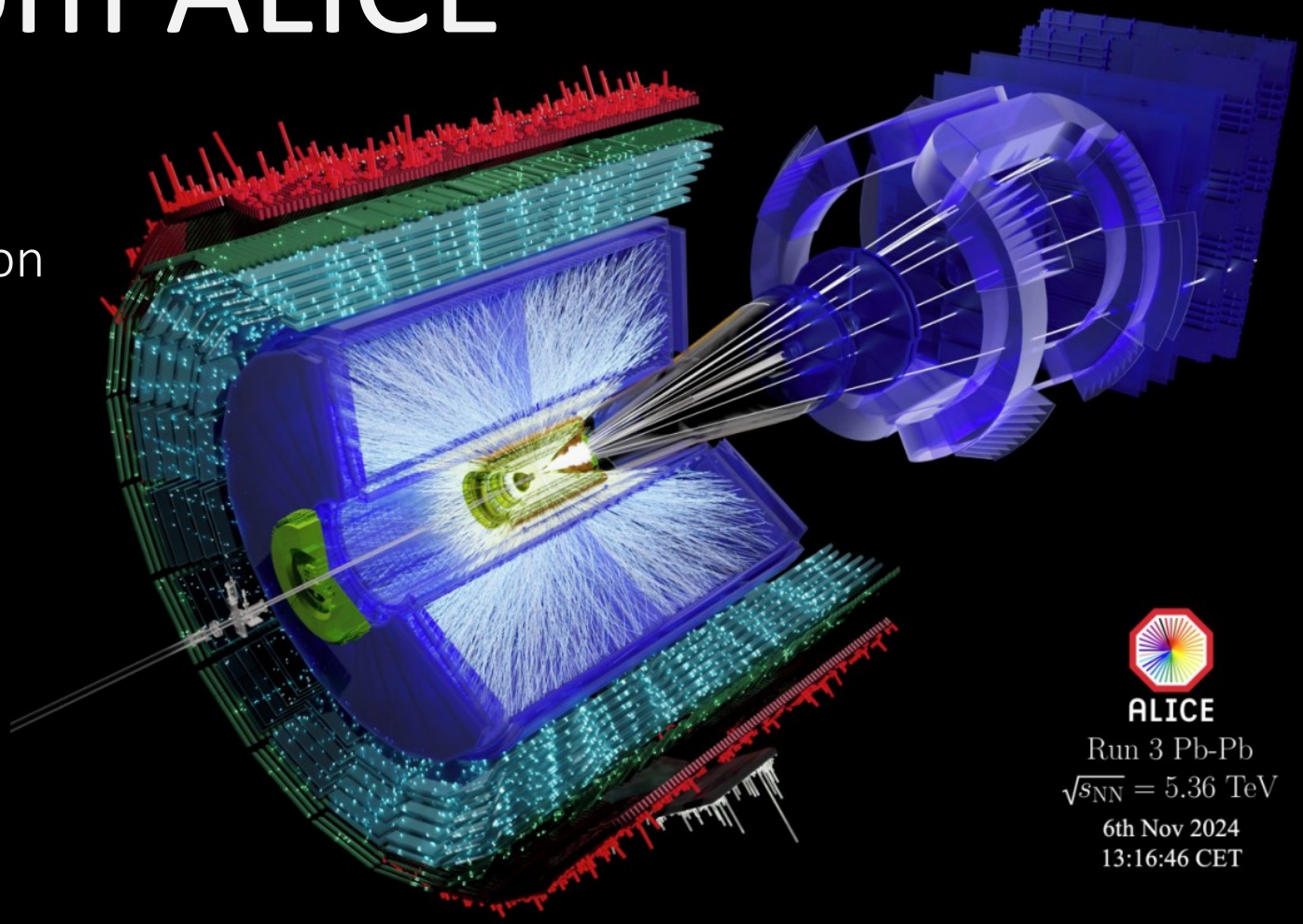
Highlights from ALICE

Igor Altsybeev (TUM)
on behalf of the ALICE Collaboration

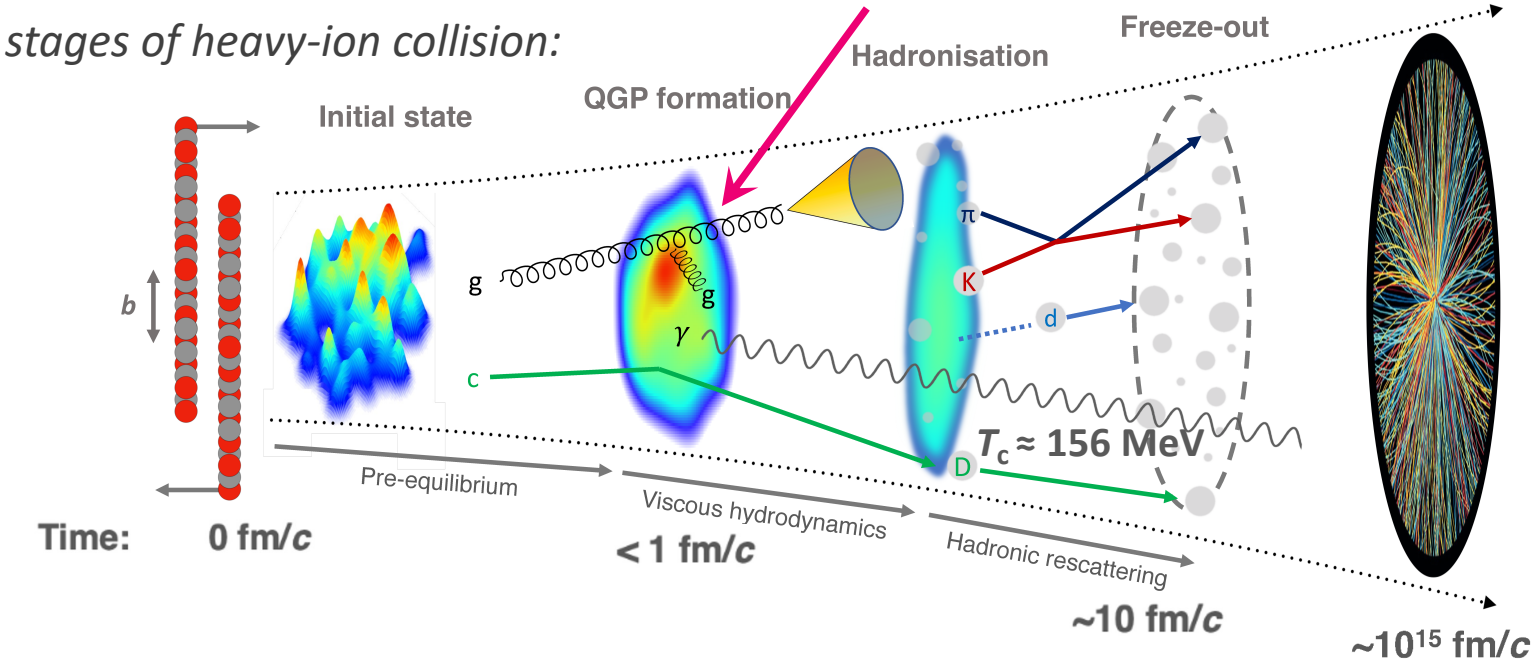
July 11, 2025
Marseille, France



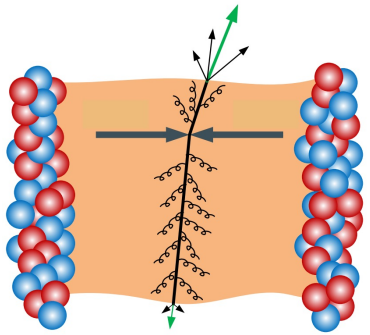
Physics with ALICE

Quark-gluon plasma (QGP) = deconfined strongly-interacting QCD matter with color degrees of freedom

stages of heavy-ion collision:



ALICE experiment: a journey through QCD
EPJC 84 (2024) 8, 813



parton energy loss

Studies with observables which characterize:

- **bulk properties** of the produced medium
- medium **interaction with hard probes, hadronisation**
- **collective effects**

Measurements at high multiplicities down to low p_T with precise PID are required (ALICE)

Heavy Ions: Theory
Urs Wiedemann, Fri 14:15

Heavy Ions: Experiment
Francesco Prino, Fri 14:45

Physics with ALICE

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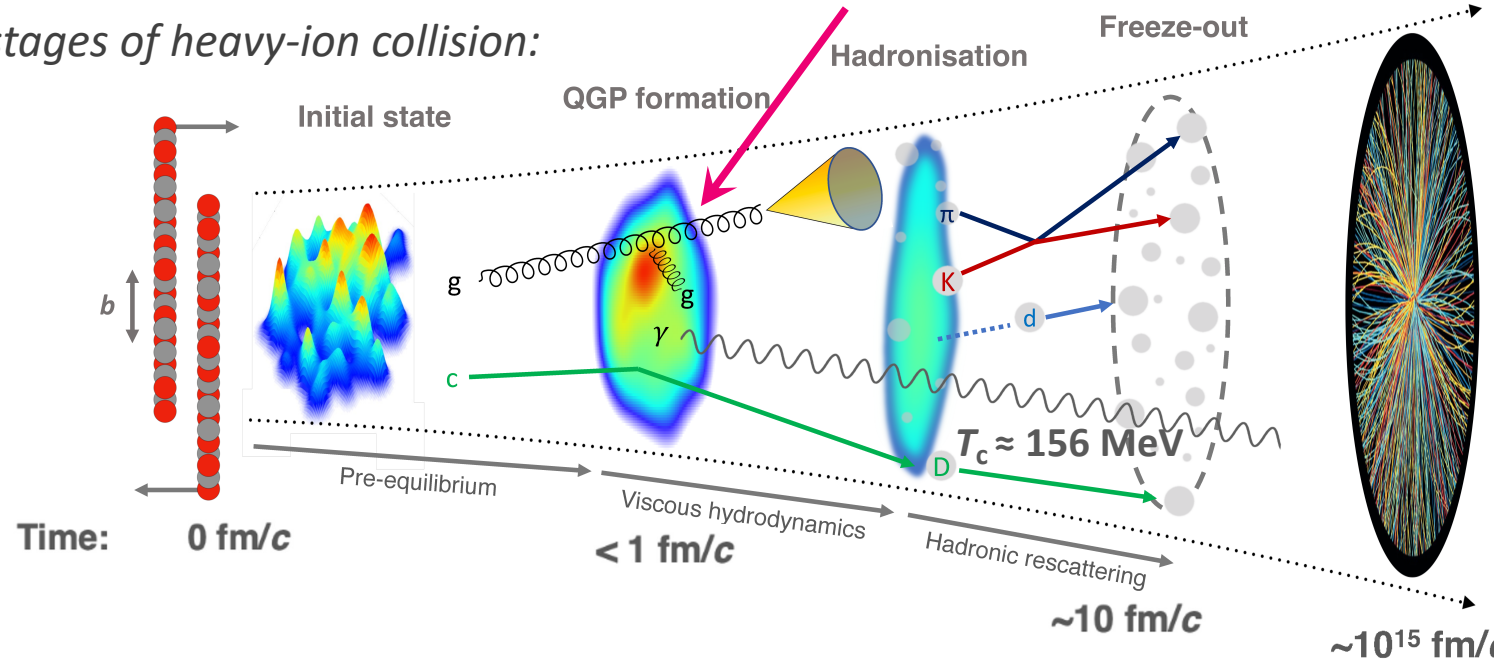

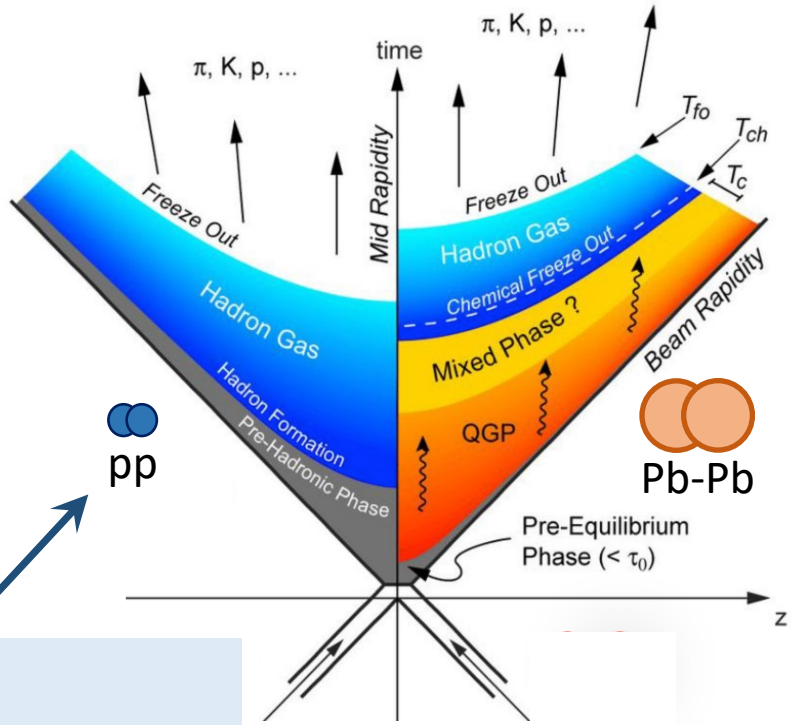

pp, p-A collisions:

- "reference" for A-A
- … but not only: pQCD, final-state strong interactions, …

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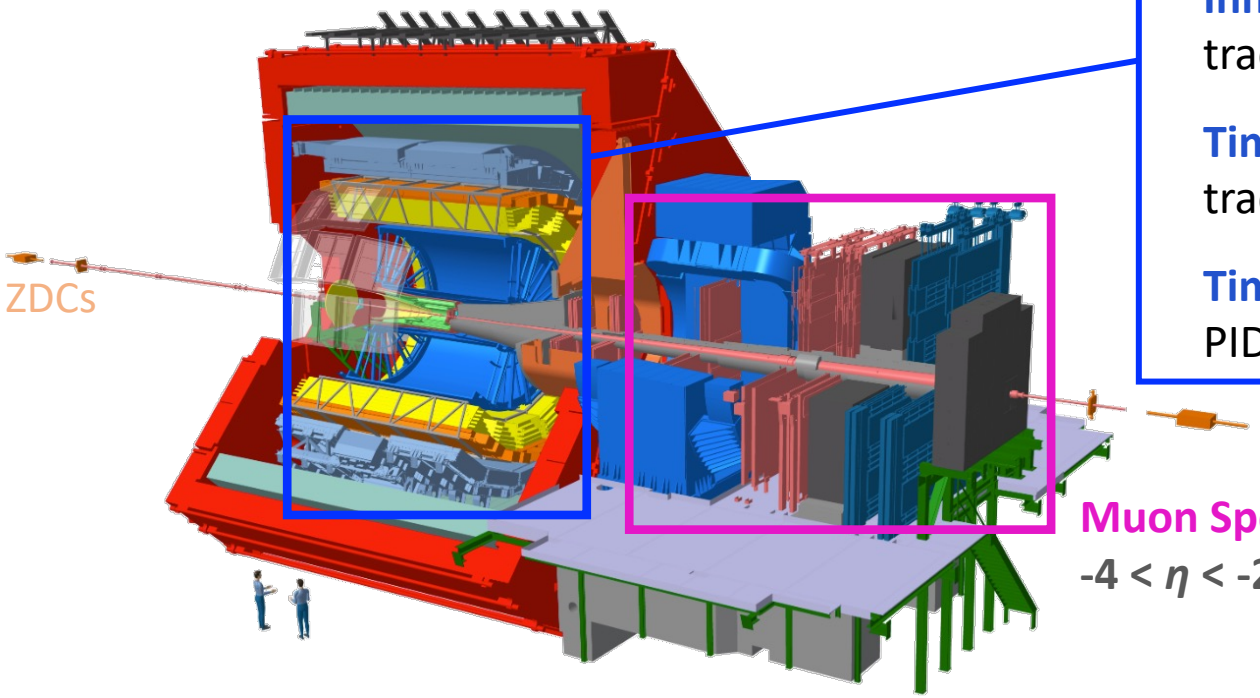
ALICE detector

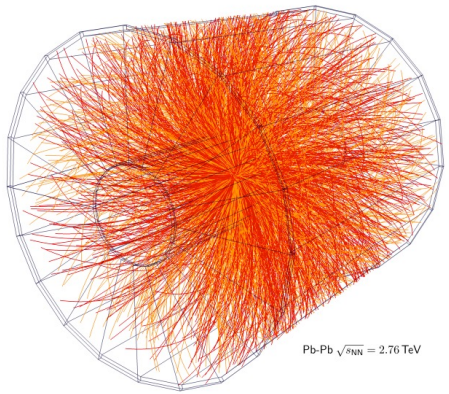


Barrel $|\eta|<0.8$

Inner Tracking System (ITS)
tracking

Time Projection Chamber (TPC)
tracking + PID

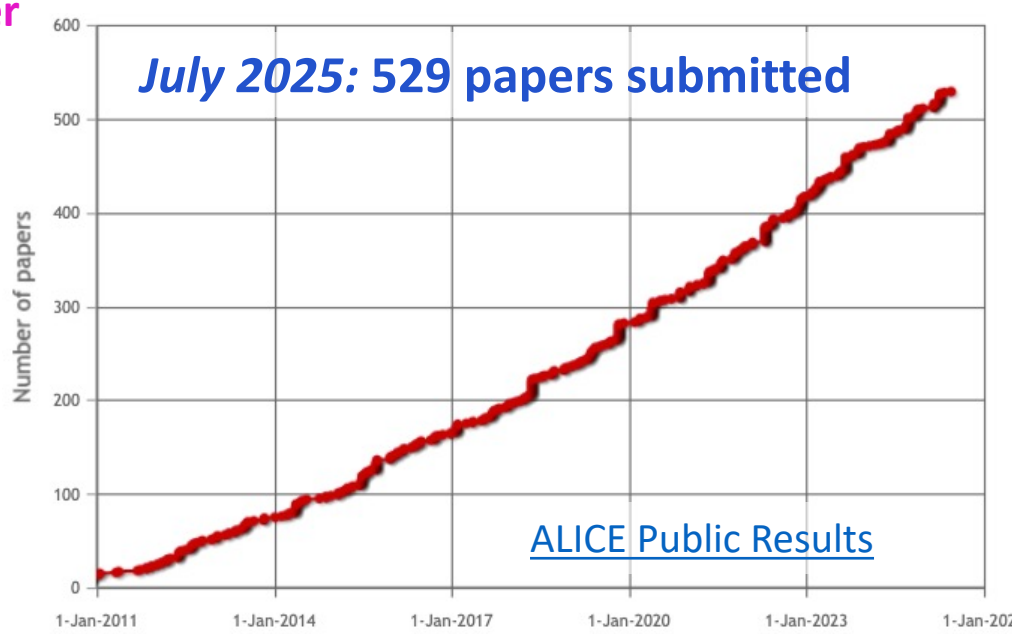
Time Of Flight (TOF)
PID



+TRD, HMPID, EMCal, PHOS

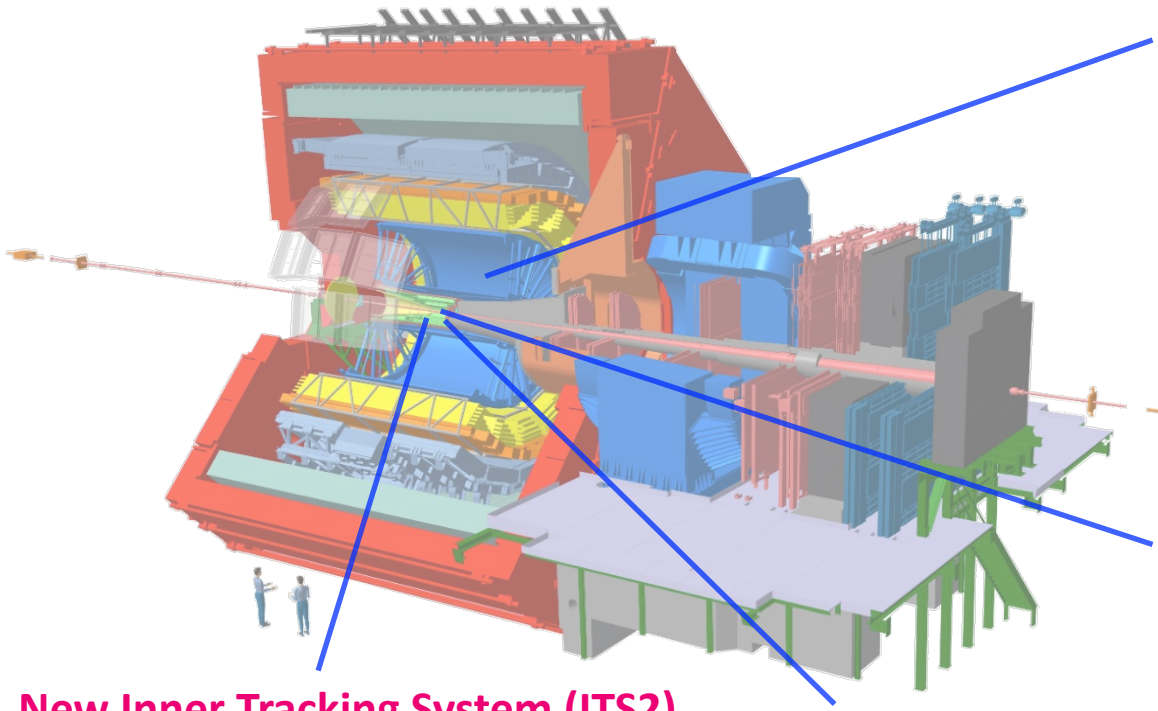
Muon Spectrometer
$-4 < \eta < -2.5$

Runs 1&2 (2009-2018)	**pp, Pb-Pb**, p-Pb, Xe-Xe
Run 3 (2022-2026)	**pp, Pb-Pb**, p-O, O-O, Ne-Ne, (p-Pb?)



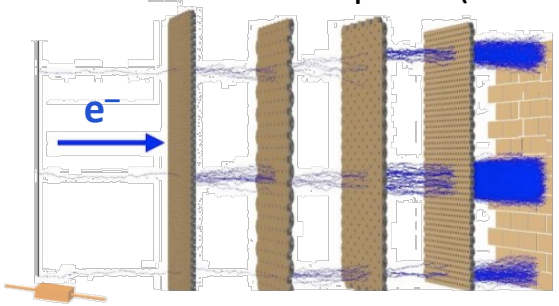
ALICE detector in Run 3 (2022-2026)

ALICE upgrades during LS2
arXiv:2302.01238



Time Projection Chamber (TPC)

new readout chambers with
Gas Electron Multipliers (**GEM**s)

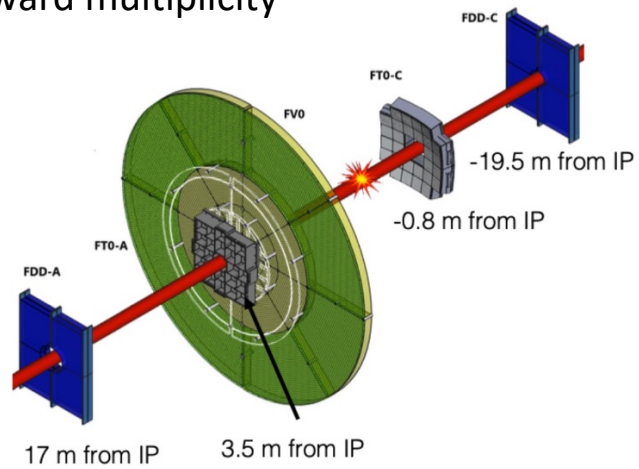


New beampipe

smaller diameter (36.4 mm),
first detection layer at 20 mm

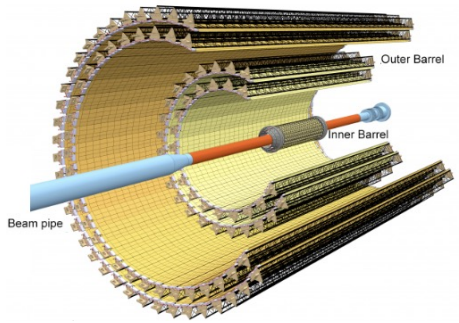
New Fast Interaction Trigger (FIT)

interaction trigger, online luminometer,
forward multiplicity



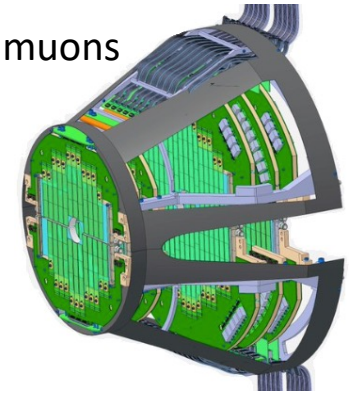
New Inner Tracking System (ITS2)

7 layers, 10 m^2 silicon tracker
based on MAPS (12 G pixels)



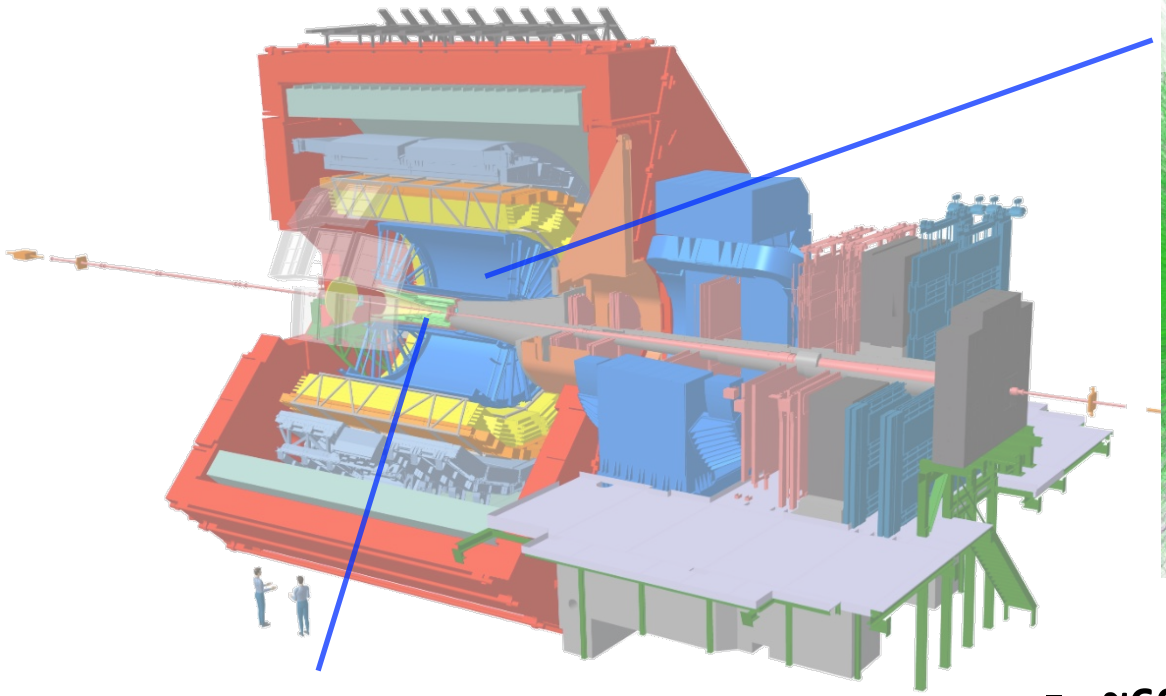
New Muon Forward Tracker (MFT)

5 planes of MAPS
forward vertexing for muons

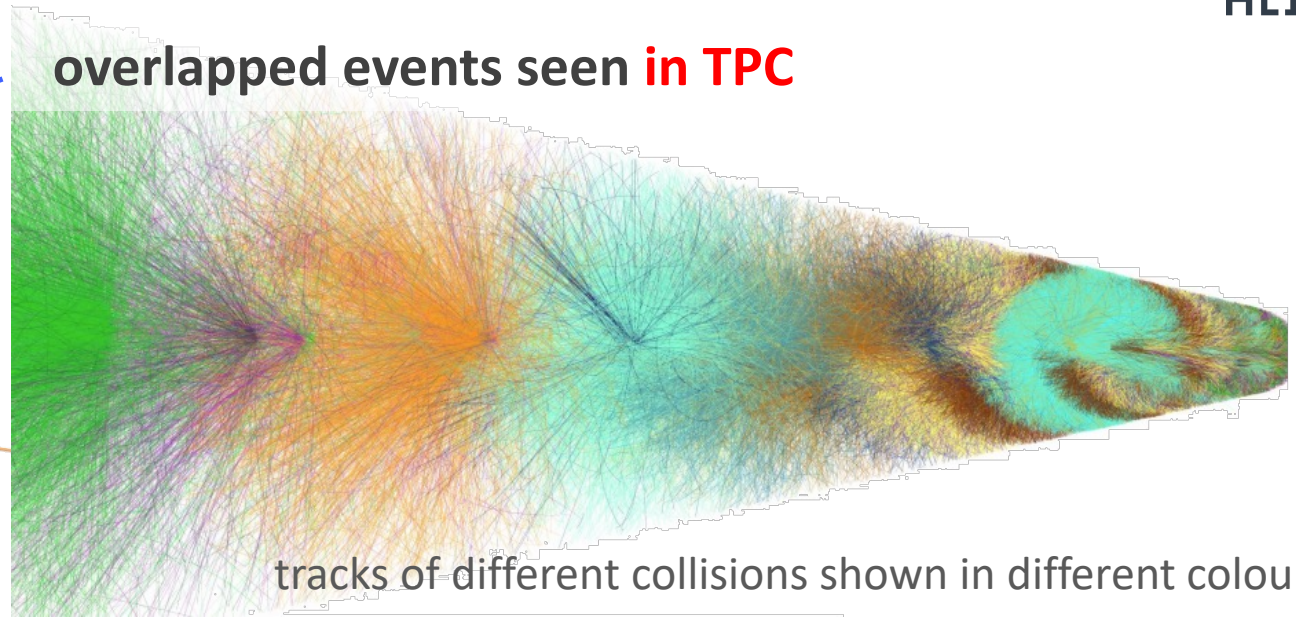


- improved **vertexing** (central and forward) and tracking **resolution at low p_T**
- operation at much **higher interaction rate, continuous readout**

Data processing in Run 3+4: continuous readout

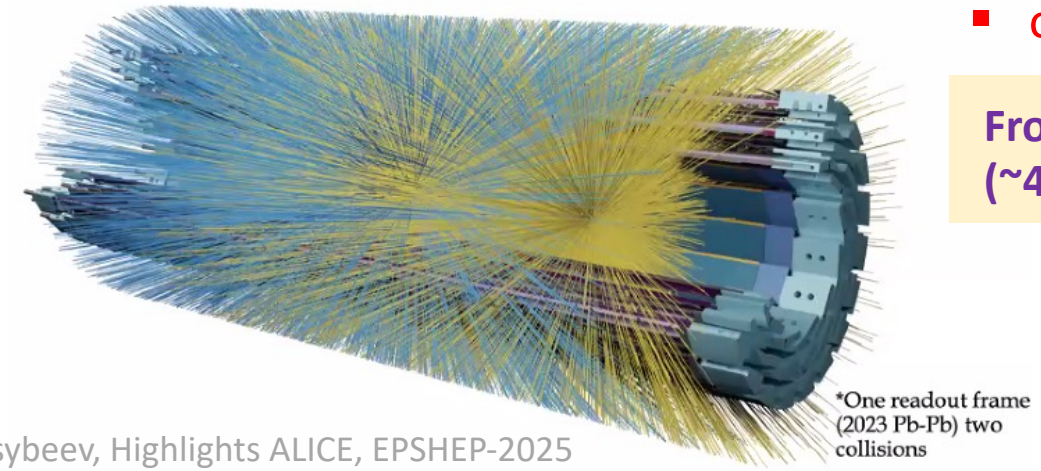


overlapped events seen in TPC



tracks of different collisions shown in different colour

collision pileup in Tracker

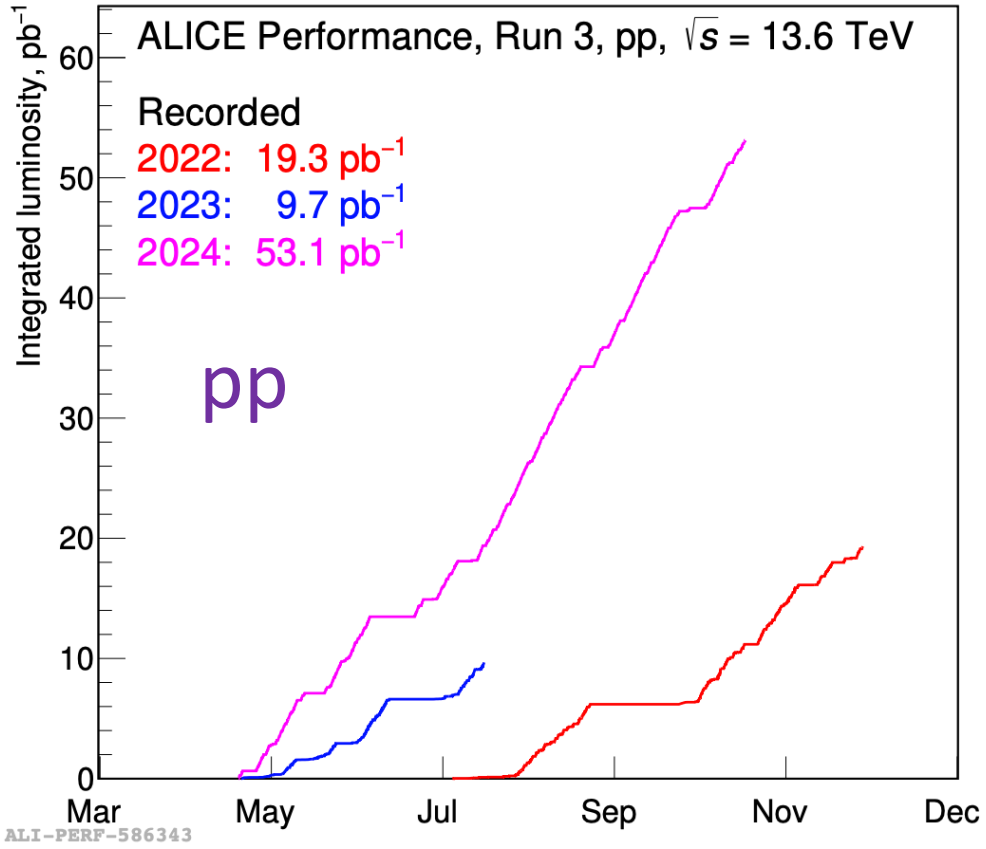


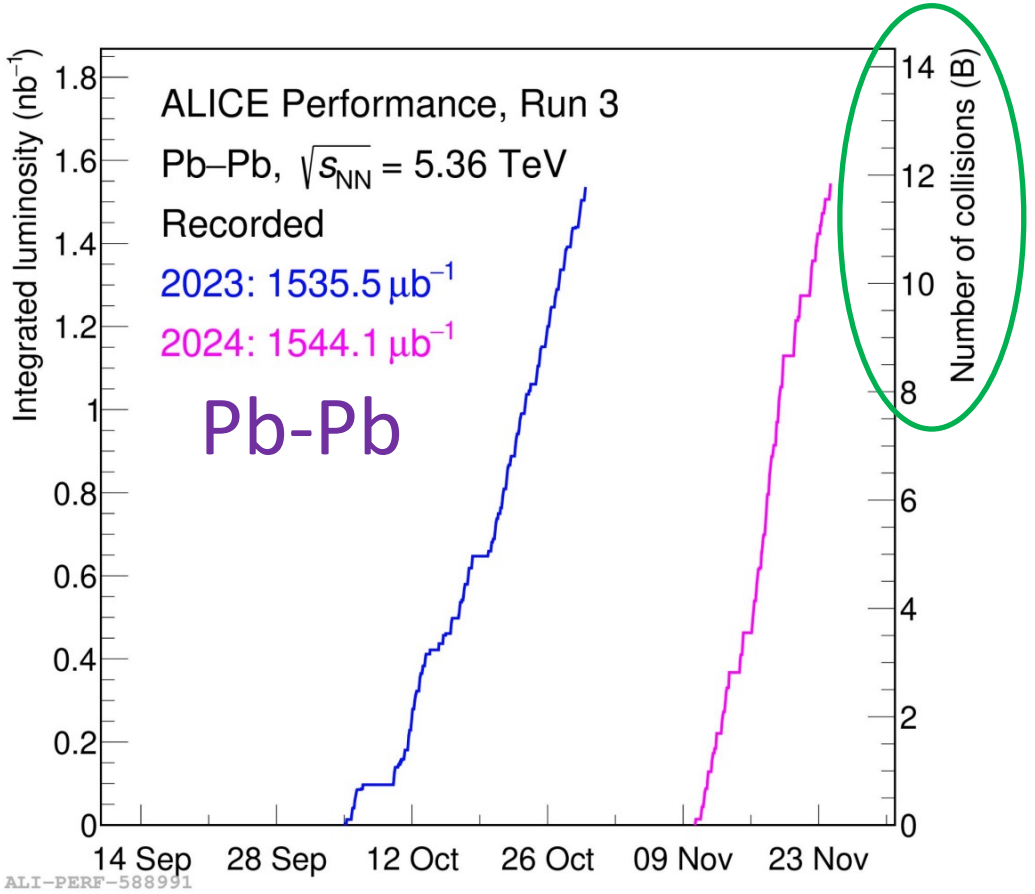
*One readout frame (2023 Pb-Pb) two collisions

