6. miniworkshop difrakce a ultraperiferálních srážek

Azimuthal anisotropies in coherent ρ^0 production

Guillermo Contreras

Czech Technical University in Prague

Děčín

September 15, 2023

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Analysis performed by **Andrea** Riffero

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.... QM interference .... and spin degrees of freedom ...

Further information

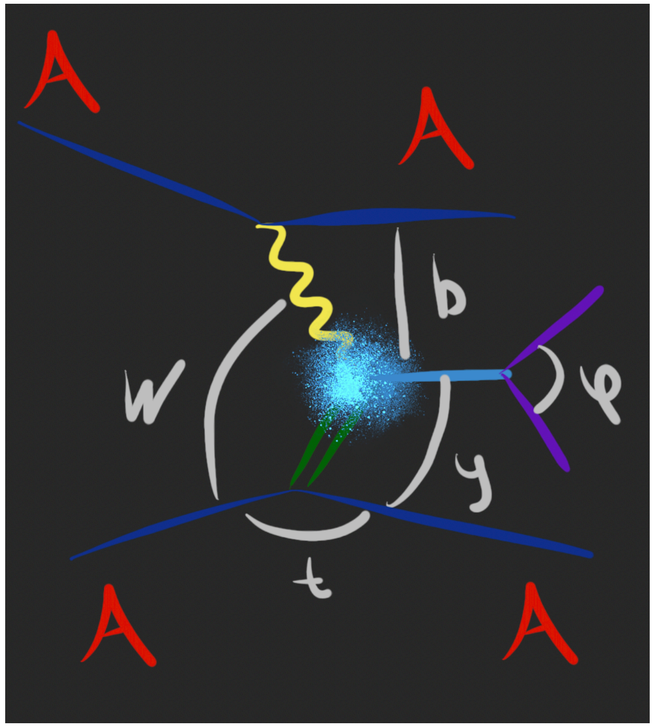
AN: https://alice-notes.web.cern.ch/node/1387

PF: https://indico.cern.ch/event/1310105/contributions/5527292/attachments/2694526/4681497/azimuthAnis_QM_preliminary_Riffero.pdf

QM poster: https://alice-conferences.web.cern.ch/node/66110

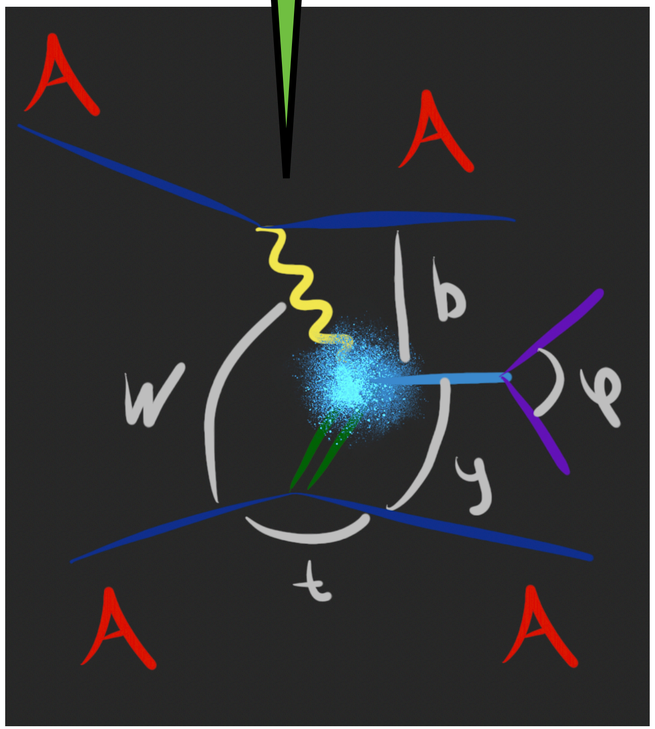
Paper: https://alice-publications.web.cern.ch/node/9523

Coherent $\rho^0 \rightarrow \pi^+\pi^-$ production in ALICE



Coherent $\rho^0 \rightarrow \pi^+\pi^-$ production in ALICE

The photon has a **spin**



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Linear polarisation along the impact parameter

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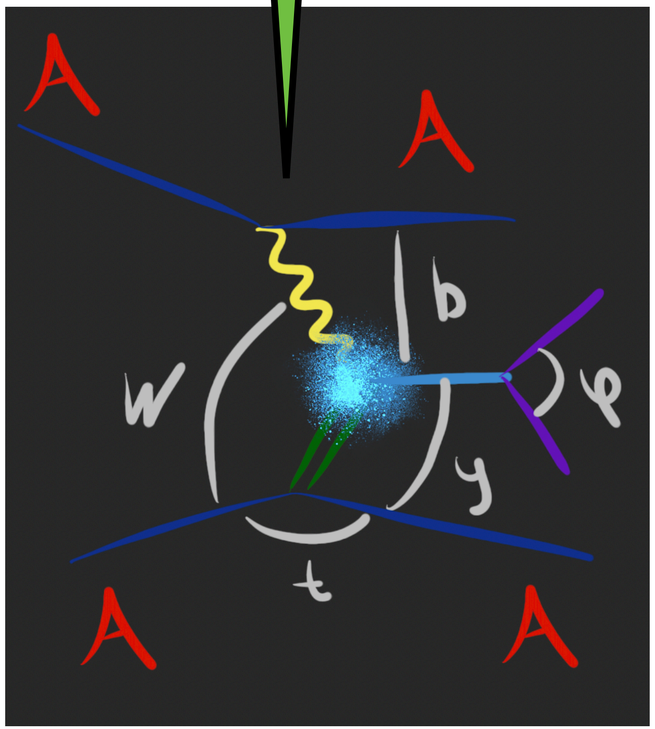

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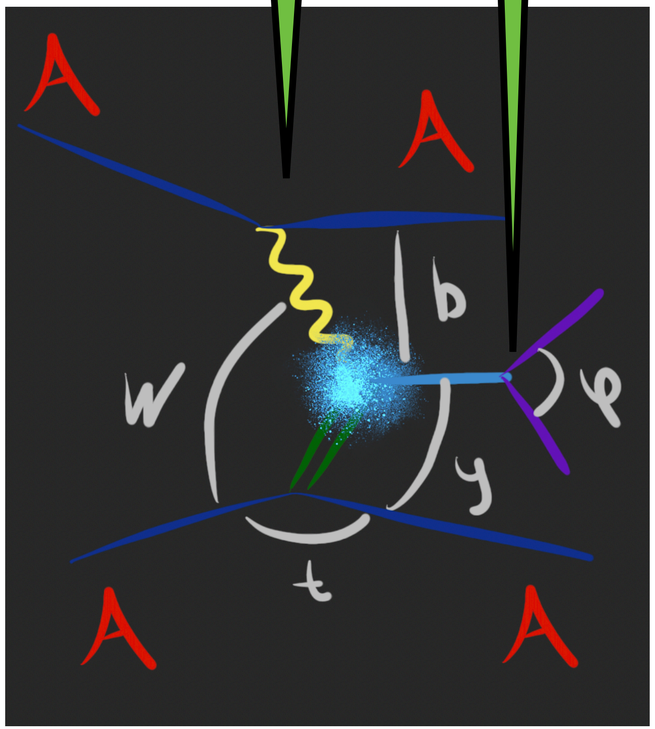

