XXIV QUARK MATTER DARMSTADT 2014

Charm Dynamics in a QGP Medium within a Linearized Boltzmann Approach

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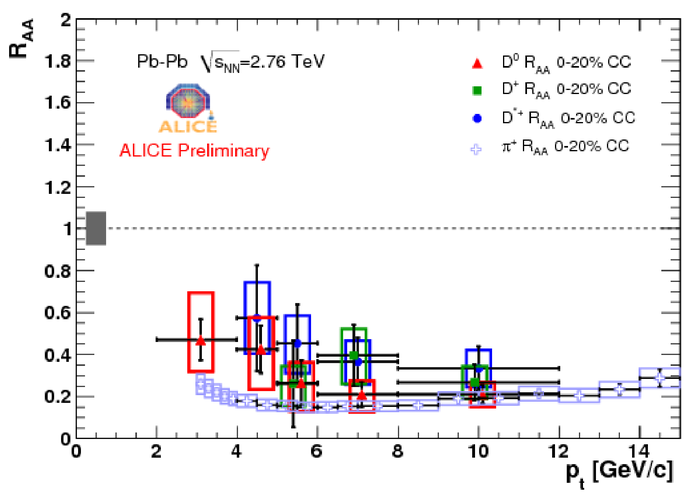
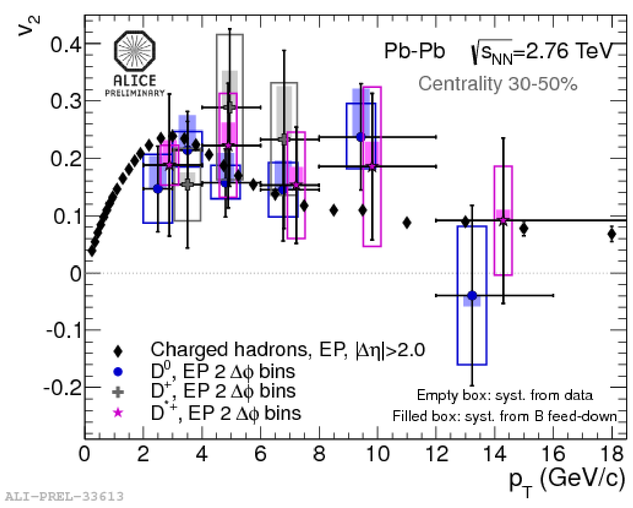
Duke Theory

SSGF STEWARDSHIP SCIENCE GRADUATE FELLOWSHIP

Why study open charm?

- curiously large suppression, large flow
- probe *entire* spacetime evolution
- test pQCD probe $\leftrightarrow$ medium coupling!

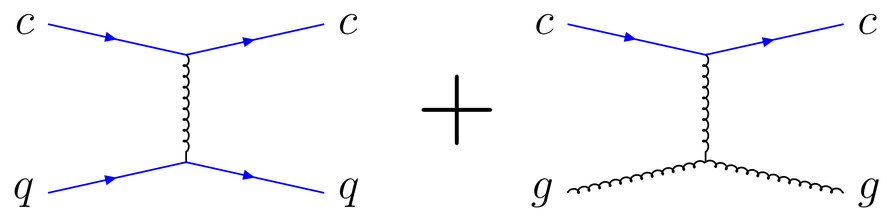




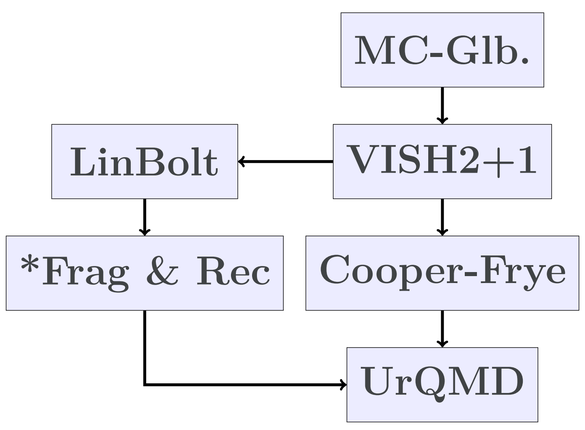
Linearized Boltzmann Model: sample $\rightarrow$ scatter $\rightarrow$ free stream (repeat)

