# Study of resonance production in small system collisions with respect to transverse spherocity using EPOS3

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## Introduction

Resonances are particles with higher mass than the corresponding ground state particle with the same quark content.

Some Known Hadron Resonances are

**$\Lambda$(1520) $\rho^0$(770) $\Delta^{++}$(1232) $f^0$(980) $K^{*0\pm}$(980) $\Sigma$(1385) $\phi$(1020)** (Tanabashi et al., 2018)

Hadronic resonaces production provide insight into the properties of the hadronic phase

Transverse spherocity, is an event shape variable, might help us to better zoom in production mechanism of resonances in hard and soft region of QCD.

in this poster, Transverse momentum spectra of **$\Lambda$(1520)** is presented for charge particle multiplicites between 28-100 and 0-110 with respect to transverse spherocity classes.

## Event Generator(EPOS3)

Energy conserving quantum mechanical approach, based on Partons, parton ladders, strings, Off-shell remnants, and Saturation of parton ladders

Event generator based on parton-based Gribov-Regge Theory (PBGRT).

The initial conditions and Core-Corona mechanism.

- A multiple-scattering approach based on Pomerons and strings.
- The core for which one employ viscous hydrodynamics.
- The corona part is fragmentation of string to produce hadrons.
- After hadronisation of the fluid (core part), these hadrons as well the corona hadrons are fed into hydro-cascade(UrQMD). (Knospe et al., 2016)

## Transverse Spherocity

Event shapes are characterised using transverse sphericity $S_0$.

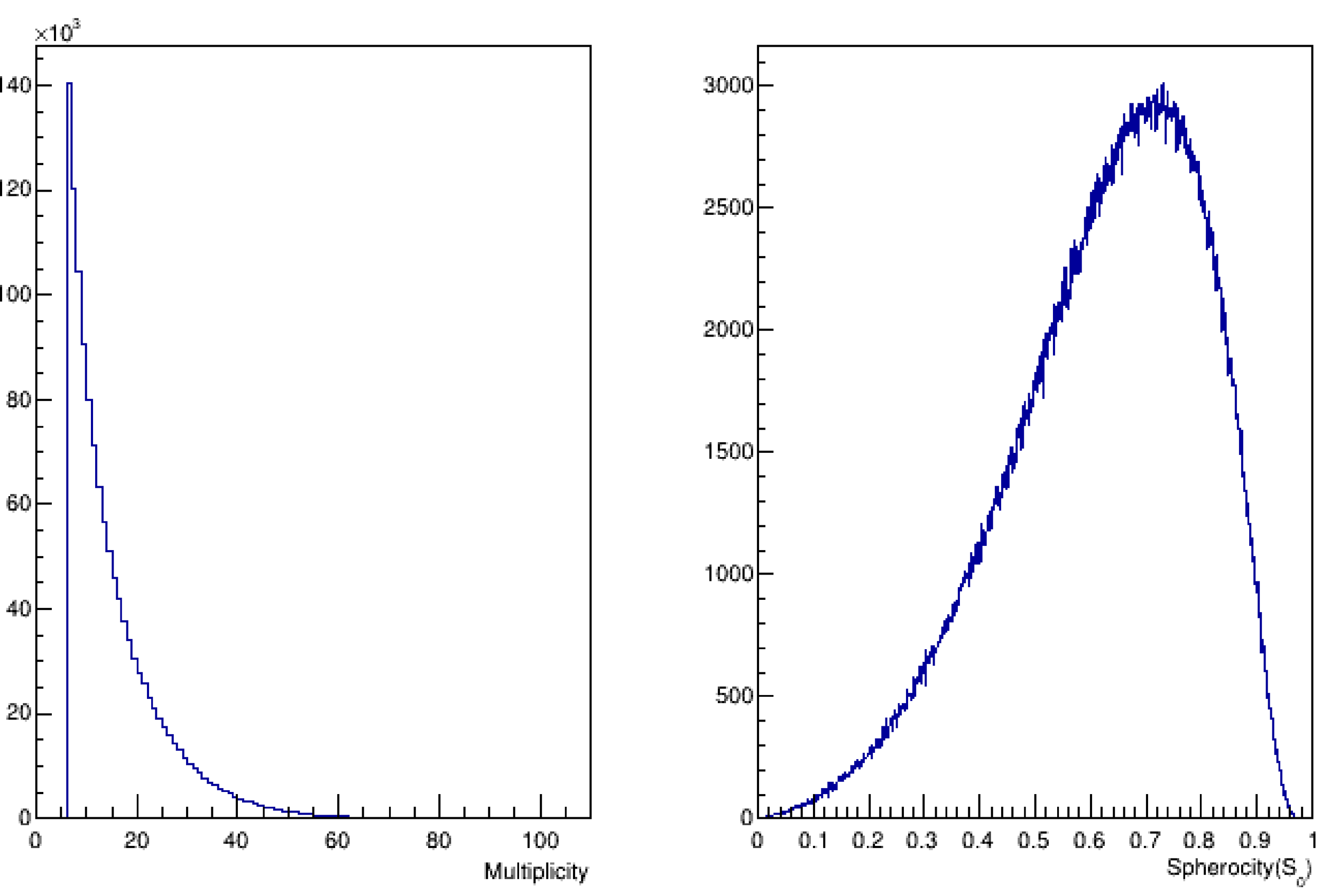
$$S_0 = \frac{\pi^2}{4} \min_{\vec{n}=(n_x,n_y,0)} \left( \frac{\sum_i |\vec{P_{T_i}} \times \hat{n}|}{N_{particles>5}} \right)^2$$

