

Probes for the QCD Phase Boundary Search(?)

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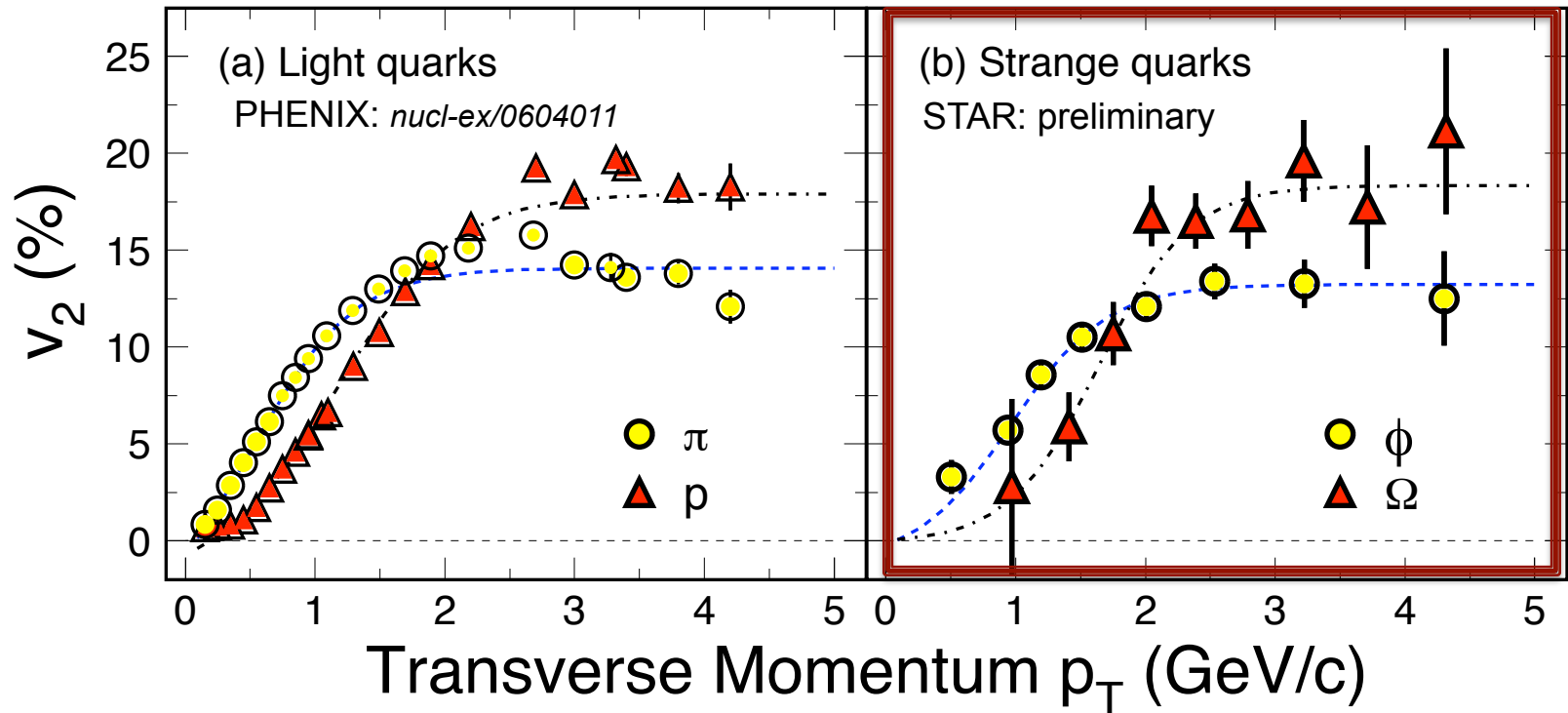
- (I) Suggestions on probes
- (II) A fix target experiment (BMN*)

(I) Observables

- (a) NQSaling in hadron v_2
- (b) High order correlations
- (c) Di-leptons slope parameters

Partonic Collectivity at RHIC

$\sqrt{s_{NN}} = 200 \text{ GeV } ^{197}\text{Au} + ^{197}\text{Au}$ Collisions at RHIC

