Theory panel

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Town meeting: heavy ion and QGP physics at CERN

17 February 2025, CERN

Thanks to:
V. Greco , M.L. Sambataro,
V. Minissale, S. K. Das, Y. Sun

HQ link to Lattice QCD at finite T

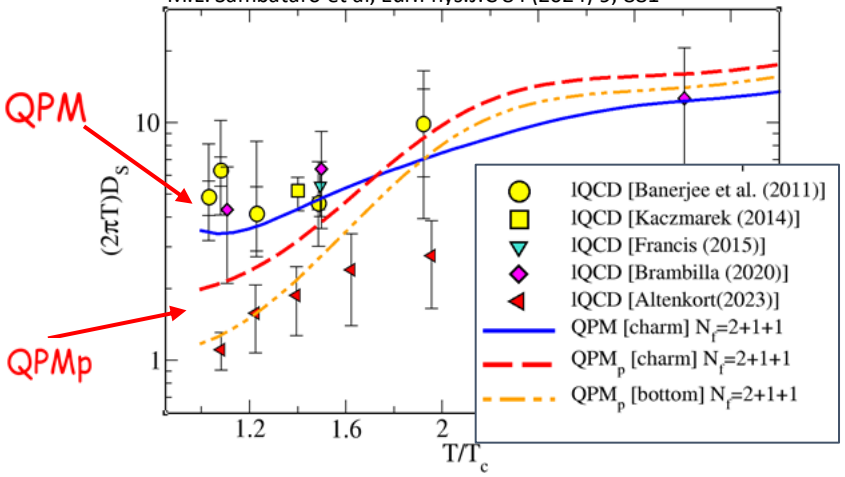
Ab-initio Diffusion Transport Coefficient

Spectral function ρ_E extracted **from euclidean color-electric correlator** $D_E(\tau)$ →

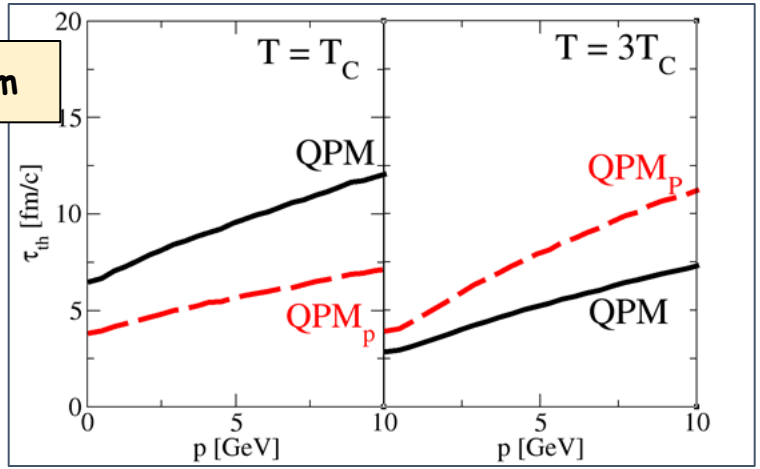
Kubo formula diffusion in the p→0 limit: $\frac{D_p}{T^3} = \lim_{\omega\to 0} \frac{T\rho_E(\omega)}{\omega}$

$$D_s = \frac{T^2}{D_p} = \frac{T}{M_Q \gamma} = \frac{T}{M_Q}\tau_{th}$$

M.L. Sambataro et al, Eur.Phys.J.C 84 (2024) 9, 881



τ_{th} for charm



HQ allow for developing a NRQCD EFT at finite T

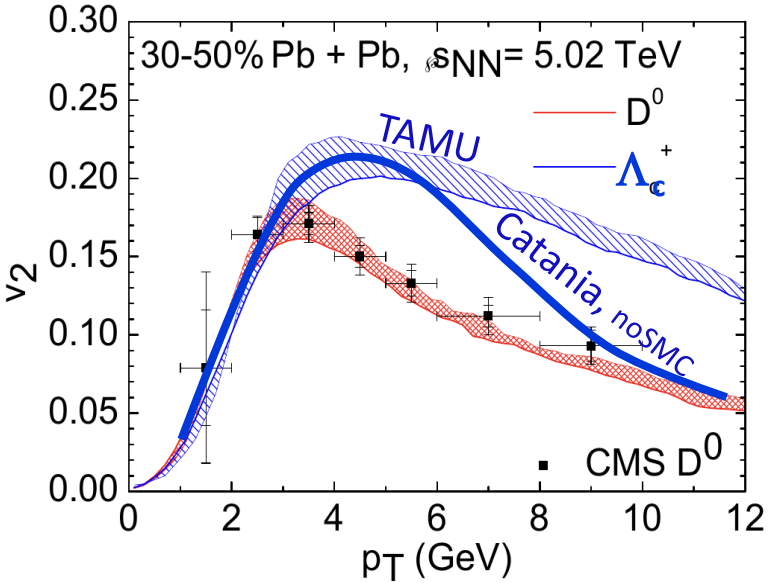
& many-body T-matrix from V(r,T) by LQCD

