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STUDY OF INITIAL STATE AND CASUAL DISSIPATIVE FLUID EXPANSION IN PP AND PPB COLLISIONS AT LHC ENERGIES

58th International Winter Meeting on Nuclear Physics
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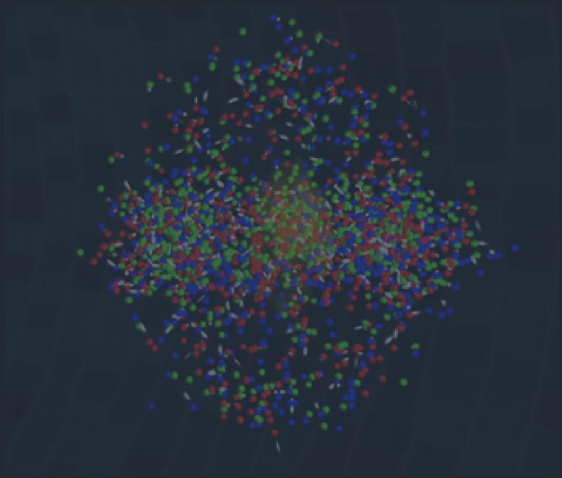
Motivations



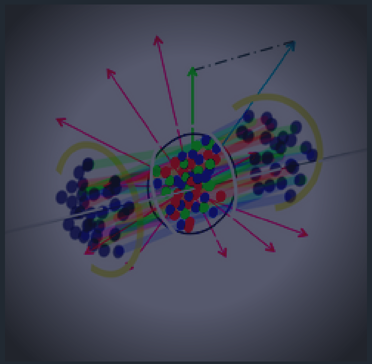
QGP in small collisions systems?

The system that is created in nuclear collisions behaves like an almost perfect fluid

