


Jets at $CCCE$

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Outline

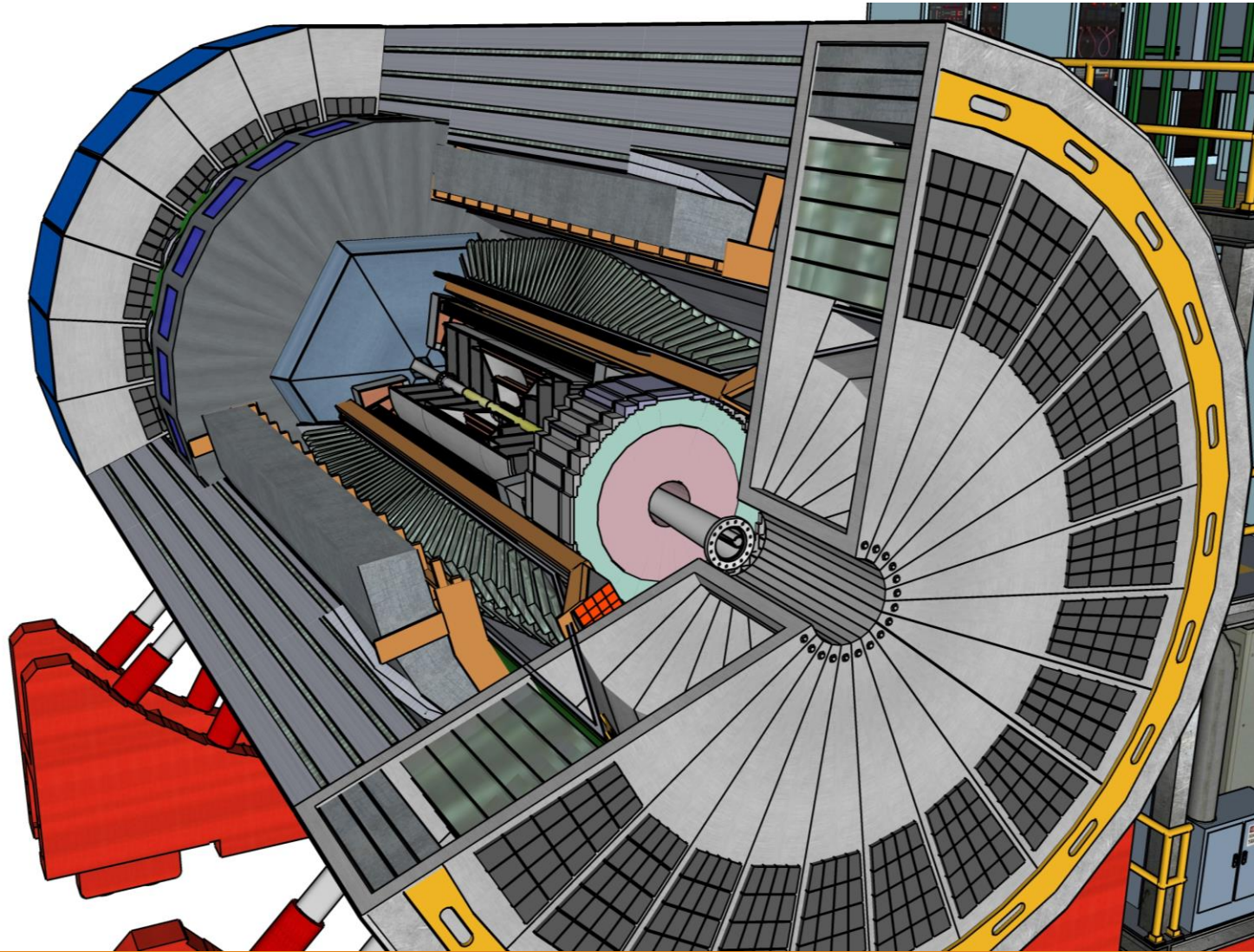
(Probably won't keep this slide, just for me)

- What is 
- Why study jets at the Electron Ion Collider?
- Track jet performance
- Calorimetry jet performance
- Future Improvements

What is ECCE?



