

# Cosmic Muon Track Reconstruction Analysis

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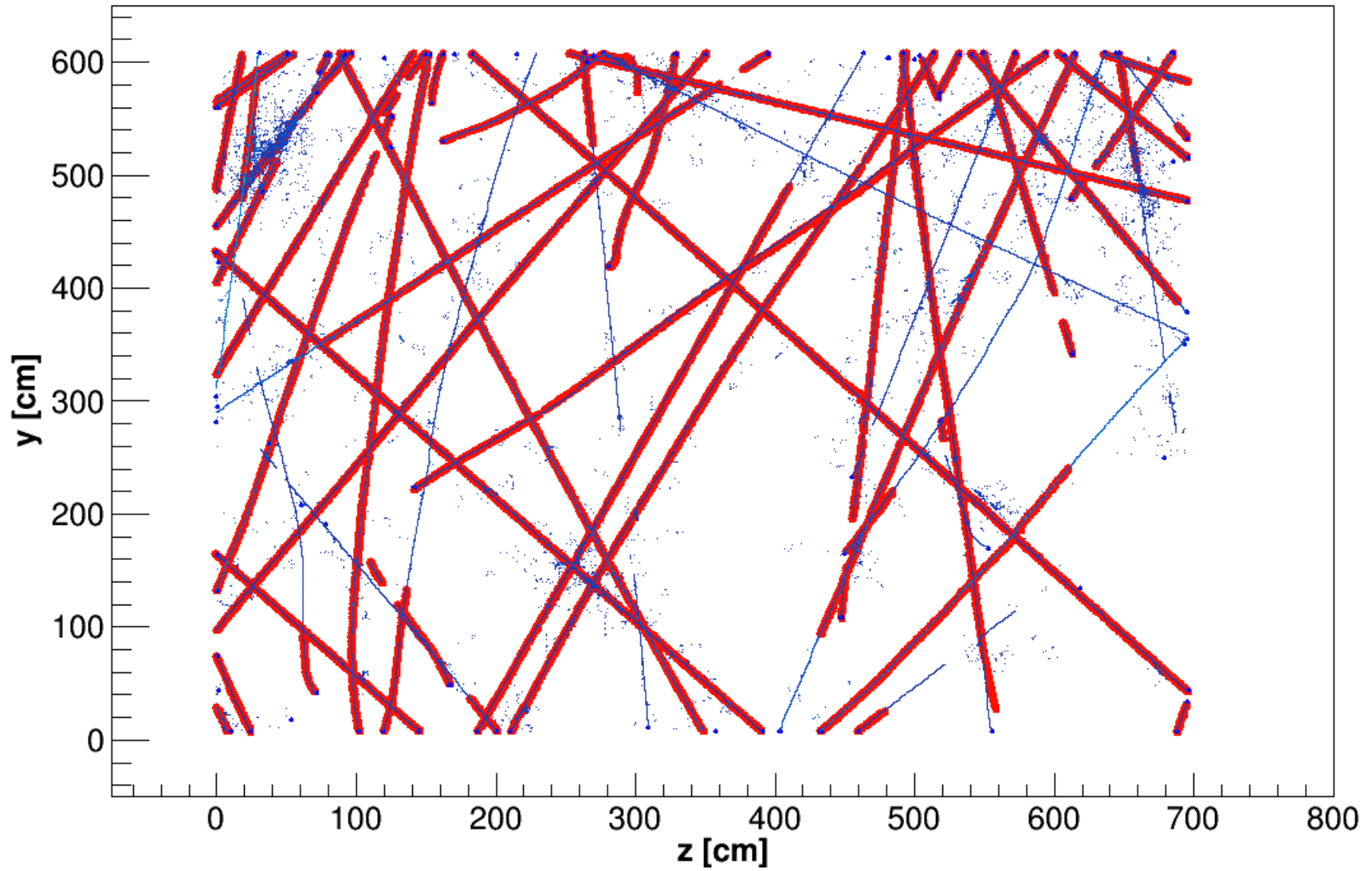
Stony Brook University

# Overview

- Starting to look at reconstructed cosmic muons
  - Ultimately want to use this information for calibration
- Characterize track finding of Projection Matching Algorithm
  - Compare reconstructed information against information from simulated energy depositions



