SCE Map Update: Performance Studies

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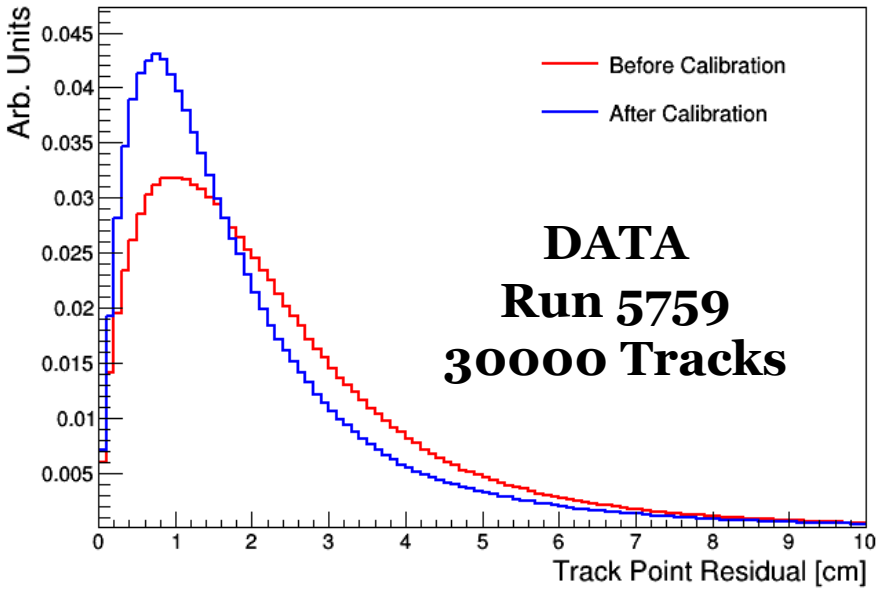
ProtoDUNE Sim/Reco Meeting

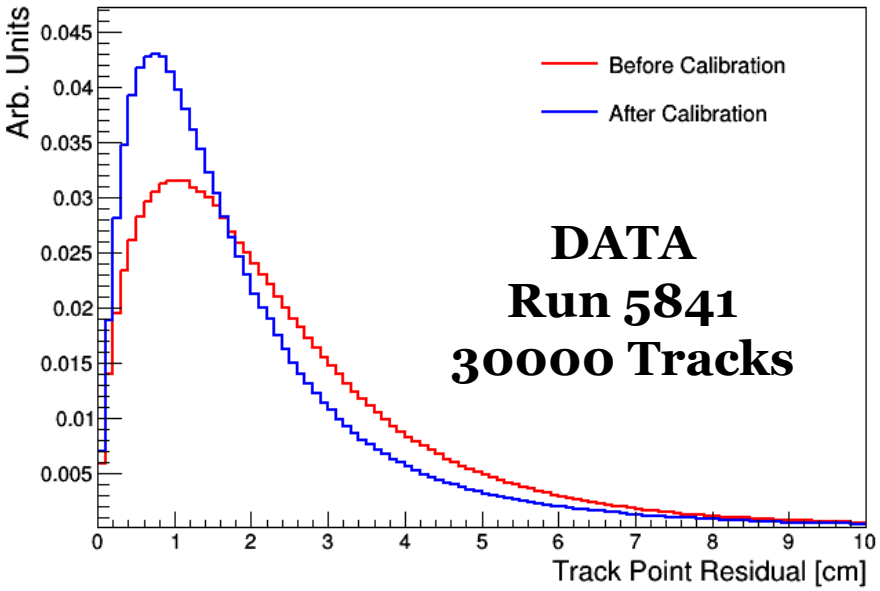
May 8th, 2019

Introduction

- Previously presented data-driven SCE maps
- Focus for today: data-driven metrics showing performance of calibration, using cathode-crossing tracks
  - Track point residuals
    - Distance of straight-line fit to track point, both before and after spatial corrections
  - dQ/dx distribution
    - Spatial correction impact (via spatial squeezing/stretching)
    - E field correction impact (via recombination)
    - Full impact (spatial and E field corrections)
- Also look at varying the center in Y/Z plane of charge distribution in maps – how is performance impacted?

