LArSoft hands-on session

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DUNE-France analysis workshop

November 17th, 2023

IJCLab Irène Joliot-Curie Laboratoire de Physique des 2 Infinis
université PARIS-SACLAY
cnrs

The UK LArSoft workshop

8th UK LArTPC Software and Analysis Workshop

24-27 octobre 2023
Science and Technology Building
Fuseau horaire Europe/London

- Vue d'ensemble
- Ordre du jour
- Liste des contributions
- Inscription
- Liste des participants

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Welcome to the 8th UK LArTPC Software and Analysis workshop! This workshop is rather informal, and it is intended for LArTPC Software/Analysis beginners (mostly PhD students and post-docs, but others are welcome too). The aim is for new collaborators on LArTPC experiments to become familiar with the software and analysis tools commonly available to experiments such as MicroBooNE, SBND, DUNE, protoDUNE and ICARUS...

This year, the school would be held in-person at Lancaster University. We will aim to run a remote connection, but the same level of participation cannot be guaranteed.

If you would like to attend this workshop, please make sure to register as soon as possible, and by no later than Friday 14th October, 2023. We look forward to seeing you in Lancaster!

https://indico.ph.ed.ac.uk/event/268/

Covered topics

- Scintillation photons
- Track/shower simulated samples
- Pandora algorithms
- Reconstruction issues
- LArSoft analyzer module
- Deep learning methods (ResNet18)

Well mature workshop definitely advisable to anybody starting on LArTPC data reconstruction!

Goal of the session

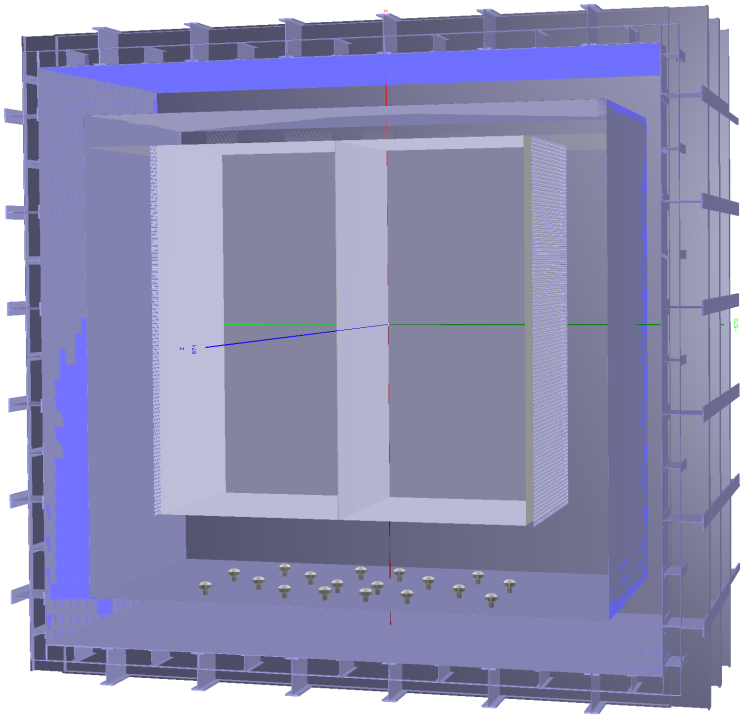
- Make sure everybody here in the room is at the same basic knowledge via a simple ‘press-button tutorial’

- Pick-up a use case to manipulate standard sim/reco stages tools
  - Install custom version of LArSoft with custom analysis module
  - Generate simulation samples
  - Look at Geant4 deposits
  - Look at Pandora reconstructed tracks
  - Look at calorimetric information

- Get feedback on your good practices and for future advanced tutorials that would include more concrete physics case (if it raises interest)!