Observe the object is related to the viscosity of the medium

Measure the deviation with respect to the conformal behavior

Thermodynamics in SPM



The model allows us to estimate some quantities from collision energy parameters

A local temperaturte

The Bjorken energy density

And from the kinetic theory

$$T(\xi^t) = \sqrt{\frac{\langle p_T \rangle_0}{2F(\xi^t)}}$$

$$\varepsilon/\varepsilon_c = \xi^t/\xi^t_c$$

$$\frac{\eta}{s} = \frac{TL}{5(1-e^{-\xi^t})}$$

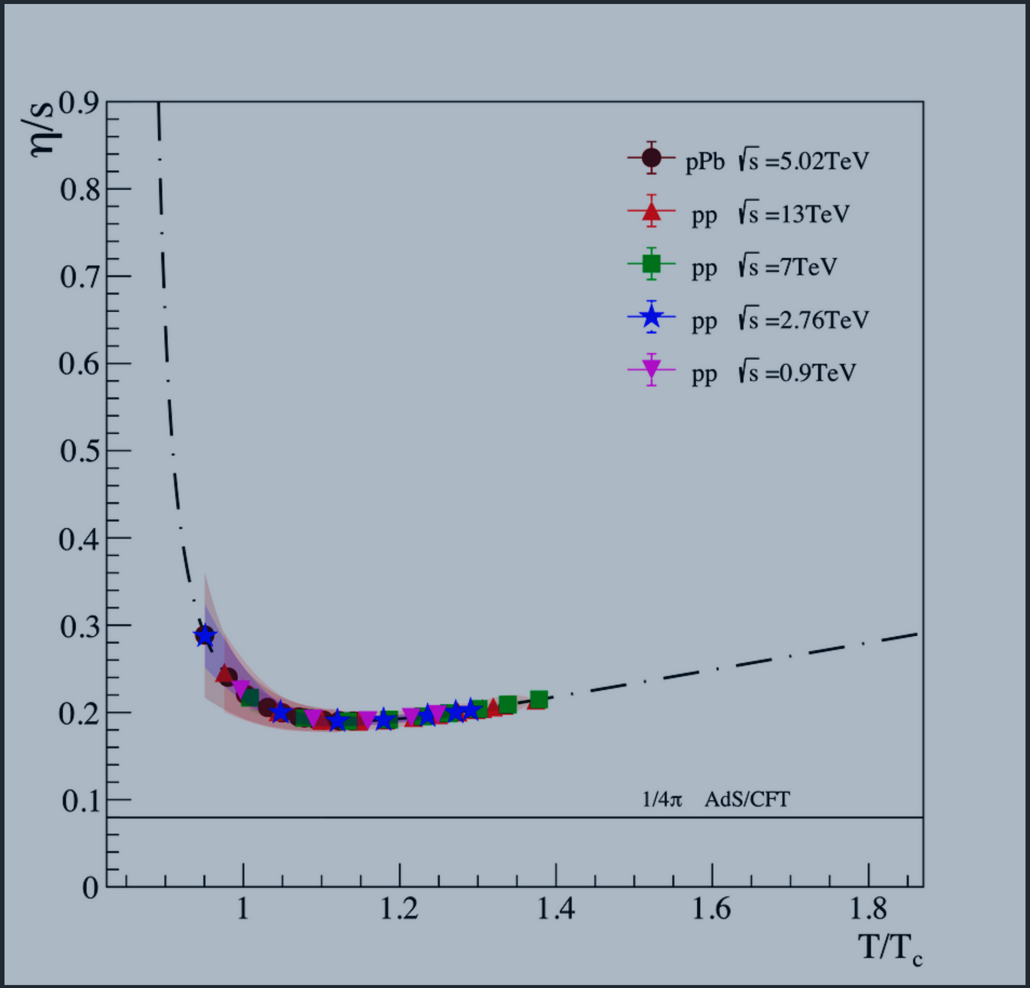
Shear Viscosity

Was proposed as a measure of the fluidity of the medium

Measures the fluid's transport resistivity

Characterizes the systems's phase transition

$$\Delta \equiv \frac{\varepsilon - 3P}{T^4} \sim \frac{s}{\eta_s}$$



Causal Dissipative Relativistic Fluid

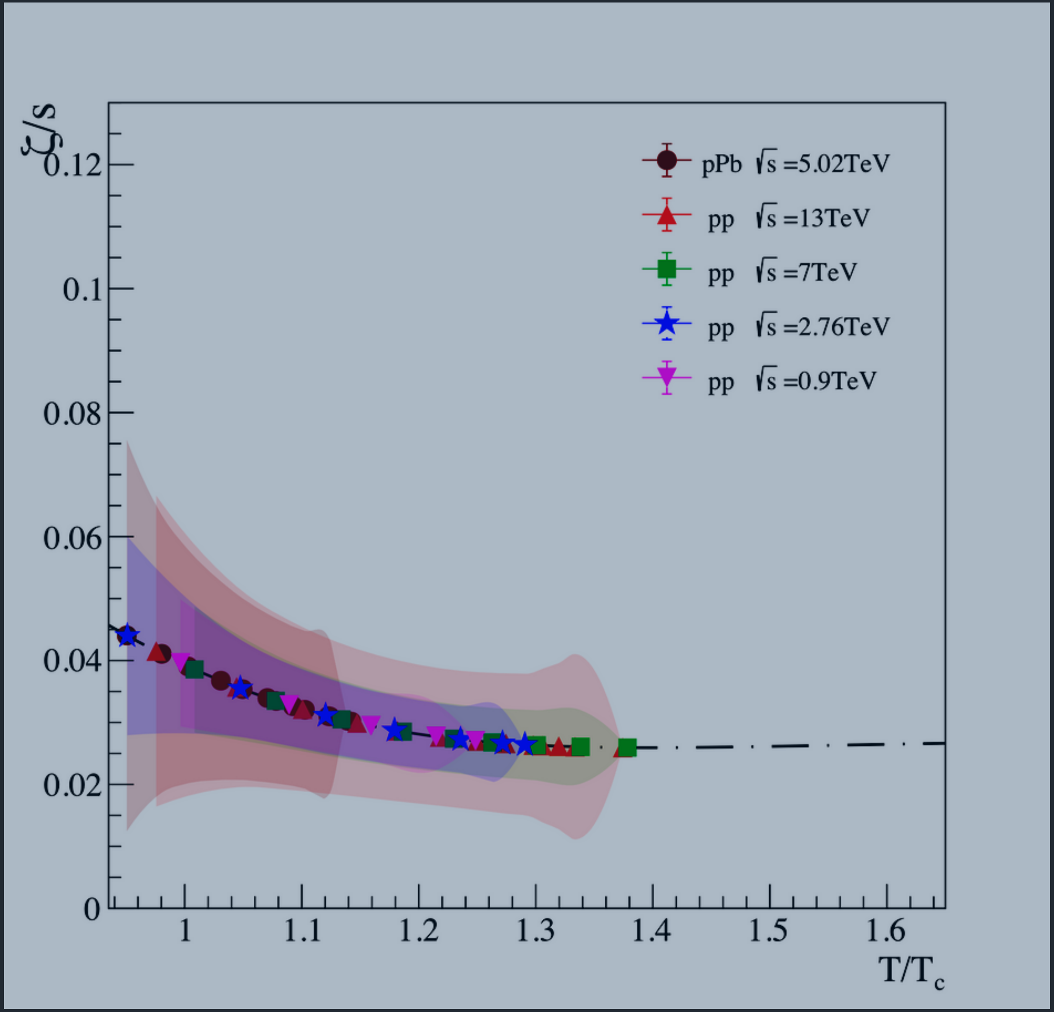
By proposing a dissipative speed of sound for the medium

$$c_{sL}^2 = \frac{P}{\varepsilon} + \frac{T^4\Delta}{12\varepsilon}\left(1 - \frac{e^{-\xi^t}}{F(\xi^t)^2}\right)$$

we follow the projection operator method to estimate the bulk viscosity coefficient

$$\frac{\eta_b}{s} = \left(\frac{1}{3} - c_{sL}^2\right)\tau_\Pi T - \frac{2T^4\tau_\Pi\Delta}{9s}$$

