EICRecon Status and Plans

Beatrice Liang-Gilman

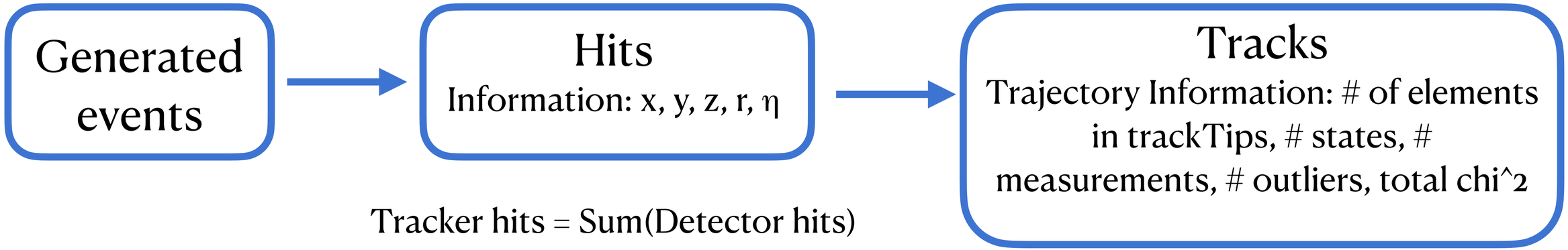
EIC RNC Meeting 2/7/2023

EICRecon Plugin

Track QA

- Plugin made by Barak
  - Located at https://github.com/eic/EICrecon/tree/track-qa-barak/src/tests/track_qa
    - Runs with the command: ./run_sim.sh
    - Produces the normal EICRecon output file, as well as the plugin's output file
    - Editable:
      - mysteer.py to change how many/what events are generated
      - trackqa_processor.cc and trackqa_processor.h to edit the plugin and add histograms
      - plot_hists.C to display the plots from the plugin's root file

Summary of Provided Information



Tracker hits = Sum(Detector hits)

Each track has some number of states

- These states can be calibrated or not calibrated
- Each state has information: location, angles, q/p, errors

ACTS Track Variables

https://acts.readthedocs.io/en/latest/api/struct/struct_acts_1_1_multi_trajectory_helpers_1_1_trajectory_state.html

struct **TrajectoryState**

Struct for brief trajectory summary info.

Public Members

- double **chi2Sum** = 0
- std::vector<double> **measurementChi2** = {}
- std::vector<unsigned int> **measurementLayer** = {}
- std::vector<unsigned int> **measurementVolume** = {}
- size_t **NDF** = 0
- size_t **nHoles** = 0
- size_t **nMeasurements** = 0
- size_t **nOutliers** = 0
- size_t **nSharedHits** = 0
- size_t **nStates** = 0
- std::vector<double> **outlierChi2** = {}
- std::vector<unsigned int> **outlierLayer** = {}
- std::vector<unsigned int> **outlierVolume** = {}

https://acts.readthedocs.io/en/latest/api/struct/struct_acts_1_1_gain_matrix_updater_1_1_internal_track_state.html

