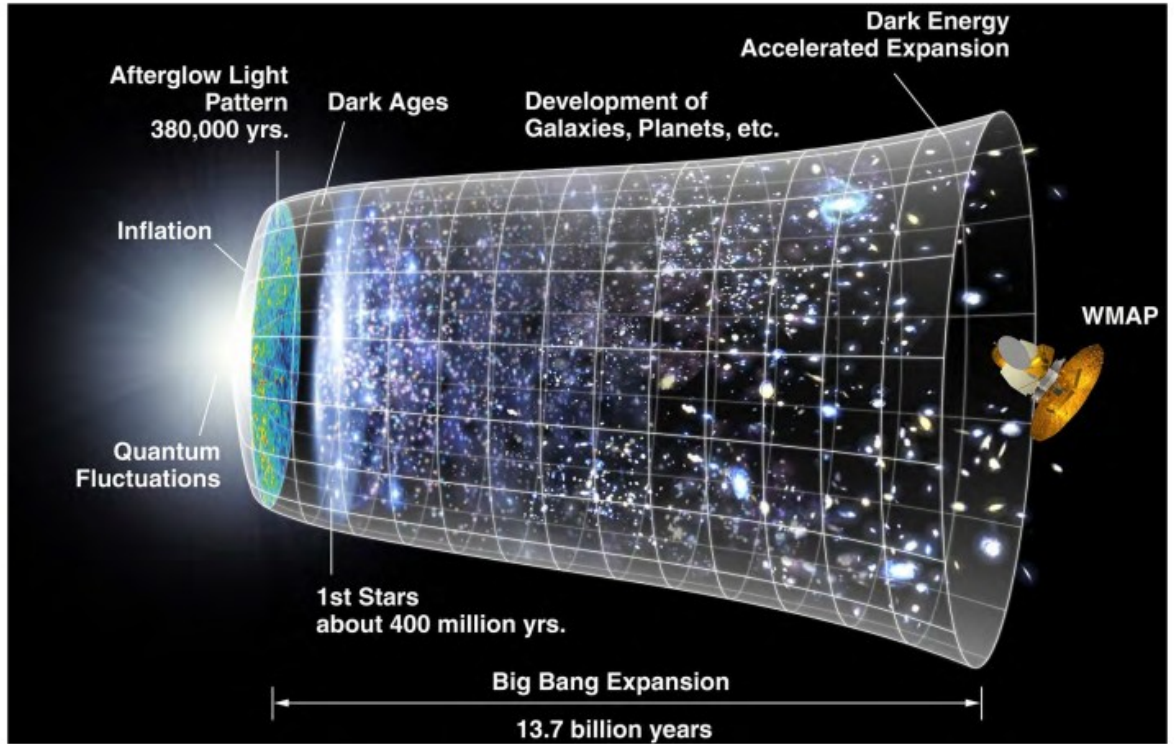
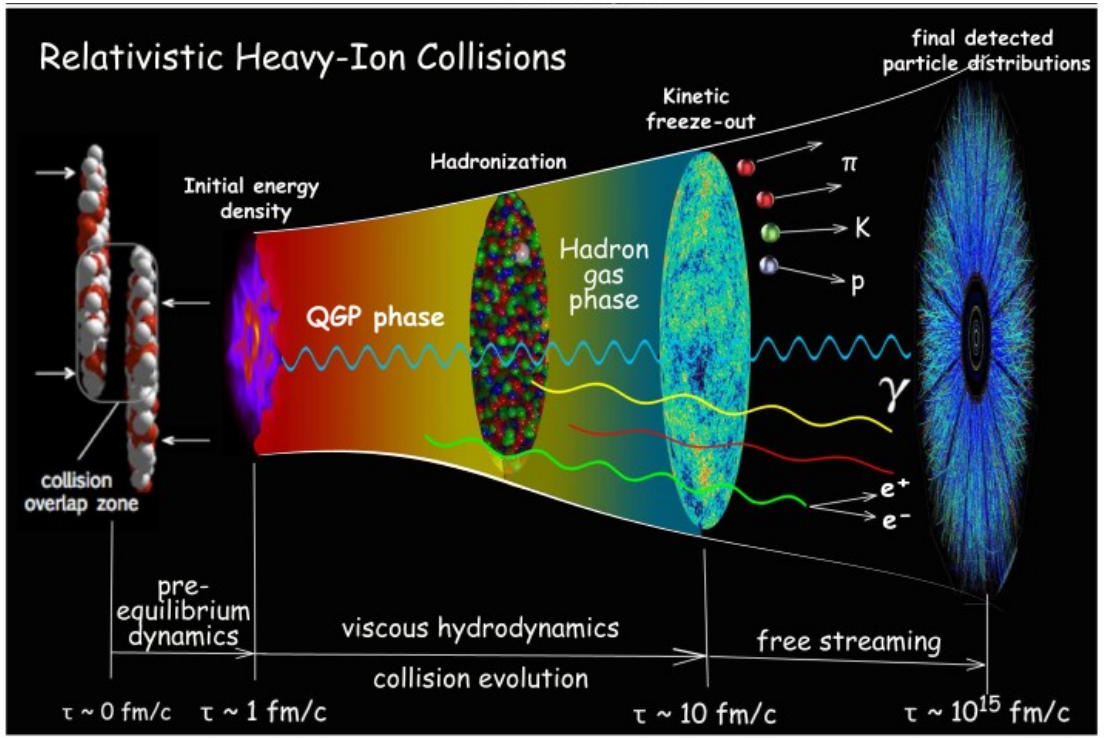
G.G. Barnaföldi *et al*: Deep learning predicted elliptic flow of identified particles at the RHIC & LHC energies





