# ALICE status report

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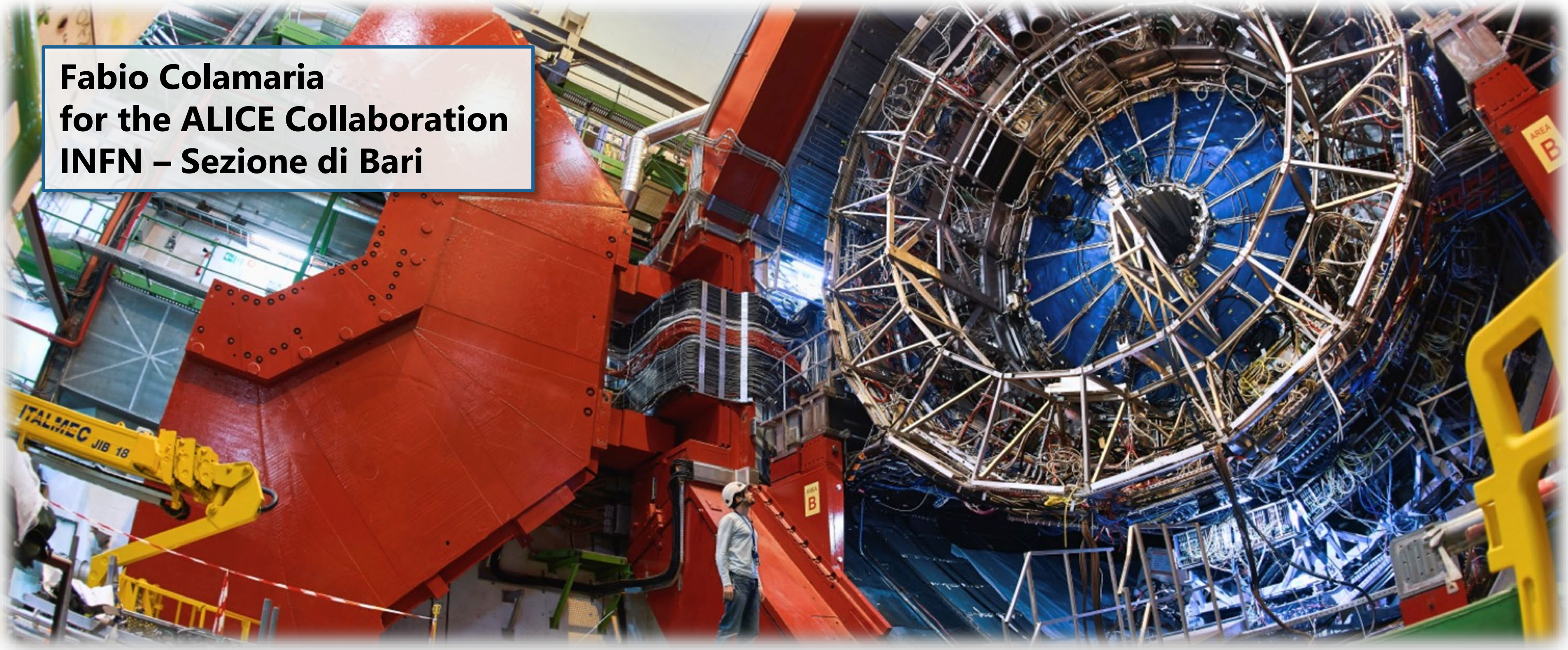
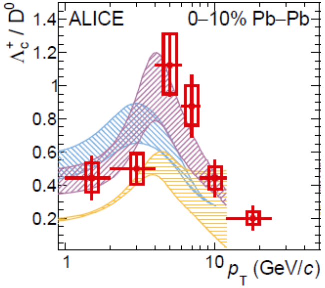
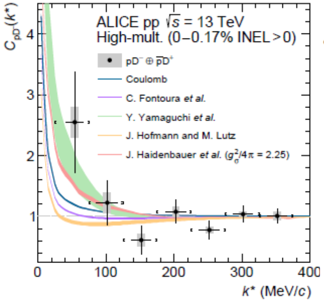


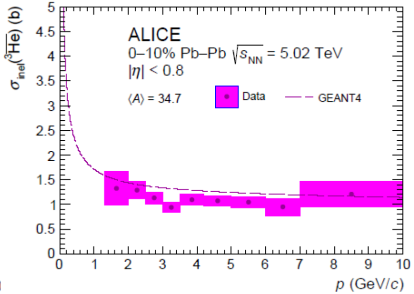

**09/03/2022** **149th LHCC meeting**

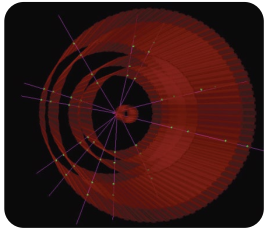
# OUTLINE

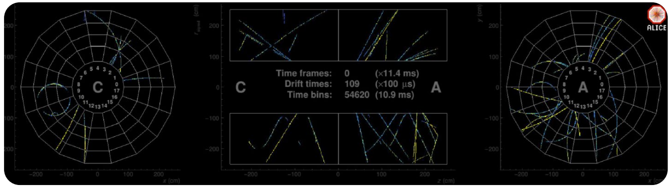
- **Recent physics highlights**
  - ➢ 9 new publications since last LHCC
- **LS2 activities**
- **Detector commissioning**
  - ➢ Status and plan for 2022
  - ➢ Detector performance from pilot beam
- **Status of the upgrades**
  - ➢ Run4: ITS3 and FoCal
  - ➢ Run5+: ALICE 3

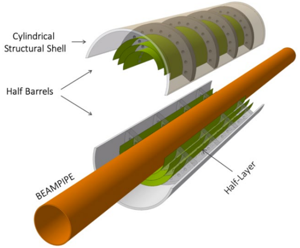


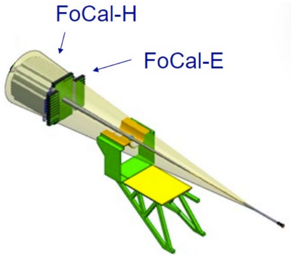



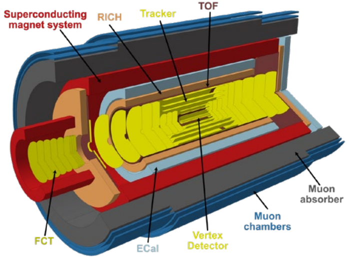






# PAPERS AND PHYSICS HIGHLIGHTS

# NEW PUBLICATIONS

ALICE

| | |
|---|---|
| Constraining hadronization mechanisms with $\Lambda^{+}_{c}/D^{0}$ production ratios in Pb−Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV | arXiv:2112.08156 |
| Observation of a multiplicity dependence in the $p_{T}$-differential charm baryon-to-meson ratios in proton-proton collisions at $\sqrt{s}$ = 13 TeV | arXiv:2111.11948 |
| Measurement of beauty production via non-prompt $D^{0}$ mesons in Pb−Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV | arXiv:2202.00815 |
| Forward rapidity J/$\psi$ production as a function of charged-particle multiplicity in pp collisions at $\sqrt{s}$ = 5.02 and 13 TeV | arXiv:2112.09433 |
| First study of the two-body scattering involving charm hadrons | arXiv:2201.05352 |
| Neutral to charged kaon yield fluctuations in Pb−Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV | arXiv:2112.09482 |
| Production of light (anti)nuclei in pp collisions at $\sqrt{s}$ = 5.02 TeV | arXiv:2112.00610 |
| First measurement of the absorption of $^{3}\overline{\mathrm{He}}$ nuclei in matter and impact on their propagation in the galaxy | arXiv:2202.01549 |
| Multiplicity dependence of charged-particle jet production in pp collisions at $\sqrt{s}$ = 13 TeV | arXiv:2202.01548 |

**9 new publications since last LHCC**

**Heavy flavour** (rows 1–5)

**Correlations & fluctuations** (rows 5–6)

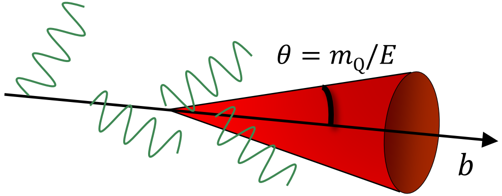
**(Anti)nuclei** (rows 7–8)

**Jet production** (row 9)

# NON-PROMPT $D^0$ PRODUCTION IN Pb–Pb COLLISIONS

- Heavy quarks: excellent probes for study of **microscopic QGP dynamics**
  - In-medium **partonic energy loss** due to gluon radiation (at high $p_T$) and elastic collisions (at lower $p_T$)

- *b* quark: expected reduced energy loss compared to *c*
  - **Dead-cone effect** vetoes gluon radiation for $\theta < \frac{m_Q}{E}$




Also observed in pp collisions for *c* quark (arXiv:2106.05713)

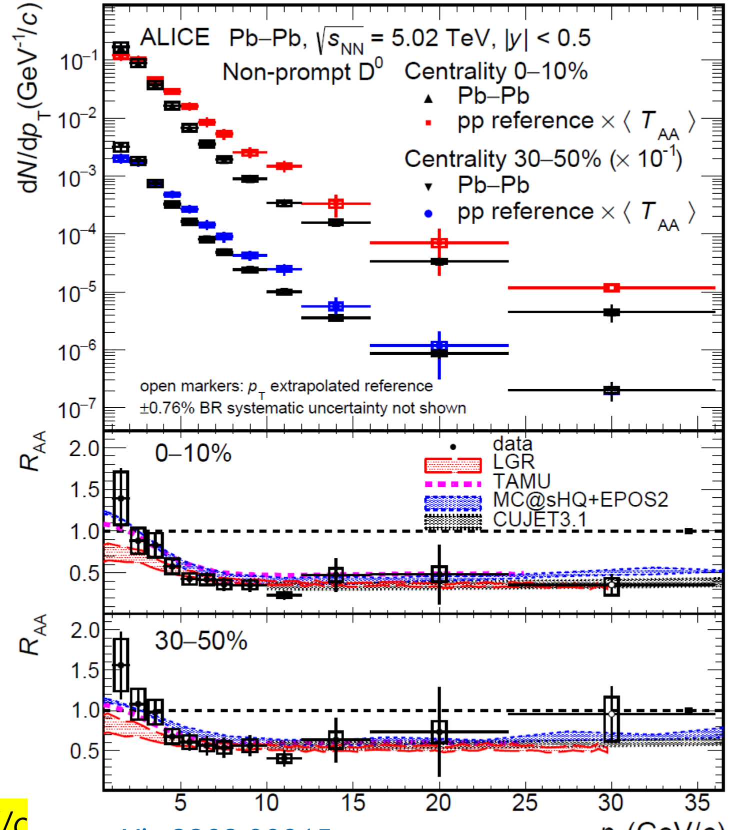
- Nuclear modification factor of **$D^0$ mesons from beauty-hadron decays**

$$R_{AA} = \frac{\left.\frac{dN^D}{dp_T}\right|_{Pb-Pb}}{\langle T_{AA}\rangle \cdot \left.\frac{d\sigma^D}{dp_T}\right|_{pp}}$$

***$R_{AA}$ = 1** → no medium effects*

***$R_{AA} \neq 1$** → breaking of $N_{coll}$ scaling due to cold and hot nuclear matter effects*

- **Suppression** up to **factor 3 (2)** in central (semicentral) collisions for $p_T$ > 5 GeV/c



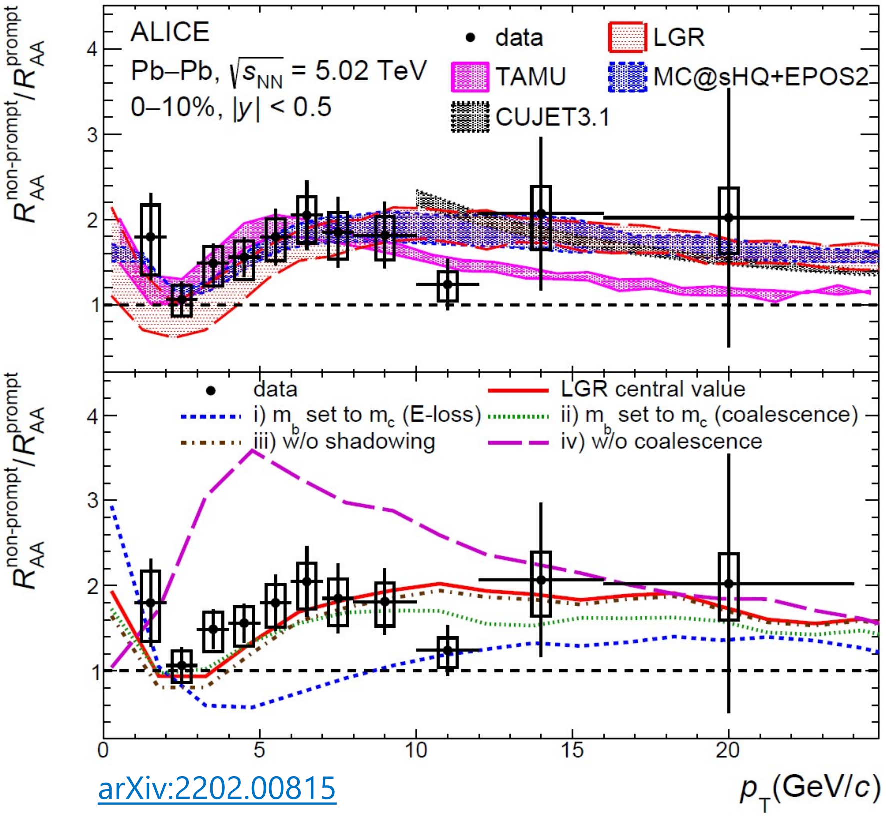

arXiv:2202.00815

# NON-PROMPT $D^0$ PRODUCTION IN Pb–Pb COLLISIONS

- Ratio of non-prompt/prompt $D^0$-meson $R_{AA}$ suggests similar suppression in $2 < p_T < 3$ GeV/$c$, and **smaller suppression for non-prompt $D^0$** at higher $p_T$

