

personal views and spurs

on AA to pp and conversely



Outline

- I. From AA to pp, pp to AA
- II. From AA to pp, pp to AA
- III. From AA to pp, pp to AA

I.1 – from pp to AA : cross-talks...



From pp to AA...



From AA to pp ...

I.2 – from AA to pp : cross-talks...



From pp to AA...



From AA to pp ...

Where is complexity / simplicity ?

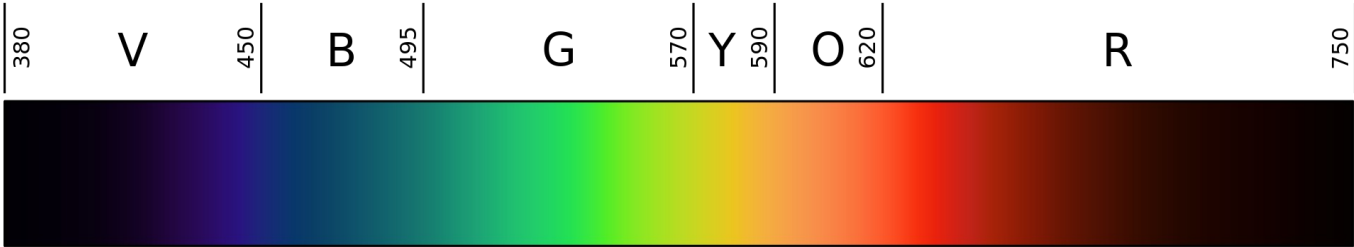
What requires fine-grained views / one statistical overview ?

II.1 – AA to pp, pp to AA : continuum of physics

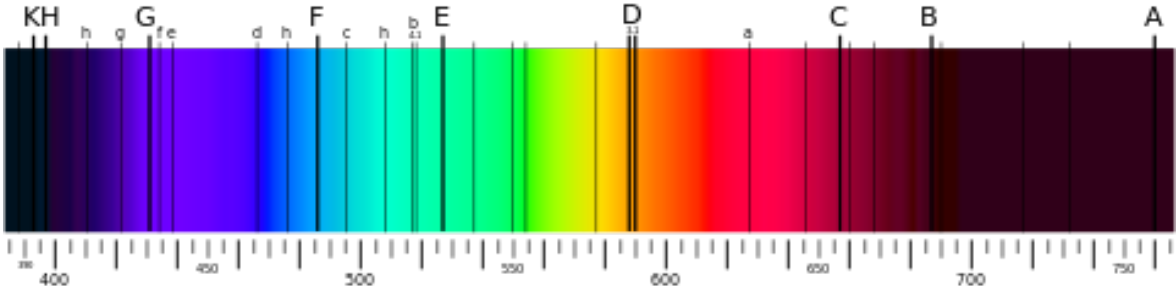
QCD



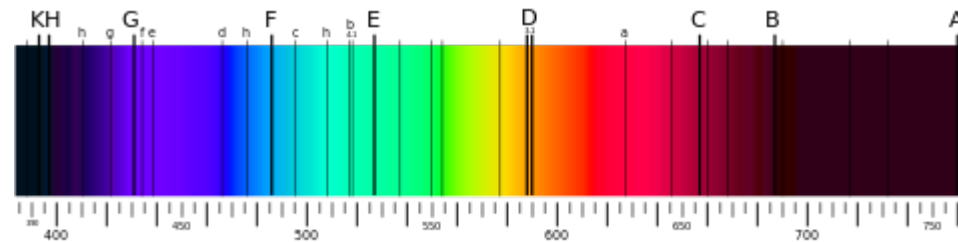
$dN_{ch}/d\eta$ map



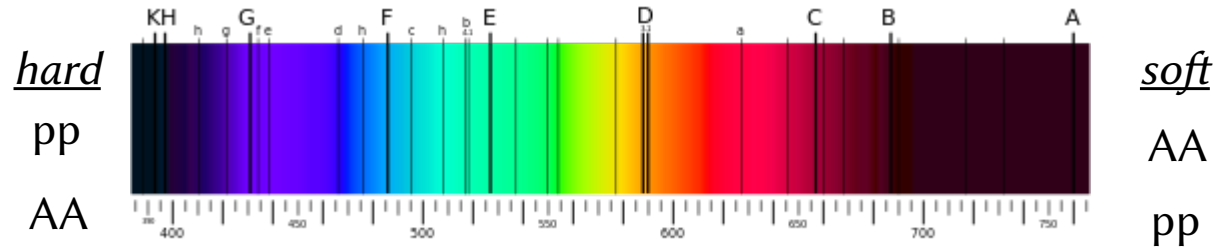
...