Hadronization mechanism through elliptic flow

If Λ_c enhancement of the yield comes from quark coalescence it should be associated to

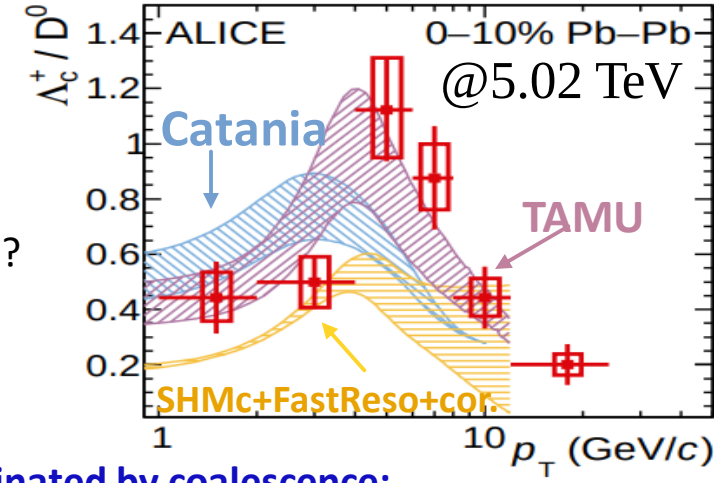
→ Large v_2 of $\Lambda_c \sim v_{2c}\left(\frac{m_c}{m_\Lambda} p_T\right) + 2\, v_{2q}\left(\frac{m_q}{m_\Lambda} p_T\right)$

→ Effect to be measured in AA; will it be seen also in pp?



