



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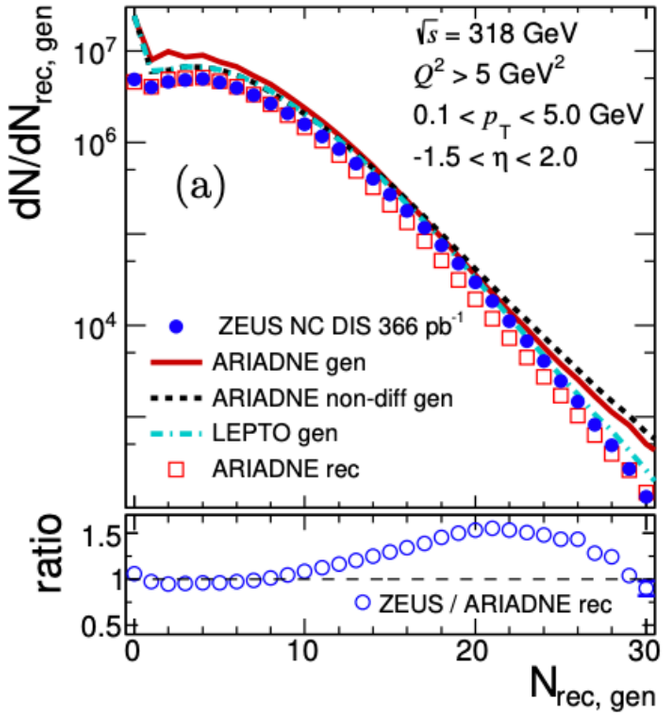
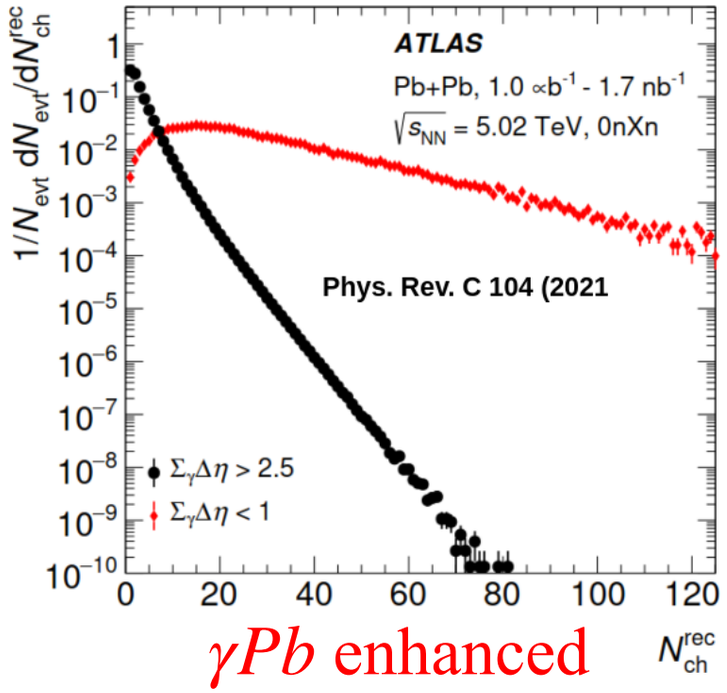
- Electron-ion and gamma-ion systems have been explored by ZEUS and ATLAS.
- No significant long range correlations or no collectivity is observed.