- Models with **radiative+collisional** energy loss and with hadronisation via **fragmentation+recombination** describe data within uncertainties

- Further insights by modifying LGR model configuration
  - Ratio closer to unity if using charm mass for *b* quarks for *E*-loss calculation → **Relevant role of dead-cone effect**
  - **Prompt-$D^0$ formation via recombination** explains the minimum at 2-3 GeV/c

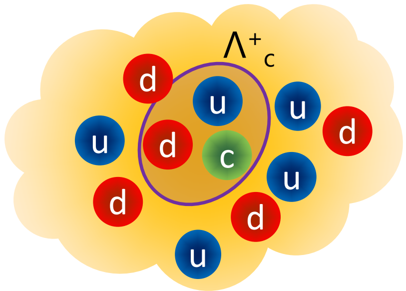



arXiv:2202.00815

# $\Lambda^+_c/D^0$ PRODUCTION RATIOS IN Pb–Pb COLLISIONS

ALICE

- In QGP medium, modified hadronisation of quarks into hadrons compared to pp collisions (**coalescence mechanism)** + mass-dependent particle spectra $p_T$ shift from **collective expansion**

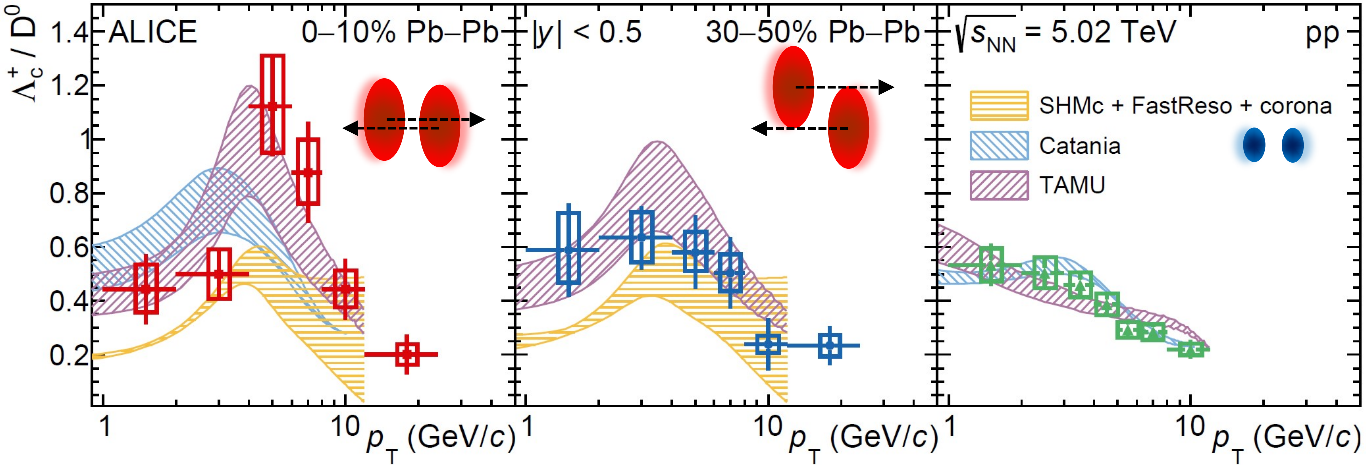



- Studied via **baryon-to-meson ratios**, also in the HF sector
  - Ratio of prompt $\Lambda^+_c$ over prompt $D^0$ mesons, in Pb–Pb collisions (0-10% and 30-50% centrality)

arXiv:2112.08156

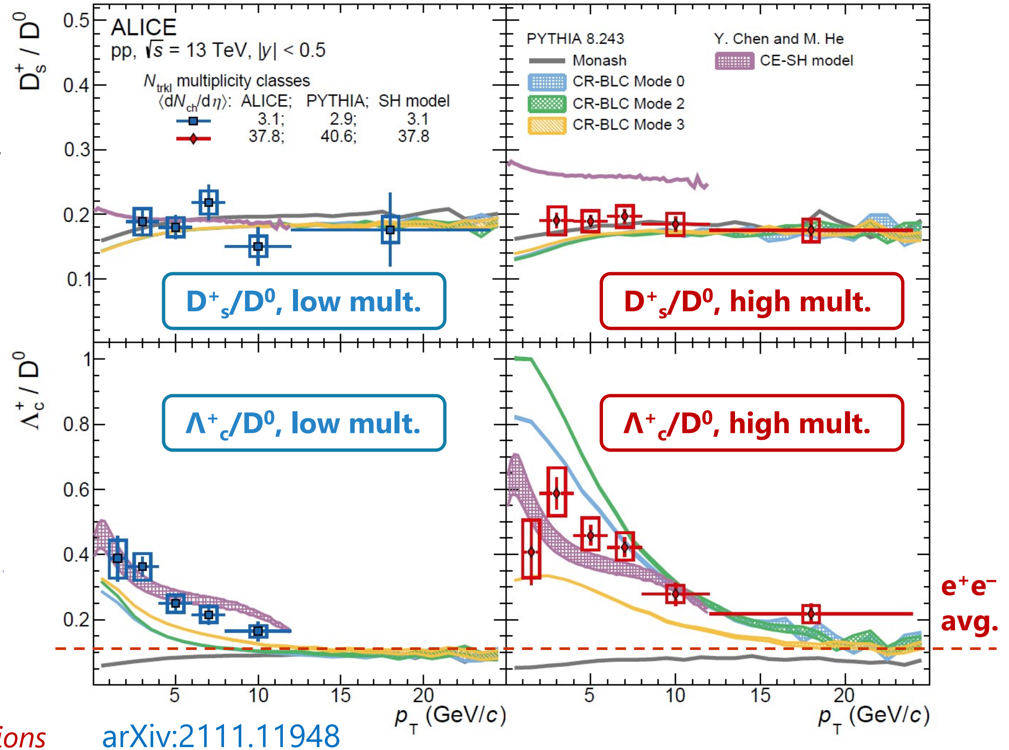
- **Significant increase** of $\Lambda^+_c/D^0$ ratio from pp to Pb-Pb central collisions, in $4 < p_T < 8$ GeV/$c$
  - **3.7σ effect**

- Qualitative agreement for models that include hadron formation via coalescence (**Catania**, **Tamu**, **SHMc**)



# $\Lambda^+_c/D^0$ PRODUCTION RATIOS VERSUS MULTIPLICITY IN pp COLLISIONS

- **Studies vs multiplicity** in pp collisions nicely connect to observed Pb-Pb enhancement at intermediate $p_T$
  - Shed further light to **non-universality** of charm **fragmentation** across collision systems
- $\Lambda^+_c/D^0$ ratios measured vs charged particle multiplicity
  - **5.7σ significant increase** from lowest to highest multiplicity intervals in $1 < p_T < 12$ GeV/c
  - **No evolution of $D_s/D^0$ ratios** with multiplicity
- $\Lambda^+_c/D^0$ multiplicity hierarchy qualitatively reproduced by **Pythia8 with CR modes beyond leading colour**
- Good description of $\Lambda^+_c/D^0$ provided by **CE-SH model** while **$D_s^+/D^0$ overestimated** at high multiplicity

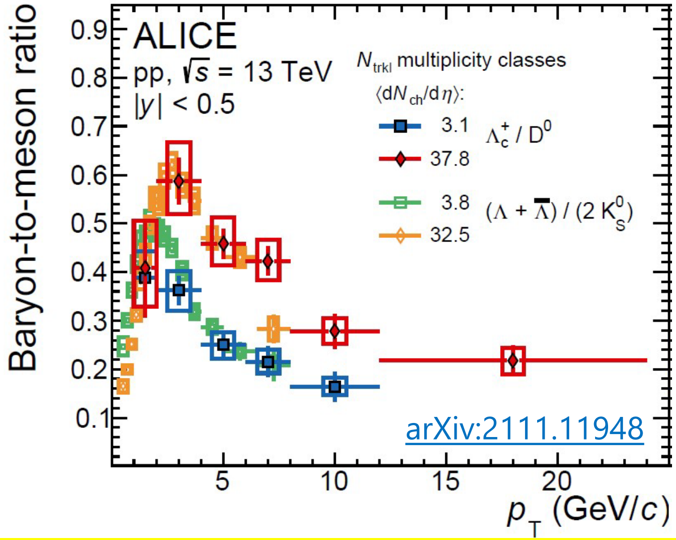


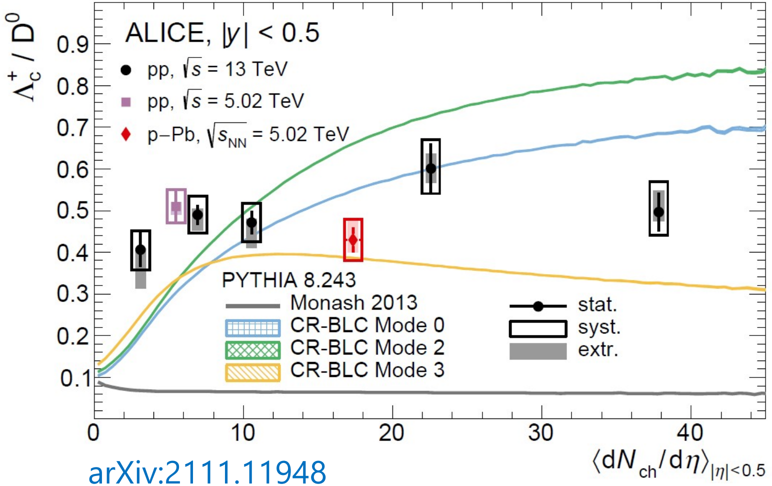

*Multiplicity estimator: SPD tracklets, $\propto \mathrm{d}N_{\mathrm{ch}}/\mathrm{d}\eta$ at midrapidity*
*Alternate estimator at forward η also checked to exclude autocorrelations*

arXiv:2111.11948

# $\Lambda^+_c/D^0$ PRODUCTION RATIOS VERSUS MULTIPLICITY IN pp COLLISIONS

- Very similar behaviours of $\Lambda^+_c/D^0$ (HF) and $\Lambda/K^0_s$ (LF) ratios against $p_T$ and multiplicity
  - **Same mechanism** at play for light- and heavy-flavour final-state particle formation?
  - Confirm **modified hadronisation** mechanisms, collision-system and multiplicity dependent




arXiv:2111.11948

- **No significant modification** of $\Lambda^+_c/D^0$ ratios **integrated over $p_T$ > 0** as a function of charged particle multiplicity
  - Different $p_T$ trend due to modifications of baryon and meson $p_T$ spectra, not to overall baryon enhancement at high multiplicity

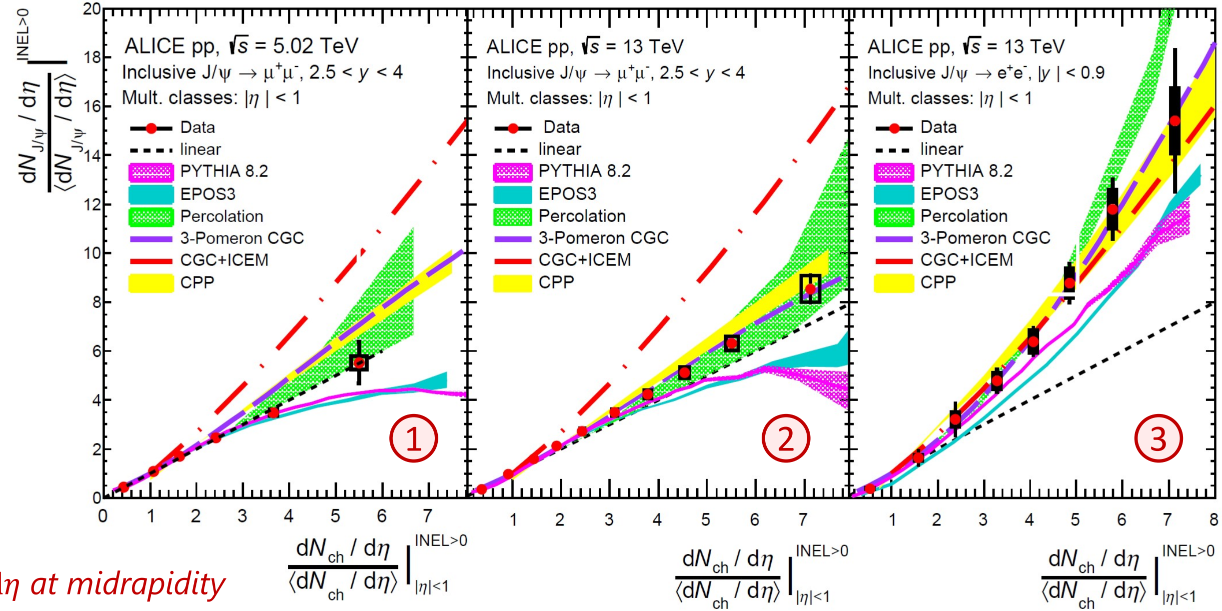
*Extrapolation to $p_T$ = 0 based on $p_T$ shape from Pythia8 CR-BLC*