- Sample scattering rate off thermal partons
- Rates in fluid frame, kinematics in cms frame

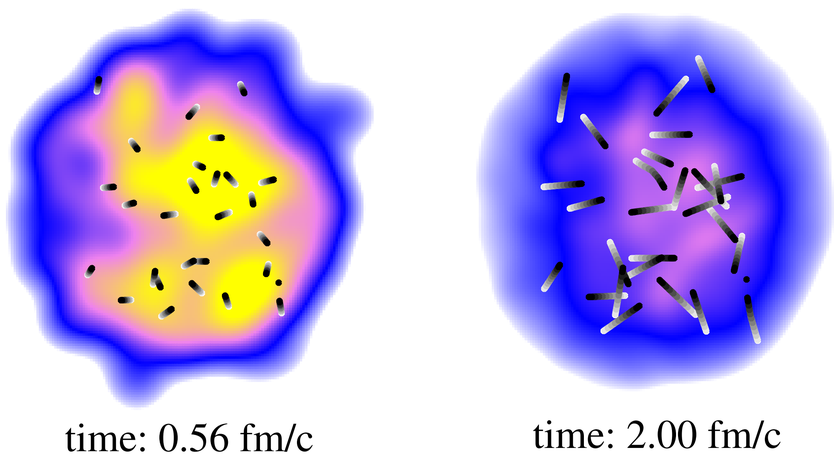
$$\Gamma_{incl} = \sum_{ij\rightarrow kl} \frac{1}{16\pi^2 E_1 \sqrt{E_1^2 - m_c^2}} \int dE_2 f_j(E_2, T) \int ds(s - m_c^2)\, \sigma_{ij\rightarrow kl}(s)$$

$C =$ 

Code Structure

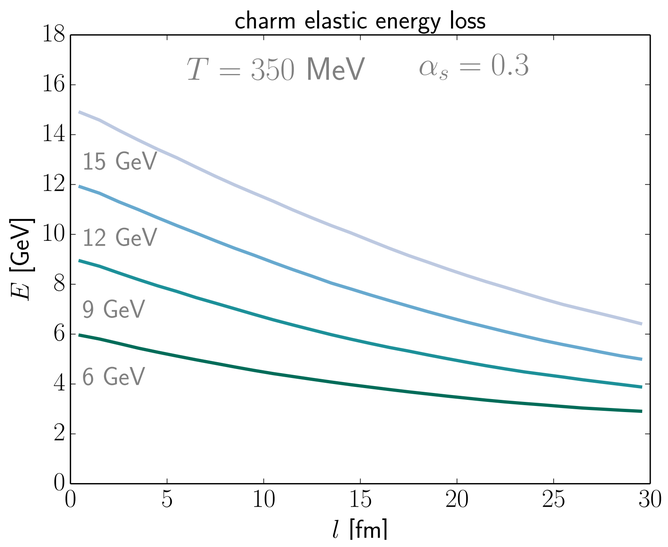


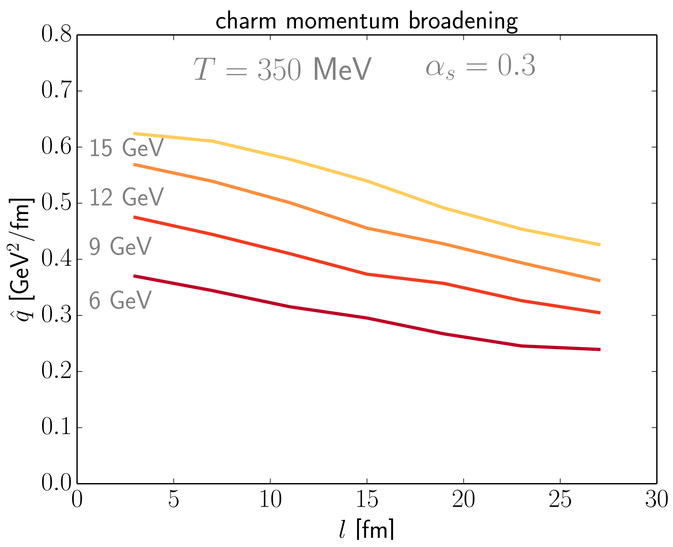
*Cao, Qin, Bass, Phys.Rev. C88 (2013) 044907