- **~600 kHz** interactions **in pp** data taking
- operate at **up to 50 kHz** during the **Pb-Pb** runs

From detector: ~3.6TB/s (~450 GB/s in Run 2) ⇨ **To disk: 170 GB/s (~10 GB/s in Run 2)** ⇨ **Storage: 130 PB (1 PB in Run 2)**

Statistics collected in LHC Run 3 (so far)





5 trillion Min. Bias pp events
~x1600 more than MB yield in Run 1+2

24 billion MB Pb-Pb events
~x70 more than MB in Run 1+2

Over 70 Run 3 results approved for 2025 summer conferences

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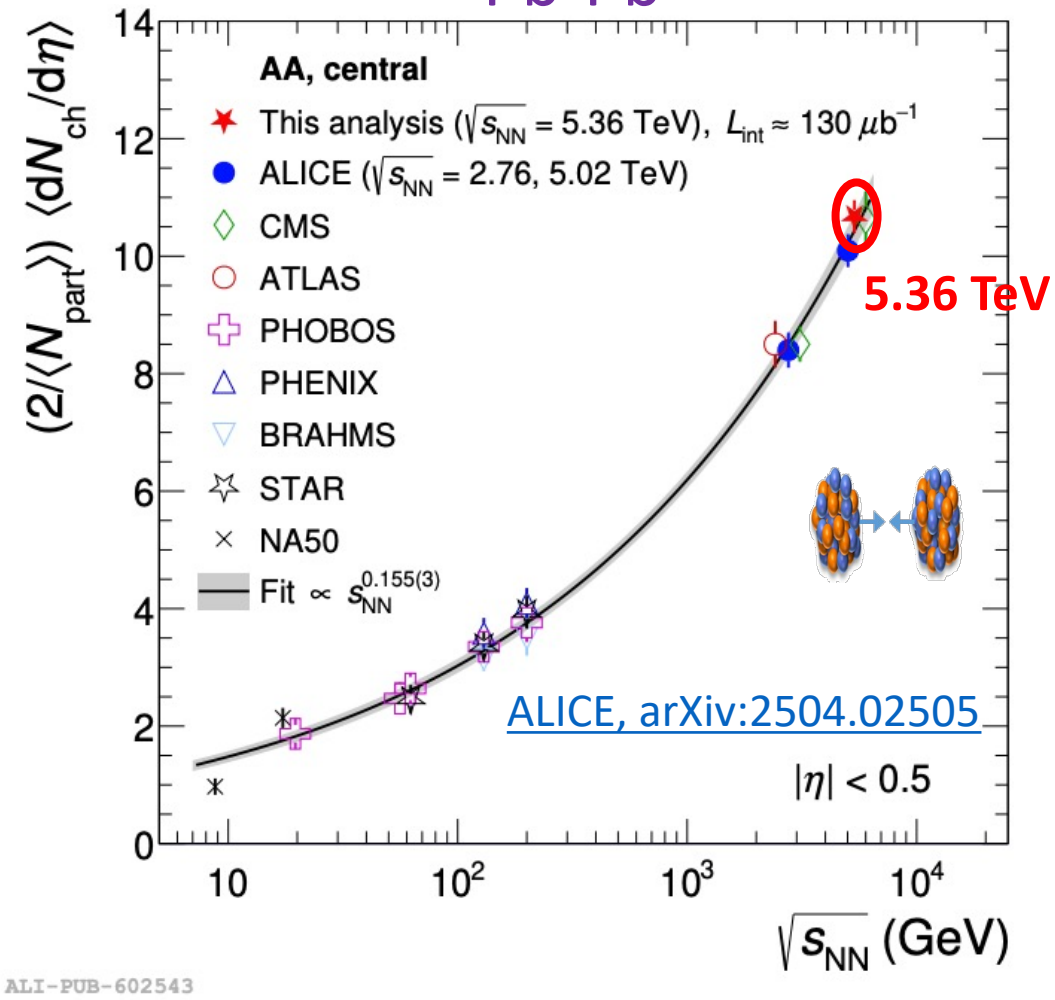
Charge particle density ($dN_{ch}/d\eta$)

Abhi Modak
T04, Mon 14:40

Pb-Pb



- First paper with Run 3 results

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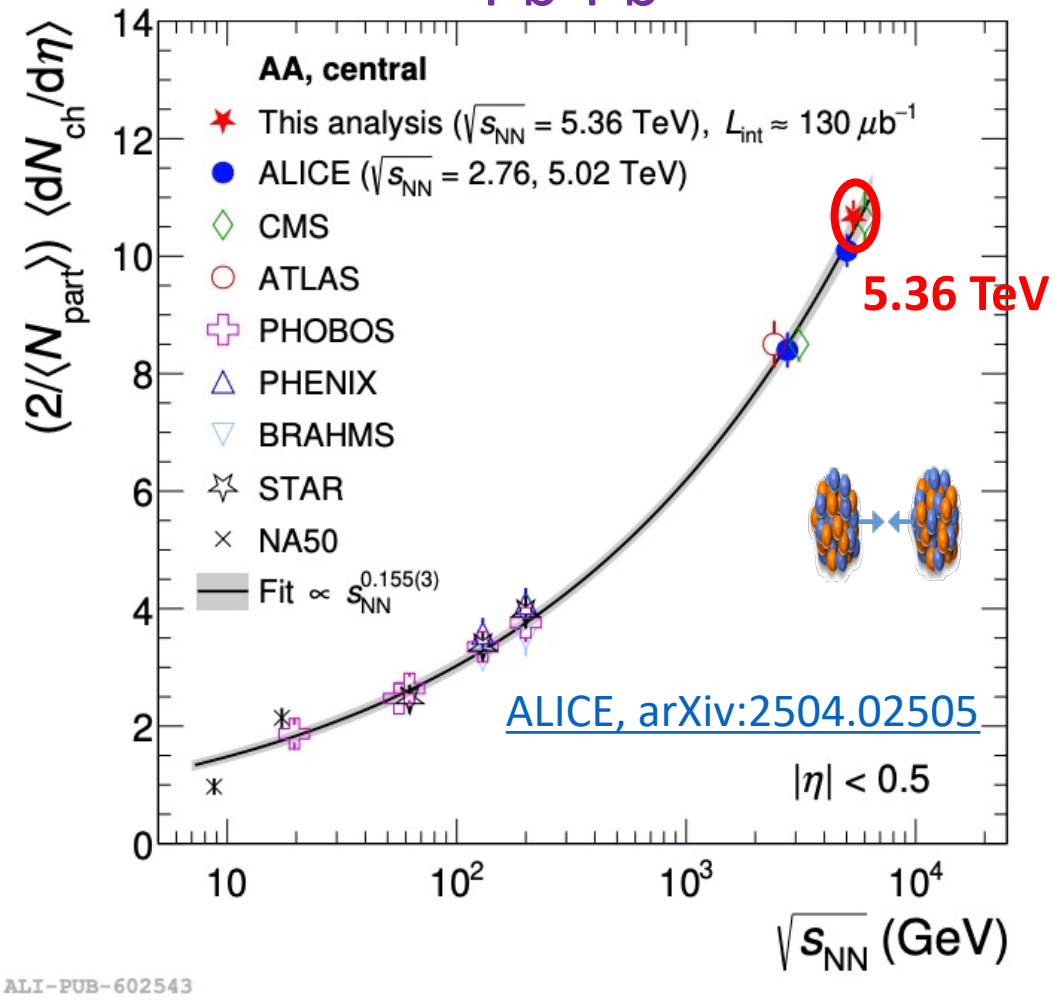
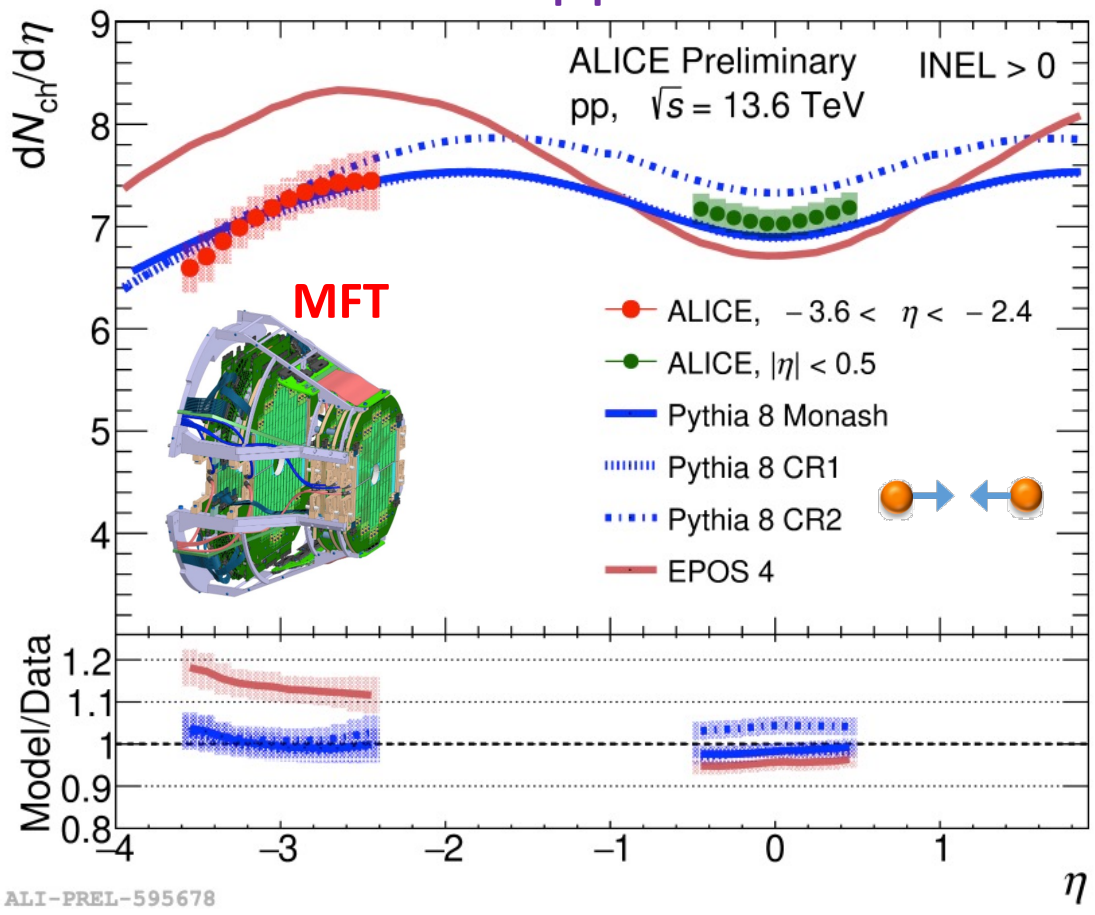


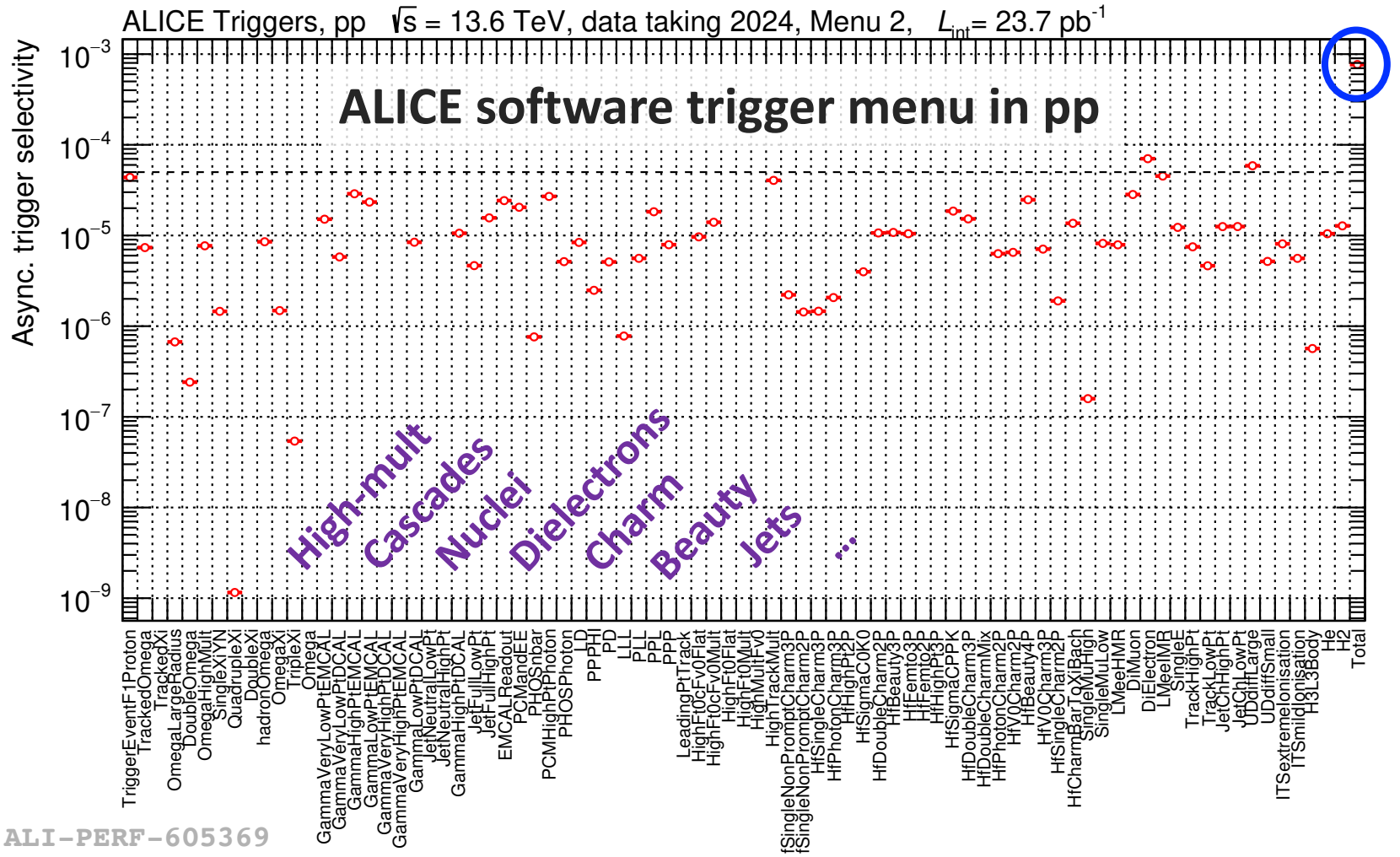
- First paper with Run 3 results

pp



- First measurement using new MFT detector
- The trend at forward rapidities is compatible with PYTHIA 8

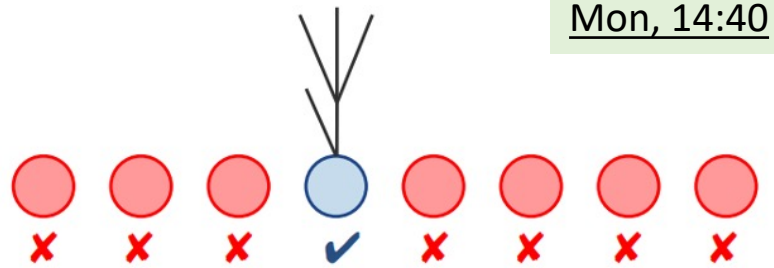
ALICE asynchronous software trigger processing in pp



Total selectivity < 10^{-3}

Selectivity =
(triggered events)/ (analyzed events)

Biao Zhang
Mon, 14:40



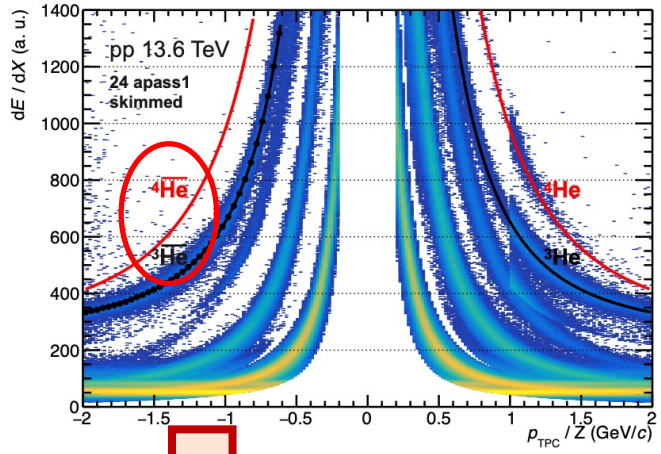
- **Skimming:** a chunk of raw data around a tagged event is kept
- the rest is deleted
  → we keep ≈4.5% of raw pp data

(For **Pb-Pb**, all events are stored)

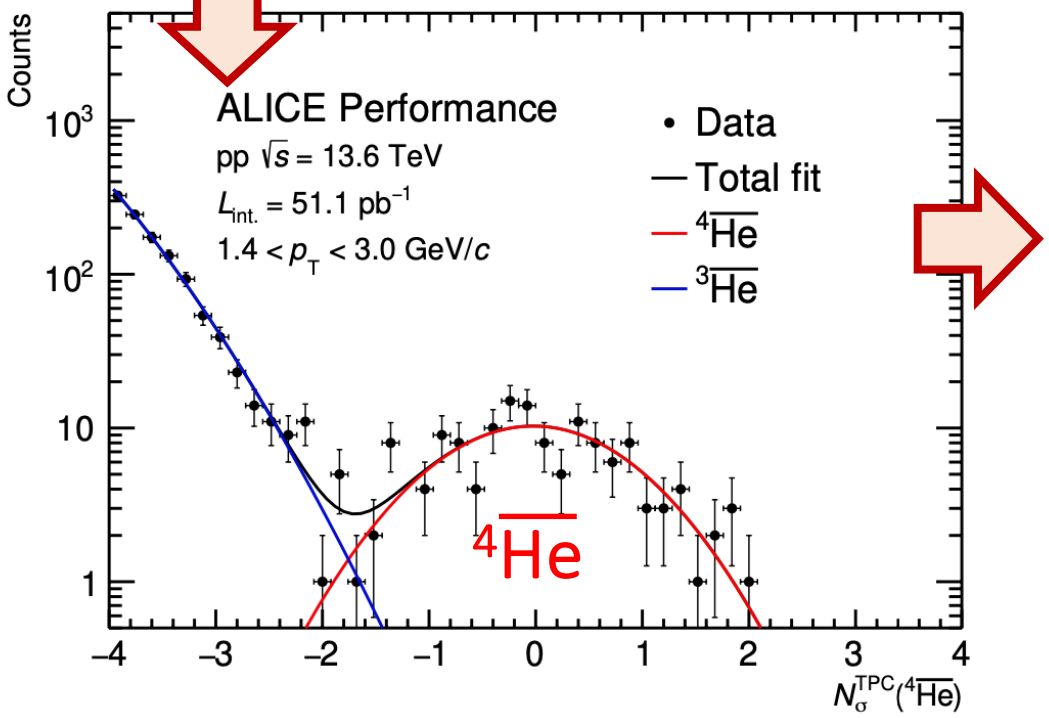
First observation of $^4\overline{\mathrm{He}}$ in pp collisions

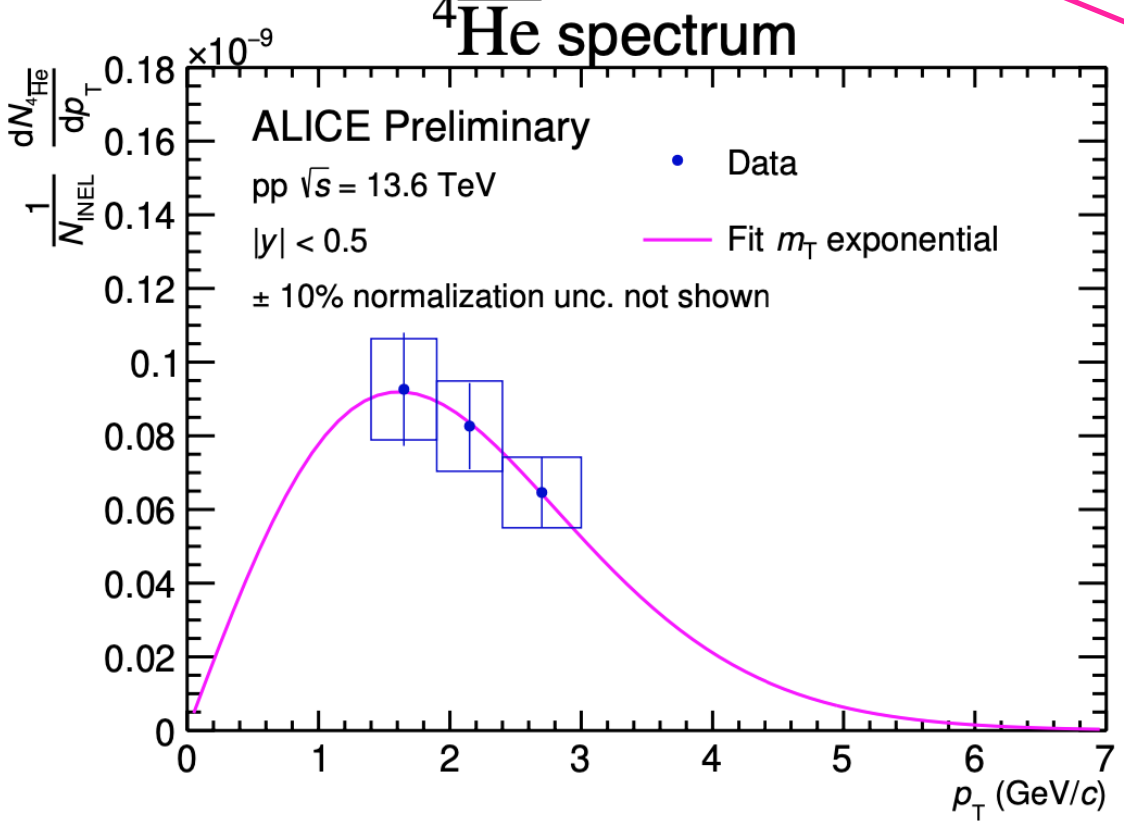
high stat.

offline trigger



3 trillion events inspected!





ALI-PREL-596070

- Clear $^4\overline{\mathrm{He}}$ peak in TPC *dE/dx* with good separation from $^3\overline{\mathrm{He}}$

ALI-PERF-595970

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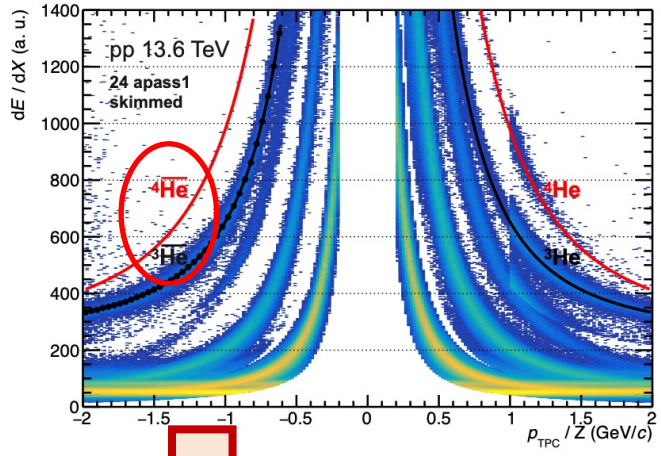

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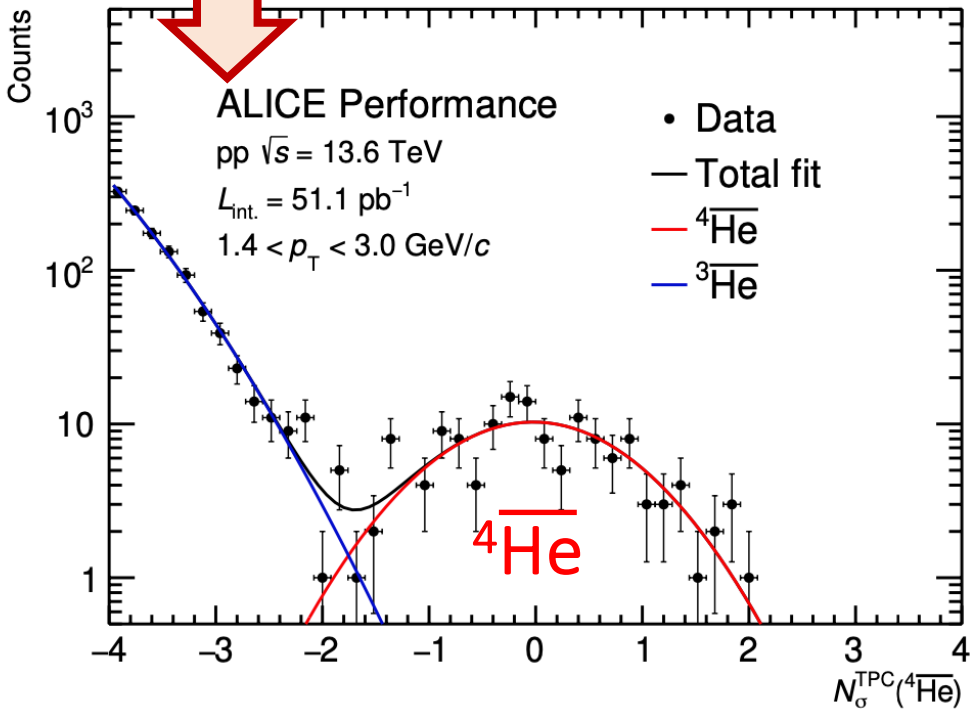
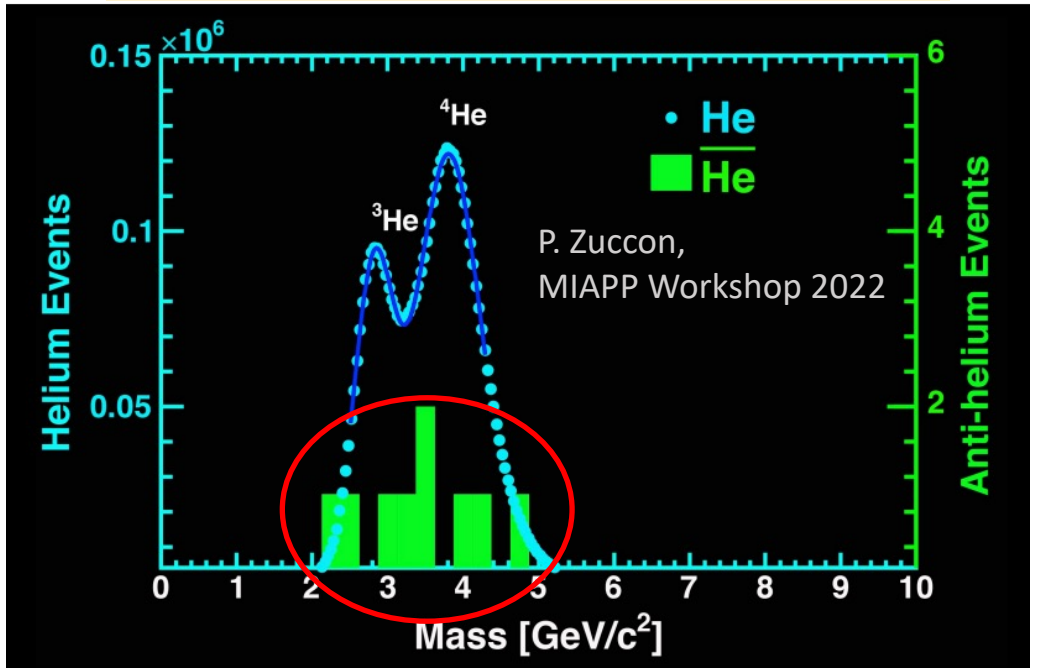


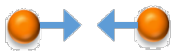
Antihelium events in AMS-02



- Clear $^{4}\overline{\mathrm{He}}$ peak in TPC *dE/dx* with good separation from $^{3}\overline{\mathrm{He}}$
- **Importance for antinucleus searches in space**

ALI-PERF-595970

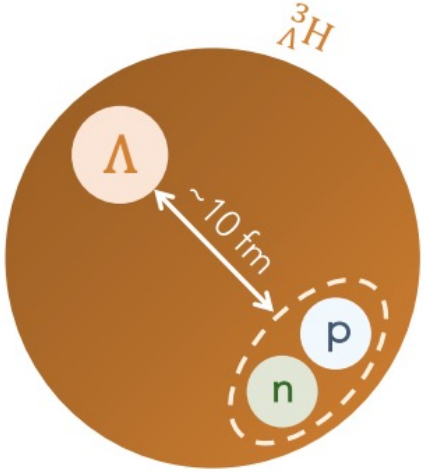
First p_T-differential measurement of hypertriton in pp



high stat.

offline trigger

- Lightest known hypernucleus
- Loosely bound object



$m \sim 2.991\ \mathrm{GeV}/c^2$

$c\tau \sim 7.1\mathrm{cm}$

$B_\Lambda \sim 100\,\mathrm{keV}$

→ Interplay between **large $^3_\Lambda$H wave function (r_A)** and **small source size in pp collisions (R_S)**

$$B_3 \sim \left(\frac{2\pi}{R_S^2+(r_A/2)^2}\right)^3$$

B_A – coalescence parameter (A=3)

First p_T-differential measurement of hypertriton in pp

high stat.

offline trigger

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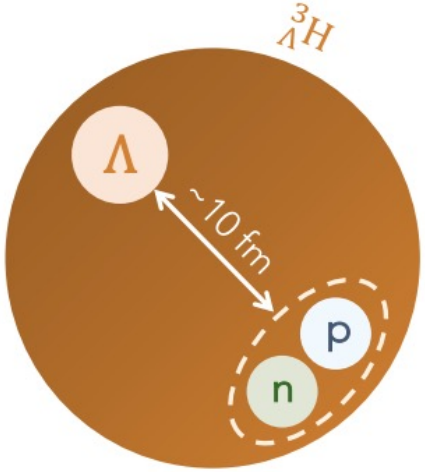