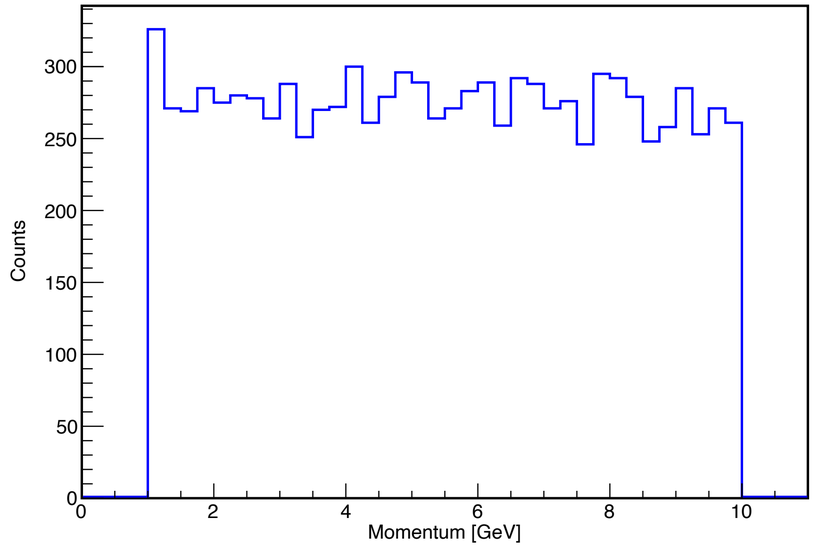
struct **InternalTrackState**

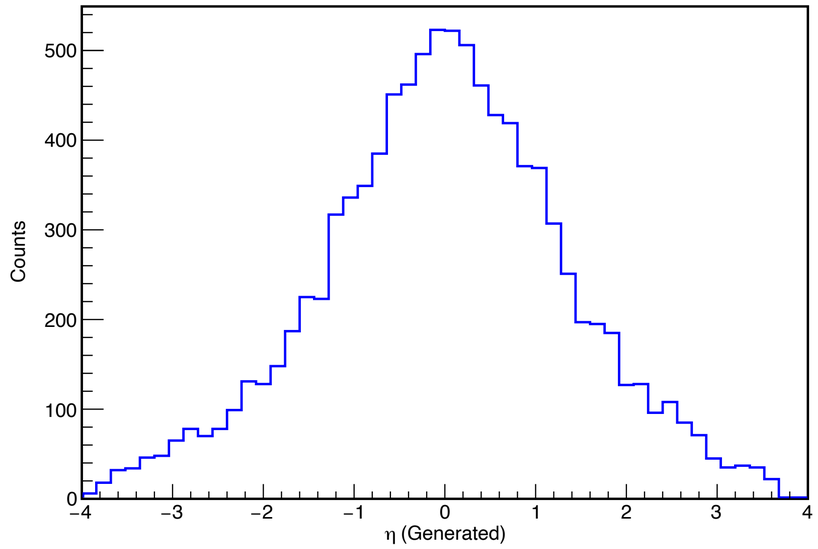
Public Members

- double ***calibrated**
- double ***calibratedCovariance**
- unsigned int **calibratedSize**
- TrackStateTraits<MultiTrajectoryTraits::MeasurementSizeMax, *false*>::Parameters **filtered**
- TrackStateTraits<MultiTrajectoryTraits::MeasurementSizeMax, *false*>::Covariance **filteredCovariance**
- TrackStateTraits<MultiTrajectoryTraits::MeasurementSizeMax, *false*>::Parameters **predicted**
- TrackStateTraits<MultiTrajectoryTraits::MeasurementSizeMax, *false*>::Covariance **predictedCovariance**
- TrackStateTraits<MultiTrajectoryTraits::MeasurementSizeMax, *false*>::Projector **projector**

