Only keep the relevant panel for the BHCal
(unless we opt for an introductory section for the full HCal chapter)

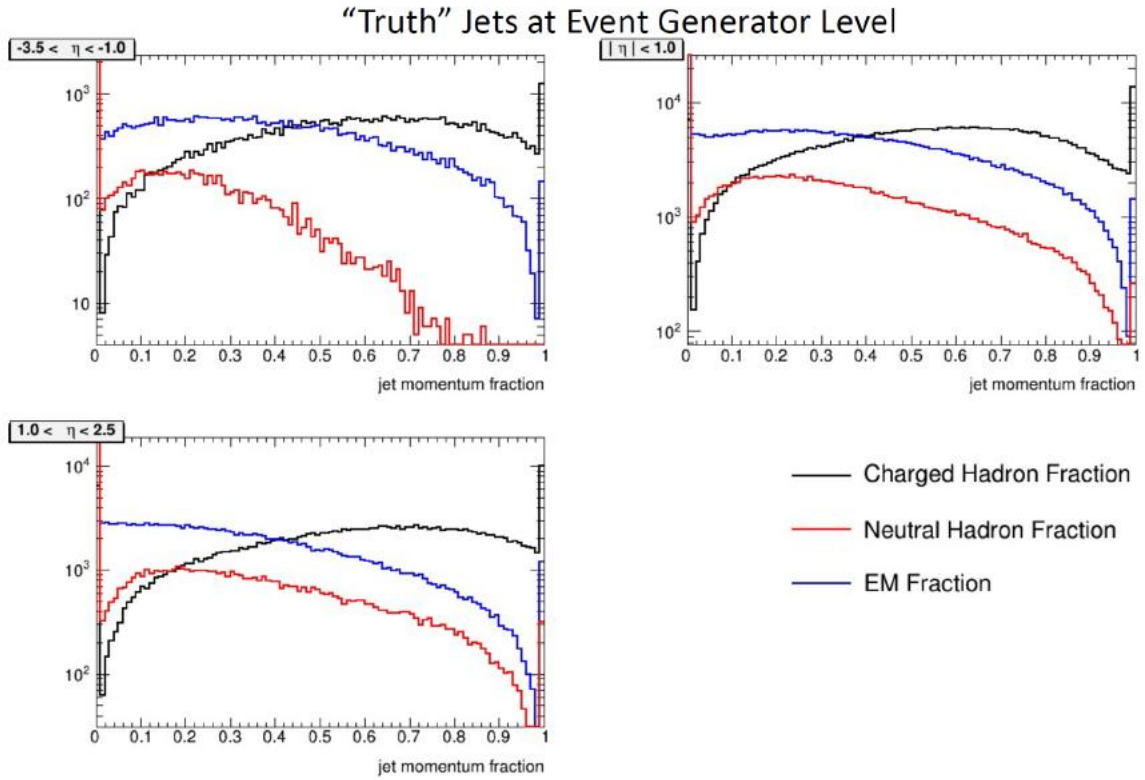


Figure 3.187: The charged (black lines), neutral EM (blue lines), and neutral hadron (red lines) fractions of jets at the truth level in $\eta \in (-3.5, 1.0)$ (upper left panel), $|\eta| < 1$ (upper right panel), and $\eta \in (1.0, 3.5)$ (lower left panel). Received from John Lajoie in private communication.

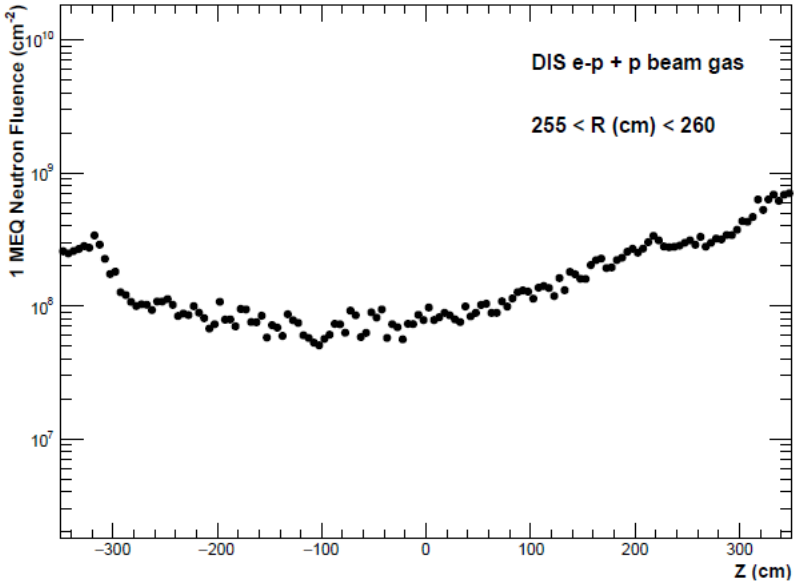


Figure 3.188: Results of ePIC simulations in the BHCal region: the 1-MeV neutron equivalent (MEQ) fluence from all processes (DIS plus beam gas events) over 15 years of running (150fb^{-1}).

Combine into one figure with two panels.

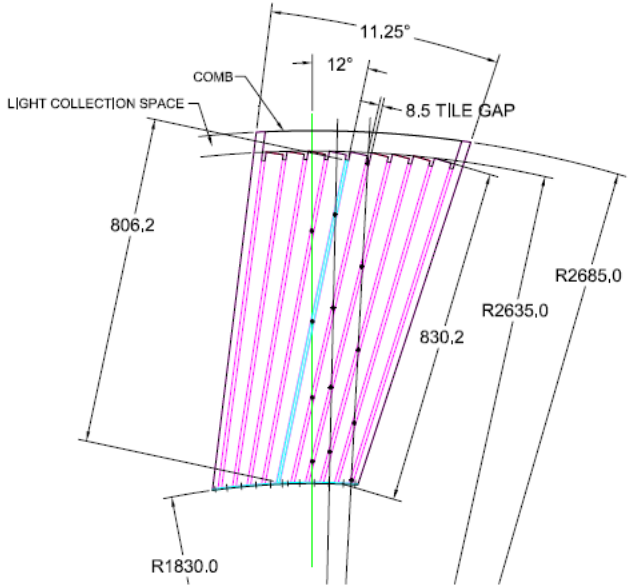


Figure 3.189: Transverse cutaway view of an sPHENIX Outer HCal module, showing the tilted tapered absorber plates. Light collection and cabling is on the outer radius at the top of the drawing.

