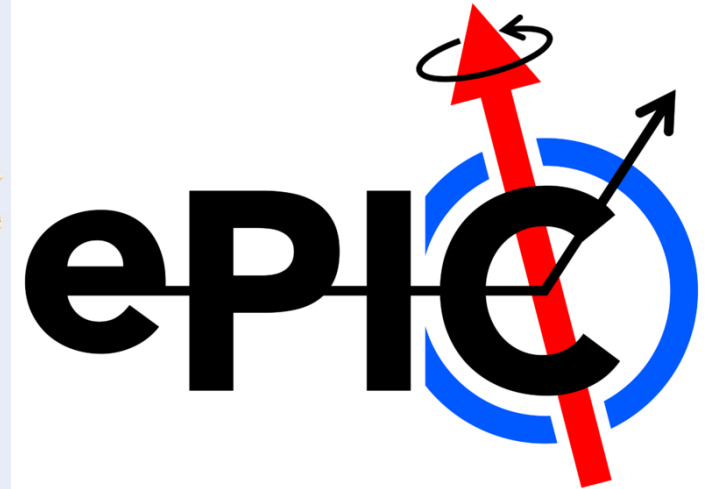
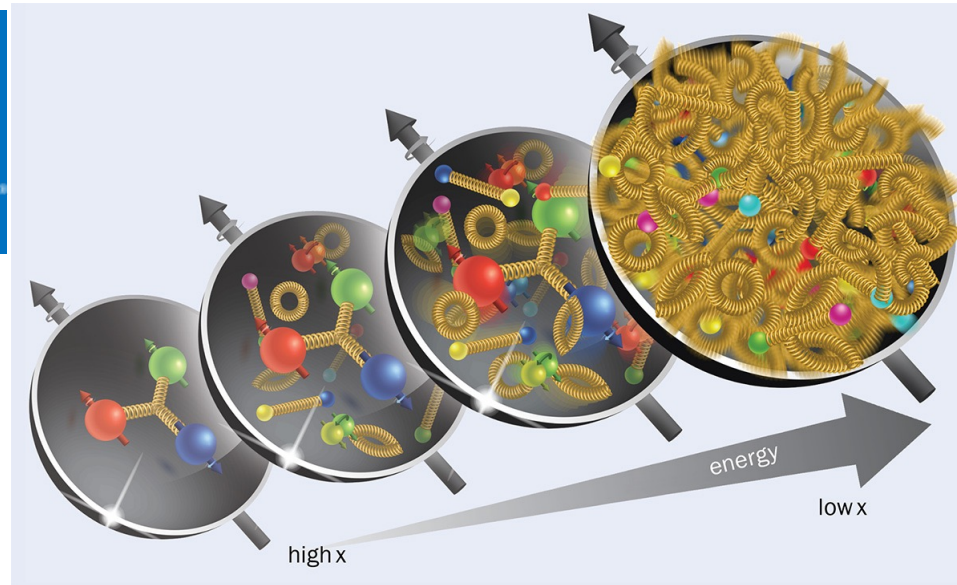


Kent State University applies for ePIC membership

Declan Keane, Spiros Margetis, Zhangbu Xu (Heavy-ion Physics)

Mina Katramatou, Gerassimos Petratos (Medium-Energy Physics)

