### Introduction & Motivation

We present the isolated photon spectrum measurement performed by the ALICE experiment at the CERN LHC in p–Pb collisions at √s_{NN} = 5.02 TeV.

**What do we measure?**
- Leading Order (LO) direct photons γ_{D}, emitted in hard parton processes at the earliest stage of hadron collisions (Compton scattering and quark annihilation) among many other photons → Reconstruction → γ_{D} + Background → γ_{D} + γ_{iso} + γ_{low} + ... 
- γ_{iso} = dominant production at high transverse energy (> a few GeV) and well described by Next-To-Leading Order (NLO) pQCD theory predictions (NLO and higher → pQCD)

**Why do we want to access γ_{D}?**
- Not affected by the QCD medium → calibrated energy reference for parton energy loss studies (e.g. with p-Pb, hadron correlations)
- Key observable to test pQCD and put new constraints on theory
- Measurement in p–Pb collisions → address cold nuclear effects by comparing with pp results and have a reference for Pb–Pb measurement and studying the QGP.

### Signal extraction & Purity estimation

- Direct photons → isolated (pT > 2 GeV/c) and narrow (low d_{iso}^{γ}) clusters
- Underlying event (UE) contribution subtracted beforehand → p_{T}^{iso} → (p_{T}^{iso} - UE) < 2 GeV/c
- Signal extracted from the (p_{T}^{iso}, d_{iso}^{γ}) phase space → 4 regions, “ABCD method” [4]

### Results: isolated photon purity

- o < (1) at low (high) photon E_{γ} → F^{ABCD} underestimated (overestimated) before correction
- F^{ABCD} and F^{ideal} compared to ideal purity
- F_{input} from Monte Carlo

### Conclusion & Outlook

- Statistic reach allowing to measure isolated photons with E_{γ} ∈ [10, 60] GeV → direct comparison to the ALICE pp measurement [2]
- High purity for high energy isolated photons → good proxy for measuring direct photons
- First isolated photon measurement in p-Pb collisions with ALICE → cross section and R_{PB} to be compared next
- Complementary to ALICE direct photon measurement at low E_{γ} [5]

### References


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**ALICE Electromagnetic Calorimeter**

Neutral clusters (charged particle veto)
- Charged particle tracks propagated to EMCal surface
- Candidate clusters must not match a track spatially
- Selection with cluster-track matching residuals (Δη, Δη)

Candidate photons (shower shape cut)
- Clusters induced by particle showers in EMCal → cluster shower shape d_{iso}^{γ} (semi-major axis)

The isolation method
- γ_{iso} production process topology → possible to isolate them from other photon contributions
- Measure hadronic activity (p_{T}^{miss}) → sum of neutral and charged particle energy in an isolation cone around a candidate photon
- Isolated photons if p_{T}^{iso} < 2 GeV/c in R_{flow} = √(η + n_{j}) + (ϕ − ϕ_{jet}) = 0.4
- γ_{iso} contributions and γ_{low} contributions strongly reduced with isolation [3]

**EMCal: the ALICE ElectroMagnetic Calorimeter**

- EMCal → Pb-scintillator sampling calorimeter with 0.014 × 0.014 granularity in (η, ϕ) [1]
- |η| < 0.67 and |ϕ| < 10.7°
- Photon reconstruction with deposited-energy cells grouped in clusters
- High level jet triggers → EMCal reach from 10 GeV to 60 GeV like the ALICE pp measurement [2]
- Other ALICE subsystems used → ITS/TPC (charged particle ID and tracking) and V0 (minimum bias trigger and luminosity measurement)

**Photon selection**

- Selection with cluster-track matching residuals (Δη, Δη)
- Isolated photons → (p_{T}^{iso} - UE) < 2 GeV/c
- Signal extracted from (p_{T}^{iso}, d_{iso}^{γ}) phase space → 4 regions, “ABCD method” [4]