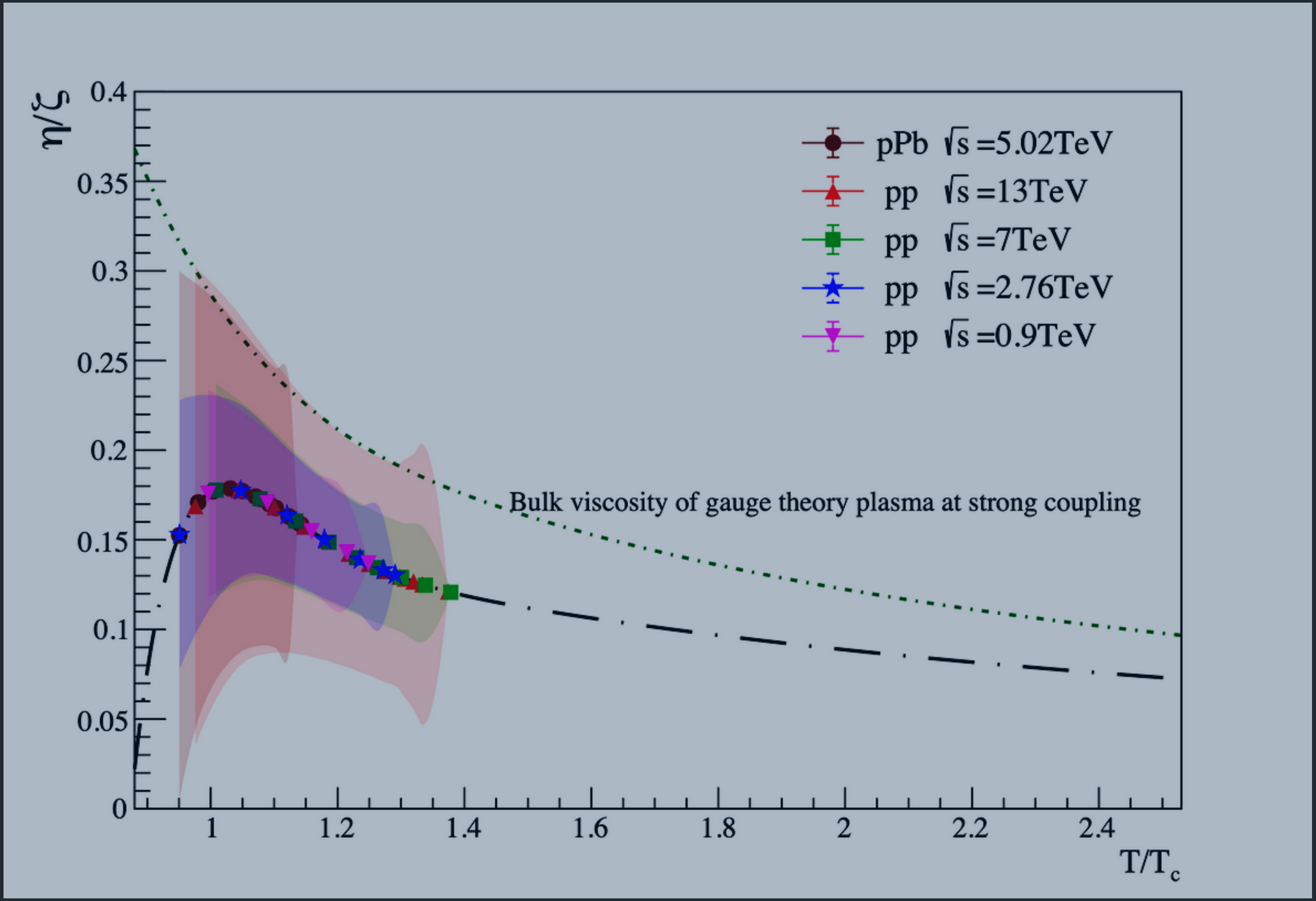
Bulk Viscosity



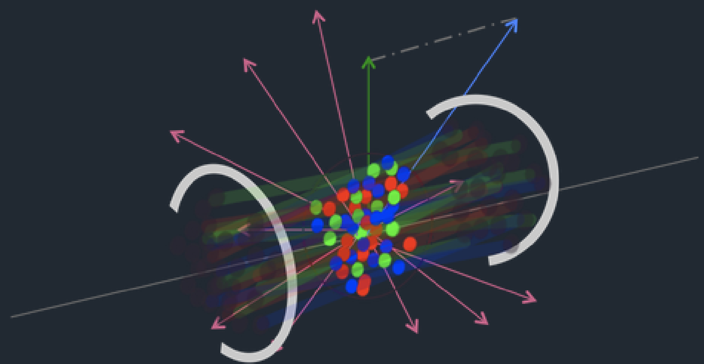
Measures the fluid's deformations resistivity

Describes the fluid's inner properties

Results



η/ζ
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
1.2
1.4
1.6
1.8
2
2.2
2.4
T/T_c
pPb √s =5.02TeV
pp √s =13TeV
pp √s =7TeV
pp √s =2.76TeV
pp √s =0.9TeV
Bulk viscosity of gauge theory plasma at strong coupling



THANK YOU, SEE YOU AT THE POSTER SESSIONS