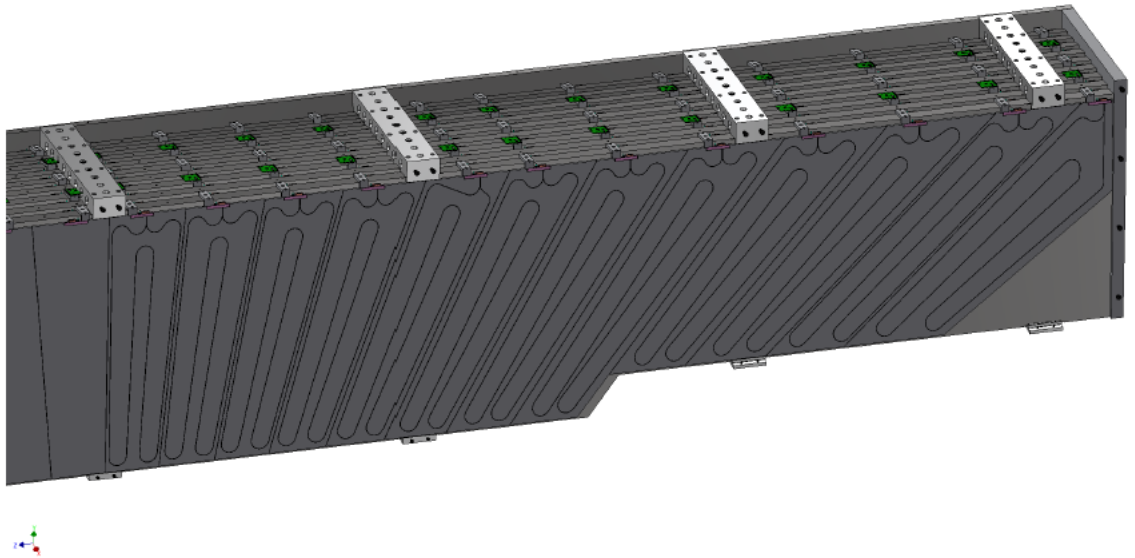


Figure 3.190: Scintillator tiles in a layer of the Outer HCal.