JHEP04(2020)070 *ep* system

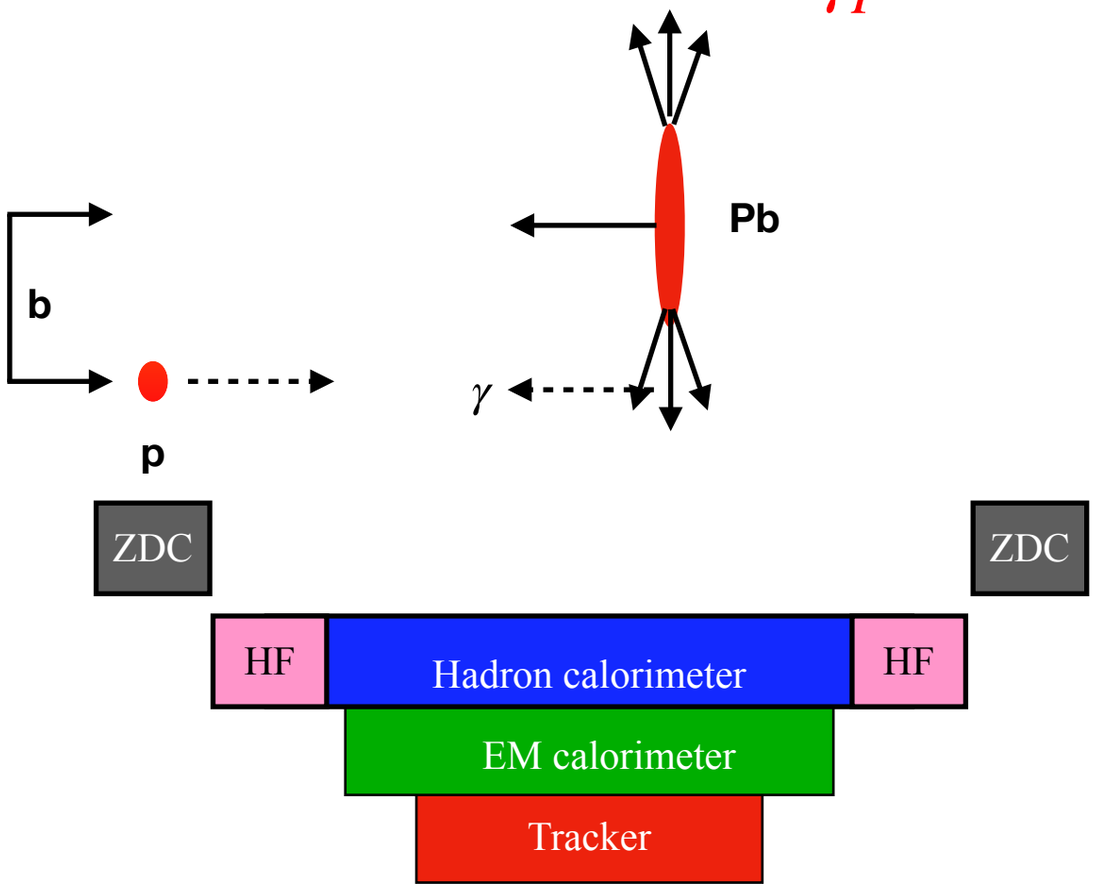
γPb enhanced *Phys. Rev. C 104, 014903*

