

# Jet-Hadron Azimuthal Correlation Measurements in pp Collisions at $\sqrt{s} = 2.76$ TeV and 7 TeV with ALICE

Dousatsu Sakata, Daisuke Watanabe for the ALICE Collaboration



ALICE  
A JOURNEY OF DISCOVERY

## Motivation

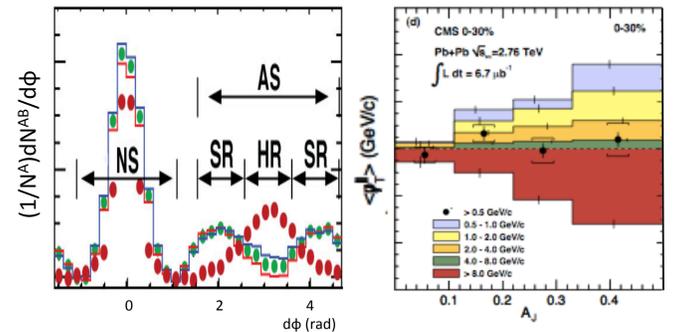
In heavy-ion collisions, jet properties are expected to be modified by the interaction with the hot and dense medium. This modification is strongly related to the properties of the created attribute of hot and dense matter and provides a versatile probe for the properties of the QGP.

However, in heavy-ion collisions it is difficult to recover the jet quenching effects at small particle momentum due to large backgrounds from thermal bulk in such a multi-body system. The measurement of hadron correlations with respect to a reconstructed jet allows to relate more directly the momentum and direction of the original parton to the distribution of its fragmentation products, combining two particle correlations and di-jet modification measurements.

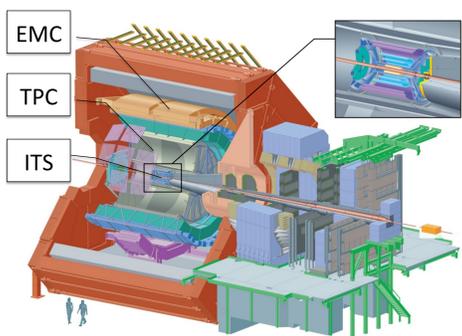
The studies of these correlations in pp collisions provides the baseline for similar measurements in Pb-Pb collisions

PhysRevC.77.011901(PHENIX)

PhysRevC.84.024906(CMS)



## Jet & Particle Reconstruction with the ALICE



$$|\eta^{\text{particle}}| < 0.9, |\eta^{\text{jet}}| < 0.5$$

$$1.4 < \phi^{\text{EMC}} < 3.2 \text{ rad}$$

$$p_T^{\text{particle}} > 0.15 \text{ GeV}/c$$

$$p_T^{\text{jet}} > 10 \text{ GeV}/c$$

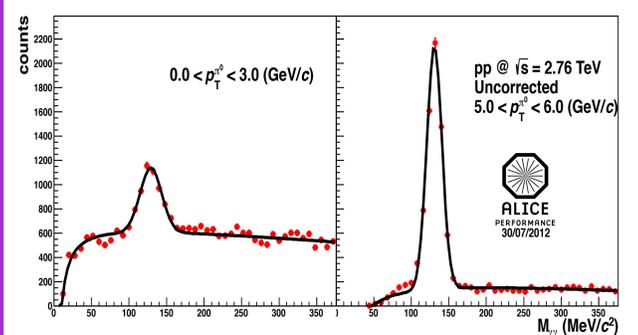
$$\text{anti-}k_T, R=0.4$$

The ALICE detector has been built to exploit the unique physics potential of nucleus-nucleus interactions at the LHC. The ALICE detector is suited to study jet modification by the hot and dense matter, since it can reconstruct charged particles from very low to high momentum using the central tracking (ITS+TPC).