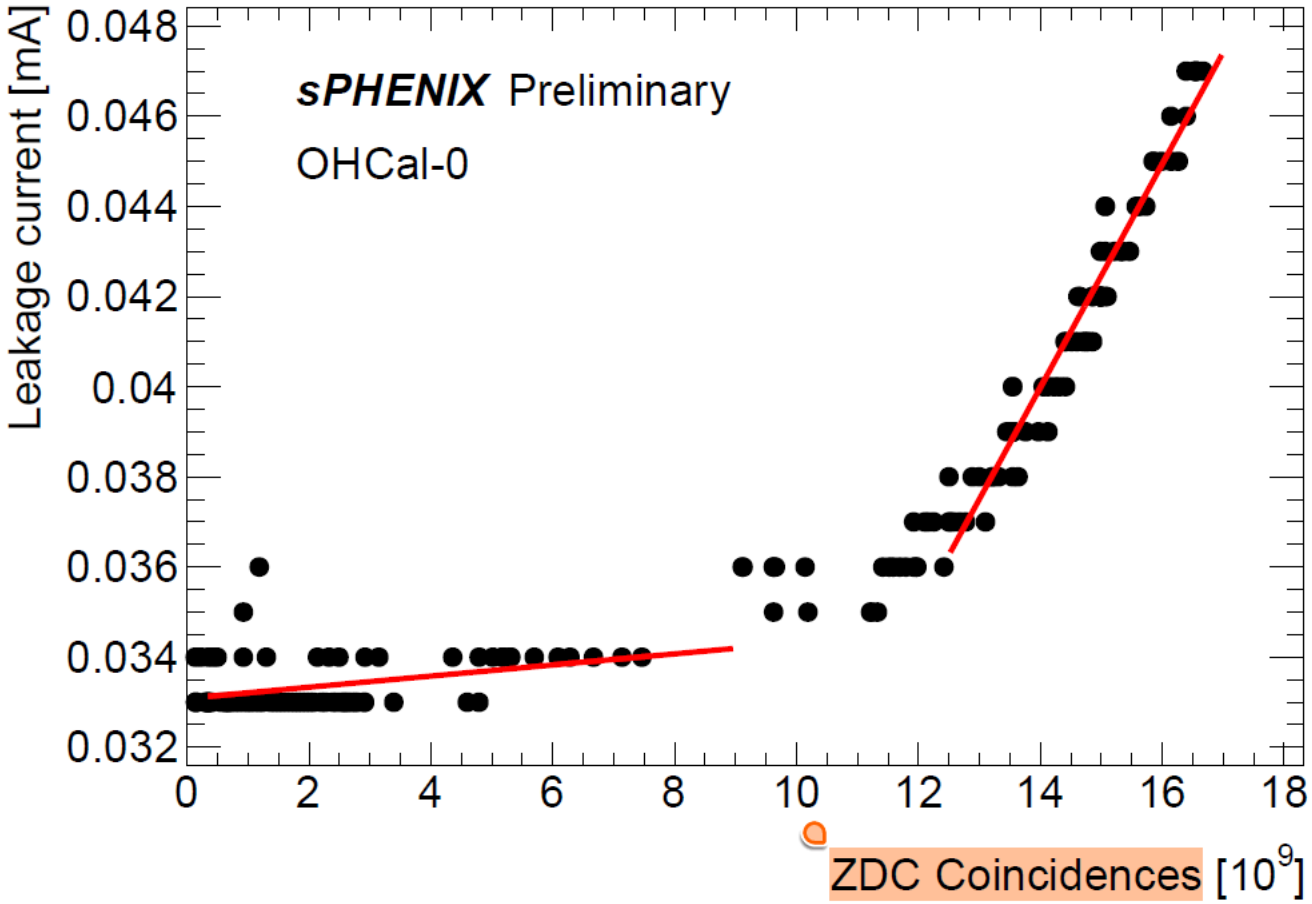
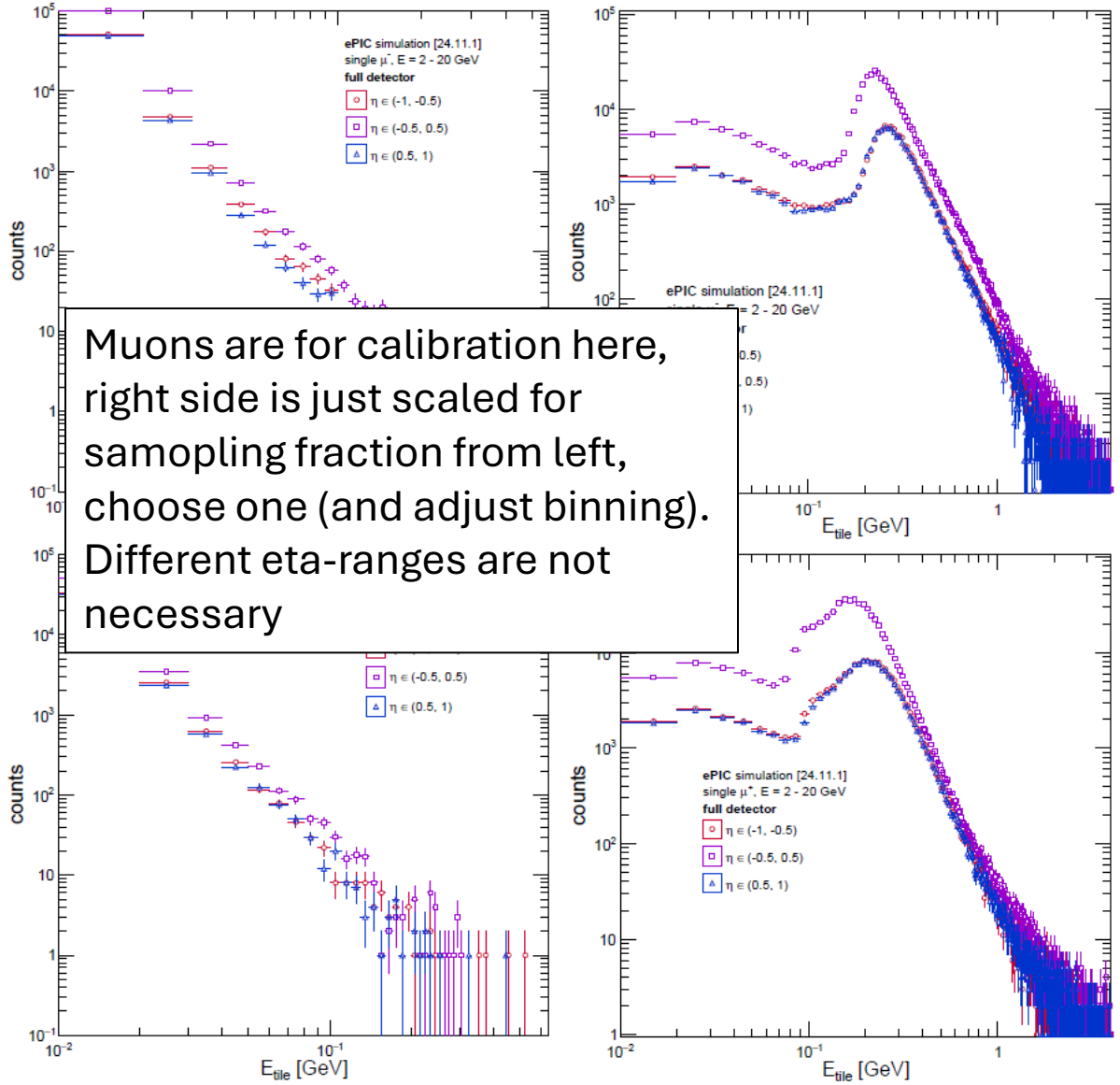


