

# LHCP2021

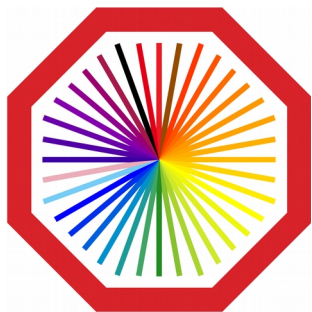
The Ninth Annual Conference on Large Hadron Collider Physics

Online

7-12 June 2021 ~~Paris (France), Sorbonne Université (IN2P3/CNRS, IRFU/CEA)~~



Measurements of inclusive photons and charged particles at forward rapidities in p-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV with ALICE



**ALICE**

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June 10, 2021

# Particle production in nuclear collisions

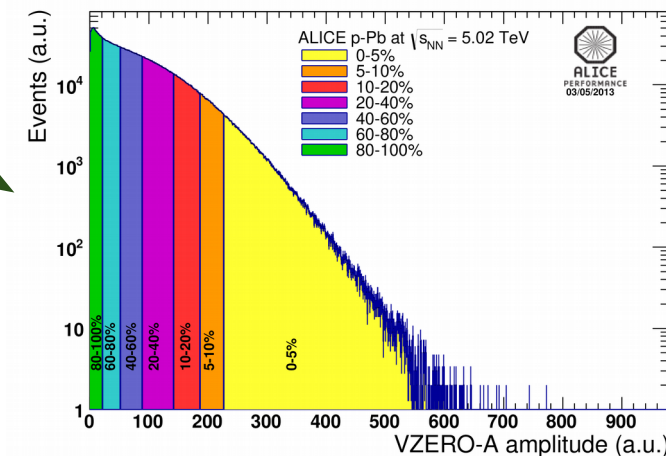
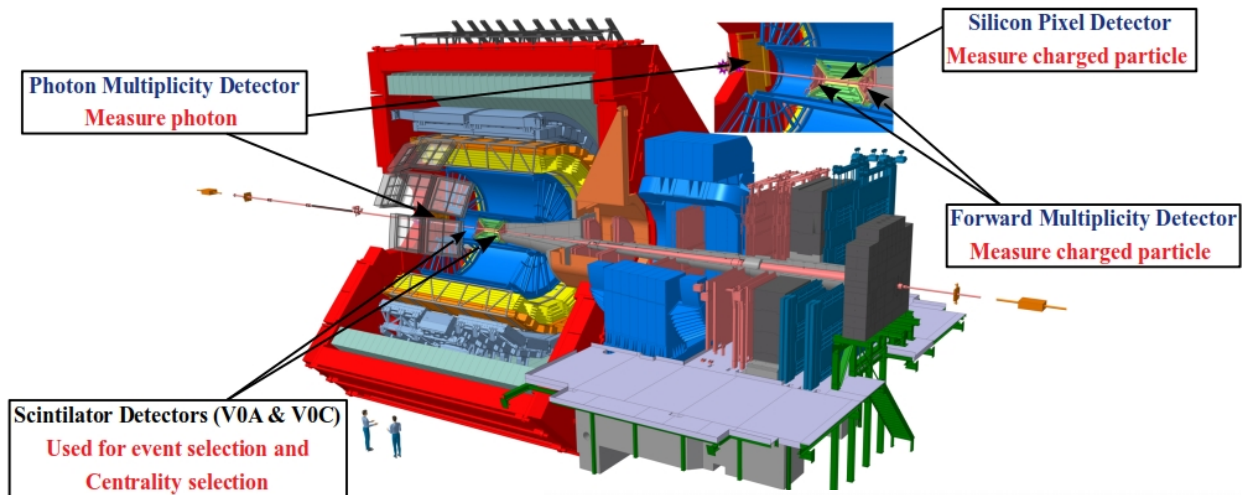
- Hard processes
  - ➔ Large momentum transfer and small  $\alpha_s$
  - ➔ Described by perturbative QCD
- Soft processes
  - ➔ Large  $\alpha_s$  and momentum transfer is small
  - ➔ Need the help of phenomenological models based on non-perturbative QCD
- $P(N)$  and  $dN/d\eta$  are important ingredients to:
  - ➔ Constrain and improve these model calculations
  - ➔ Understand the particle production mechanisms
- p-Pb collisions are important as they are an intermediate step going from hadronic collisions to heavy-ion collisions
- Inclusive photon (mostly from  $\pi^0$ ) measurement is complementary to the charged-particle measurement