He and Rapp, PRL 2020

ALICE Coll. arXiv:2112.08156v1

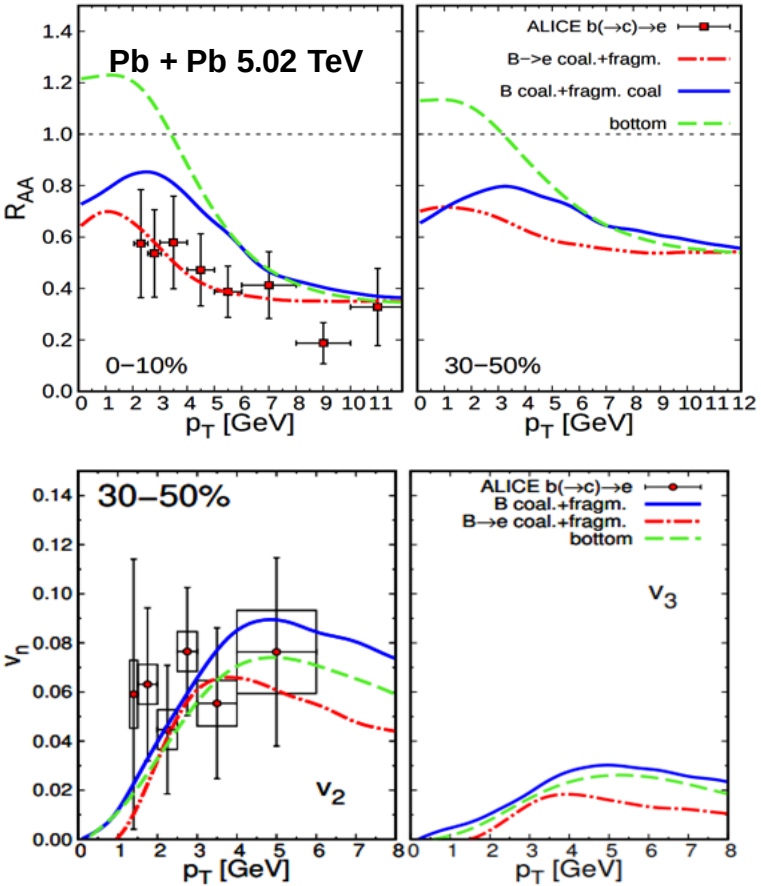


✓ **Λ_c dominated by coalescence: p_T range? self-consistent with Λ_c/D ratio?**

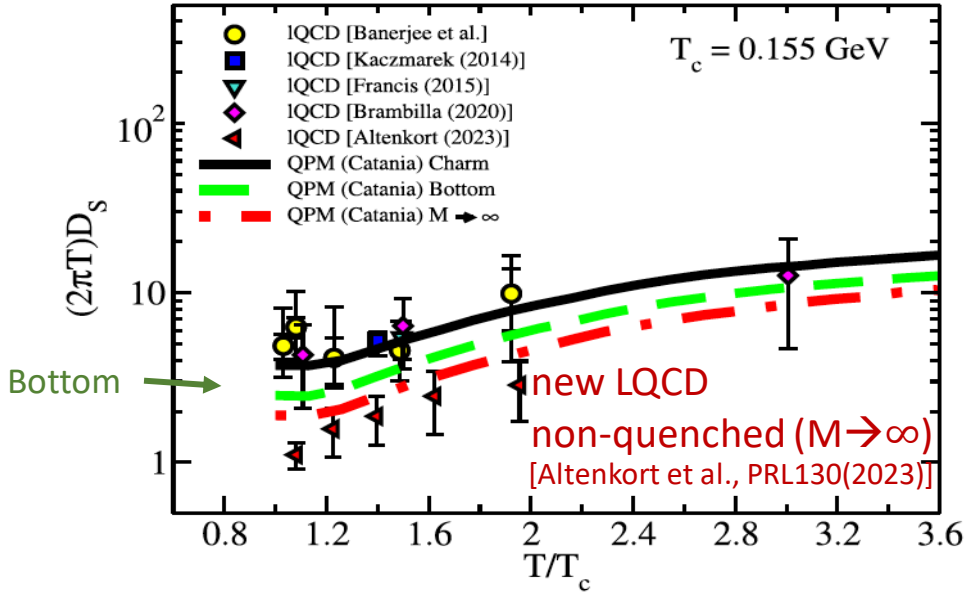
➢ Would PYHTIA-CR predict finite v_2 of D, Λ_c in pp? by String shoving? Can it predict D, Λ_c systematic for v_2?

Methods/tools of AA allow better insight into hadronization in pp!?

Extension to bottom dynamics: R_{AA} v_2, v_3



- Agreement within still large uncertainty
- QPM implies a mass dependence of $D_s(T)$, not seen in LQCD/NRQCD



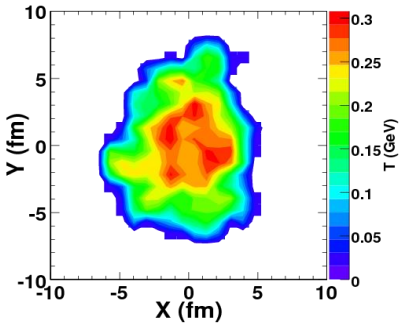
M.L. Sambataro et al., *PLB* 849(2024)

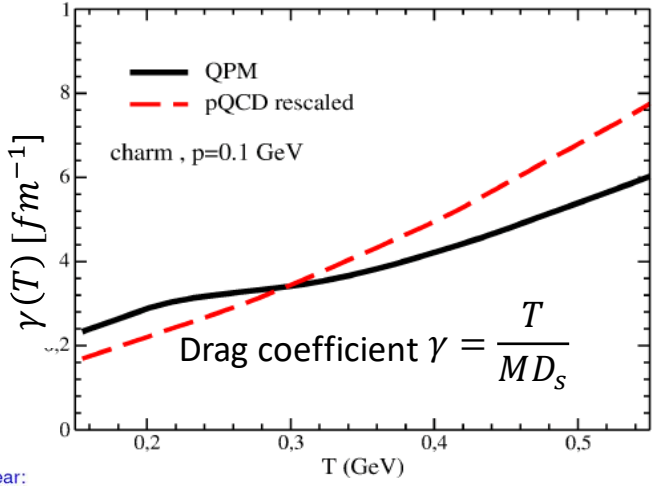
HL-LHC allows to access v_n light-HQ correlation