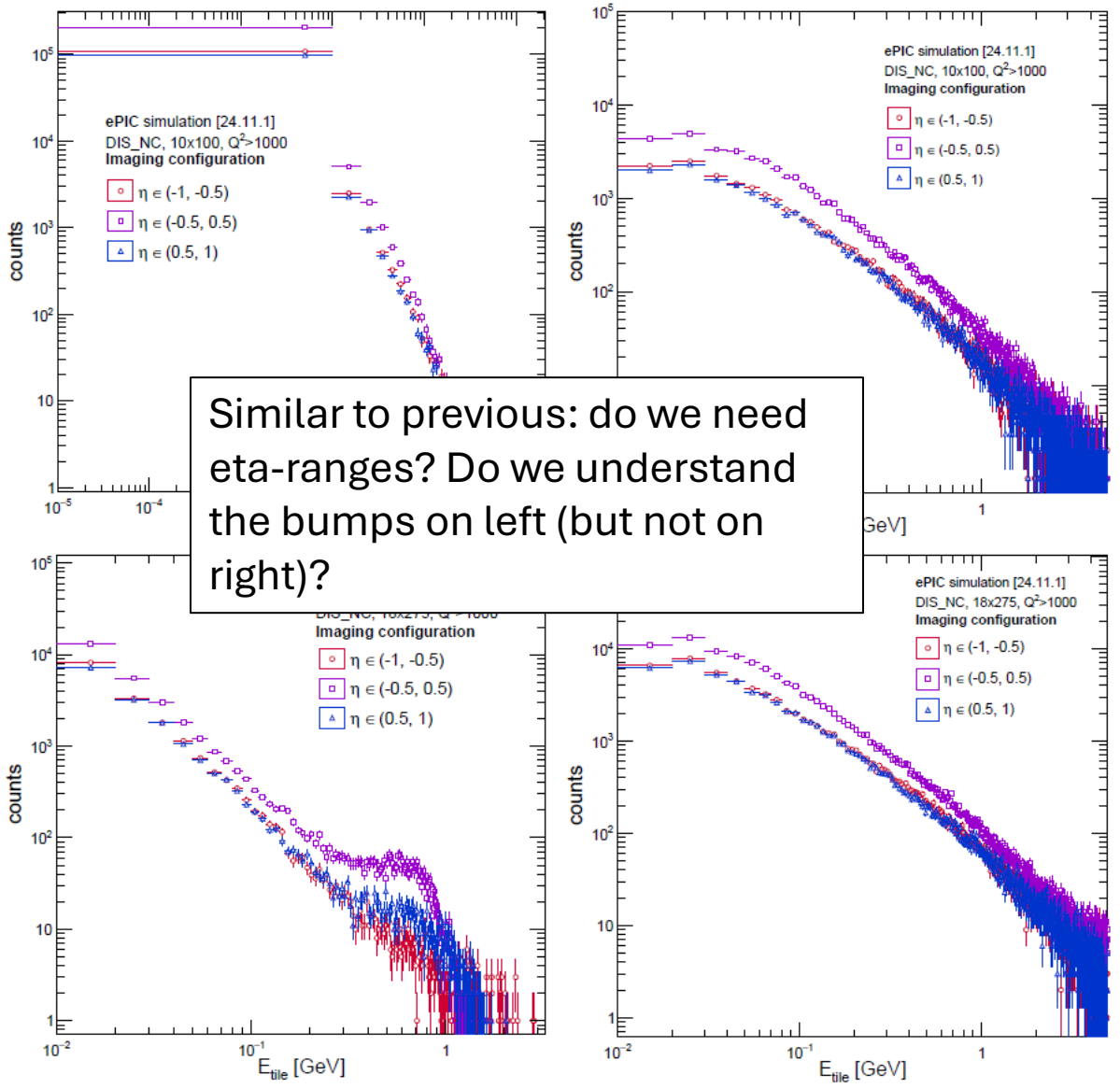
Figure 3.191: Leakage current in HCal measured once per fill as a function of total number of ZDC coincidence hits.

Plot from sPHENIX, needs more context or scaling for ep/A environment (ZDC will not be used at EIC)



Muons are for calibration here, right side is just scaled for samopling fraction from left, choose one (and adjust binning). Different eta-ranges are not necessary

Figure 3.192: Energy deposited on BHCal tiles (left panels) and reconstructed tile energies (right panels) by single μ^- (top row) and μ^+ (bottom row) as a function of tile pseudorapidity. Muons were simulated using the 2024.11.1 simulation geometry with energies between 2 and 20 GeV. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies



Similar to previous: do we need eta-ranges? Do we understand the bumps on left (but not on right)?

Figure 3.193: Energy deposited on BHCal tiles (left panels) and reconstructed tile energies (right panels) by all particles in 10×100 (top row) and 18×275 (bottom row) NC DIS events as a function of particle pseudorapidity. Distributions were simulated using the 2024.11.1 simulation geometry with $Q^2 > 1000\ \text{GeV}^2$. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies

