ECCE Jet R_{eA}

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Updates from last Friday

- Resolved scaling issues:
  - Weight is now taken as nPDF / proton PDF evaluated at same x, Q^2
    - Previously didn't account for impacts of proton PDF
  - Weighted eA spectra are now similar to ep
  - Sidesteps other issues about absolute value of PDF
  - See backup for quick comparison
- Removed 1/A factor in R_{eA} expression that was included last time
- Many small bug fixes: calculating kinematics, acceptance, etc

Note for analyzers

- Something for event evaluator users to watch out for: variables with the same name have different meaning in the PYTHIA6 vs PYTHIA8 output
- In PYTHIA8:
  - `_hepmcp_Q2` is **actually** Q (actually, `info::QRen()`), not Q^2
  - `_hepmcp_x1` is the quark x
- In PYTHIA6:
  - `_hepmcp_Q2` is truly Q^2
  - `_hepmcp_x1` is the quark x
- If you calculate these things yourself, you'll be fine
  - Alternatively, handled properly in my branch of the afterburner

Reminder: analysis parameters

- Using $Q^2 > 100$ PYTHIA8 production from `prop.4`:
  `HFandJets/pythia8/ep-10x100-q2-100/`
  - $1 < Q^2 < 100$ is qualitatively the same up until statistics run out, so I'll stick with the high Q^2
  - May switch to PYTHIA6, but stayed with PYTHIA8 given the evaluators that were available
- Jet finding with anti-k_T R = 0.3, 0.5, 0.8, and 1.0
  - Constituents: $p_T < 30$ GeV/c
  - Requiring at least two constituents, based on John's Centauro studies.
- Charged and calo jets for today

Reminder: measuring the R_{eA}

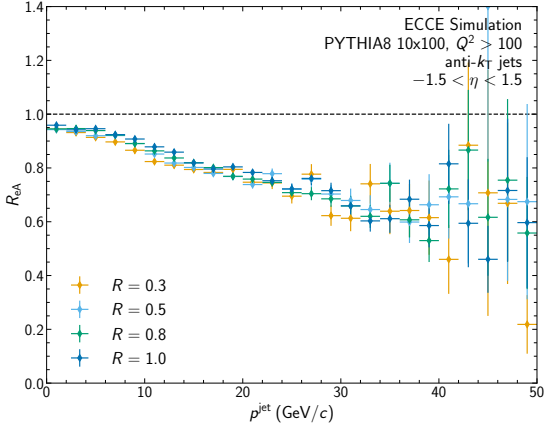
- Using $Q^2 > 100$ PYTHIA8 production from `prop.4`:
  `HFandJets/pythia8/ep-10x100-q2-100/`
  - Used subset of stats just for development
- R_{eA} defined as:

$$R_{eA} = \frac{\int_{\eta_1}^{\eta_2} d\sigma/d\eta dp|_{eA}}{\int_{\eta_1}^{\eta_2} d\sigma/d\eta dp|_{ep}}$$

- Calculating ReA using nPDF scaling as proposed by Nathan
  - Using `EPPS16nlo_CT14nlo_Au197` so far
  - Could add other nPDFs, but variations on a single nPDF may be enough
  - Normalized by `CT14nlo`.

Charged jet R_{eA}

Barrel



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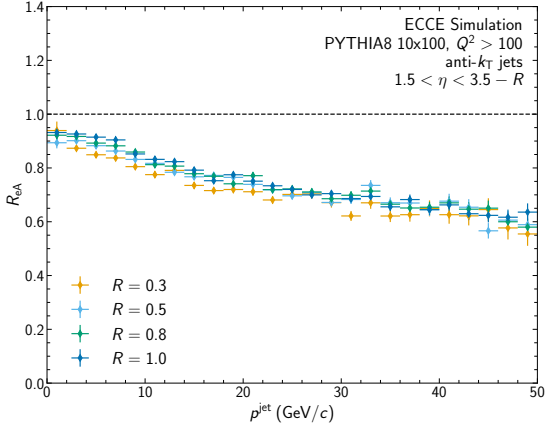
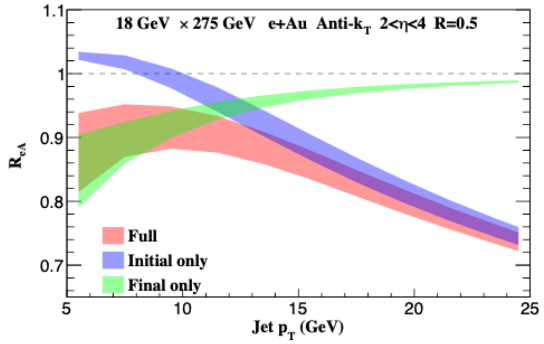