ProtoDUNE-Dual phase

6 m long drift volume

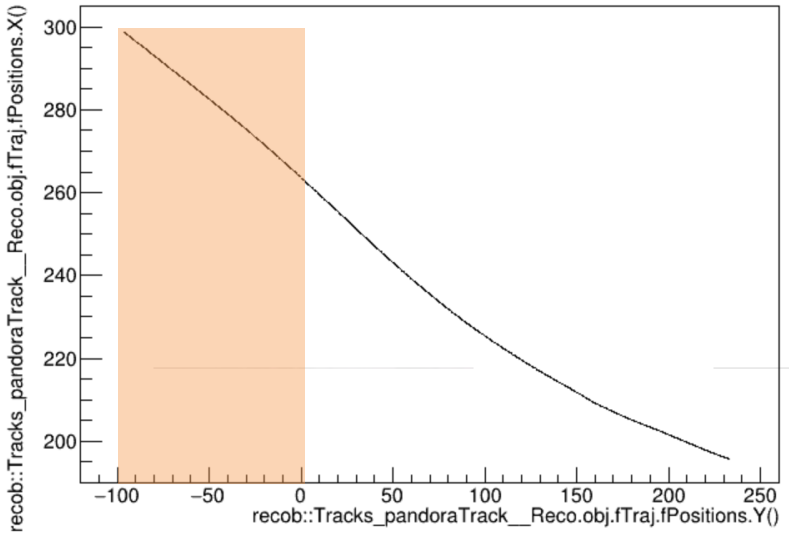


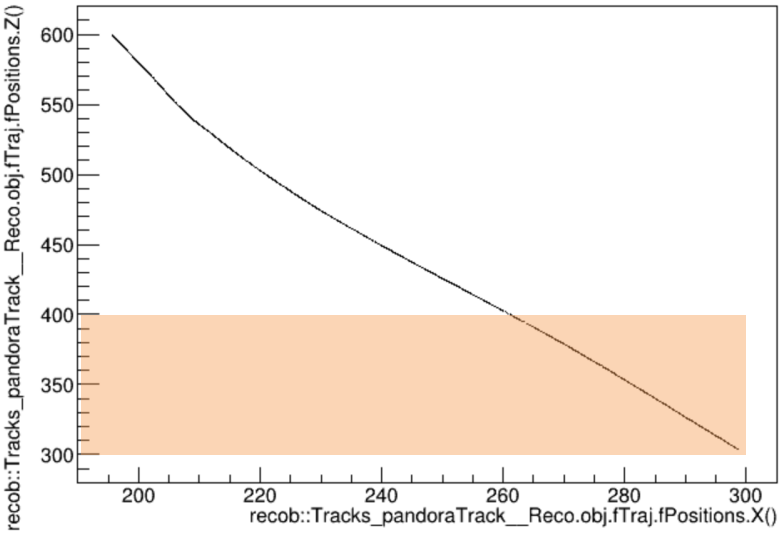
Started to study earlier this year the diffusion in Lar
Reconstructed data available – data / MC comparison possible in principle

