A Few Remarks on Exp Perspective

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Extraordinarily Fundamental Discovery Requires Extraordinary Evidence
Observing Topological Charge Transitions

To observe in the lab
- add massless fermions
- apply a magnetic field
We all agree –
\( \gamma \) correlator in pA largely due to background
\( \gamma \) correlator in general has (significant) background

We need to address –
1) CMS \( \gamma(\text{OS-SS})/v_{2c} \) (pPb) \( \sim \) (PbPb) peripheral
Coincidental or not?
STAR p+Au > Au+Au @ 200 GeV
2) Can pA and peripheral AA be extrapolated to
mid-central and central AA?
-- two-component feature in \( \gamma(\text{OS}) \) and \( \gamma(\text{SS}) \)
-- centrality dependence of two-components
CMS: $v_{2,c}$ data for pPb and PbPb
Are they quantitatively the same?
If not, there is a non-$v_2$ related background component!

Coincidental or Not?
Two Components \( ? \) !

We may not know the physical origins of these components – but there are two components showing very different centrality dependence!

We urge CMS to publish detailed centrality dependence of OS and SS \( \gamma \) Correlators !
ALICE Event-Shape Engineering Effort

What does it take for ALICE to constrain CME fraction to the level of 10%?
A Cautious Note on \( \kappa_K \) Parameter

\[ \kappa_B \equiv \frac{\Delta \gamma + \Delta H}{v_2(\Delta \delta - \Delta H)}, \quad \kappa_K \equiv \kappa_B(\Delta H = 0) = \frac{\Delta \gamma}{v_2 \Delta \delta}. \]

If \( \kappa_K > \kappa_B \) for real data, there could be extra physics like the CME.

\( \kappa_K > 2 \) there likely something beyond the bk model
\( \kappa_K < 2 \) not necessarily mean no CME signal
    – need detailed bk comparison of OS and SS


ALICE – Mother Nature Unkind

Most Central Events very Special!
Combining ES Engineering and B Field Consideration

Residual components in two systems

scaled by $N_{\text{part}}$

$$\Delta \gamma \times N_{\text{part}}$$

- U+U 193 GeV
- Au+Au (Residual)

STAR preliminary

scaled by $N_{\text{part}}/v_2$

- Au+Au (Residual)
- U+U (Residual)

STAR preliminary

Au+Au is lower than U+U at large $N_{\text{part}}$

$$\Delta \gamma_{\text{Background}} \approx \frac{v_2 \{2\}}{N}$$

In a pure background scenario this plot should be flat & universal

System dependence → not explained by naive background model

P.Tribeley, QCD chirality workshop, UCLA, 2017
Isobars at RHIC in 2018 – absolutely important

Event shape engineering at RHIC

H correlator analysis at the LHC in p+Pb and Pb+Pb

See if the signal in p+Pb can be made to go away

Ultra-central Pb+Pb at the LHC

Scaled vs unscaled comparison of $\gamma$ between CMS and STAR

Theory progress on both CME and background

2017 QCD Workshop on Chirality, Vorticity and Magnetic Field in Heavy Ion Collisions will be held on March 27-30, 2017 at UCLA
http://starmeetings.physics.ucla.edu/

2018 QCD Chirality Workshop – Francesco Becattini et al
https://indico.cern.ch/event/614524/
Phases of Quantum Chromodynamics (QCD) and Beam Energy Scan Program with Heavy Ion Collisions

Aug 15-18, 2017 @Fudan University

Welcome to the International Workshop on

"Phases of Quantum Chromodynamics (QCD) and Beam Energy Scan Program with Heavy Ion Collisions"

that will take place August 15-18, 2017 at Fudan University, Shanghai China.

The goal of this workshop is to bring together theorists and experimentalists worldwide to discuss the current status and future opportunities for exploring the phases of QCD matter through the Beam Energy Scan program at RHIC and beyond. With the planned RHIC Isobaric collisions in 2018 and BES II in 2019 and 2020 as well as the FAIR and NICA on the horizon, it is an exciting time for investigating the QCD emergent properties at finite baryon density. The workshop plans to have intensive discussions on status and future for the search of anomalous chiral transport effects as well as the search of chiral critical point and 1st order phase transitions. The workshop also aims to strongly promote the communications and facilitate future collaborations among scientists in and outside China who share common interests in this research frontier.

This workshop is sponsored by the Physics Department of Fudan University and the Institute of Modern Physics of Fudan University. The workshop is also endorsed by the Beam Energy Scan Theory (BEST) Collaboration.