EIC Yellow report activities in Jet and Heavy Flavor from Stony Brook University

- People Involved :
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  - Experiment : <u>Roli Esha,</u> <u>Mriganka Mouli Mondal</u>, Meng Jia Ou, Abhay Deshpande

- Our Interest : Jet (Event) substructure

  - as it changes as a function of polarization

  - the effect of nuclear medium

  - emergence of jets as a function of CM energy
  - exploring the advantages of using observables in the Breit Frame

- Currently using event generators like PYTHIA-6/8, BeAGLE
  - Jet reconstruction using FASTJET

Jets Substructure/Spin dependent fragmentation inside jets – some ideas

- Reconstructing jets in Breit frame (referencing the photon)

- Tagging jets from struck quark (final-state radiation, FSR), initial-state radiation (ISR), and spectator (forward), and their correlations

- Tagging jet polarization using IRC safe observables, relating them to Collins and Sivers functions

- Tagging spectator jets to constrain the hard process and Parton distribution function

- Tagging photons within jets

- Constraining target fragmentation

And relevance of nuclei in studying these

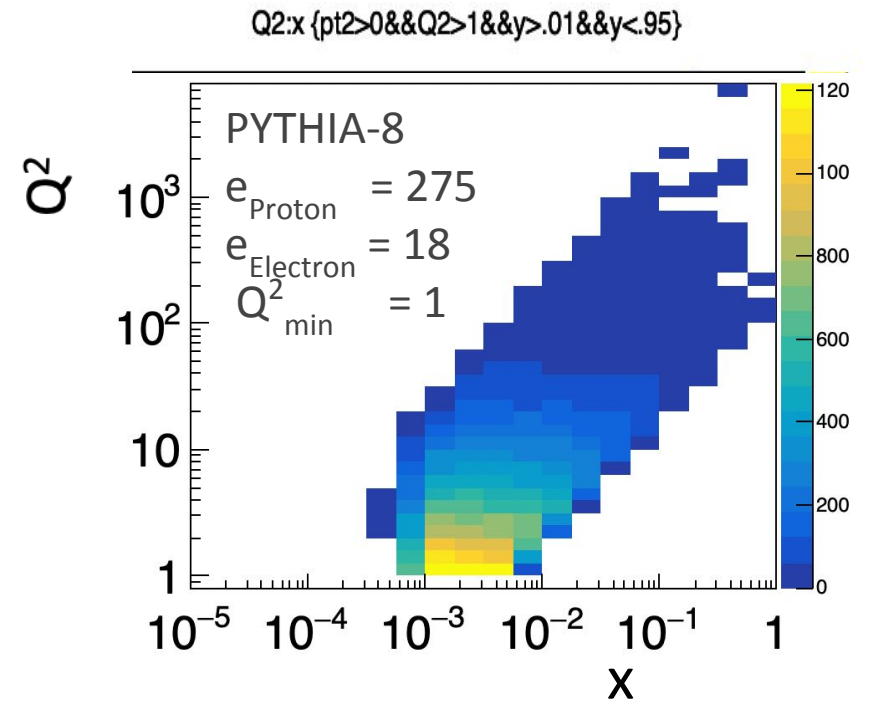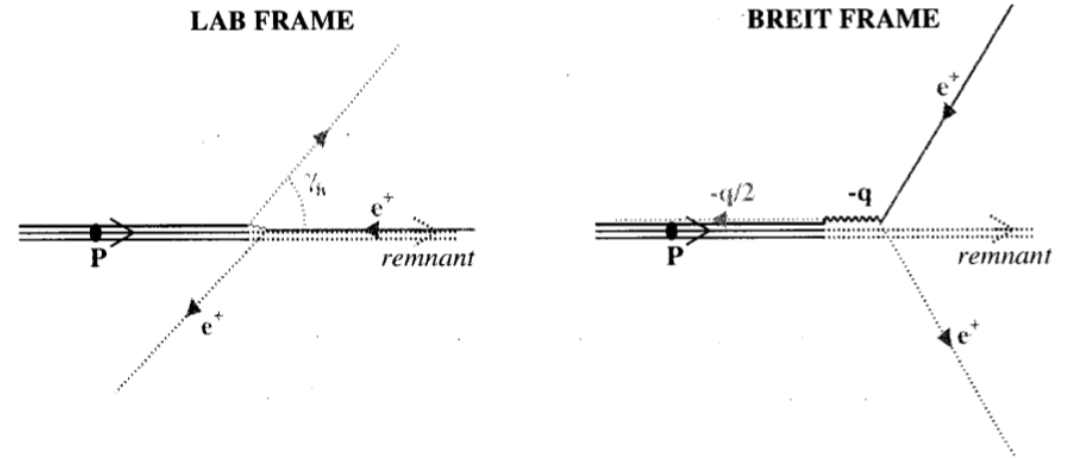# Jet substructure in ep

- **Jet reconstruction at generator level**
  - Pythia-8 vs. Pythia-6
  - Jets in Breit frame - struck parton and proton remnant are in opposite directions
  - Jets grooming

- **Using eic smear**
  - acceptance and efficiencies at forward rapidity
- **eA can be used for same set of studies**

LAB FRAME   BREIT FRAME

$Q2:x \{pt2>0 \&\& Q2>1 \&\& y>.01 \&\& y<.95\}$

PYTHIA-8

$e_{Proton} = 275$

$e_{Electron} = 18$

$Q^2_{min} = 1$

Jets in eA - effect of the nuclear medium

- Using BeAGLE event generator, compare observables across different systems and energies :

e (10, 18) + Au (100)   e (10, 18) + C (100)   e (10, 18) + d (100)

- Precision measurement of neutron PDF by tagging forward proton
- Insight into the nuclear structure - relation between impact parameter and jet characteristics
- Definition of jets - in a traditional sense - as we vary the CM energy
- Interaction between forward jets and beam remnants (effect of spectator on hard processes)