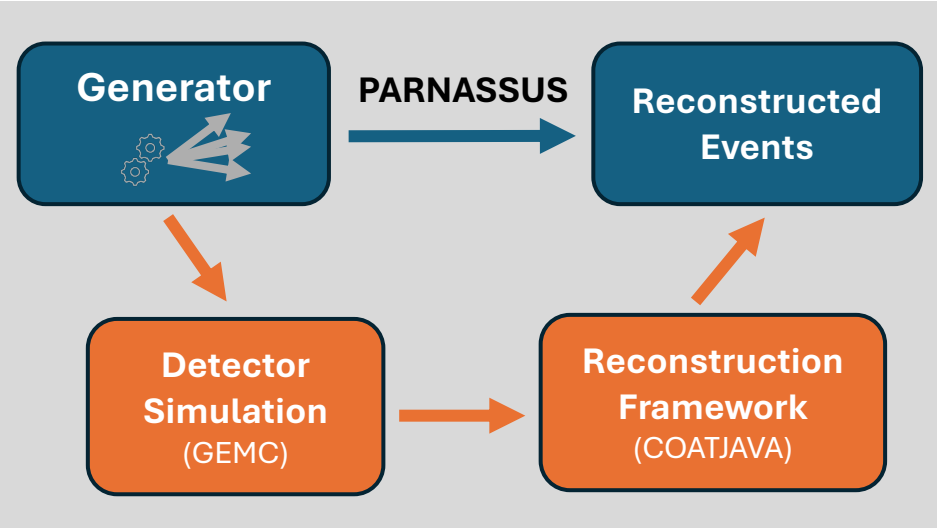
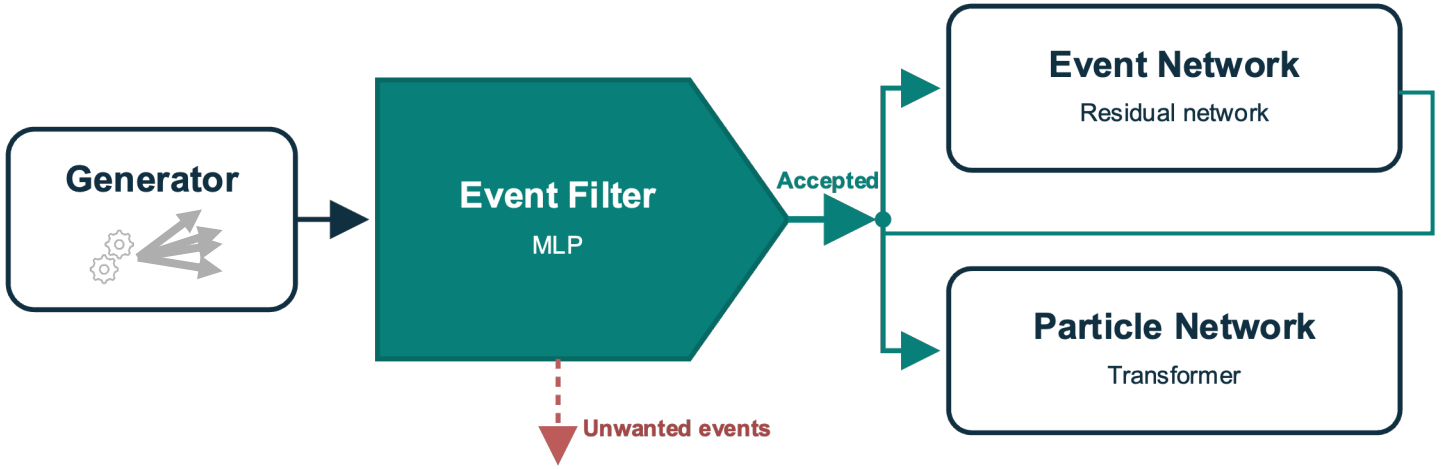
Parnassus for CLAS12

- Accurate surrogate model for detector simulation and reconstruction
- A set-to-set generation approach captures the full detector response on complex multi-particle states.
- Conditional Flow Matching transforms a noisy prior to the resulting reconstructed particles