Charged jet R_{eA}

- Shape and scale are similar (now, for p_T)
- NOTE: We only have initial state effects

Yellow report



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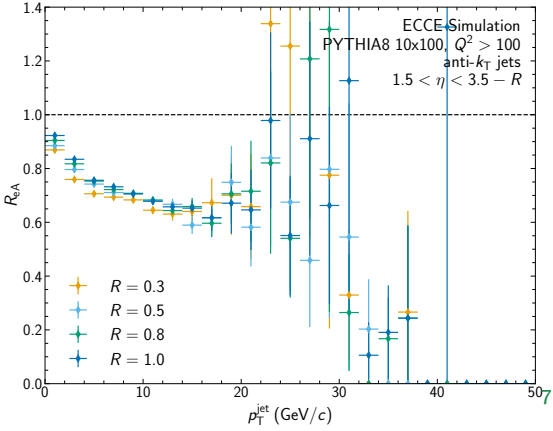
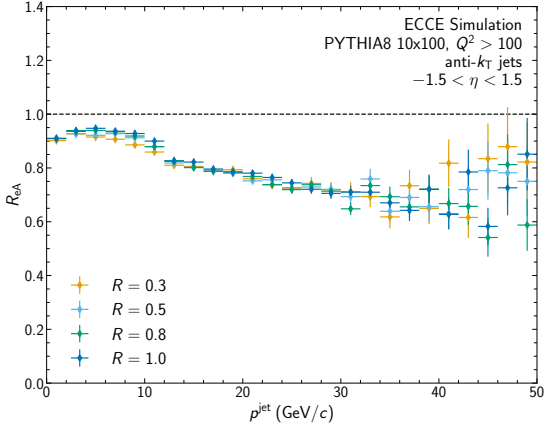


Charged jet R_{eA} - true

Barrel



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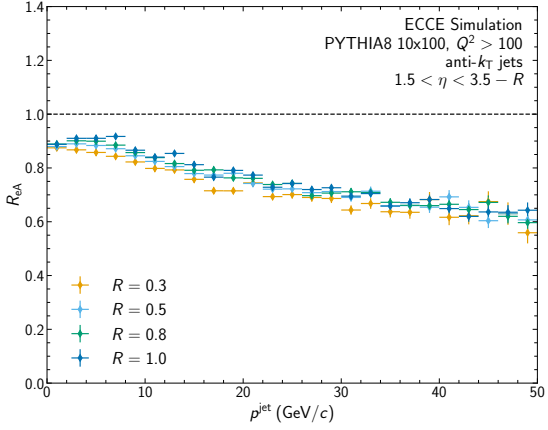
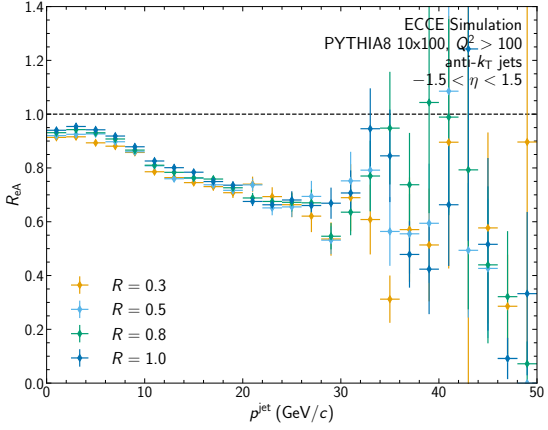