Event-by-event coupling of the anisotropy of the bulk (light) and the charm (heavy) one

→ Much more precise determination of the strength interaction: drag $\gamma \sim 1/D_s$

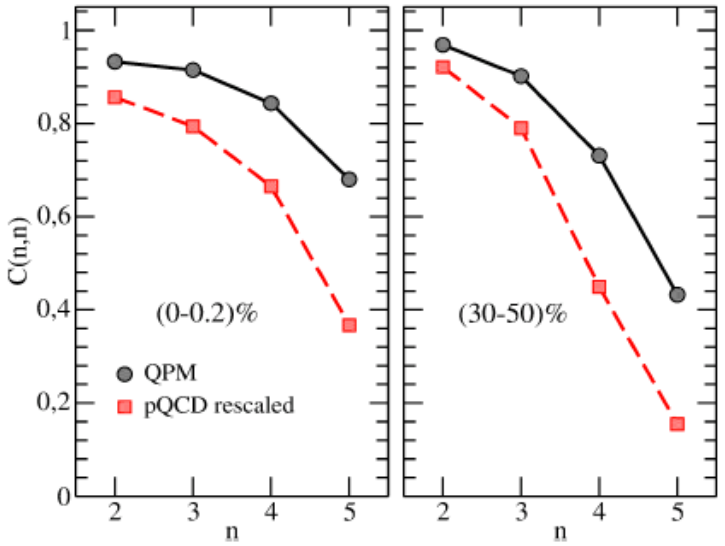
$$C\left(v_n^{light}, v_m^{heavy}\right) = \left\langle \frac{\left(v_n^{light} - \langle v_n^{light} \rangle\right)\left(v_m^{heavy} - \langle v_m^{heavy} \rangle\right)}{\sigma_{v_n^{light}} \sigma_{v_m^{heavy}}} \right\rangle$$





When including fluctuations, all moments appear:

Very large sensitivity to T dep. of Ds

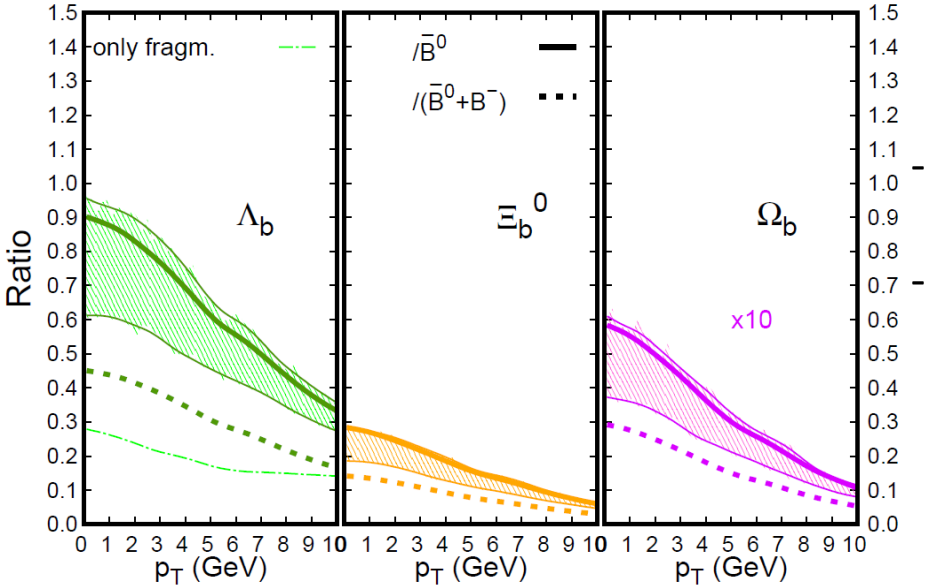


S. Plumari et al., Phys.Lett.B 805 (2020)

All at fixed $R_{AA}(p_T)$

Small systems: Coalescence in pp? (bottom hadrons)