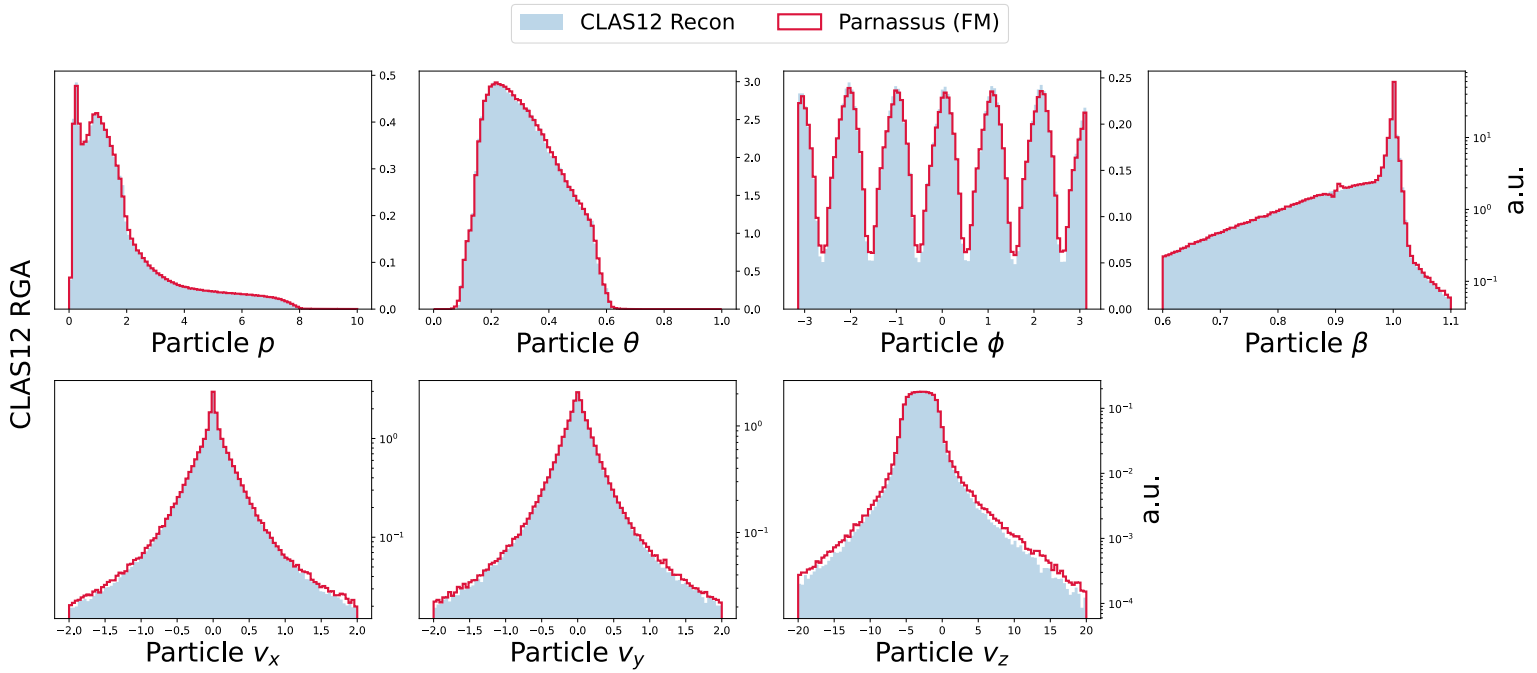


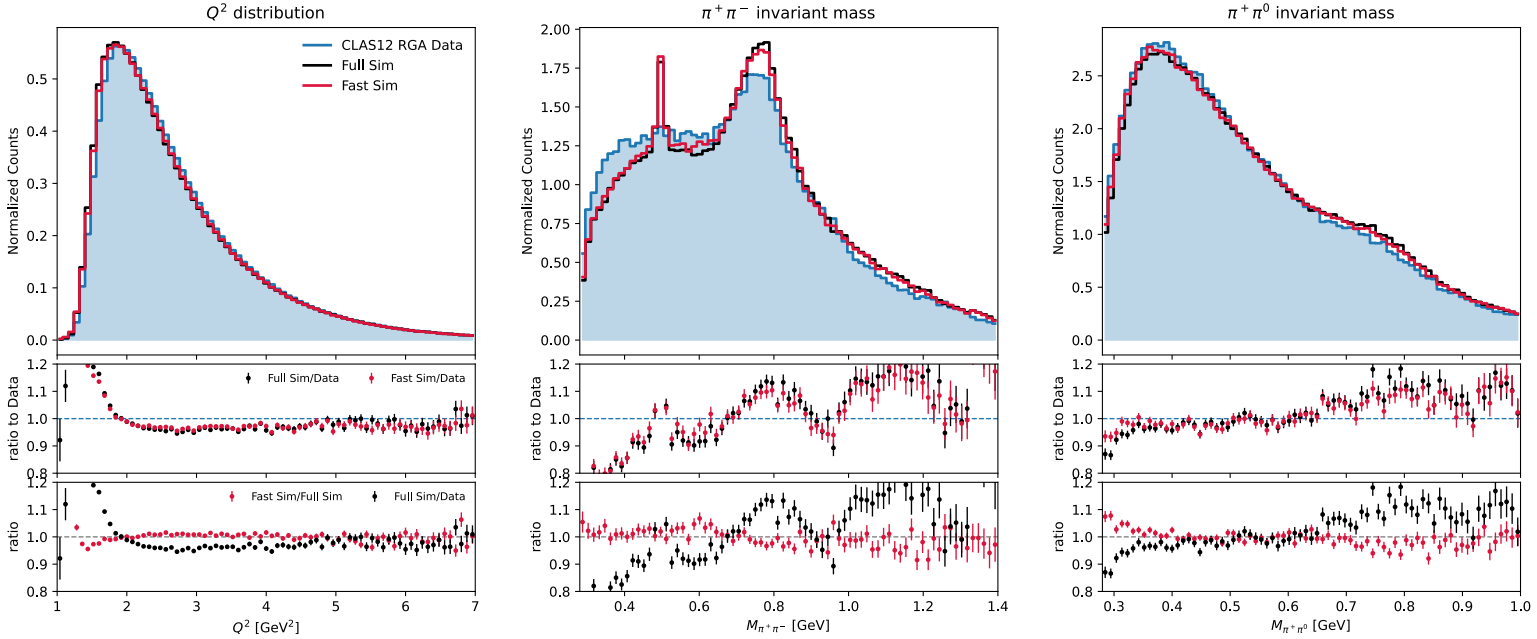


- **Event Filter:** predicts and filters out events where no electron will be reconstructed
- **Event Network:** Predicts reconstructed event level quantities
- **Particle Network:** Predicts reconstructed particle level quantities

Results

- Trained on pass 2 RGA inbending detector setup (Forward Detector only)
- Accurately replicates the full simulation across the particle level features (top figure) and on the di-hadron level (bottom figure).
- Inaccuracies between the fast and full sim are smaller than inaccuracies in the full sim and data (bottom figure), demonstrating readiness for simulation/experiment comparisons.





Available on Github:
Main Repo: https://github.com/omphalos-mc/parnassus-clas12

Paper will be on arXiv soon