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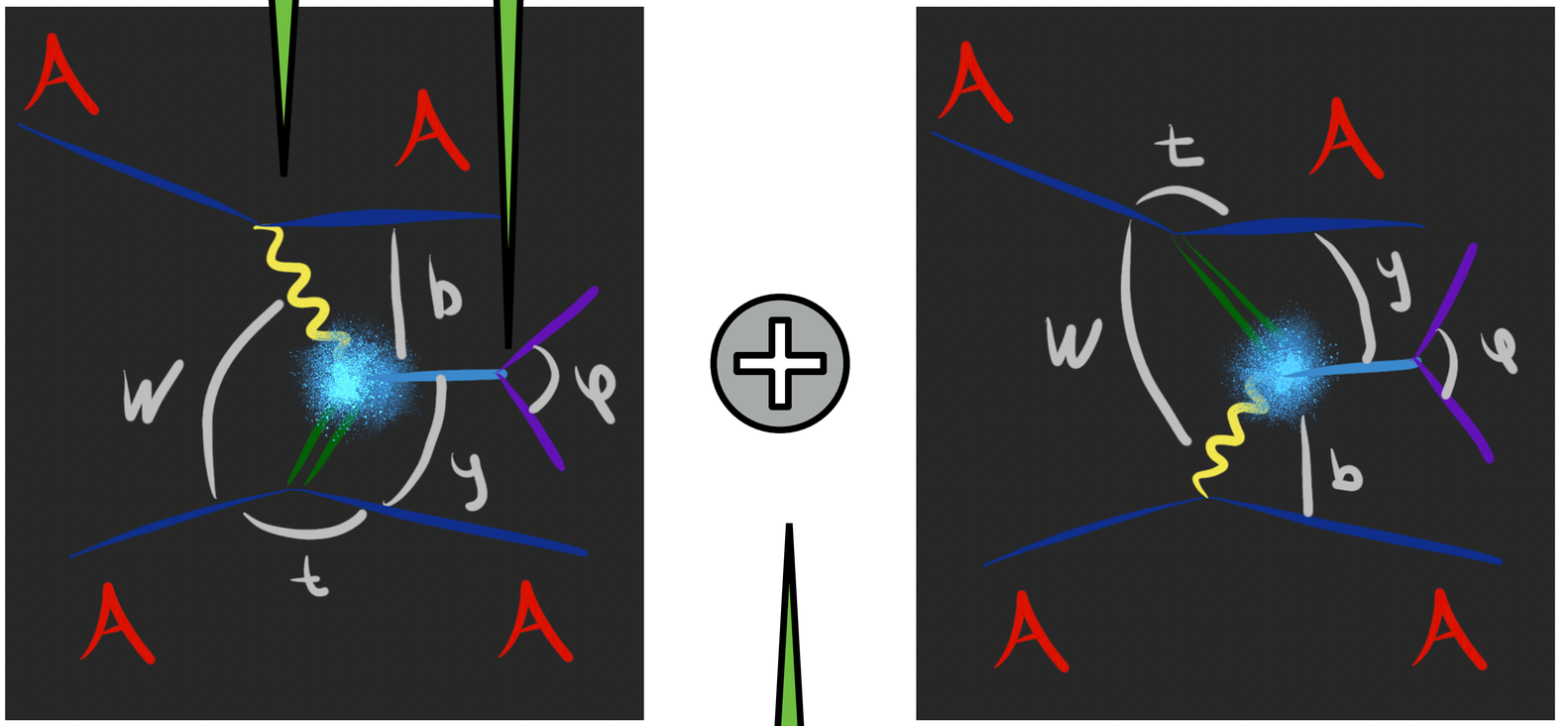

Interference and the decay into to scalar particles produces a $\cos(2\phi)$ modulation

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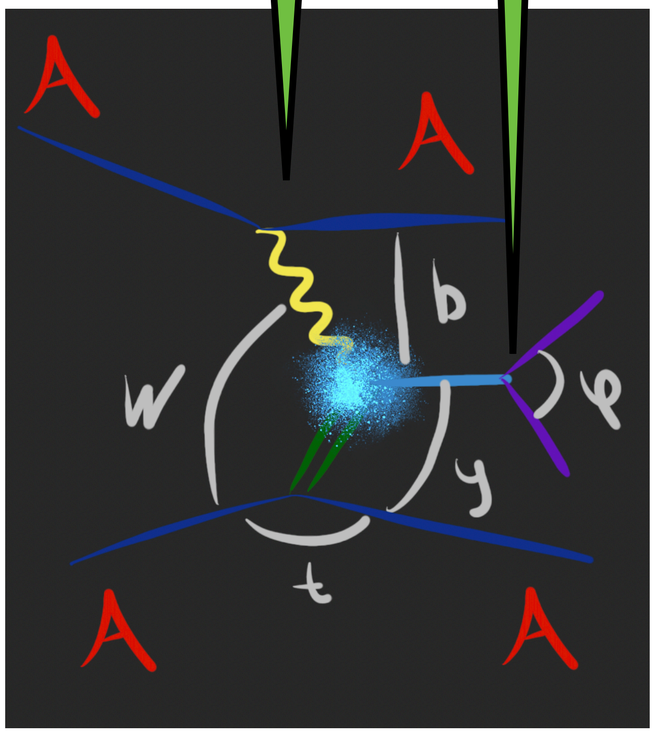

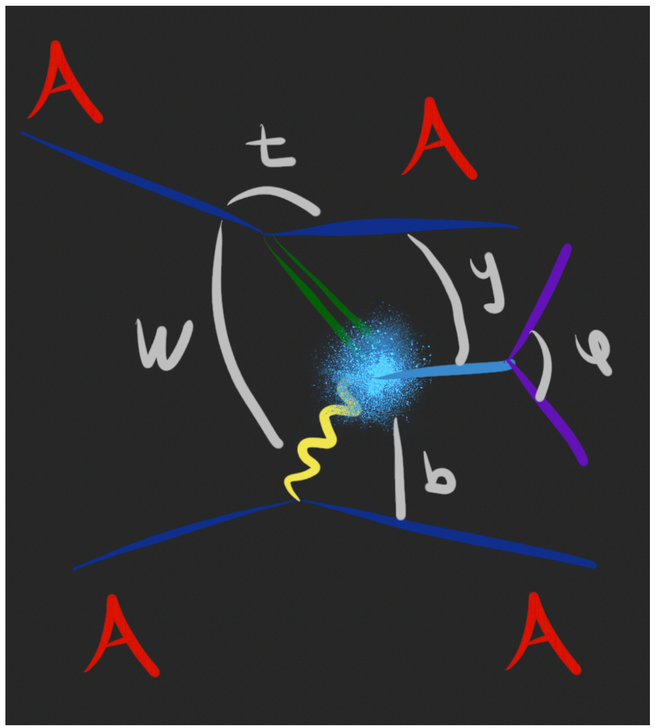

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ϕ is the **azimuth** angle between the sum and the difference of the **pion** four-vectors