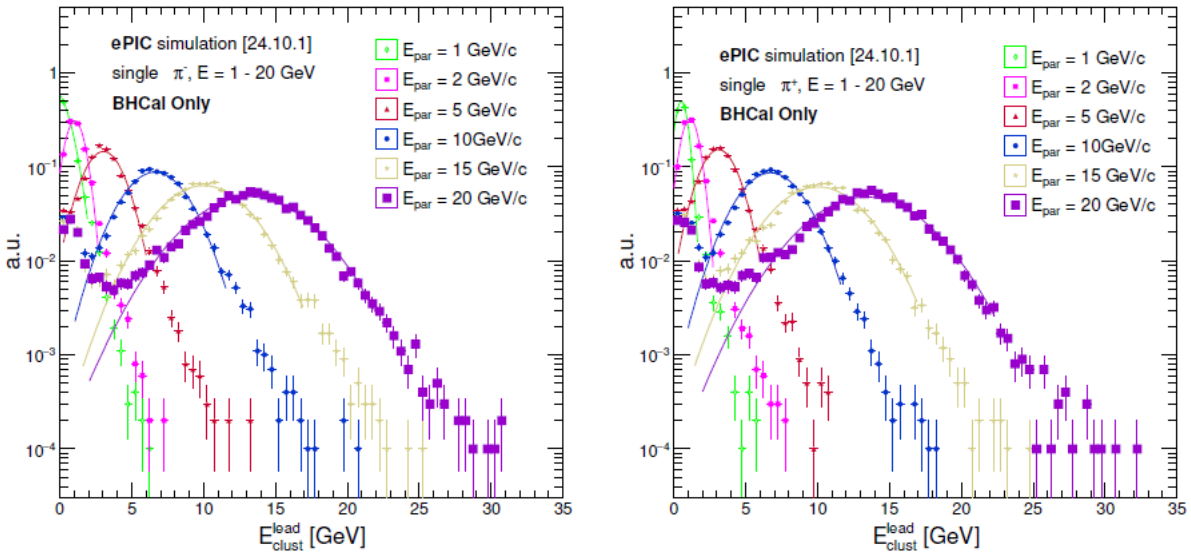
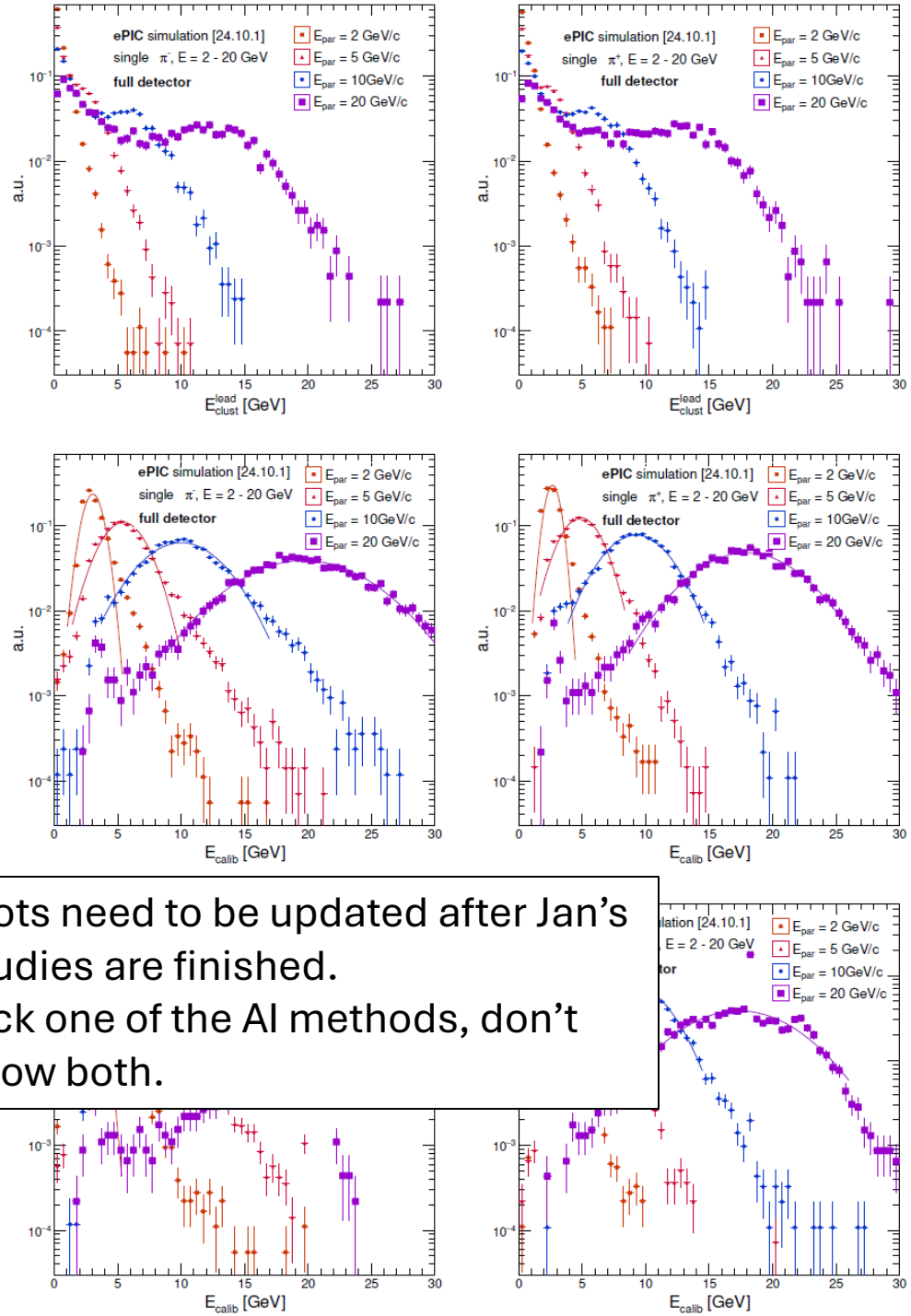


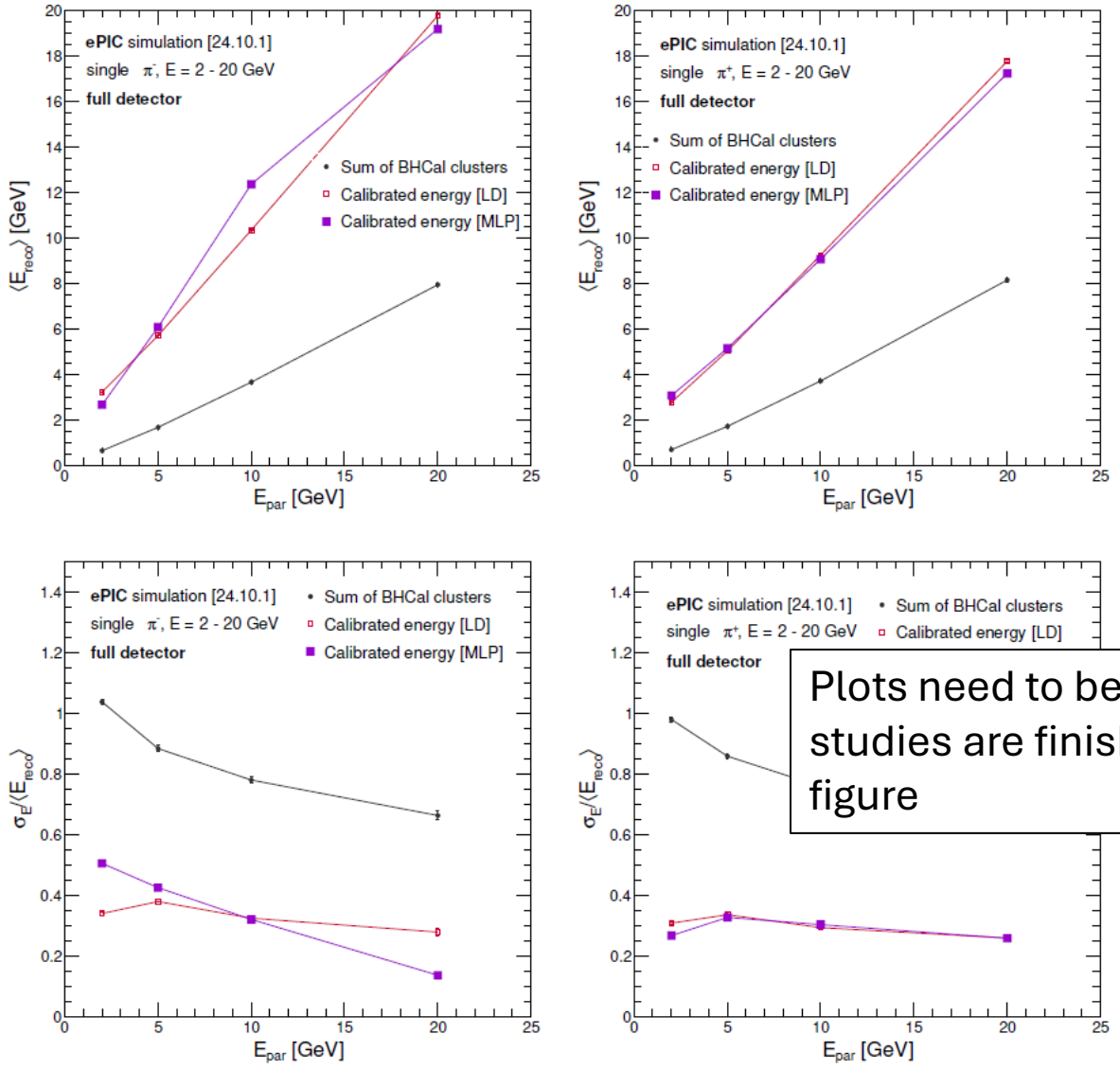
Figure 3.194: Reconstructed energy of leading BHCal cluster for 1 (green) - 20 GeV (purple) single π^- (left) and π^+ (right) in BHCal-only simulations. Pions were simulated using the 2024.10.1 simulation geometry. Solid lines are Guassian fits. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies

