The study on the medium parton distribution from momentum kick model in Heavy-Ion Collisions





The Ninth Annual Large Hadron Collider Physics (LHCP2021)

Soyeon Cho and Jin-Hee Yoon

Department of Physics, Inha University, Incheon 22212, Republic of Korea

2) Kinematic interaction between Jet & Medium

Jet particles mainly lose own energy while passing through medium by radiation



^[1] C. Y. Wong, *Physical Review C* 85, 064909 (2012)

Based on previous study¹, we expect that amplitudes from these two symmetric

$$\mathcal{M}|^{2} = \left|\mathcal{M}_{(a)} + \mathcal{M}_{(b)}\right|^{2} = \left|\mathcal{M}_{(a)}\right|^{2} + \left|\mathcal{M}_{(b)}\right|^{2} + (interference)$$

3) Distribution for initial medium patons

$$\int d^{3}\vec{a} \rightarrow \int f(y_{a}, a_{T}) \times |J| dy_{a} da_{T} d\varphi_{a}$$

The study on the medium parton distribution from momentum kick model in Heavy-Ion Collisions



The Ninth Annual Large Hadron Collider Physics (LHCP2021)

Soyeon Cho and Jin-Hee Yoon

5) Dependency Check

The study on the medium parton distribution from momentum kick model in Heavy-lon Collisions

Results & Conclusion

7) Formulation of correlation

Correlation function in experiment

$$C(\Delta\eta,\Delta\varphi) = \frac{S(\Delta\eta,\Delta\varphi)}{B(\Delta\eta,\Delta\varphi)}$$

 Adopt correlation function between arbitrary two particles to compare to experimental results,

$$C(\boldsymbol{a}_1, \boldsymbol{a}_2) = \frac{P_f(\boldsymbol{a}_1, \boldsymbol{a}_2)}{P_i(\boldsymbol{a}_1) \cdot P_i(\boldsymbol{a}_2)}$$

- $P_f(\boldsymbol{a}_1, \boldsymbol{a}_2) = P_f(\boldsymbol{a}_1) \cdot P_f(\boldsymbol{a}_2)$
- $P_i(a)$: Probability of final medium partons before interaction with jet particle
 - · Calculated using the medium partons' distribution

$$P_i(y,\varphi) = \int f(\boldsymbol{a}) a_T da_T$$

- $P_f(a)$: Probability of final medium partons after interaction with jet particle
 - · Consist of $P_{interacting}(y, \varphi)$, $P_{interacting}(y, \varphi)$, normalized respectively

$$P_{f_{2}} = P_{interacting}(y, \varphi) + P_{non-interacting}(y, \varphi)$$

 $P_{f_1} = P_{interacting}(y, \varphi)$

Where,

$$P_{interacting}(y, \varphi) = \int f(\boldsymbol{a}) \times d\sigma(\boldsymbol{a} \to \boldsymbol{a}') d^{3} \vec{a}$$

$$P_{non-interacting}(y,\varphi) = \int f(\mathbf{a}') \times (1 - d\sigma(\mathbf{a}' \to \mathbf{a}'')) d^{3} \overrightarrow{a'}$$

9) Summary

а

- Check characteristic of Parton Distribution based on Hard scattering model (PDh)
- Compare PDh to PYTHIA simulation and choose free parameters of PDh
- Calculate correlation using PDh with selected values of free parameters

The Ninth Annual Large Hadron Collider Physics (LHCP2021)

Soyeon Cho and Jin-Hee Yoon

Department of Physics, Inha University, Incheon 22212, Republic of Korea



- Range of Δy is enough to express the Ridge structure
- Peaks in marginal Δy are high
- Need to investigation

10) Outlooks

- Compare PDh to other MC simulation ; PYTHIA-string shoving, EPOS, etc.
- Investigate marginal peaks in calculated correlation.
- Consider to include jet components.