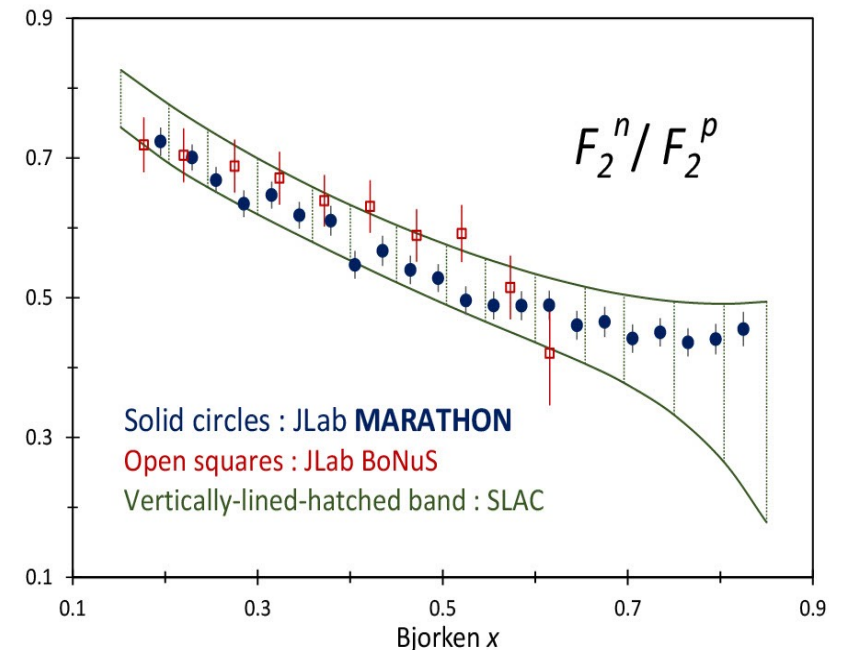
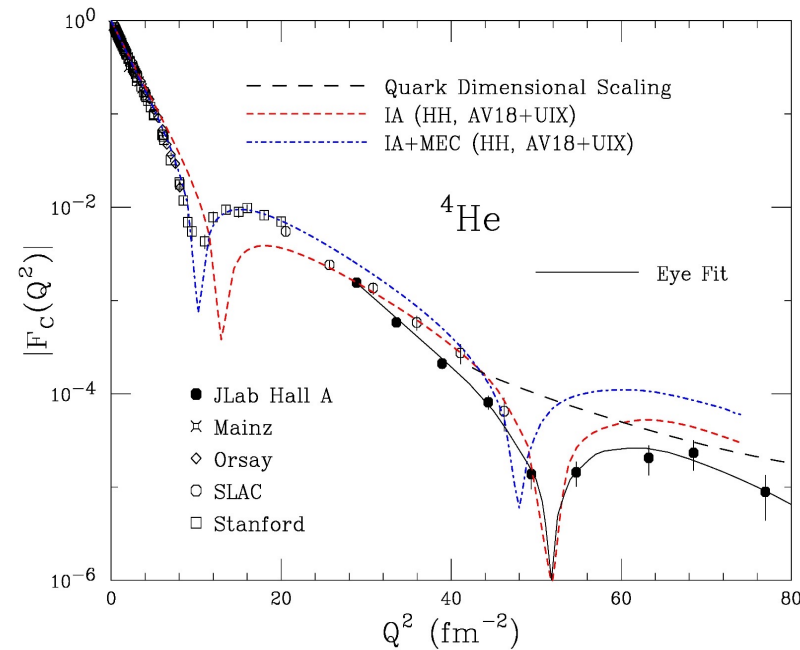
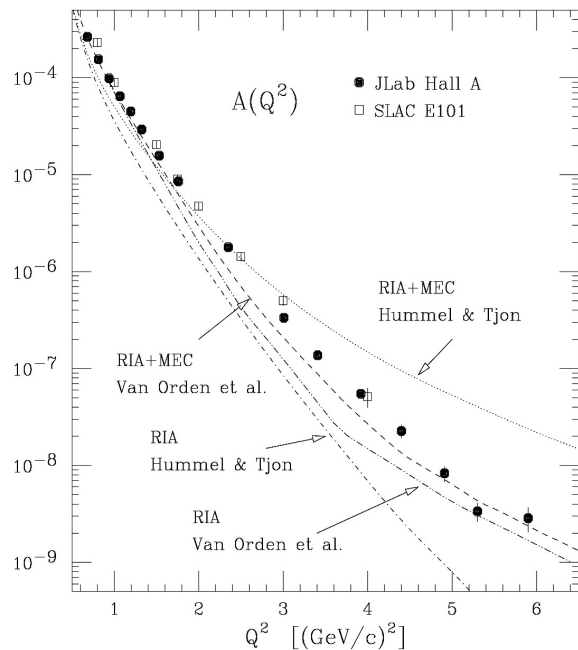