# Track Finding



6.45 ms of cosmics

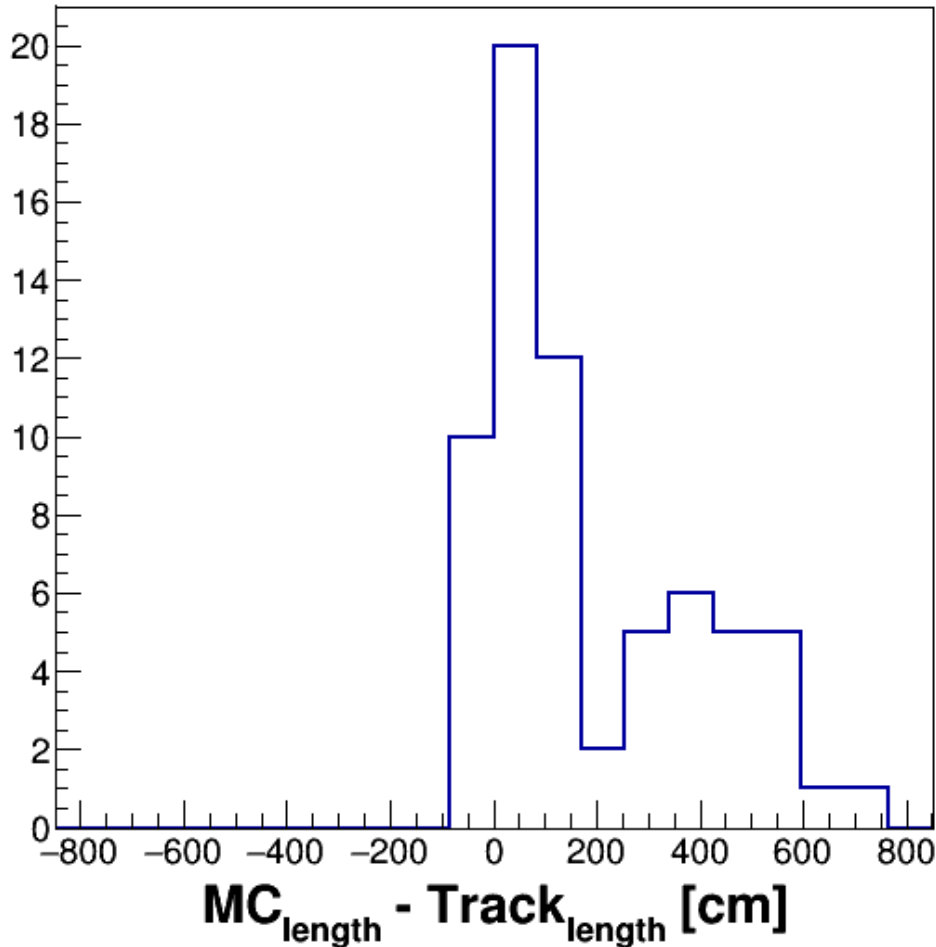
Reconstructed Tracks

Simulated Energy Deposition



# Track Finding

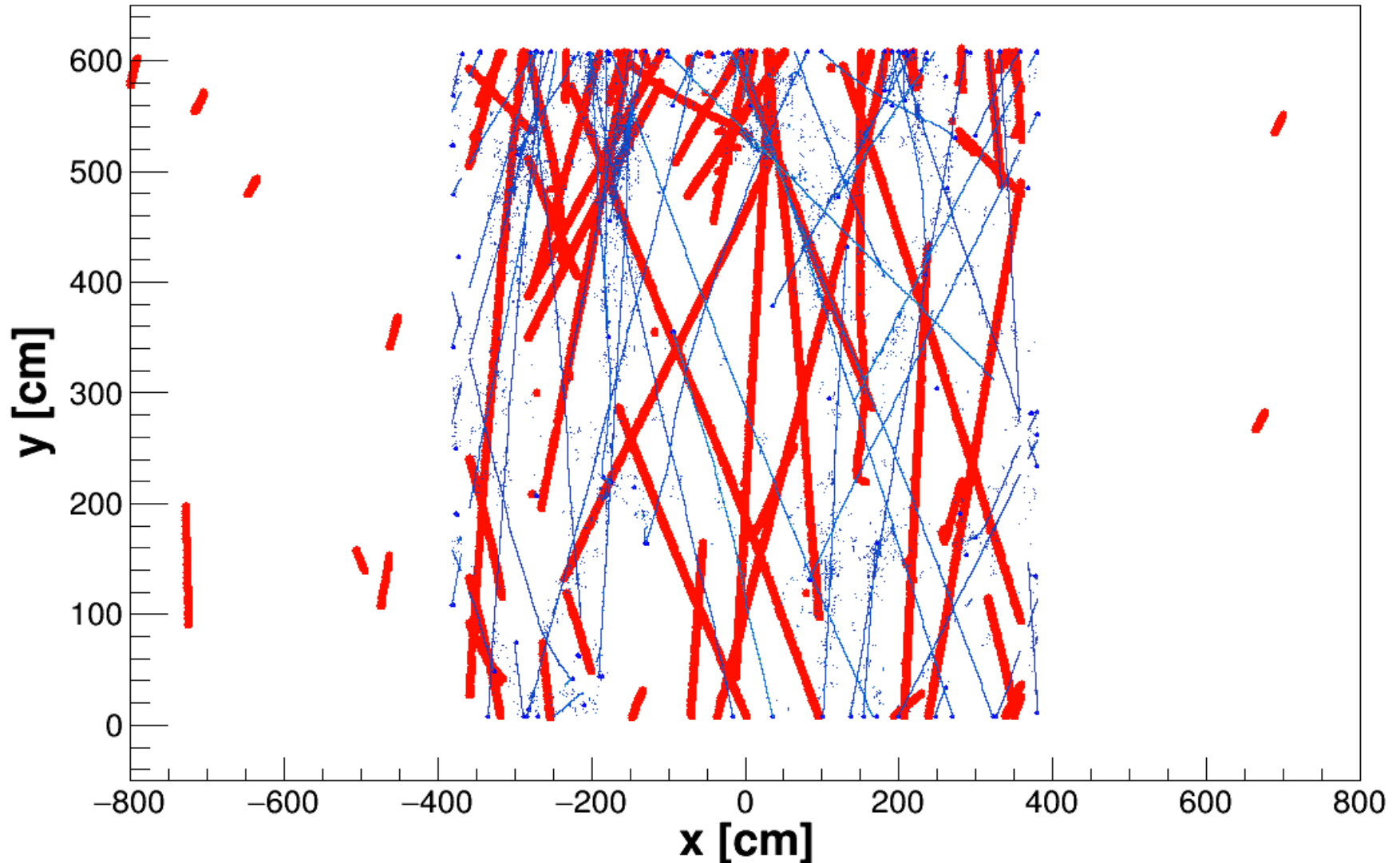
Track Length Residual



- *[ $MC_{length}$  determination not perfect]*
- Track finding coming up short
- Failing to stitch across TPCs?
  - Crossing CPA
  - Crossing APA
  - Crossing APA boundary