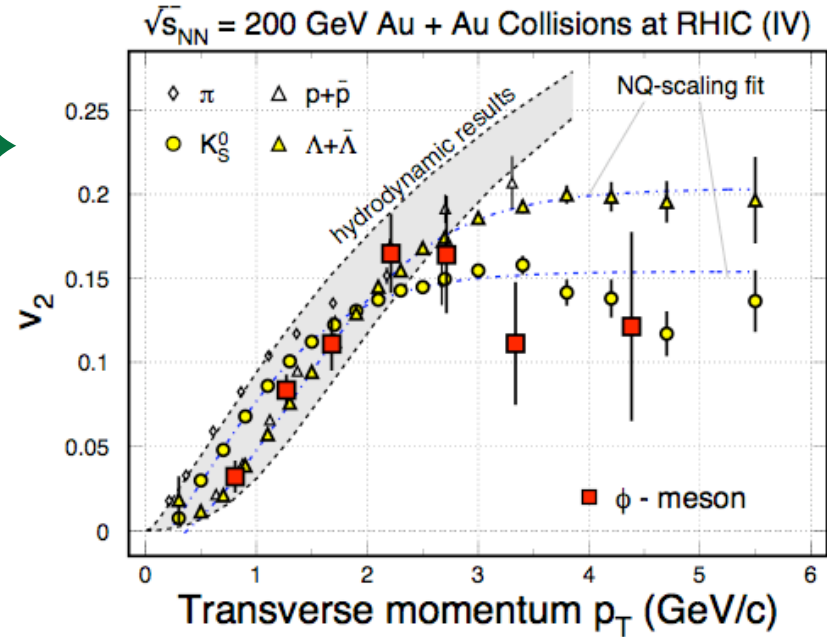
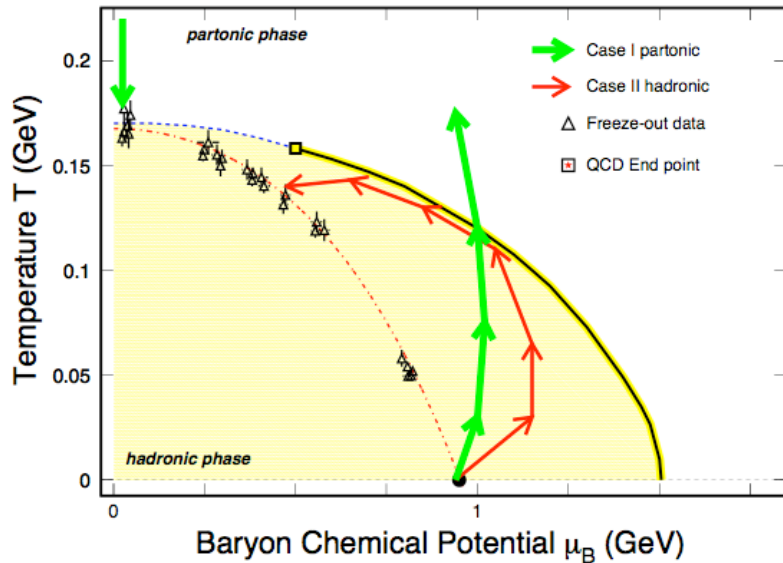


QM09: arXiv 0907.2265

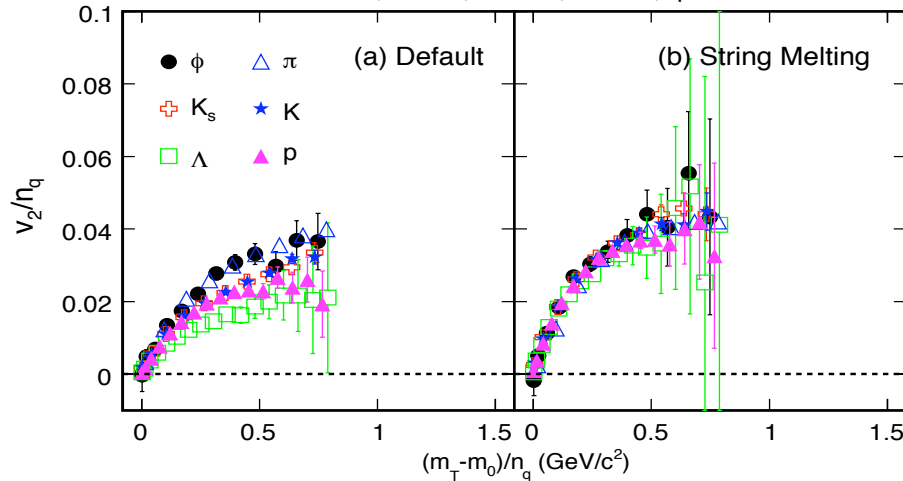
Low p_T ($\leq 2 \text{ GeV/c}$): hydrodynamic mass ordering
 High p_T ($> 2 \text{ GeV/c}$): number of quarks ordering
 s-quark hadron: smaller interaction strength in hadronic medium
 light- and s-quark hadrons: similar v_2 pattern

=> Partonic Collectivity at RHIC !