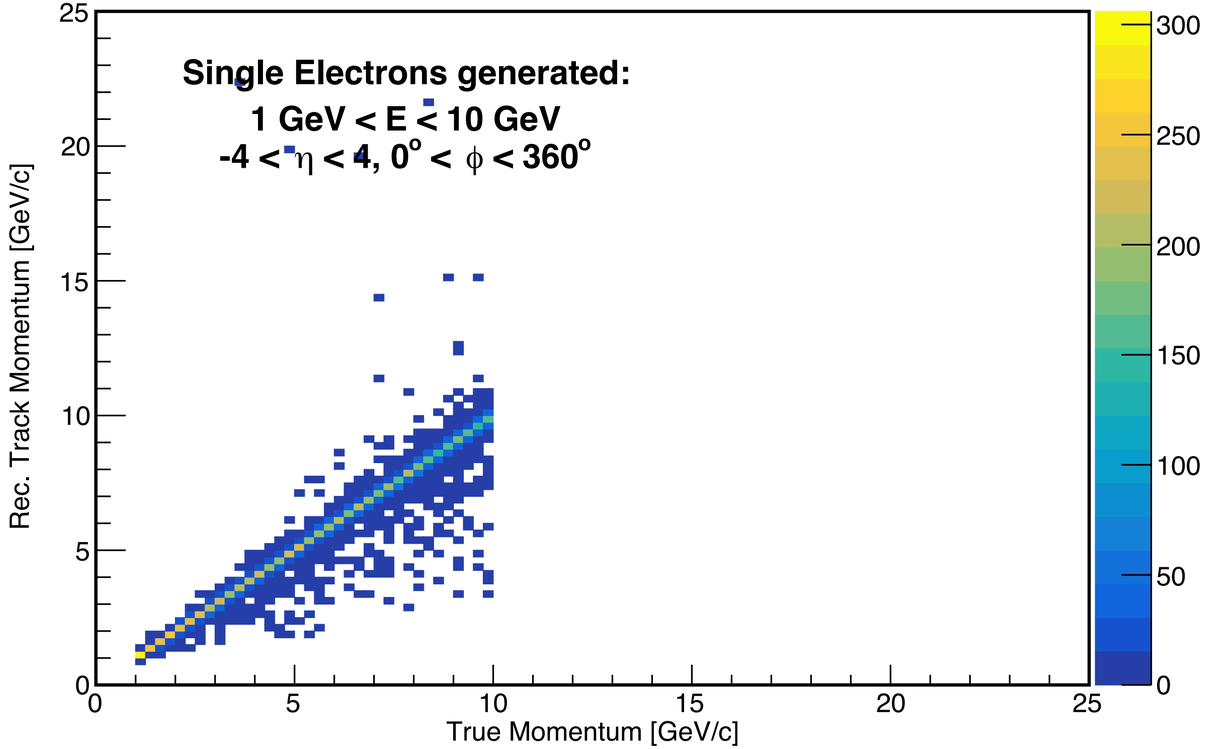
Current Work

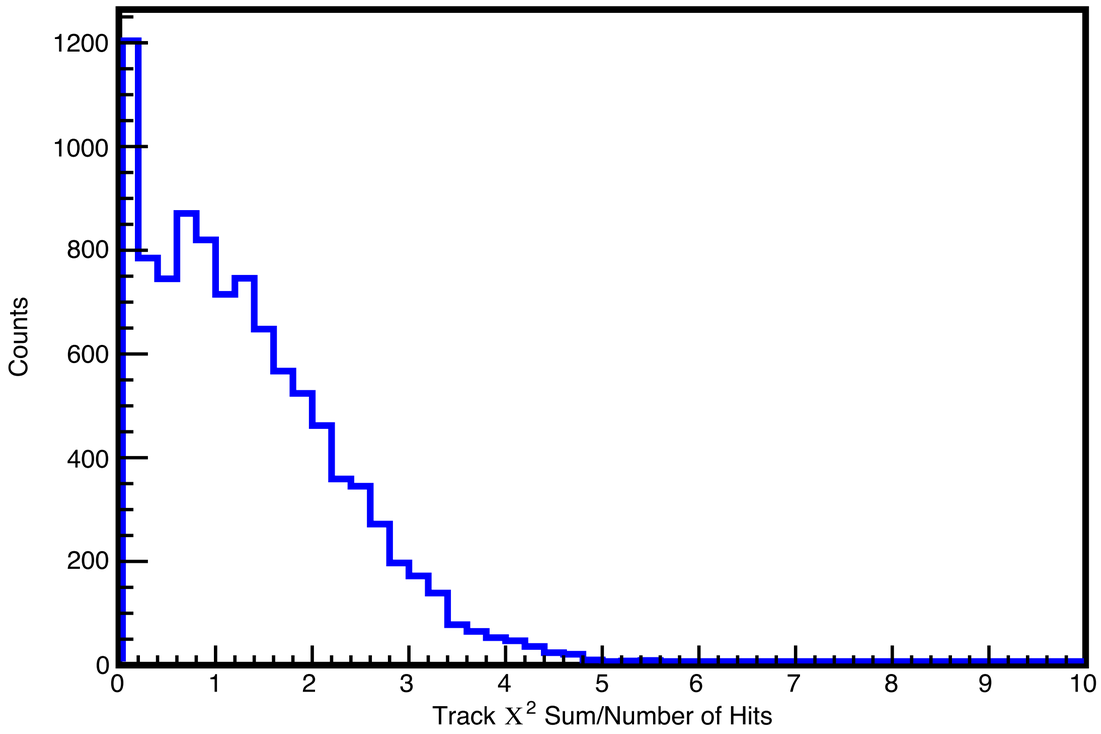
- Generated 10,000 events
  - $1 < p < 10$ GeV
  - $-4 < \eta < 4$
- Reconstruction is currently using **truth seeding**