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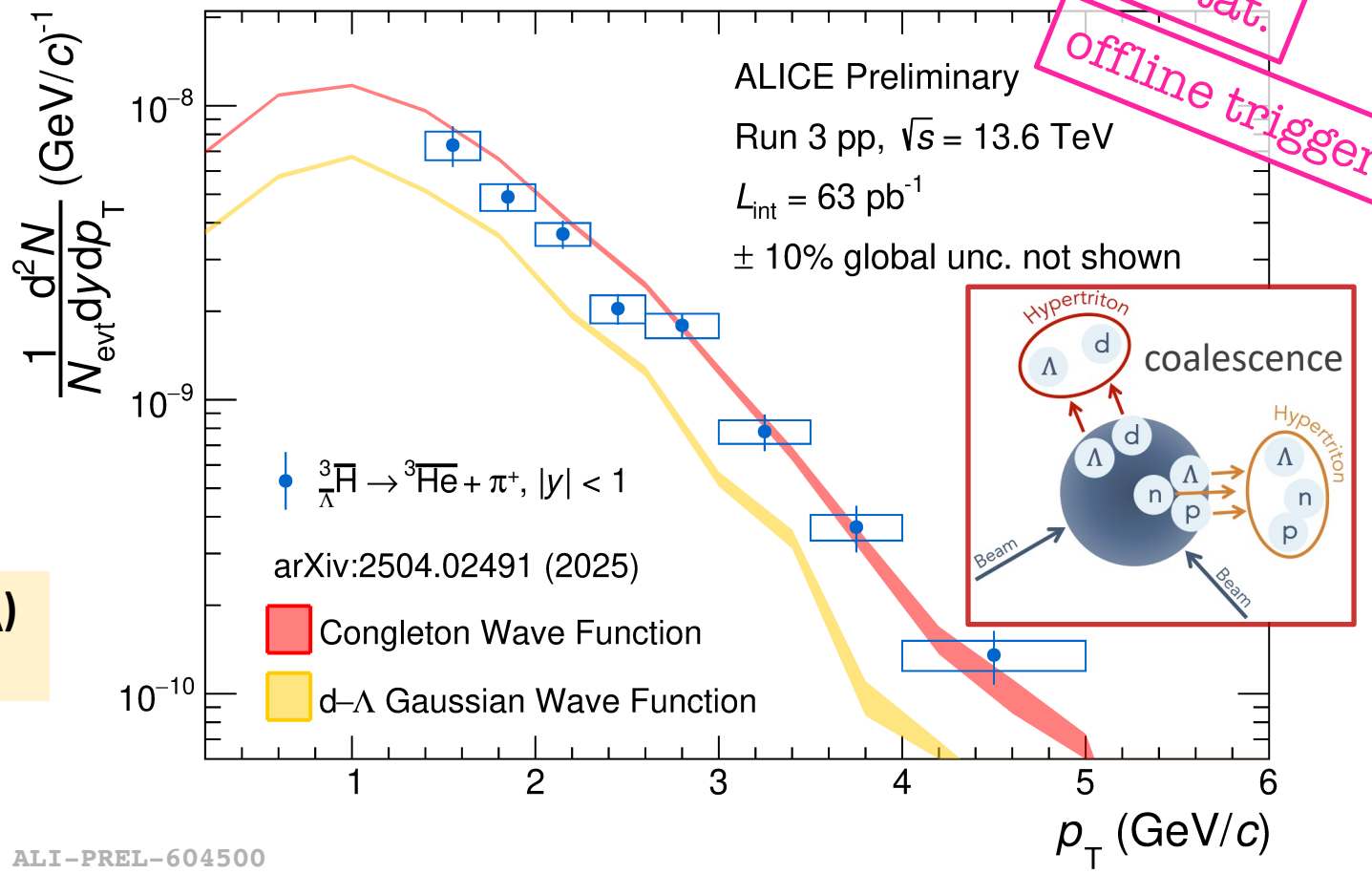


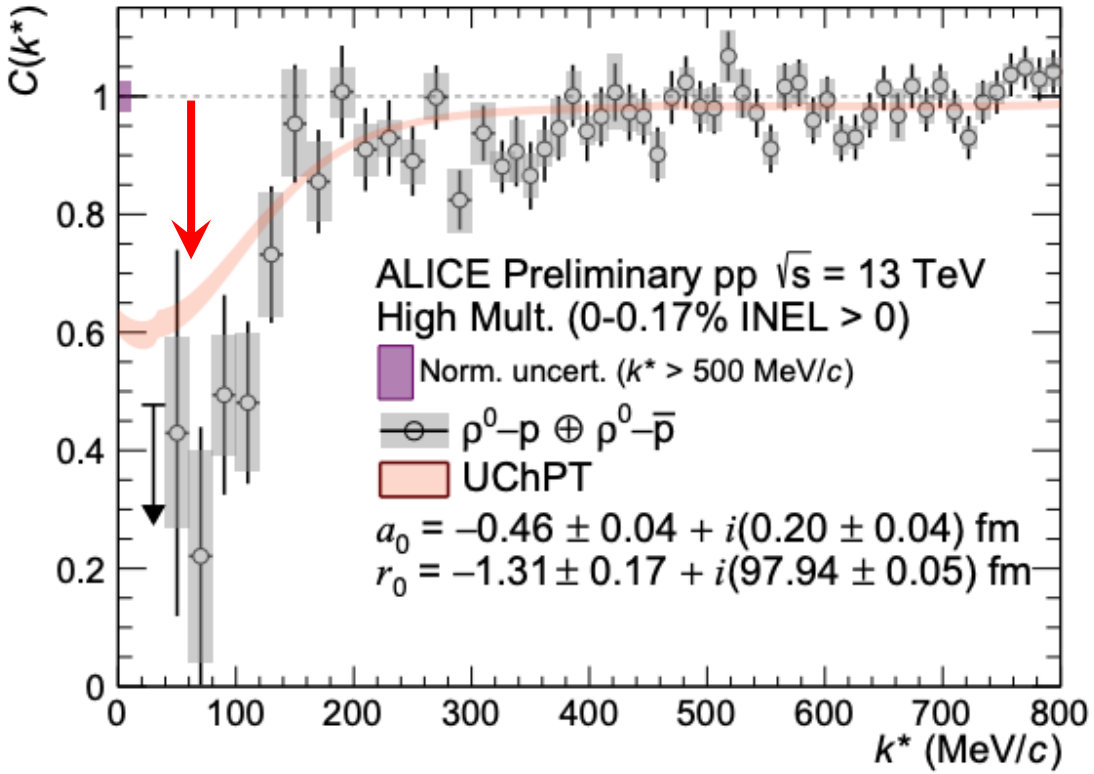
→ **$^3_\Lambda$H as ideal probe to study nucleosynthesis mechanism**

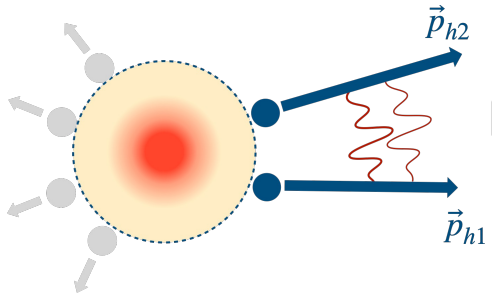
- Relevant for the equation of state of neutron stars

Carolina Anna Reetz
T04, Mon 14:20

Accessing strong forces *via* femtoscopic observables in pp

First direct access to ρ^0–p interaction at small relative momentum (k^*)





Relative momentum $\vec{k}^* = \frac{1}{2} | \vec{p}_1^* - \vec{p}_2^* |$

$$C(k^*) = \int S(r^*) \left| \Psi(\vec{k}^*, \vec{r}^*) \right|^2 d^3 r^*$$

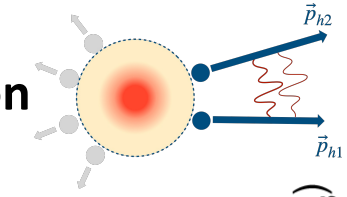
measured correlation func. — source shape — wave function → **study interaction**

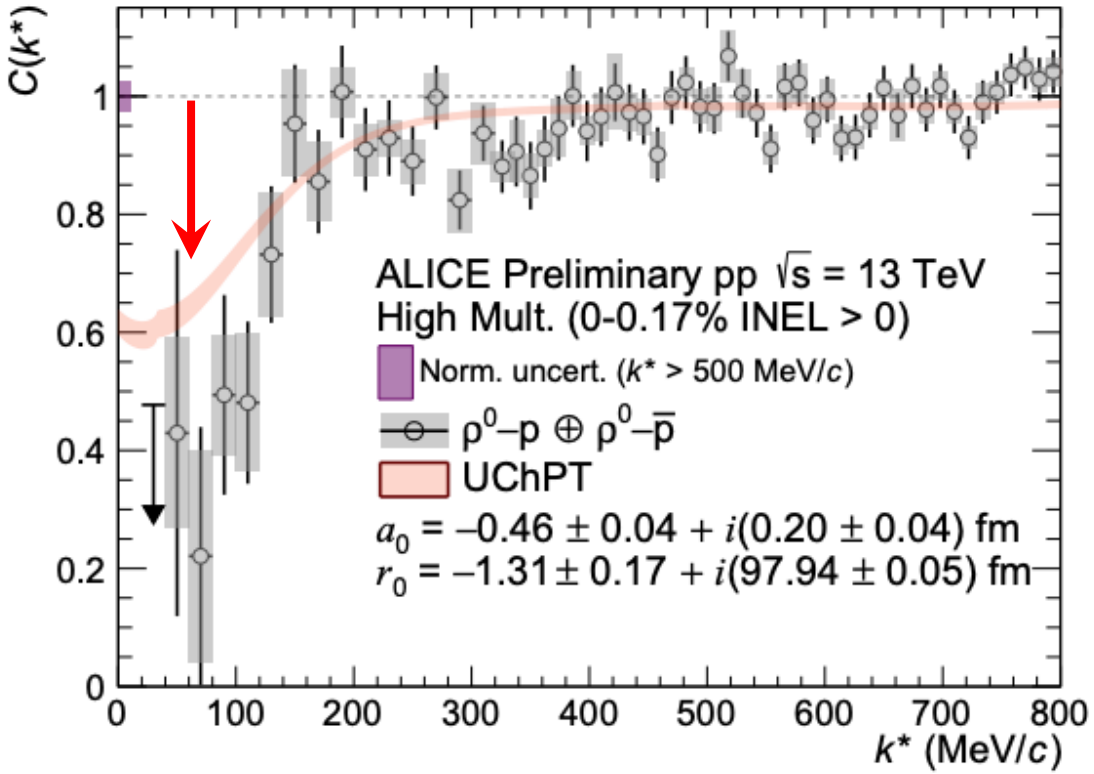
- Access the interaction of the shortest-living QCD states

Maximilian Korwieser
T05, Thu 09:21

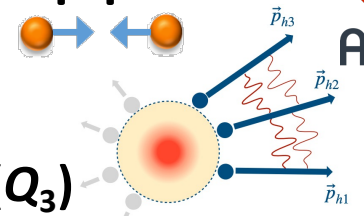
Accessing strong forces *via* femtoscopic observables in pp

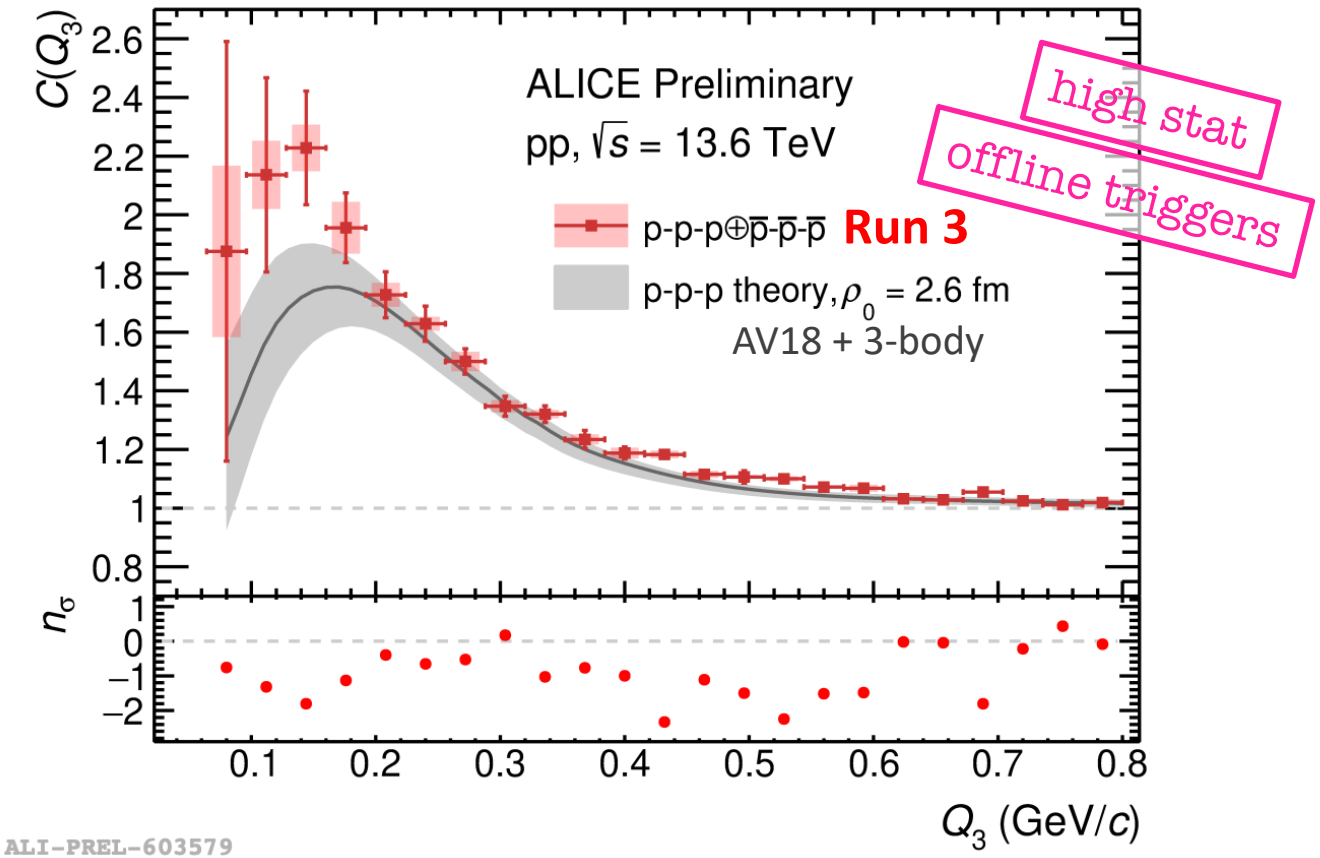
First direct access to ρ⁰–p interaction at small relative momentum (*k)**





3-proton interaction at small relative momentum (Q_3)





ADD WATERMARK

ALI-PREL-603579

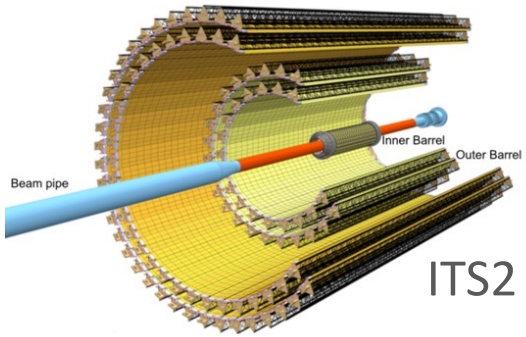
- Access the interaction of the shortest-living QCD states

Maximilian Korwieser
T05, Thu 09:21

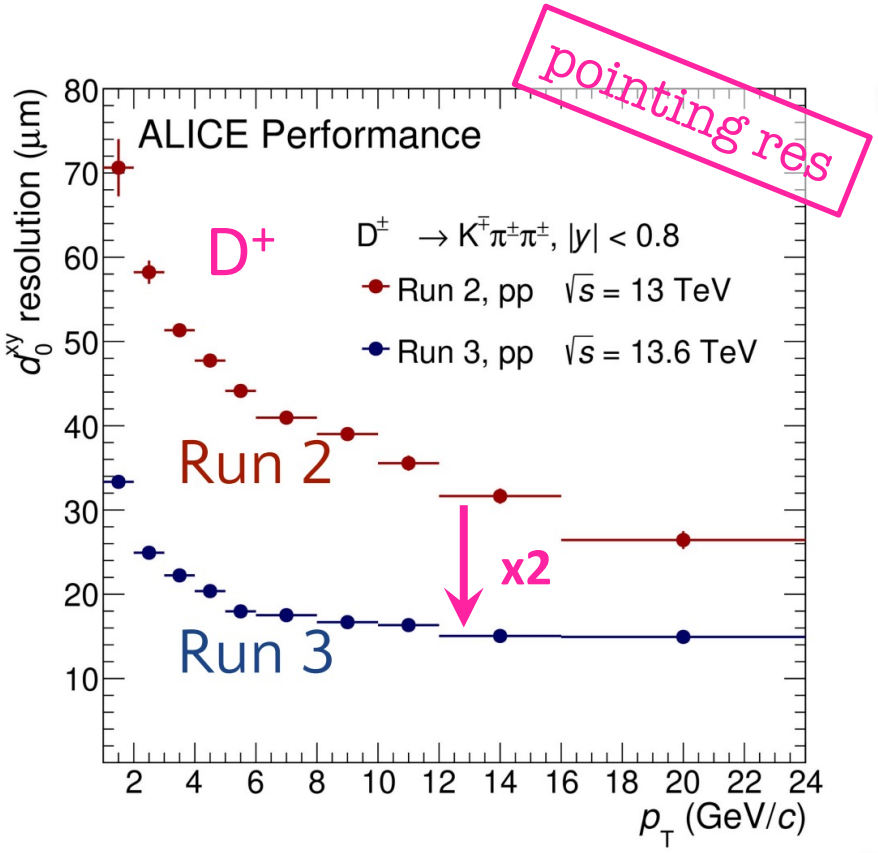
- Good description by theory if 3-body interactions are included

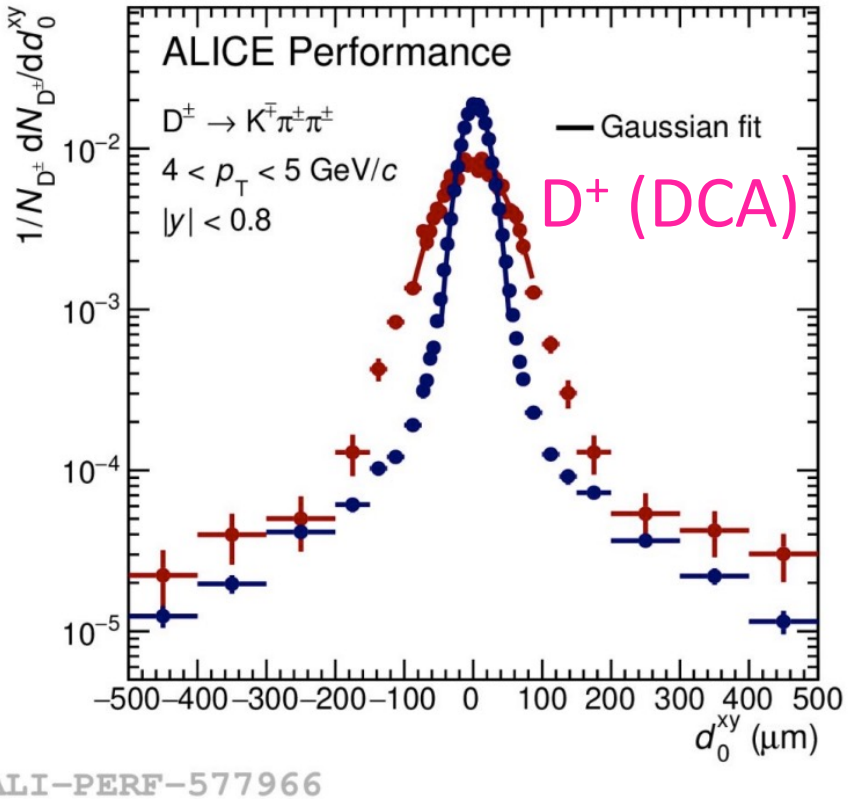
Anton Riedel
Poster

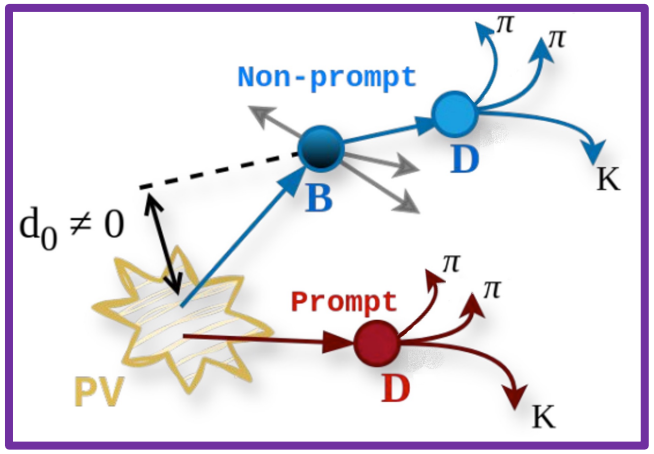
Improved pointing resolution



ITS2



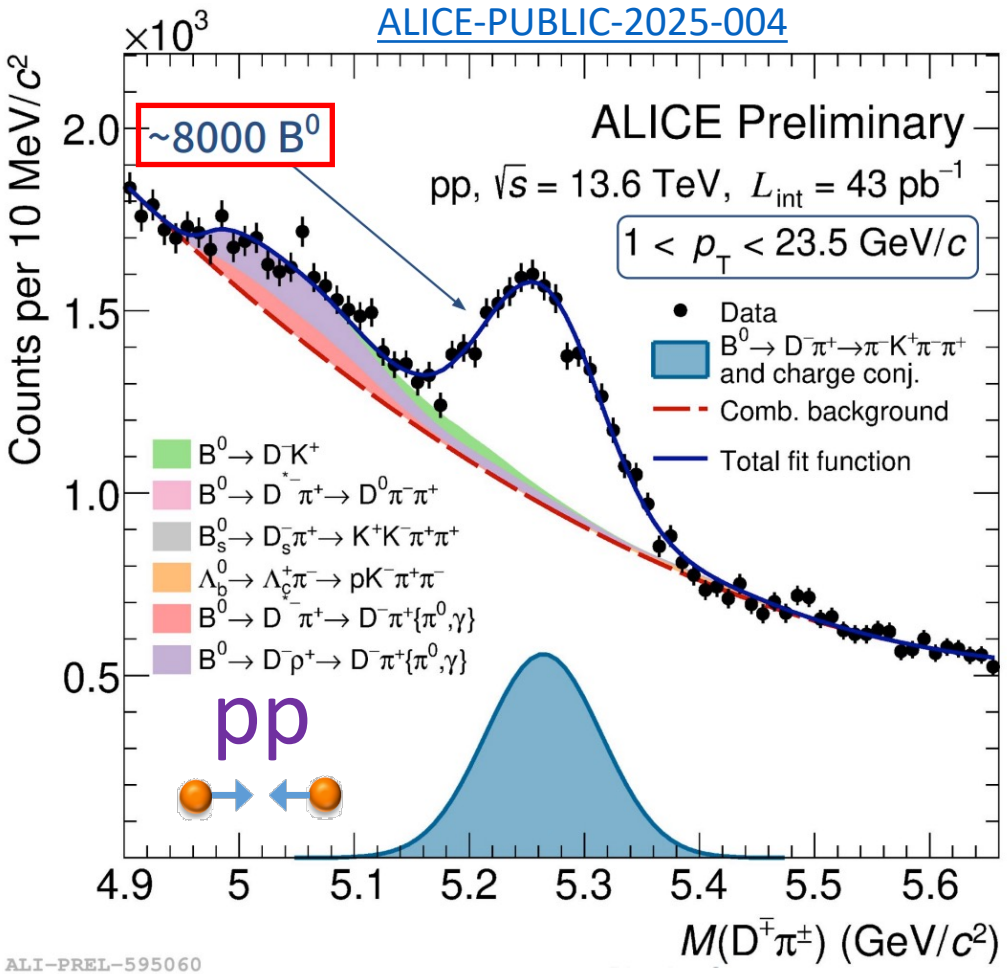




- ITS2 pointing resolution in Run 3 is **x2 better** than in Run 2
  - important for **Heavy Flavour prompt** / **non-prompt** separation

(DCA – distance of closest approach to primary vertex)

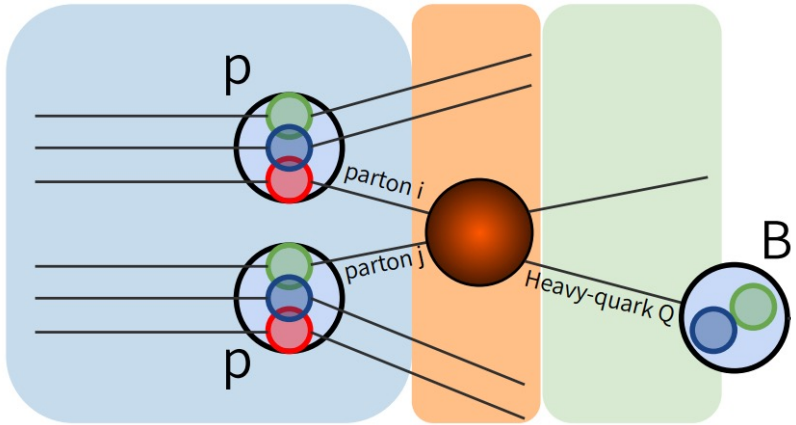
First full reconstruction of open-beauty hadrons at ALICE

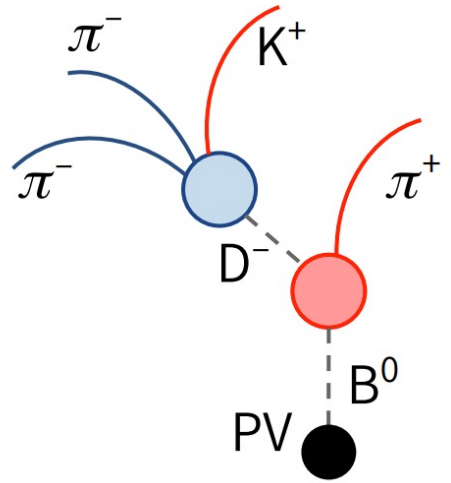


Charm and **beauty** quarks
- produced in initial hard scatterings
- calculable with pQCD

pp: test of PDFs and hadronization models

AA: energy loss, transport, thermalization





cτ ≈ 455 μm

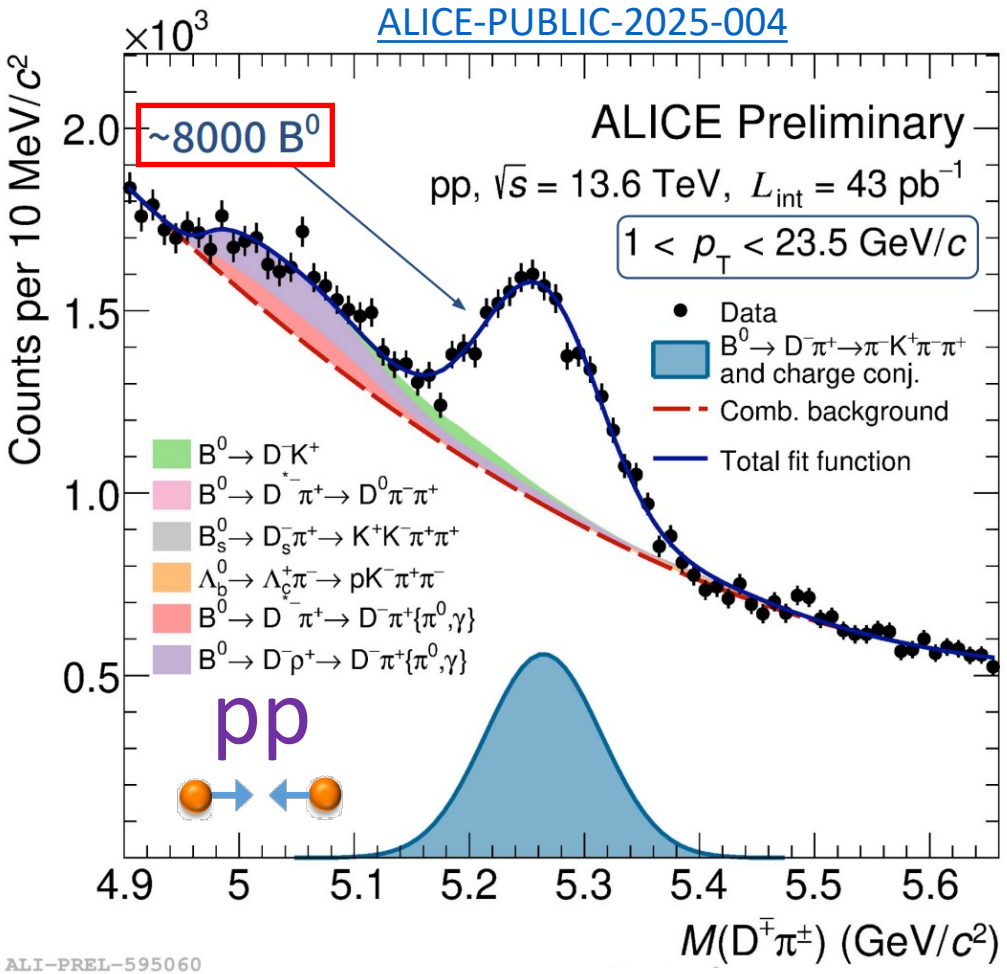
pointing res.
offline triggers
high stat.

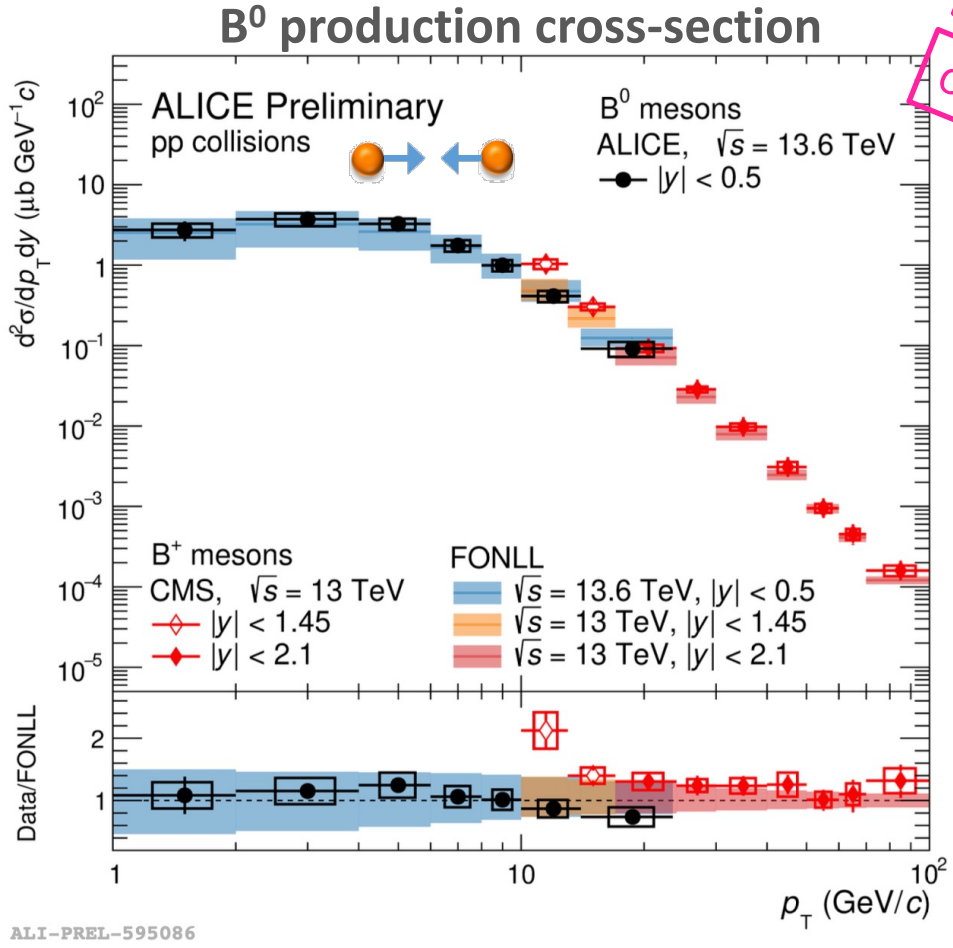
- **First measurement of B^0 at midrapidity** (not accessible with previous detector)

Antonio Palasciano
T04, Mon 15:40

First full reconstruction of open-beauty hadrons at ALICE

ALICE-PUBLIC-2025-004





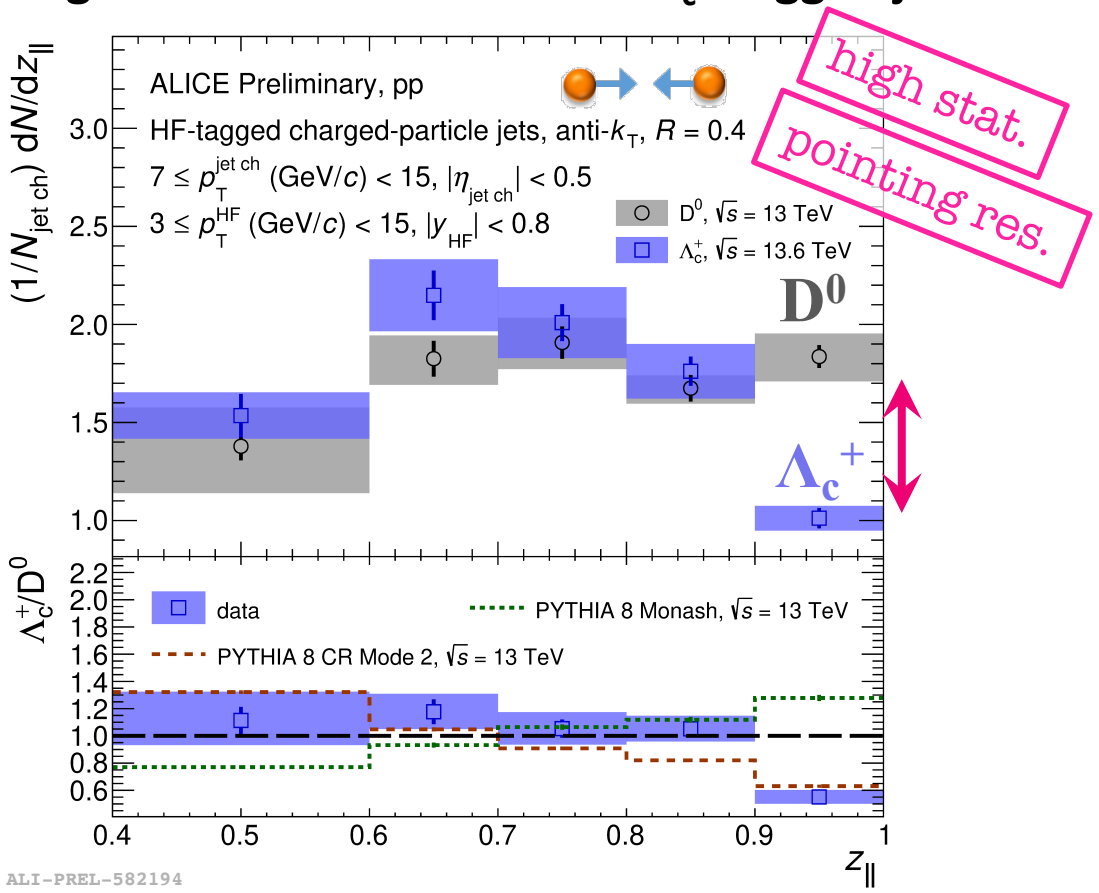
pointing res.
offline triggers
high stat.