Kent State Heavy-Ion Experimental Research Group

- Three professors:
Declan Keane
Spiros Margetis
Zhangbu Xu
 - One Research Scientist:
Sooraj Radhakrishnan
 - Two postdocs
 - Three students
- Multi-decade experience with large collaboration management and contributions:
Spokesperson of E895 at AGS
Spokesperson of STAR at RHIC
Physics Analysis Coordinator of STAR at RHIC
DOE medium-energy program detailee
- Research focus of last two decades had been on relativistic heavy-ion physics with STAR at RHIC
 - **Physics Interests (readily relevant to EIC):**
Flow and QCD phase transition
Strangeness and heavy-flavor production
Search for antimatter nuclei and hypernuclei
photo-process in Ultra-peripheral collisions
Baryon and charge transport
 - **Hardware and software:**
TPC tracking and calibration
Silicon Tracker software
Gas Detector (TPC, MRPC)
ZDC detector construction and operation
Real-time Data QA

Kent State Medium-Energy Research Group

- Group currently consists of 2 faculty (Katramatou and Petratos), and one graduate student. In the past few years, 5 students received a PhD degree on Jefferson Lab (JLab) experiments' related subjects.
- The two professors have:
 - Worked on **elastic, quasi-elastic, and deep-inelastic electron scattering experiments**, starting in the early 1980's with the measurement of the A dependence of the EMC effect at SLAC (E139).
 - Been principal investigators of JLab experiments that measured the **deuteron $A(Q^2)$ elastic structure function**, and **the elastic form factors of ^3He and ^4He few-body systems**, at large momentum transfers.
 - Been principal investigators of a recent JLab experiment that measured precisely i) **the ratio of the F_2 structure functions of the nucleons**, and ii) **the EMC of the $A=3$ mirror nuclei**, using a tritium target.



Interests and involvements in ePIC and EIC

Zhangbu Xu, Sooraj Radhakrishanan

Previous and on-going work

Charm production simulation
and silicon tracker software

Diffractional VM production and PID

Baryon transport and carrier in SIDIS

ATHENA proposal writing committee member

EIC UG representative

ePIC council representative (BNL)

ePIC TOF common system co-manager

ePIC TOF Detector Subsystem Leader (DSL)

Proposed (additional) future work

- ePIC TOF DSL
- TOF backend electronics
- TOF/SVT related tracking and calibration
- **Applied what we learned at RHIC about projective imaging to exclusive vector meson production at EIC**
Collaborate with Rongrong Ma, Thomas Ullrich and Kong Tu (BNL)
- **Exploring the spin structure of the Pomeron at EIC with Quantum Entanglement we learned at RHIC**
Collaborate with Daniel Brandenburg (OSU), Kong Tu and Raju Venugopalan (BNL)
- **Vertexing and tracking development for ePIC at EIC**
Collaborate with LBL group (stationed at LBL)

EIC simulation of baryon vs charge transports

Summary of the 1st workshop on 2nd EIC detector (05/15/23)