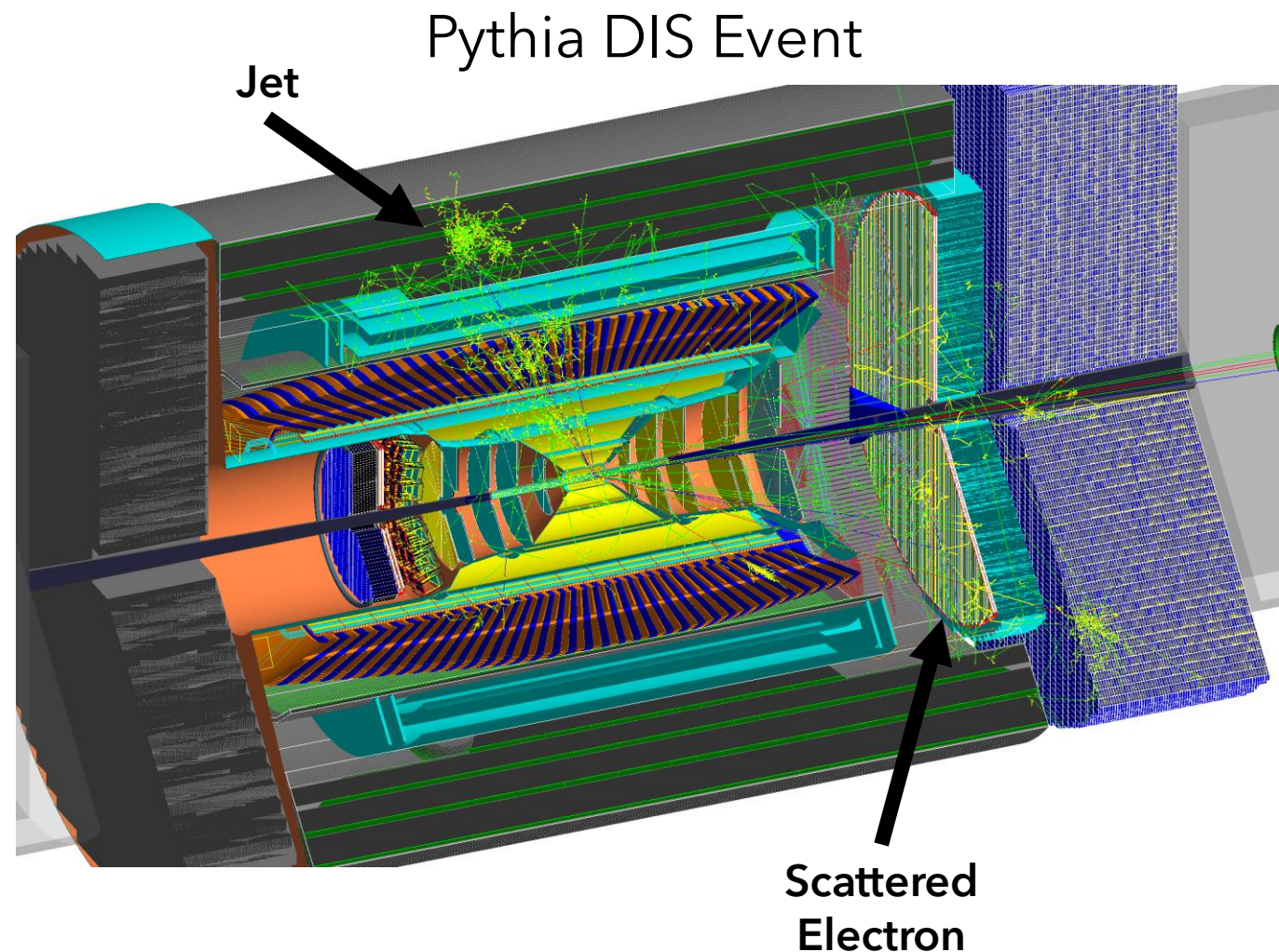
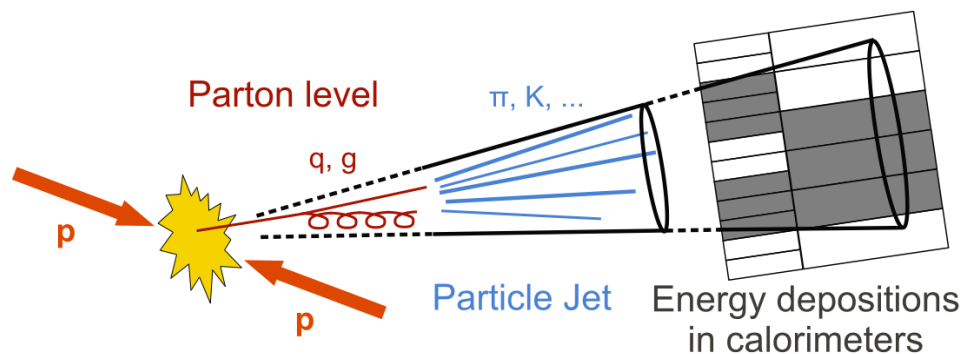
- A global collection of 80+ institutions working to design an EIC detector offering full kinematic coverage and an optimized far forward detector system
- ECCE will submit a proposal to be the EIC project detector, demonstrating it can address the complete EIC science program



Jets in ep and eA Collisions



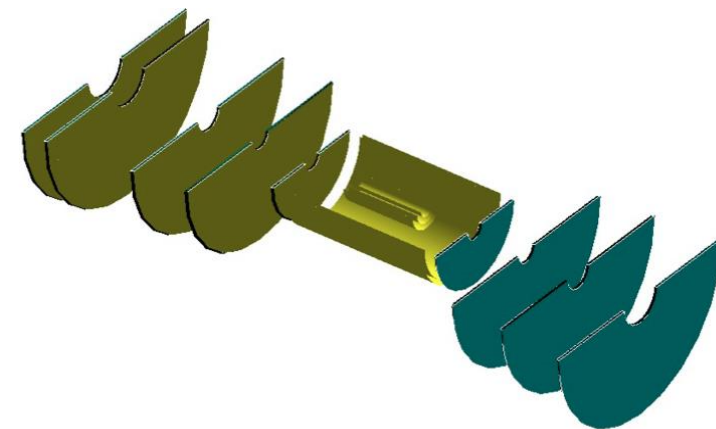
- Jets offer a view into parton kinematics
 - They correlate with the parton which form them
- Jet structure can yield insight into the hadronization process



Tracked Jets, Detectors



- ECCE has tracking capabilities across a wide pseudorapidity range
- AI optimized inner tracker
- 4 disc Micro Pattern Gaseous Detector electron endcap tracker
- 5 disc Micro Pattern Gaseous Detector hadron endcap tracker

