BEAM ENERGY SCAN PROGRAM WITH EPOS MODEL

Maria Stefaniak, Hanna Zbroszczyk, Klaus Werner
Warsaw University of Technology
SUBATECH, University of Nantes IN2P3/CNRS IMT Atlantique

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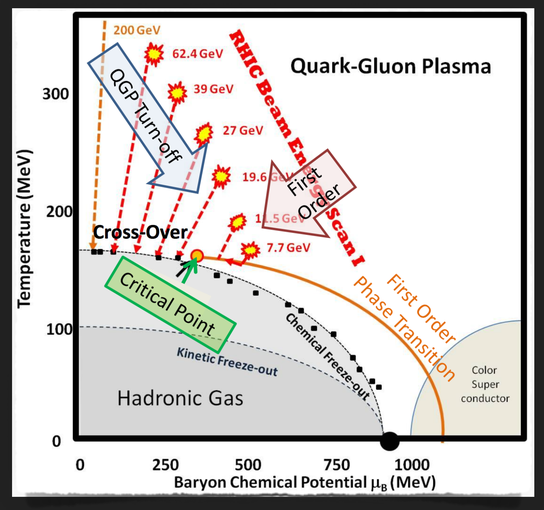
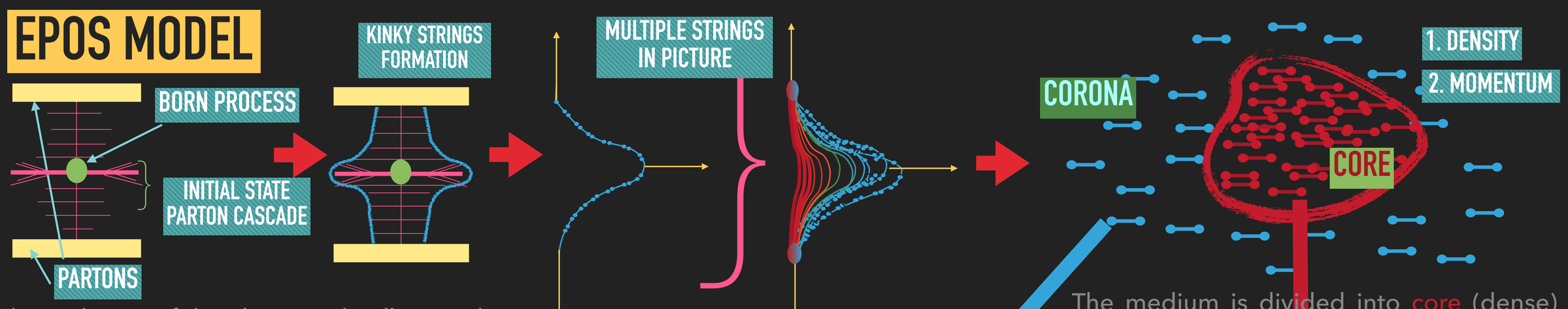
ABSTRACT Studies of collisions of highly accelerated ions are the key to understand the creation of quark matter. In order to explain the complex processes occurring in such experiments the sophisticated models have been constructed, one of them being the EPOS approach. There is ongoing Beam Energy Scan program at RHIC experiment with the aim to investigate the QCD phase diagram, in particular to study the type of phase transition between confined and deconfined phases of matter at large baryon densities and find possible signatures of critical point of the strongly interacting matter. Transport models successful at full RHIC or LHC energies have difficulties to describe this energy range properly. The aim of our investigation is to adapt the EPOS model for the collisions of ions with energies studied in the framework of the BES program.



BEAM ENERGY SCAN

Program dedicated to exploration of the QCD phase diagram runs at STAR experiment in Brookhaven National Laboratory. The gold ions are collided at various energies form $\sqrt{s_{NN}}$ = 7.7 to 62.4 GeV. Experimentalists are looking for signatures of phase transition between deconfined matter (Quark-Gluon Plasma) and Hadronic Gas. Between the first order phase transition and cross-over there is a critical point, which collects a lot of attention, where the behaviour of matter fluctuates, and finally changes drastically. The part of QCD phase diagram covering higher barion densities is a big challange for the theoretical description.