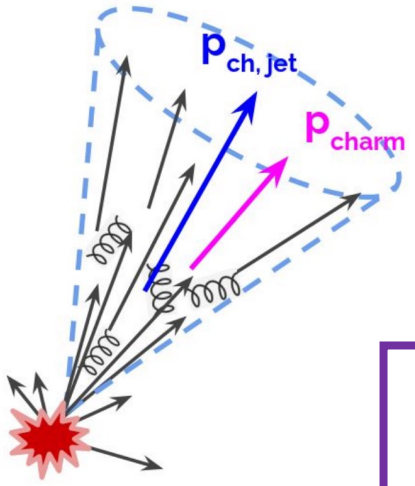
- **First measurement of B^0 at midrapidity down to p_T = 1 GeV/c**
- In agreement with FONLL calculations (theoretical unc. >> experimental unc.!)

Antonio Palasciano
T04, Mon 15:40

Jet measurements in Run 3

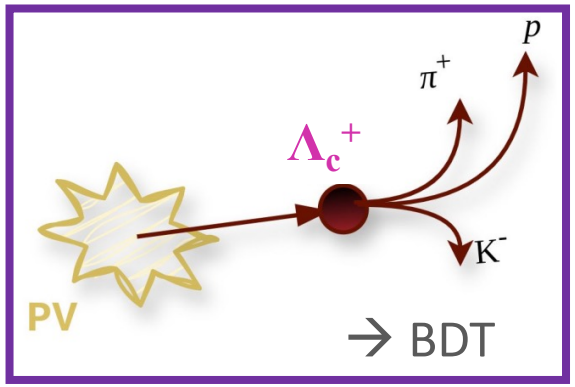
Fragmentation function with Λ_c^+-tagged jets





longitudinal momentum fraction

$$z_{\parallel} = \frac{\vec{p}_{\text{ch, jet}} \cdot \vec{p}_{\text{HF}}}{\vec{p}_{\text{ch, jet}} \cdot \vec{p}_{\text{ch, jet}}}$$



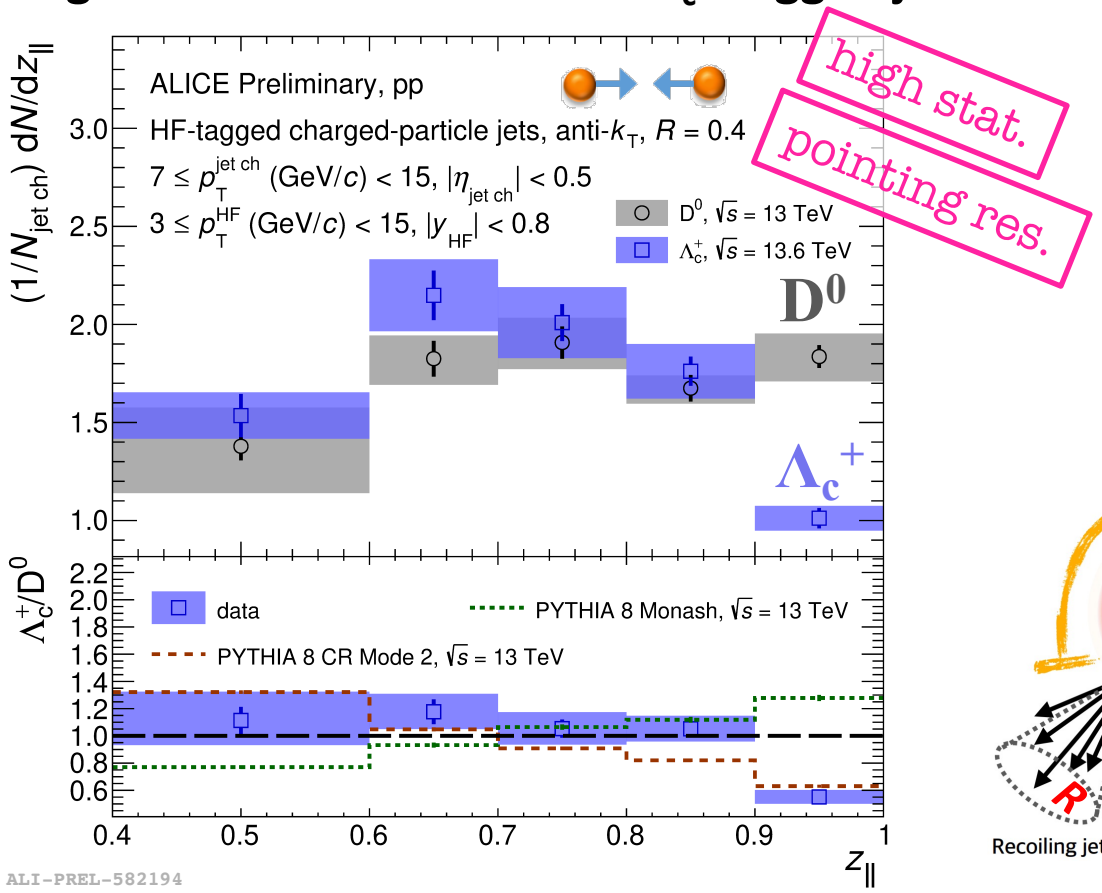
- Hint of softer fragmentation of charm into Λ_c^+ than D^0

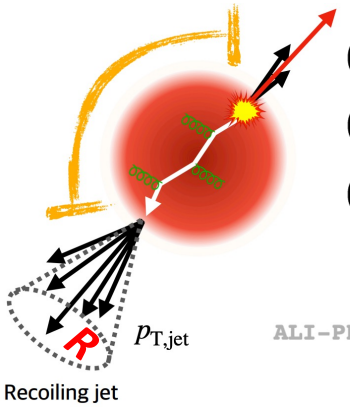
Samuele Cattaruzzi
T05, Fri 09:10

Daniel Jones
T04, Mon 09:45

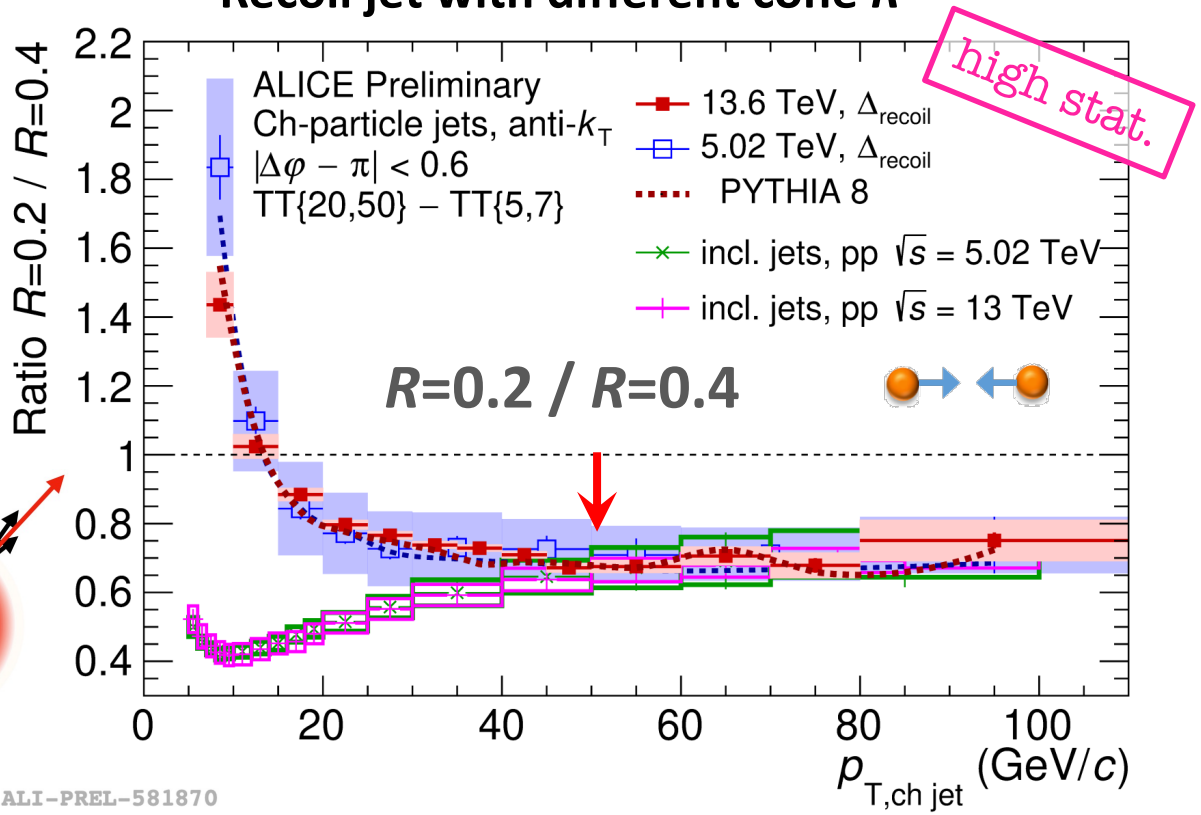
Jet measurements in Run 3

Fragmentation function with Λ_c^+-tagged jets





Recoil jet with different cone R



- Hint of softer fragmentation of charm into Λ_c^+ than D^0

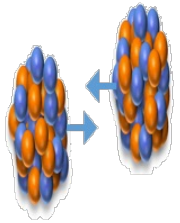
Samuele Cattaruzzi
T05, Fri 09:10

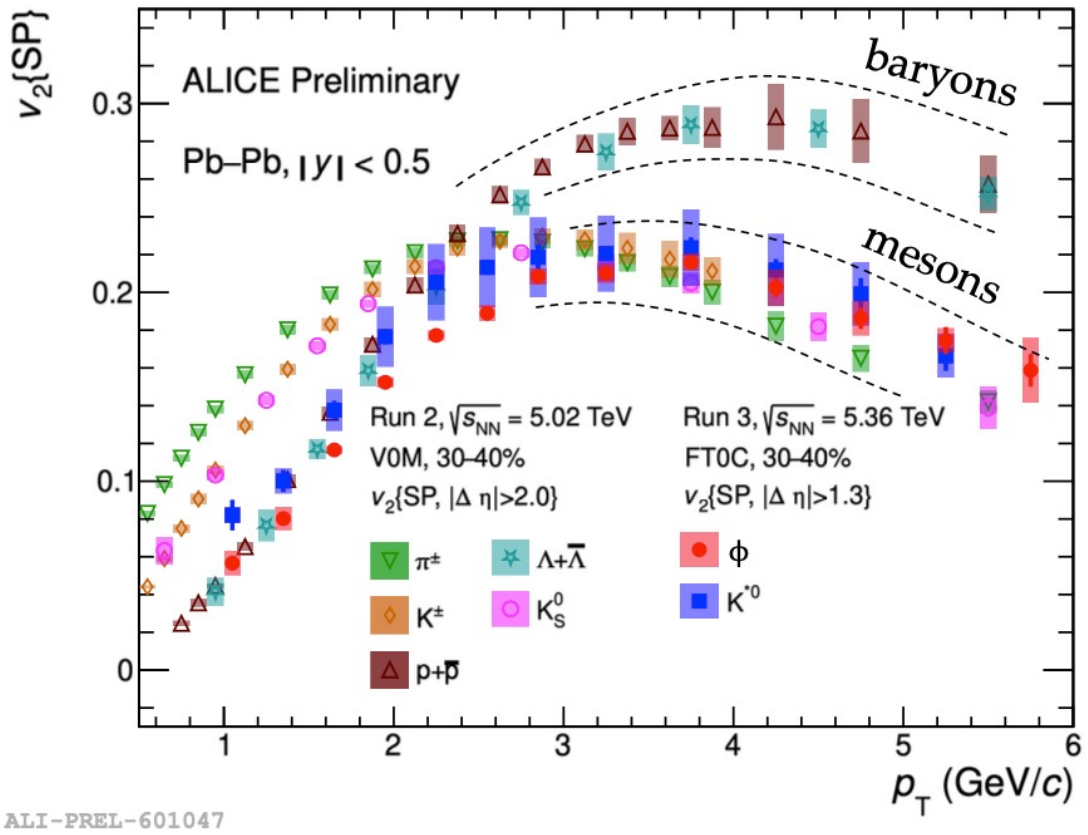
Daniel Jones
T04, Mon 09:45

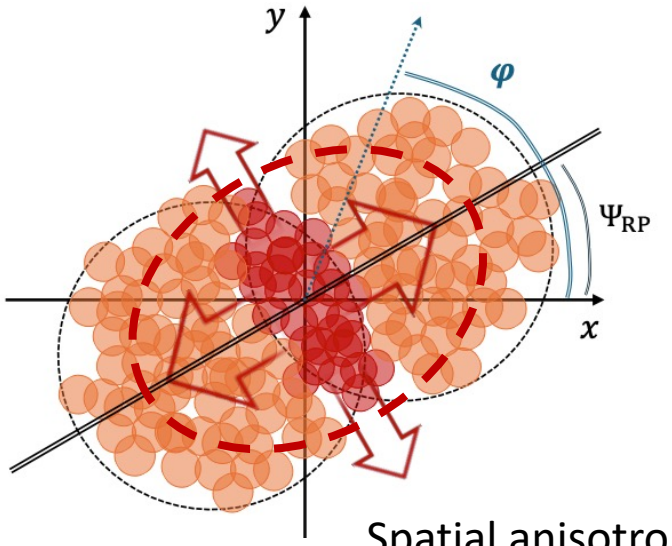
- Suppression at high jet p_T: QCD radiation outside of jet cone

Joonsuk Bae
T05, Tue 09:30

Anisotropic flow of particles in **Pb-Pb** collisions







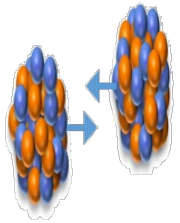
Spatial anisotropy → **momentum anisotropy**

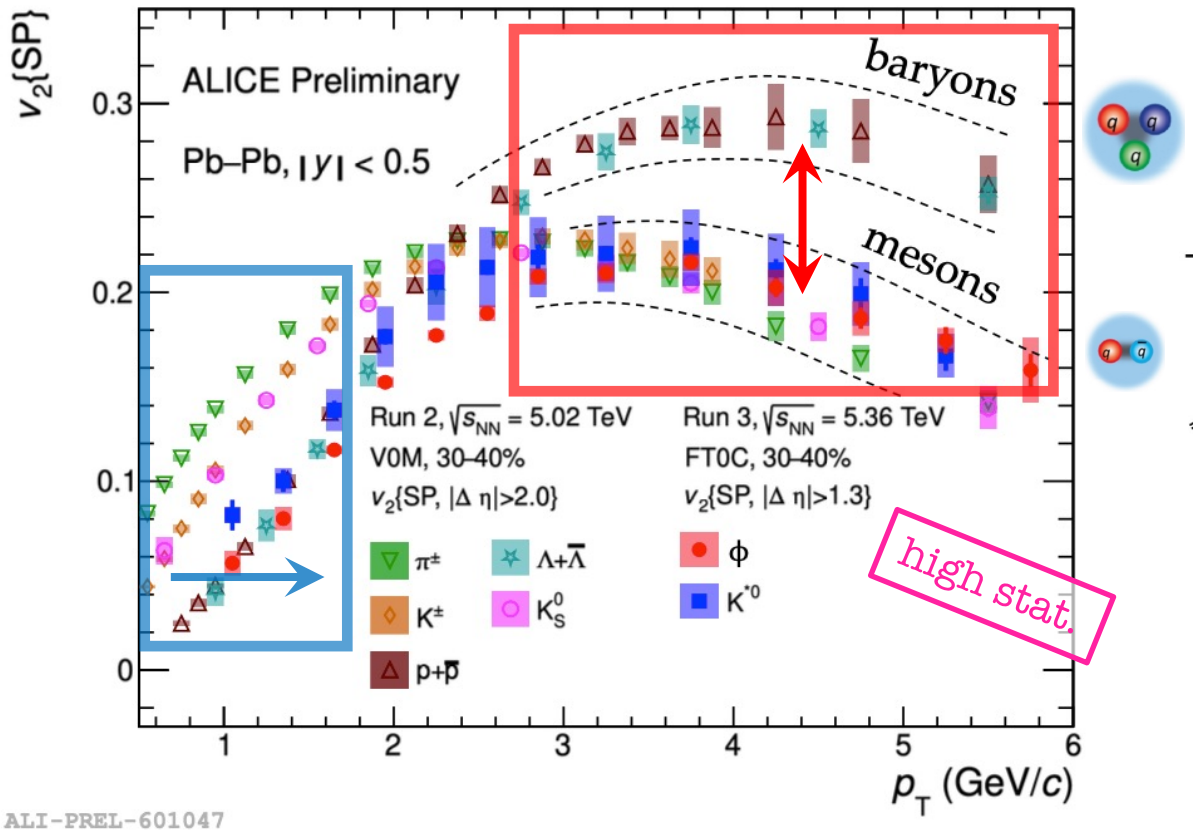
- quantified via Fourier decomposition:

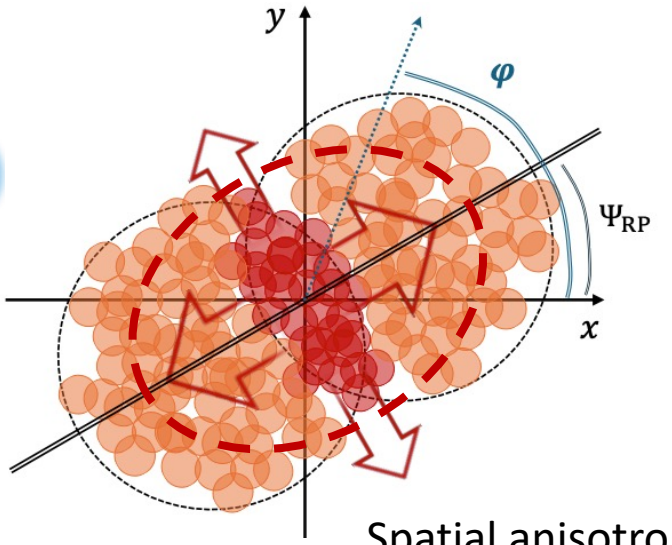
$$\frac{dN}{d\varphi} \propto \left(1 + 2\sum_{n=1}^{\infty} v_n(cos[n(\varphi - \Psi_{RP})])\right)$$

leading term: v_2 – "elliptic flow"

Anisotropic flow of particles in **Pb-Pb** collisions







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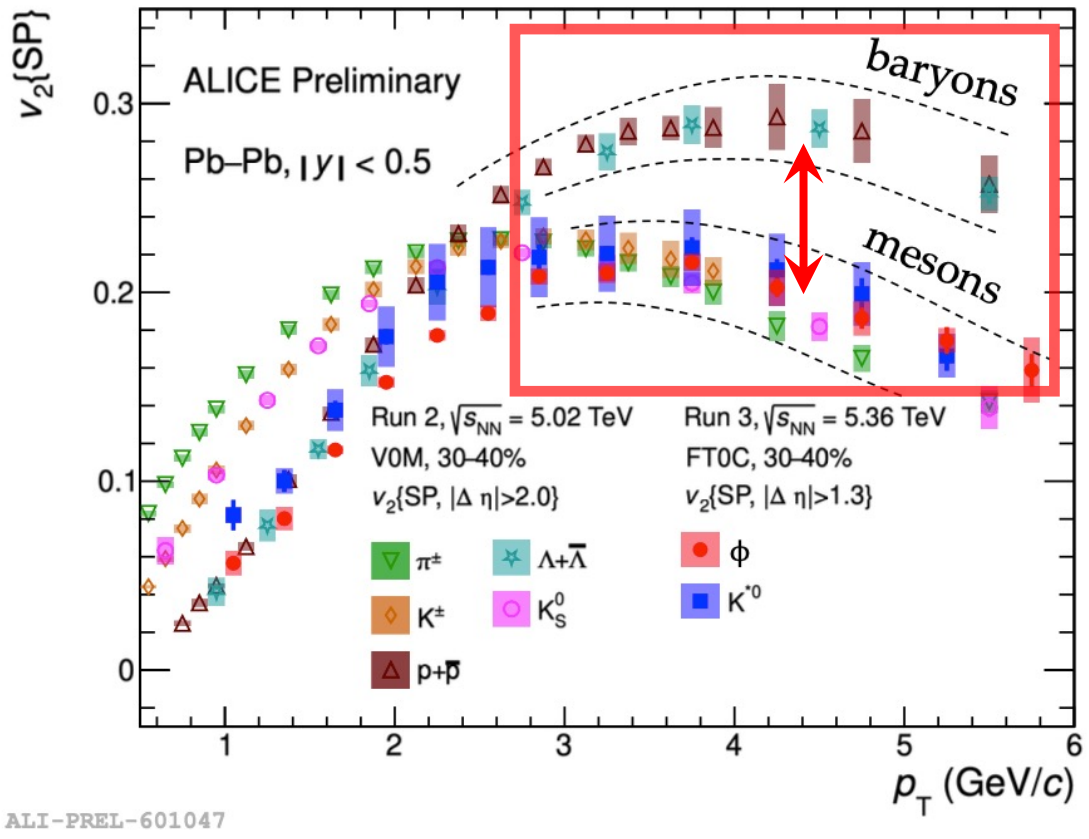
$$\frac{dN}{d\varphi} \propto \left(1 + 2\sum_{n=1}^{\infty} v_n(cos[n(\varphi - \Psi_{RP})])\right)$$

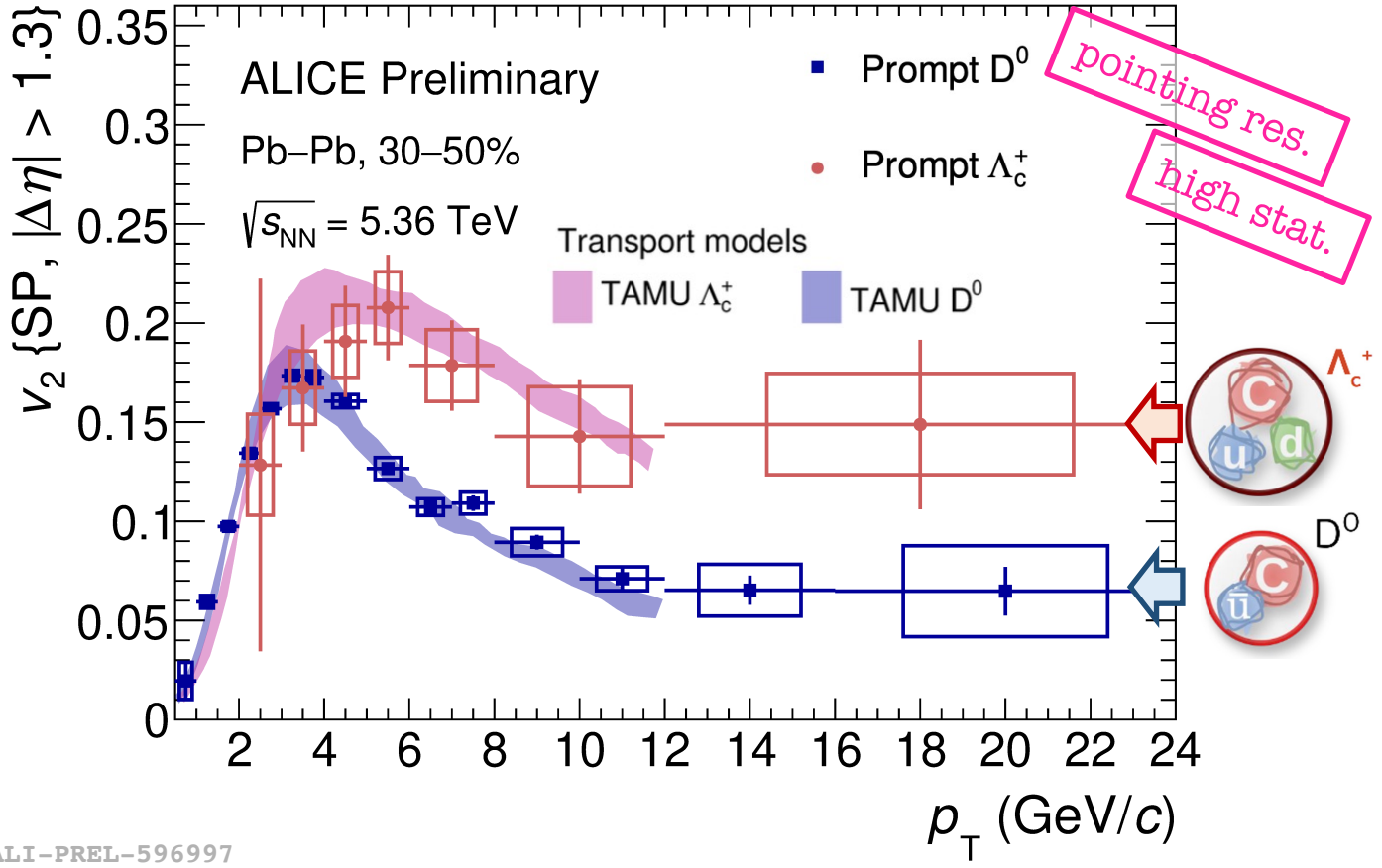
leading term: v_2 – "elliptic flow"

- Low p_T: **"ordering" by particle mass** ⟶ common velocity field
- High p_T: **baryon/meson grouping** ⟶ quarks recombine (coalescence)

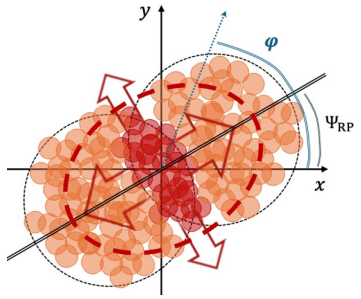
World-first measurement of Λ_c^+ baryon flow in Pb–Pb



ALI-PREL-601047



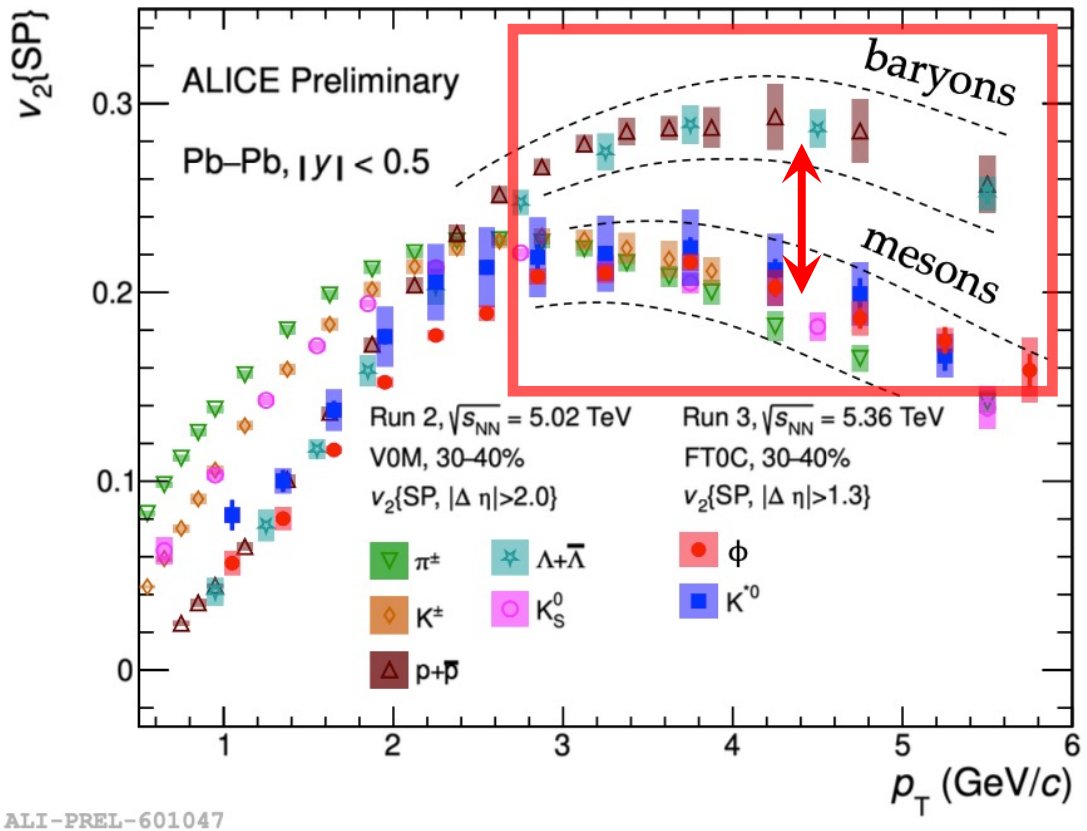
ALI-PREL-596997



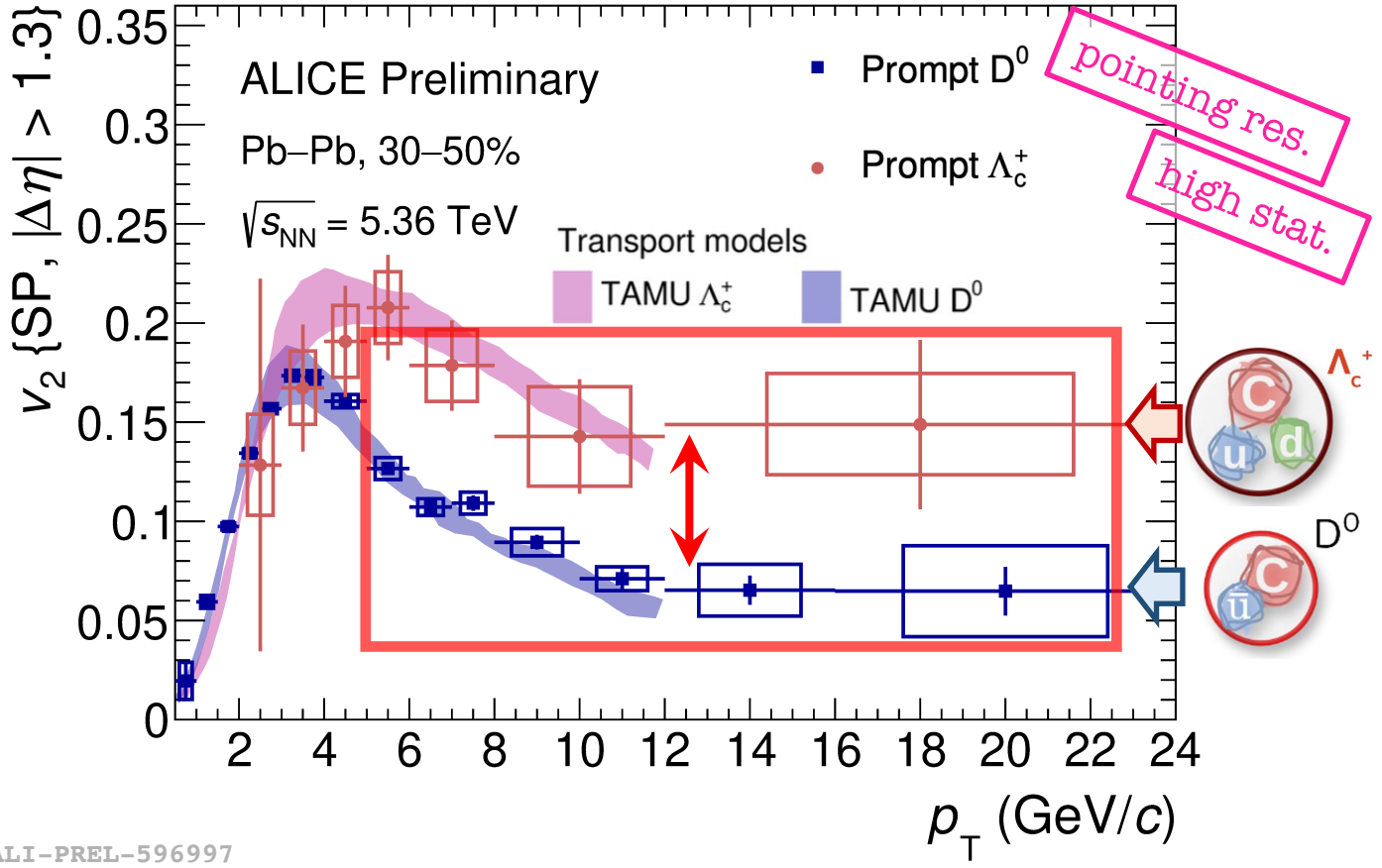
- **First prompt charm-baryon v_2 measurement in heavy-ion collisions**

Marcello Di Costanzo
T04, Wed 17:00

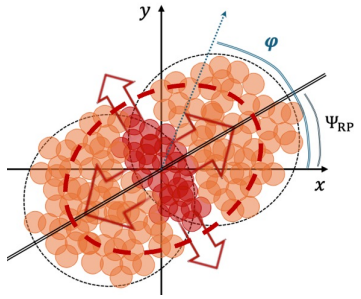
World-first measurement of Λ_c^+ baryon flow in Pb–Pb



ALI-PREL-601047



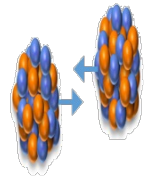
ALI-PREL-596997



- First prompt charm-baryon v_2 measurement in heavy-ion collisions
- First evidence of **charm baryon/meson splitting** at intermediate/high p_T
  - **TAMU**: includes quark coalescence ⟶ captures the trend

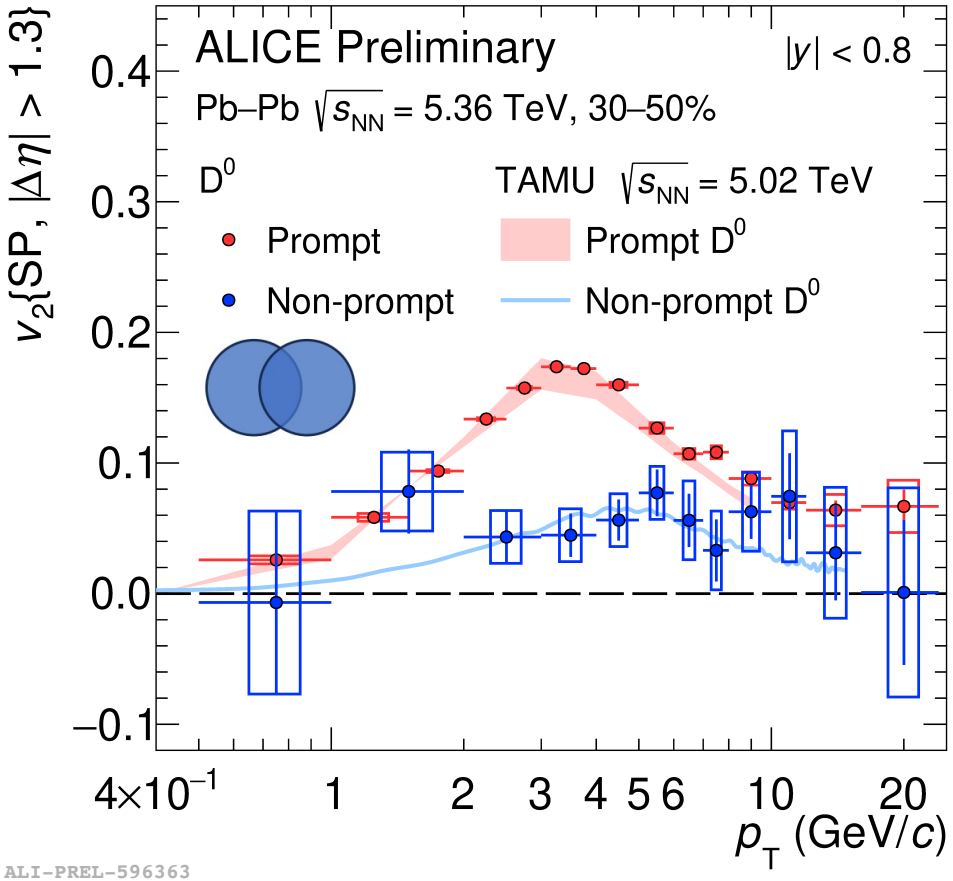
Marcello Di Costanzo
T04, Wed 17:00

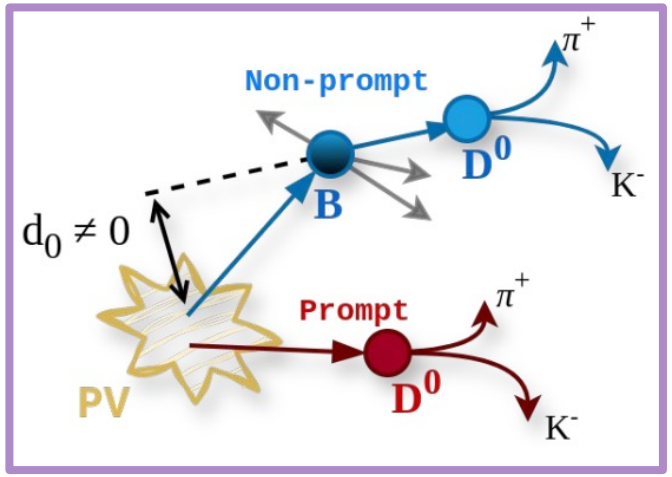
Anisotropic flow of charm and beauty

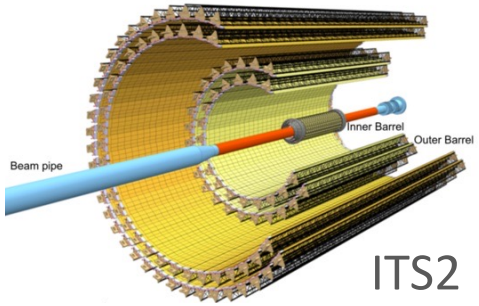


pointing res.

high stat.