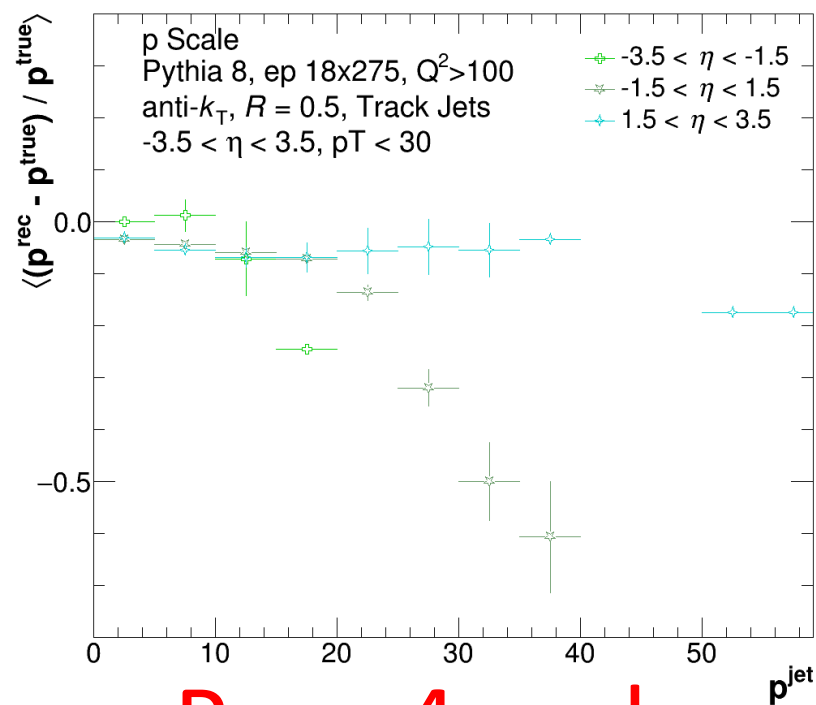


Tracked Jets, Momentum

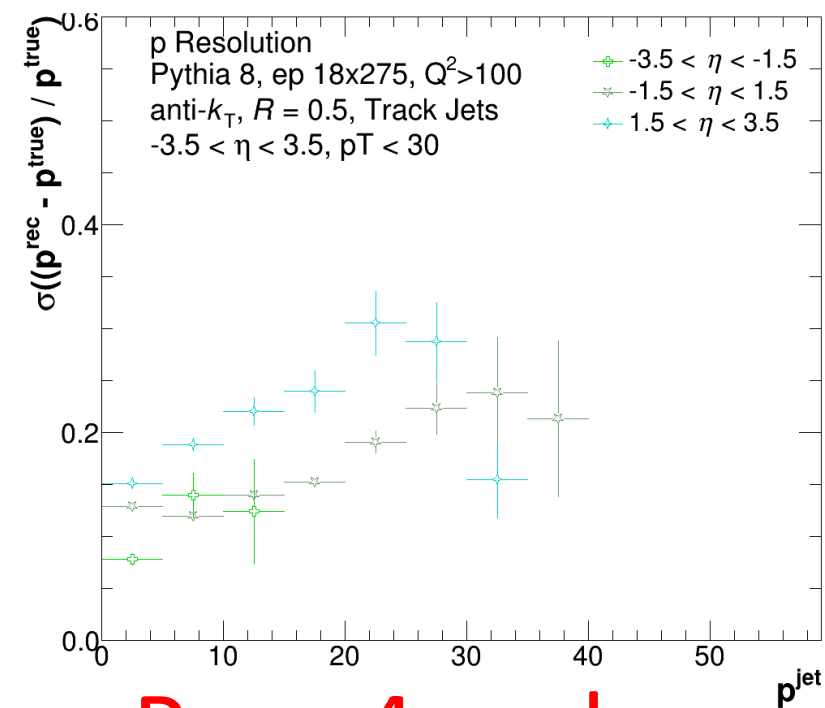


The tracking systems enable excellent jet momentum measurements

- Scale better than -0.3 at low
- Resolution better than 0.2



Prop.4 early

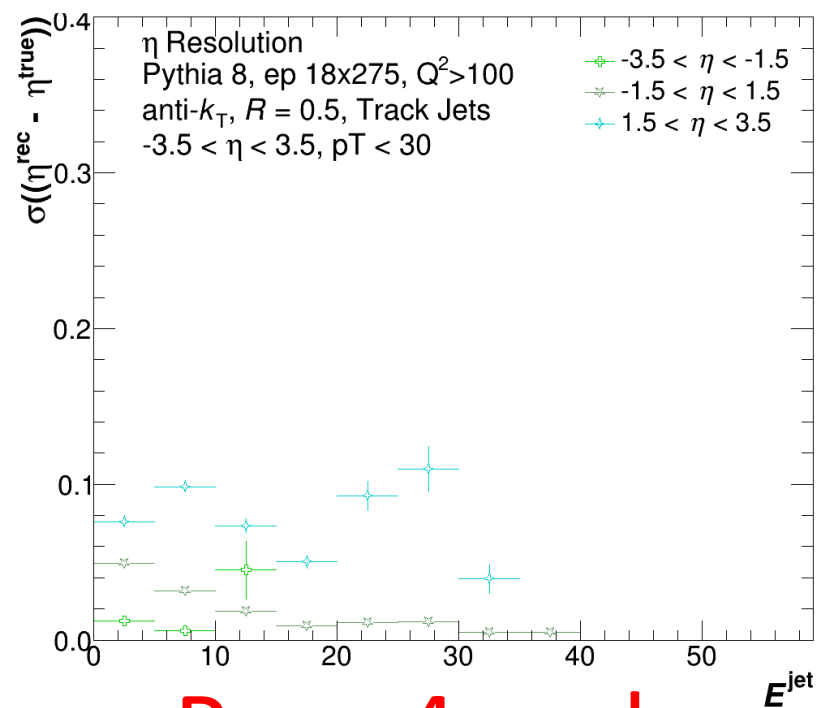


Prop.4 early

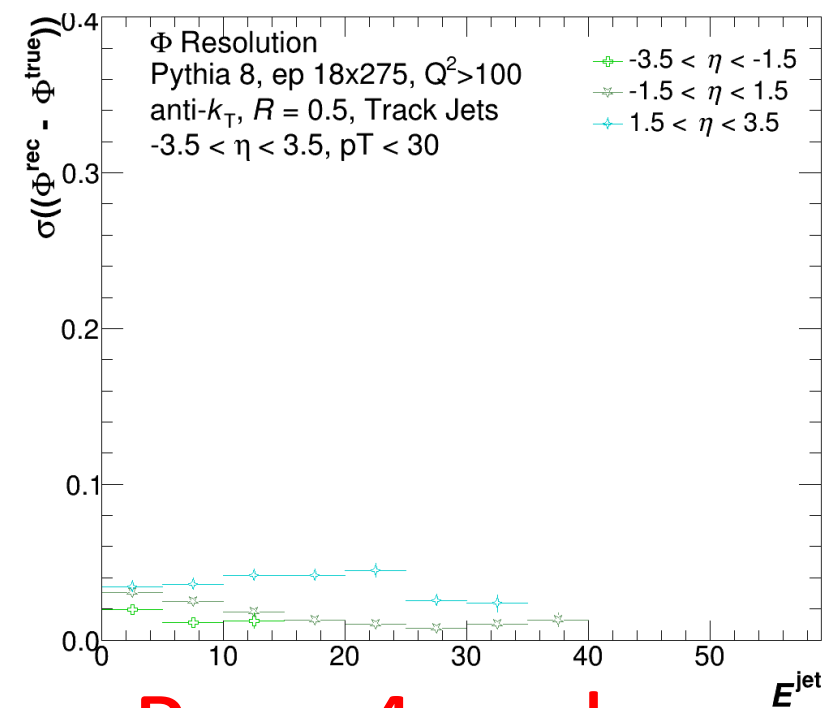
Tracked Jets, Position



- Excellent spatial resolution as well
 - Less than 1 in pseudorapidity
 - Less than 0.5 in azimuthal angle