# J/ψ PRODUCTION VERSUS MULTIPLICITY IN pp COLLISIONS

- Study of heavy-flavour production as a function of multiplicity in pp can also shed light on the **role of MPI** in heavy-quark production
  - **Self-normalised yields** of inclusive J/ψ mesons at forward rapidity in pp at $\sqrt{s}$ = 5.02 (1) and 13 TeV (2)

arXiv:2112.09433

- **Approximately linear increase** with self-normalised multiplicity at midrapidity
  - Independent of collision energy
  - **Different trend** compared with **midrapidity** results (3)
- Best description of data trend by **3-Pomeron CGC**, **Percolation** and **CPP** models, pointing to initial-state effects

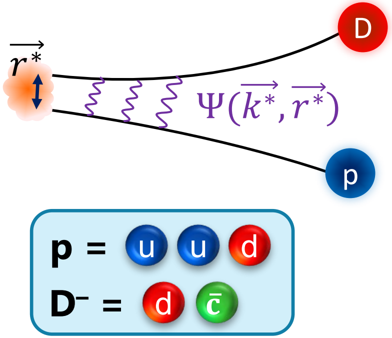



*Multiplicity estimator: SPD tracklets, ∝ $\mathrm{d}N_{\mathrm{ch}}/\mathrm{d}\eta$ at midrapidity*

# TWO-BODY SCATTERING WITH CHARM HADRONS

[arXiv:2201.05352](arXiv:2201.05352)

- First measurement of **interaction** between **charm hadron and nucleon** via femtoscopic studies
  - ➢ Gives access to **residual strong interaction** in charm sector
  - ➢ Also relevant to explain structure of **exotic states** with charm (XYZ states, $T_{cc}^{+}$, $P_c$ states, …)



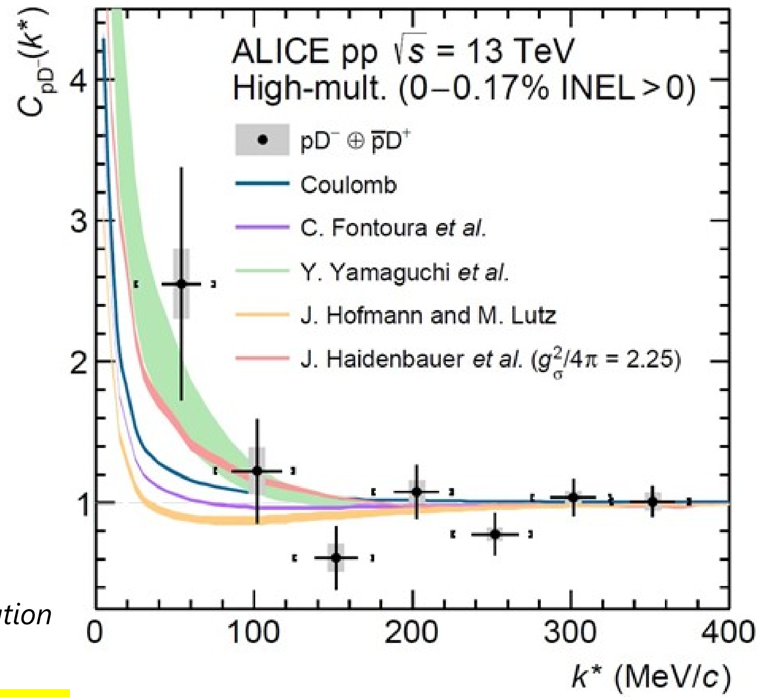

- Two-particle **momentum correlation function** ***C*(*k**)** of **pD⁻** and **p̄D⁺** pairs measured in high-multiplicity pp collisions at $\sqrt{s}$ = 13 TeV

- Connection to **source function** and **two-particle wave function**:

$$C(k^*) = \int d^3 r^* S(r^*) |\Psi(k^*, r^*)|^2$$

→ *Koonin-Pratt equation*

  - ➢ Allows to extract the potential for proton and D⁻ meson interaction



# TWO-BODY SCATTERING WITH CHARM HADRONS

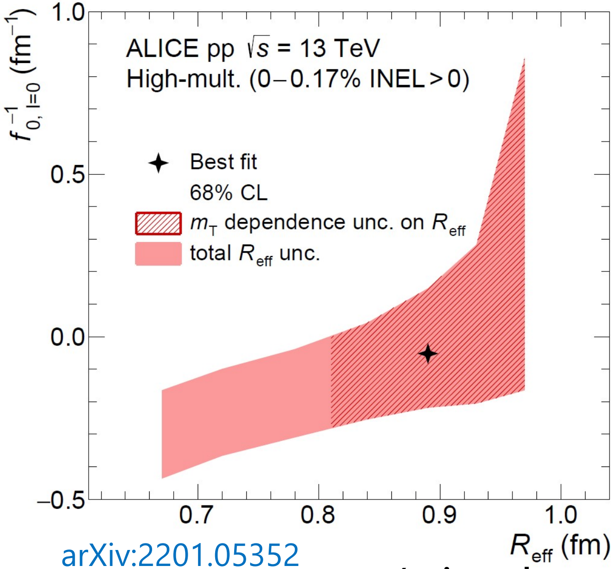
| Model | $f_0$ (I = 0) | $f_0$ (I = 1) | $n_\sigma$ |
|---|---|---|---|
| Coulomb | | | (1.1–1.5) |
| Haidenbauer et al. | | | |
| $-g_\sigma^2/4\pi = 1$ | 0.14 | −0.28 | (1.2–1.5) |
| $-g_\sigma^2/4\pi = 2.25$ | 0.67 | 0.04 | (0.8–1.3) |
| Hofmann and Lutz | −0.16 | −0.26 | (1.3–1.6) |
| Yamaguchi et al. | −4.38 | −0.07 | (0.6–1.1) |
| Fontoura et al. | 0.16 | −0.25 | (1.1–1.5) |

$f_0 > 0$: Attractive potential

$f_0 < 0$: Repulsive potential or attractive with bound state

- Data consistent with an **attractive potential**
  - 1.1$\sigma$–1.5$\sigma$ compatibility with **Coulomb-only interaction**
  - Improved agreement adding an **attractive strong interaction** (Yamaguchi et al., Haidenbauer et al.)

- **Inverse scattering length $f_{0,I=0}^{-1}$** of ND system, by constraining to data the correlation function obtained varying source radius and potential $V_{I=0}$
  - In 1$\sigma$ from best fit: $V_{I=0} \in$ [–1450, –1050] MeV → $f_{0,I=0}^{-1} \in$ [–0.4, 0.9] fm$^{-1}$
  - Consistent with **attractive interaction, with or without bound state**

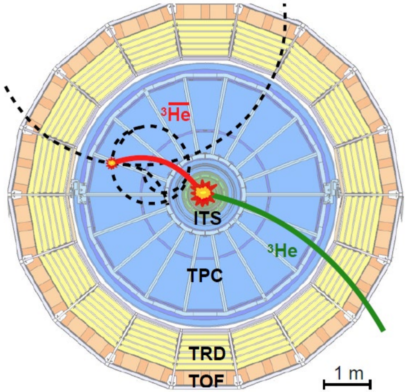



arXiv:2201.05352

**(estimated source size)**

# ABSORPTION OF $^{3}\overline{\text{He}}$ IN MATTER

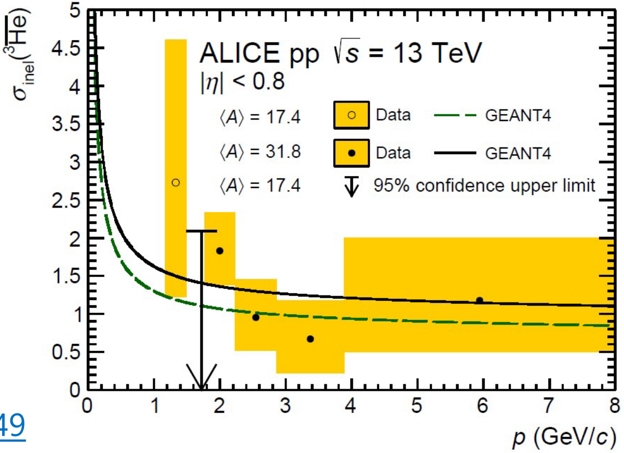
- Measurements of **antinuclei** provide important input for **astrophysics and dark-matter studies**
  - One of dominant production mechanisms is **DM annihilation** (e.g. $\chi + \chi \rightarrow W^{+}W^{-} \rightarrow {}^{3}\overline{\text{He}} + X$)

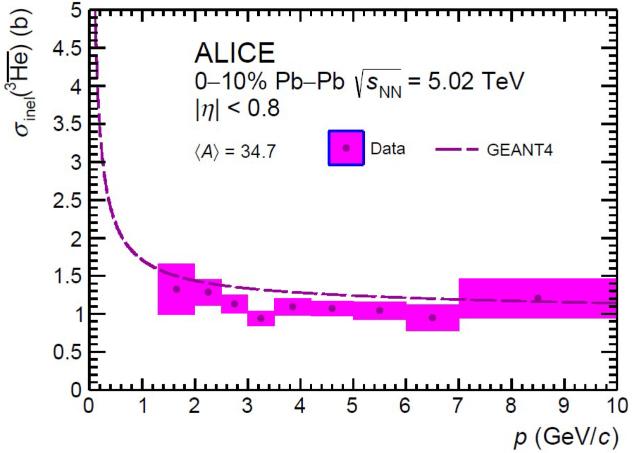



- **Disappearance probability** of antinuclei (quantified by $\sigma_{\text{Inel}}$) while traversing matter is one of the main ingredients for modeling their propagation and studying the galaxy transparency

- **First $\sigma_{\text{Inel}}$ measurement** done by ALICE for $^{3}\overline{\text{He}}$
  - Antinuclei factory + interaction in detector material
  - Via baryon/antibaryon ratio (pp), or TOF-to-TPC ratio (Pb-Pb)

- GEANT4 modeling **consistent within 2$\sigma$** sigma with data




arXiv:2202.01549

# ABSORPTION OF $^{3}\overline{\mathrm{He}}$ IN MATTER

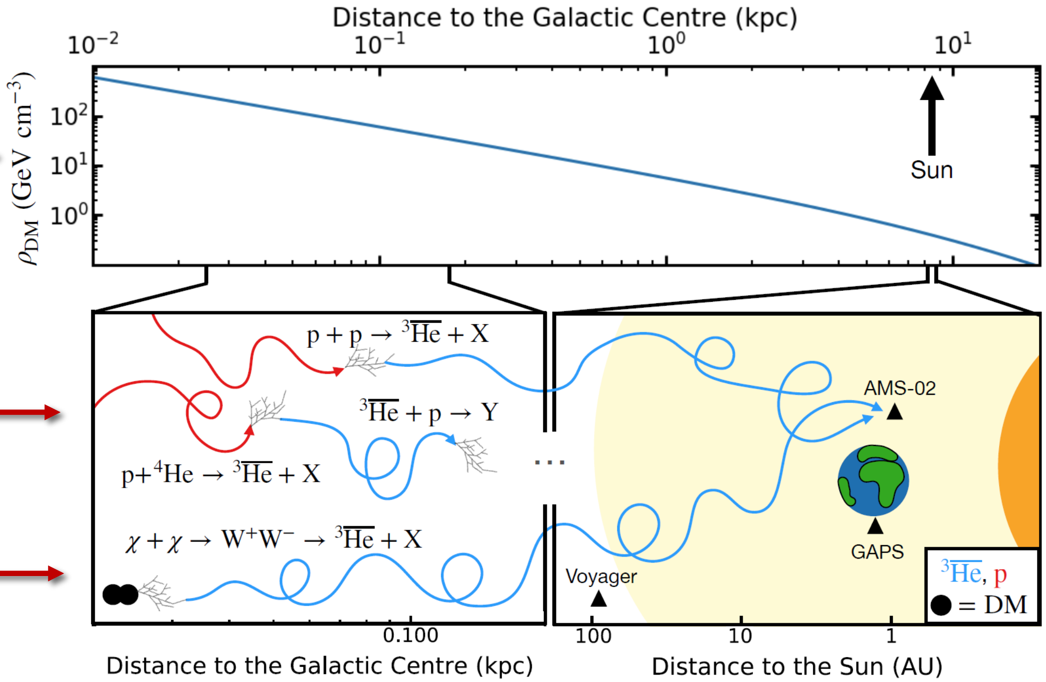
- Propagation through galaxy of $^{3}\overline{\mathrm{He}}$ from **dark-matter decays** and **cosmic-ray interactions** based on transport equation
  - Inelastic interactions modeled via $p_{\mathrm{T}}$- and $A$-scaling of experimentally measured $\sigma_{\mathrm{Inel}}(^{3}\overline{\mathrm{He}})$

***Distribution of DM** as a function of distance from galactic centre*

**Modeled $^{3}\overline{\mathrm{He}}$ sources**

*Interactions **of high-energy cosmic rays** with interstellar medium*

***Dark-matter decays** (WIMPS of 100 GeV/c$^2$)*

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# ABSORPTION OF $^3\overline{\mathrm{He}}$ IN MATTER