Where,

$$S_0 = \begin{cases} 0, & \text{''pencil-like'' limit (hard events)} \\ 1, & \text{''isotropic'' limit (soft events)} \end{cases}$$

and $\hat{n}$ is a two dimensional unit vector in the transverse plane,chosen in a way so that $S_0$ is minimised.

## Distribution Plots




Distribution of charged multiplicity and transverse spherocity

## Quantile of multiplicity distribution and spherocity distribution

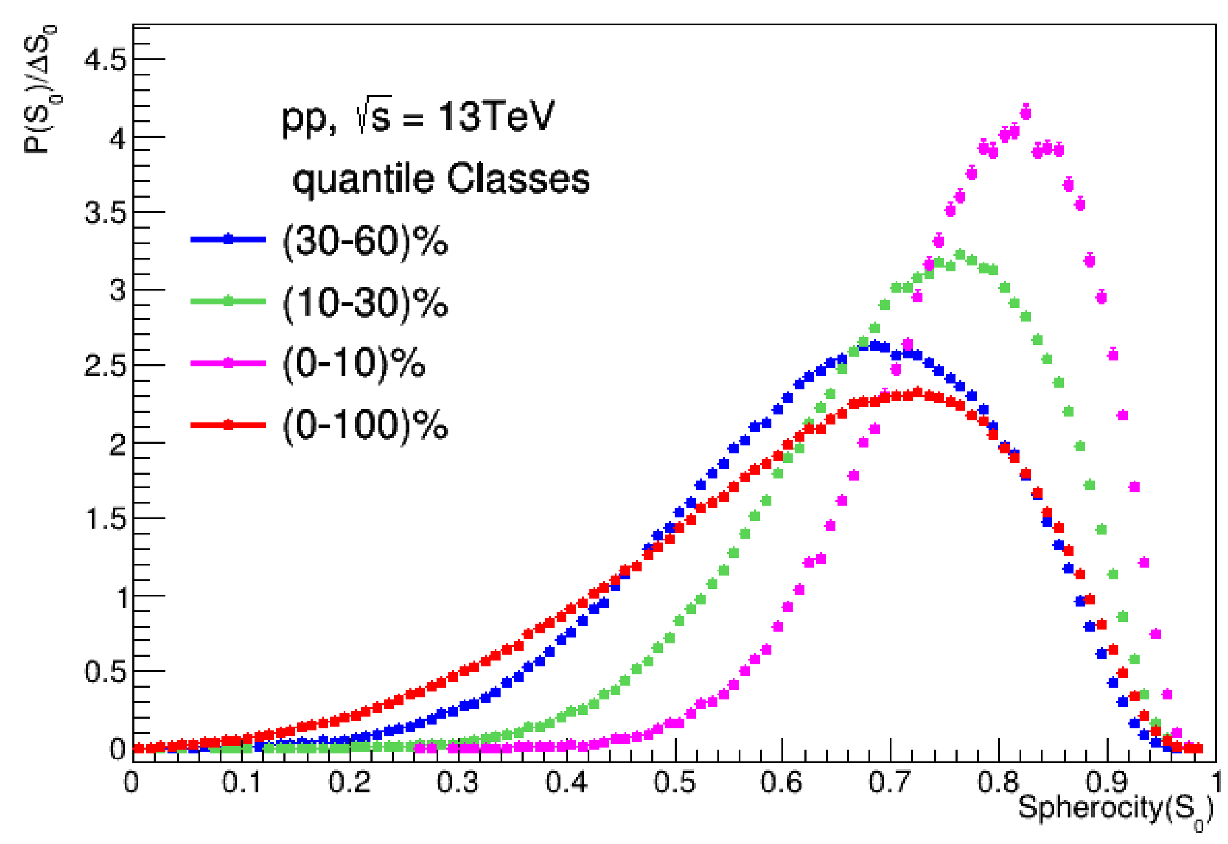
| No. of charged particle | Percentile(lower) | Percentile(upper) |
|---|---|---|
| 28 - 110 | 90-100% | 0-10% |
| 18-28 | 70-90% | 10-30% |
| 11 - 18 | 40-70% | 30-60% |
| 0-110 | 0-100% | 0-100% |