II.2 – AA to pp, pp to AA : describe, discretize a continuum

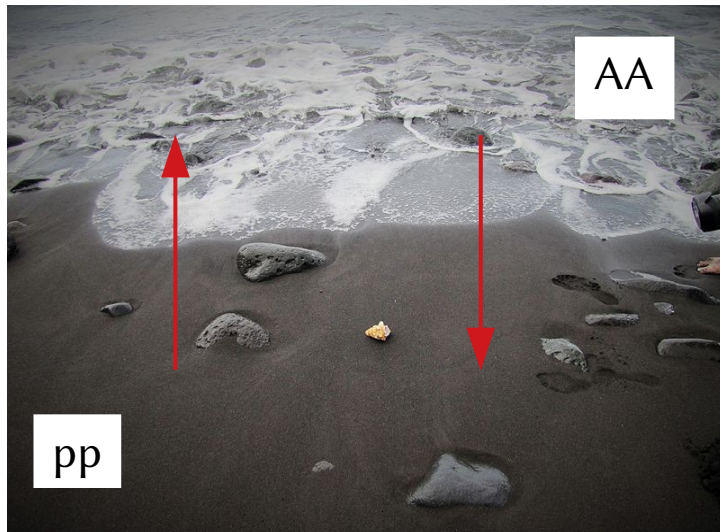


II.2 – AA/pp, pp/AA : mild_(naïve?) vs (hyper-)granular discretizat°...



- 1) Decide a first scope of interest on the spectrum
- 2) Pick-up the right mixing console...
- 3) push things further (how far ?)

II.3 – AA \rightleftharpoons pp : the knobs



Space-time picture,
i.e. dynamics
under evolving conditions

- **Initial state conditions**

- PDF - dPDF - nPDF - CGC saturation +fluctuations

- **Mimic/ pretend hydrodynamics,**

but without hydrodynamics (e.g. $v_2, v_3, v_4, \dots \neq 0$)

- glasma from saturation (AA-spirit), multiple-scattering, rope shoving (pp-spirit)
- QCD interferences between MPI centres
- kinetic theory (with ≥ 1 hit)

→ flow vs non-flow (hard scattering vs the rug “UE”...)

- **Actual hydrodynamization**

0- applicability of hydro ? (opacity, Knudsen ... / core-corona, HBT ...)

1- radial flow

2- flow modulation in φ : anisotropy in (\mathbf{p}, t)

- **Soon Vs late interactions in the collision time**

- at soon (*partonic*) stages :

colour reconnections = $f(\mathbf{r}, t)$

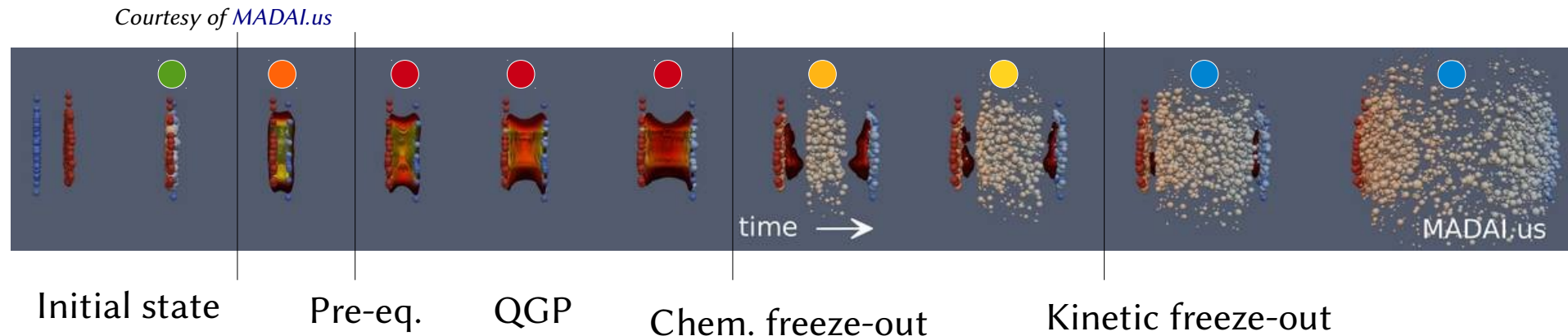
(initial impact param., centre-to-centre distance $\approx f(t)$...)

- at late (*hadronic*) stages :

hadronic rescattering (UrQMD-like)

- when/how to switch from parton to hadron ?

III.1 – from AA to pp : AA thermodynamics and features/issues...



- Sudden and common freeze-out (?), common temperature ?
- Level equilibrium of partons ? → hadrochemistry (statistical hadronisation picture...) → questioned in AA...

NB : From kinetic theory, $\tau_{\text{Hydrodynamisation}} < \tau_{\text{chemical equilibration}} < \tau_{\text{thermalisation}}$

[arXiv:1811.03068](https://arxiv.org/abs/1811.03068)

- “Jet quenching” = “in-medium energy loss” = “parton-medium interaction” → never observed in pp (effect there but tiny ?), ≈ challenging the picture of an AA-like collectivity in pp...