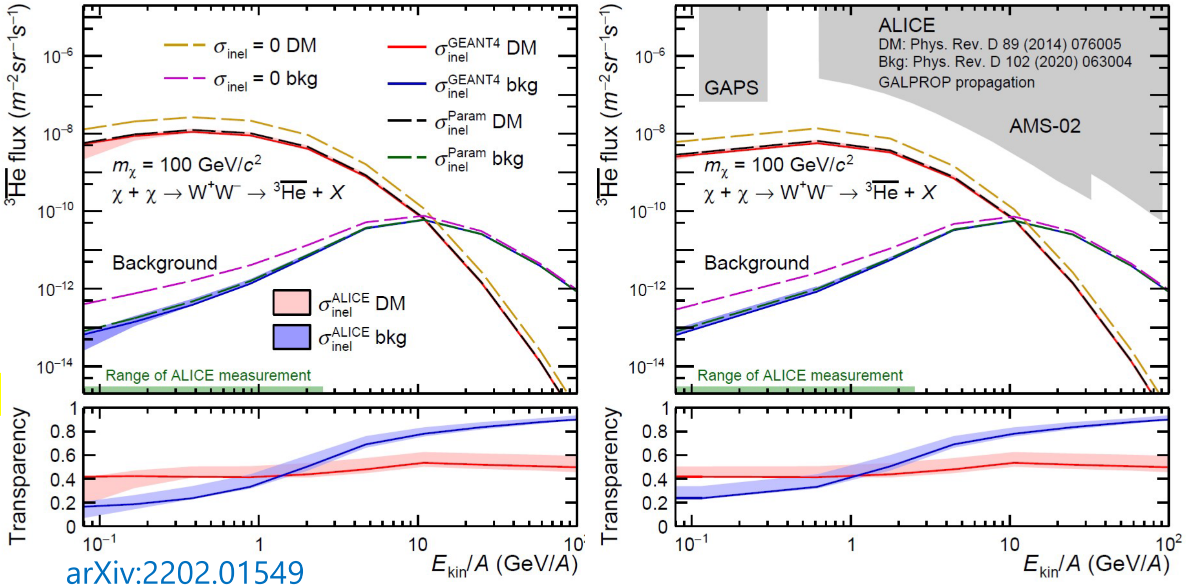
- Propagation through galaxy of $^3\overline{\mathrm{He}}$ from **dark-matter decays** and **cosmic-ray interactions** based on transport equation
  - ➢ Inelastic interactions modeled via $p_T$- and $A$-scaling of experimentally measured $\sigma_{\mathrm{Inel}}(^3\overline{\mathrm{He}})$

- **Estimated flux of $^3\overline{\mathrm{He}}$** near Earth, before and after solar modulation
  - ➢ Consistent with model predictions using different $\sigma_{\mathrm{Inel}}(^3\overline{\mathrm{He}})$ parameterizations

- Transparency of galaxy about **50% for DM source**, 25% for low-$E$ $^3\overline{\mathrm{He}}$ from cosmic-ray background

- Experimentally-driven uncertainties reduced to **10%-15%**, subleading w.r.t. other ingredients used for DM modelling

*Propagation performed using GALPROP code*




arXiv:2202.01549


# LS2 ACTIVITIES AND COMMISSIONING

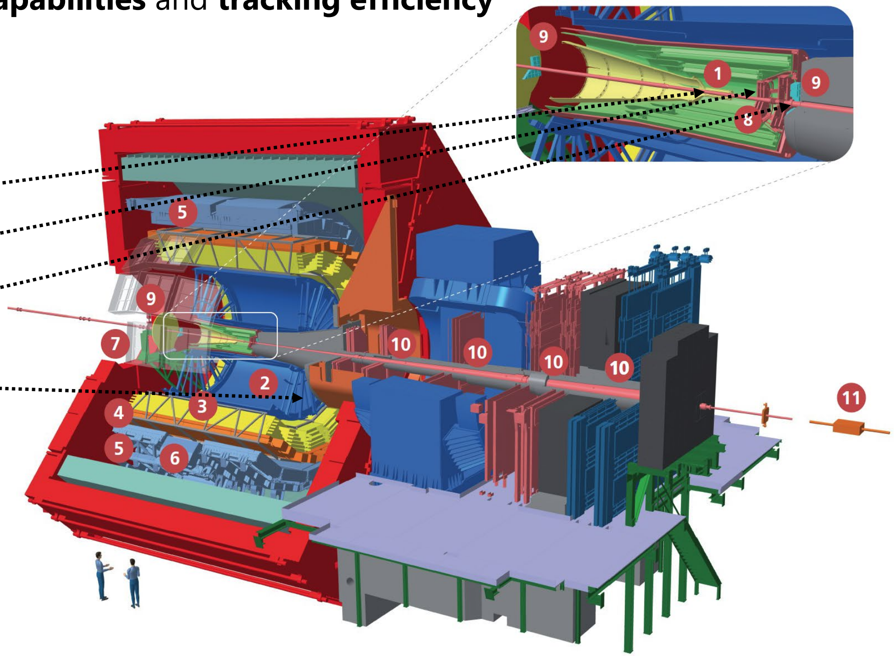
# ALICE 2 DETECTOR

## Main objectives for ALICE detector for Run 3+4:

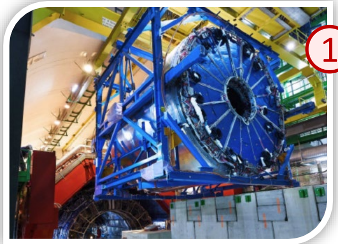
- Collect $L_{int}$ ≈ **13 nb$^{-1}$** of Pb-Pb collisions → **x50-x100** statistics increase for most of the observables
- Sustain rate of **50 kHz** for Pb-Pb collisions, with **continuous readout** and **online data reconstruction**
- Substantial improvements in **vertexing capabilities** and **tracking efficiency**

### New/improved systems:

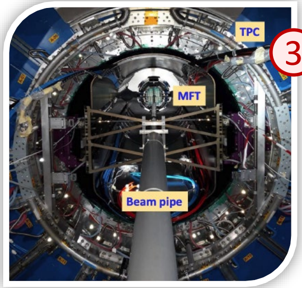
- New **tracking systems** based on **MAPS**:
  - ➢ **Inner Tracking System** (ITS)
  - ➢ **Muon Forward Tracker** (MFT)
- New **Fast Interaction Trigger** (FIT) detector
- **TPC** readout chambers employing GEM
- New **Online/Offline** system (O$^2$) for data processing and reconstruction
- Upgraded **readout systems** for the other detectors, to cope with continuous readout



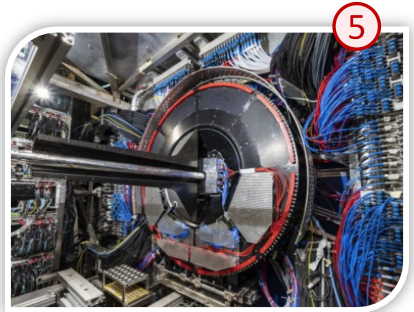
# ALICE LS2 SCHEDULE

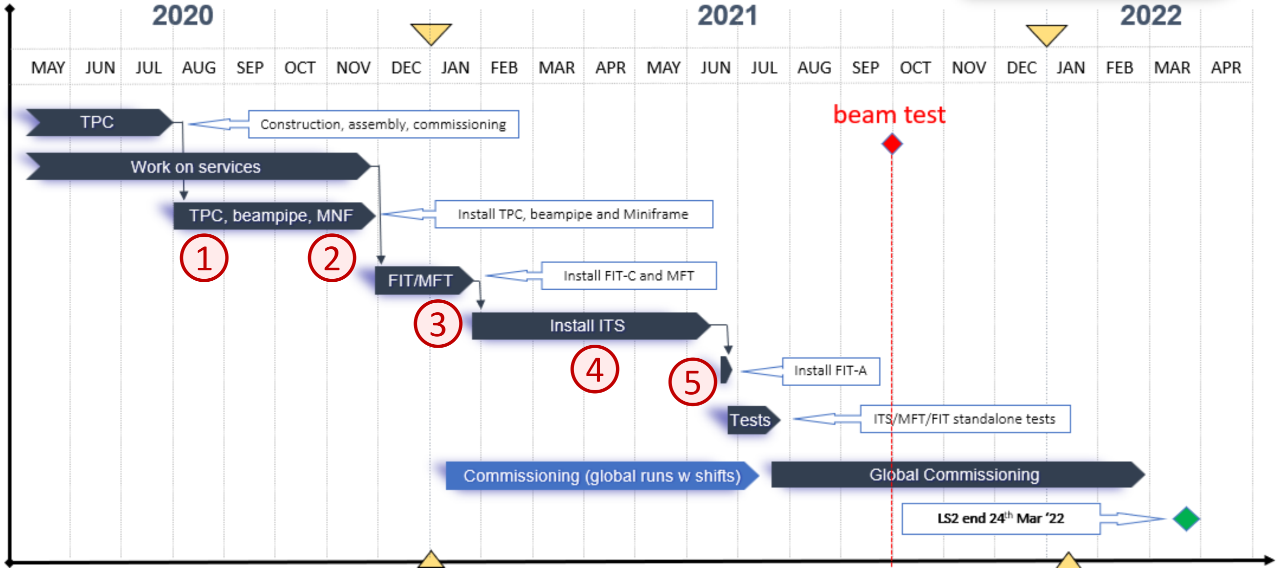








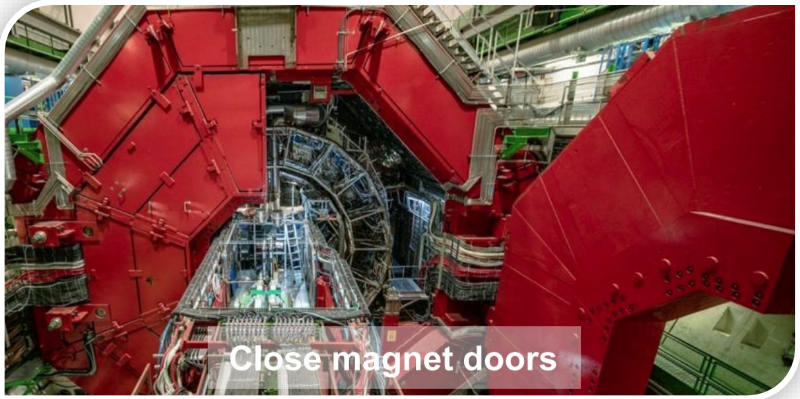


# LS2 RECENT ACTIVITIES AND PLANS

## Latest activities at P2 and roadmap

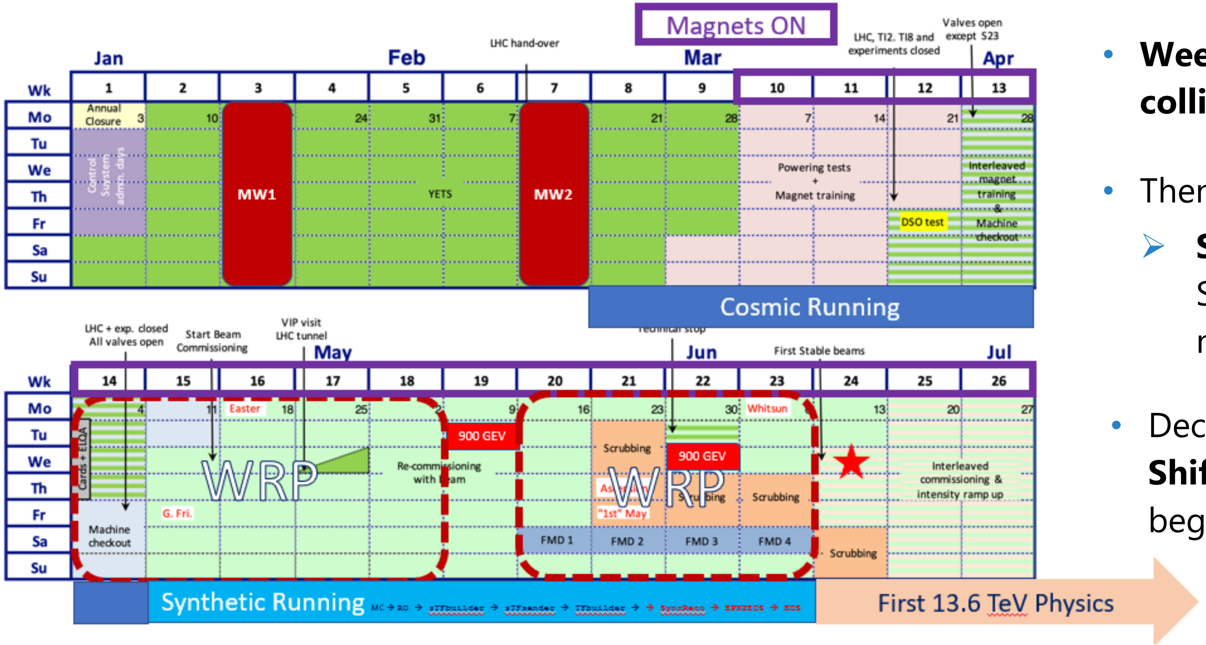
- **Finished installation** of ALICE subsystems, **maintenance/replacement activities** for several detectors (TOF, ITS, MFT, TPC, MCH, EMCal, Dcal, PHOS)
- L3 doors closed February 14, ventilation reinstalled February 15, miniframe shielding installed the following week
- ALICE closed by week 9 (March 2nd) and restart magnets in week 10 (March 7th)
- **Underground access** ends on **March 24th**
- **Machine commissioning with beam** expected to start on **April 13th** (Easter week)