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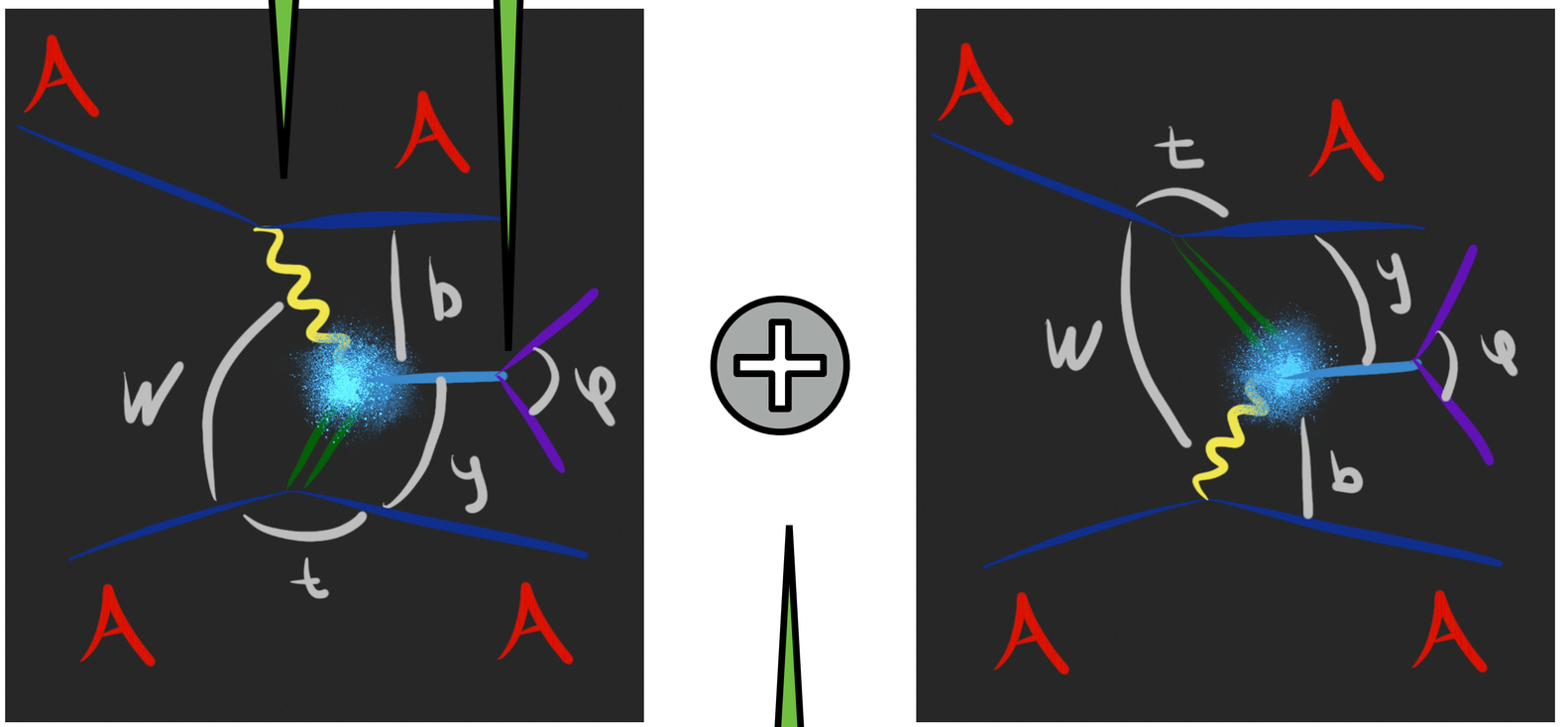

Interference effects are more **important** at mid-rapidity, where both amplitudes are similar, and at small impact parameters

Interference and the decay into to scalar particles produces a $\cos(2\phi)$ modulation

ϕ is the **azimuth** angle between the sum and the difference of the **pion** four-vectors

Data analysis

Data

2015 Pb-Pb data at 5.02 TeV
CUP9 trigger (vetoes in AD/V0 and 0STP)
Lumi ≈ 0.48 1/μb

Paper: https://alice-publications.web.cern.ch/node/9523

PF: https://indico.cern.ch/event/1310105/contributions/5527292/attachments/2694526/4681497/azimuthAnis_QM_preliminary_Riffero.pdf

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Standard event, track and pion-pair selection
Three neutron classes: 0n0n, 0nXn, XnXn
15 ϕ bins in each class
AxE from STARlight
Soeding-like invariant mass fit in each bin
Simultaneous fit in all three classes

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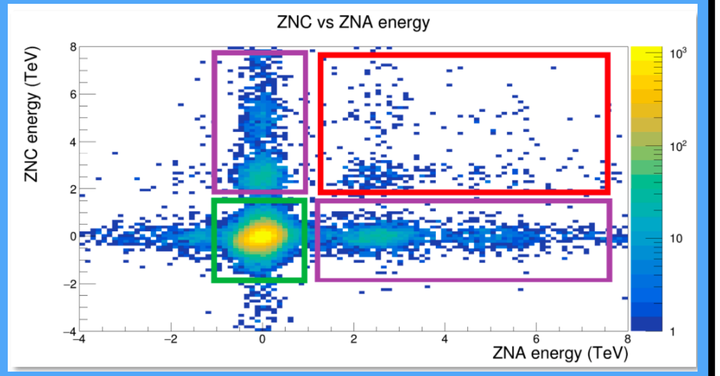

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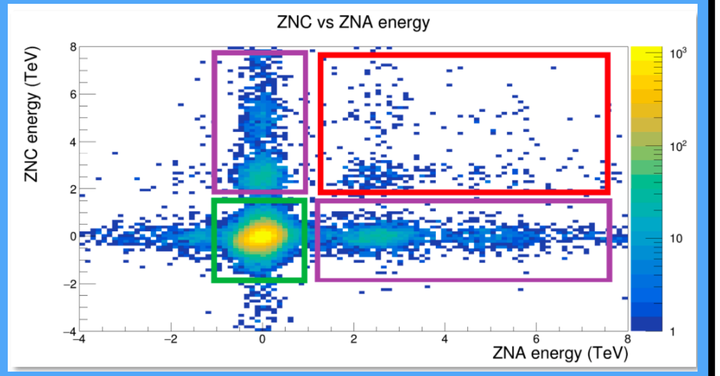
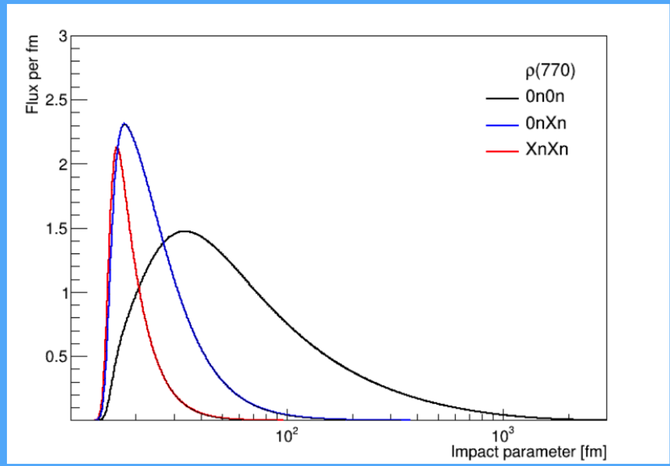