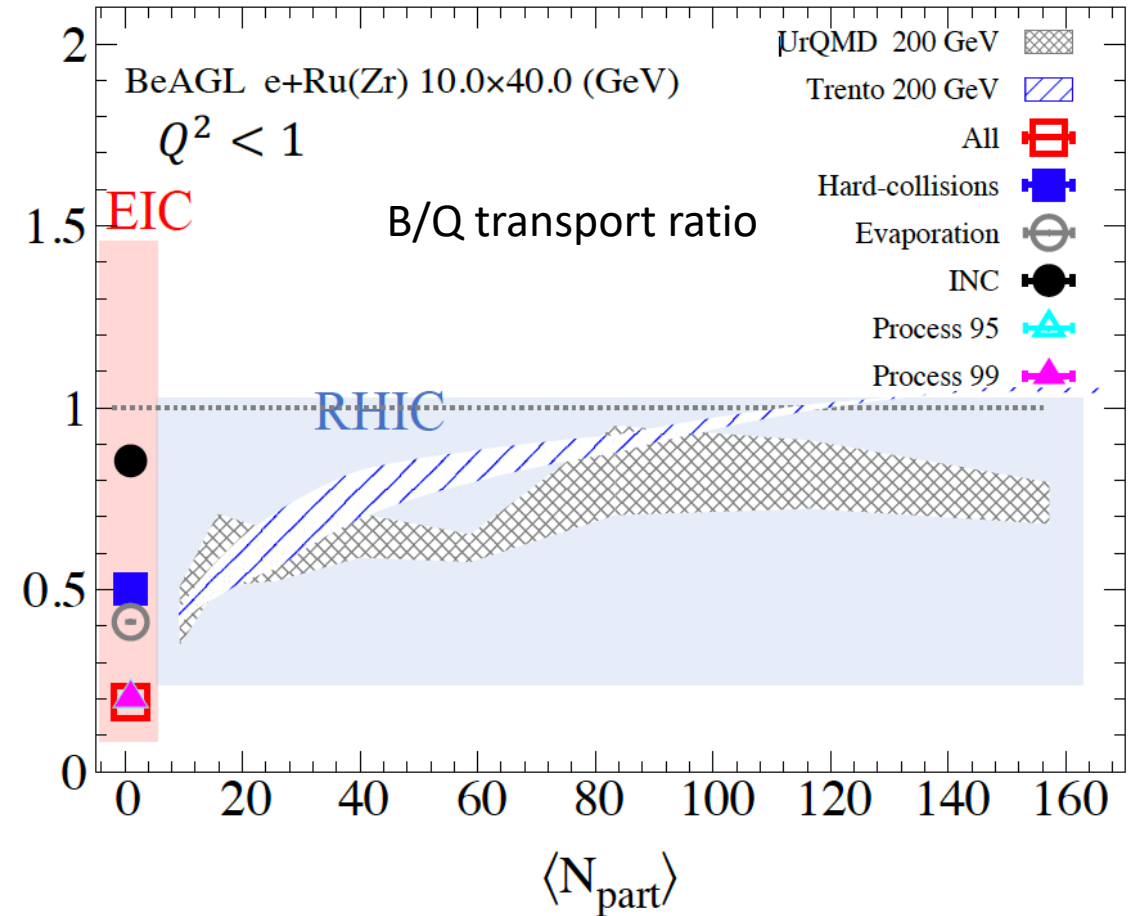
Golden Channels Strawman

CHANNEL	PHYSICS	DETECTOR II OPPORTUNITY
Diffractive dijet	Wigner Distribution	detection of forward scattered proton/nucleus + detection of low p_T particles
DVCS on nuclei	Nuclear GPDs	High resolution photon + detection of forward scattered proton/nucleus
Baryon/Charge Stopping	Origin of Baryon # in QCD	PID and detection for low p_T $\pi/K/p$
F_2 at low x and Q^2	Probes transition from partonic to color dipole regime	Maximize Q^2 tagger down to 0.1 GeV and integrate into IR.
Coherent VM Production	Nuclear shadowing and saturation	High resolution tracking for precision t reconstruction

These channels are just a starting point, a way to initially focus activities within the group. Additional ideas and efforts are welcome!