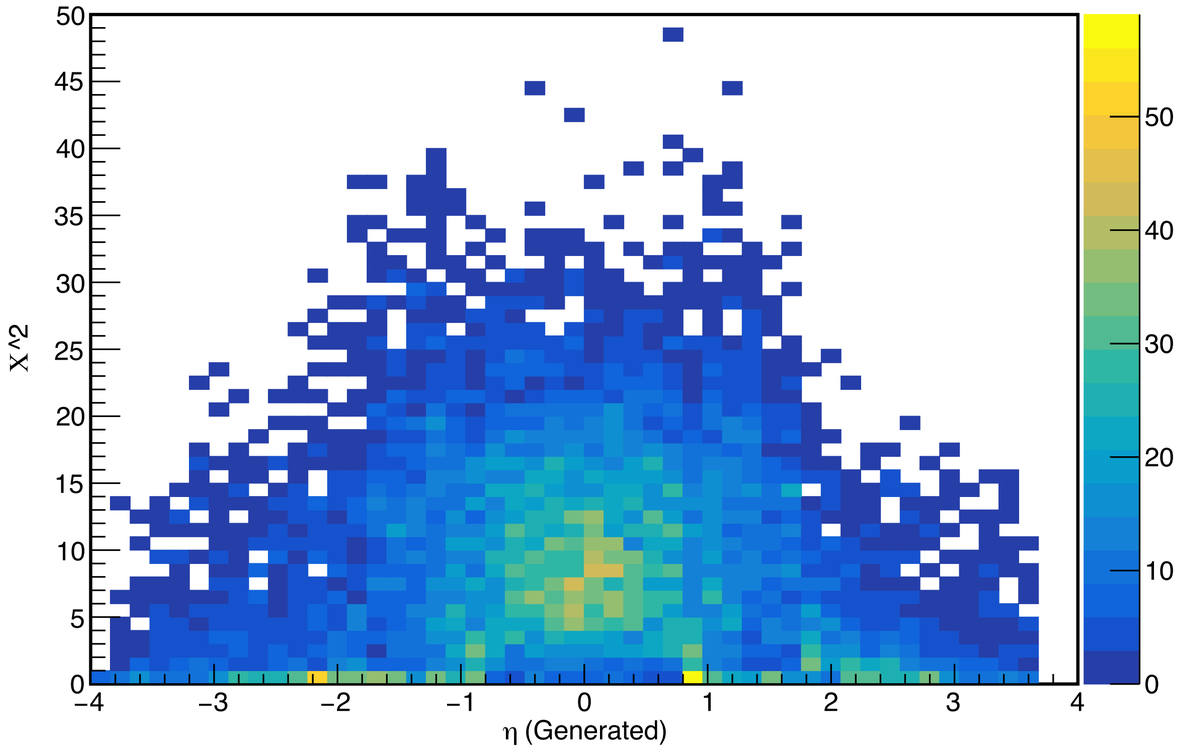


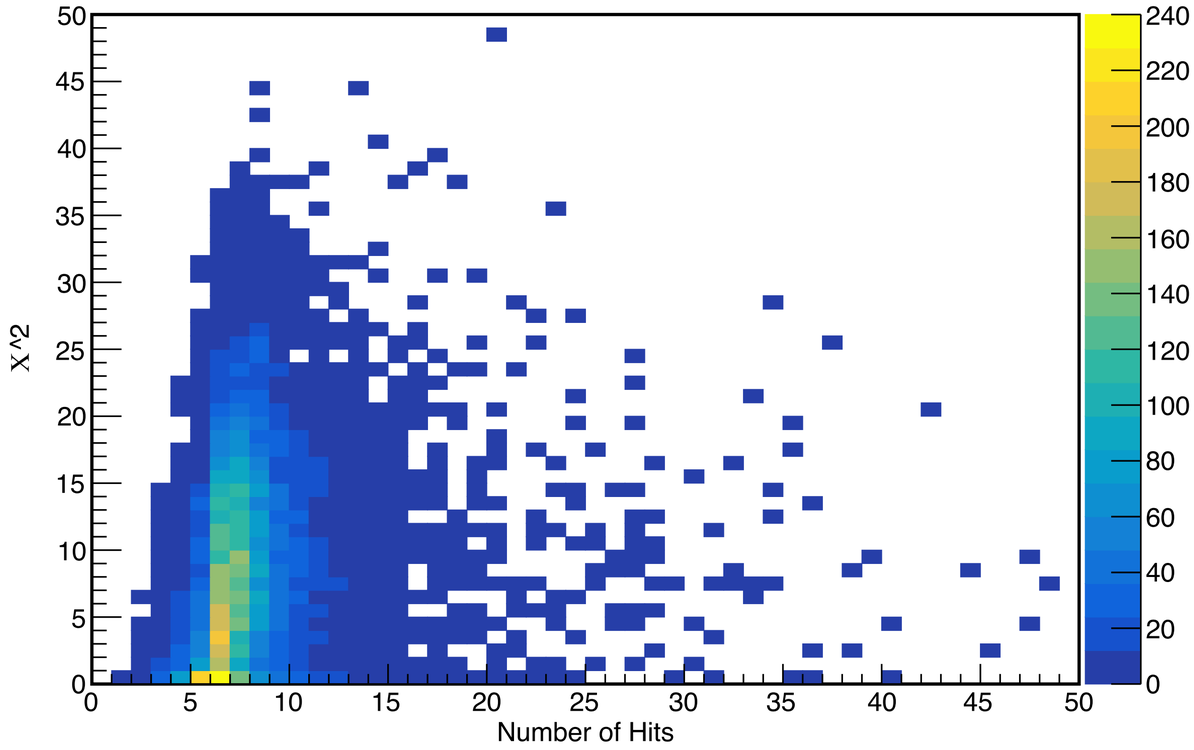
Current Work (cont.)