Selection of impact-parameter ranges



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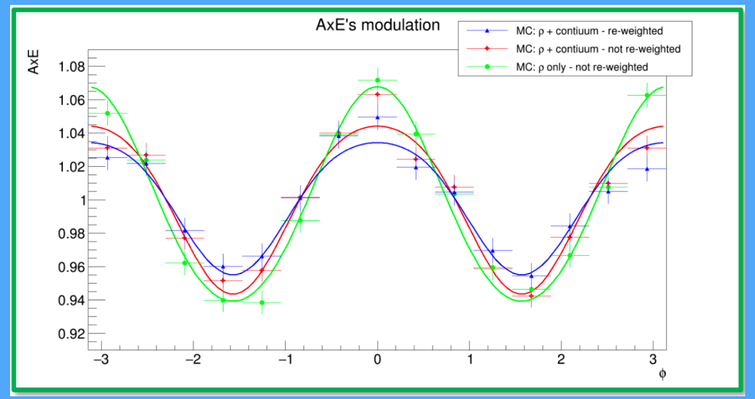
STARlight needed reweighting



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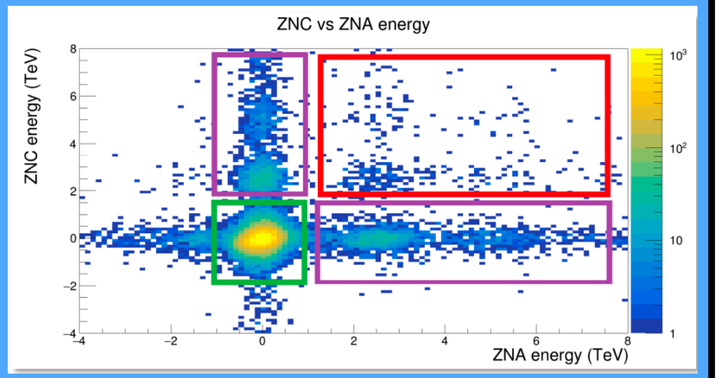

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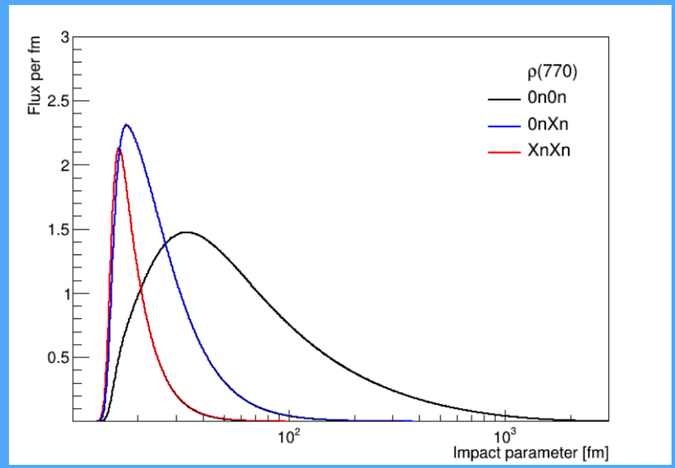

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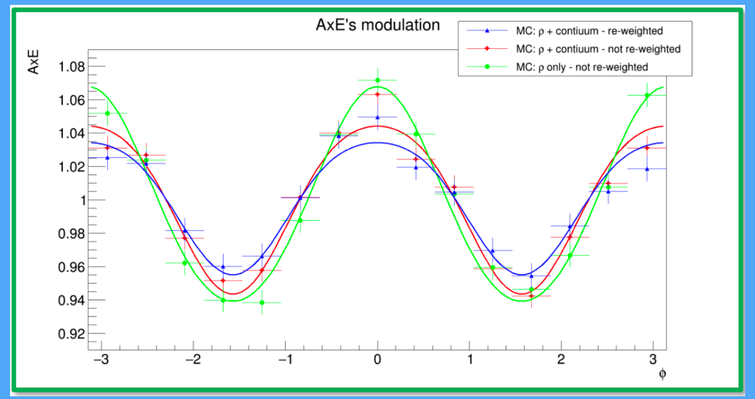

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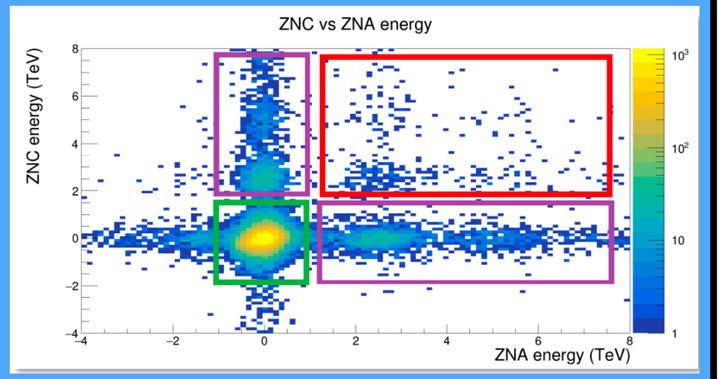

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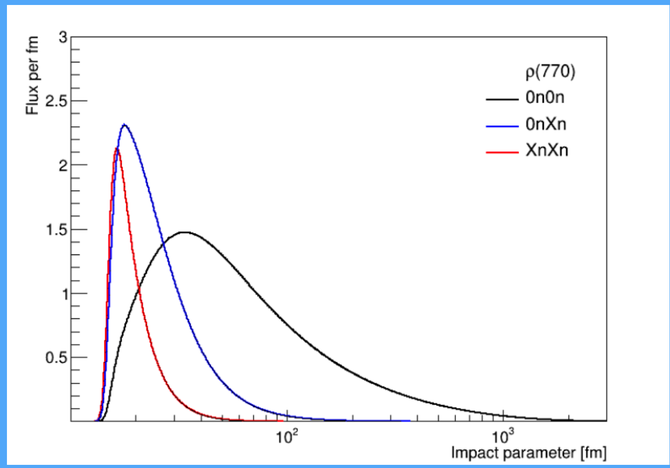
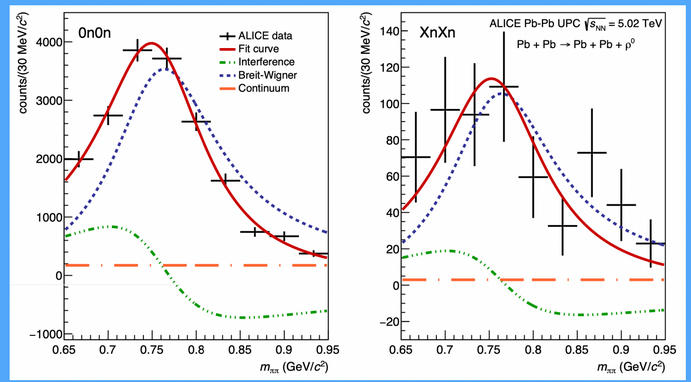