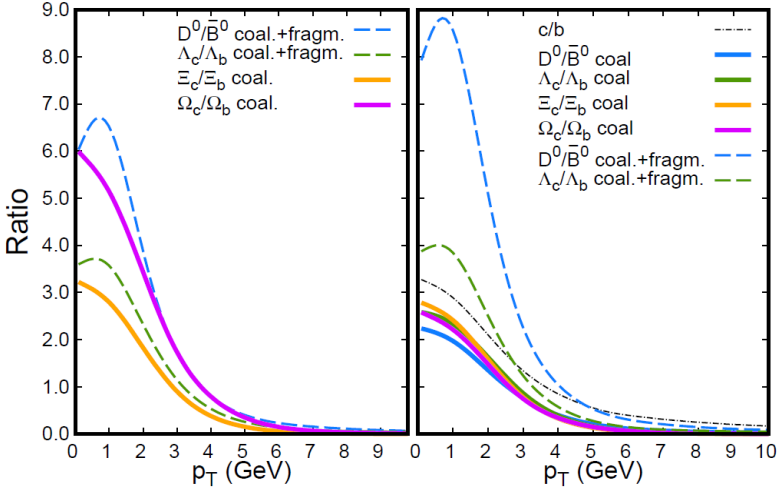
V. Minissale et al, arXiv:2405.19244 [hep-ph]



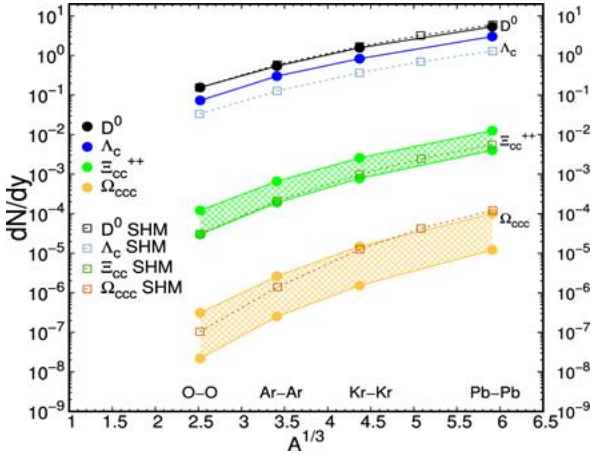
Coal gives enhancement of Baryon/meson ratio

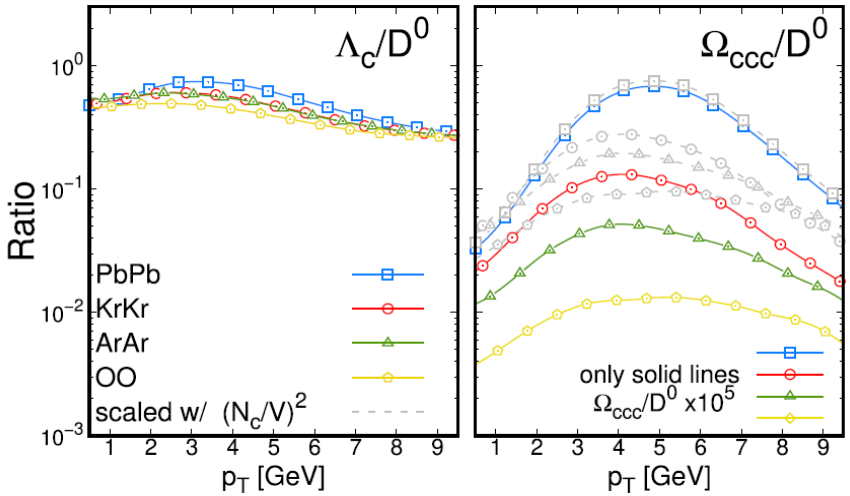
Error band correspond to $<r^2>$ uncertainty in quark model

D/B, Λ_c/Λ_b, Ξ_c/Ξ_b, Ω_c/Ω_b provide information about hadronization and f(c)/f(b)
Scaling if only coal. is assumed