EuCAIFCon 2024, JENAA
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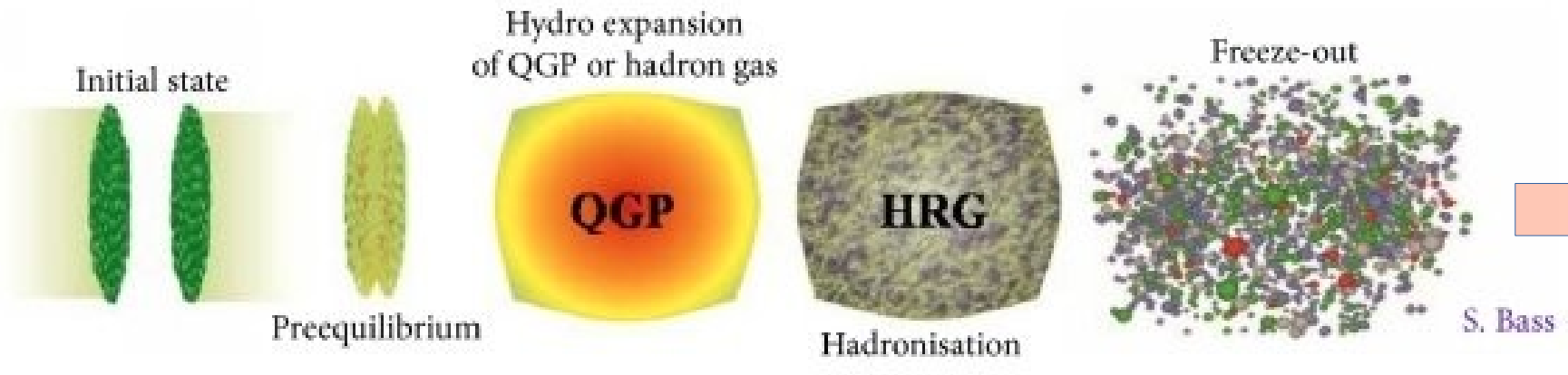
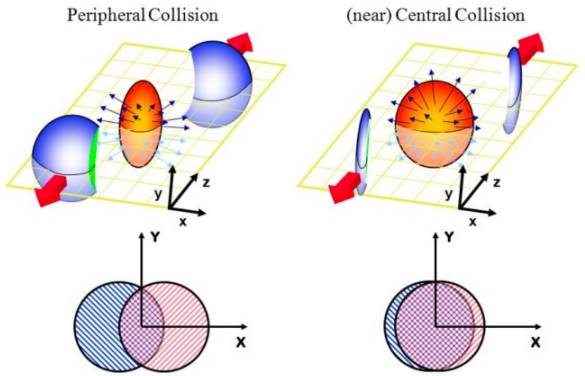
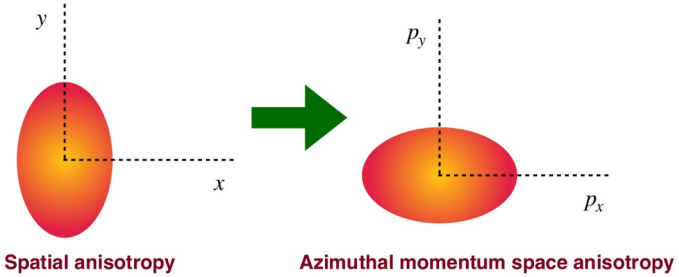
QGP signature: elliptic flow (v_2) in HIC