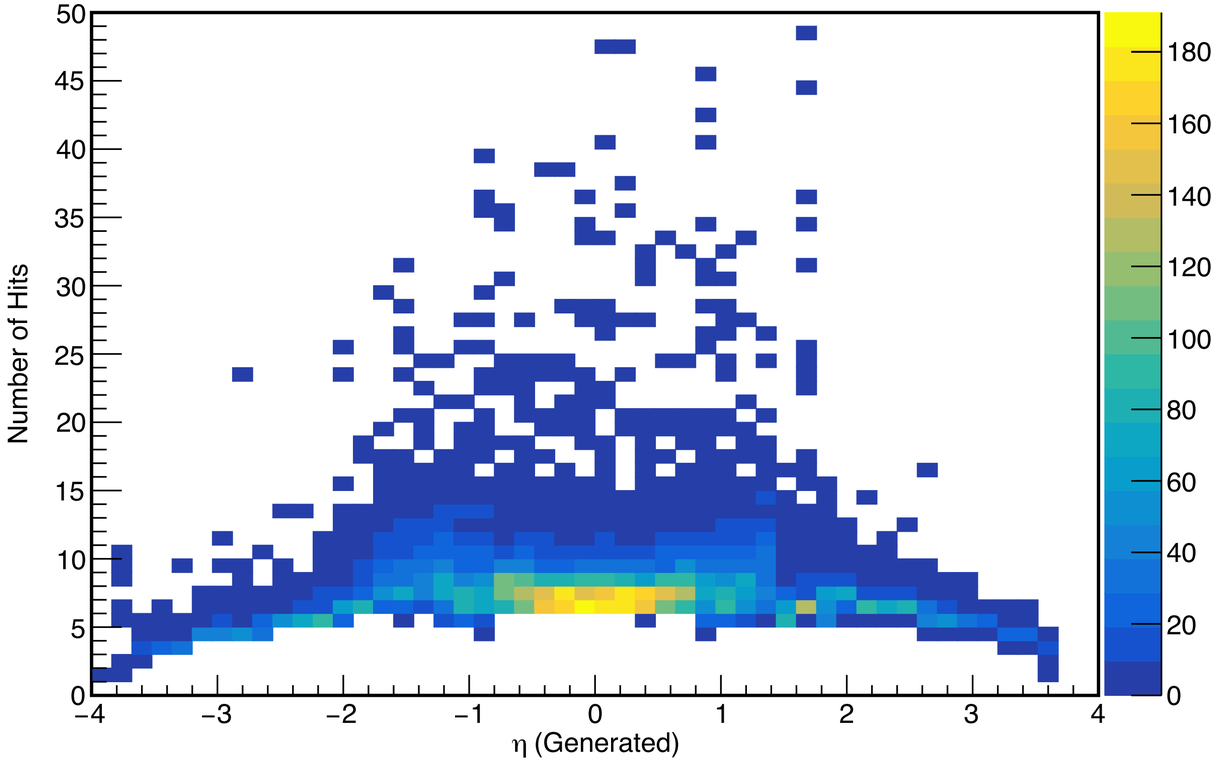


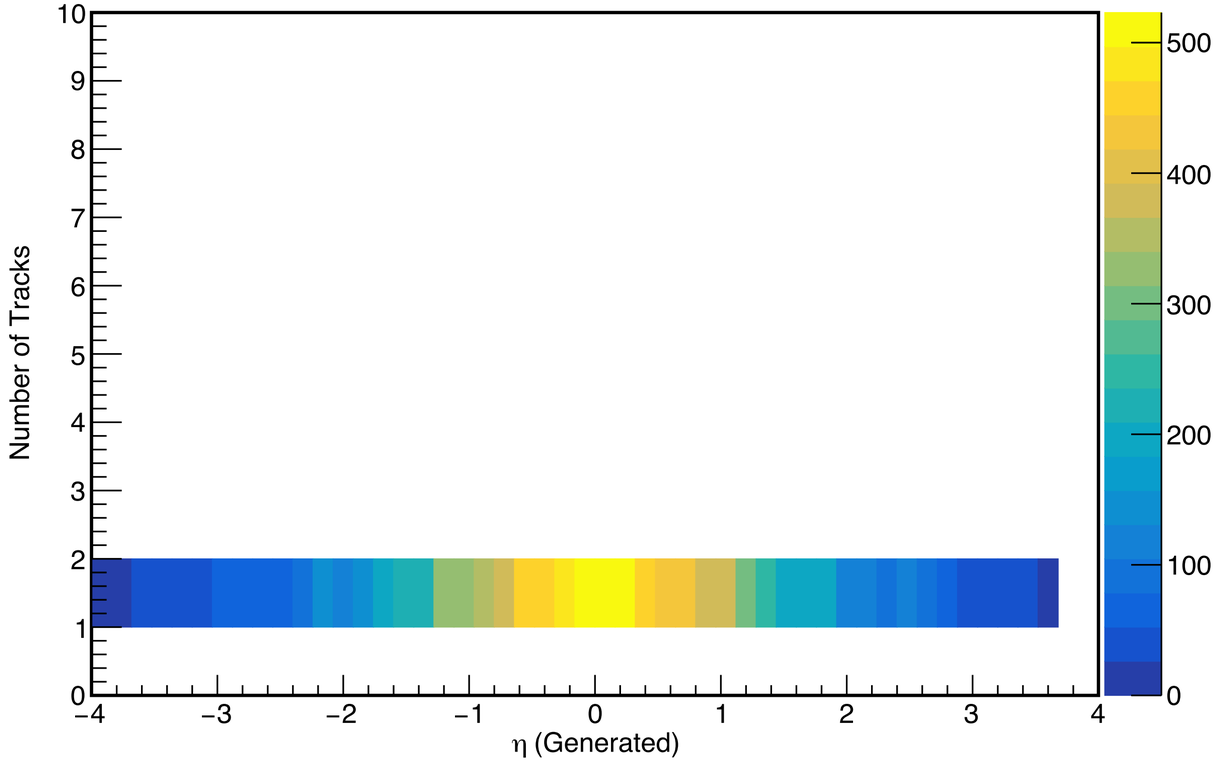
Some plots of χ^2



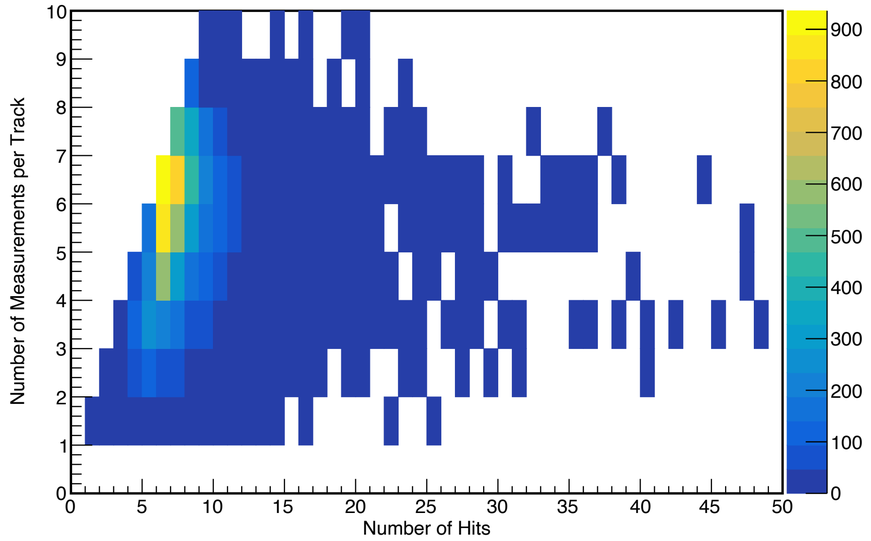


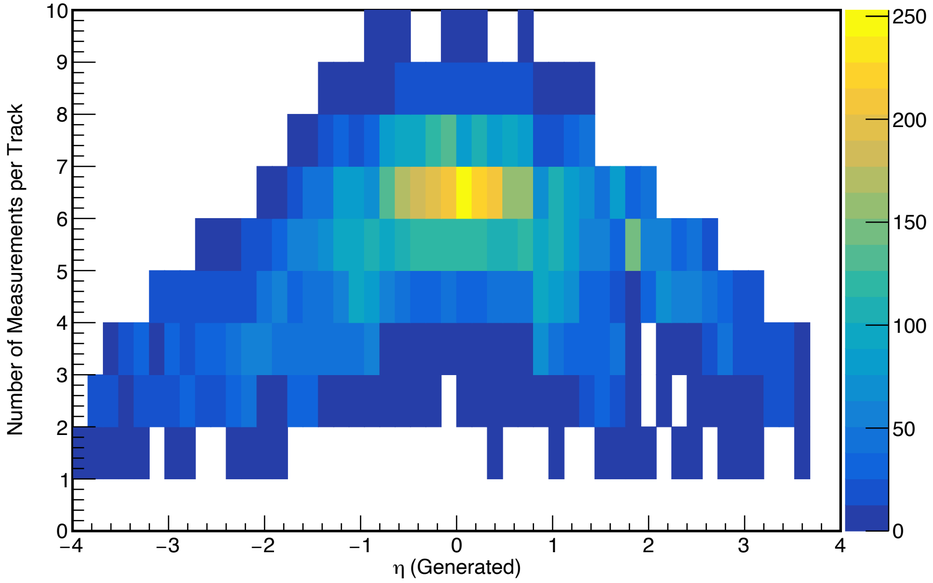