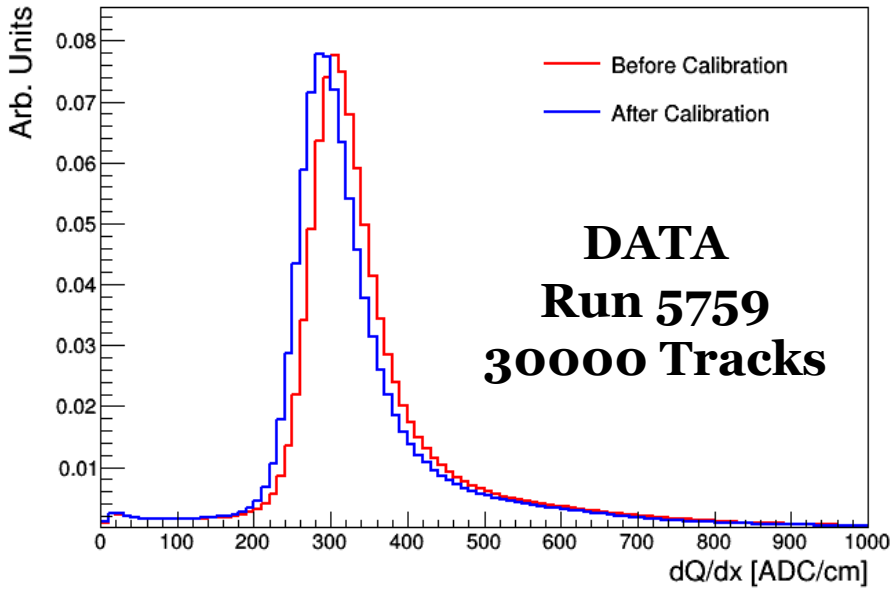
Track Point Residuals

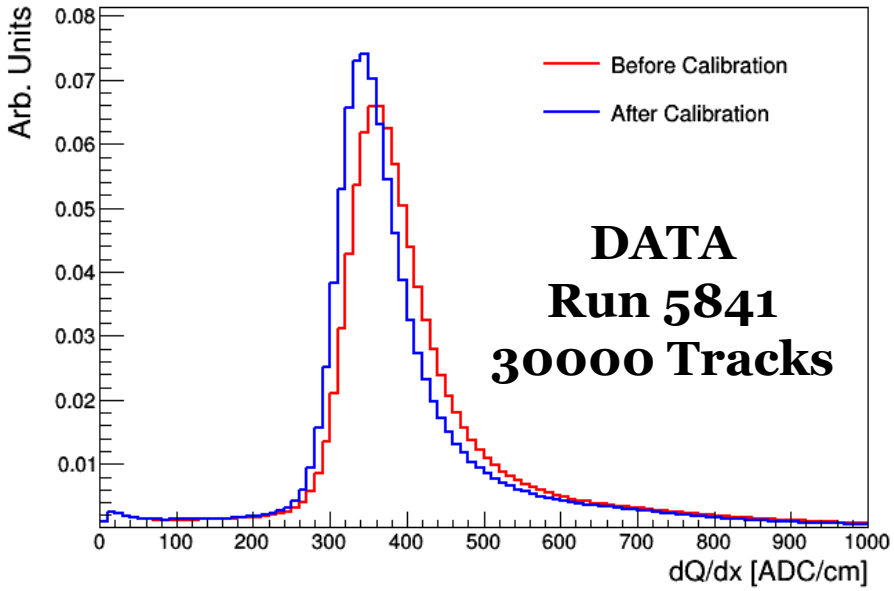




- Tracks become straighter after correction – not surprising
- Should compare to MC w/o SCE to better understand how much MCS complicates metric