Prop.4 early

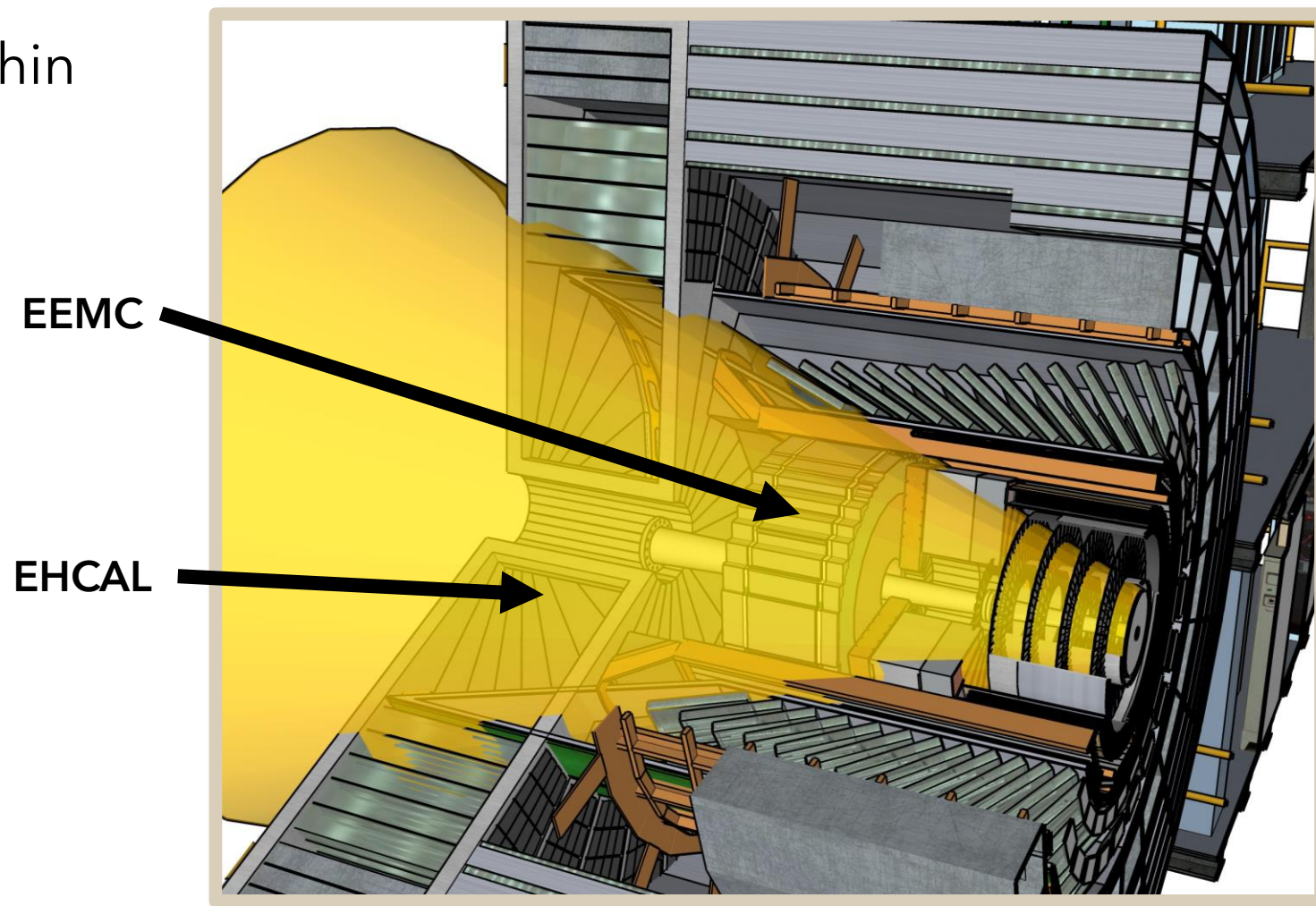


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Calorimetry Jets, Detectors



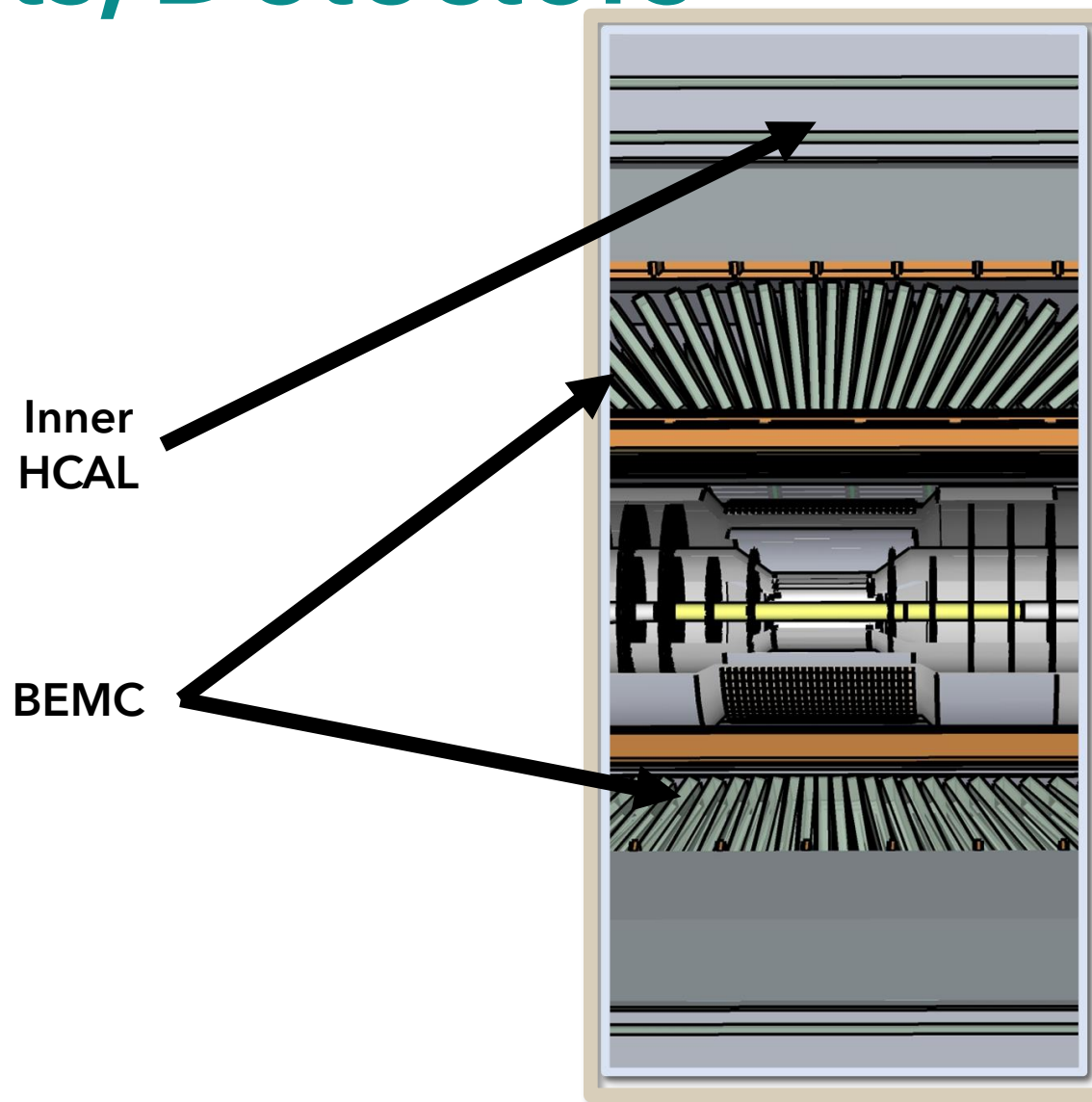
- ECCE has calorimetry within the range $-1.75 < \eta < 3.5$
- Electron Endcap
 - EEMC
 - EHCAL
- Center Barrel
 - BEMC
 - Inner HCAL
 - Outer HCAL
- Hadron Endcap
 - FEMC
 - FHCAL