## Analysis details

- **System:** p-Pb
- **Energy:** 5.02 TeV

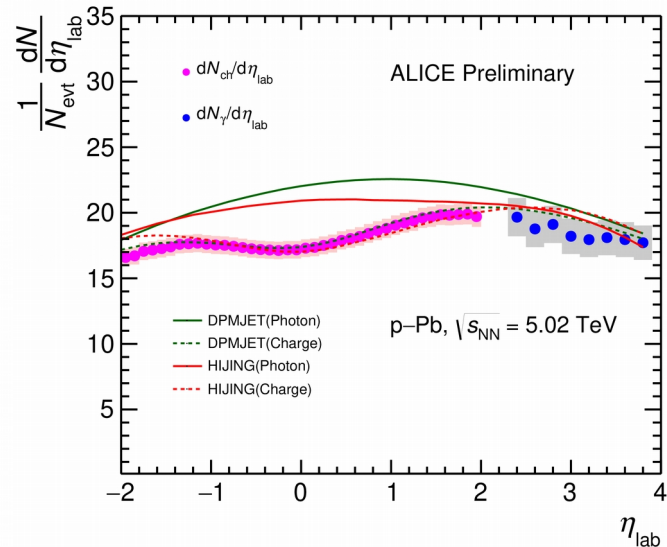
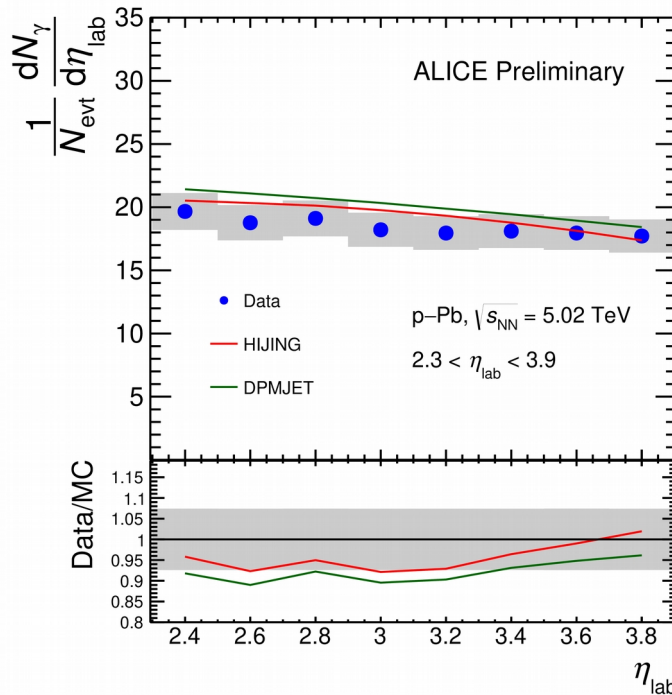
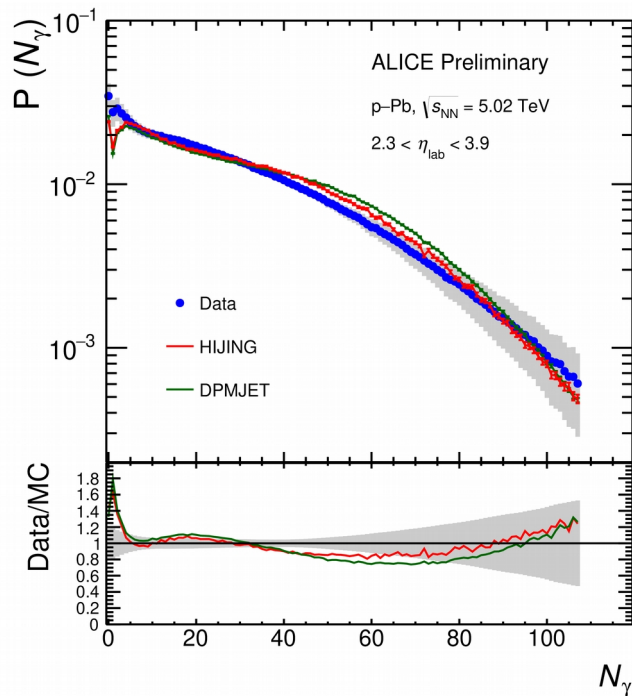
- **Correction for Instrumental Effects**
  - ➔ Bayesian unfolding for MB results
  - ➔ Efficiency-Purity method for centrality dependent results