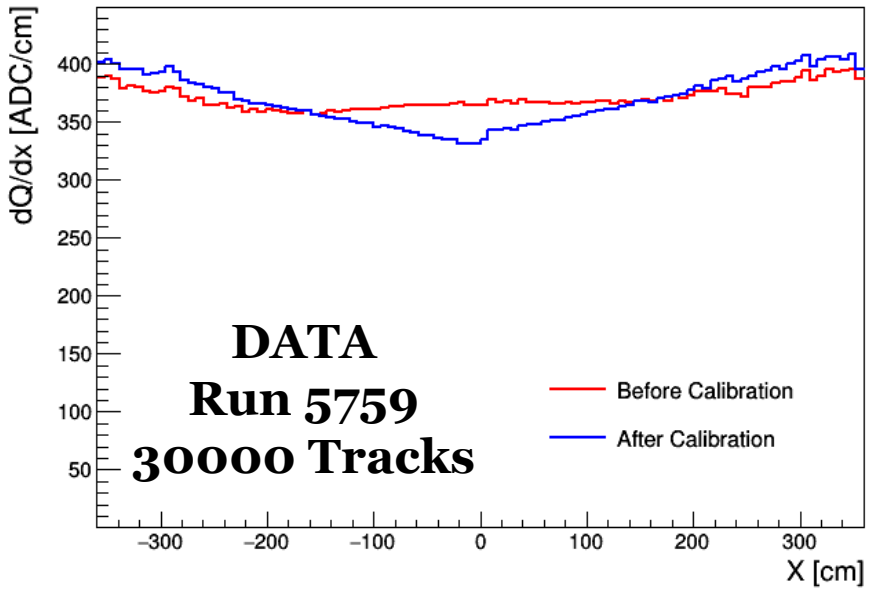
dQ/dx Distributions

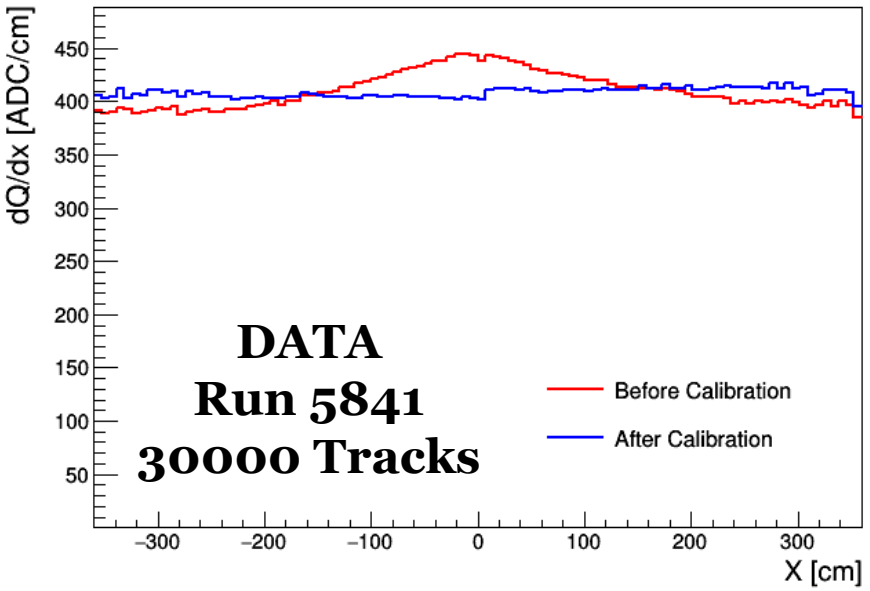




- dQ/dx distribution becomes more narrow after corrections
- Mean of distribution shifts to lower dQ/dx
- Feature at dQ/dx ~ 0 due to track being nearly orthogonal to anode plane (mostly removed via cut of dx < 2.0)