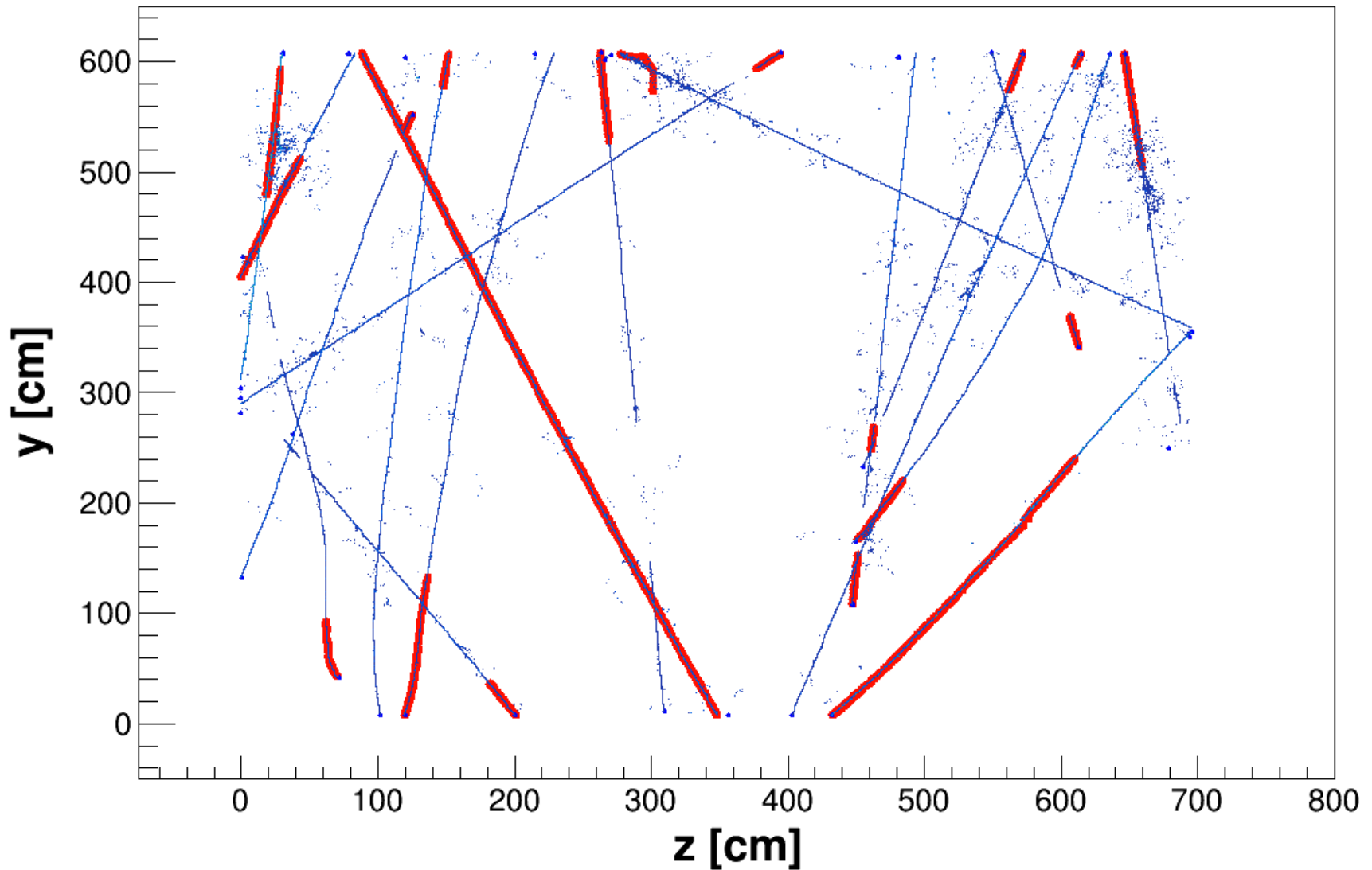
# Track Finding



**Issue with reconstructed track's X position. T0 offset handling?**



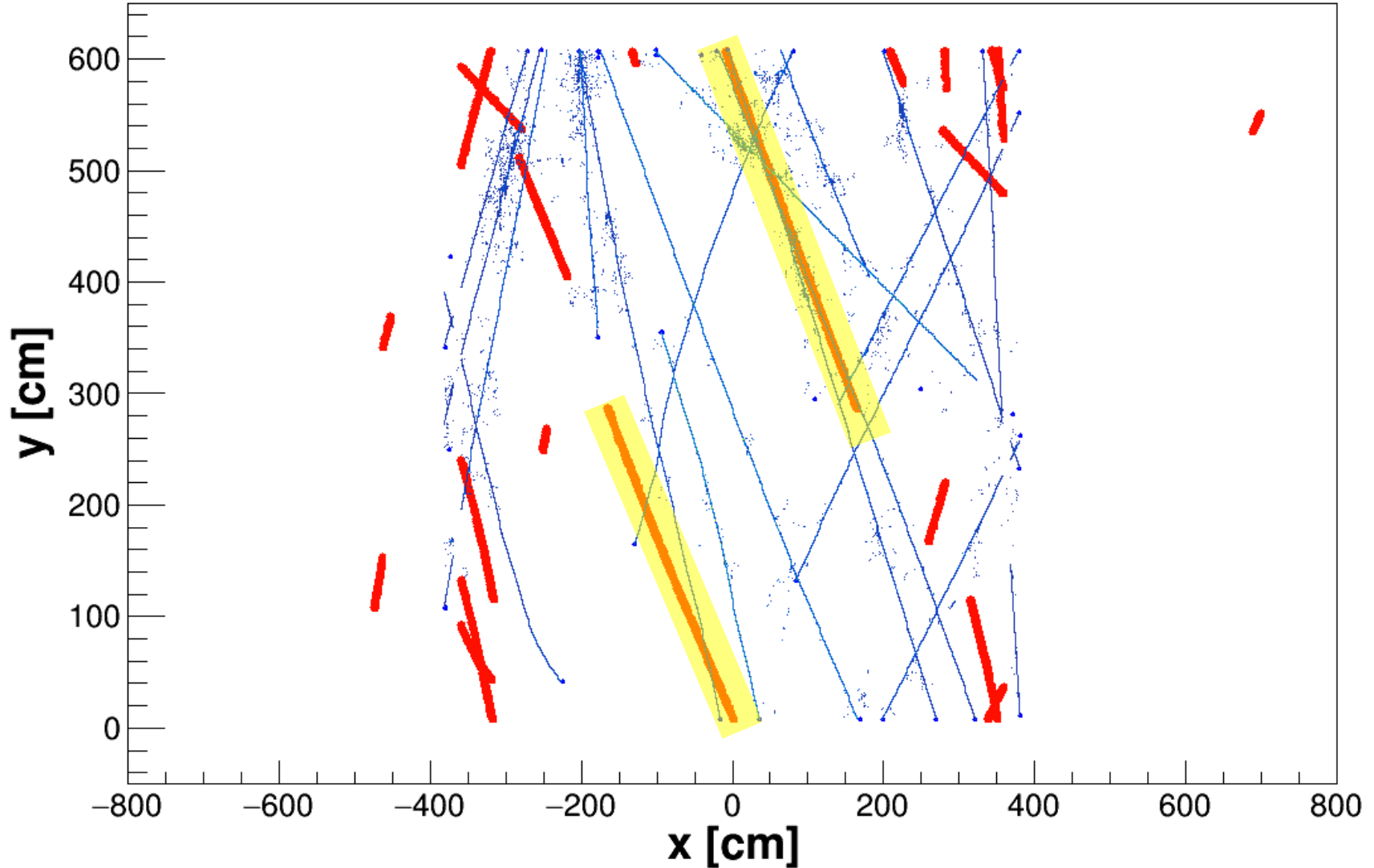
# Track Finding Failures



Tracks with residual length > 200 cm.



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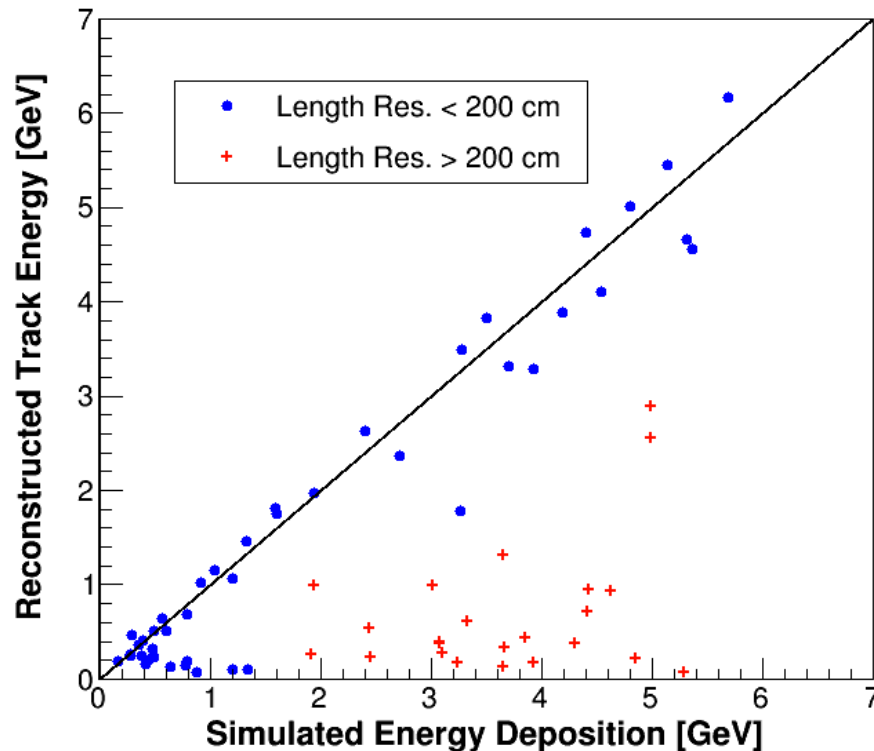


# Calorimetric Reconstruction

$$E_h = Q_h \cdot C e^{\frac{t_0-t}{\tau_e}}$$

$$E_t = \sum_h E_h$$

- Hit charge is corrected for finite electron lifetime  
 $\tau_e \equiv 3ms$  (no recombination correction)
- The reconstructed energy deposition for each hit belonging to a track is summed



Should address missing parts of tracks before moving forward with this...





# Summary

- Tracks seem to be getting cut short
  - Also need to understand how X positions are assigned to tracks in “events” with time windows  $>2.3\text{ms}$
- Seem to be able to do calorimetry pretty well, but would like to address the first bullet before moving forward
  - Implementing recombination correction
  - Towards calibration (identify stopping muons)