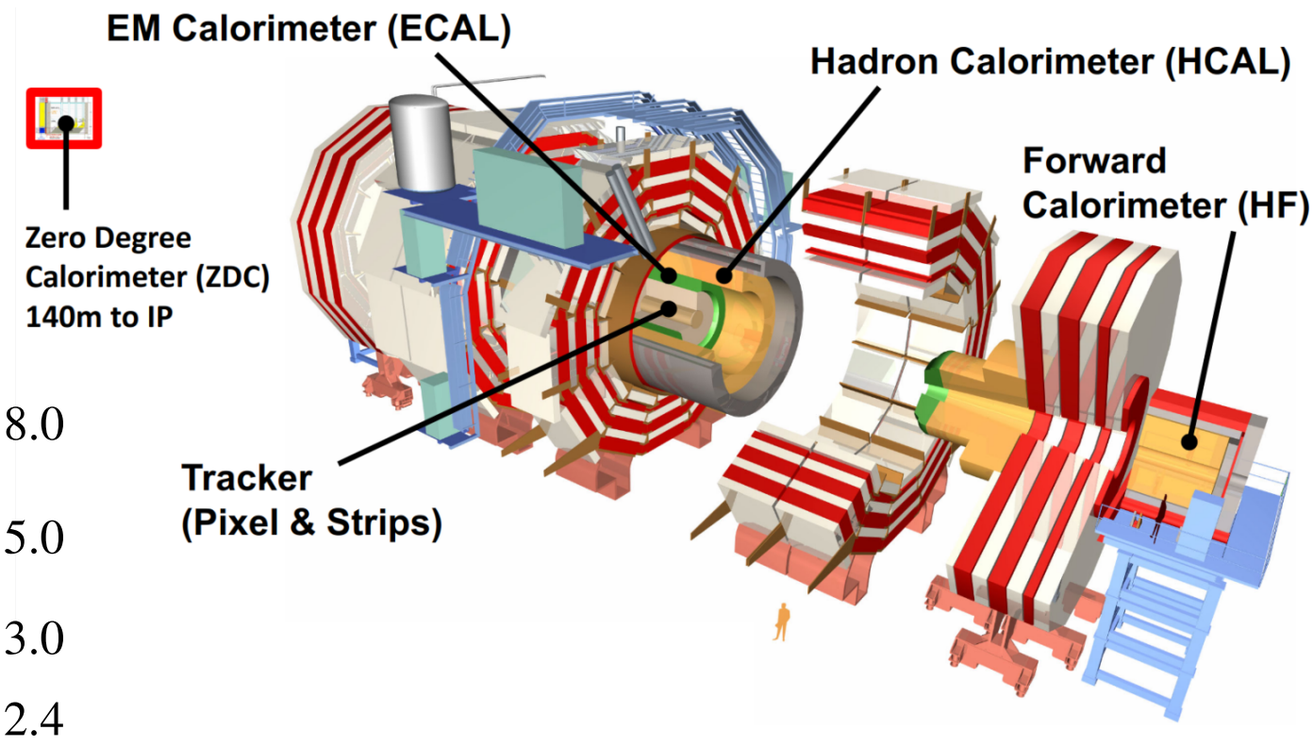
Selecting ultra peripheral collisions (UPC) at CMS