Not clear that this figure is necessary (although the HCal intrinsic resolution is important)



Plots need to be updated after Jan's studies are finished.
Pick one of the AI methods, don't show both.

Figure 3.195: Uncalibrated (top row) vs. LD-calibrated energy (middle row) and MLP-calibrated (bottom row) of lead BHCal clusters for 2 (orange), 5 (pink), 10 (blue), and 20 GeV (purple) π^- (left column) and π^+ (right column). The calibration procedures are described in the text. Distributions were simulated using the 2024.10.1 simulation geometry. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies



Plots need to be updated when studies are finished, see previous figure

Figure 3.196: Linearity (top row) and energy resolution (bottom row) of calibrated single π^- (left column) and π^+ (right column). Red lines indicate LD-calibrated energies, purple lines indicate MLP-calibrated energies, black lines indicate the linearity, resolution of summing BHCal clusters without calibration. The calibration procedures are described in the text. Distributions were simulated using the 2024.10.1 simulation geometry. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies

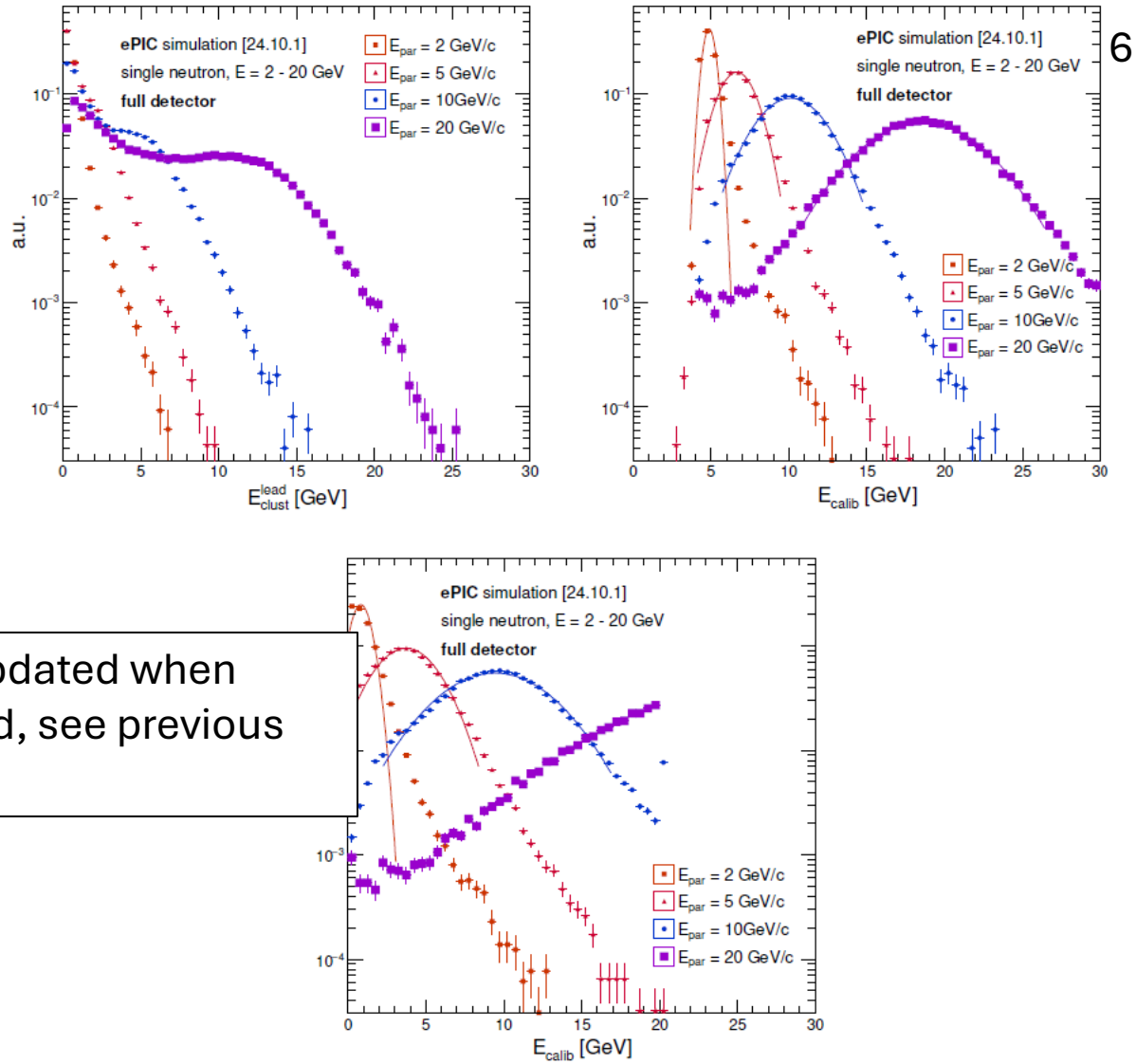


Figure 3.197: Uncalibrated (to left) vs. LD-calibrated energy (top right) and MLP-calibrated (bottom) of lead BHCal clusters for 2 (orange), 5 (pink), 10 (blue), and 20 GeV (purple) neutrons. The calibration procedures are described in the text. Distributions were simulated using the 2024.10.1 simulation geometry. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies

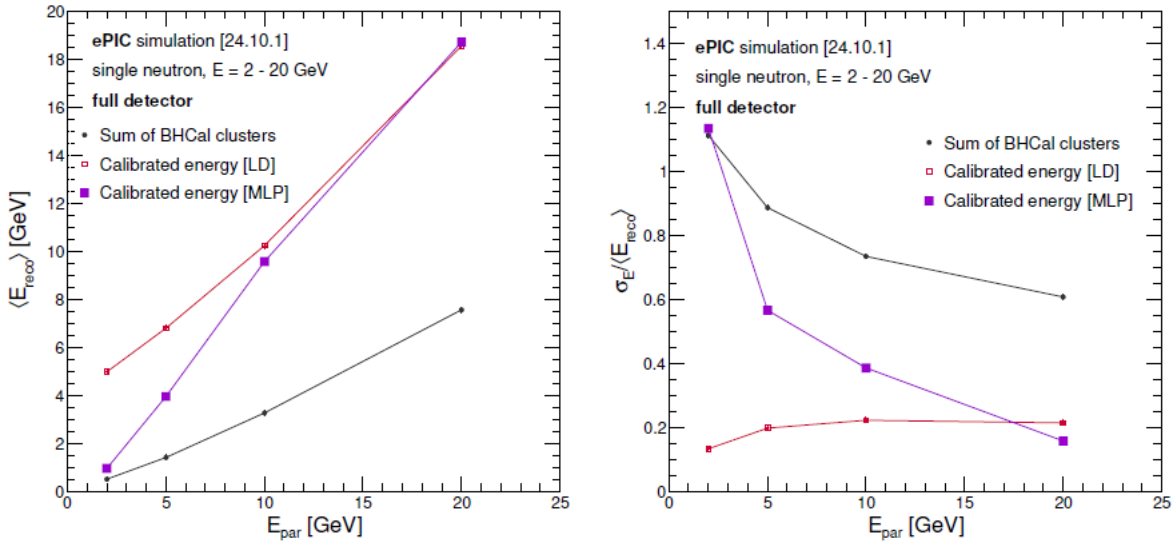


Figure 3.198: Linearity (left) and energy resolution (right) of calibrated single neutrons. Red lines indicate LD-calibrated energies, purple lines indicate MLP-calibrated energies, black lines indicate the linearity, resolution of summing BHCal clusters without calibration. The calibration procedures are described in the text. Distributions were simulated using the 2024.10.1 simulation geometry. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies

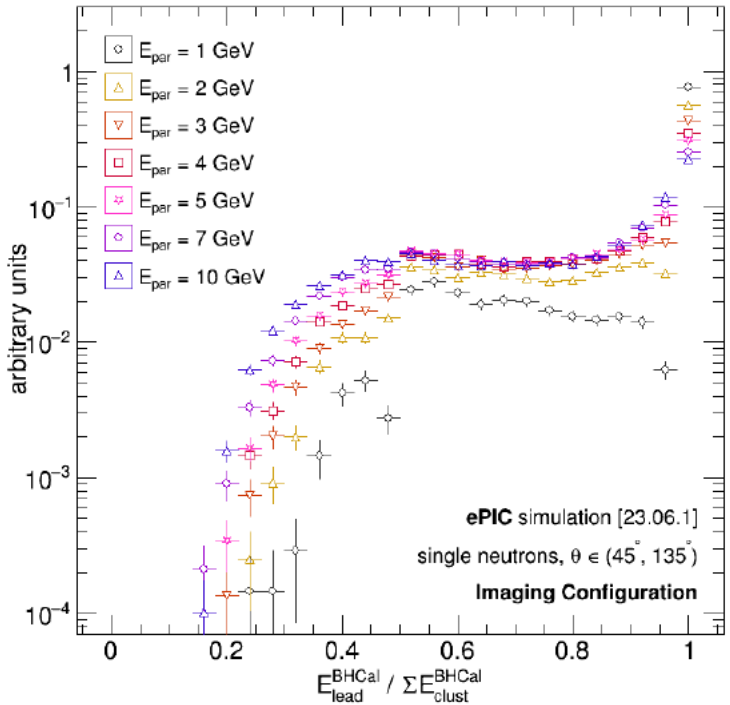


Figure 3.199: ratio of uncalibrated lead BHCal cluster to the sum of all BHCal clusters for 2 (grey) - 10 GeV (blue) single neutrons. Distributions were simulated using the 2023.06.1 simulation geometry. Repository: https://github.com/ruse-traveler/EpicBHCalPTDRStudies