Example of mass fit



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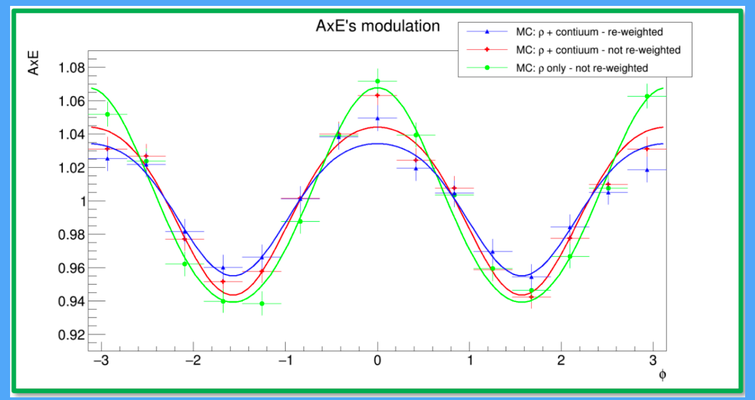

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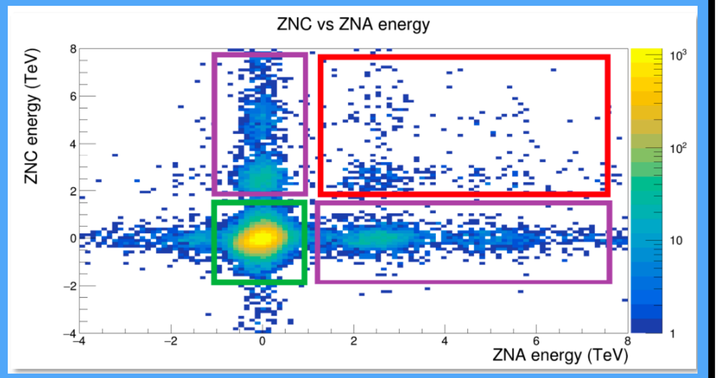

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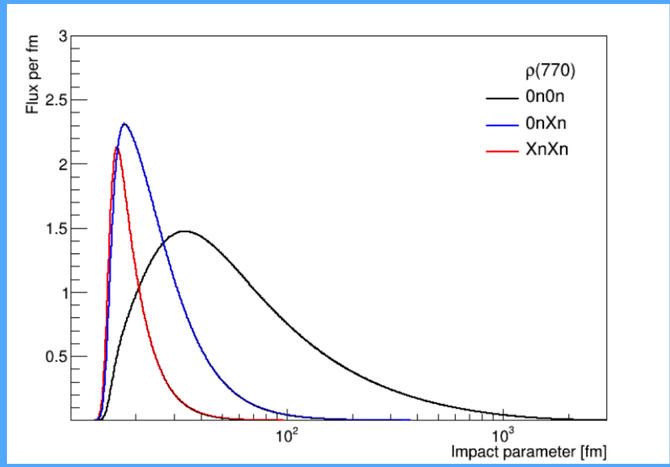
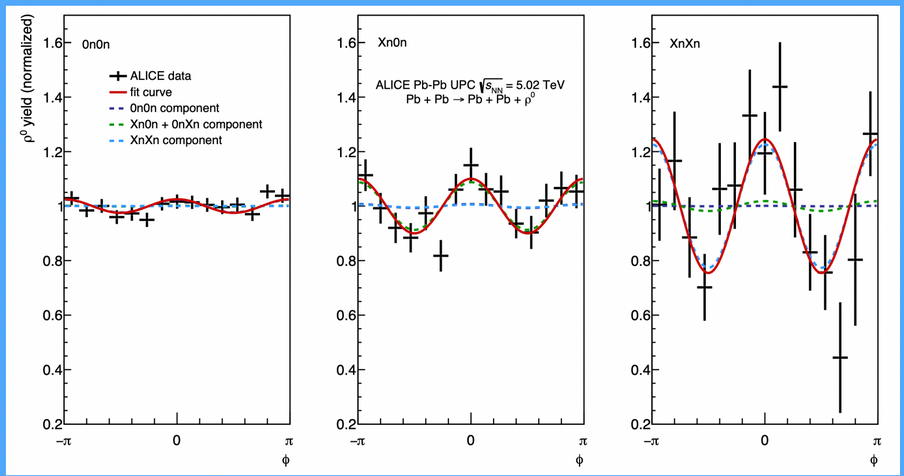


Simultaneous fit to account for migrations



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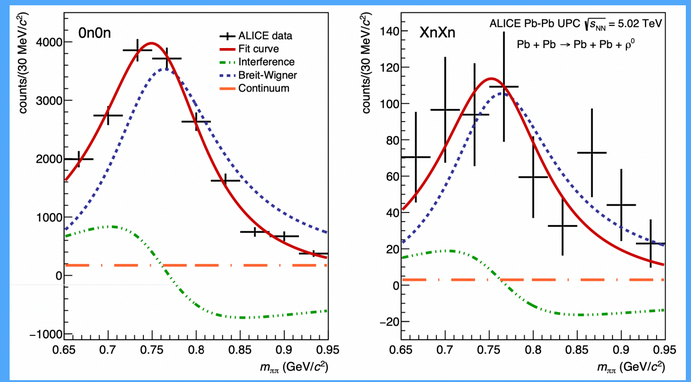

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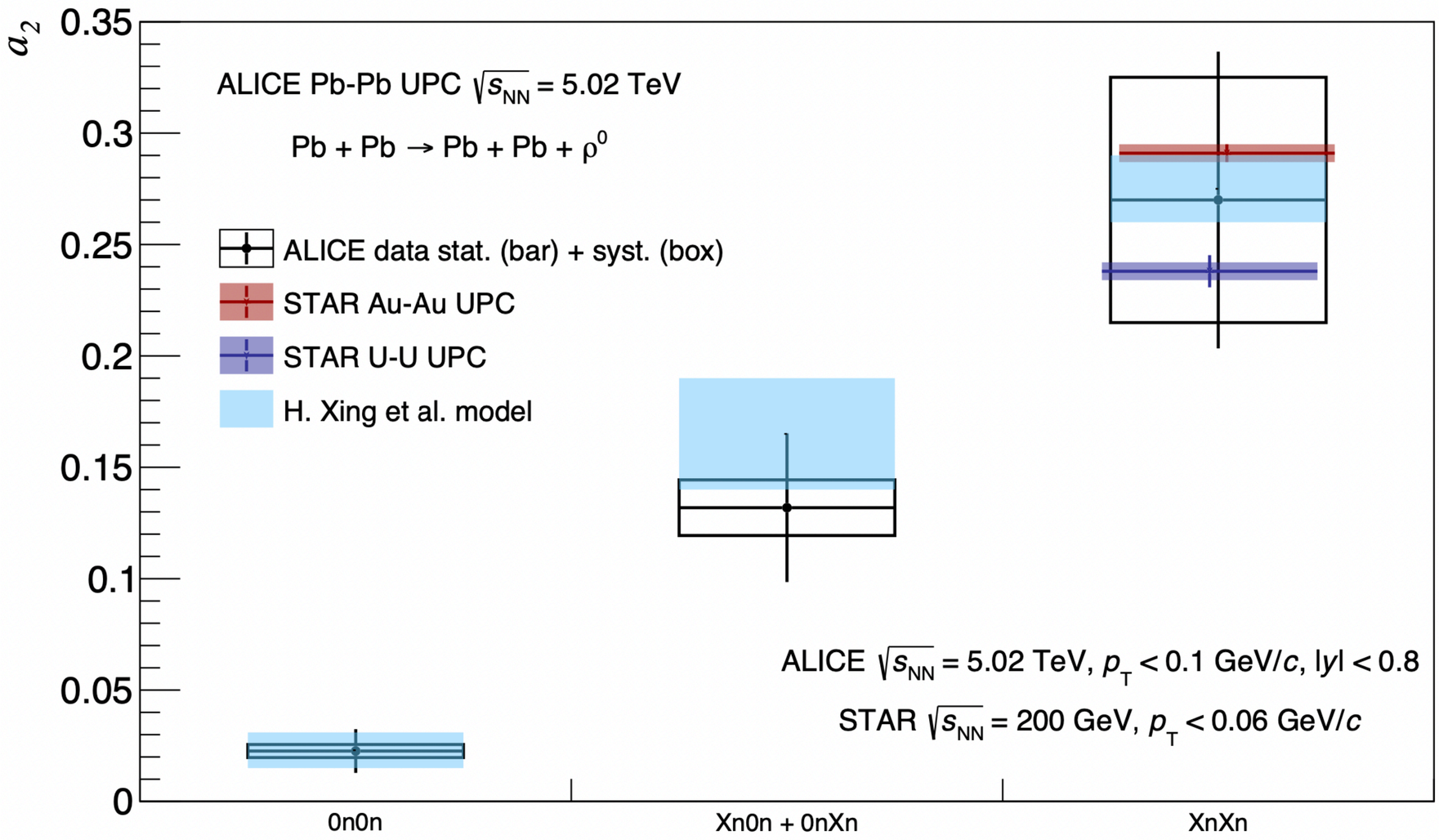
Results