Observable: Quark Scaling



AMPT, Au+Au, 9.2GeV, b<14fm, |η|<1



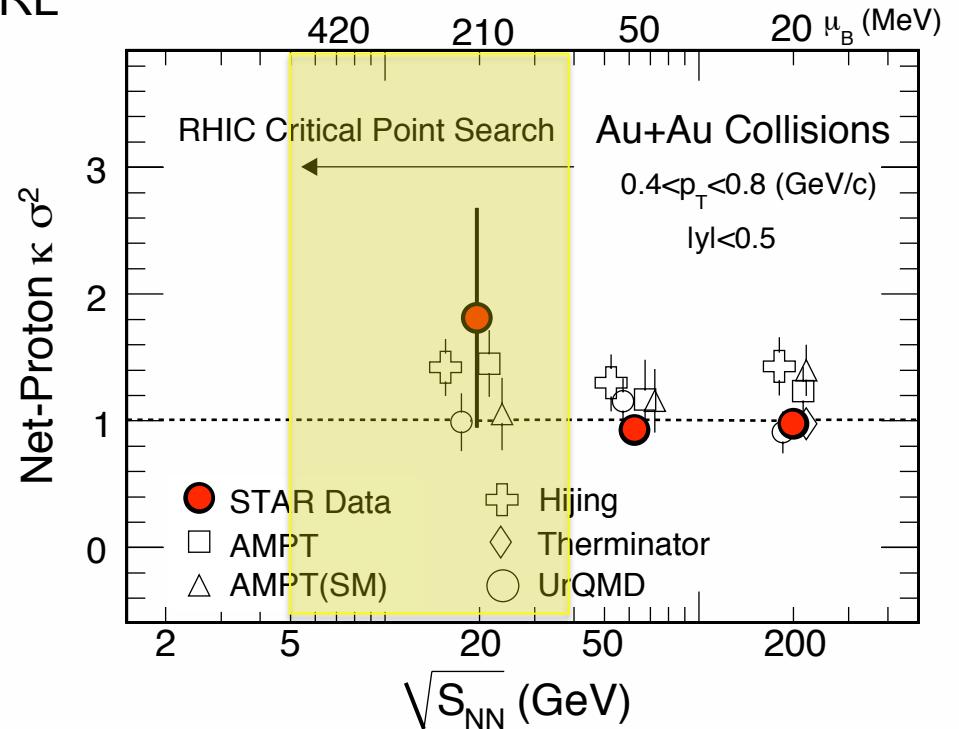
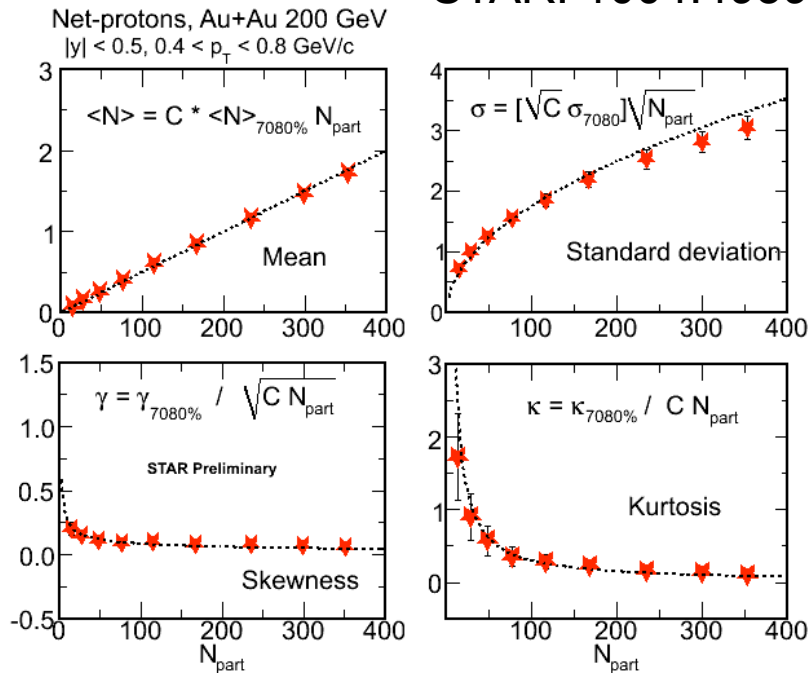
- $m_\phi \sim m_p \sim 1 \text{ GeV}$
- $ss \Rightarrow \phi$ not $K^+K^- \Rightarrow \phi$
- $\sigma_{\phi h} \ll \sigma_{p\pi, \pi\pi}$

In the hadronic case:

- (i) No number of quark scaling
- (ii) Very small value of ϕv_2 !