EPOS MODEL



The exchange of the gluon can be illustrated with a "ladder" where the branches represent the initial state patron cascades.

The flux tube is treated as a relativistic string with "kink", which segments. [1]

The medium is divided into core (dense) and corona (high momenta, close to kink).

HADRONIC CASCADES

The UrQMD procedures are implemented.

PARTICLIZATION

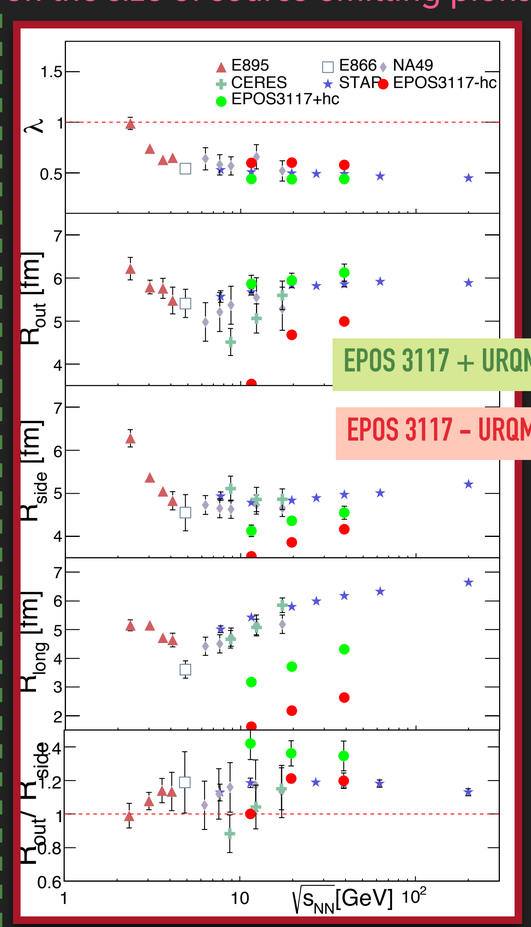
The energy density equals to **0.57** GeV/fm³

VISCOUS HYDRODYNAMIC EXPANSION

The cross-over equation of state, η/s = 0.08

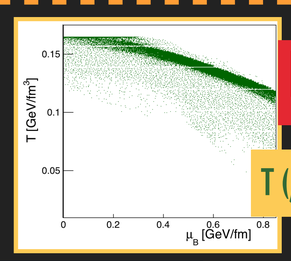
PION FEMTOSCOPY MEASUREMENTS [3]

Huge impact of hadronic cascades on the size of source emitting pions

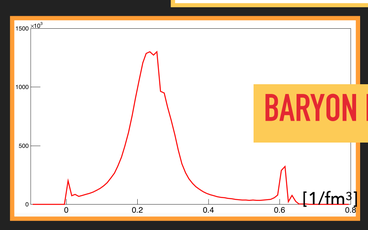


AU+AU | PION-PION | K_T ≈0.225 GEV/C

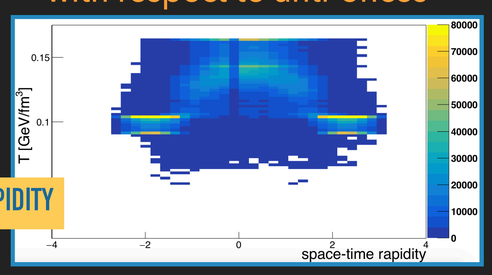
Elements of particlization hyper-surface (hs) characterised with various T and μ_B