Calo jet R_{eA}

Barrel



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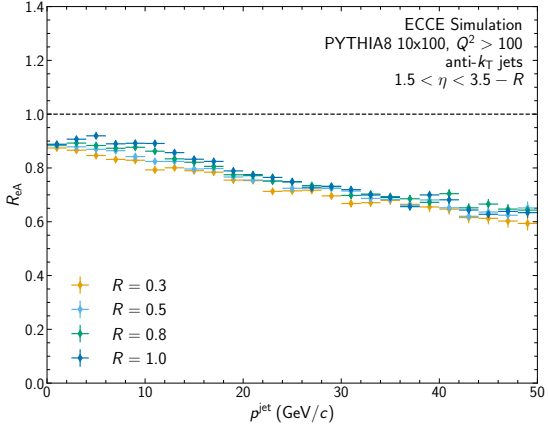
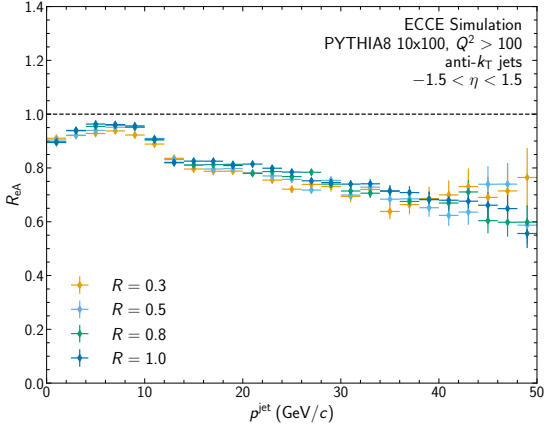


True jet R_{eA}

Barrel



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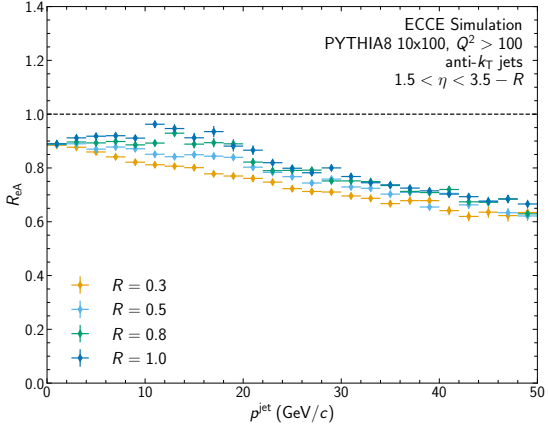
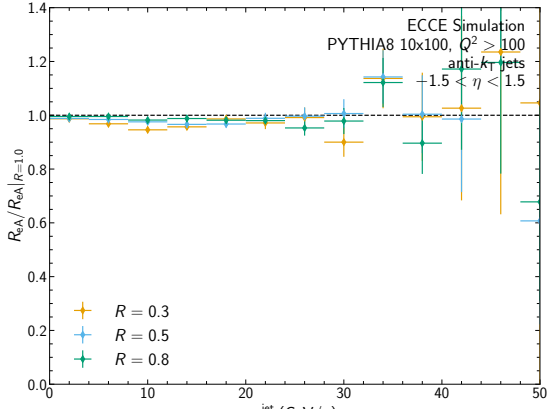


R_{eA} ratios: charged jets

- Seems to be under much better control, with correct ordering forward

Barrel



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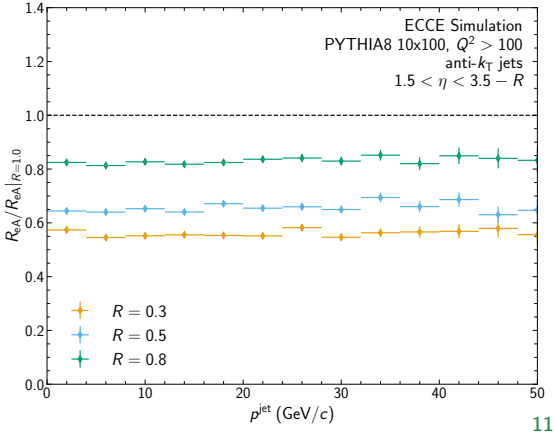
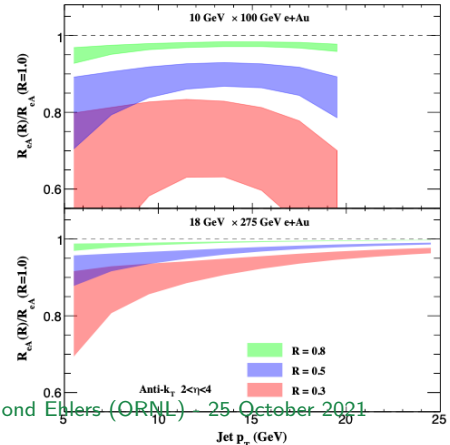