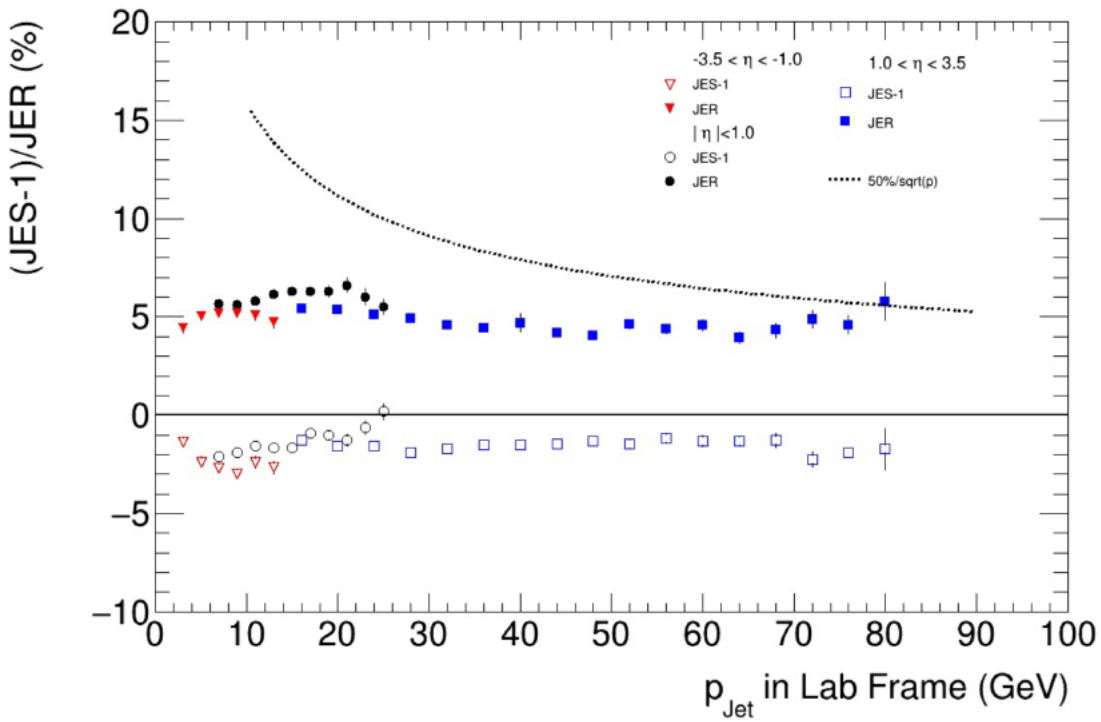


Figure 3.200: JES/R for full (tracks + ECal + HCal): The JES $-1 = \langle \Delta p/p \rangle$ (open markers) and JER (closed markers) plotted as a function of p_{jet} in the lab frame for jets in $\eta \in (-3.5, 1.0)$ (red points), $|\eta| < 1$ (black points), and $\eta \in (1.0, 3.5)$ (blue points). In the barrel region, jets are constructed from reconstructed tracks and ECal clusters *without* a nearby track. Neutral hadrons are included in the jets by smearing the particle energy by the measured energy resolution of the sPHENIX OHCal. Jets are reconstructed via the Centauro algorithm (R = 0.8) and transformed back into the lab frame. Jets are required to have at least 2 particles, and exclusively charged or neutral jets are rejected. From ECCE responses to the EIC DPAP Review Panel

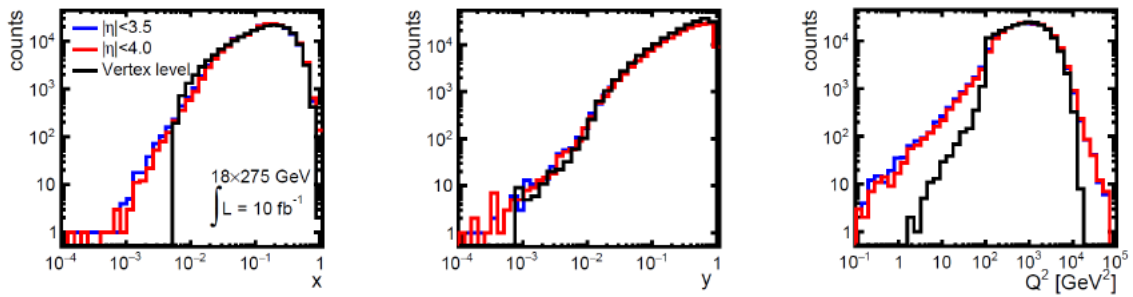


Figure 3.201: JB variables at truth ("vertex", black) and reconstructed level for particle $|\eta| < 3.5$ (blue) and $|\eta| < 4$ (red) in 18×275 CC DIS events. Detector simulation and reconstruction was carried out using a fast simulation using Delphes. Figure 8.21 from the EIC Yellow Report.

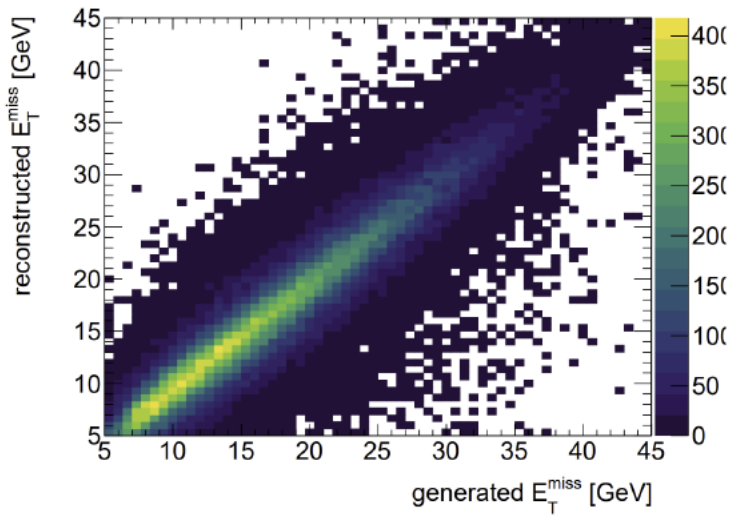


Figure 3.202: Truth vs. reconstructed $E_{\text{T}}^{\text{miss}}$: the truth (x-axis) vs. reconstructed (y-axis) $E_{\text{T}}^{\text{miss}}$ for 10×275 CC DIS events. Detector simulation and reconstruction was carried out using a fast simulation using Delphes. Figure 4 from arXiv:2006.12520.