Characterizing Jets in Heavy Ion Collisions by Flow Method

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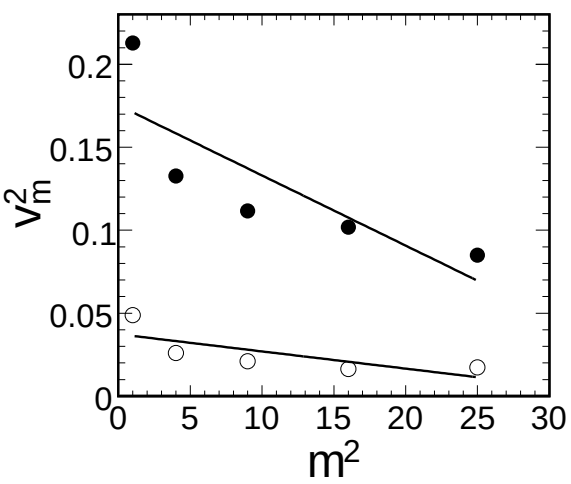
Identifying jets in heavy ion collisions is of significant interest since the properties of jets are expected to get modified because of the formation of quark gluon plasma. The detection of jets is, however, difficult because of large number of non-jet hadrons produced in the collision process.

Recently, we have developed a method[1] based on the the flow coefficients for events containing jets which allows one to identify the jet events, determine the jet opening angle and the associated number of particles in the jet in heavy ion collisions. Very recently, we have extended this method[2] by computing transverse momentum weighted flow coefficients. Using these flow coefficients, we are able to estimate the transverse momentum (p_T) of the jet as well as the jet opening angle(ϕ) and the number of jet particles(N_j).

The method is based on the fact that for particles(N) distributed uniformly in ϕ and the coefficients can be determined as

$$v^2_{m,p_T} = \frac{N_j^2 < p_T >^2}{N^2} \Big[j_0(m\Delta\phi/2) \Big]^2,$$

where $< p_T >$ is the average transverse momentum carried by a particle in the jet. Thus $N_j < p_T >$ gives the total transverse momentum of the jet.



A plot of v_m^2 *vs* m^2 for p_T cut of 0.75 GeV for background particles from HIJING event generator and 10 jet particles is shown. The closed (open) symbols are for with (without) p_T weight. This is the case of one jet with background particles. The extracted values of number of jet particles, jet p_T(GeV), opening angle are 11.60 ± 2.29, 18.17 ± 2.47, 0.46 ± 0.07 (with p_T) and 0.57 ± 0.008 (without p_T), respectively, for the corresponding inputs are number of jet particles 10, jet p_T(GeV) 18.26 and opening angle $\pi/6$, respectively.

We find in the figure that the flow coefficients are significantly larger than those obtained for an event without a jet. These type of plots will be discussed in the presentation for only background particles, only jet particles and jet with background particles. Also we will display the case like two Jets with background in the presentation.

References

[1] S. C. Phatak and P. K. Sahu, Phys. Rev. **C 69**, 024901 (2004).
[2] S. Dash, D. K. Mishra, S. C. Phatak and P. K. Sahu, arXiv:nucl-th/0607014.