OPTICAL SELECTION FOR PANDORA-BASED ELECTRON NEUTRINO SEARCHES IN MICROBOONE

Invisibles Workshop, KIT

Wouter Van De Pontseele

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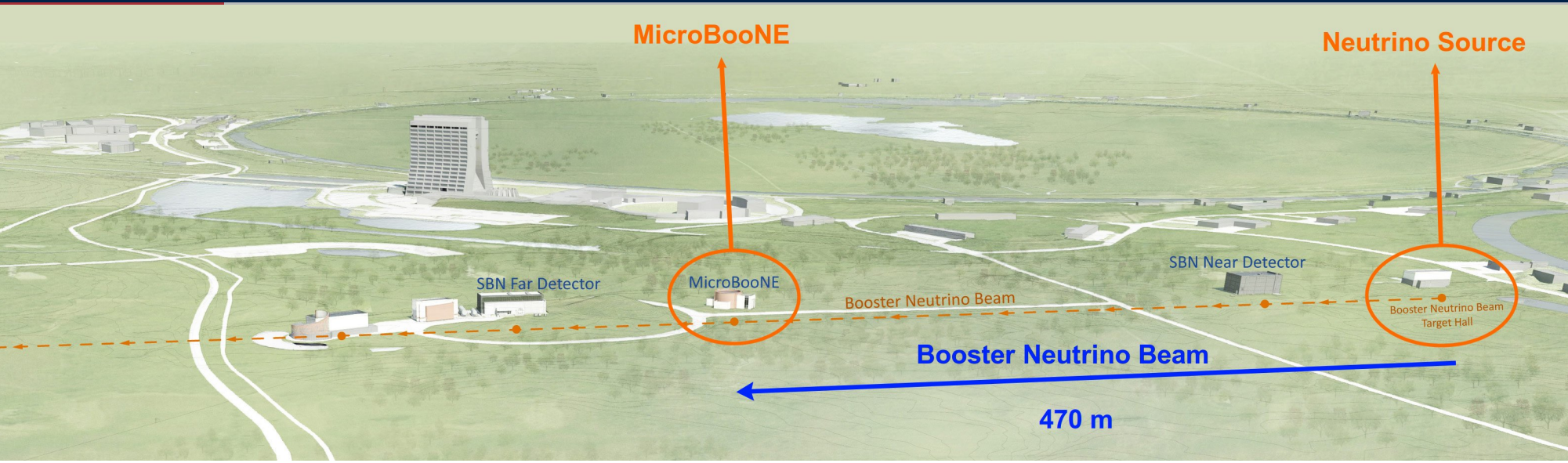
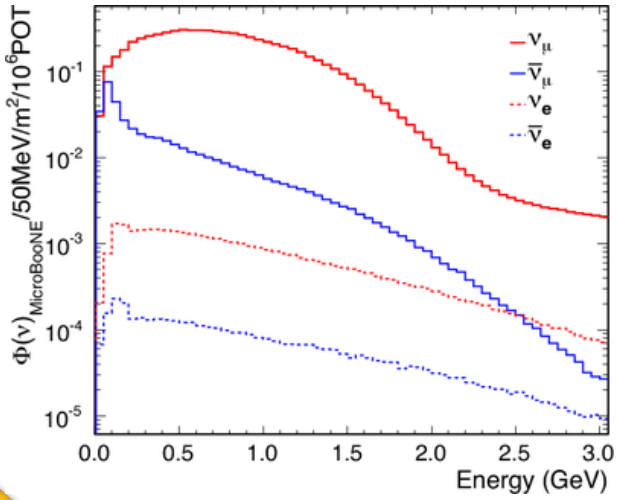
University of Oxford, Harvard University