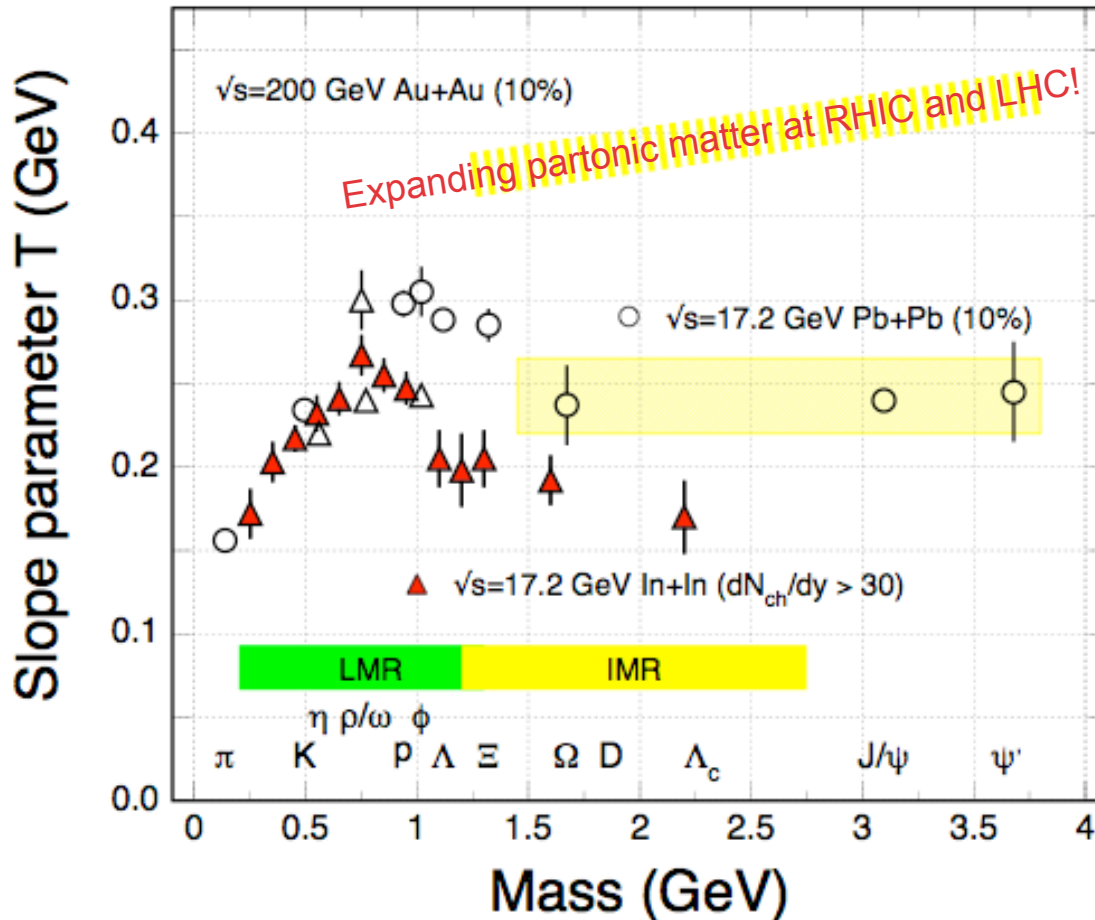
High Moment – Critical Point

STAR: 1004.4959, PRL



- 1) High moments are more sensitive to critical point related fluctuation.
- 2) High moments are directly related to the corresponding thermodynamic quantity: susceptibility for conserved quantum numbers such as Baryon number, charge and strangeness.

Direct Radiation Measurements



Direct radiation:



STAR already started its *di-electron* measurements!

Di-leptons allow us to measure the direct radiation from the matter with partonic degrees of freedom, no hadronization!