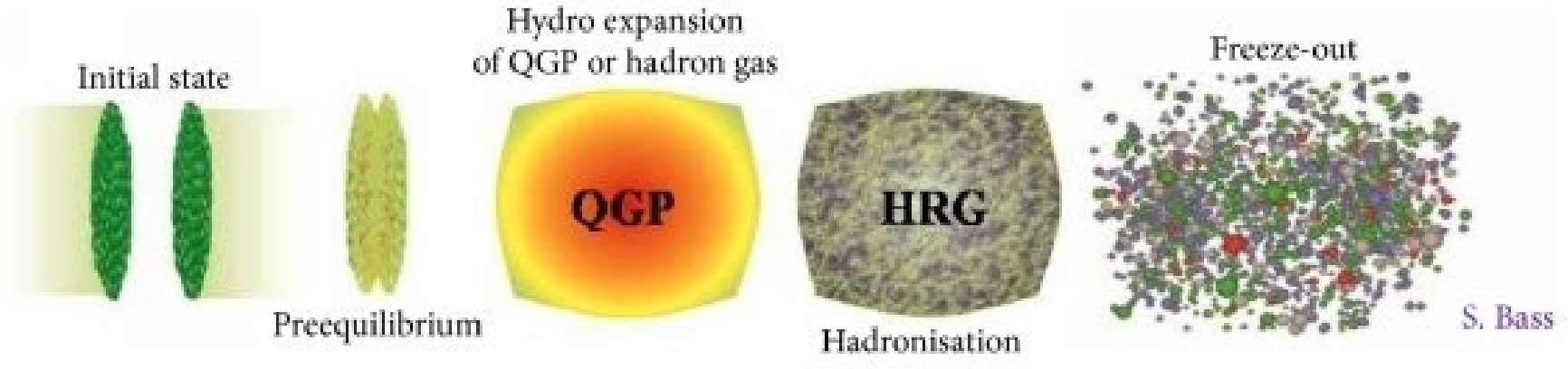
Elliptic flow describes the azimuthal momentum space anisotropy of particle emission for a non-central heavy-ion collision.

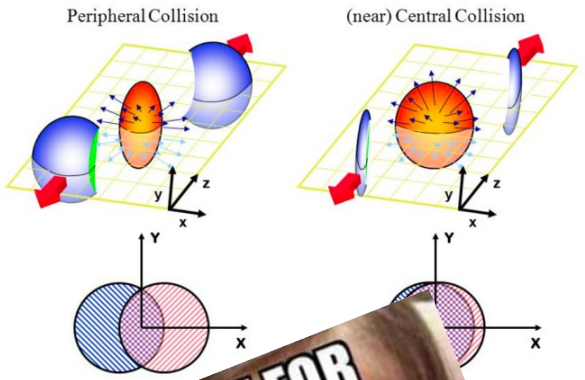
$$E\frac{d^3N}{dp^3} = \frac{d^2N}{p_T dp_T dy}\frac{1}{2\pi}\left(1 + 2\sum_{n=1}^{\infty} v_n \cos[n(\phi - \psi_n)]\right)$$