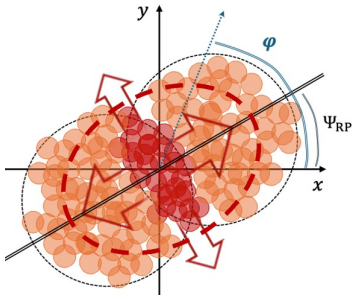






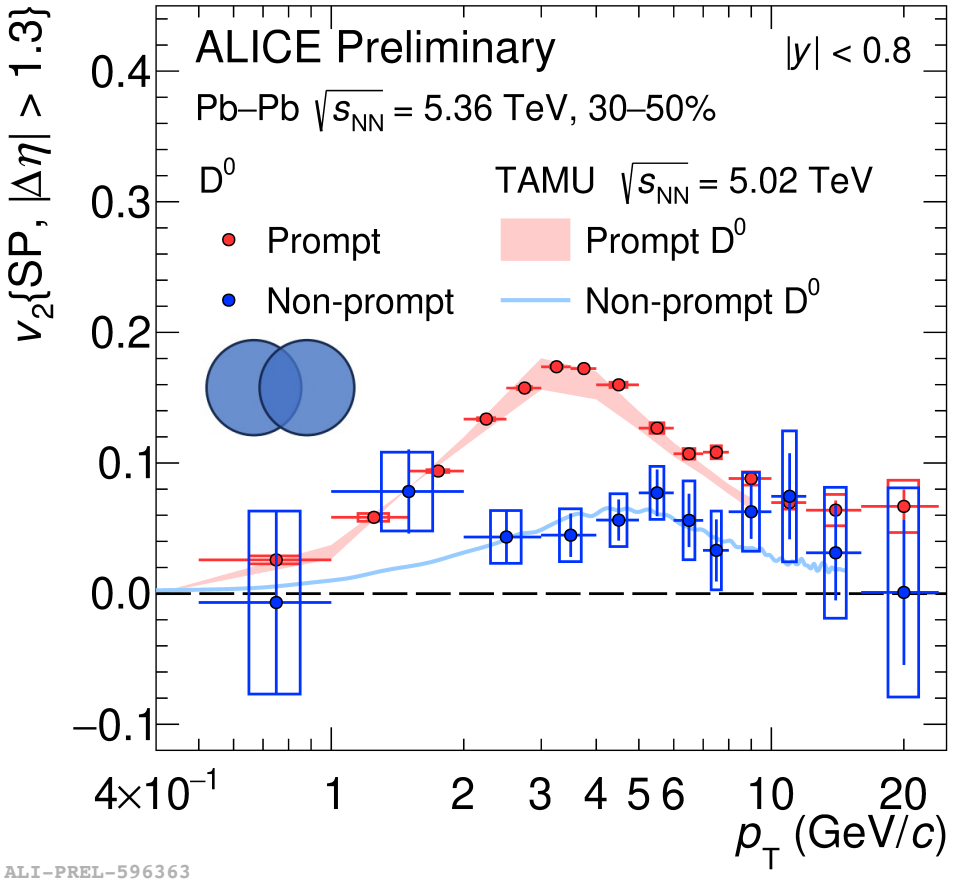
Marcello Di Costanzo
T04, Wed 17:00

ALI-PREL-596363

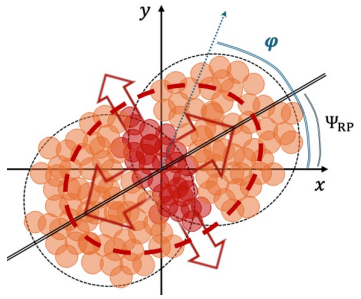


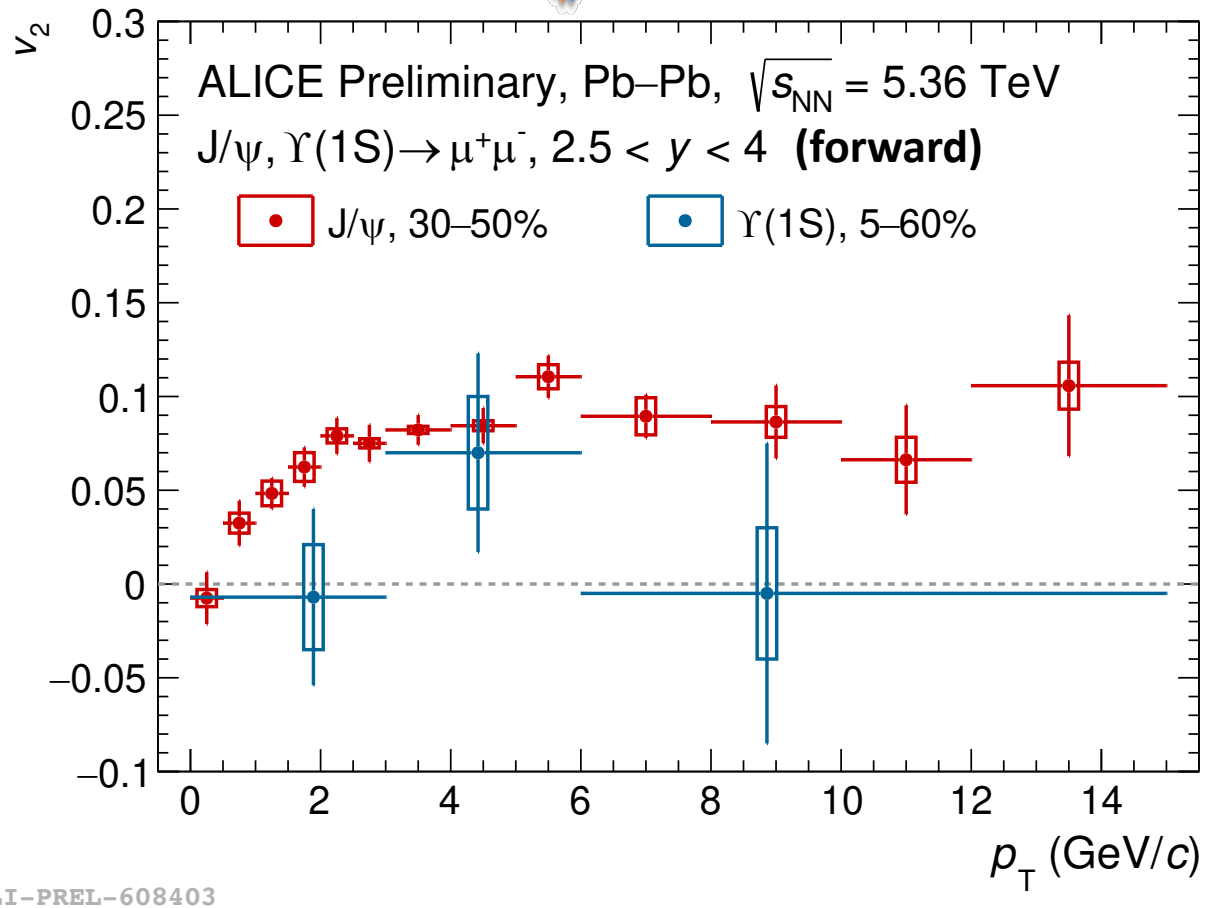
- **Non-prompt D^0** flow (~beauty) smaller than **charm flow**

Anisotropic flow of charm and beauty



ALI-PREL-596363





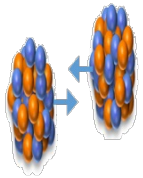
ALI-PREL-608403

- **Non-prompt D^0** flow (~beauty) smaller than **charm flow**
- **Υ(1S) flow** is compatible with zero

⇒ **Beauty hadrons:** less influenced by collective motion, longer relaxation time, no Υ regeneration?

Luca Micheletti
T04, Wed 16:40

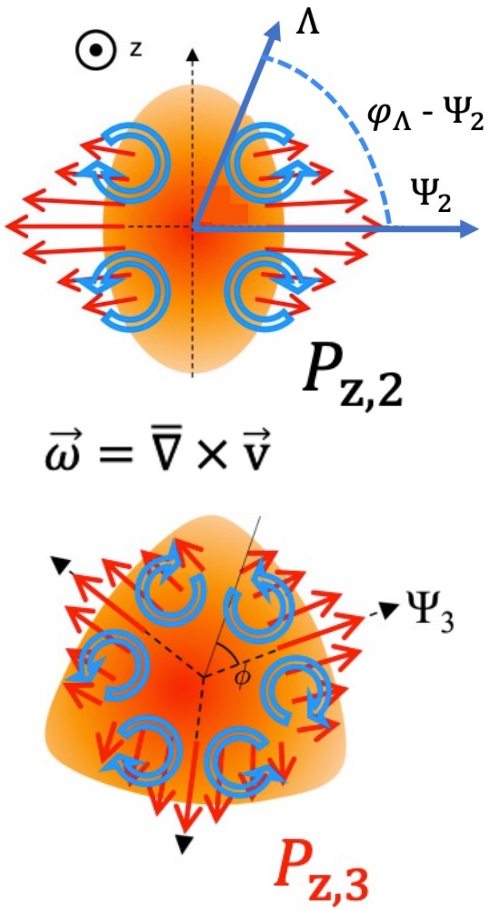
Longitudinal polarization of hyperons in Pb-Pb

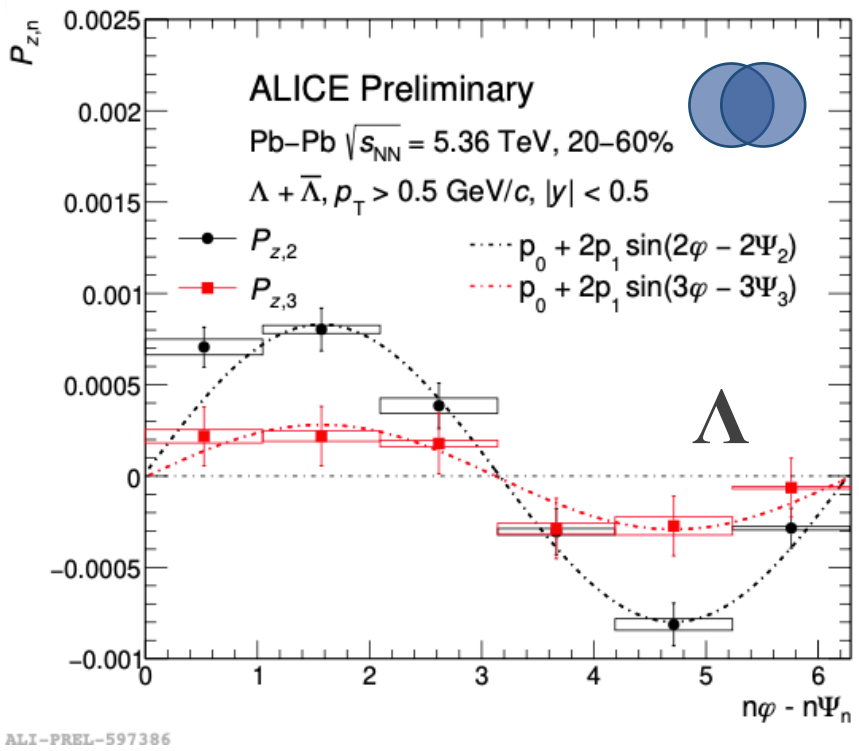


Chiara De Martin
T04, Mon, 14:00

ALICE

high stat.

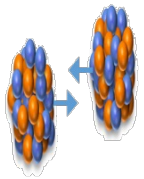




- **Vorticity along the beam axis** → **longitudinal polarization of particles**
- First measurement of **3rd-harmonic longitudinal polarization and for Λ** at LHC

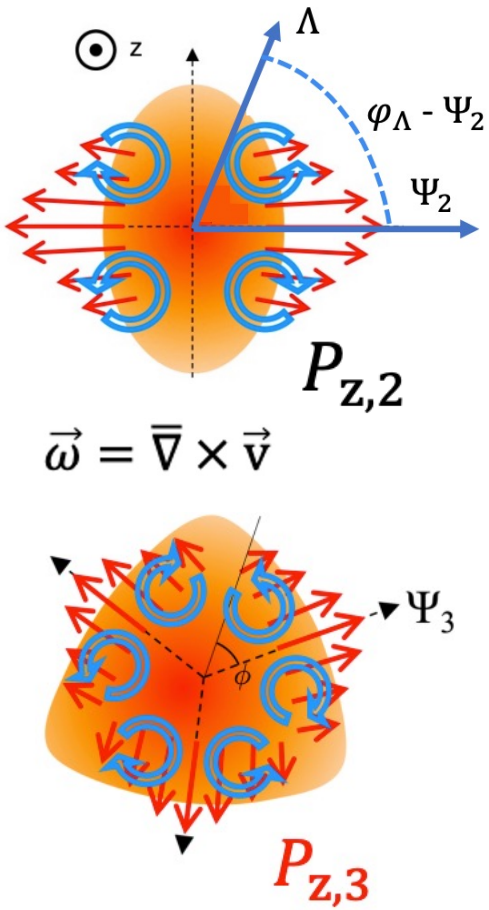
S. Voloshin and T. Niida, Phys. Rev. C 94 (2016) 021901(R)

Longitudinal polarization of hyperons in Pb-Pb

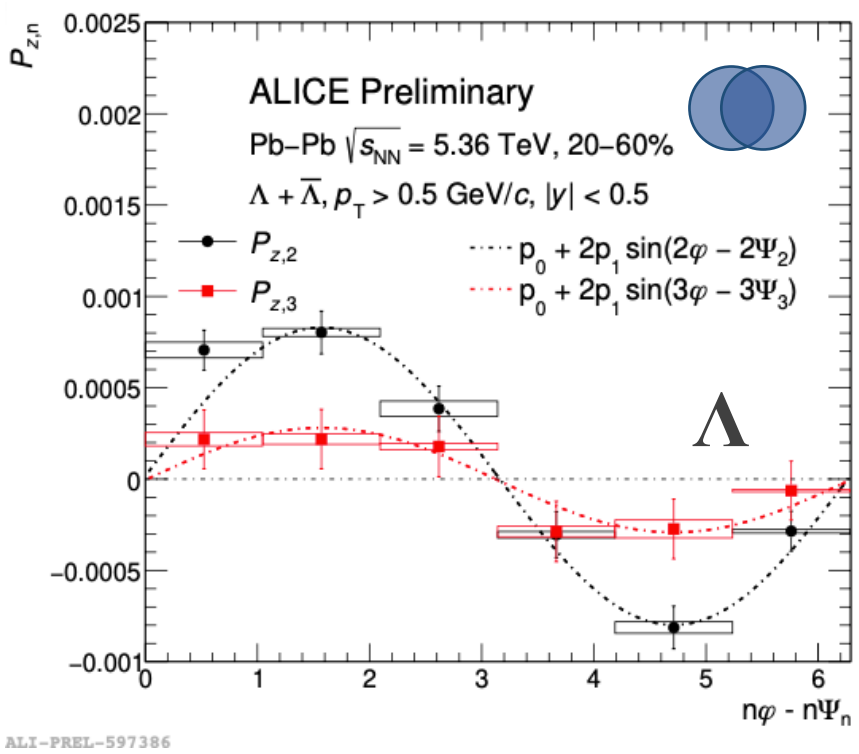


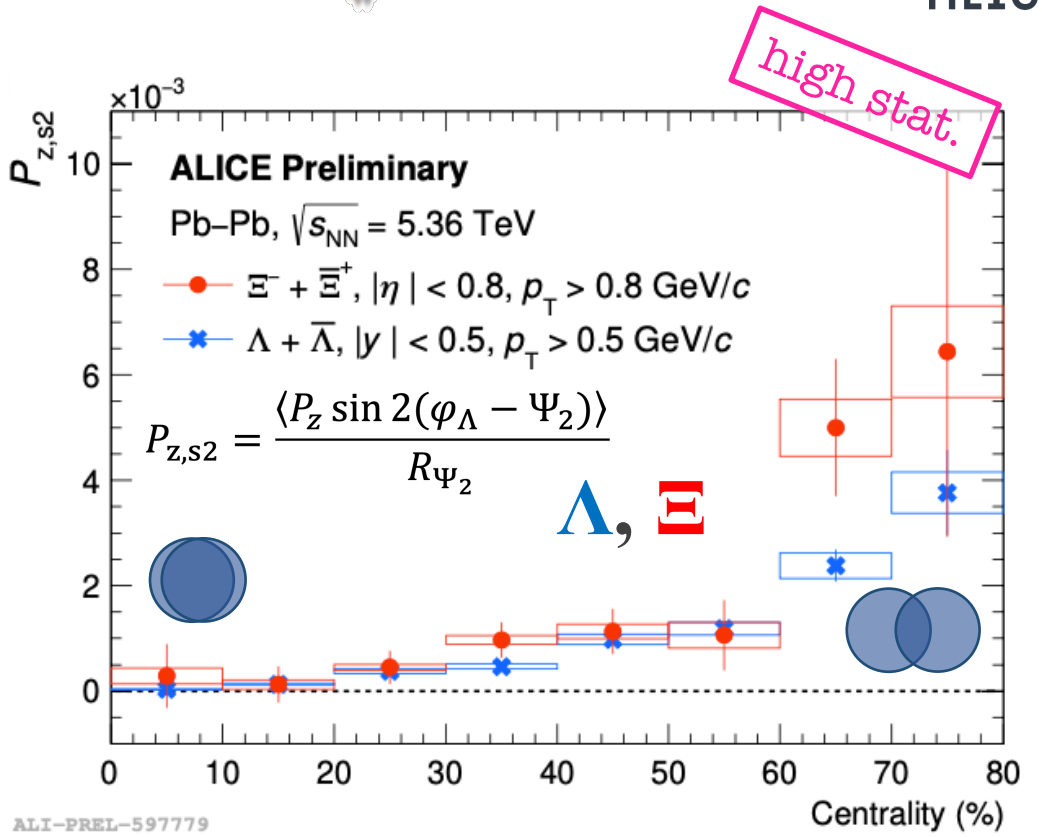
Chiara De Martin
T04, Mon, 14:00

ALICE



S. Voloshin and T. Niida, Phys. Rev. C 94 (2016) 021901(R)





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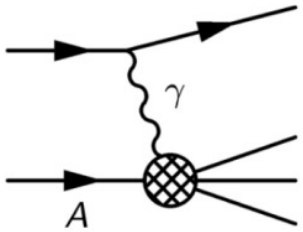
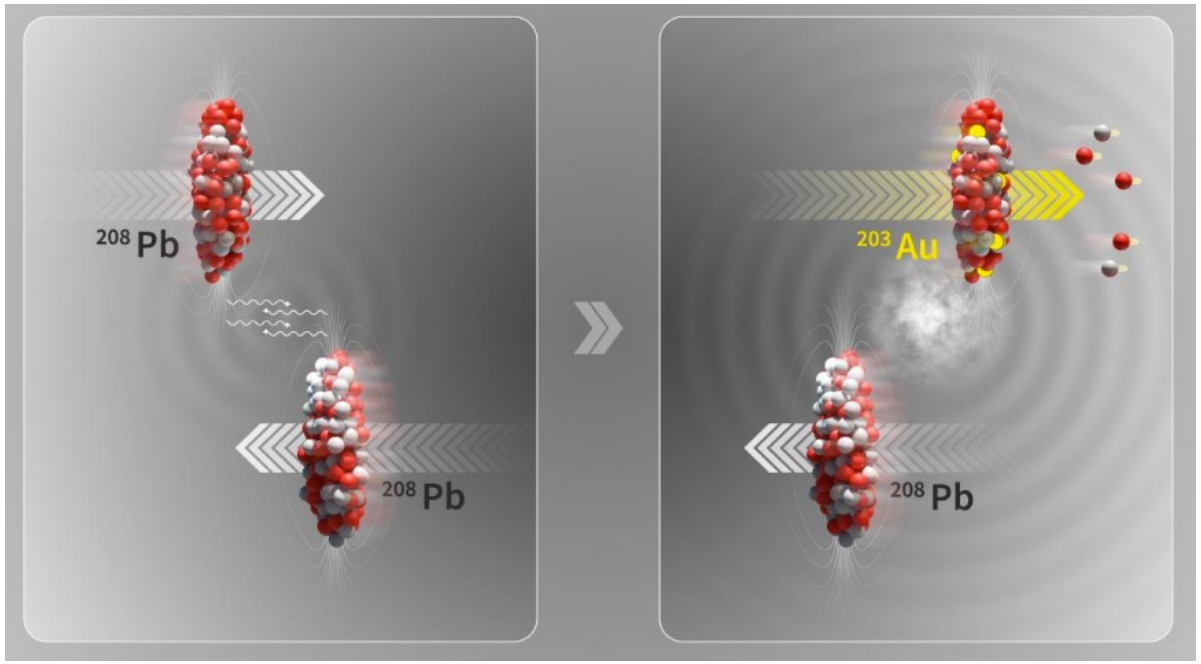
- First measurement of **longitudinal polarization of Ξ** at LHC

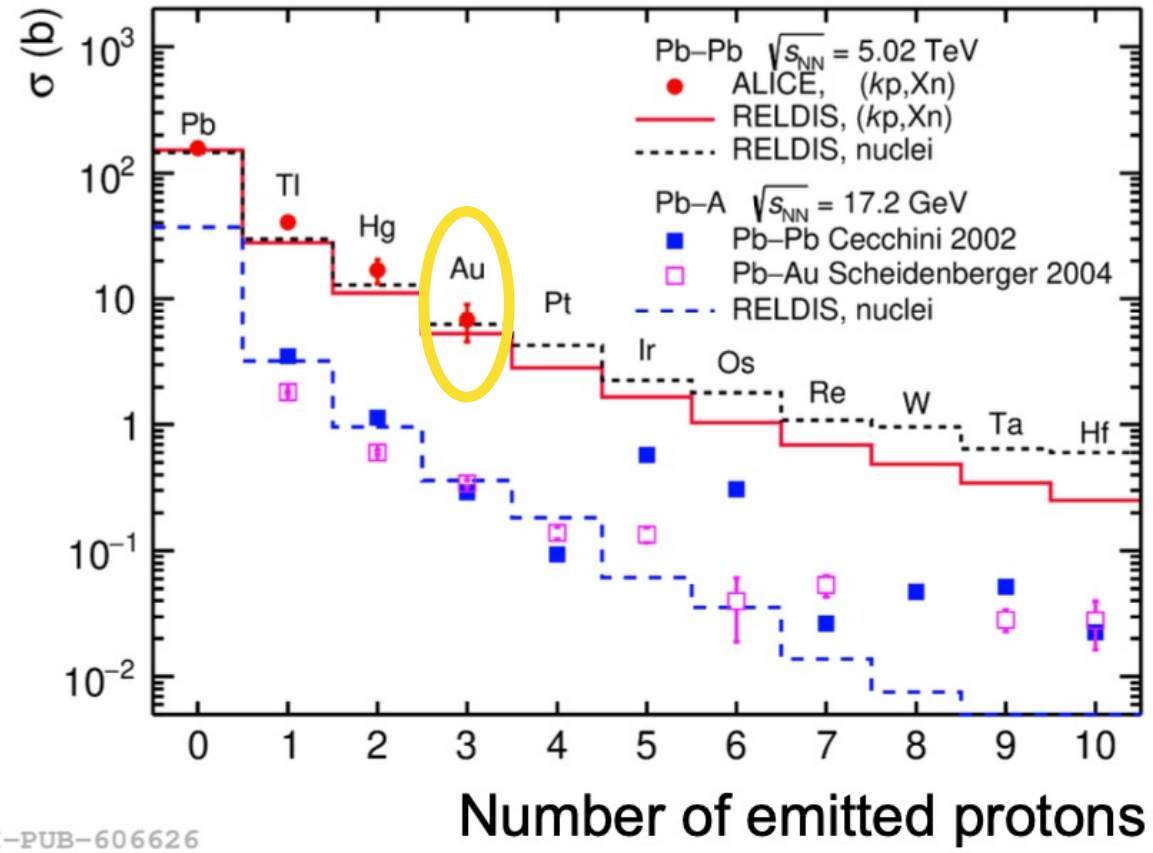


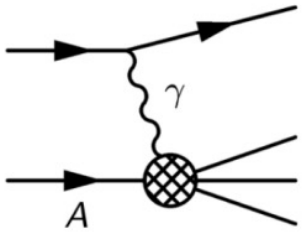
γ-Pb Ultra-Peripheral Collisions: Alchemy at the LHC

- Electromagnetic dissociation of Pb nucleus in ultraperipheral collisions
  - emission of 3 protons corresponds to **transmutation of Lead into Gold by light** (≈2.9 x 10^{-11} g of Au produced in Run 2)



ALICE, PRC111 (2025) 054906

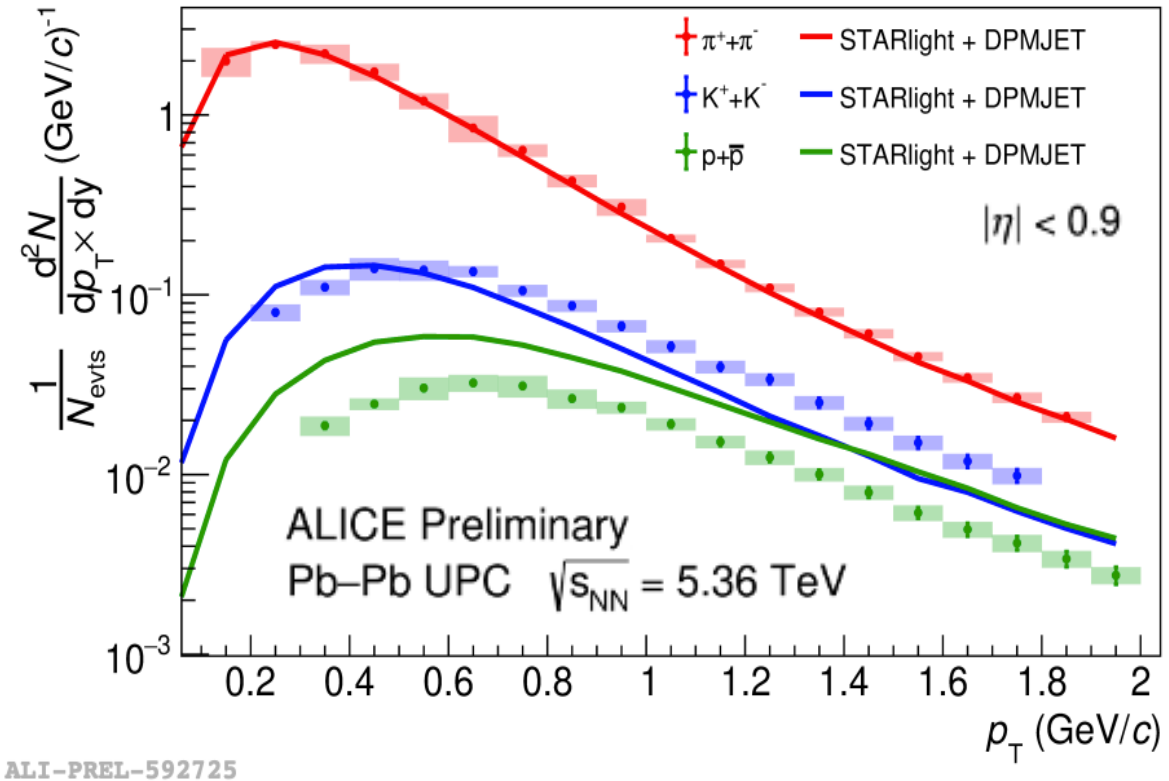




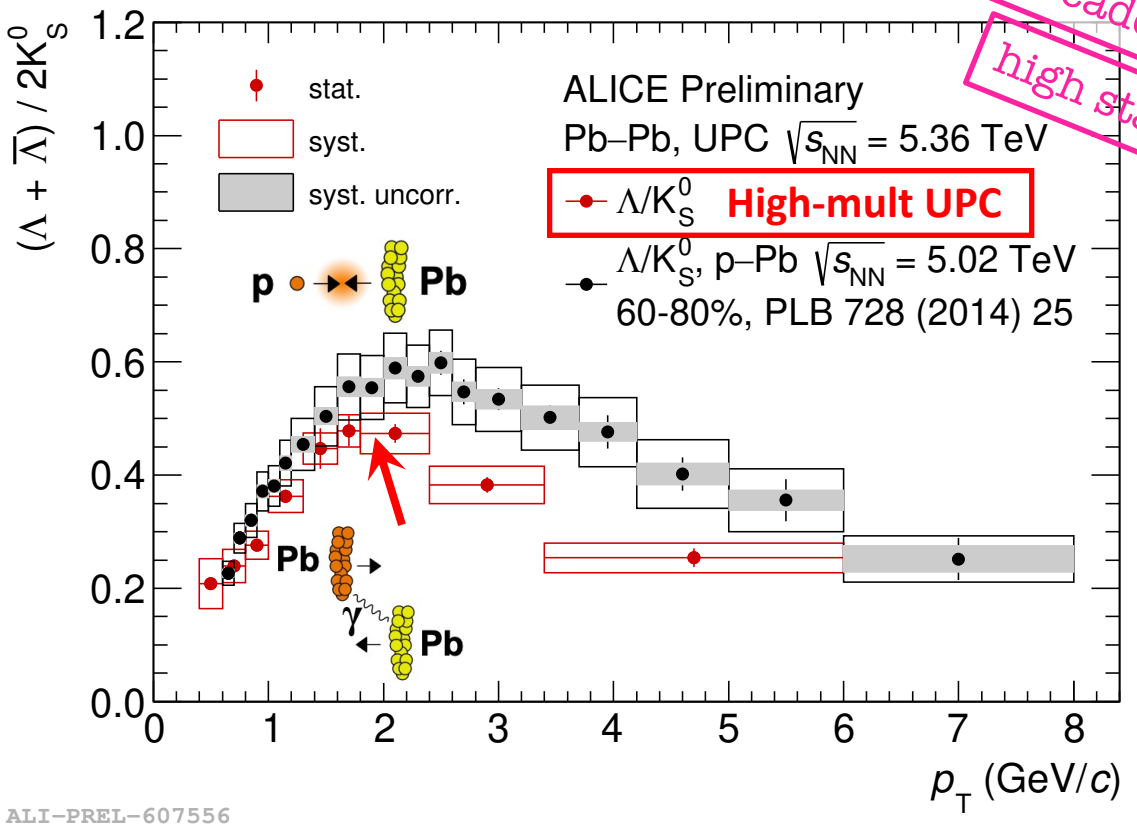
γ-Pb Ultra-Peripheral Collisions

continuous readout

high stat.