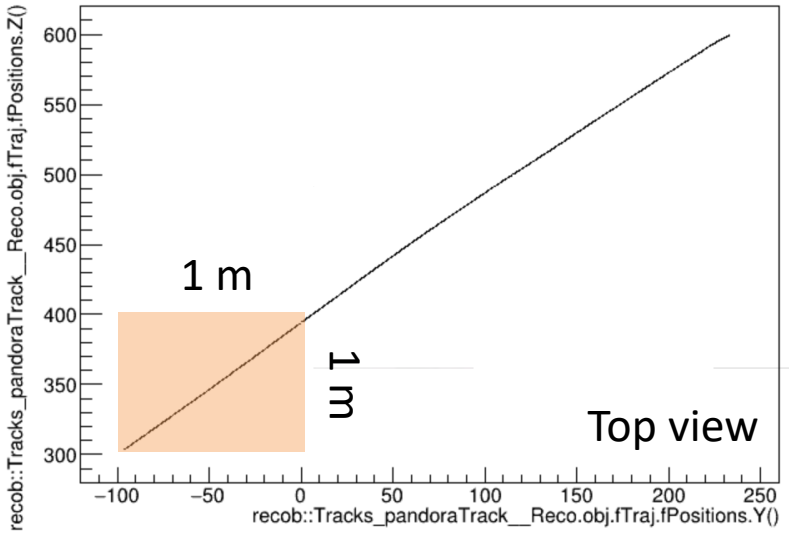
Simulation track

Anode template: $\theta_{XZ} = 20$ & $\theta_{YZ} = 45$

= active CRP volume

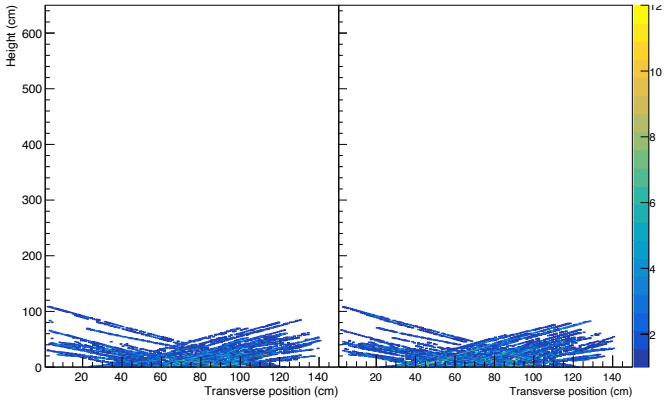


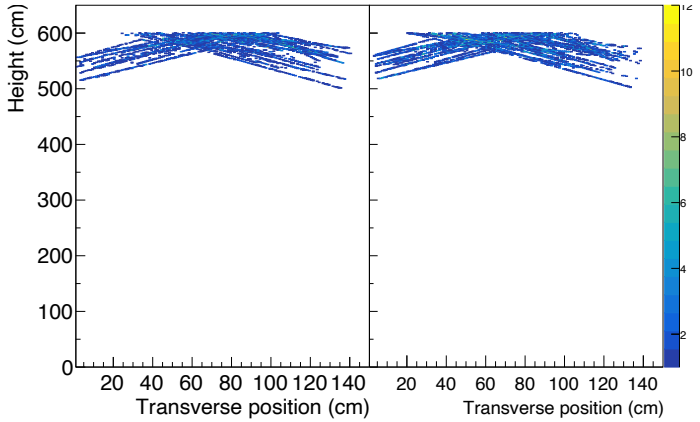




Anode / cathode tracks selection

- Wrote a custom module for my specific needs

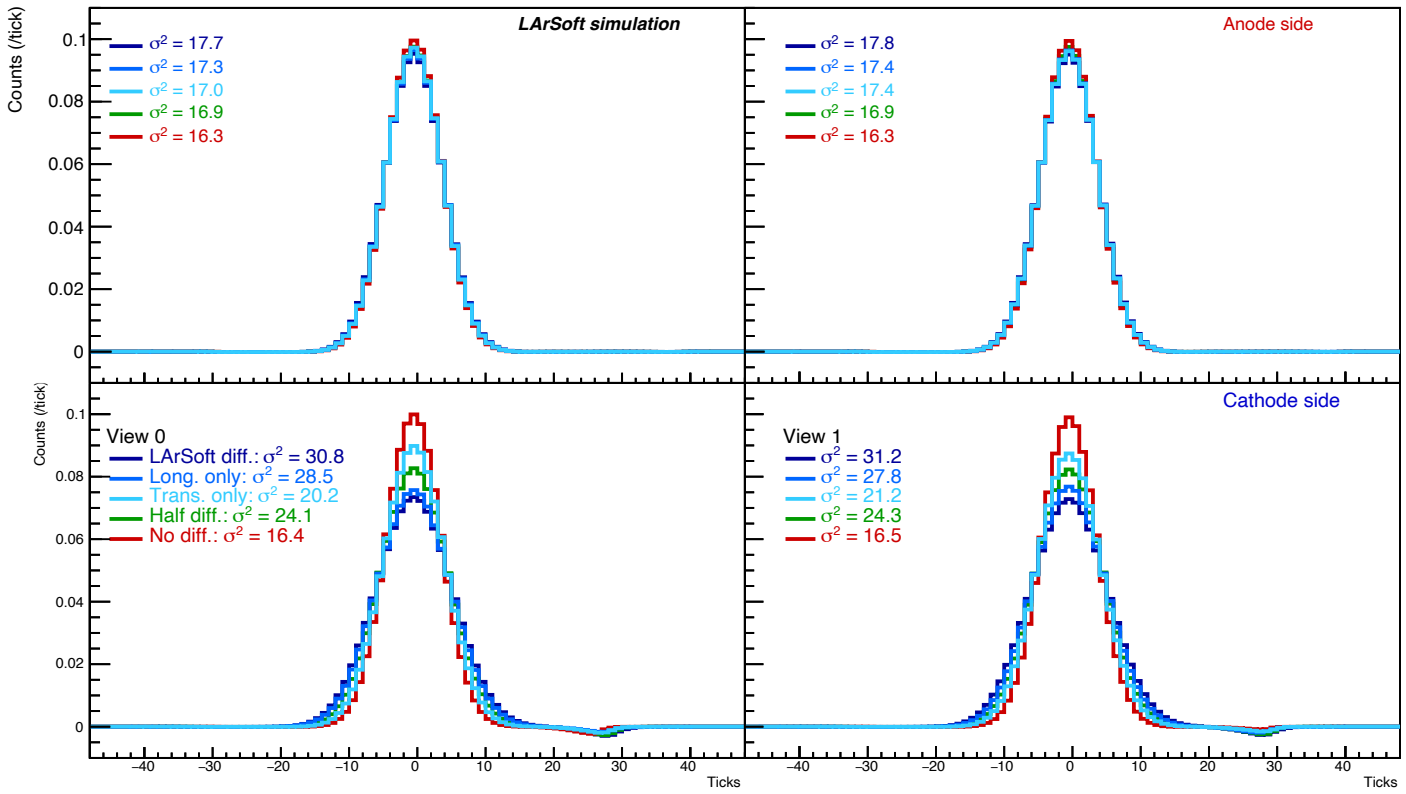




- NB: No T0 trigger, use start and end track position to discriminate anode/cathode from the rest

Varying LArSoft diffusion