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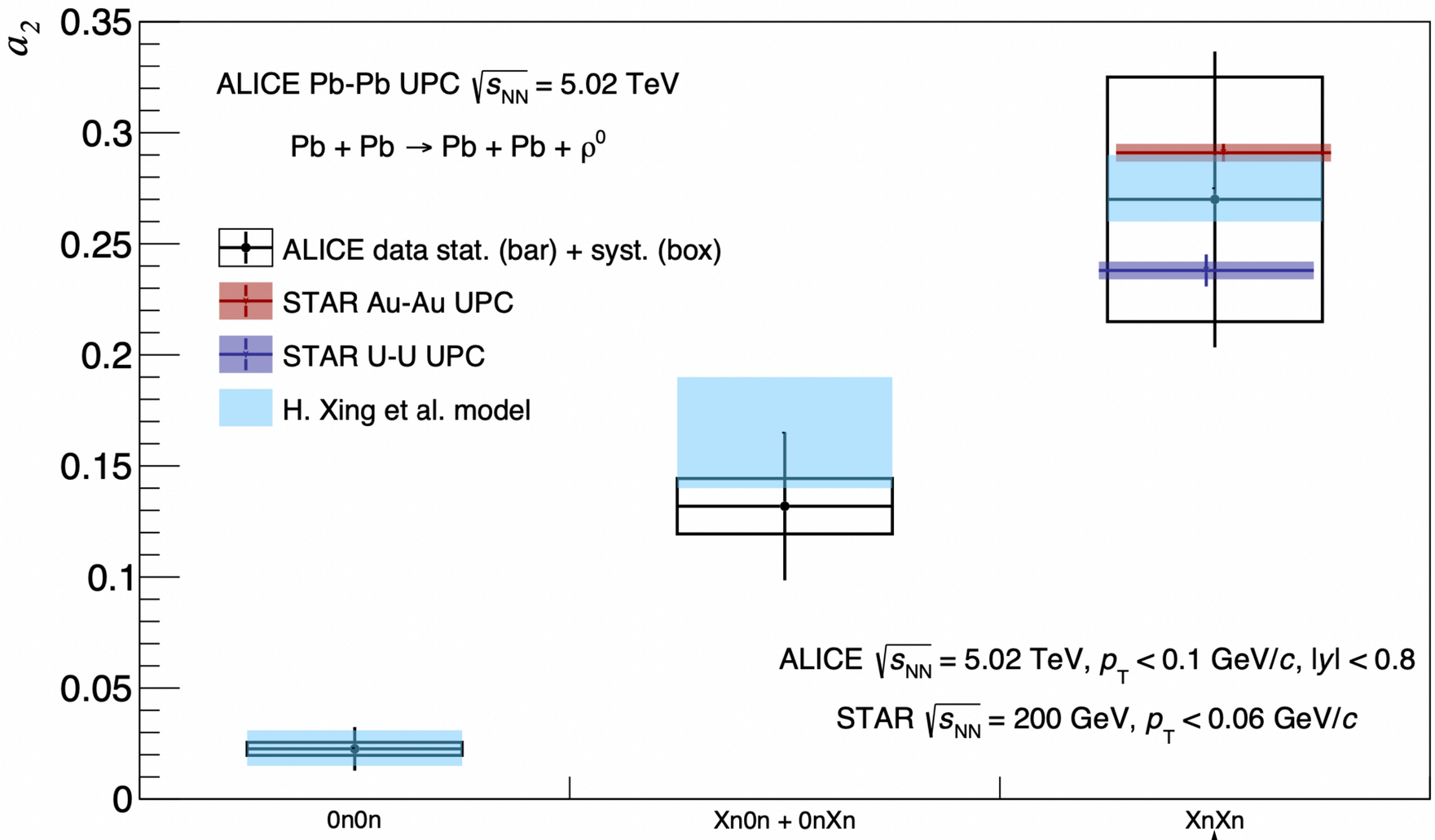