ALI-PREL-592725



ALI-PREL-607556

- *Continuous readout:*
  - no trigger needed anymore, **everything is recorded**
- Fully corrected **π**, **K**, **p** spectra up to $p_T \sim 2$ GeV/c

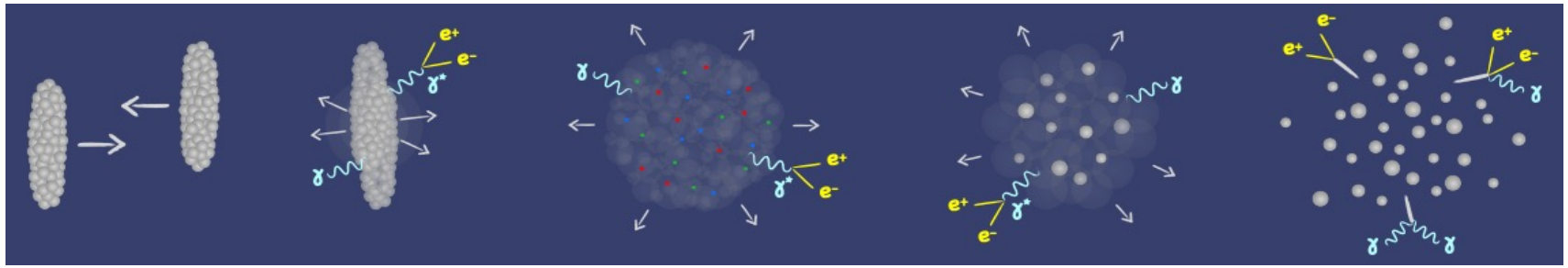
Simone Ragoni
T04, Tue 08:50

Testing QGP-attributed signatures in UPC:

- Λ/K^0_S ratio **enhancement in γ-Pb** is reminiscent of that measured **in p–Pb**

Romain Schotter
T04, Wed 09:50

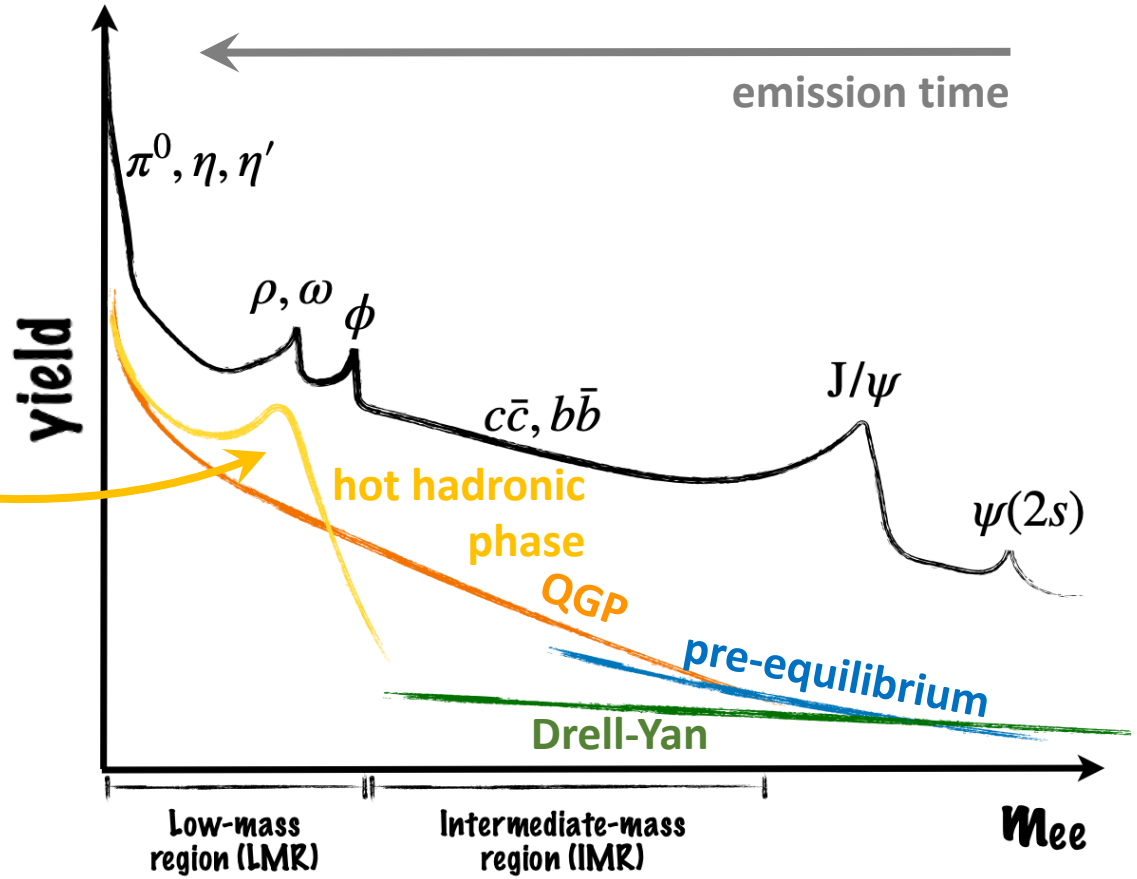
Probing properties and evolution of QGP with dielectrons



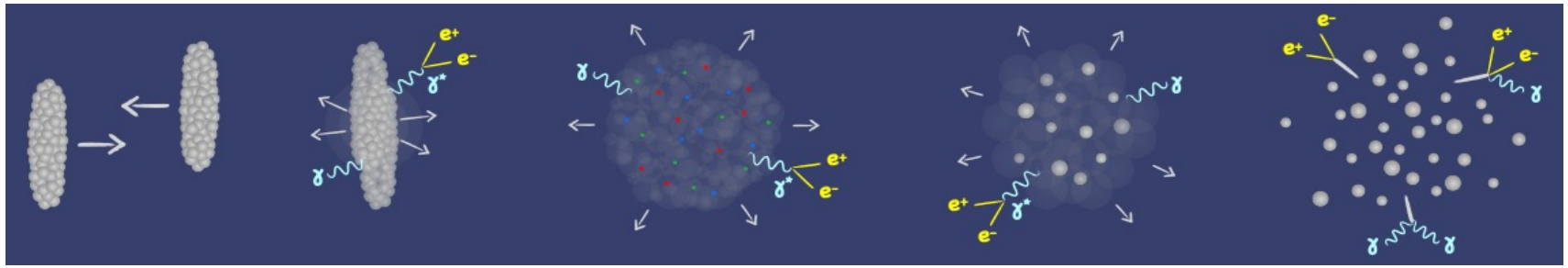
Emma Ege
T04, Tue 09:50

Dielectrons are created in **all stages of the collision**, **do not interact strongly** → access to:

- **chiral symmetry restoration**
- **QGP temperature**



Probing properties and evolution of QGP with dielectrons



Emma Ege
T04, Tue 09:50

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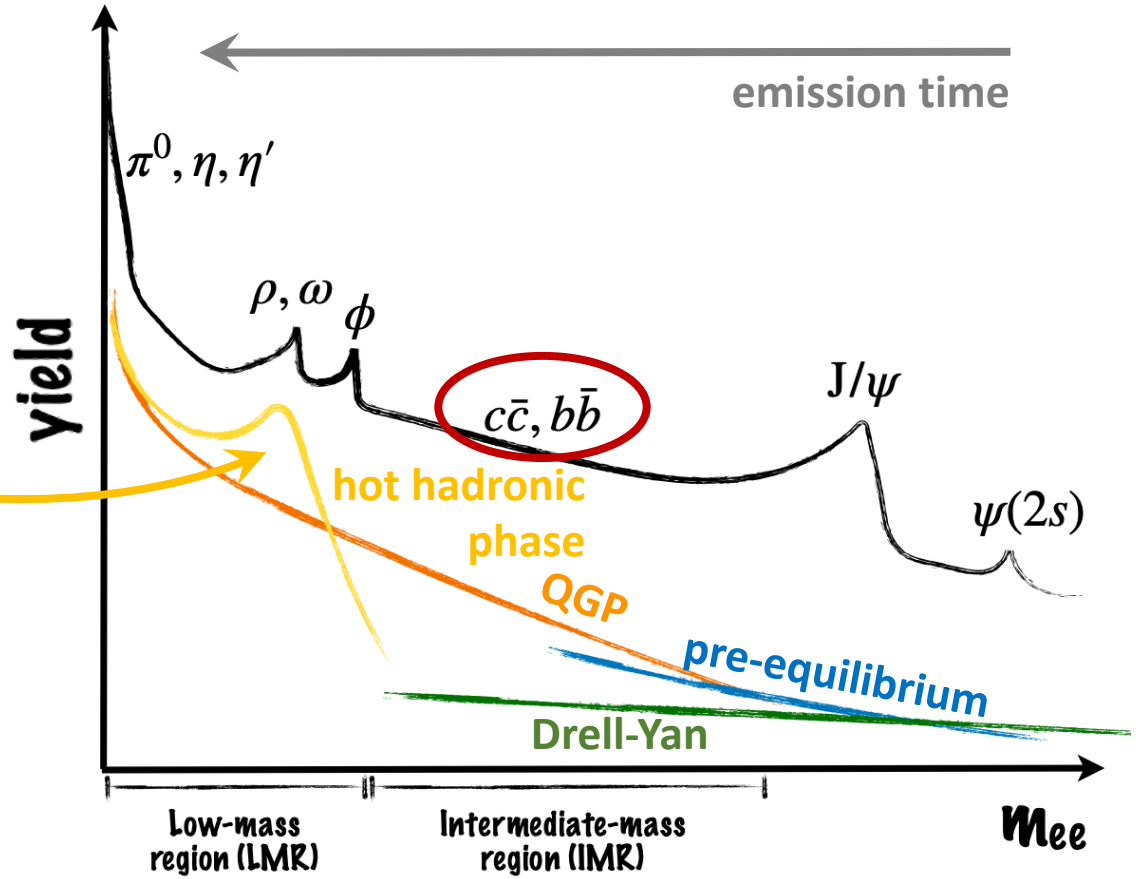
shape modification



At LHC energies: **huge Heavy-Flavour background**
→ **require good pointing resolution**

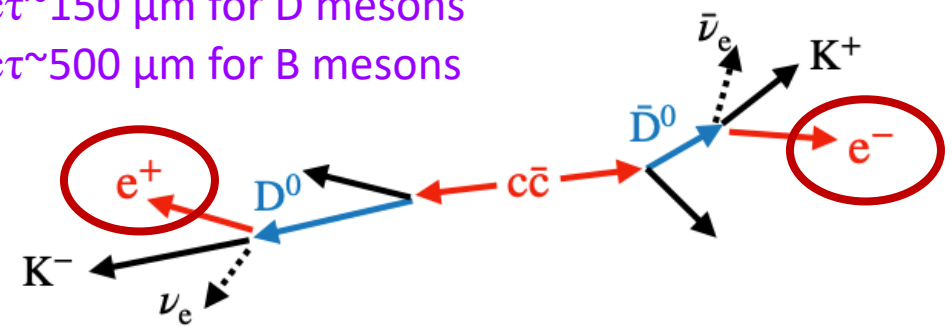
First unfolded dielectron spectra in Run 3 (pp)

high stat.

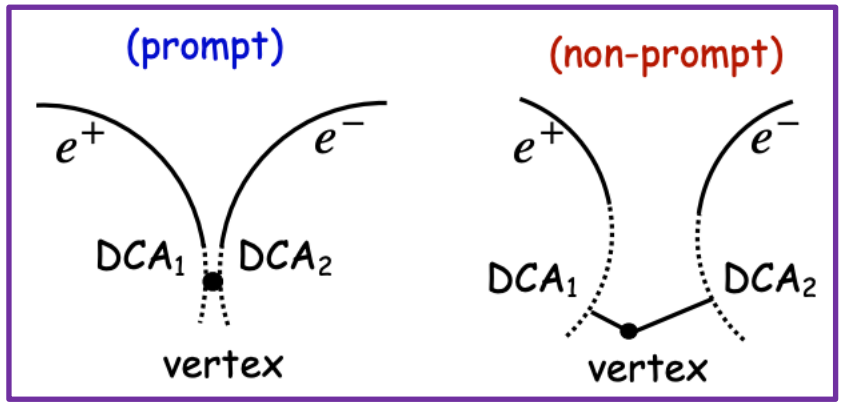
pointing res.

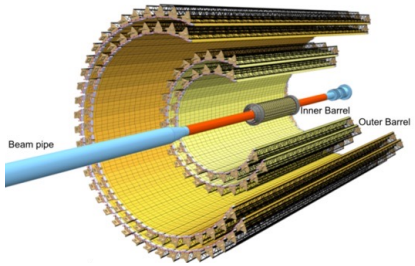
cτ~150 μm for D mesons

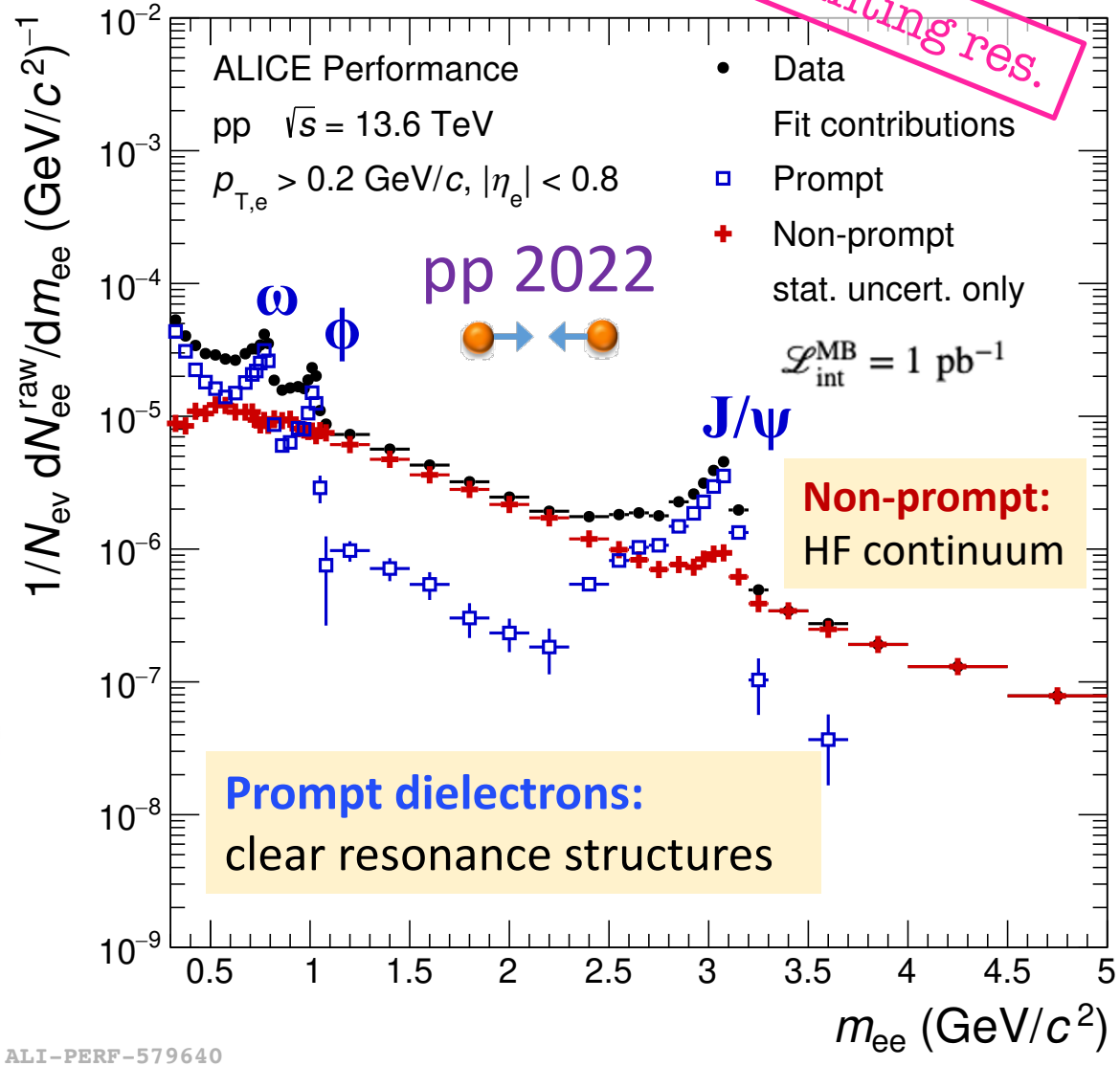
cτ~500 μm for B mesons



→ Suppress HF decay background utilizing **pointing resolution of new ITS2:**







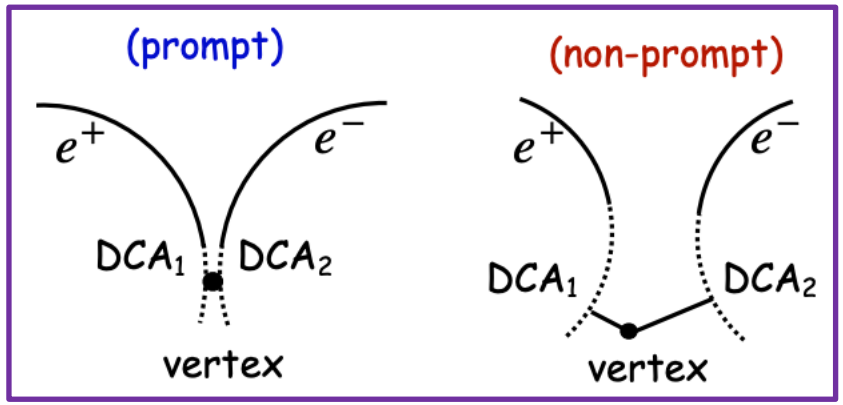
Emma Ege
T04, Tue 09:50

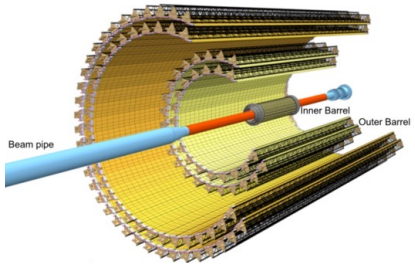
First dielectron spectra in Pb-Pb

high stat.

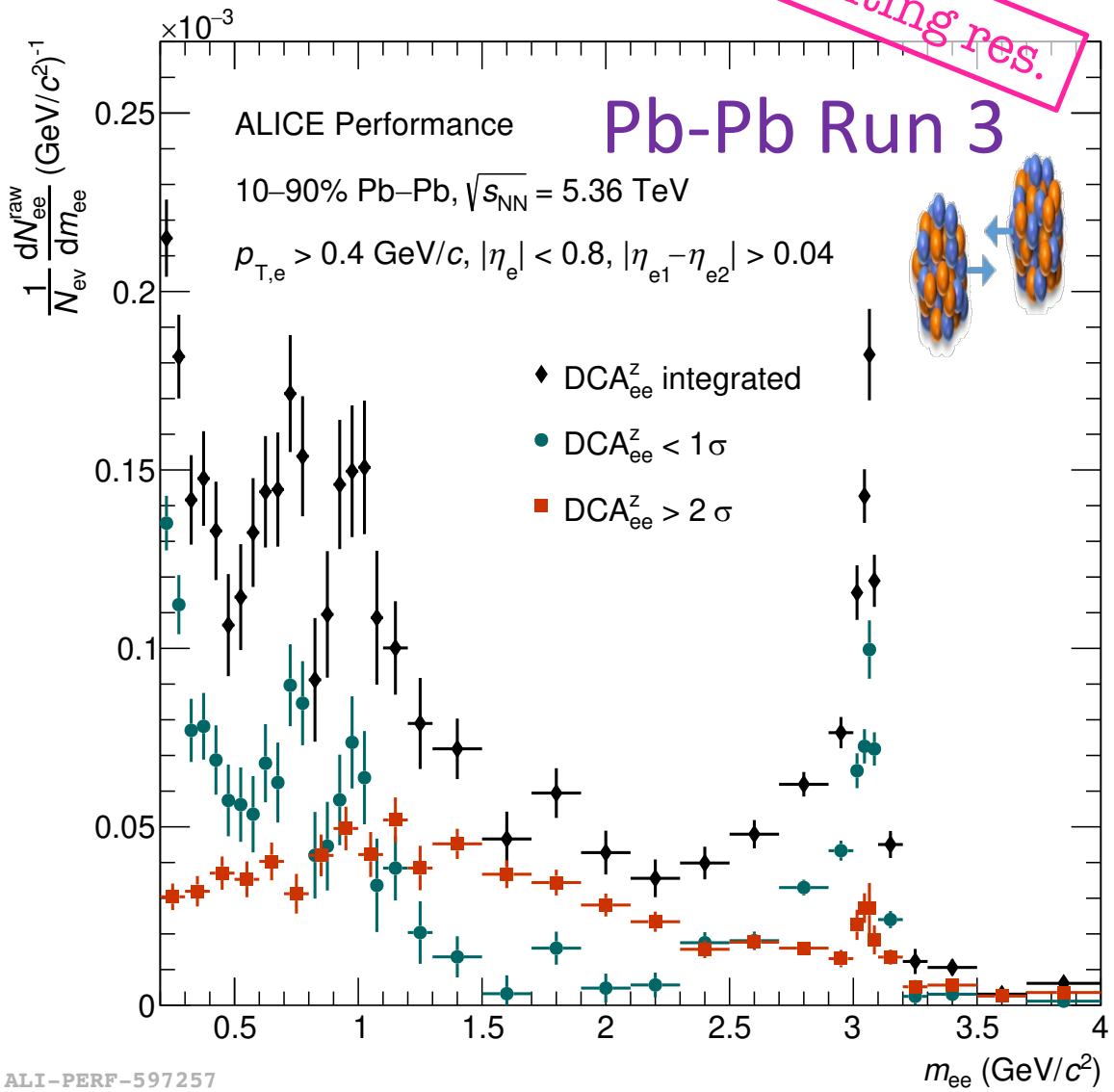
pointing res.

- Clear separation of **prompt** and **non-prompt** sources
- Vector mesons clearly visible



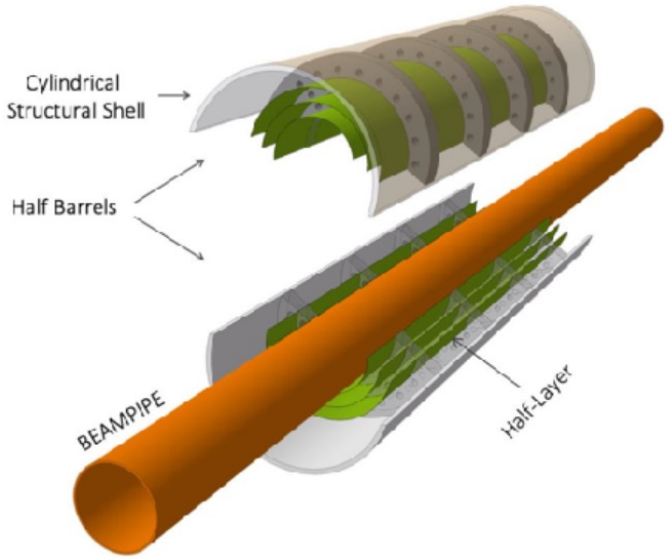


Emma Ege
T04, Tue 09:50



ALICE upgrades

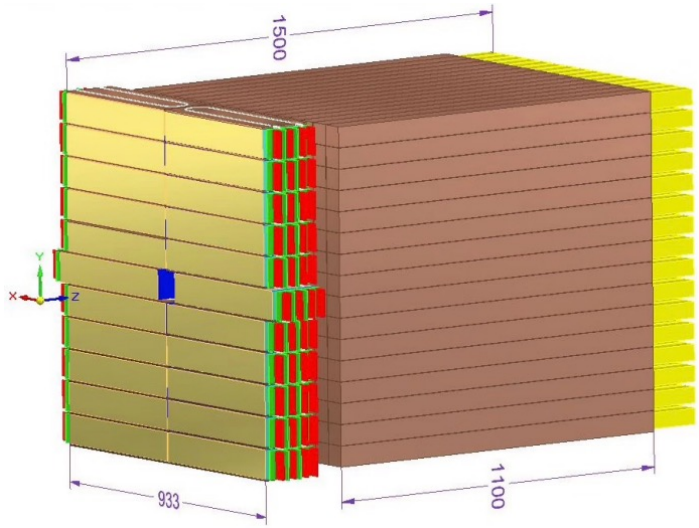
ITS3



ITS3 TDR CERN-LHCC-2024-003

Jory Sonneveld
T12, Mon 15:24

FoCal

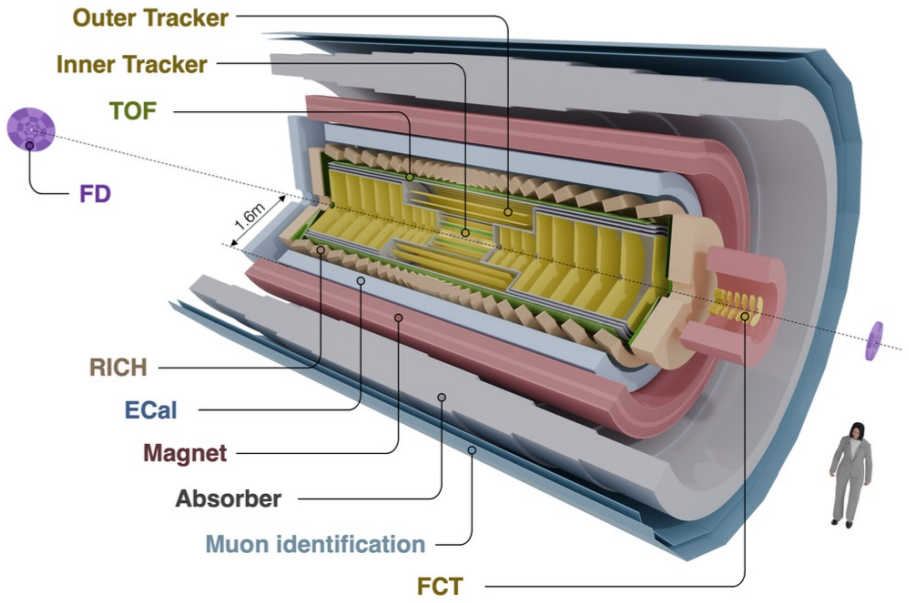


FoCal TDR: CERN-LHCC-2024-004

→ **moving to production**

Shihai Jia
T12, Wed 16:54

ALICE 3



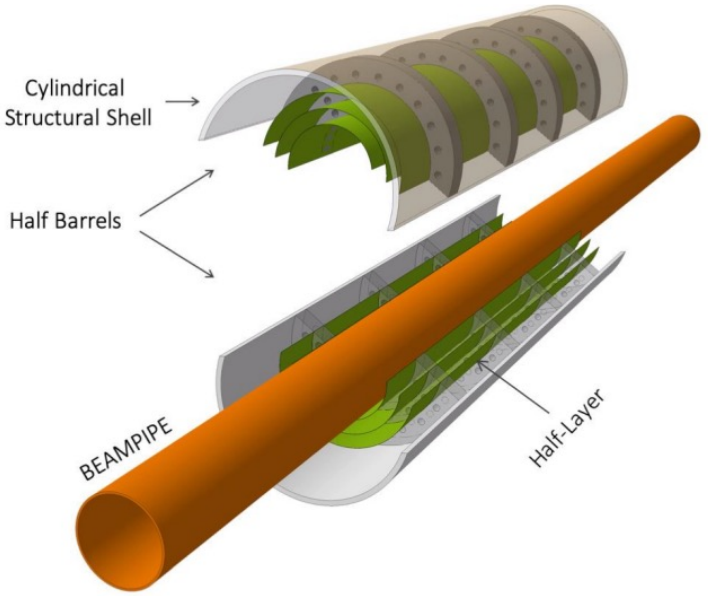
LoI: CERN-LHCC-2022-009
Scoping doc.: CERN-LHCC-2025-002

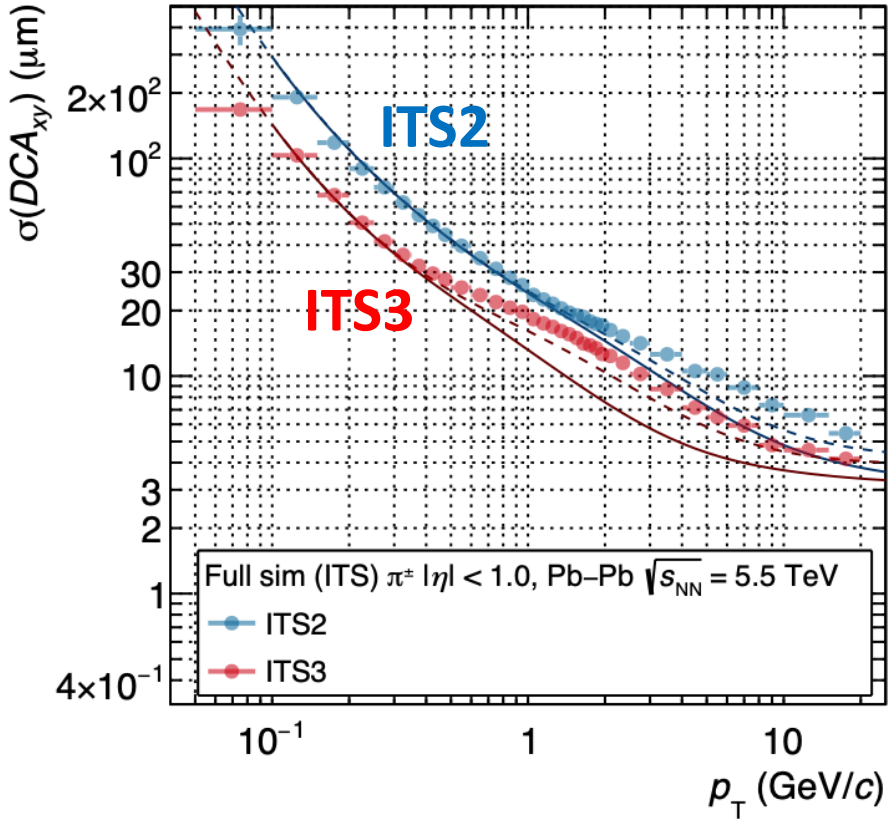
Antonin Maire
T12, Mon 15:42

ITS3: more precise vertexing and tracking

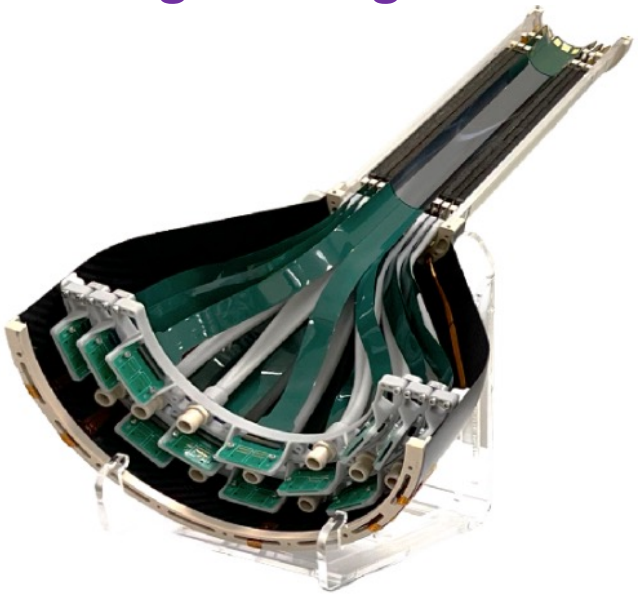
TDR CERN-LHCC-2024-003

Jory Sonneveld
T12, Mon 15:24





ITS3 engineering model #3



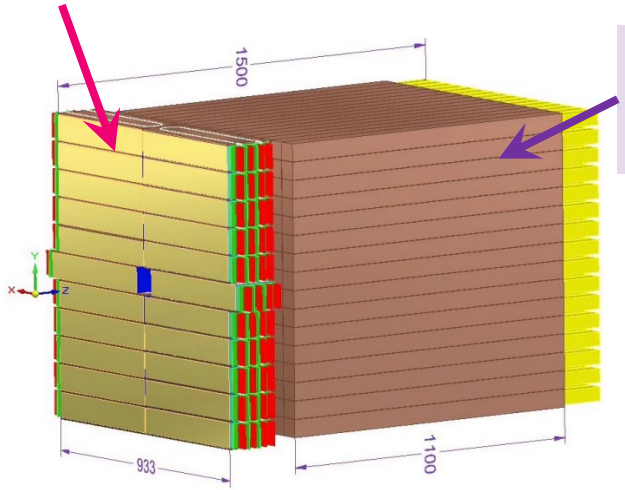
- New vertex detector for ALICE with 3 cylindrical (**bent**) layers of Monolithic Active Pixel Sensors
- **0.09% X_0 per layer**
- higher precision for charm, beauty, low mass dileptons

Forward calorimeter (FoCal)

TDR: CERN-LHCC-2024-004

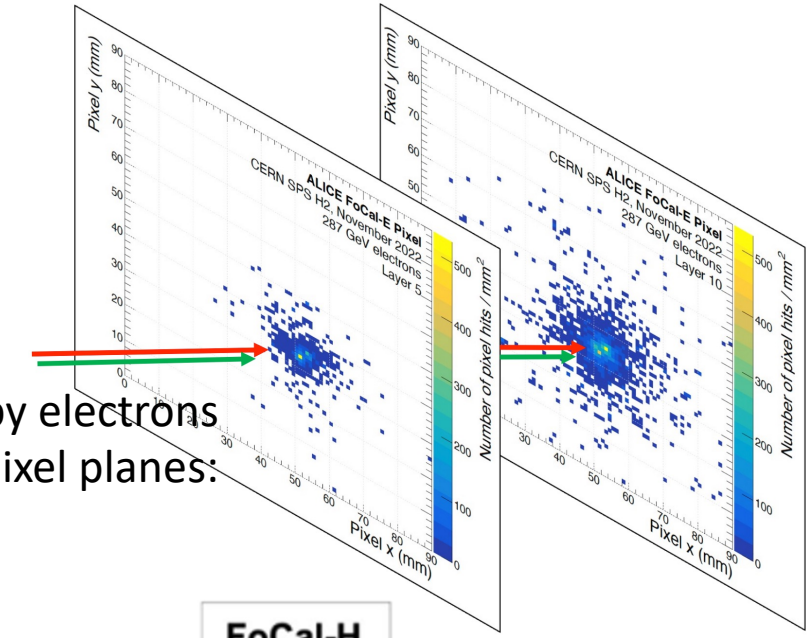
Shihai Jia
T12, Wed 16:54

FoCal-E: Si-W EM calorimeter + 2 pixel layers
- direct γ detection, forward π^0, J/ψ in UPC