## A Large Ion Collider Experiment



ALI-PERF-51387

# Minimum Bias photon multiplicity results

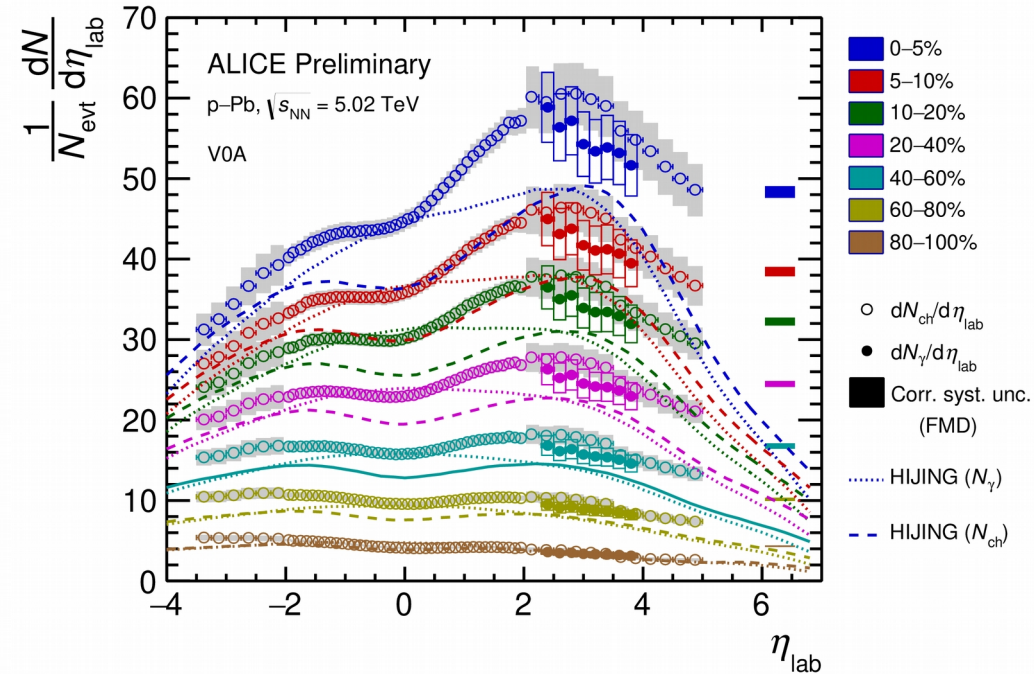
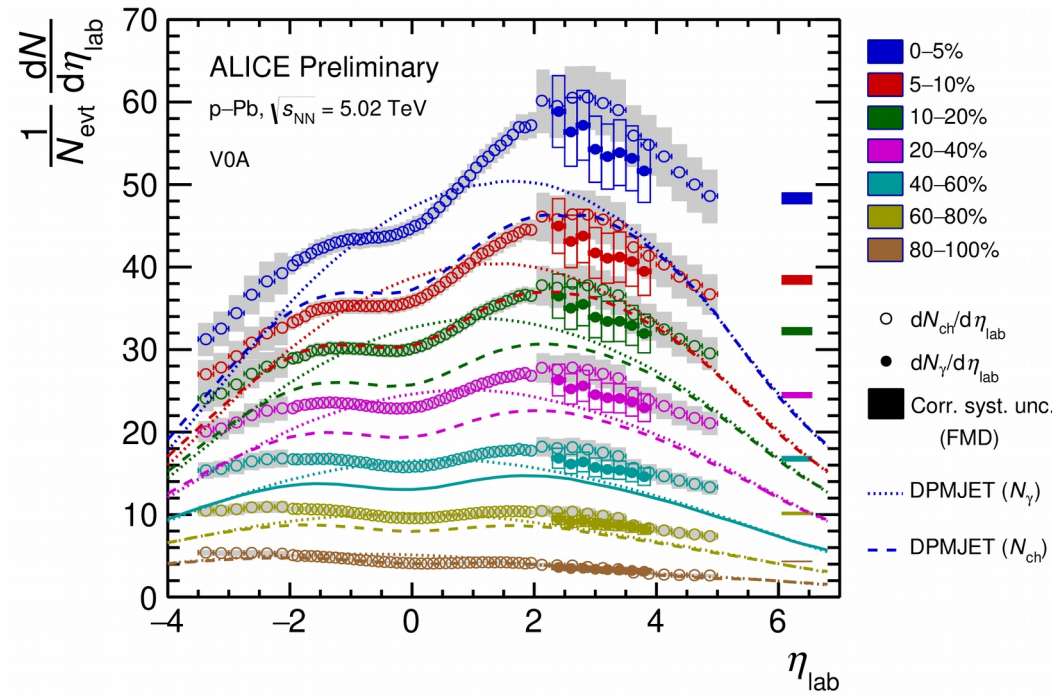


- Models underestimate  $P(N_\gamma)$  at low multiplicity ( $N_\gamma < 10$ )
- Models agree in the intermediate to higher multiplicity bins within uncertainties

- HIJING agrees with the data
- DPMJET slightly overpredicts the data towards midrapidity

- $dN_{ch}/d\eta$  at mid-rapidity is compared with  $dN_\gamma/d\eta$  at forward rapidity
- $dN_{ch}/d\eta$  is well described by both models

# Centrality evolution of particle production



- Photon (mostly from  $\pi^0$ ) and charged-particle production have similar dependence on centrality
- Models describe the data for low multiplicity events and underpredict the same for events with higher centrality

## Conclusions

- $P(N_\gamma)$  and  $dN_\gamma/d\eta$  at forward rapidity in p-Pb collisions at  $\sqrt{s_{NN}} = 5.02$  TeV are presented
- Centrality dependent  $dN_\gamma/d\eta$  and  $dN_{ch}/d\eta$  are studied and compared: they are compatible with each other
- Results are compared with MC predictions: HIJING and DPMJET
  - ✓ Both MC models underpredict  $P(N_\gamma)$  at low multiplicity ( $N_\gamma < 10$ ) and agree in higher multiplicity bins within uncertainties
- $dN_{ch}/d\eta$  is well described by both MC models whereas  $dN_\gamma/d\eta$  is slightly overestimated by DPMJET at lower pseudorapidity region
- None of the models considered could explain the centrality dependent evolution of photon and charged-particle production except for low multiplicity events