# ALICE COMMISSIONING – PLANS UP TO STABLE BEAMS

## Roadmap to 13.6 TeV Collisions

- **Week 8-14** (February-April): Global and standalone commissioning with Weekly Run Plans
- **Week 15-23** (April-June): Global commissioning with synthetic runs exploiting MC fake data

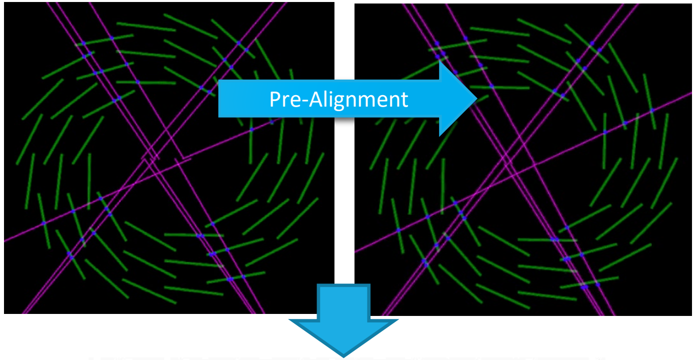


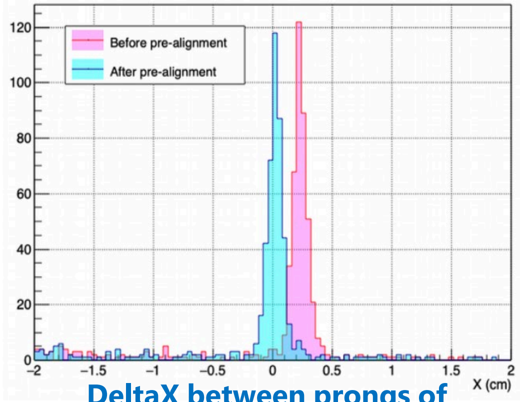

- **Weeks 19,23**: new rounds of **900 GeV collisions** (min 2 fills)
- Then **ready for Stable Beams** at 13.6 TeV
  - **Start-up plans** for p-p running after first SB are **ready**, to be discussed with machine experts
- Decided to preserve possibility of **Virtual Shift Blocks** for some systems, until the beginning of data taking

# HIGHLIGHTS FROM PILOT BEAM

- Good **detector performance** from pilot beam
- Data are being exploited for alignment studies
- New analysis framework commissioned with data

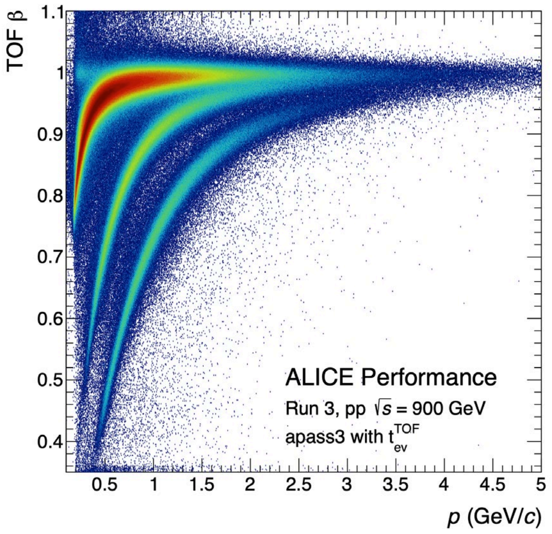
**ITS pre-alignment using cosmics and pilot-beam data**



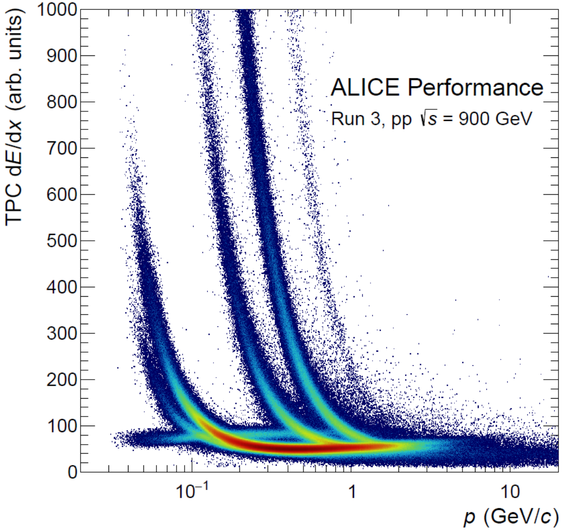




**DeltaX between prongs of cosmic muon tracks**

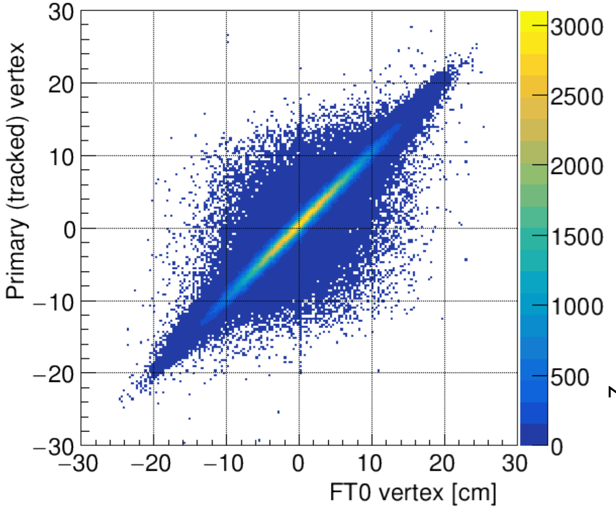
**TOF PID performance**




**TPC PID performance**

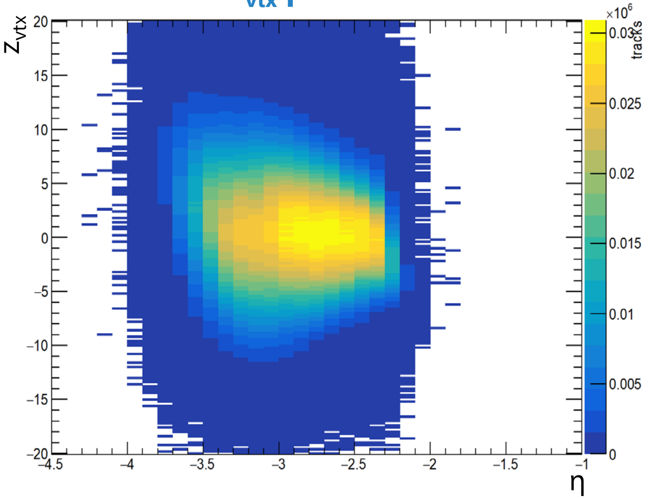


# HIGHLIGHTS FROM PILOT BEAM

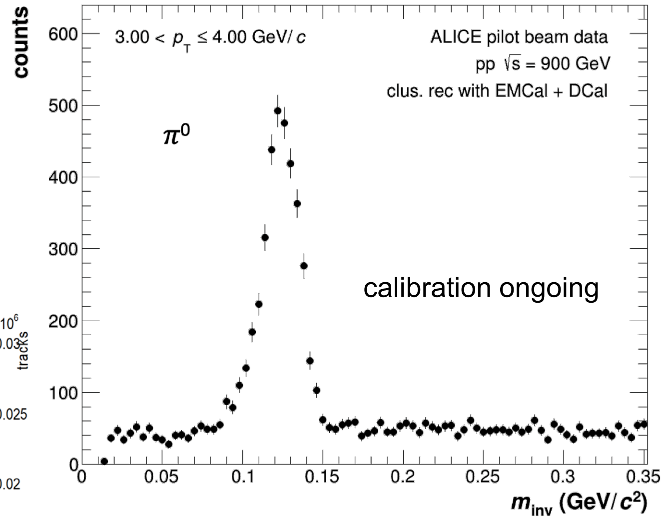



**FT0 vs track-based $z_{vtx}$ position**

**η of standalone MFT tracks vs $z_{vtx}$ position**




*two-cluster invariant mass distribution*

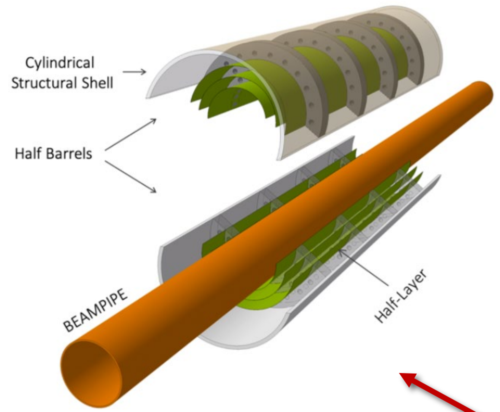


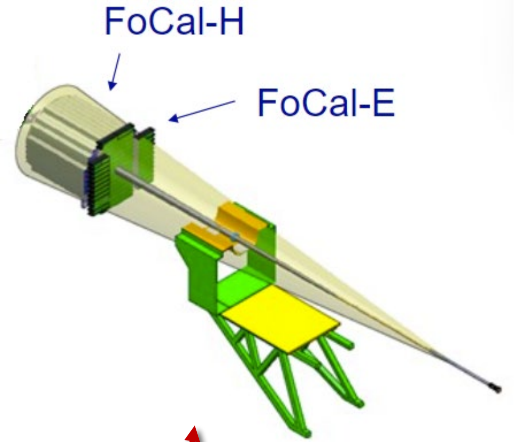

**Invariant mass peak of $\pi^0$ from EMCal+DCal**


# STATUS OF ALICE UPGRADES

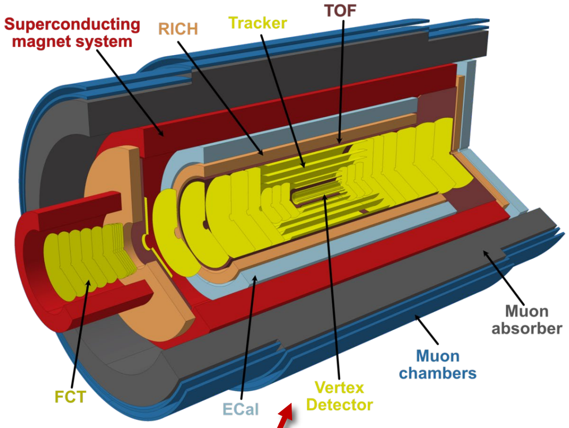
# ALICE UPGRADES TIMELINE

ITS3



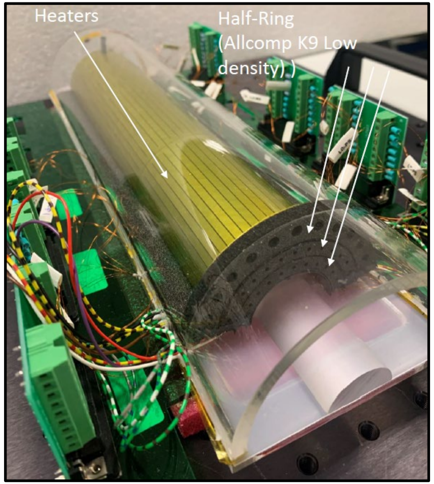

ALICE 3




# ITS3 STATUS

**Replacement of ITS2 inner barrel with the novel ITS3 during LS3**

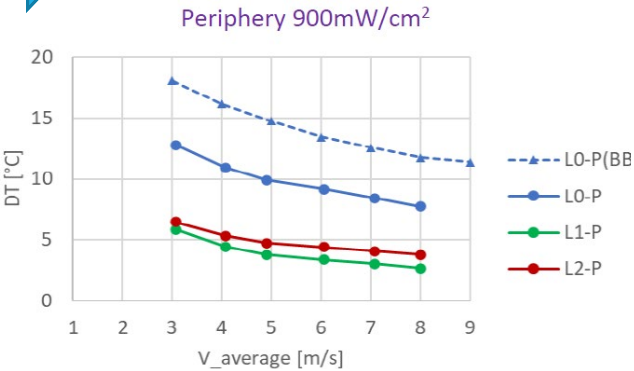
- Three layers of wafer-scale sensors of ultra-thin MAPS, bent around the beam pipe
  - **~6x** less material budget: ~0.02-0.04% $X_0$ per layer
  - First layer at 18 mm from IP → **2x** pointing resolution and low-$p_T$ efficiency

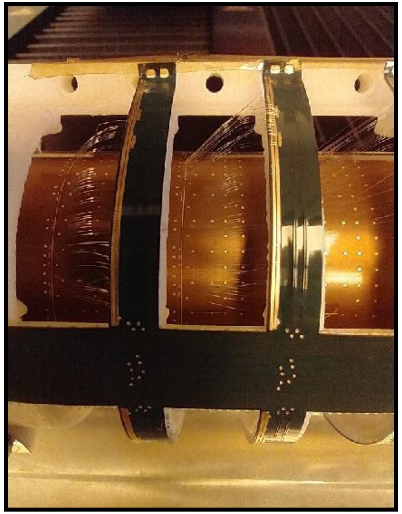



## Mechanics updates

**Wind tunnel studies with model + heaters**

- Verified possibility of cooling via airflow
- Larger heating at periphery, can be dissipated via a carbon foam radiator, no water cooling required