PRELIMINARY



Visible growth of production of particles with respect to anti-onces

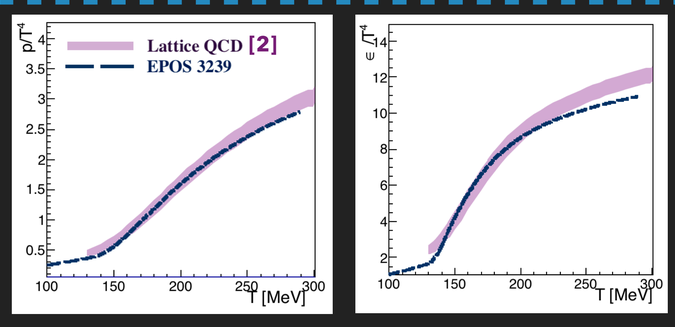


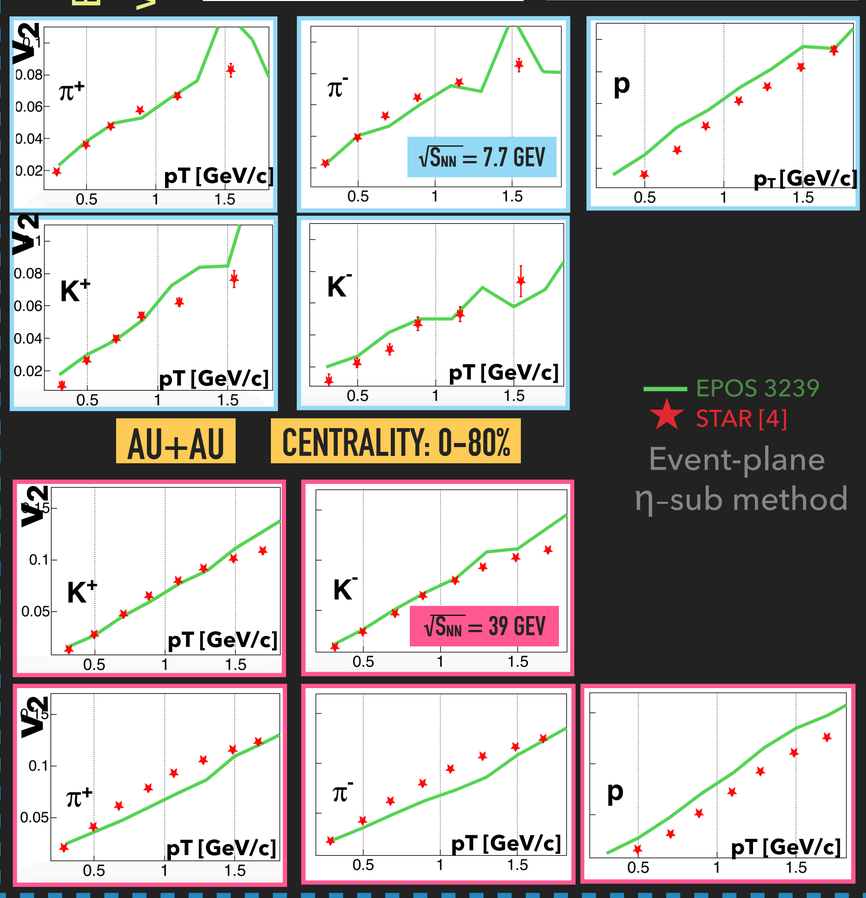
Mid-rapidity: higher temperatures
Closer to "edges" of hs : T ≈ 100 MeV/fm³

SUMMARY

- Significant variations of temperature and chemical potential over the hypersurface of particlization
- Trends of elliptic flow at given collision energies captured in the model
- The particle-type dependence of the elliptic flow indicates necessity of improvements in the model

EoS compatibile with Lattice-QCD





AU+AU | CENTRALITY: 0-80%

References:
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4. Adamczyk, L. and others, STAR Collaboration, 10.1103/PhysRevC.88.014902