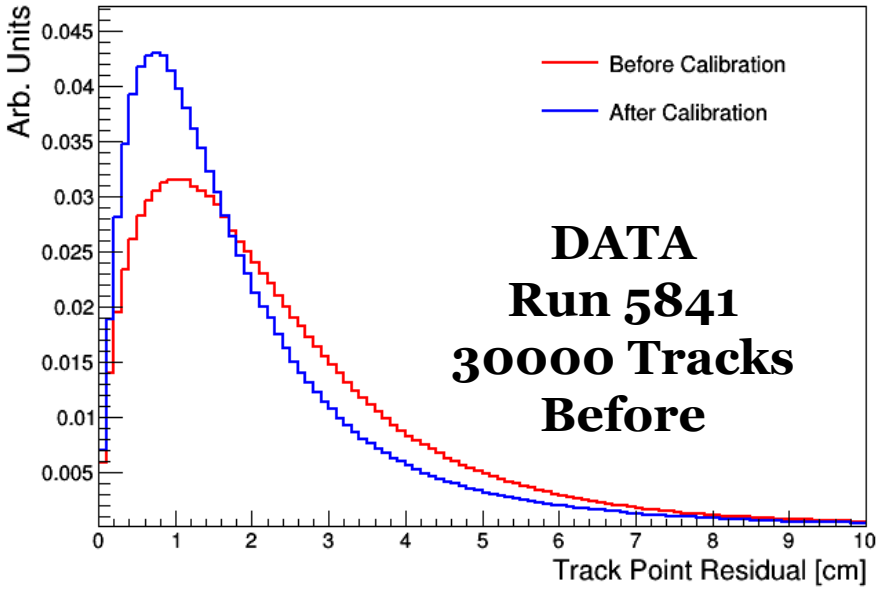
dQ/dx vs. X

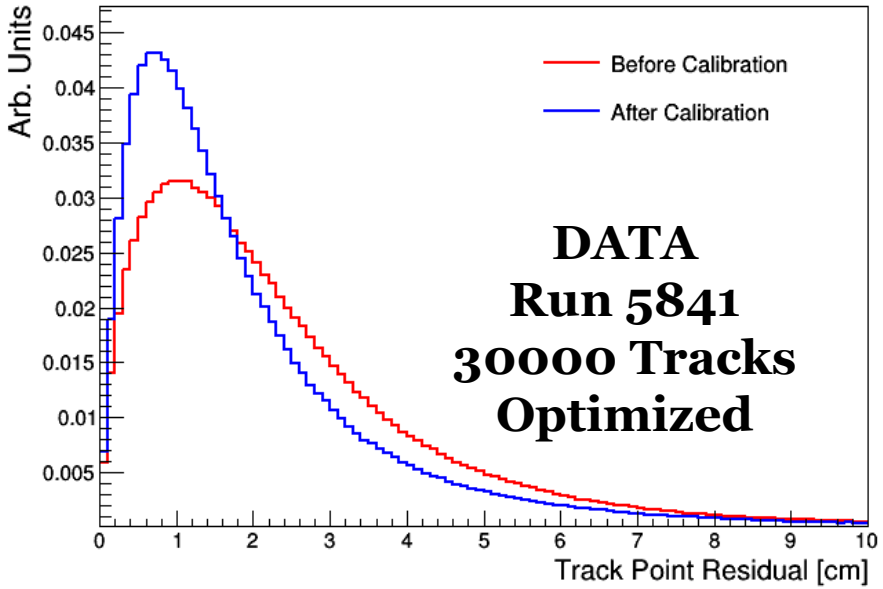




- dQ/dx vs. X shows different trend for different runs
  - Run 5759: post-correction electron lifetime ~ 12 ms
  - Run 5841: post-correction electron lifetime very, very high
- Either residual SCE after this preliminary correction or purity monitors underpredicting electron lifetime