- Need small Q^2 , large rapidity coverage and low-momentum hadron particle identification
 $Q^2 \leq 1 \text{ GeV}^2$; $\pi/k/p$ PID $p_t \geq \sim 100 \text{ MeV}$
- Isobar collisions to measure charge transport (quark transport), Zr/Ru; $^7\text{Li}/^7\text{Be}$

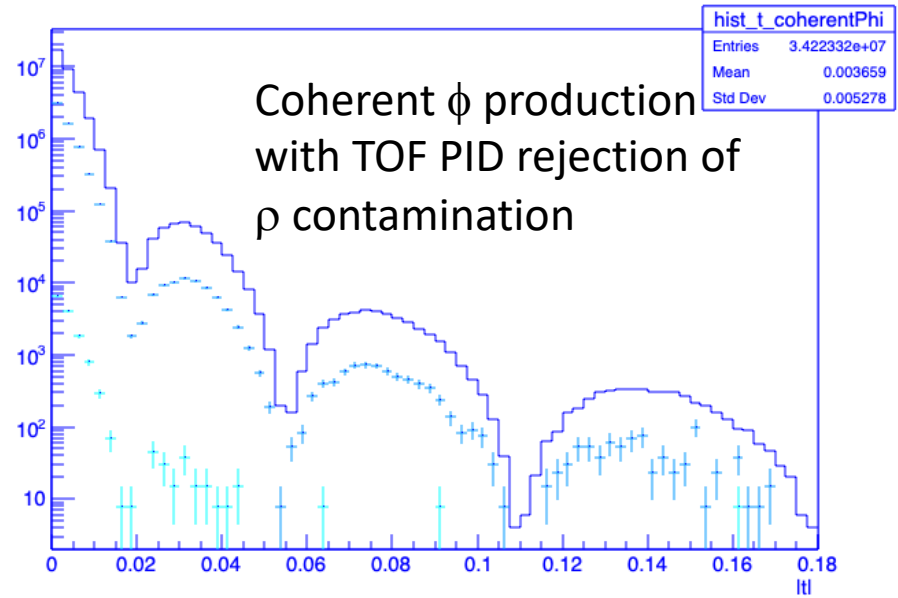
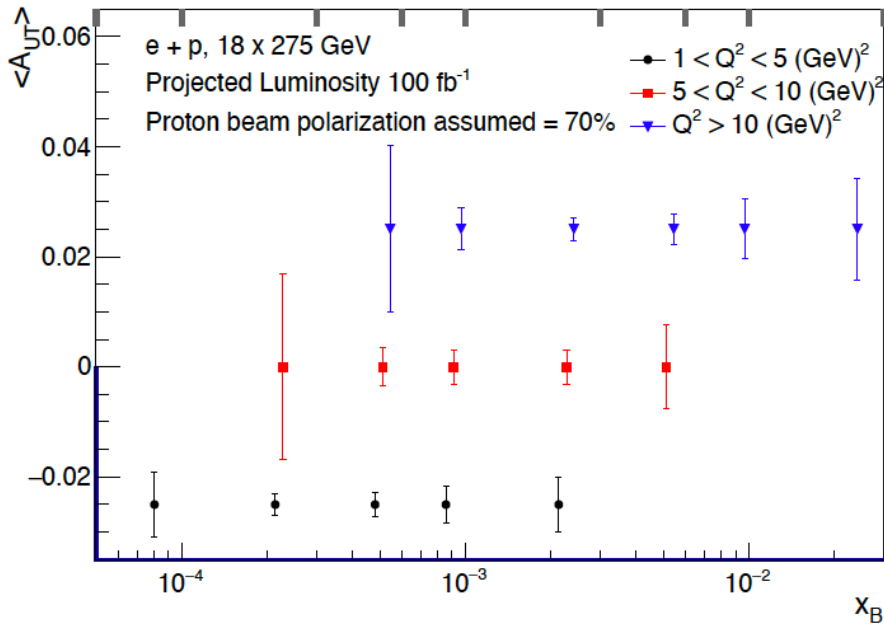
Niseem Magdy (SBU/UTK)



EIC can measure the baryon junction distribution function

Simulations of heavy flavor and VM diffractive

Particle ID



Dual-Radiator RICH(dRICH)