R_{eA} ratios: charged jets vs YR

- A bit low for large R compared to upper YR panel, but generally fine
- Mostly consistent within uncertainties, maybe due to nPDF variations

Yellow Report



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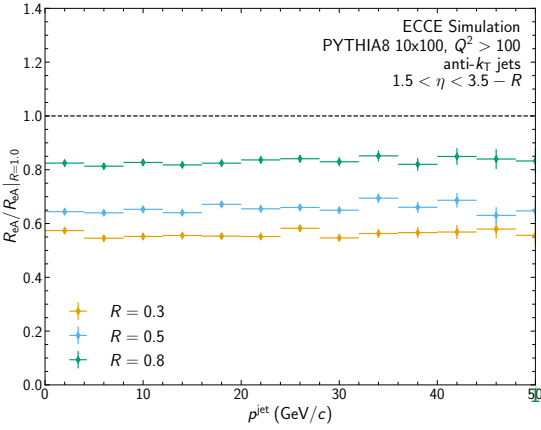
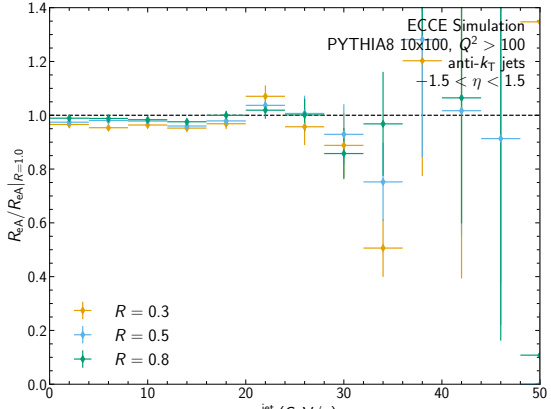


R_{eA} ratios: calo jets

- Same story for calo jets as charged jets

Barrel



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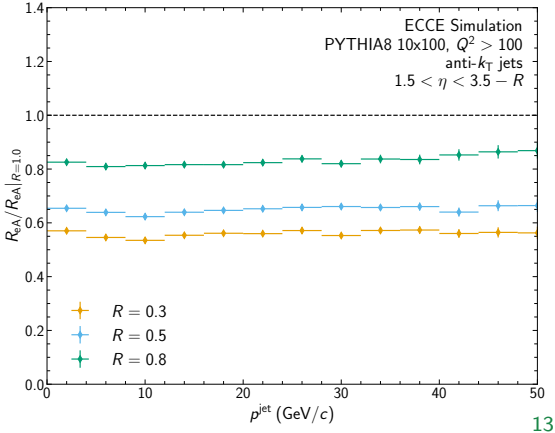


Uncertainty projections

- Project stat uncertainties given full luminosity
- Take central values from nPDF projections
- Errors are increased by L_{int}:
  - ep: 10 fb^{-1}
  - eA: 0.05 fb^{-1}
- Additional systematic uncertainties?
- Uncertainties from the nPDF can be propagated, but may not be so meaningful

Next steps

- Bottom line: seems that we'll be able to measure R_{eA} effectively, without substantial detector effects
- Analysis note!
  - Continue over weekend
- Finish running rest of stats

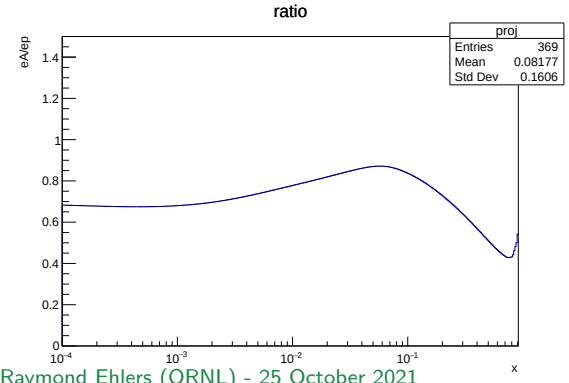
Backup

nPDF scaling

For up quark, $Q^2 = 10$ (sorry for quick and dirty plots)

eA / ep

- Values within reasonable range



eA alone

- (Probably?) needs $1/x$, so will be large