In this analysis, 13k di-jet events are analyzed for  $\sqrt{s} = 2.76$  TeV, as well as 30k di-jet events for 7 TeV for charged particle correlations. 160k EMC triggered events were analyzed for  $\pi^0$  correlations

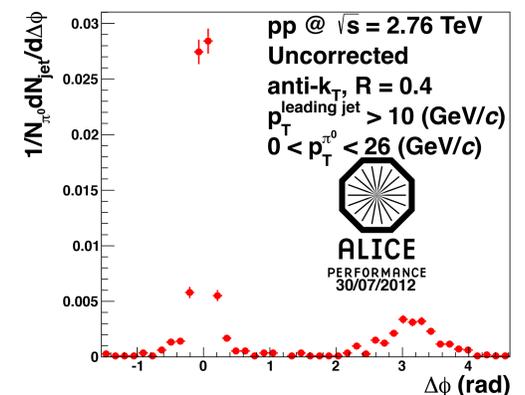
## $\pi^0$ -Jet Correlation

$\pi^0$  invariant mass distribution



In this analysis,  $\pi^0$ s are reconstructed up to 12 GeV/c from gamma pairs with good mass resolution.

Leading Jet distribution with respect to  $\pi^0$

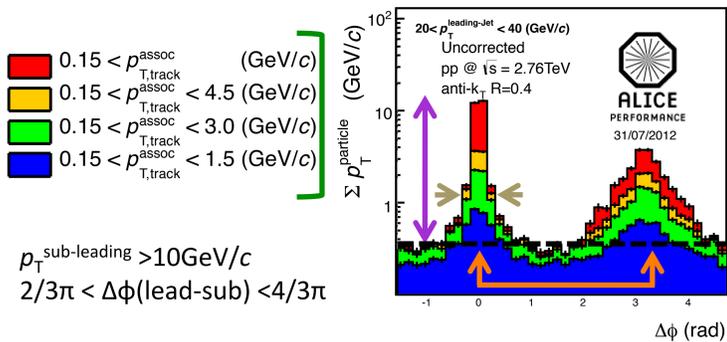


Two clear jet peaks are observed, indicating that high  $p_T$   $\pi^0$  production is related to jet production.

The correlation measurement provides additional tools to investigate neutral particle production. In addition, it is an excellent probe for nuclear modification measurements.

## Jet-Charged Particle Correlation

Transverse momentum distribution with respect to leading Jet

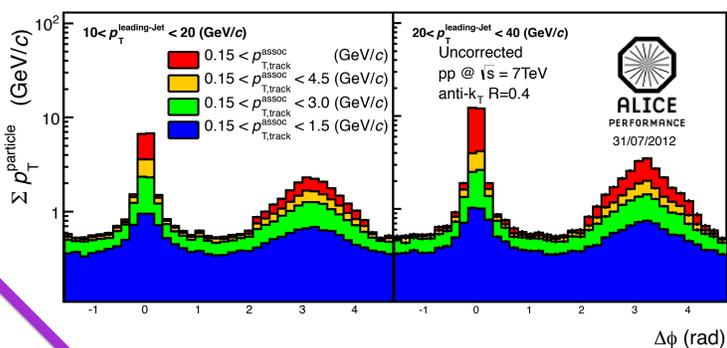


The measurements show Jet properties related to the:

- █ Fragmentation Function
- █ Jet Momentum
- █ Jet Shape
- █ Background Momentum
- █ Di-Jet properties

We study single- and di-jet events using Jet-Particle Correlation in pp collisions. It can be seen that these correlations depend strongly on jet energy and collision energy.

Therefore, these kinds of analysis could be excellent tools to measure jet properties in pp collisions as well as in Pb-Pb collisions.



## Further Topics under Study

- Momentum asymmetry dependence of di-jet properties
- Parton identification of trigger jet (quark, gluon)
- Di-Jet properties in high (jet) multiplicity event
- Combine charged and neutral particle correlations

## Conclusion

We have established the methods to measure Jet properties in pp collisions using jet-hadron azimuthal correlations.

We will use jet-hadron correlations to measure jet properties in detail in pp collisions and Pb-Pb collisions.