Zero Degree (ZDC) and hadron Forward (HF) calorimeters

- ZDC calorimeter ensures no neutrons are detected in the intact Pb nucleus side which is the source of the photon flux. Additionally HF confirms the activity on the proton side. Also, the tracker system is deployed to identify the presence of a rapidity gap that characterises the events.

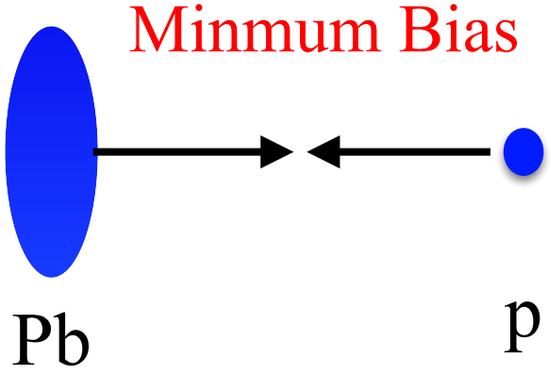
γp enhanced system





Two particle correlation in UPC pPb

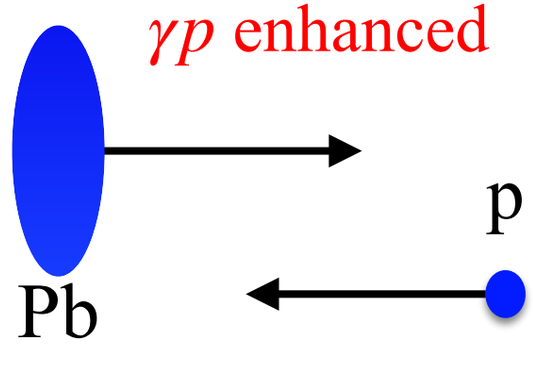
Minmum Bias

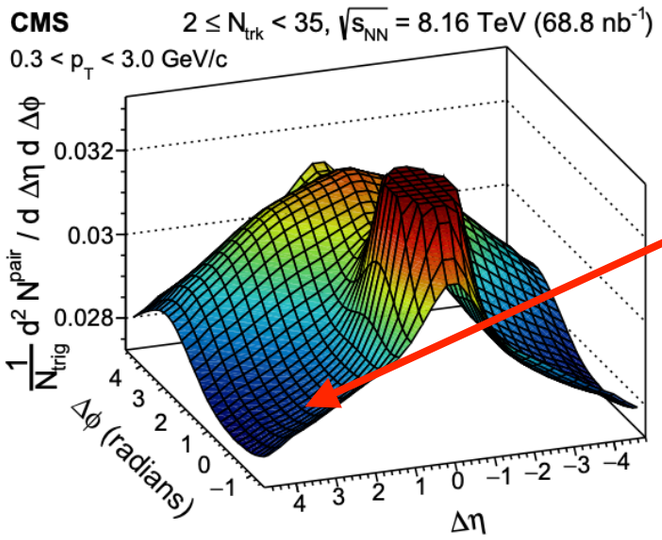


CMS FIRST measured

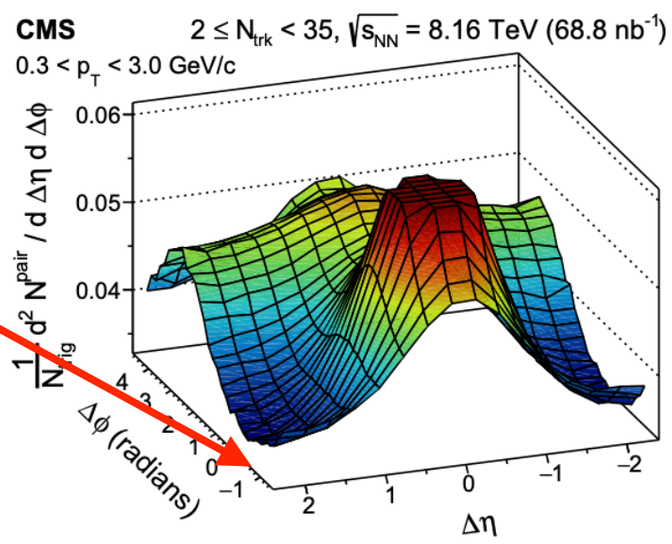
Extending correlation in smaller system

γp enhanced

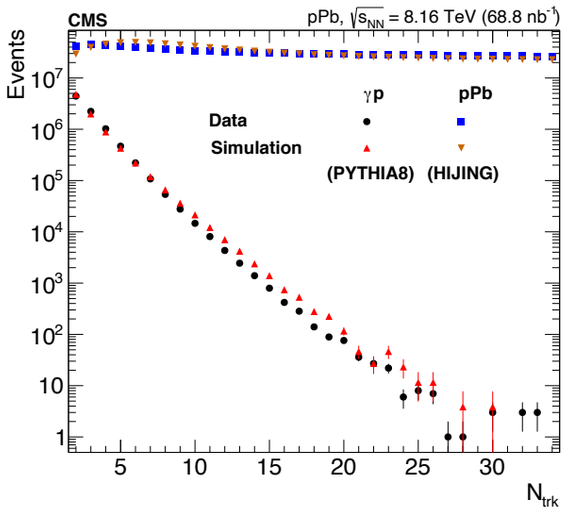




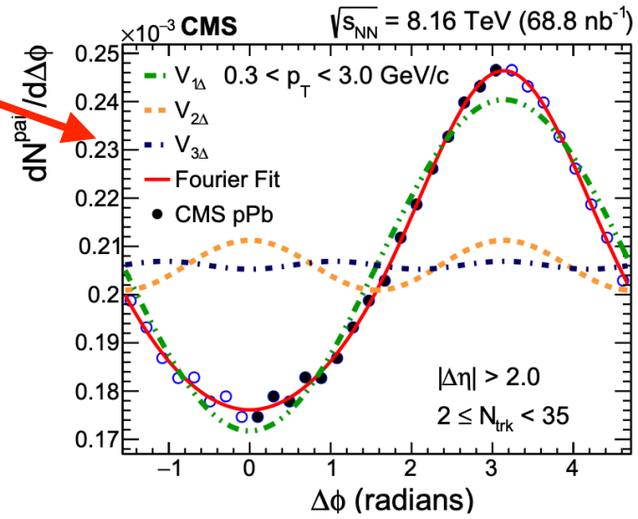
No evidence of ridge structure



Fitted with the Fourier decomposition series and $v_{n\Delta}$ values are extracted.