Neutron classes ≈ impact parameter ranges

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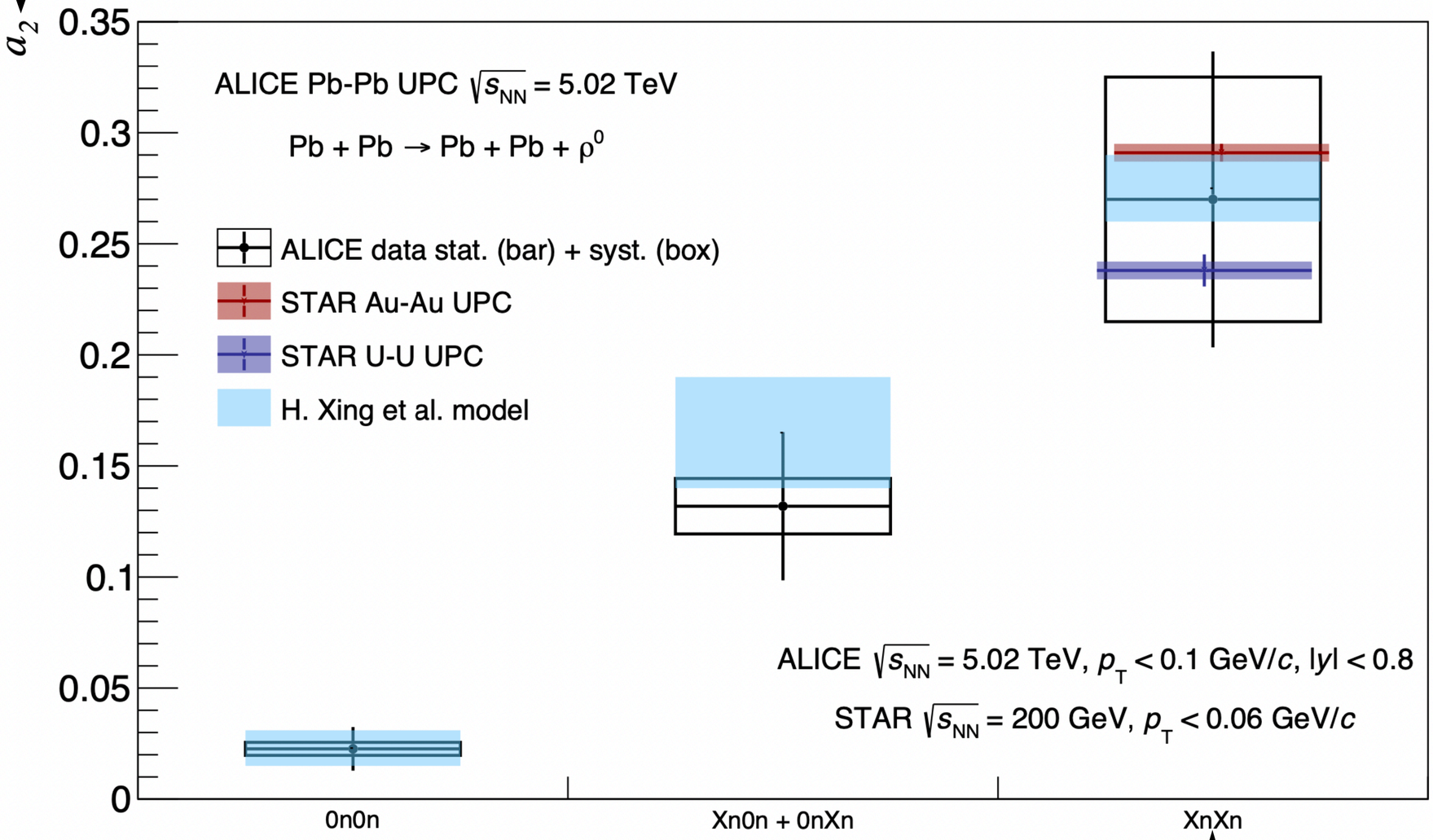
amplitude of $\cos(2\phi)$ modulation



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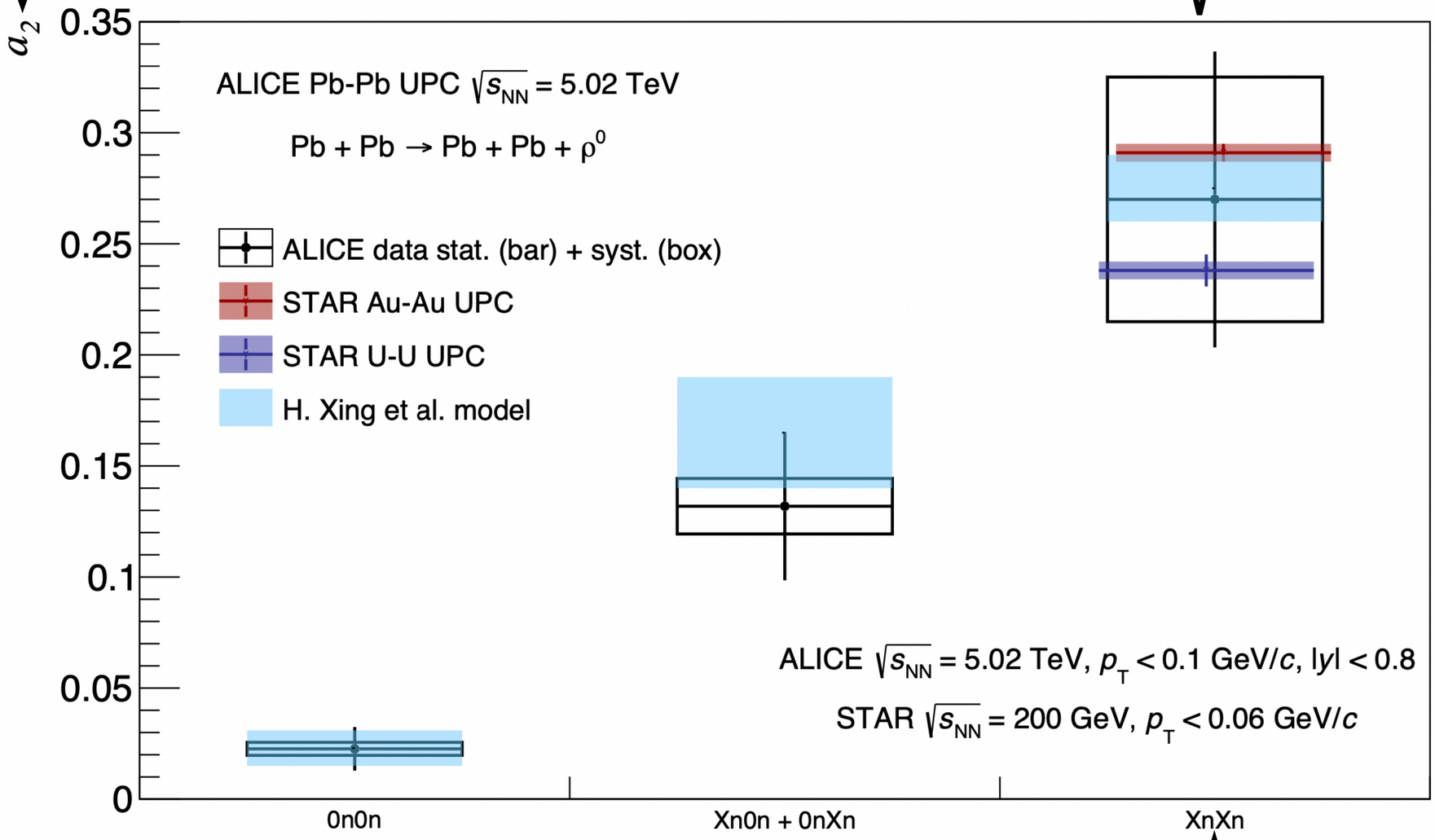