Calorimetry Jets, Detectors



- ECCE has calorimetry capabilities in all regions
- Electron Endcap
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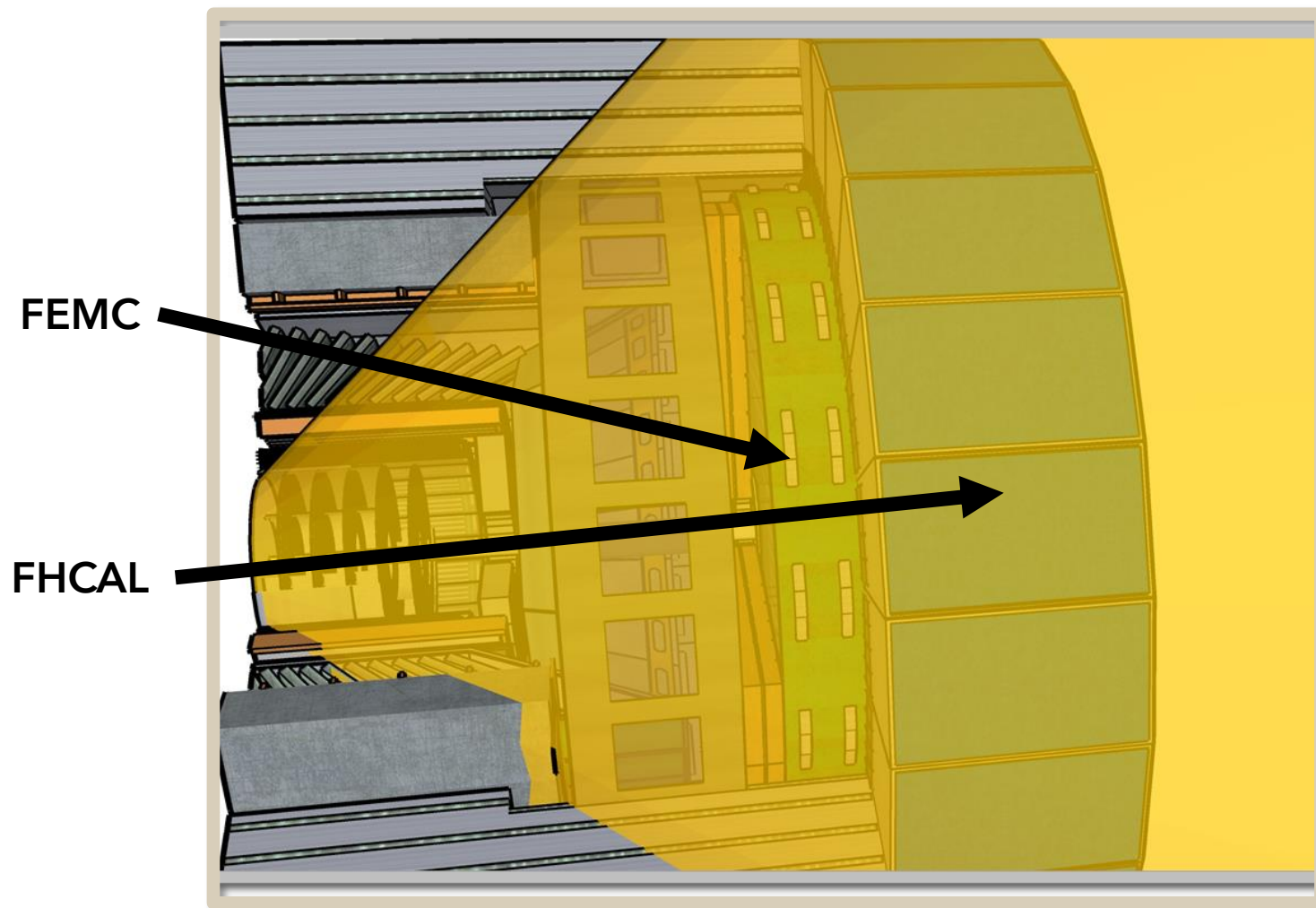


I can either find or make a better image for this, but this is what I had on hand

Calorimetry Jets, Detectors



- ECCE has calorimetry capabilities in all regions
- Electron Endcap
 - EEMC
 - eHCAL
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Calorimetry Jets, Clustering



- Individual calorimeter towers is grouped into clusters
- Clustering routines continue to be analyzed and tuned for each calorimeter
- V3 – Groups neighboring towers with smaller energy into clusters
- MA – Clusters along diagonals as well