- Low mass region:

$\rho, \omega, \phi \Rightarrow e^-e^+$

$m_{inv} \Rightarrow e^-e^+$

medium effect
Chiral symmetry

- Intermediate region:

J/ $\psi \Rightarrow e^-e^+$

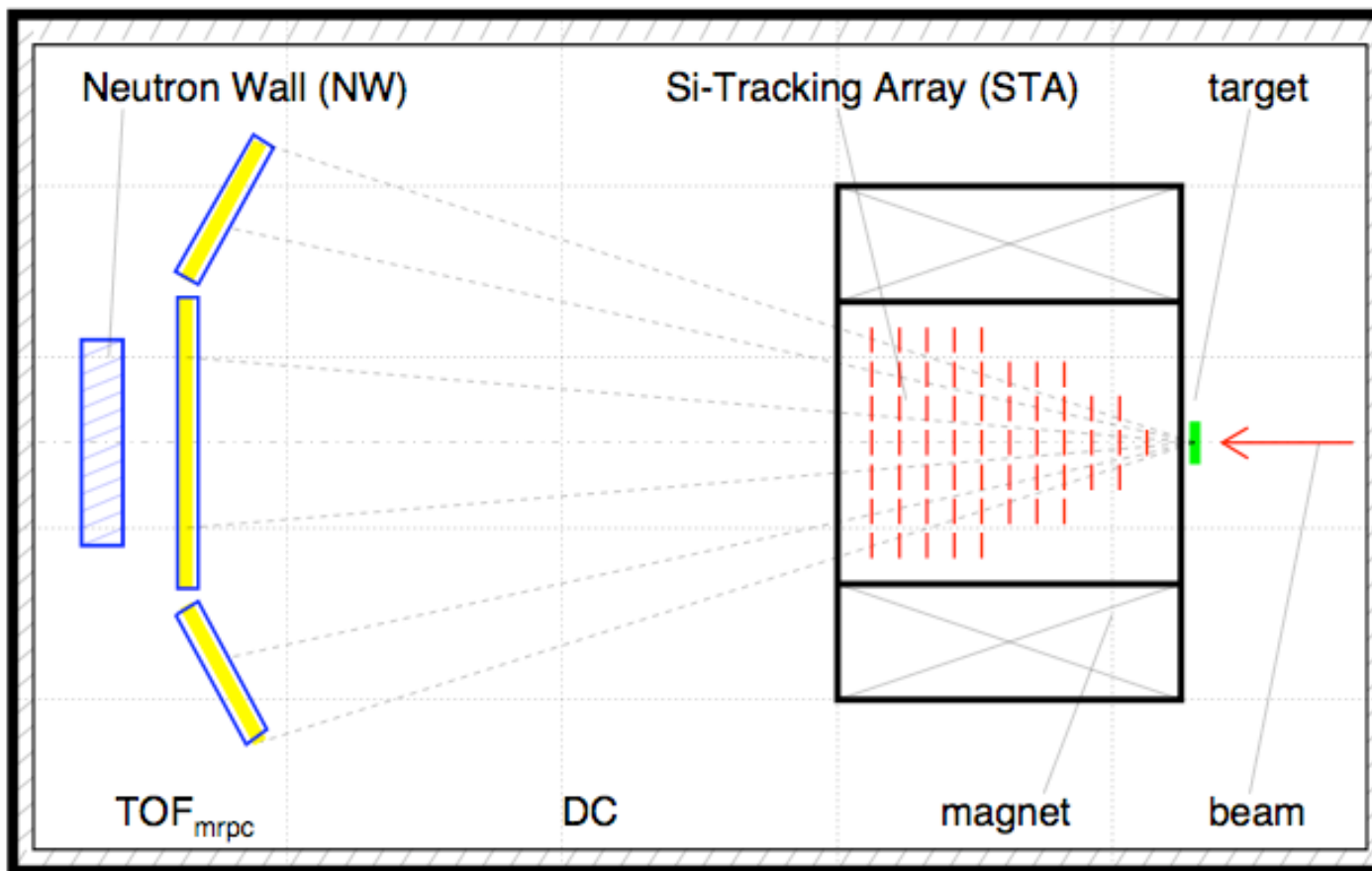
$m_{inv} \Rightarrow e^-e^+$

Direct radiation

(II) Fix Target Experiment

BMN*

Fix Target Experiment – BMN*



Measurements: ($p_T > 0$, $0 < y < y_B$)

- 1) Zero-degree neutrons
- 2) Charged hadron multiplicity
- 3) π , K, n, p, Λ spectra

Key Physics:

- 1) N_{ch} versus collision geometry
- 2) π , K, n, p, ϕ , Λ : dN/dy , and v_0 , v_1 , v_2
- 3) Correlation of net-p, net-K, net-Q