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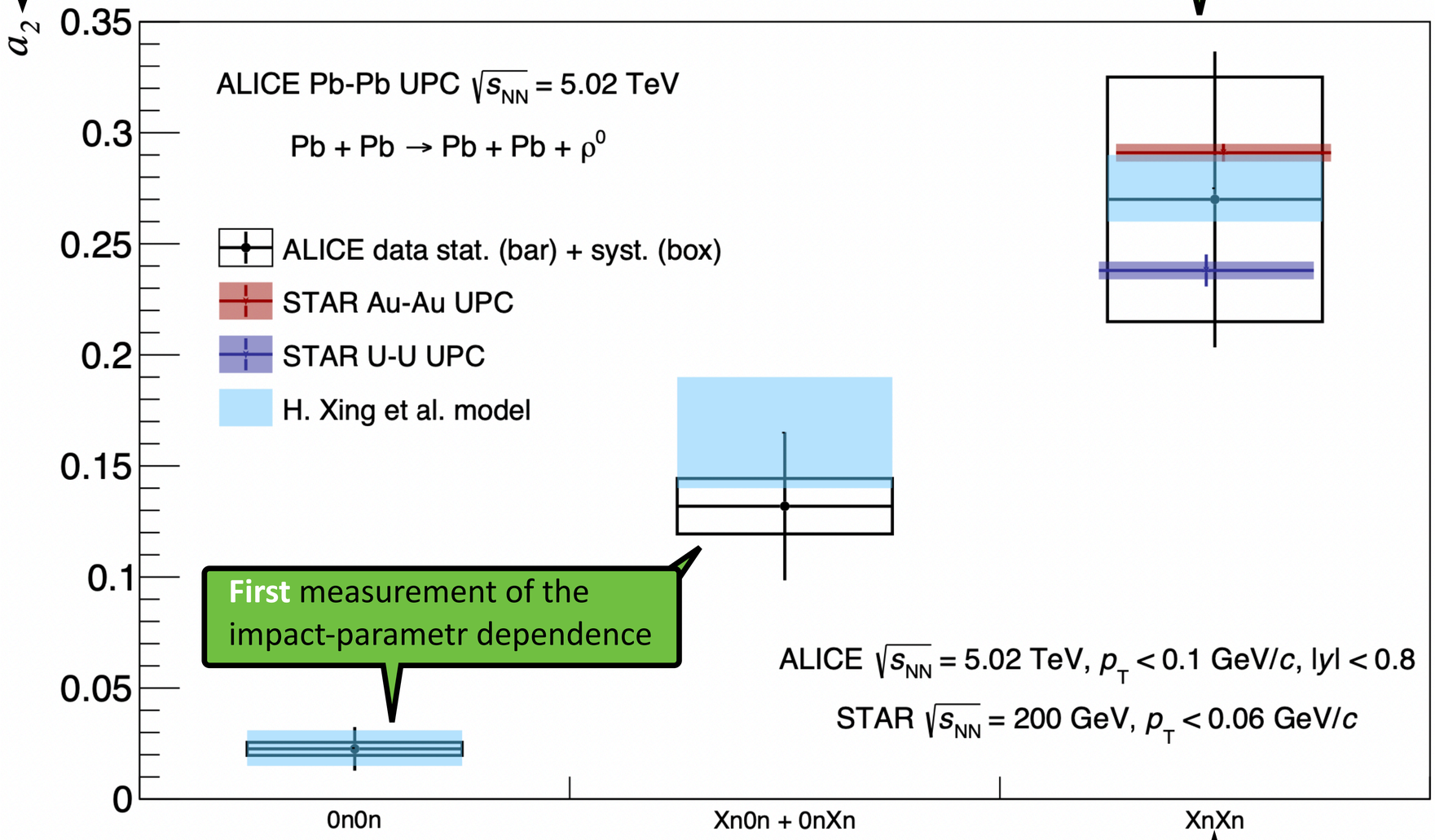

First measurement of the impact-parametr dependence

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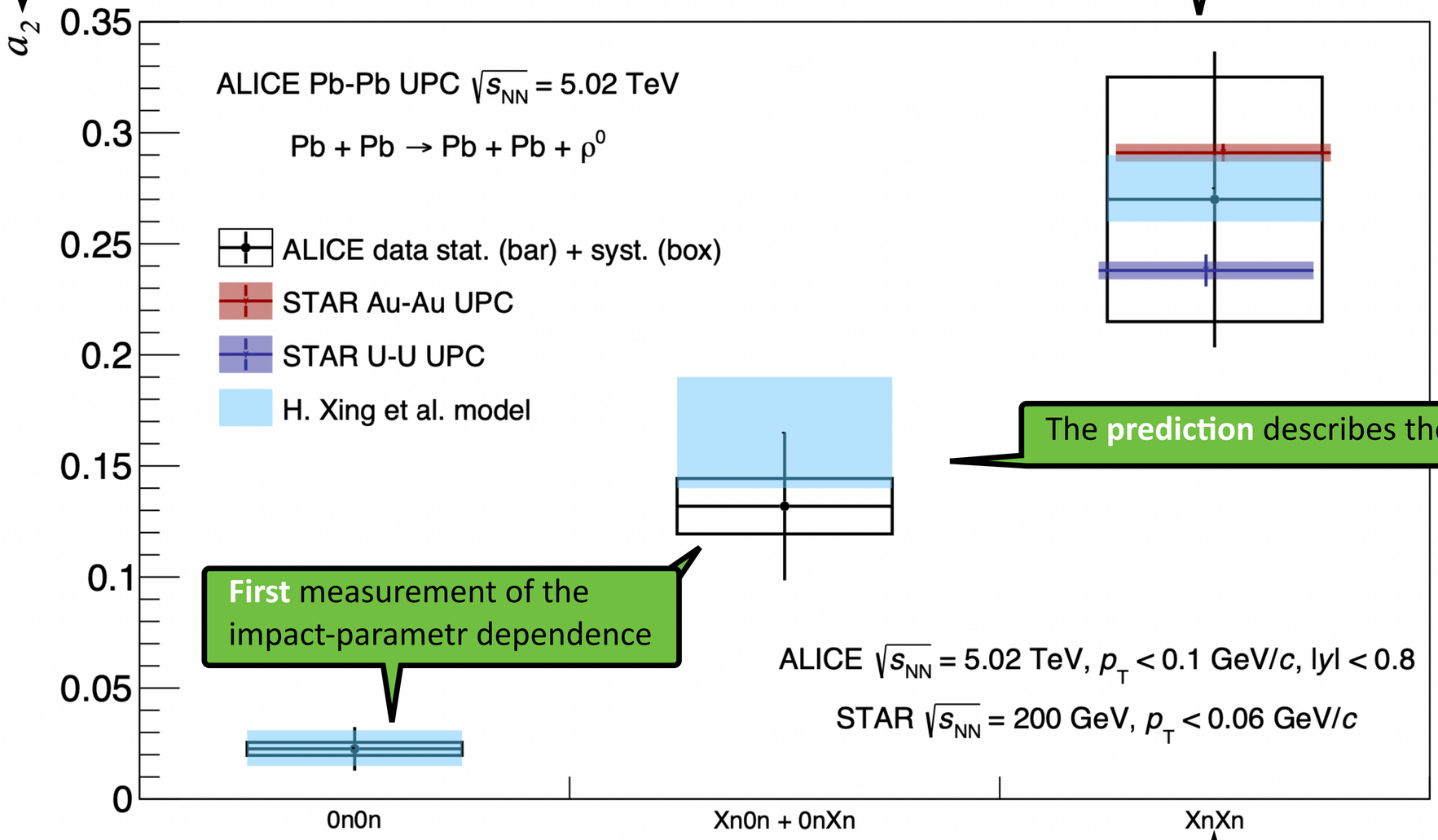

The **prediction** describes the data

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Summary and outlook

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We should have much more (50k vs billions) data in Run 3 :)