**Super-ALPIDE chips**

- Assembled and bent, to be bonded on exoskeleton and tested

LoI: CERN-LHCC-2019-018

# ITS3 STATUS

## Sensor developments

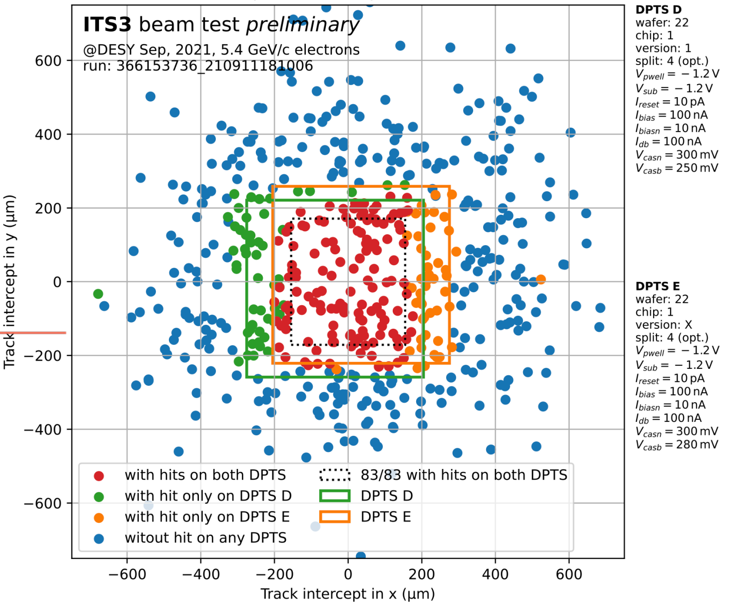
Test structures from MLR1 submission received (TowerJazz 65 nm)

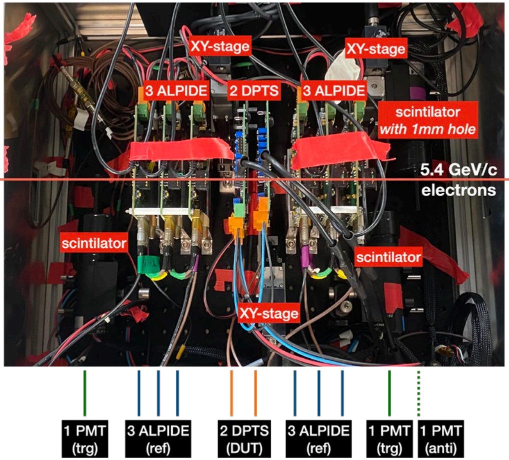
### Tests in laboratory and with beam

- Digital Pixel Test Structures (DPTS) operational with 100% efficiency
  - ➢ DPTS remains fully efficient after combined NIEL + TID irradiation
- Further tests performed with DPTS and other types of structures
  - ➢ Position resolution, cluster size, time resolution, …
- **65 nm** process is a **viable solution** for ITS3 and beyond

**Test beam results with two displaced DPTS**

Reconstructed telescope tracks, on plane between 2 DTPS sensors



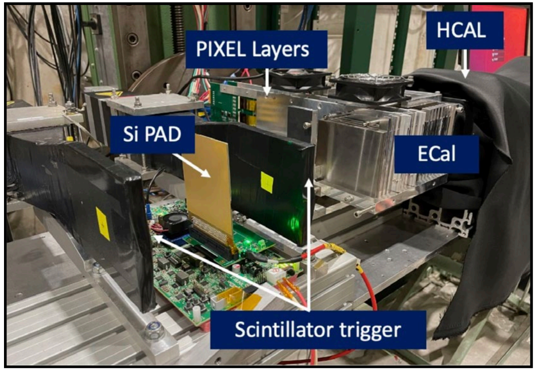




**DPTS test beam setup**

# FoCal STATUS

**FoCal: forward electromagnetic+hadronic calorimeter → Run4 upgrade**

- **FoCal-E**: high-granularity Si-W sampling calorimeter for **direct γ** and $\pi_0$
- **FoCal-H**: metal-scintillator sampling calorimeter for **photon isolation** and **jets**




**Test beam in September 2021**

- **FoCal-E**: 2 pixel (ALPIDE) layers, 1 pad layer
- **FoCal-H**: complete prototype, commercial readout system
- Full-pixel prototype: **EPICAL-2**

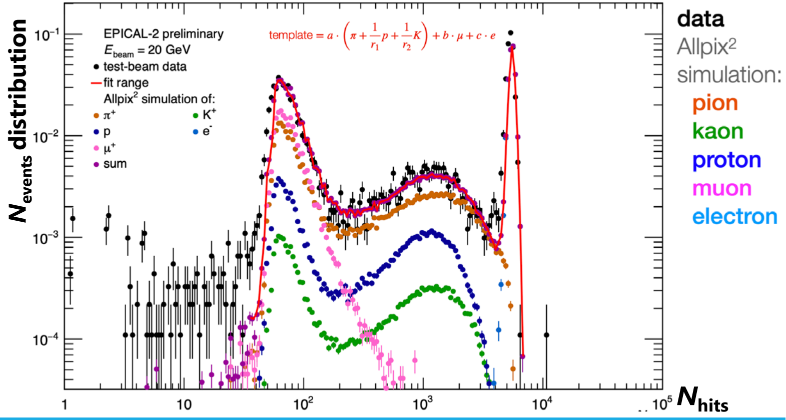
**LoI ALICE-PUBLIC-2019-005**

**Next steps:**

- Further laboratory tests of pad readout
- Construct full FoCal-E tower prototype
- 2 test beams planned in 2022 (June for pad electronics, Sep/Oct for full demonstrator)

**HCAL prototype**

**EPICAL-2: data and simulation**



# ALICE 3 – PHYSICS GOALS

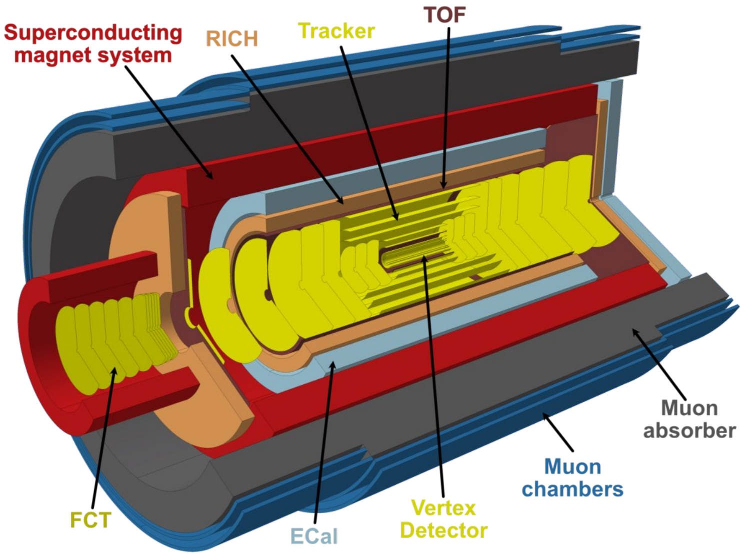
Several questions in key areas still expected to remain unaddressed after Run 3+4!

→ **New dedicated heavy-ion detector currently under planning for Run 5 and beyond: ALICE 3**

**Selection of key points of ALICE 3 physics programme**

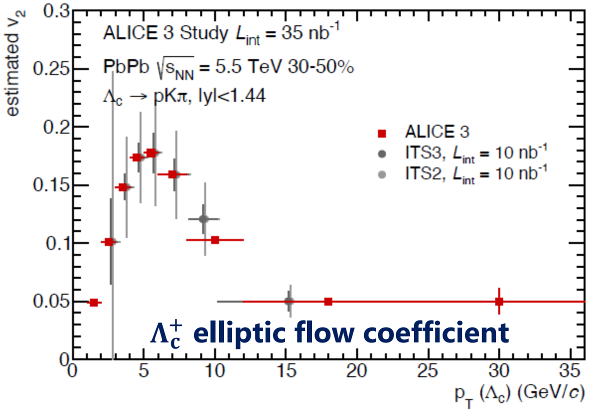
- **Precision measurements of dileptons**
  - Characterisation and evolution of the QGP
  - Chiral symmetry restoration
- **Systematic measurements of (multi-)heavy-flavoured hadrons**
  - Transport properties and diffusion in the QGP
  - Mechanisms of hadronisation
- **Hadron correlation measurements**
  - Interaction potentials
  - Fluctuations of conserved charges

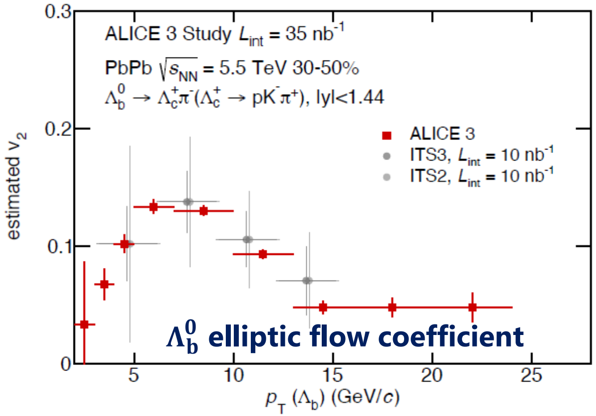
*Compact, low-mass **all-silicon tracker**, with excellent **vertexing** and **PID capabilities** over **wide acceptance***



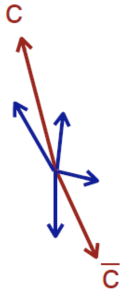
## Heavy-flavour transport

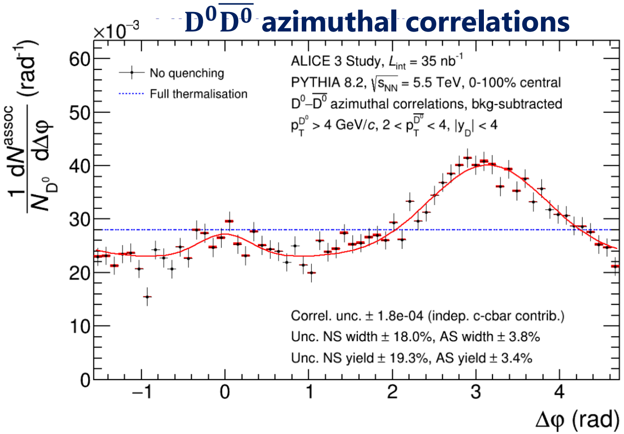
- Goal: understand **heavy quark diffusion** and how they reach **thermalisation**




- **Charm and beauty transport** in the diffusion regime:
  - ➢ $\boldsymbol{R_{AA}}$ and $\boldsymbol{v_2}$ of mesons and baryons down to low $p_T$
- Access to **angular decorrelation** and further sensitivity to **energy loss** mechanisms via $\mathbf{D\overline{D}}$ **correlations**

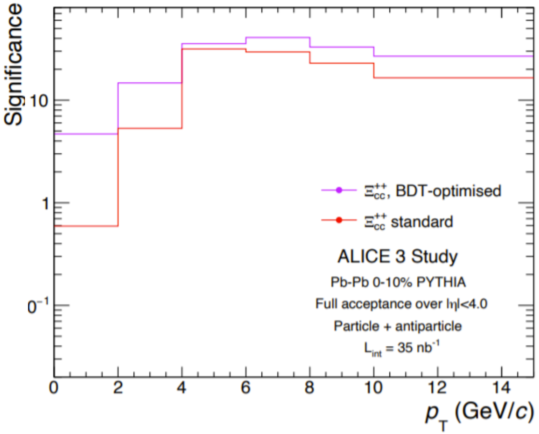


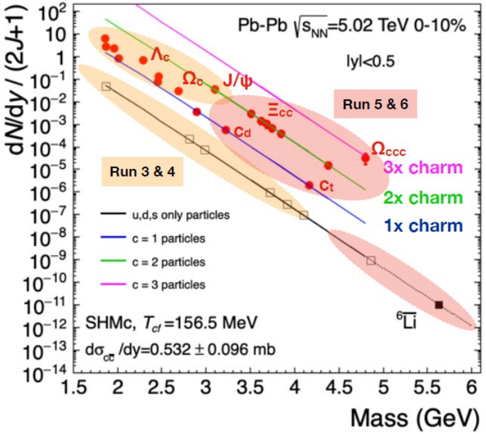



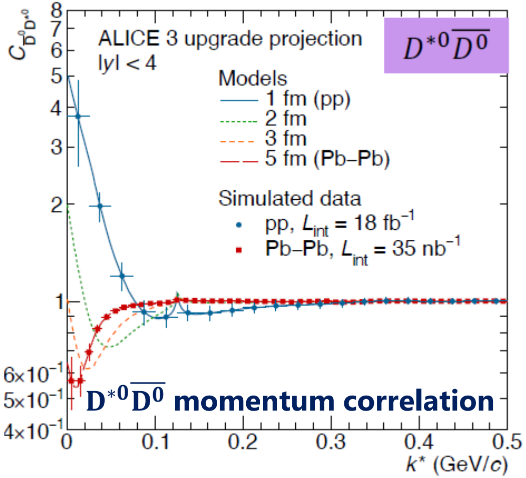
# ALICE 3 – HIGHLIGHTS FROM LoI STUDIES

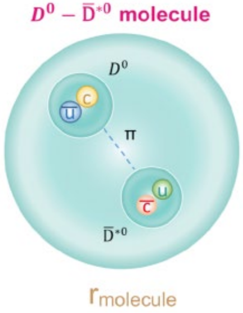
## Multi-charm and exotic states

- **Multi-charm baryons**: unique probe of hadron formation
  - ➢ Requires production of multiple c quarks via (>1) hard scatterings
- SHM predicts **very large enhancement** in AA
  - ➢ Characteristic relation between *n*-charm yields ($g_c^N$)



