Measuring jet constituent yields in $\sqrt{s_{NN}} = 5.02$ TeV Pb-Pb collisions using jet-hadron correlations with ALICE

Charles Hughes
(for the ALICE Collaboration)
University of Tennessee - Knoxville

Jet-hadron correlations
$\Delta \phi$ - azimuthal separation (b/w jet axis and assoc. hadron)
$\Delta \eta$ - pseudorapidity separation (b/w jet axis and assoc. hadron)

Jet-hadron constituent yields
$\frac{dN}{dp_T}$ - measure of particle spectra in jets

How does jet orientation with respect to event plane affect yields for Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV?

“Jet-hadron correlations measured relative to the second order event plane in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV”

Phys. Rev. C 101, 064901

S. Acharya et. al.

Acknowledgments:
Joel Mazer (Rutgers)
**Analysis procedure**

**Pb-Pb** $\sqrt{s_{NN}} = 5.02$ TeV, 30-50 %

Track Selection:
- $\chi^2 / \text{N.D.F} < 4.0$
- $|\eta| < 0.9$
- $p_T > 150 \text{ MeV}/c$
- $R = 0.2$ anti-$k_T$ full jets
- $20 \text{ GeV}/c < p_T^{\text{jet}} < 40 \text{ GeV}/c$
- $p_T^{\text{assoc}}: [0.5, 1.0, 1.5, 2.0, 3.0, 4.0, 5.0, 6.0, 10.0] \text{ GeV}/c$

1. Measure correlations, scale by single track reconstruction efficiency

2. Correct for acceptance using mixed events technique (divide raw corr.)

Quark Matter 2022 (April 6, 2022) Krakow, Poland
Jet hadron correlations

Pb-Pb, $\sqrt{s_{NN}} = 5.02$ TeV, 30-50%

- $p_T^{\text{jet}} : 20-40$ GeV/c, $p_T^{\text{assoc.}} : 2-3$ GeV/c


- $p_T^{\text{jet}} : 20-40$ GeV/c, $p_T^{\text{assoc.}} : 4-5$ GeV/c

Fit on near side only ($|\Delta\phi| < \pi/3$, $0.8 < |\Delta\eta| < 1.2$)
Results - jet constituent yields

Near-side yields (NS)
- Within uncertainties, no ordering

Away-side yields (AS)
- Some ordering in lowest $p_T^{assoc.}$ bin ($< 3\sigma$)

\begin{align*}
\text{In-plane:} & \quad |\varphi_{\text{jet}} - \Psi_2| < \pi/6 \\
\text{Mid-plane:} & \quad \pi/6 < |\varphi_{\text{jet}} - \Psi_2| < \pi/3 \\
\text{Out-of-plane:} & \quad \pi/3 < |\varphi_{\text{jet}} - \Psi_2| < \pi/2
\end{align*}
Results - yield ratios, comparison to simulation

Compare yields to each other (ratios)

- Searching for event plane (EP) dependence
- **Out/in** and **mid/in** for NS and AS
- Within uncertainties - no EP dependence
- $3\sigma$ from unity in $2 < p_T^{assoc.} < 3$ GeV/c AS

Compare yield ratios to simulation (JEWEL)

- Within uncertainties - agreement
- JEWEL with no recoils

**In-plane:** $|\varphi_{jet} - \Psi_{2}| < \pi/6$

**Mid-plane:** $\pi/6 < |\varphi_{jet} - \Psi_{2}| < \pi/3$

**Out-of-plane:** $\pi/3 < |\varphi_{jet} - \Psi_{2}| < \pi/2$