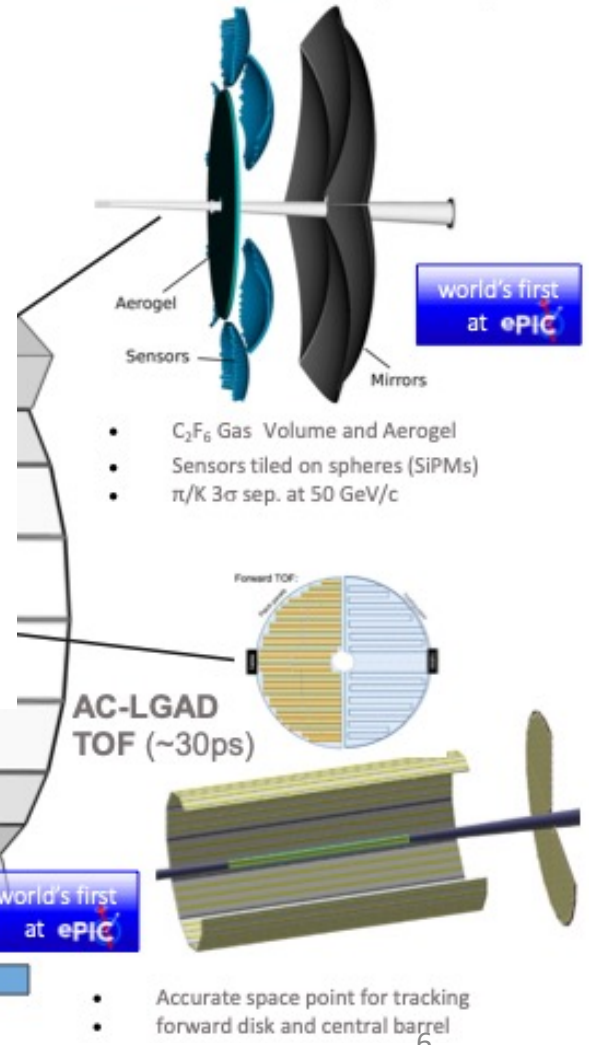


Figure 3: Projected statistical uncertainties for the transverse asymmetry for heavy-flavor hadron pairs, A_{UT}^h , shown as error bars, in different x_B bins for different Q^2 . The A_{UT}^h values around which the error bars are shown are arbitrary and chosen for plotting convenience. The projections are shown for a luminosity of 100 fb^{-1} $e + p$ collisions at beam energies 18×275 GeV. The bin boundaries in x_B corresponding to the projections are indicated by solid lines on the top axis.

Kent State Expertise/Interests and Possible Involvements

	Physics Interests /expertise	Involvement	Estimate Effort ~2 years	Estimate Effort >2 year
Zhangbu Xu	Baryon Junction, Diffractive VM and QM Entanglement; Charmed hypernuclei; TOF Detectors; ZDC	AC-LGAD TOF DSL; Backend electronics	50%	50%
1 FTE student +1 FTE postdoc	Baryon transport and VM simulations	Setup TOF LV/HV PS control/test/QA	50%	100%
Declan Keane	Exotics and small-system flow; ZDC	Supervision /committees	20%	20%
Spiros Margetis	Strangeness and Heavy-flavor production; tracking software	DOE detailee (2025)	0%	50%
Sooraj Radhakrishnan	Heavy-flavor and small-system flow; tracking software	Silicon Tracking simulations	20%	50%
Mina Katramatou Gerassimos Petratos	DIS, nuclear structure functions, quasi-elastic scattering; nucleon spin	Supervision /committees	10%	30%

Additional Research Resources at Kent State

CENTER FOR NUCLEAR RESEARCH

Kent / Physics / Research / Center For Nuclear Research



CNR was established in 1988 by the state of Ohio to support, enhance, and promote nuclear physics academic activities in the KSU Physics Department. CNR faculty includes theorists and experimentalists doing research in the areas of high-energy nuclear physics and astrophysics.

- Physics Department total faculty 30
- 3 high-energy nuclear experimental professors (RHIC, EIC)
- 2+1 high-energy/astrophysics nuclear theorists (department chair)
- 2 nuclear structure and medium-energy nuclear experimentalists (JLab Hall A)
- Excellent track record of diverse graduate students