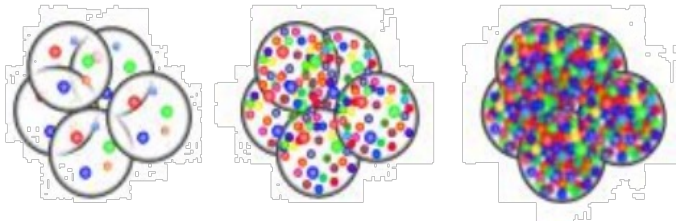
$3.4 < \eta < 5.8$

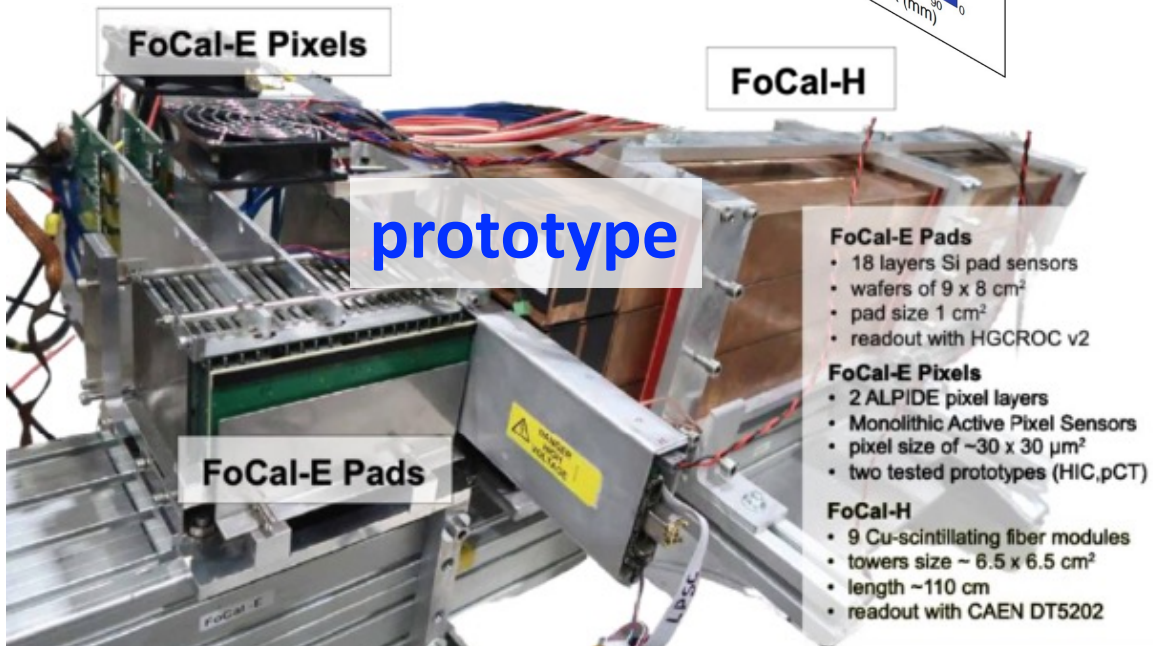
FoCal-H: hadronic sampling calorimeter
- jets, γ isolation



separation of nearby electrons in pixel planes:

→ probing **gluon PDF down to x~10^{-5}**

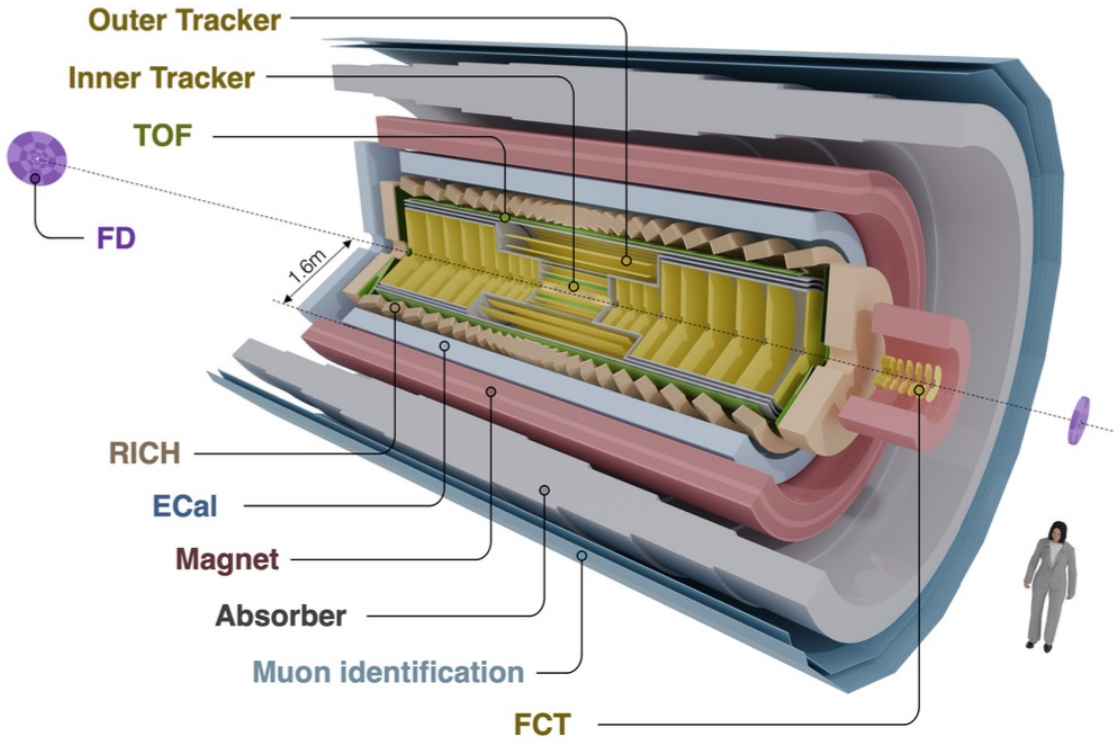




ALICE 3 (Run 5, 2036–…)

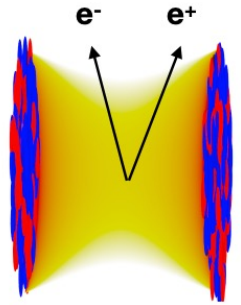
Letter of Intent: arXiv:2211.02491

Antonin Maire
T12, Mon 15:42



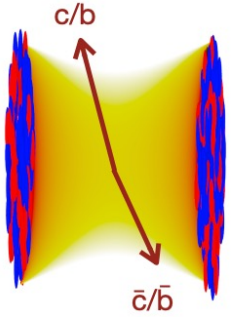
Detector concept:

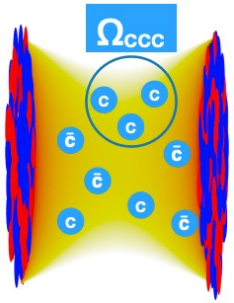
- compact **low-mass** all-silicon tracker
- excellent **vertex** reconstruction
- wide acceptance $|\eta| < 4$
- PID in **wide p_T range**
- high readout rate in A-A and pp

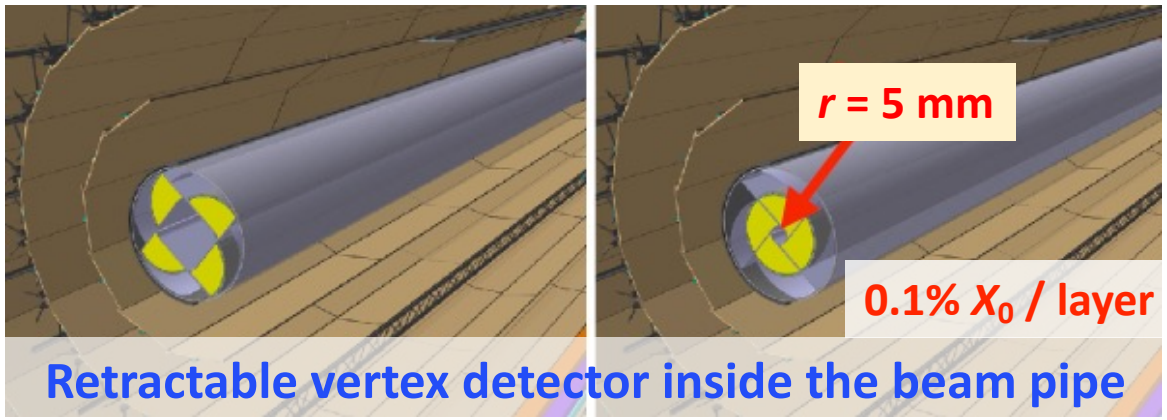


Key objectives:

- early stage temperature with **dielectrons**
- properties and hadronisation of the QGP with **(multi-) heavy flavour hadrons**
- fundamental aspects of the QCD phase transition





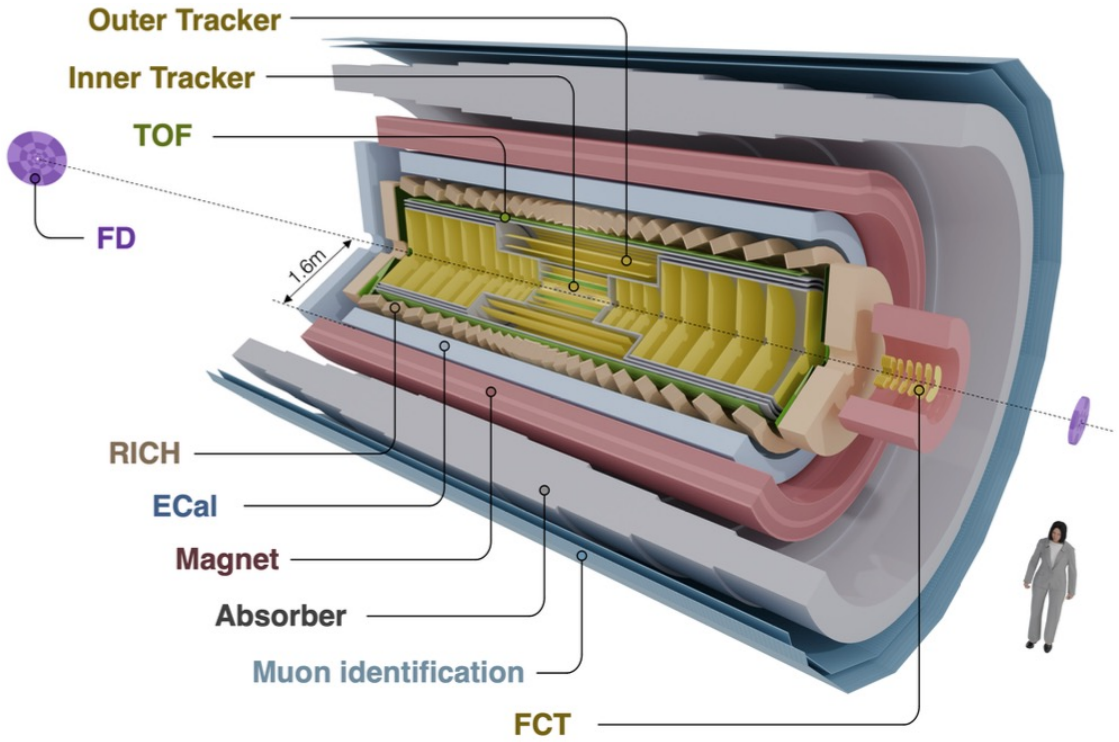


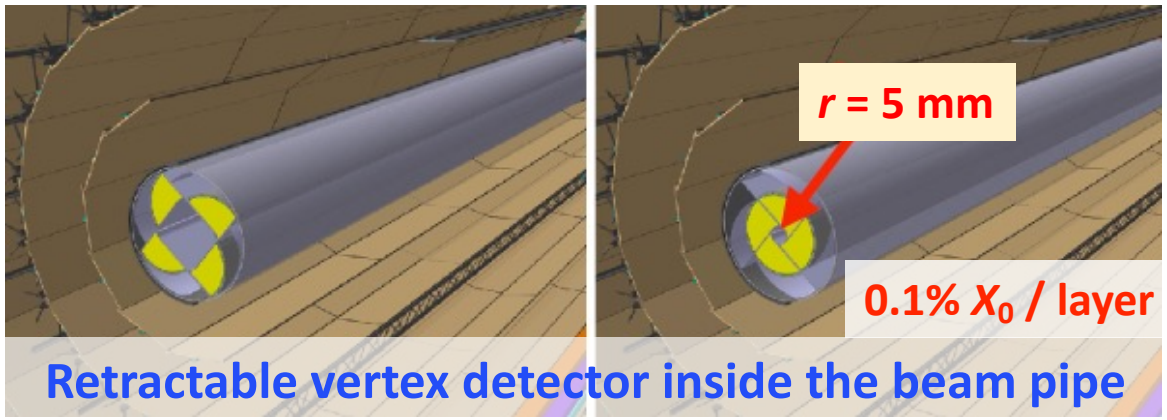
Retractable vertex detector inside the beam pipe

ALICE 3 (Run 5, 2036–…)

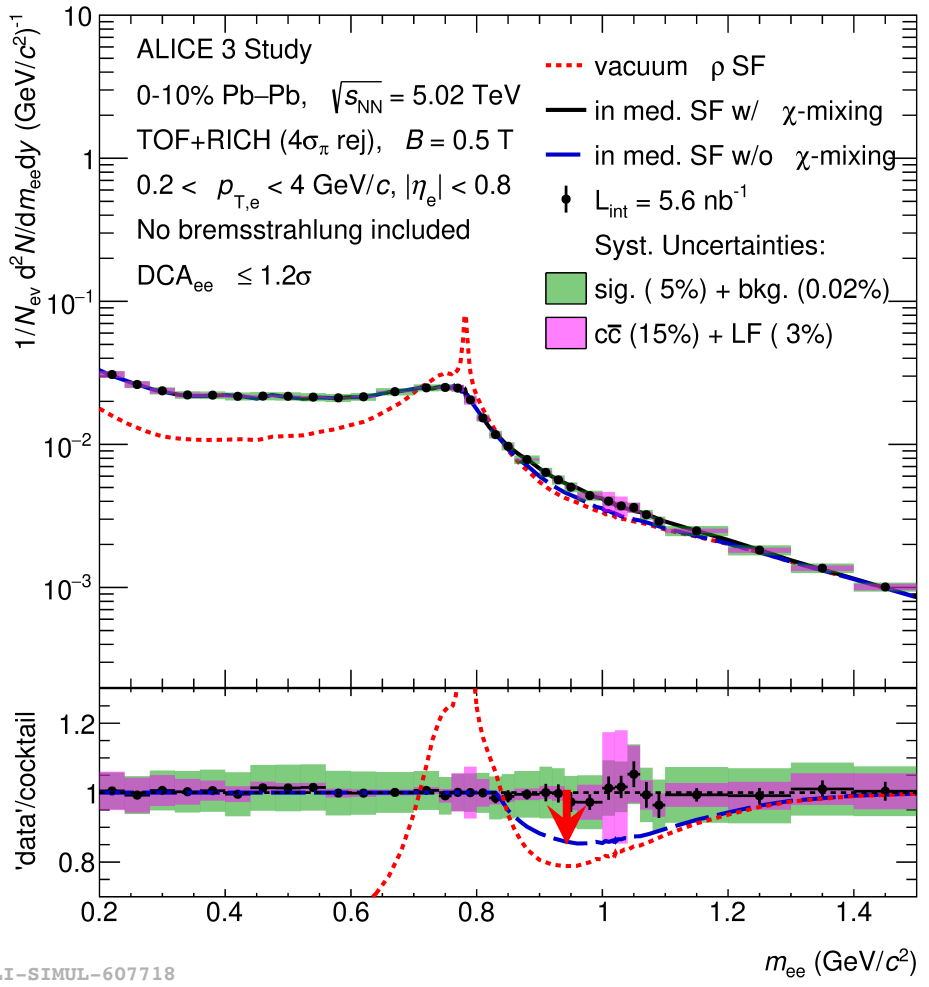
Letter of Intent: arXiv:2211.02491

Antonin Maire
T12, Mon 15:42





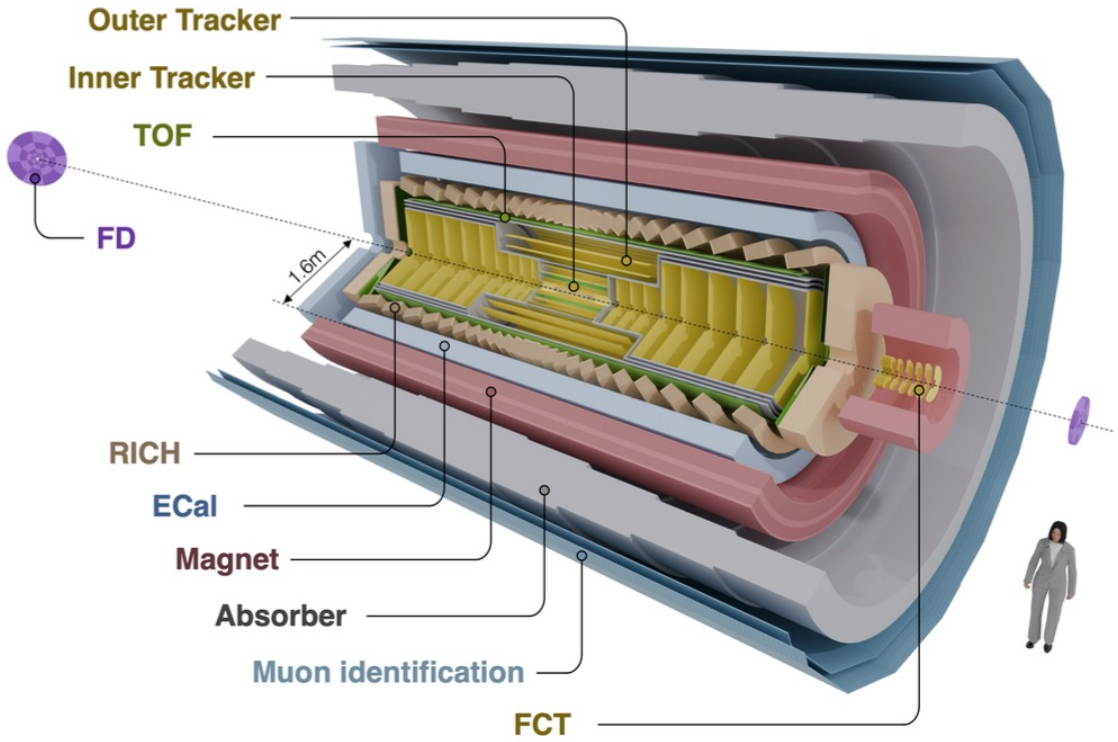
- Signals of the **Chiral symmetry restoration** in the dielectron spectrum

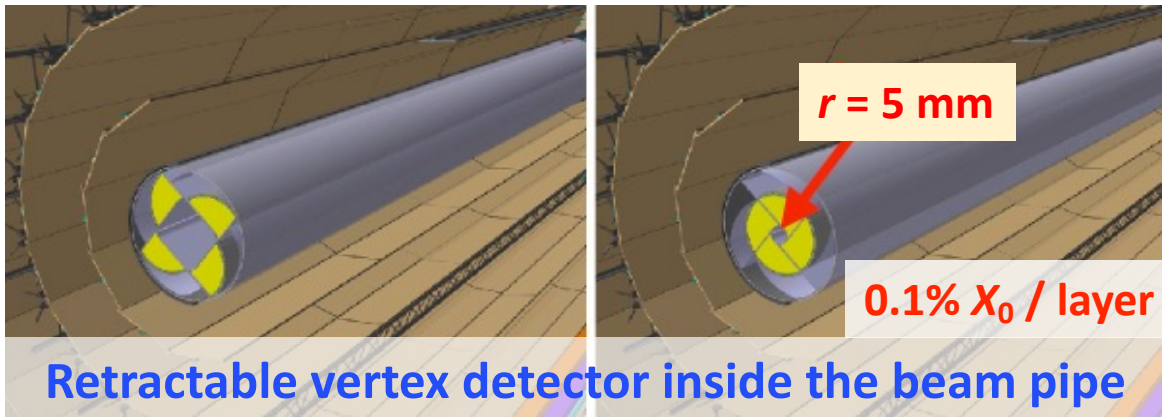


ALICE 3 (Run 5, 2036–…)

Letter of Intent: arXiv:2211.02491

Antonin Maire
T12, Mon 15:42

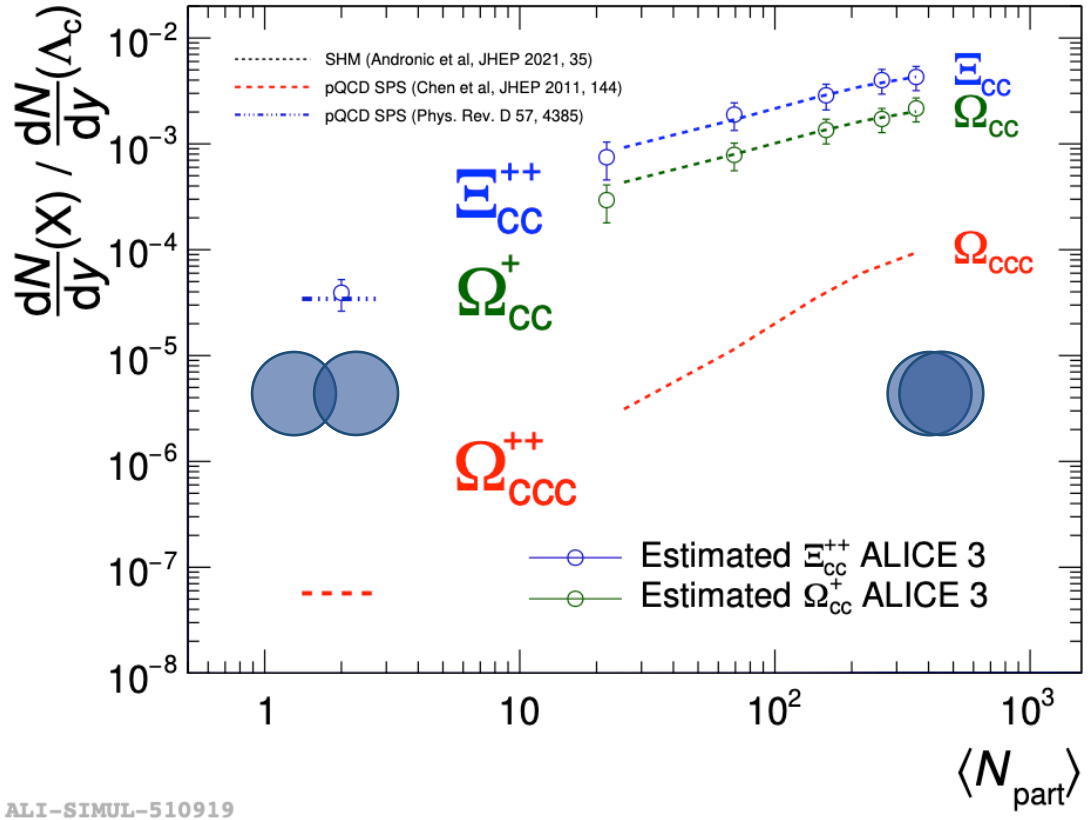




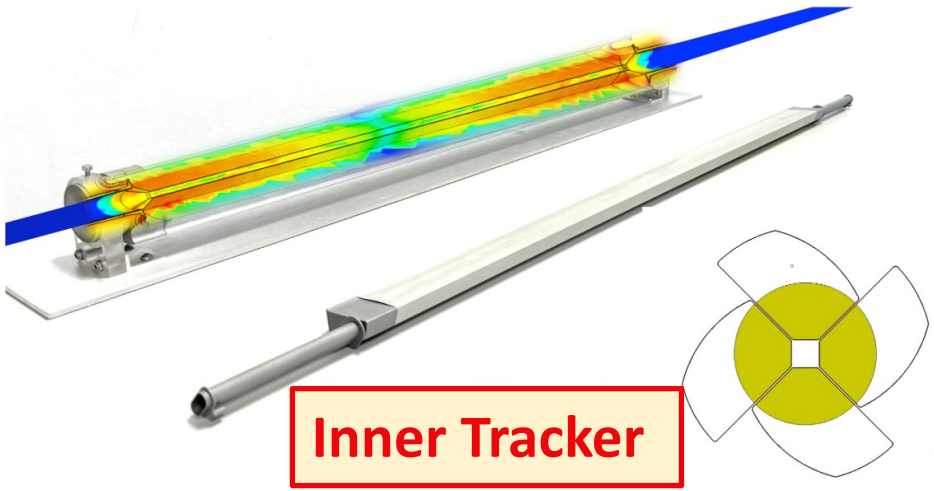
Retractable vertex detector inside the beam pipe

Multi-charm baryons at low p_T

- unique probe of hadron formation
- recombination models predicts 2-3 orders of magnitude enhancement in Pb-Pb

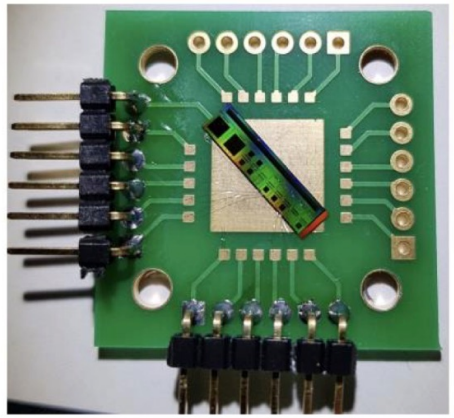


ALICE 3 R&D

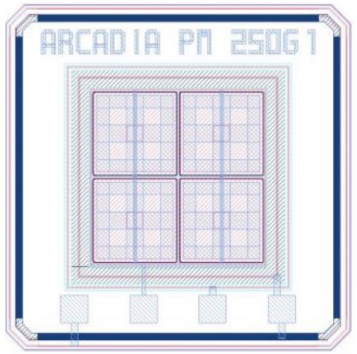


Inner Tracker

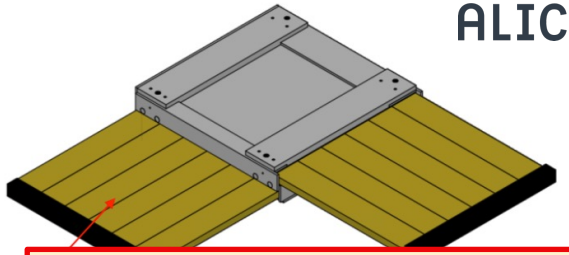
Bonded test devices



Test devices layout:
2x2 array of $(250\ \mu m)^2$

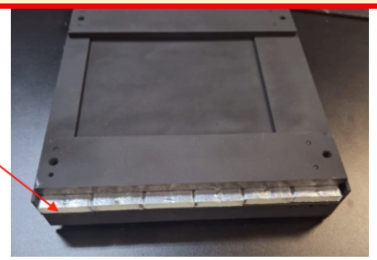


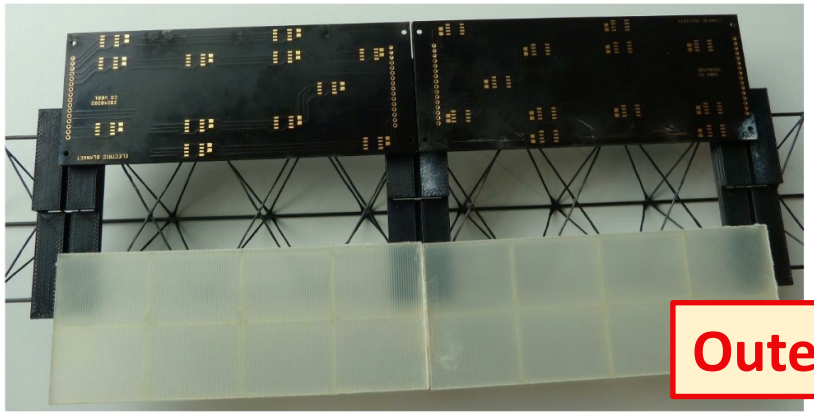
Time Of Flight



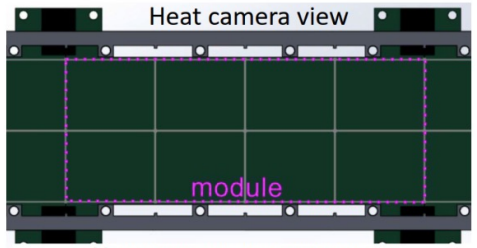
Muon identification

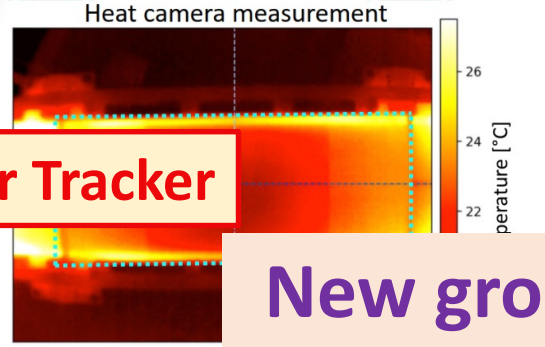
scintillators

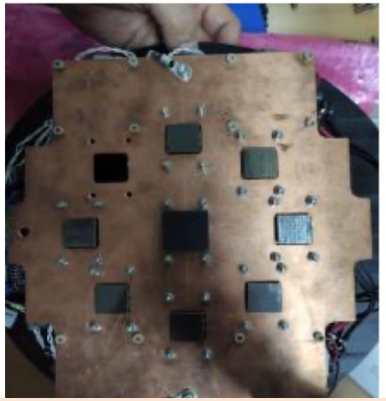




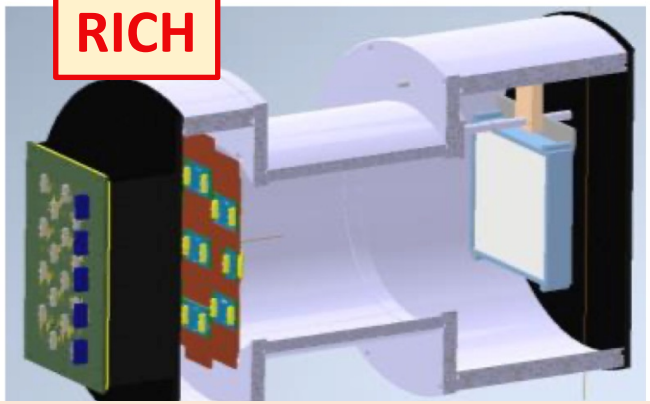
Outer Tracker







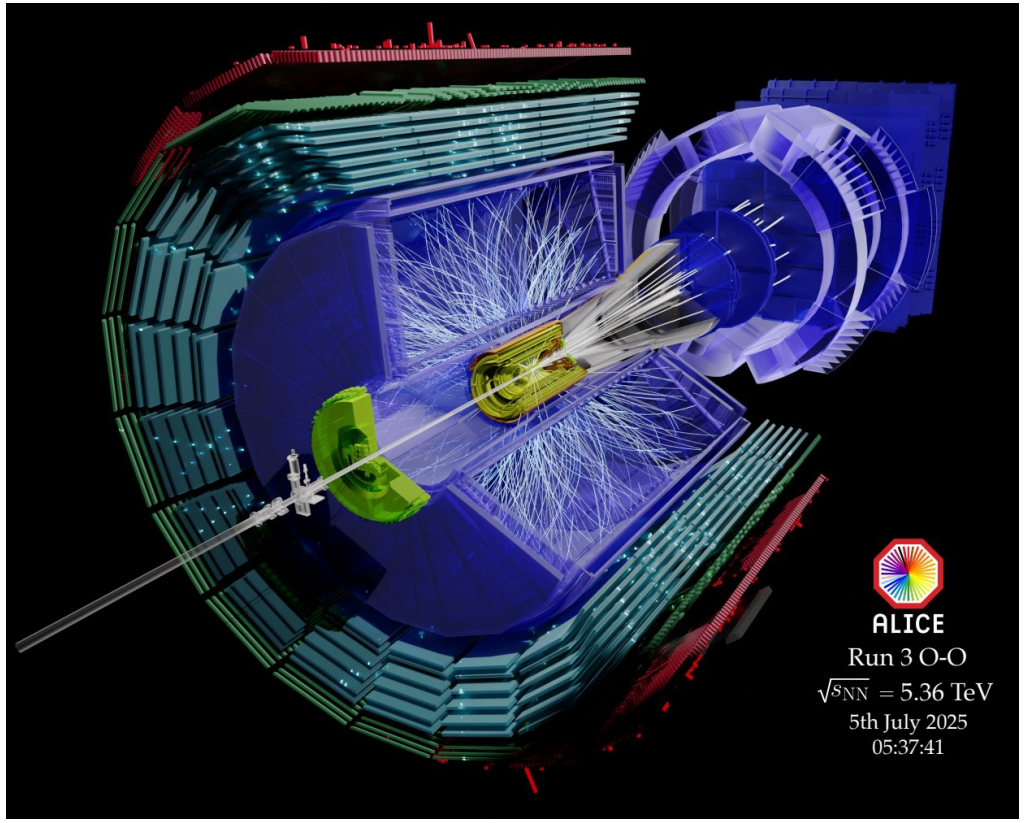
RICH

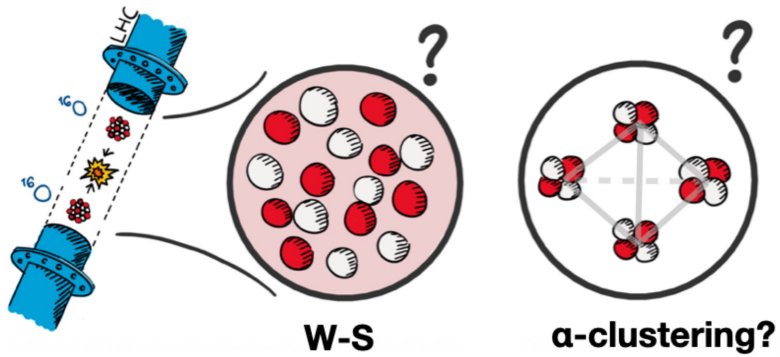


New groups are welcome to join ALICE 3!