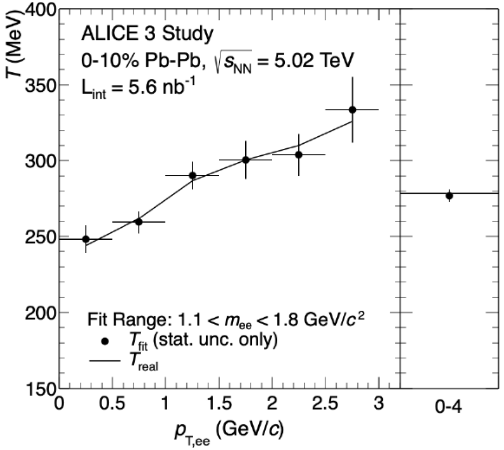

- Characterisation of **charm exotic states**: X(3872), $T_{cc}^+$, …
  - ➢ Yield measurements to understand **dissociation** and **regeneration** in QGP
  - ➢ Femtoscopic studies to investigate their **structure**

## Electromagnetic probes

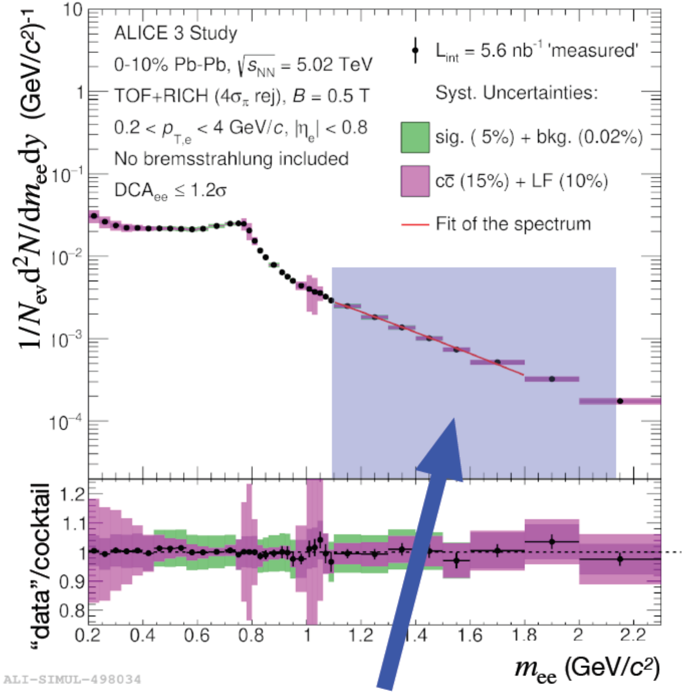
- Precise measurement of **QGP temperature** in its early stages from invariant mass dilepton measurements
  - ➢ $1 < m_{ee} < 3$ GeV/$c^2$ range dominated by thermal emission
  - ➢ Differential measurement to probe **time dependence** of T

- **Improved precision** compared to Run 3+4 measurements

- Complementary measurement of temperature via spectrum of **direct photons**
  - ➢ Different set of systematic uncertainties




Dilepton invariant mass spectum




Dominated by black-body radiation from QGP

# ALICE 3 – DEVELOPMENT OF PROPOSAL

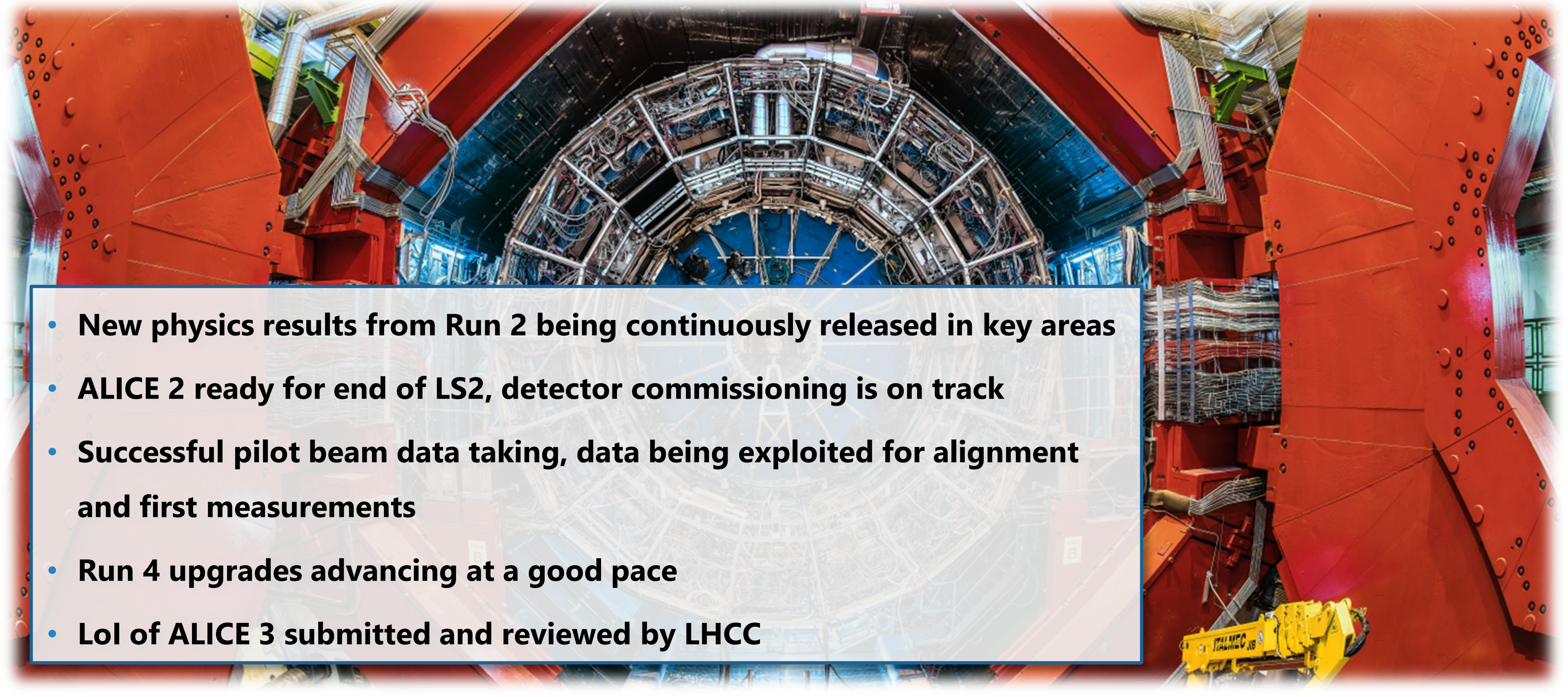
ALICE

## **Letter of Intent** submitted and reviewed by LHCC

- LoI draft **endorsed** by ALICE Collaboration Board with very strong support
- Submitted to the **LHCC** for review
  - ➢ The review process has led to a report from the LHCC review panel for discussion this week
- Final version in preparation, public release of final version shortly

**Contents**

# SUMMARY



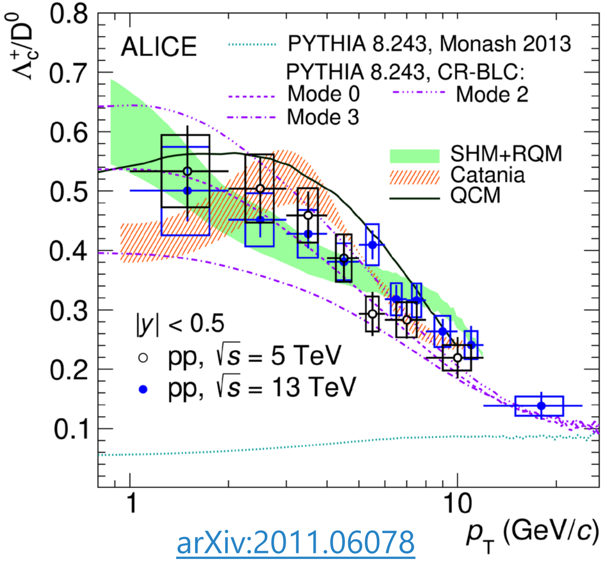
- New physics results from Run 2 being continuously released in key areas
- ALICE 2 ready for end of LS2, detector commissioning is on track
- Successful pilot beam data taking, data being exploited for alignment and first measurements
- Run 4 upgrades advancing at a good pace
- LoI of ALICE 3 submitted and reviewed by LHCC


# BACKUP SLIDES

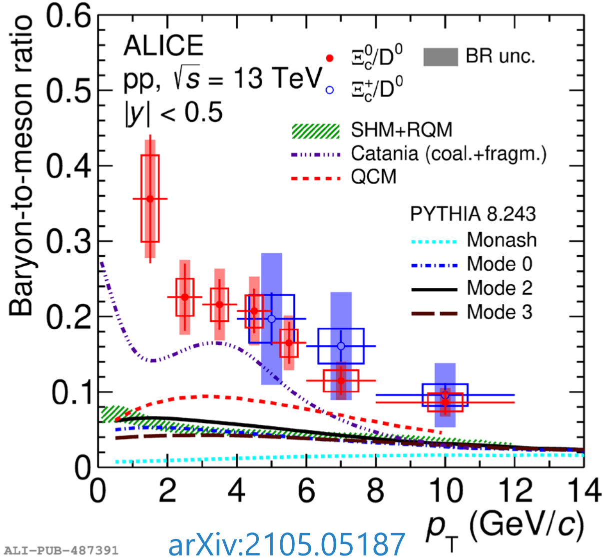
# $\Lambda^+_c/D^0$ PRODUCTION RATIOS VERSUS MULTIPLICITY IN pp COLLISIONS

ALICE

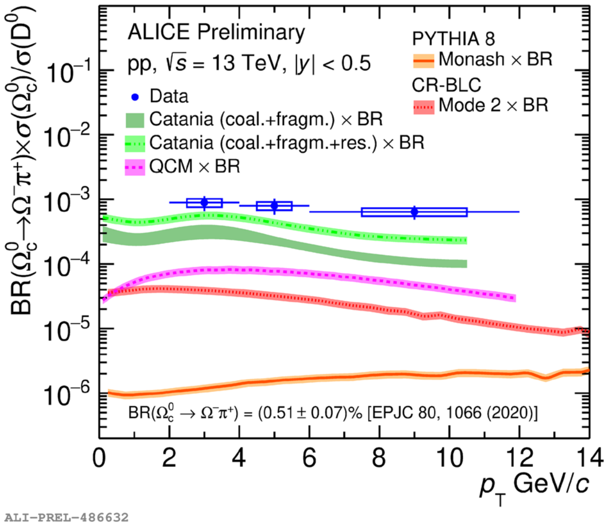
- From charm baryon-to-meson ratio measurements, **charm fragmentation** is **not universal** across collision systems
  - pp ratios enhanced compared to $e^+e^-$, $e^-p$, in particular at low $p_T$




arXiv:2011.06078




arXiv:2105.05187

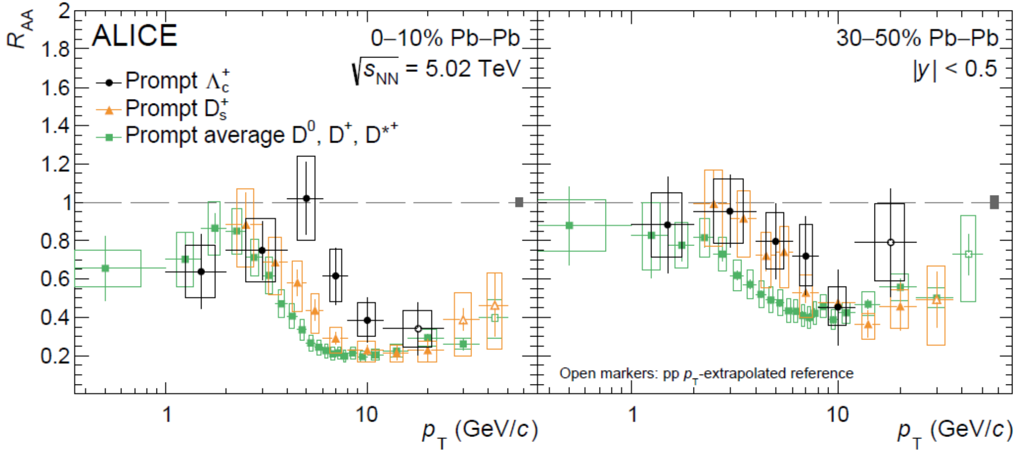


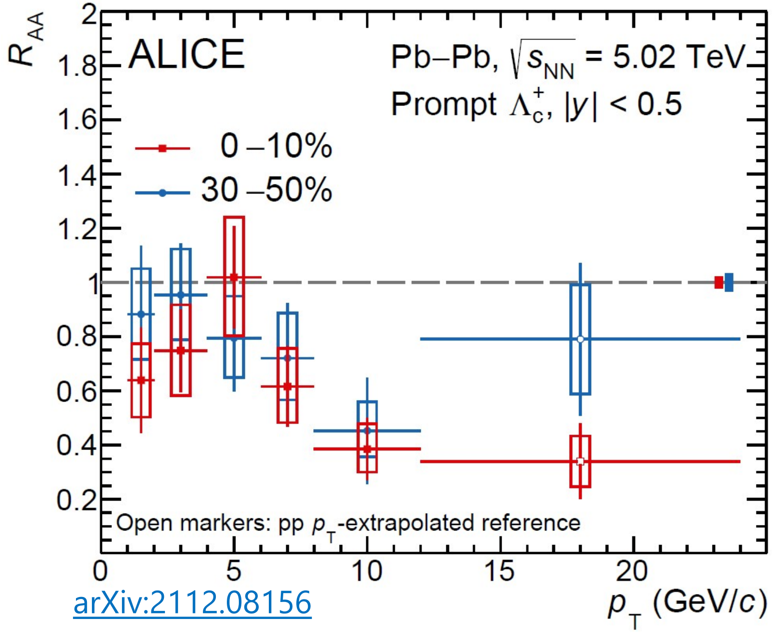

$\Lambda^+_c$ quark content: u d c — $\Xi_c^0$ quark content: d s c — $\Xi_c^+$ quark content: u s c — $\Omega_c^0$ quark content: s s c