Looking at # of Hits & # of Tracks

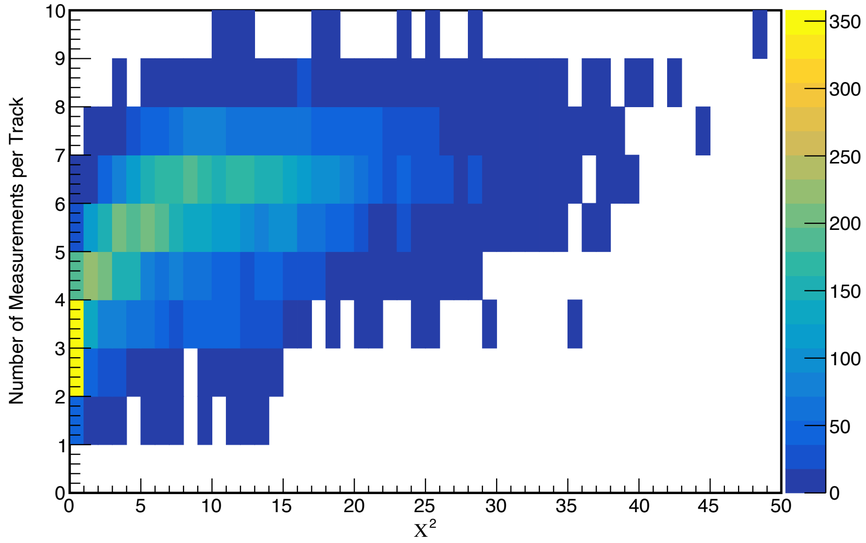




Looking at the # of measurements per track







Next Steps

- Read up on ACTS track variables
- Run with a flat distribution in eta
- Continue to add histograms to the plugin
- Push additions to github
- Combine EICRecon plugin with realistic seeding parameter optimization

Backup

of Measurements vs # of Hits