- **Tested influence of reduced diffusion and L or T diffusion only**

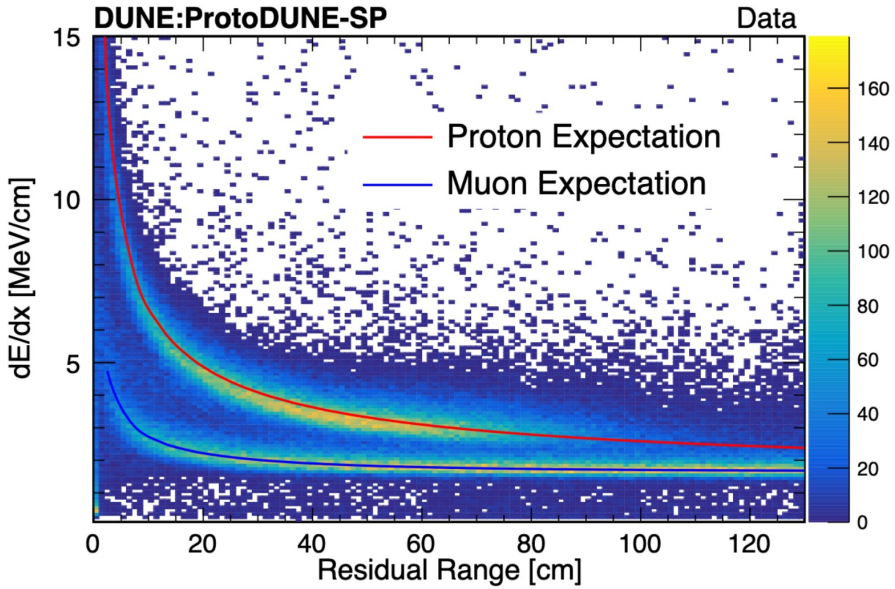


- *NB: validation of the selection yet to be done on data…*

For this tutorial

- Try to select stopping particles: muons & protons

[2007.06722]



- An exhaustive tutorial can be found here:
  https://indico.ph.ed.ac.uk/event/268/contributions/2731/attachments/1458/2252/LArSoft_Analysis_Tutorial_2023.pdf
- For today, go to:
  https://gitlab.in2p3.fr/dune-france/analysis-workshop/-/wikis/Stopping-particles-LArSoft-tutorial