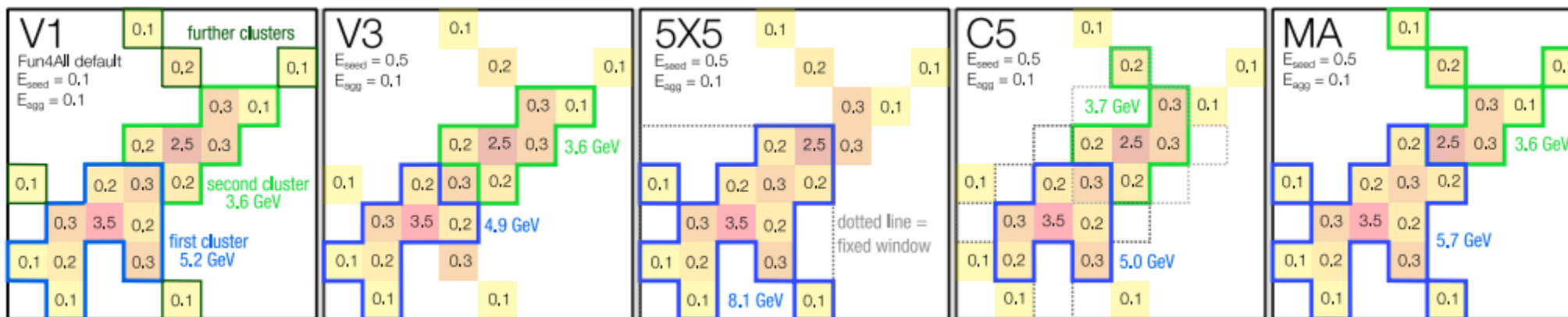


Image courtesy F. Bock

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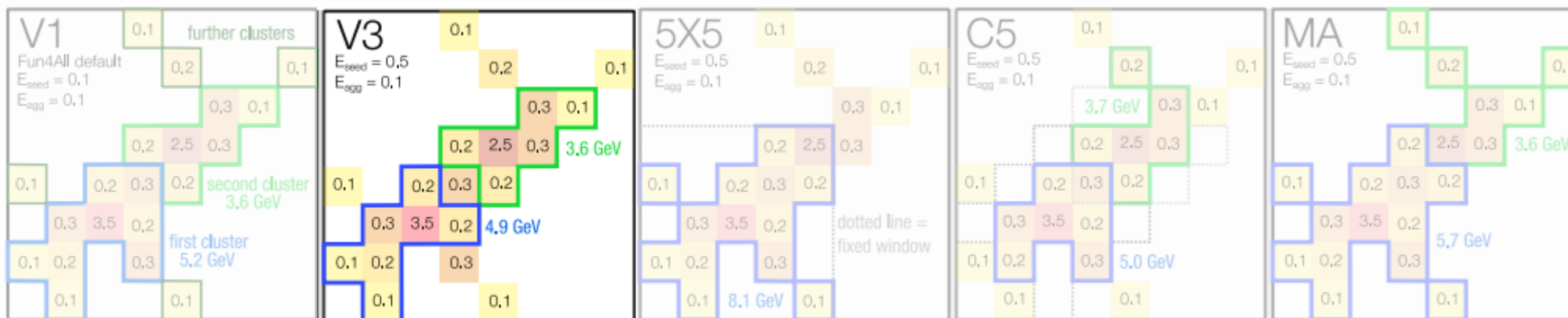


Image courtesy F. Bock

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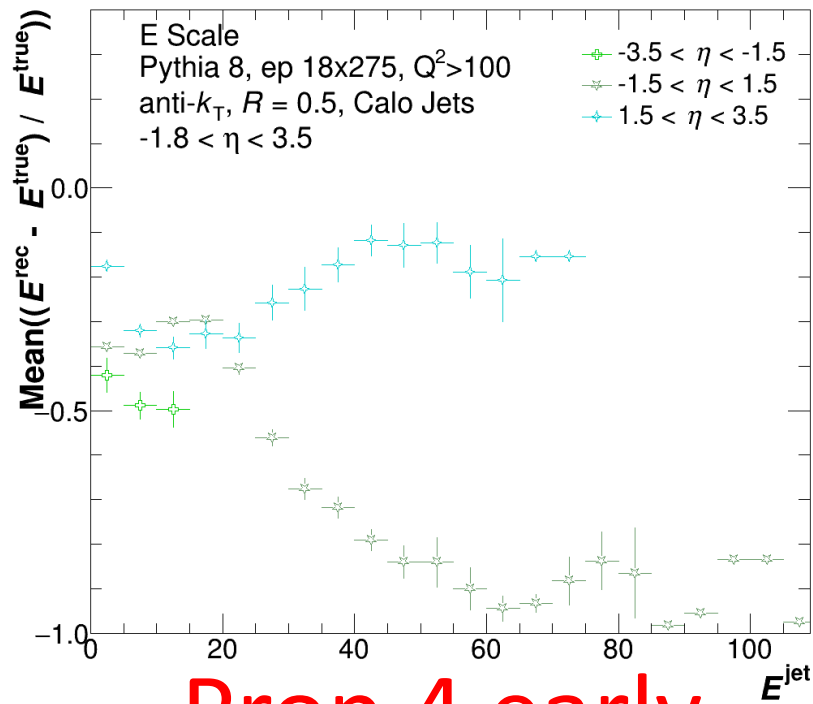


Image courtesy F. Bock

Calorimetry Jets, Energy

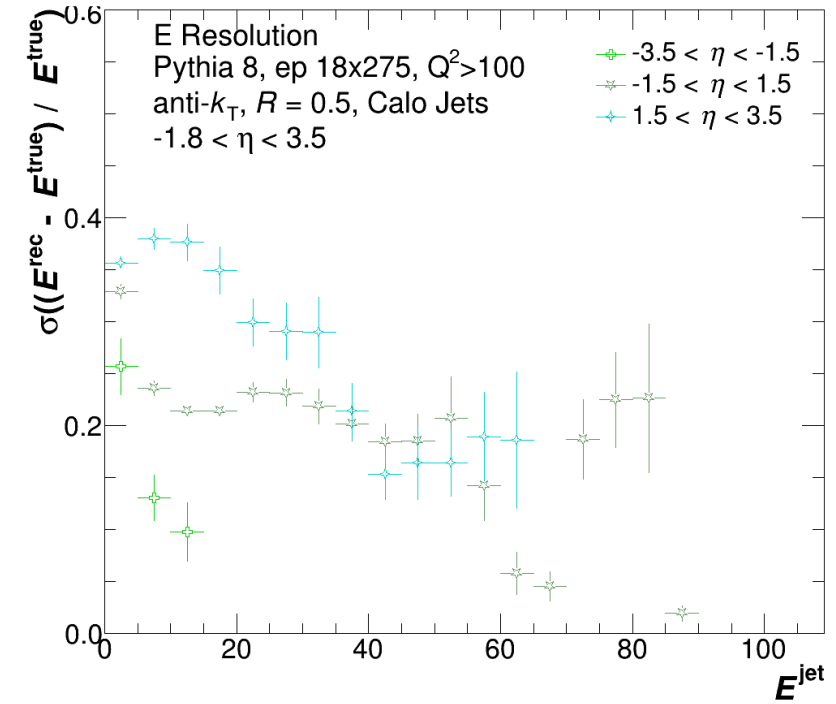


- The energy scale... well let's see what this looks like once we have prop.4 tuned



Prop.4 early

- The resolution is good, always less than 0.4 and trends better for higher energies