Modifying Y/Z Charge Center





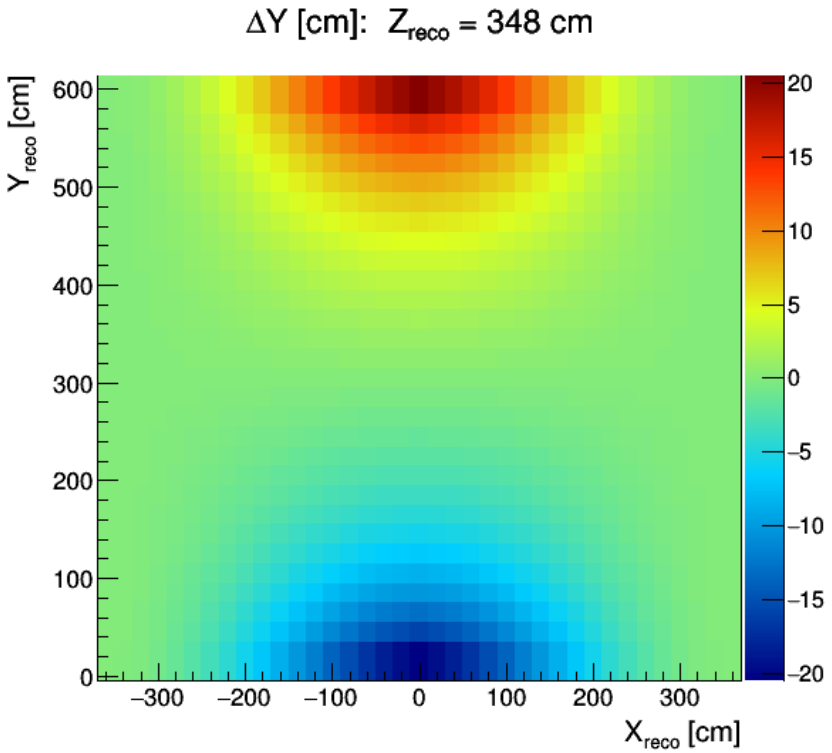
- Allow for Y/Z position of "center of charge" in distortion map calculation to vary within ±60 cm in both directions
- Small adjustment made: Y center same, Z center shifted by +30 cm – but very, very little difference

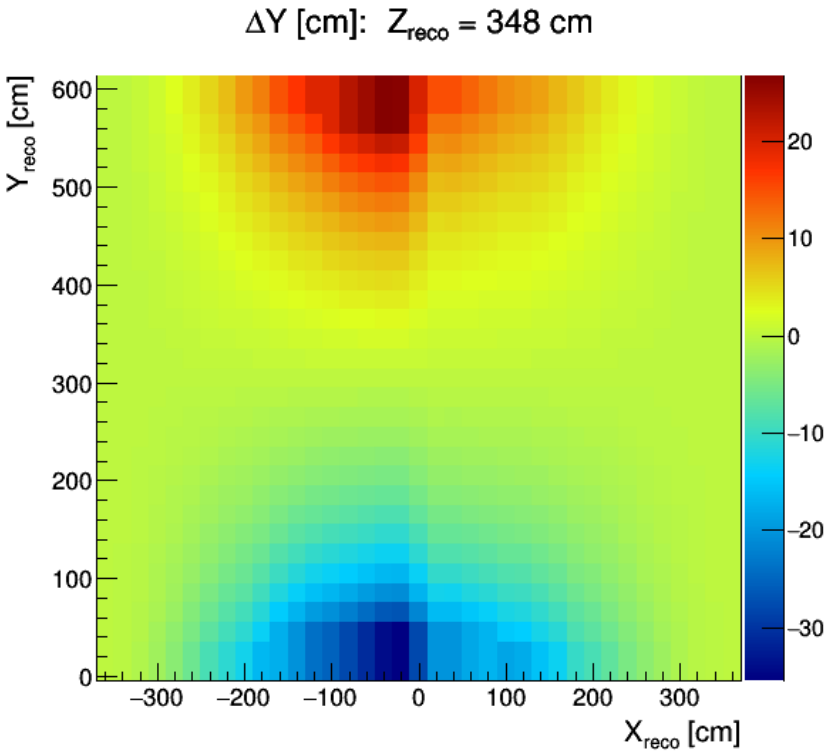
Summary

- Data-driven metrics studied – SCE calibration is improving things!
- Trends in dQ/dx vs. X still being understood
- Infrastructure in LArSoft also working – see Hannah's talk
- Data-driven SCE maps ready for next production (both simulation and reconstruction/calibration)