# $\Lambda^+_c/D^0$ PRODUCTION RATIOS IN Pb–Pb COLLISIONS

- Nuclear modification factor of prompt $\Lambda^+_c$ **consistent with unity up to 6 GeV/*c***, $\Lambda^+_c$ **suppression for higher $p_T$**
  - Similar $R_{AA}$ values between the two centrality classes

- Hint of **larger $R_{AA}$** compared to D-meson average for central collisions in 6 < $p_T$ < 12 GeV/*c* range
  - **Hint of hierarchy of $R_{AA}(\Lambda^+_c)$ > $R_{AA}(D^+_s)$ > $R_{AA}(D^0,D^+,D^{*+})$** points toward relevant impact of coalescence on charm hadron formation

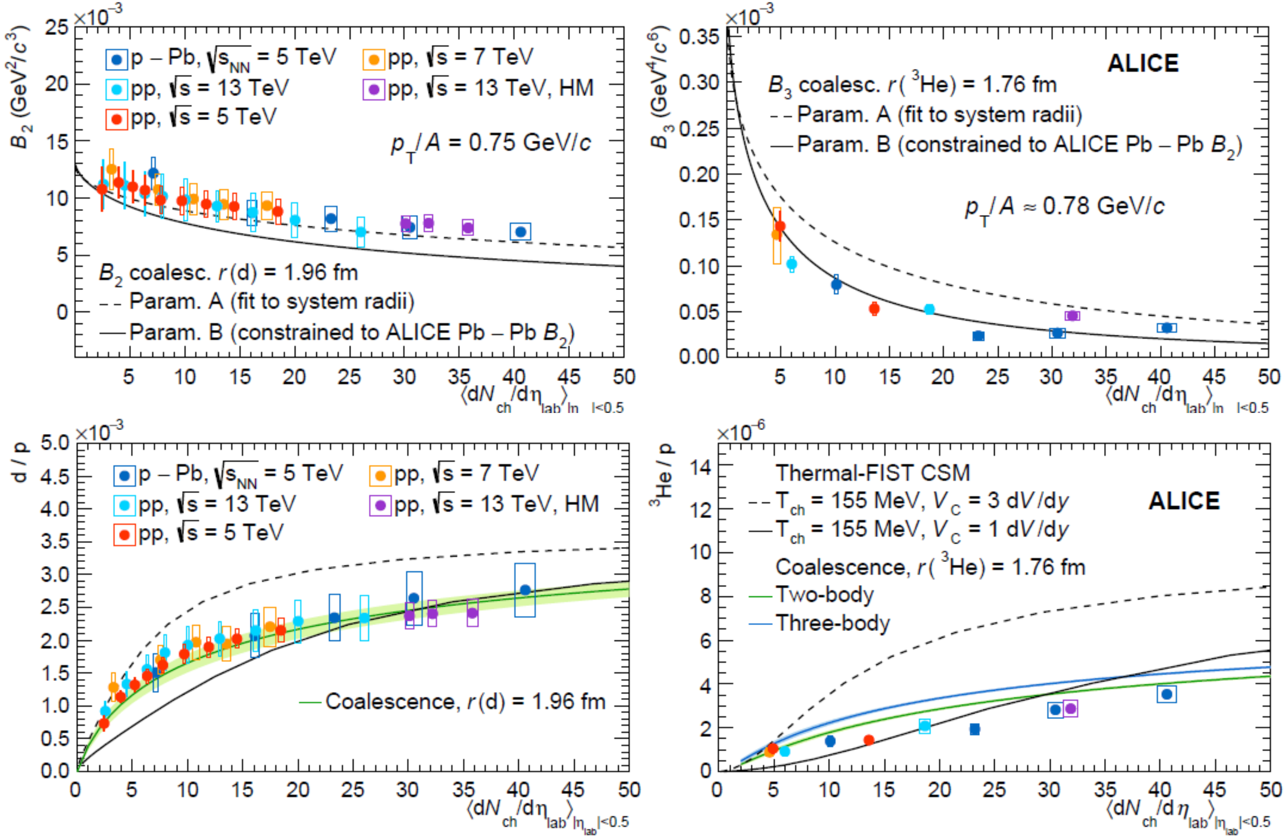



arXiv:2112.08156

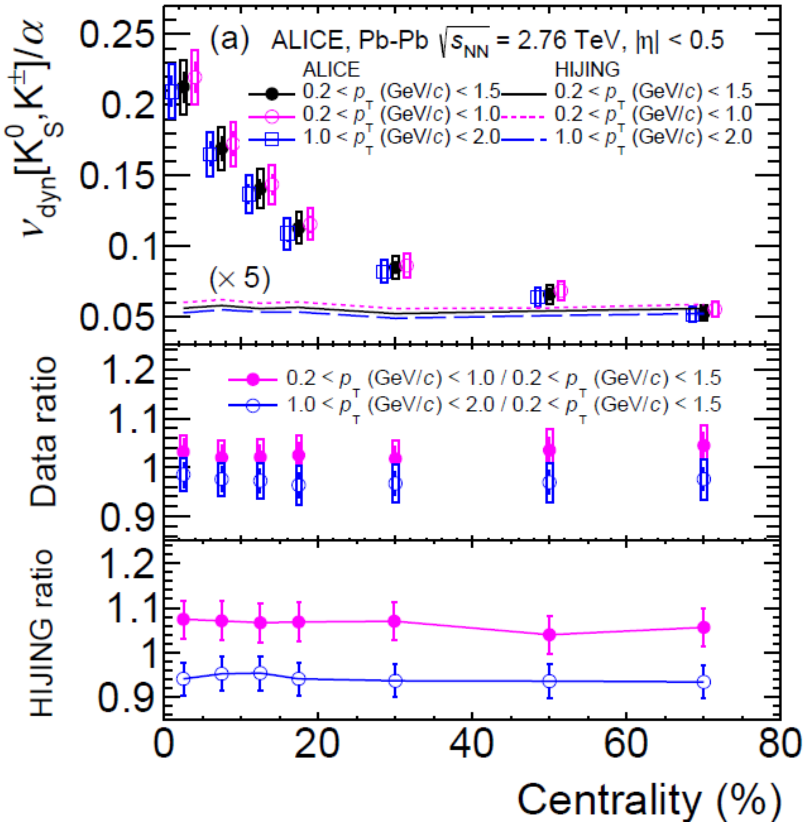
# OTHER RESULTS FROM PUBLICATIONS

- Production of (anti)nuclei as a function of multiplicity in pp collisions
- d/p and $^{3}$He/p results qualitatively described by coalescence model and SHM for canonic ensemble
- Discrepancies possibly related to system size determination



# OTHER RESULTS FROM PUBLICATIONS

- Isospin fluctuations in kaon sector, and their multiplicity dependence, sensitive to chiral phase transition
  - $\nu_{dyn} = R_{cc} + R_{00} - 2R_{c0}$
- Breaking of centrality scaling observed for $\nu_{dyn}/\alpha$ not reproduced by models
- No significant low-$p_T$ enhancement observed, not supporting the production of disoriented chiral condensates (DCC)

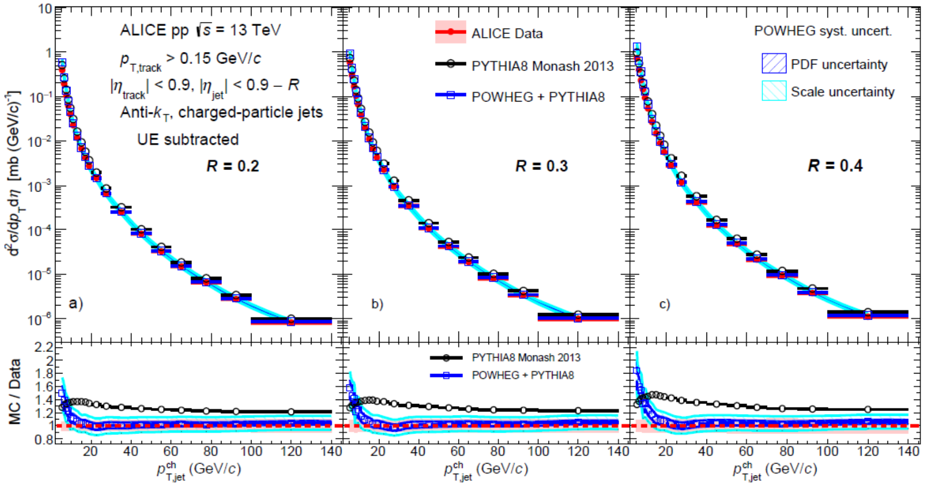


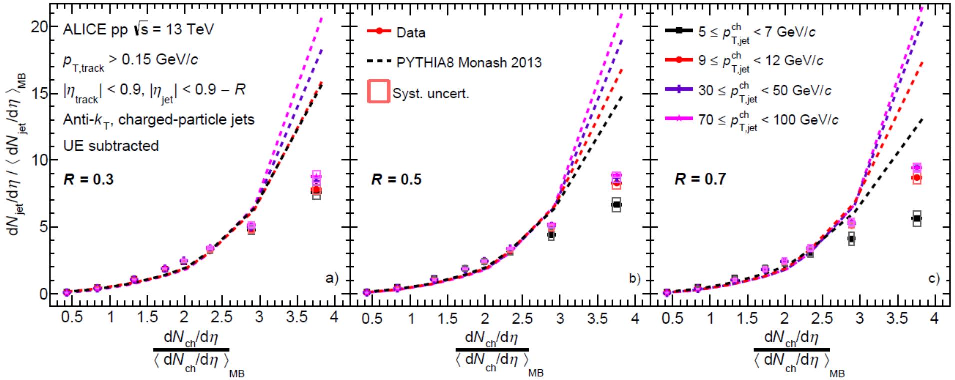
# OTHER RESULTS FROM PUBLICATIONS

- Measurement of inclusive charged jets produciton vs charged particle multiplicity in pp
  - ➢ Better agreement with NLO models, compared to LO, though yields overestimated below 20 GeV/*c*

- From ratios of production cross sections at different *R*, stronger collimation for high-$p_T$ jets observed

- Self-normalised yields: faster-than-linear increase observed for all values of jet radius R



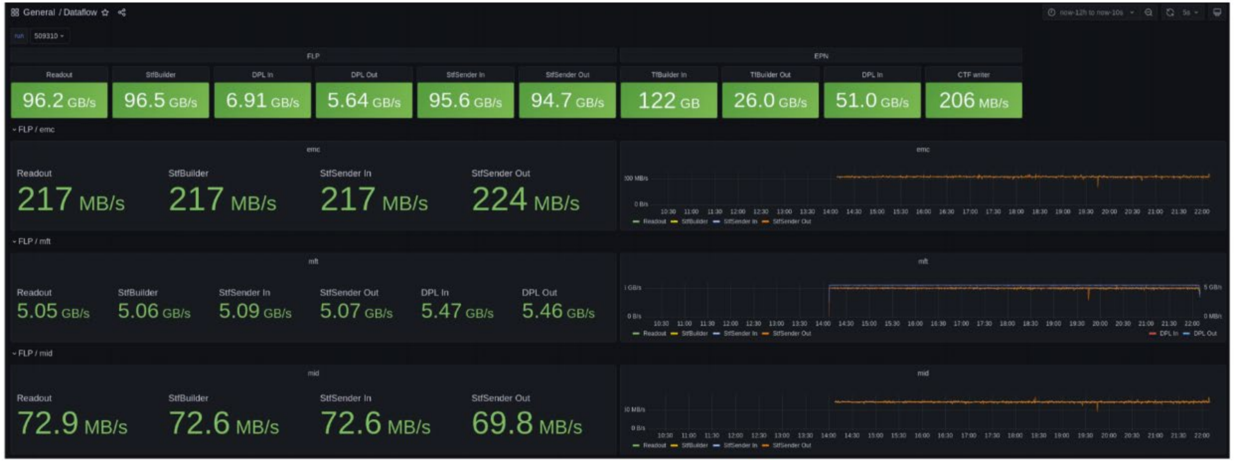



# ALICE COMMISSIONING - STATUS

**Recommissioning without beam is progressing well**

- **MW2 (week 7)**: first large testing focused on **detector calibrations**, with strong development and progresses
- MW approach extended with **Weekly Run Plans**
  - ➢ Plan activities by balancing detector standalone testing and exercise Central Systems to achieve long term stability
- **Global runs** done with cosmic data taking and synthetic running (unstable beam)

- Now possible to perform **CRU+CRORC** global runs
- Possibility to run with **intermittent error conditions** using incomplete TF building




**Example: 8.5h run with EMC (CRORC) + MFT + MID + TOF + TPC + TRD (CRU)**