Fresh news from the p-O, O-O, Ne-Ne runs

- Multiplicities $\mathbf{1 \lesssim \langle dN_{ch}/d\eta \rangle_{|\eta|<0.5} \lesssim 200}$
  - **overlaps with the one covered by pp, p-Pb, Pb-Pb**
- Initial conditions in O-O, Ne-Ne (geometry, fluctuations), parton energy loss, …
- **α-clustering** of ^{16}O and ^{20}Ne nuclei?
  - accessible with flow observables





You Zhou, T04
Mon 15:40

Fresh news from the p-O, O-O, Ne-Ne runs

- Multiplicities $\mathbf{1 \lesssim \langle dN_{ch}/d\eta \rangle_{|\eta|<0.5} \lesssim 200}$
  - **overlaps with the one covered by pp, p-Pb, Pb-Pb**
- Initial conditions in O-O, Ne-Ne (geometry, fluctuations), parton energy loss, …
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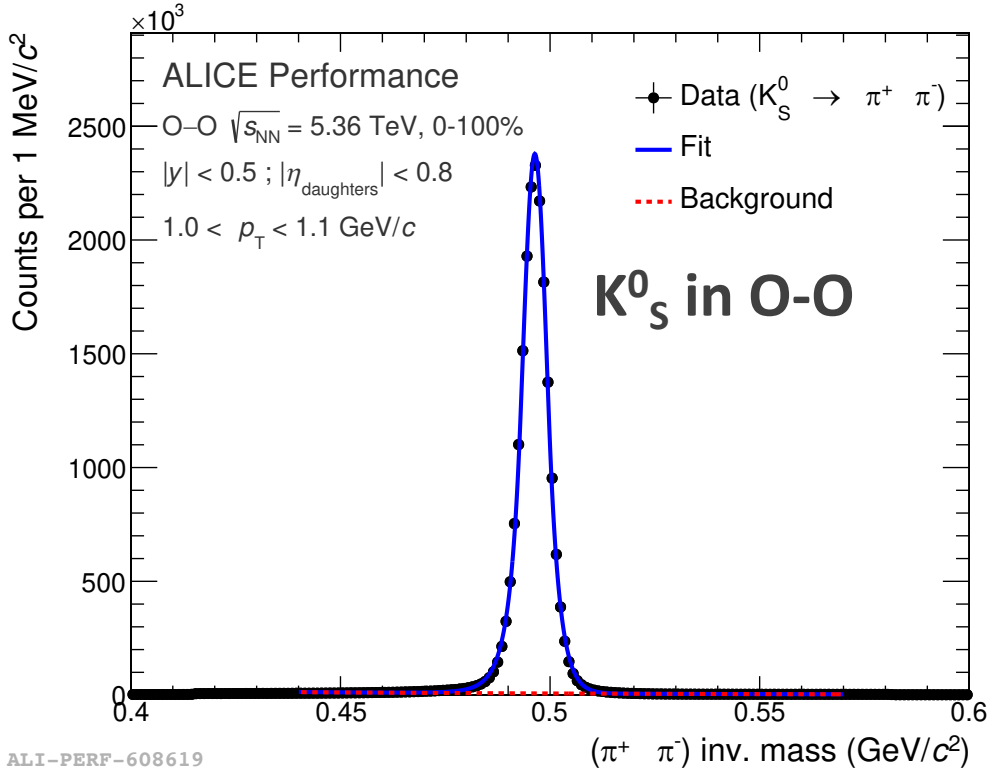
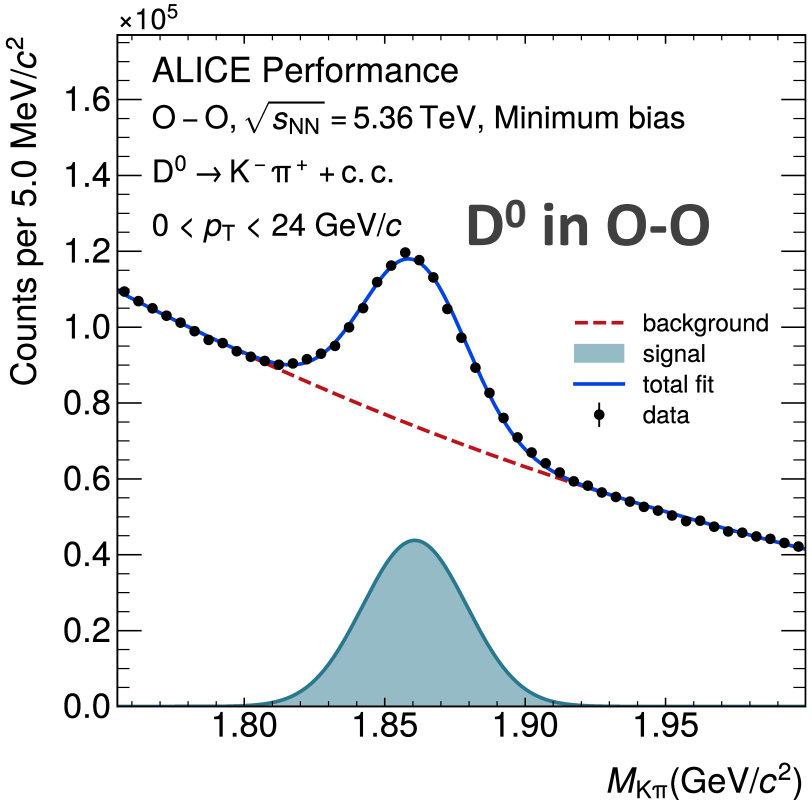


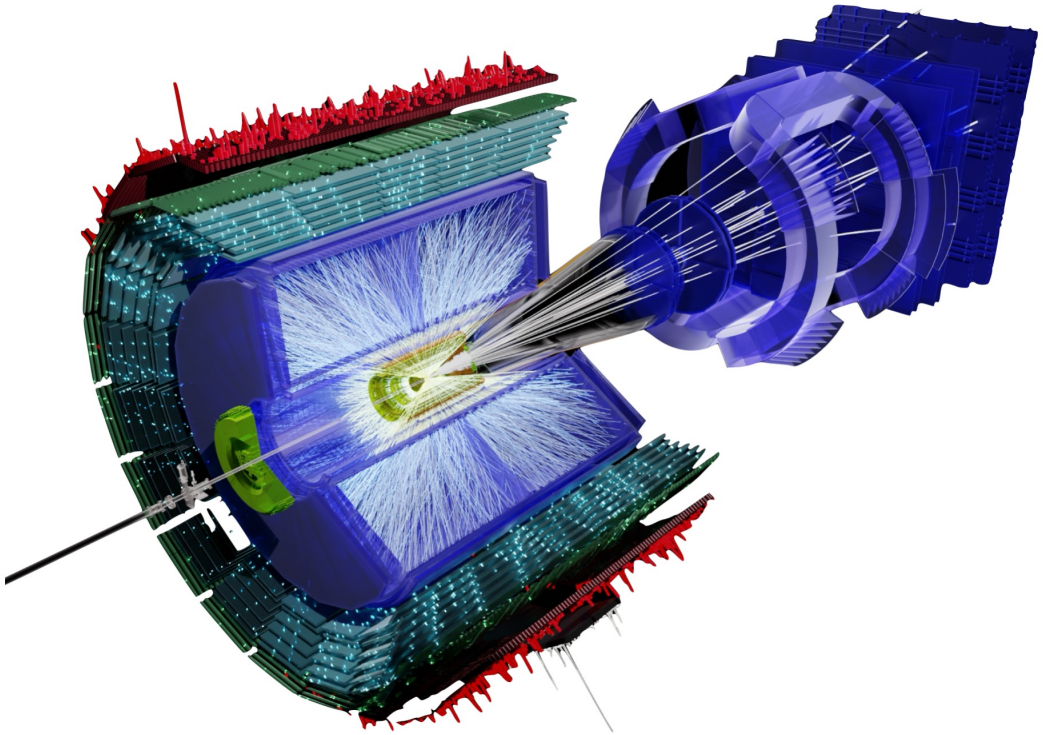


ALICE at EPS-HEP 2025

Ultra-rel nuclear collisions	Jet modification studies down to low p_T and large radius with ALICE	Daniel Jones	Mon, 09:45
T04	Longitudinal polarization of hyperons in Run 3 Pb-Pb collisions with ALICE	Chiara De Martin	Mon, 14:00
	Production and properties of hypernuclei with ALICE	Carolina Anna Reetz	Mon, 14:20
	Charged-particle production in pp collisions at 13.6 TeV and Pb-Pb collisions at 5.36 TeV with ALICE	Abhi Modak	Mon, 14:40
	Shedding light on the baryon production via angular correlation studies with ALICE	Malgorzata Janik	Mon, 15:00
	Differential measurements of particle-emitting source via proton-proton femtoscopy in Run 3 pp and Pb-Pb with ALICE	Gleb Romanenko	Mon, 15:20
	Overview of particle production in inelastic photonuclear interactions with ALICE	Simone Ragoni	Tue, 08:50
	Dielectron production in pp and Pb-Pb collisions with ALICE in Run 3	Emma Ege	Tue, 09:50
	Quarkonium production and collectivity in heavy-ion collisions with ALICE	Luca Micheletti	Wed, 16:40
	Investigating charm-quark dynamics in the QGP via the charm-hadron elliptic flow in Pb–Pb collisions with ALICE	Marcello Di Costanzo	Wed, 17:00
	Exploring the hadronic phase with momentum and azimuthal distribution of short-lived resonances and understanding the internal structure of exotic resonances with ALICE	Hirak Kumar Koley	Poster
	Probing sound propagation in the QGP via relativistic ultra-central collisions with ALICE	Nicolò Jacazio	Poster
	Thermal radiation from small to large systems via low-mass dielectrons with ALICE	Ivan Vorobyev	Poster
QCD and Hadronic Physics	Testing perturbative QCD calculations with beauty-meson production in proton–proton collisions with ALICE	Antonio Palasciano	Mon, 15:40
T05	Inclusive and semi-inclusive jet cross-section measurements in pp collisions at 13.6 TeV with ALICE	Joonsuk Bae	Tue, 09:30
	Investigating quarkonium production in proton-proton collisions with ALICE	Emilie Barreau	Tue, 17:50
	Single charm-hadron production and charm-hadron pairs production in pp collisions at 13.6 TeV	Maja Karwowska	Tue, 18:10
	Investigating excited N states via the measurement of ρ^0-p final-state interaction with ALICE	Maximilian Korwieser	Thu, 09:21
	Testing perturbative QCD calculations with charm-tagged jets and correlations of charm hadrons with charged particles	Samuele Cattaruzzi	Fri, 09:10
	Accessing Three-Body Dynamics with p–d and Λ–d Correlations in pp Collisions at 13.6 TeV with ALICE	Anton Albert Riedel	Poster
	Measurement of associated production of electrons and muons from heavy-flavour decays in pp collisions with ALICE	Maolin Zhang	Poster
Joint T04+T05	Strangeness enhancement with effective energy in pp collisions at the LHC with ALICE	Francesca Ercolessi	Wed, 09:30
	System size dependence of light-flavor hadron production: from the smallest to the largest collision system with ALICE	Romain Schotter	Wed, 09:50
Detectors	Design and expected performance of ALICE ITS3 tracker upgrade	Jory Sonneveld	Mon, 15:24
	ALICE 3: a next-generation heavy-ion detector for LHC Run 5	Antonin Maire	Mon, 15:42
	ALICE Forward Calorimeter upgrade (FoCal): physics program and expected performance	Shihai Jia	Wed, 16:54
Data Handling, Computing	The new ALICE asynchronous software trigger processing	Biao Zhang	Mon, 14:40
Outreach	Outreach, educational activities and communication of the ALICE collaboration	Simone Ragoni	Thu, 09:30

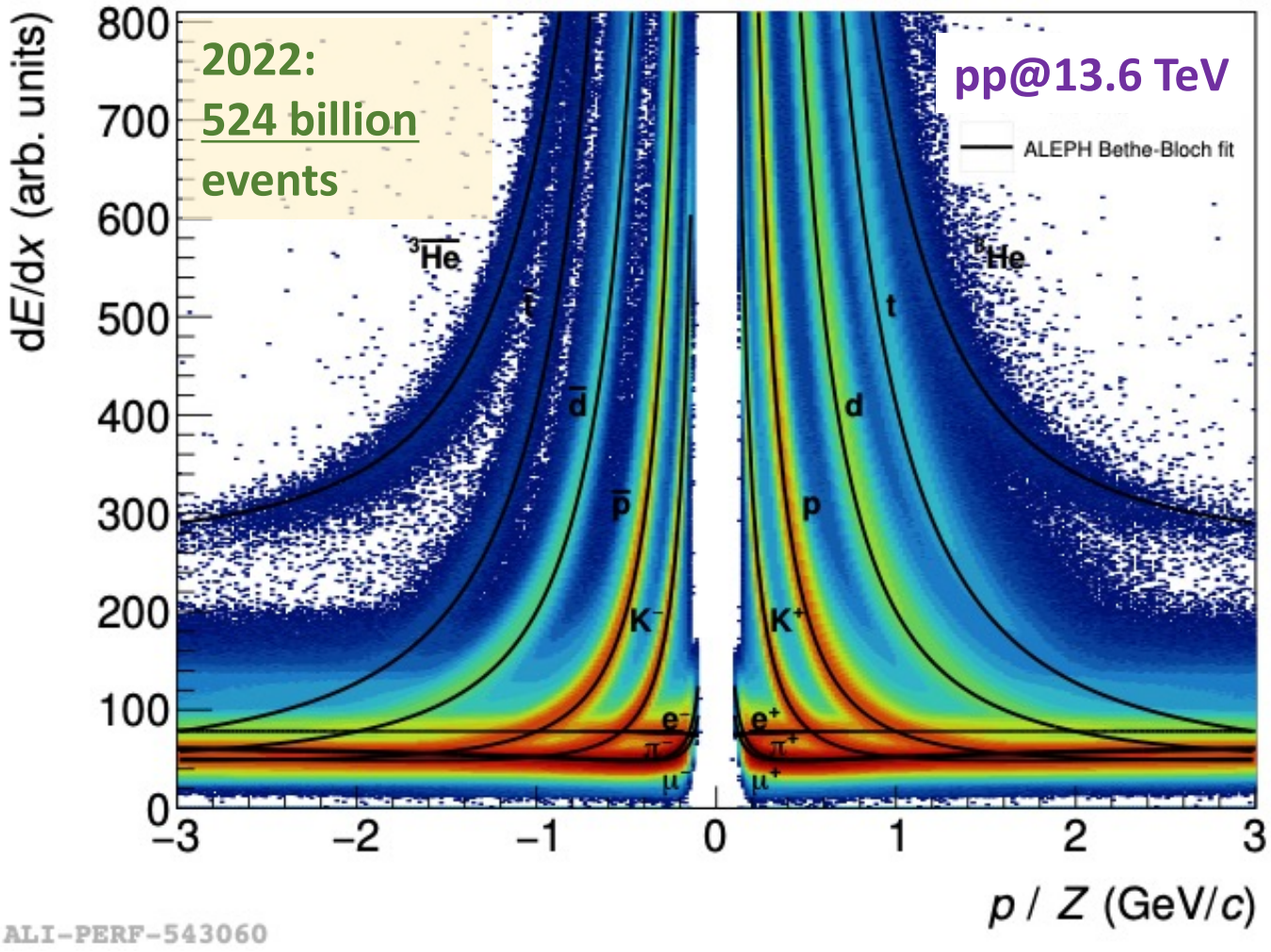
Summary

- ALICE is efficiently taking Run 3 data with the upgraded detector, a wealth of new Run 3 results
- Preparations for the future ALICE upgrades are ongoing
- *This year:* pp, Pb-Pb, but also p-O, O-O, Ne-Ne!



Backup

Particle identification with TPC: huge statistics in pp



→ Use **software triggers** to store only events with rare signals

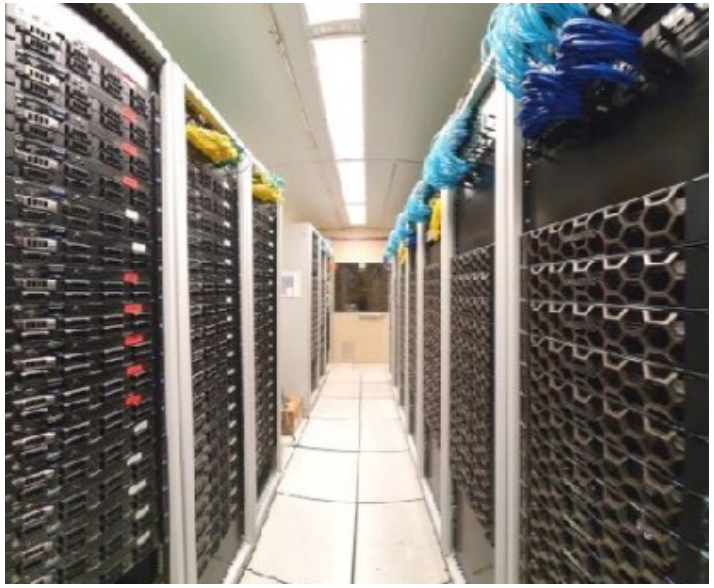
ALICE asynchronous software trigger processing for pp

Impossible to keep all raw **pp** events on disk!

Therefore:

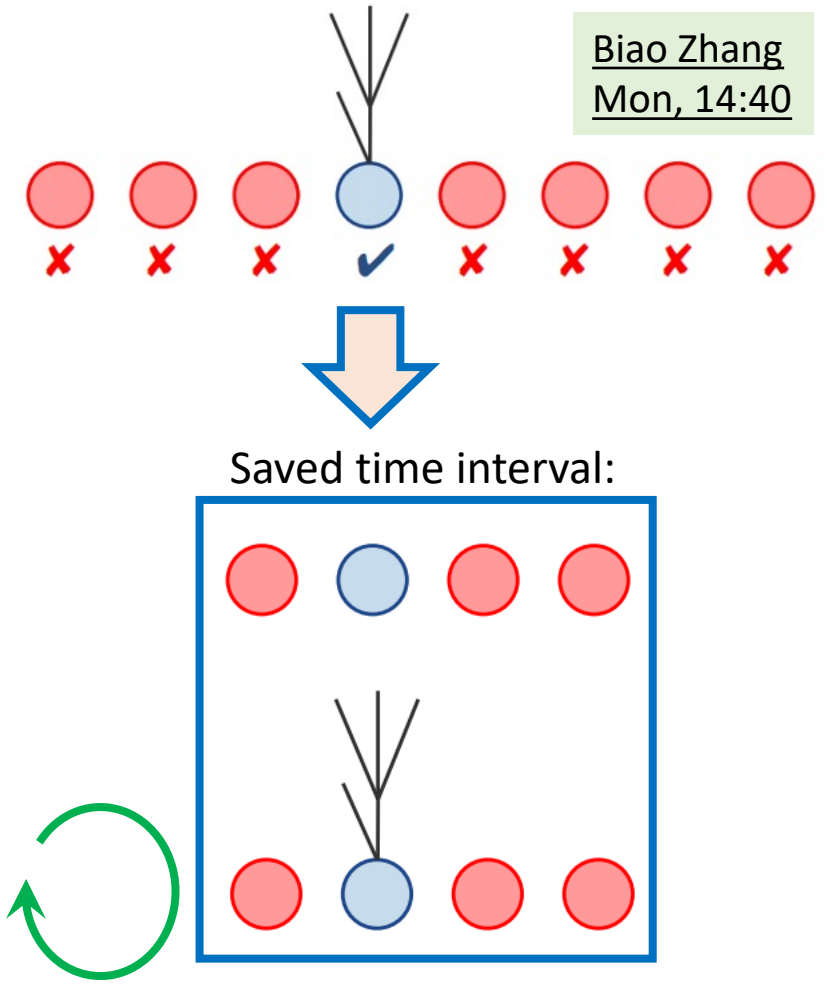
- A whole dataset is reconstructed with available detector calibration
- Offline Trigger Selections are applied → **interesting events tagged**
- **Skimming:** a chunk of raw data around a tagged event is kept
  - the rest is deleted → **we keep ≈4.5% of raw pp data**

(For **Pb-Pb**, all events are stored)



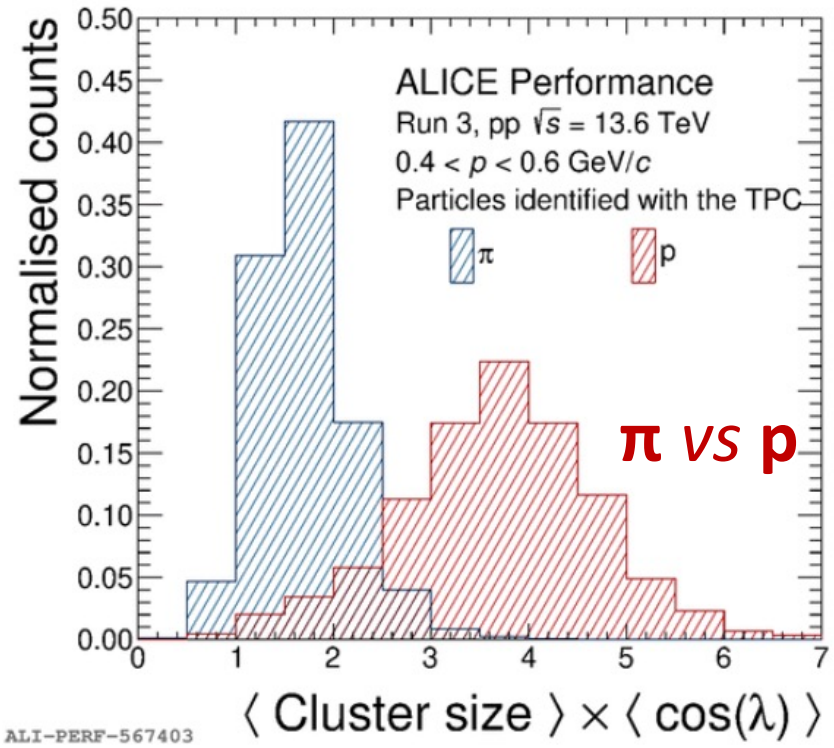
TDR (O^2): CERN-LHCC-2015-006

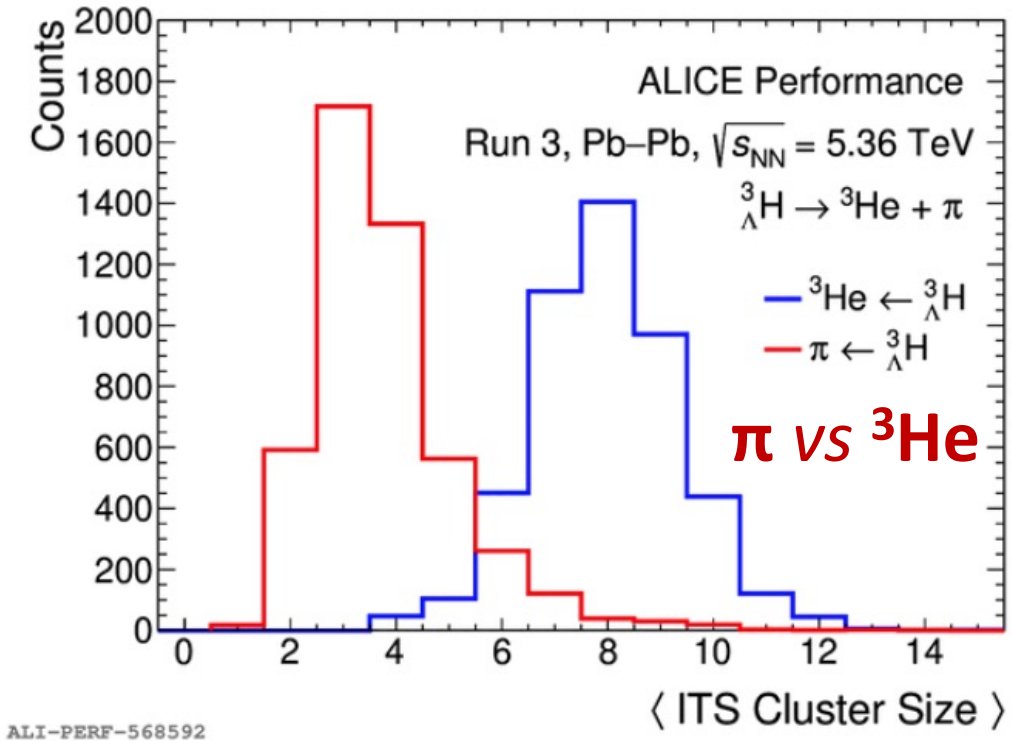
Biao Zhang
Mon, 14:40



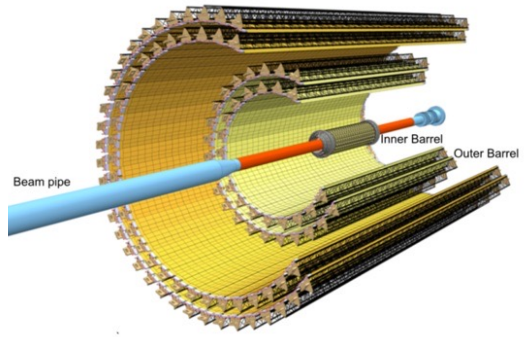
Data in skimmed time windows can be **re-reconstructed multiple times with improved calibrations**

Useful “byproduct” feature of ITS2: PID by pixel cluster size



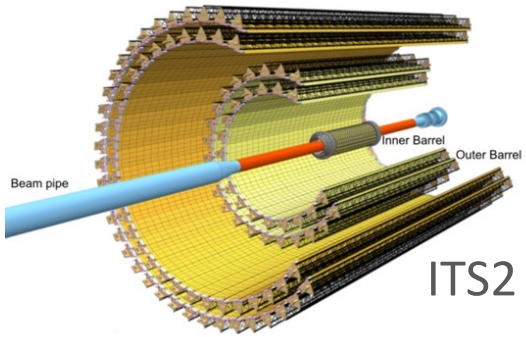


ITS2



- After PID by dE/dx in TPC, **additional cleanup for ITS-TPC mismatched tracks**

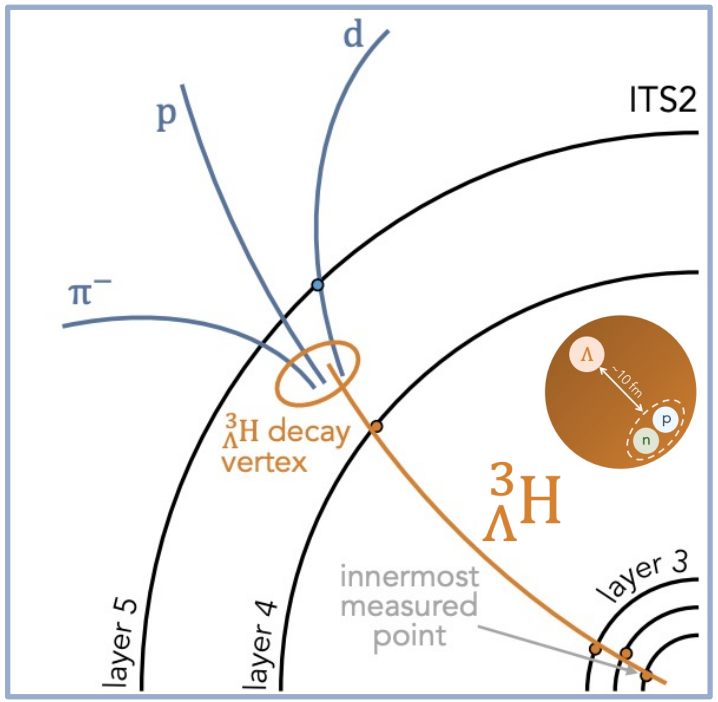
Direct tracking of strange particles

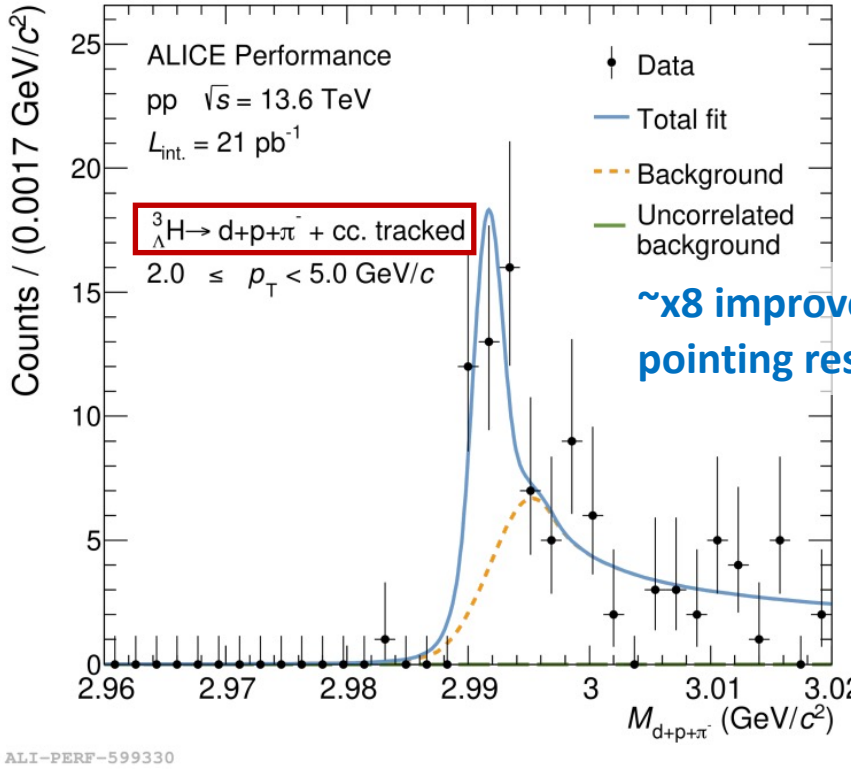


ALICE

ITS2 Inner Barrel has the **first three layers within 4 cm**

→ **Direct tracking of charged weak-decaying particles** before their decay



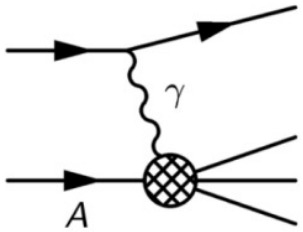


~x8 improved hypertriton pointing resolution

Carolina Anna Reetz
T04, Mon 14:20

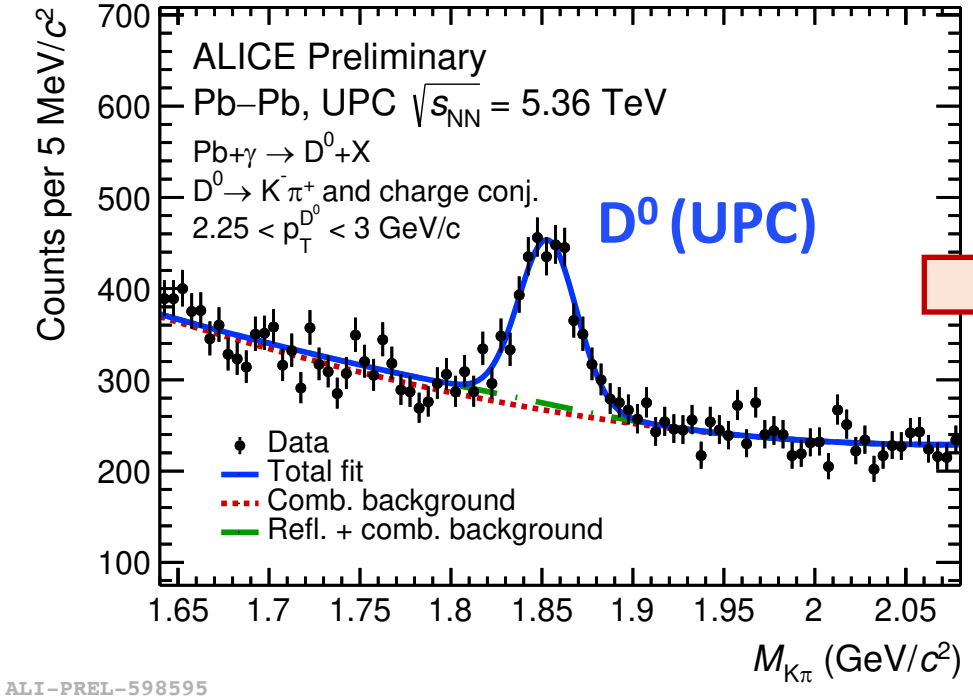
O(20μm) pointing precision → New possibilities:

isolation of feeddown from charm and beauty decays (e.g. $\Omega^- \leftarrow \Omega^0_c$), hypernuclei, exotic bound states

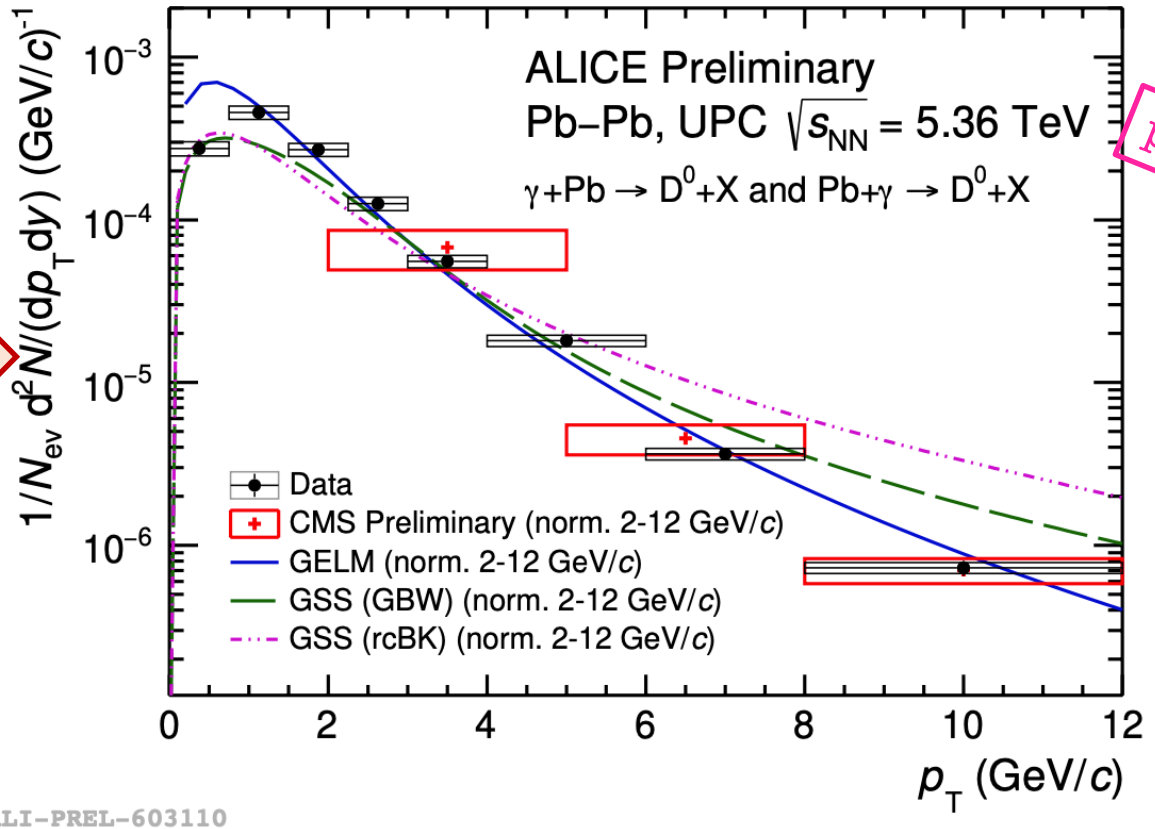


D^0 in Ultra-Peripheral Pb-Pb Collisions

continuous readout
high stat.
pointing res.



ALI-PREL-598595



ALI-PREL-603110

- Charm hadrons: give access to gluon PDFs down to $x<10^{-4}$

Simone Ragoni
T04, Tue 08:50