BACKUP SLIDES

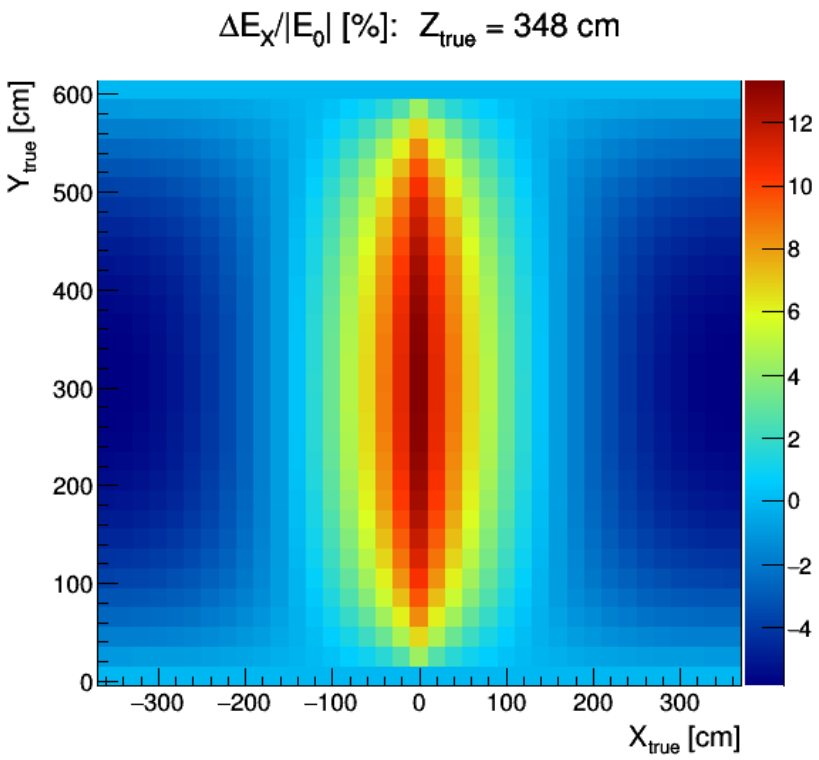
Backward Displacement Maps

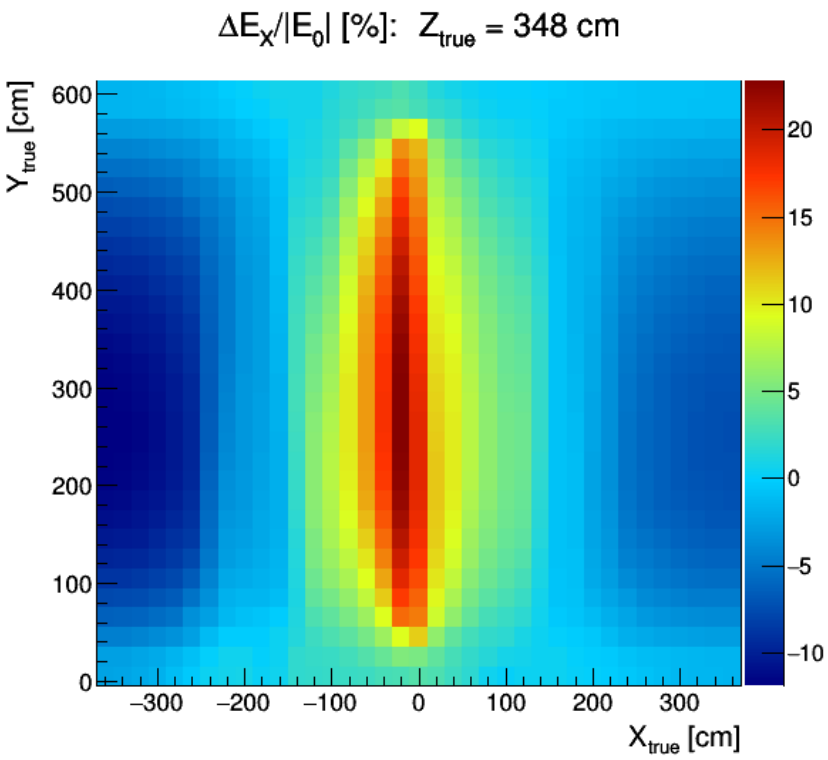




MC (No Flow) **Data**

E Field Maps





MC (No Flow)

Data