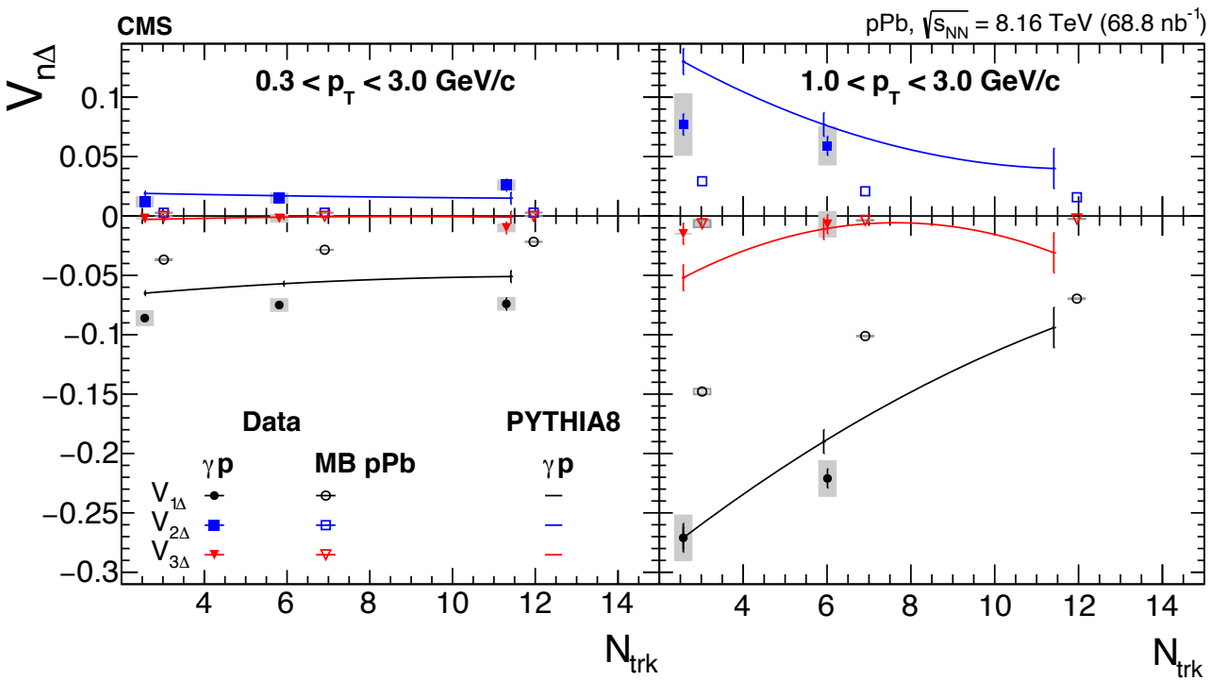


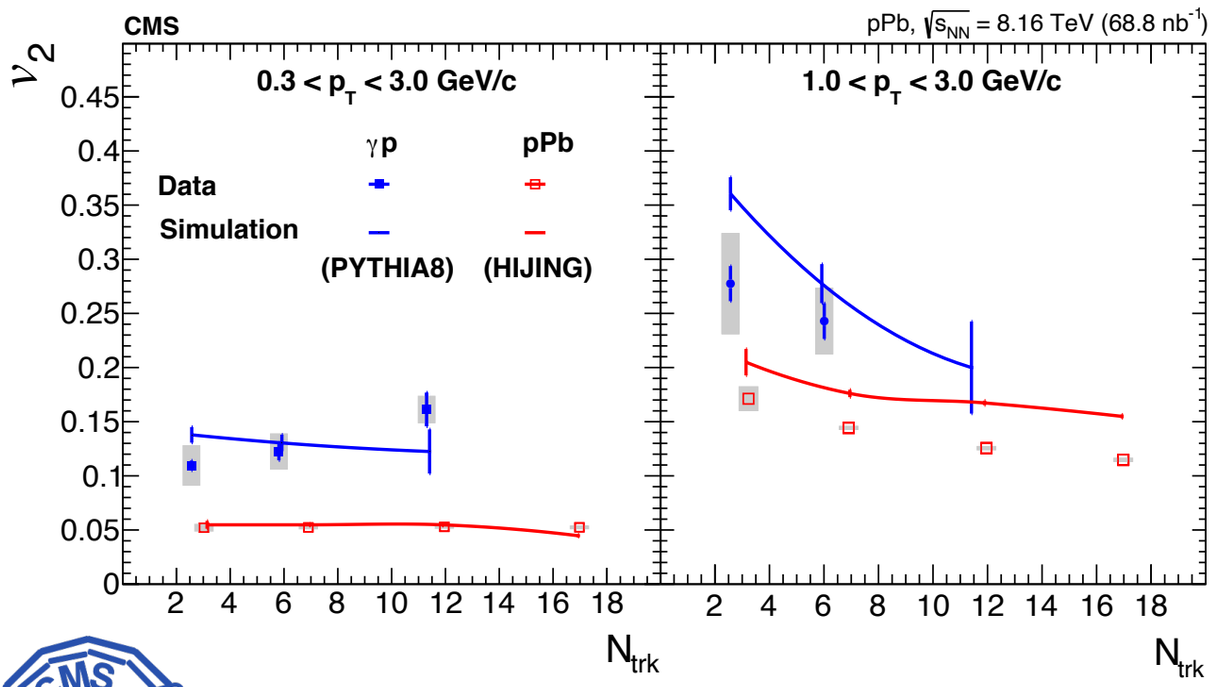
Kinematic cut : $p_T > 0.4$, $|\eta| < 2.4$, $N_{trk} < 35$ (shows in the left figure)