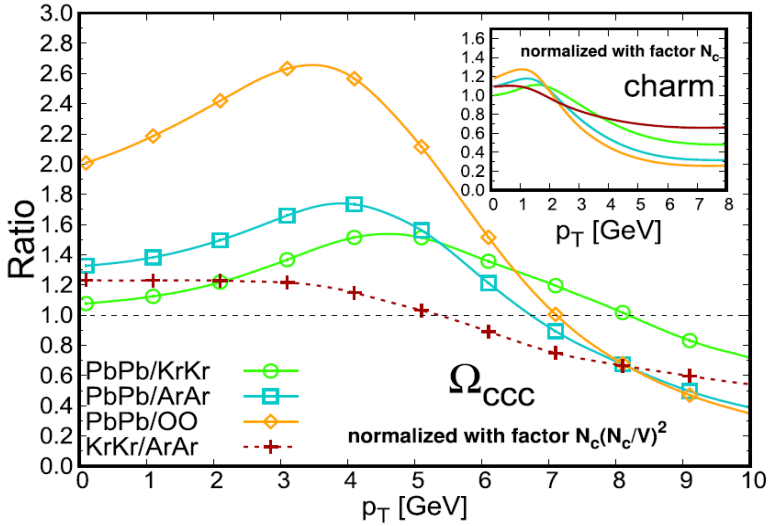


Multi-charm in PbPb-KrKr-ArAr-OO





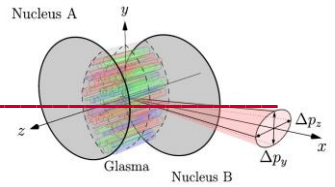
V. Minissale, et al. , *Eur. Phys. J. C 84, no.3, 228 (2024)*



Expected scaling at full equilibrium with Nc $(Nc/V)^{c-1}$

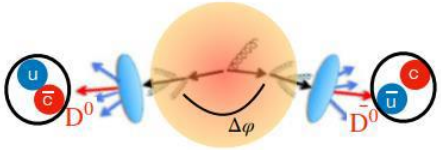
- *It can be a meter of non-equilibrium.*
- *Translation of features of charm spectra at low pT in to higher momentum region.*
- *Ω_{ccc}/D^0 more sensitive with respect to Λ_c/D^0*

Glasma impact on angular $Q\bar{Q}$



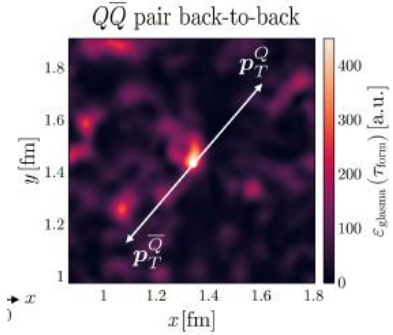
First study of azimuthal $Q\bar{Q}$ correlation: large decorellation **in only 0.2 fm/c**

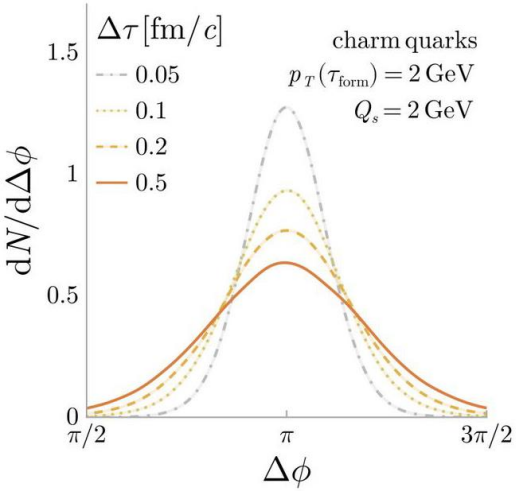
Significant effect of glasma on HQ!



pA collision should keep memory of it especially correlating it to R_{AA}, v_n:

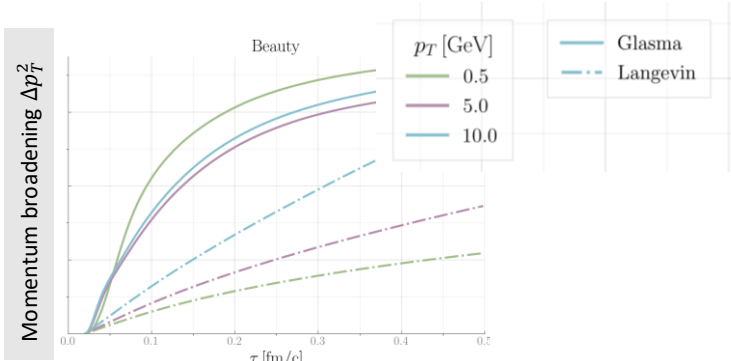
- identify Glasma phase
- solve the puzzle od R_{pA} ~1 and v_2 large





Nearly **identical for bottom** despite mass [smaller t_{form}]

Calculation in SU(3) +longitudinal expansion



D. Avramescu et al., arXiv:2409.10.565. [hep-ph]