Fixed Temp. "Box Mode"

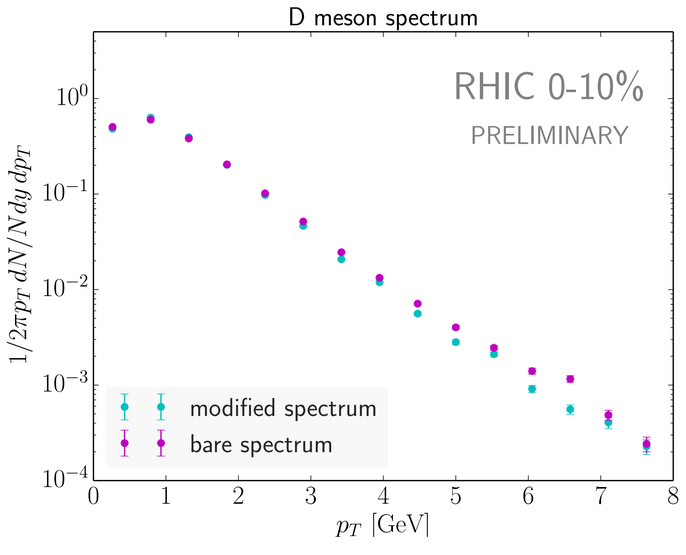
- inifinite medium, fixed coupling
- vary initial charm energy
- $\hat{e} = \langle \frac{1}{l} \sum_{\text{ncoll}} \Delta E \rangle$
- $\hat{q} = \langle \frac{1}{l} \sum_{\text{ncoll}} \Delta p_\perp^2 \rangle$

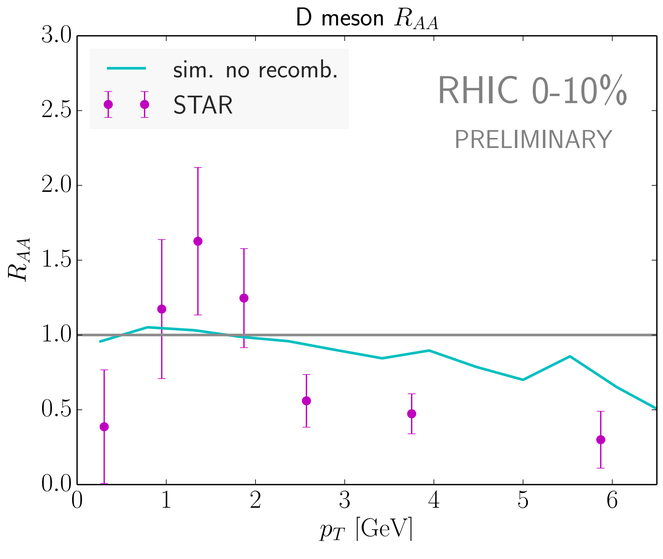




E-by-E Viscous Hydro

- $R_{AA} = \frac{dN_{AA}/dp_T^2 dy}{T_{AA}\, d\sigma_{pp}/dp_T^2 dy}$
- recomb (x), frag. (✓)
- cold nuclear matter effects (x)
- baseline: fragment w/o medium





Summary

- linearized Boltz. model in e-by-e viscous hydro
- fragmentation & after-burner
- infinite box and realistic medium modes
- calculated elastic charm transport coefficients and nuclear modification

Future Development

- multi-particle correlations
- radiative processes
- NNLO initial cond.
- transport model comparisons

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