The 2nd harmonic coefficient of the Fourier expansion of azimuthal momentum distribution: $v_2(p_T, y) = \langle\cos(2(\phi - \psi_2))\rangle$

QGP signature: elliptic flow (v_2) in HIC





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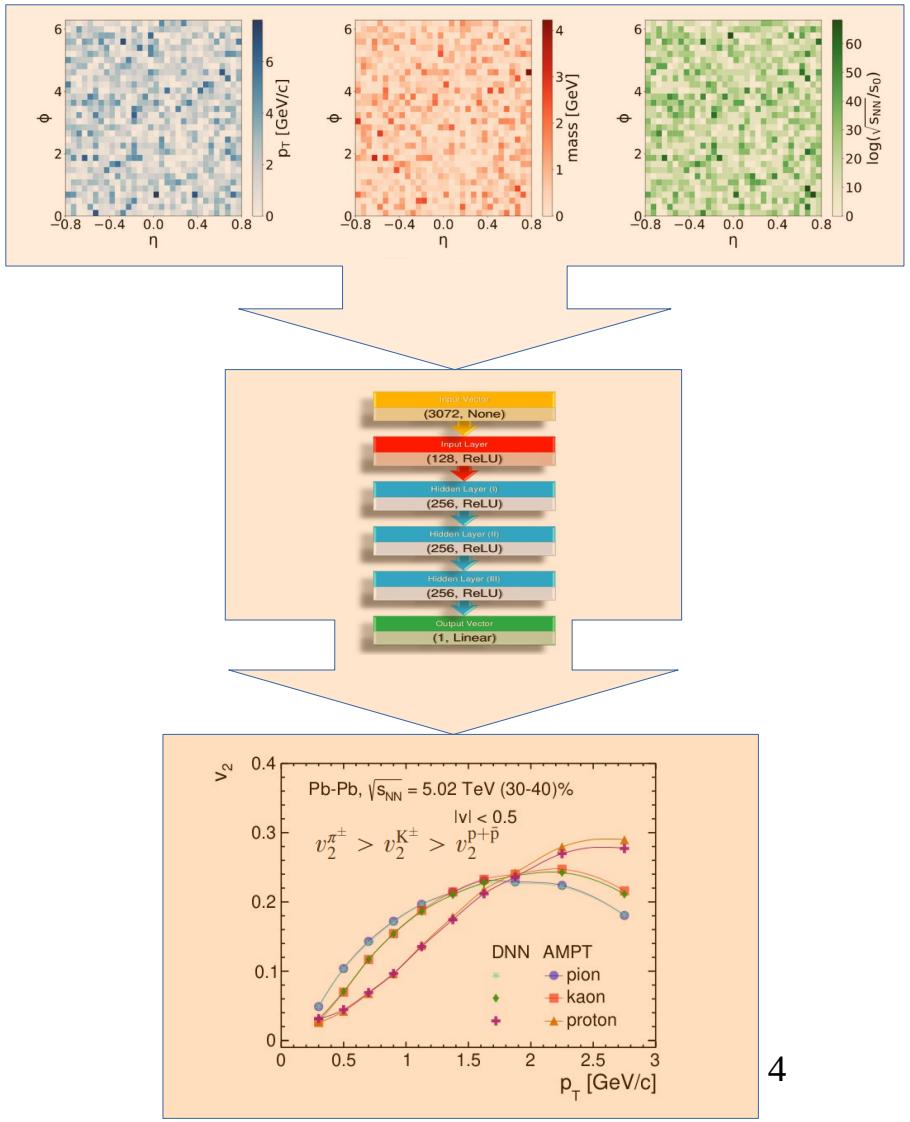
Results: how ML can help with this?

- **It is possible to estimate the elliptic flow by ML**
  - Get best Min. Bias. Monte Carlo simulation data and train the well-designed DNN system...
    - → AMPT & DNN correlates well for all centrality
    - → Best correlation is for the highest statistic
    - → Energy scaling is well preserved (non-linear)
    - → The $v_2(p_T)$ is also preserved with PID & NCQ
- **See more on poster #105**



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Refs.: PRD 105, 114022 (2022) PRD 107, 094001(2023)