Submitted to PLB *arXiv:2204.13486v1*

Fourier coefficients





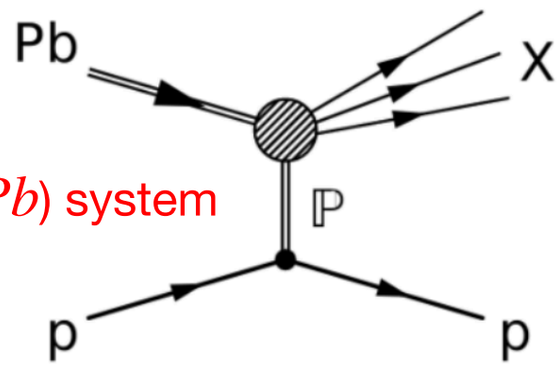
- The positive ($v_{2\Delta}$) and negative ($v_{1\Delta}$) values are suggesting a strong effect of jet-like correlations.
- Predictions from the PYTHIA8 and HIJING models describe well the γp and pPb MB data at low p_T.
- Models do not have collective effects, the data suggest the absence of collectivity in the γp system over the multiplicity range explored in this work.

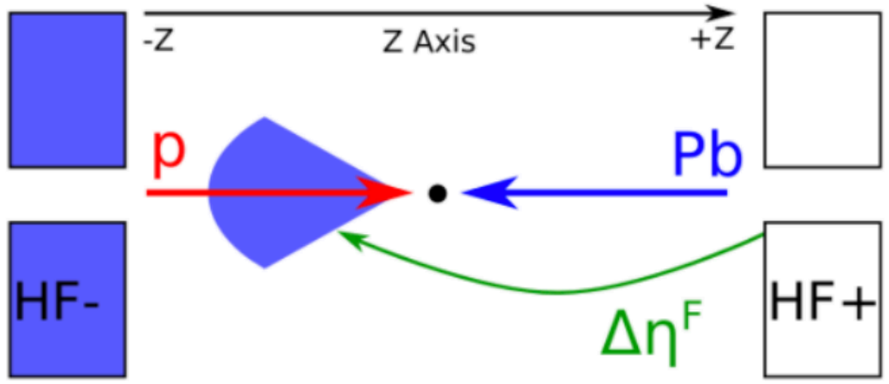
arXiv:2204.13486v1 *Submitted to PLB*

Summary

- The long-range two particle correlations has been extended to photon-proton (γp) interactions first time in CMS. Similarities studies over electron-ion system.
- No evidence of ridge structure is observed in γp or pPb MB hadronic collisions.
- The γp data are consistent with model predictions that have no collective effects thus suggesting the absence of collectivity in the γp system over the multiplicity range explored in this work.

Pomeron lead ($I\!PPb$) system





Forward rapidity gap

- Diffractive components of $I\!PPb$ type of interactions can be characterised by the presence of forward rapidity gap.

Thank you!