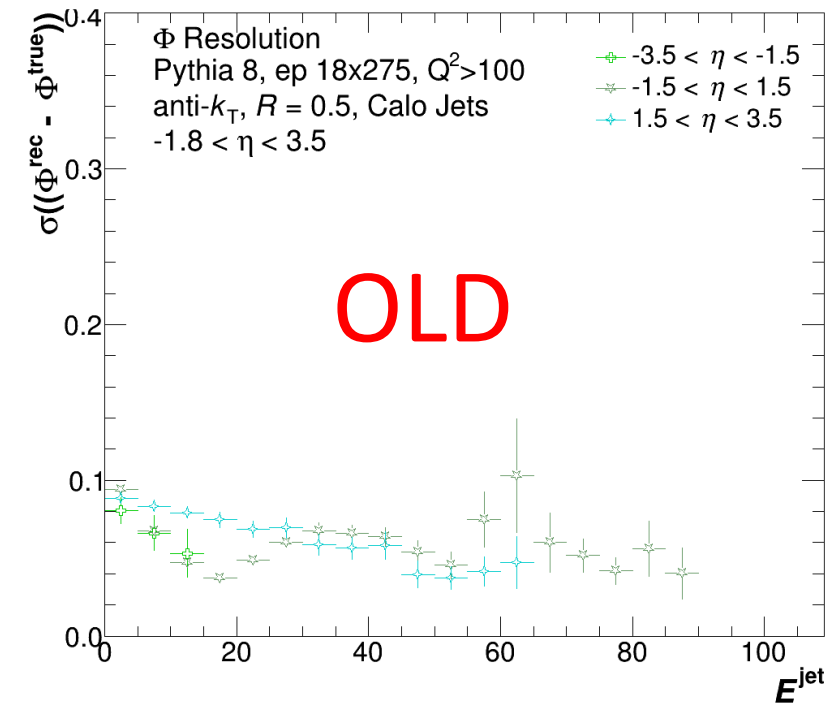
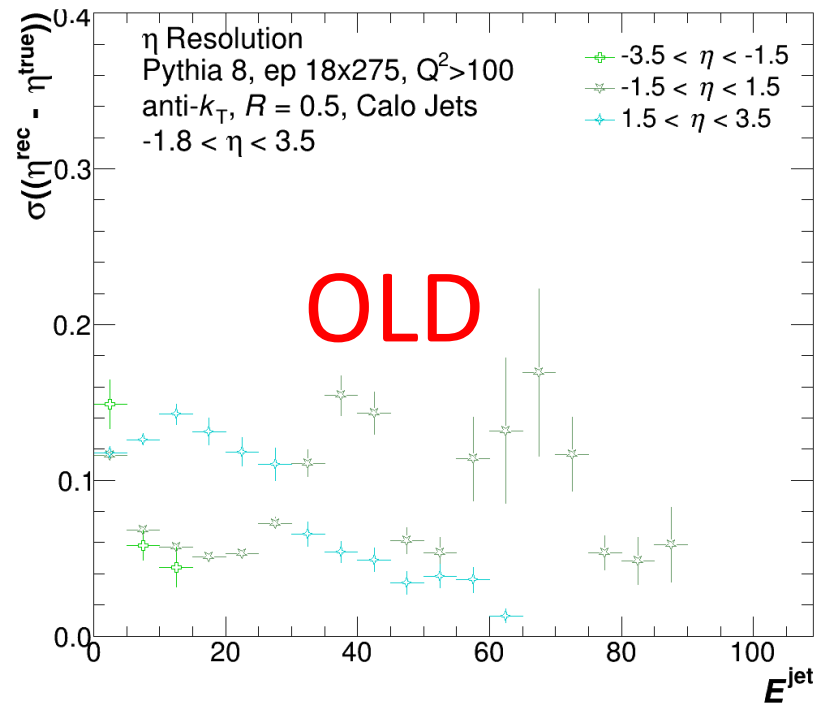


Prop.4 early

Calorimetry Jets, Position

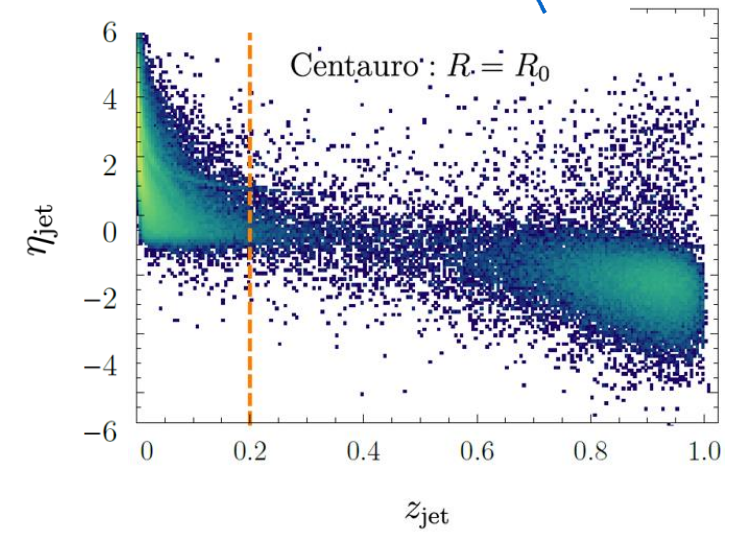
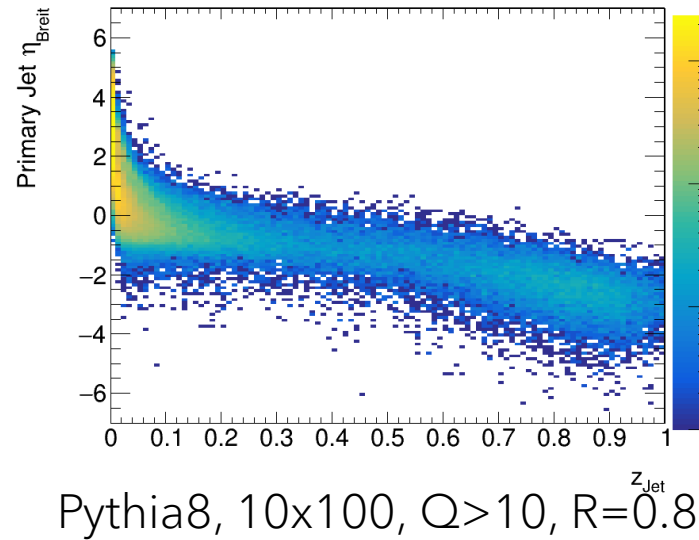
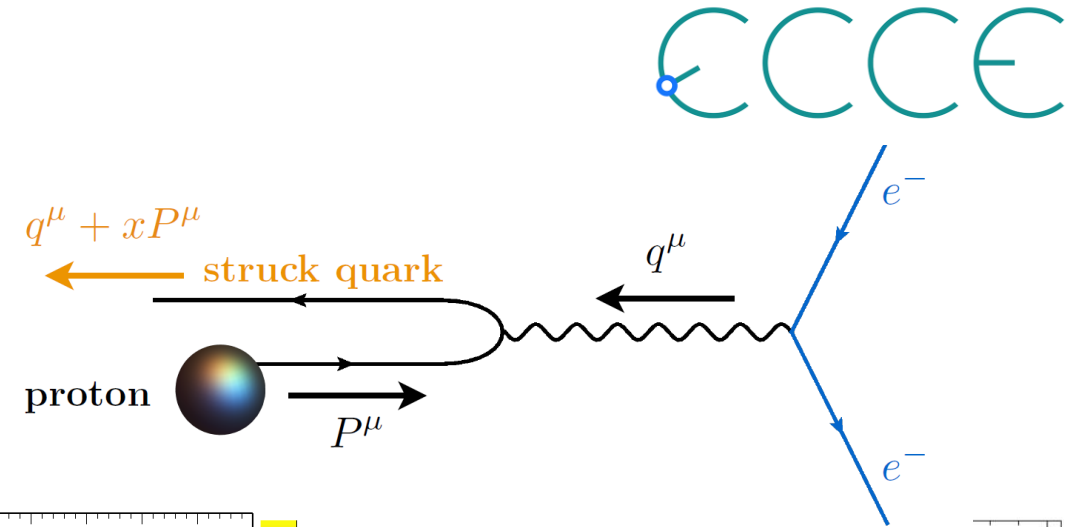