Percentile of multiplicity distribution

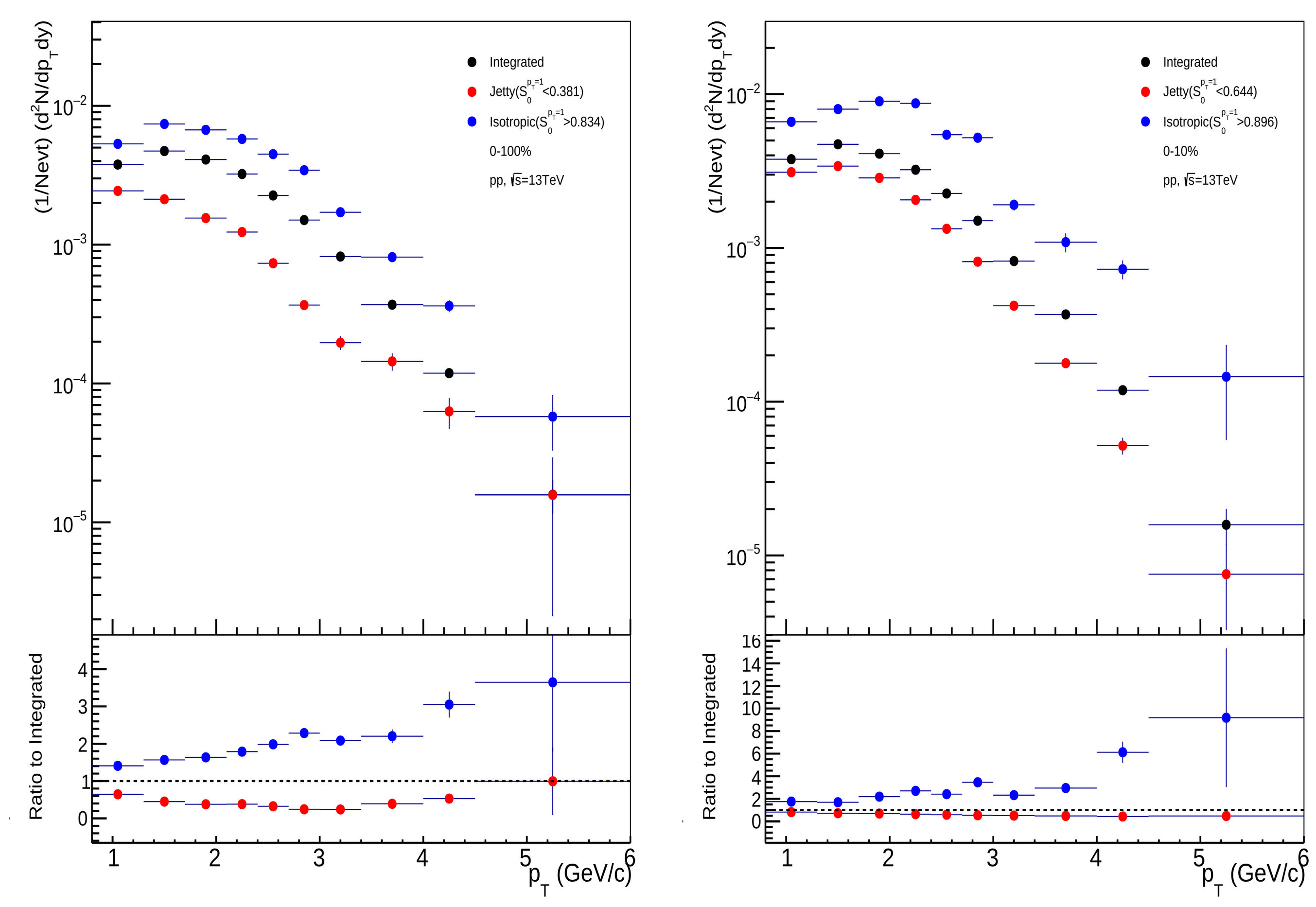
| Multiplicity(%) | Jetty 0-10%(lower) | Isotropic 0-10%(upper) |
|---|---|---|
| 0-100 | 0.00-0.381 | 0.834-1.00 |
| 0-10 | 0.00-0.644 | 0.896-1.00 |
| 30-60 | 0.00-0.442 | 0.824-1.00 |

Quantile of spherocity distribution

## Spherocity distribution(Multiplicity dependence)




## $\Lambda$(1520) $p_T$ spectra




## Outlook

Results will be compared with without hadro-cascade mode.

## Referències

Knospe, A. G., Markert, C., Werner, K., Steinheimer, J., & Bleicher, M. (2016, Jan). Hadronic resonance production and interaction in partonic and hadronic matter in the epos3 model with and without the hadronic afterburner urqmd. *Phys. Rev. C*, *93*, 014911. Retrieved from https://link.aps.org/doi/10.1103/PhysRevC.93.014911 doi: 10.1103/PhysRevC.93.014911

Tanabashi, M., Hagiwara, K., Hikasa, K., Nakamura, K., Sumino, Y., Takahashi, F., ... Schaffner, P. (2018, Aug). Review of particle physics. *Phys. Rev. D*, *98*, 030001. Retrieved from https://link.aps.org/doi/10.1103/PhysRevD.98.030001 doi: 10.1103/PhysRevD.98.030001

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