- In both pseudorapidity and azimuthal angle, the spatial resolution of the calorimetry system 0.15 and 0.1 respectively



Centauro Algorithm

- Breit Frame
 - The virtual photon has only momentum along -z axis
- Centauro Algorithm
 - Allows separation of the current jet from beam remnant jets
 - Longitudinally invariant
 - Like anti- K_T
 - But, spherically invariant in negative rapidity

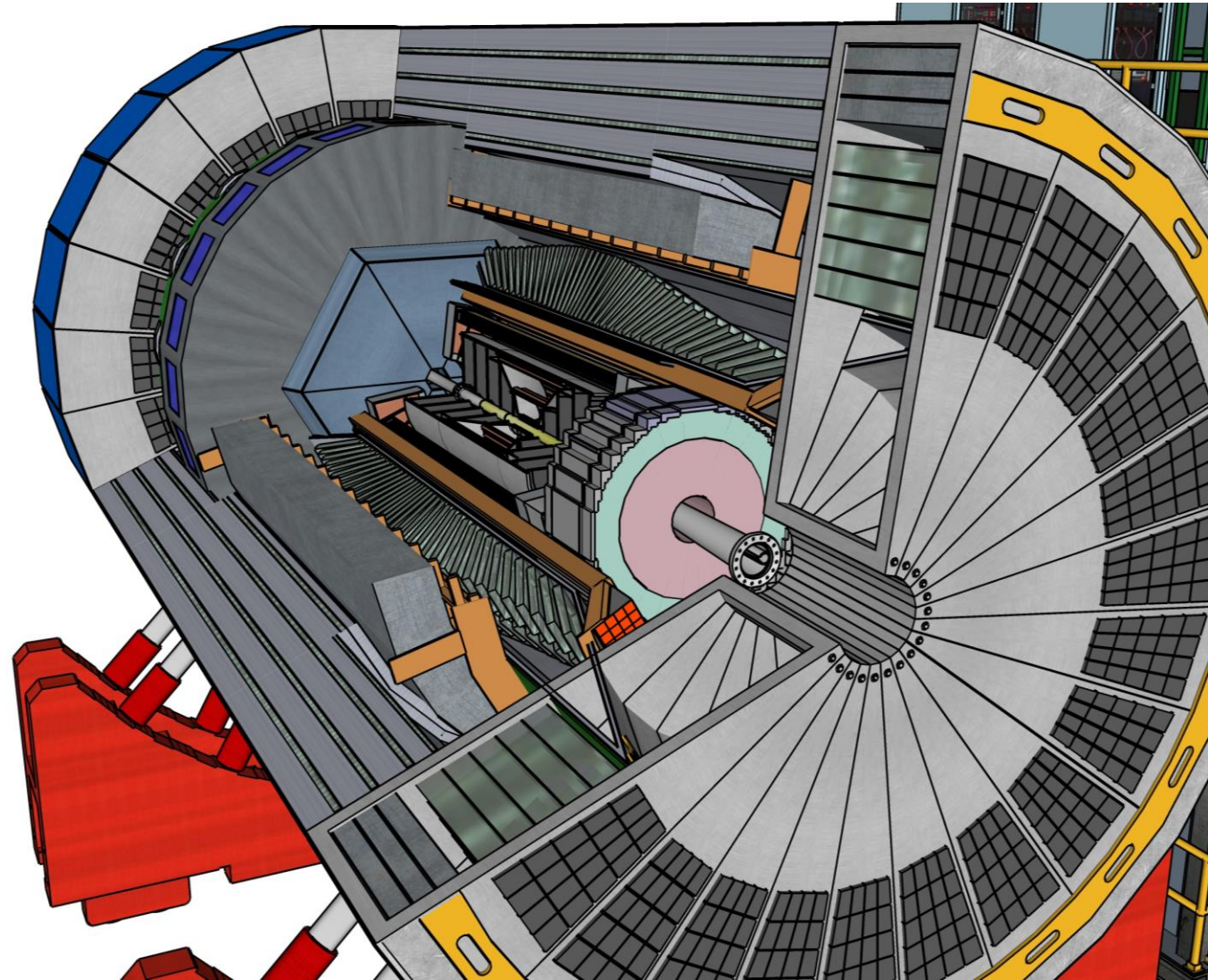


M. Arratia, Y. Makris, D. Neill, F. Ringer, and N. Sato
 Phys. Rev. D **104**, 034005 (2021)

Conclusions



- Jets offer powerful probe into EIC physics
- Ecce offers excellent scale and resolution across full acceptance range
 - Track jets:
 - Scale better than 0.06
 - Resolution better than 0.2
 - Calorimetry jets
 - Scale better than **INSERT**
 - Resolution better than 0.4



BACKUP

TEMPLATE SLIDE



- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
- Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.