The MicroBooNE experiment

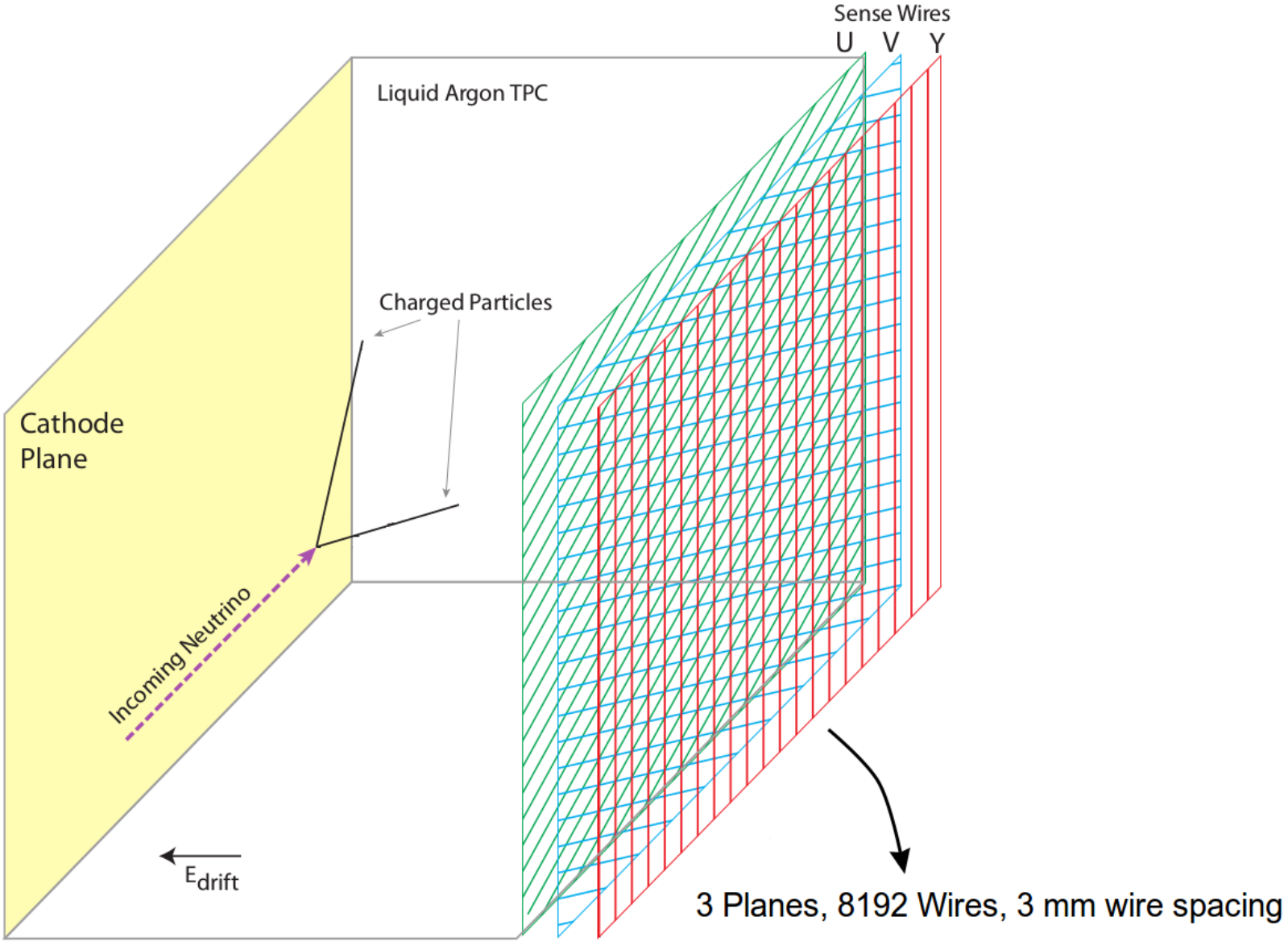


Physics goals

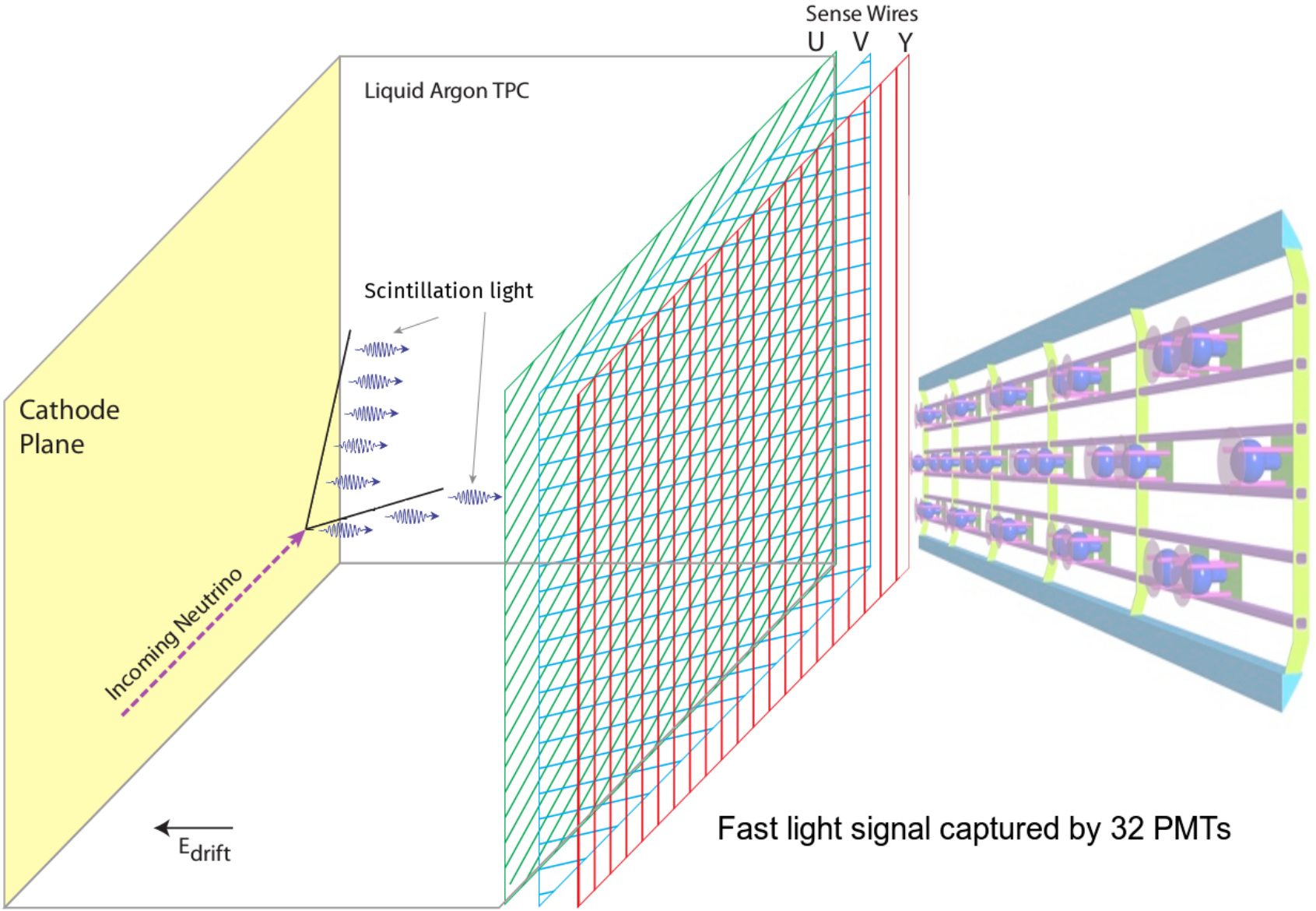
- First step in the **Fermilab short baseline program**
- Electromagnetic **low-energy excess** observed by MiniBooNE
- **Cross section** measurements
- Liquid Argon Time Projection Chamber (LArTPC) **R&D**



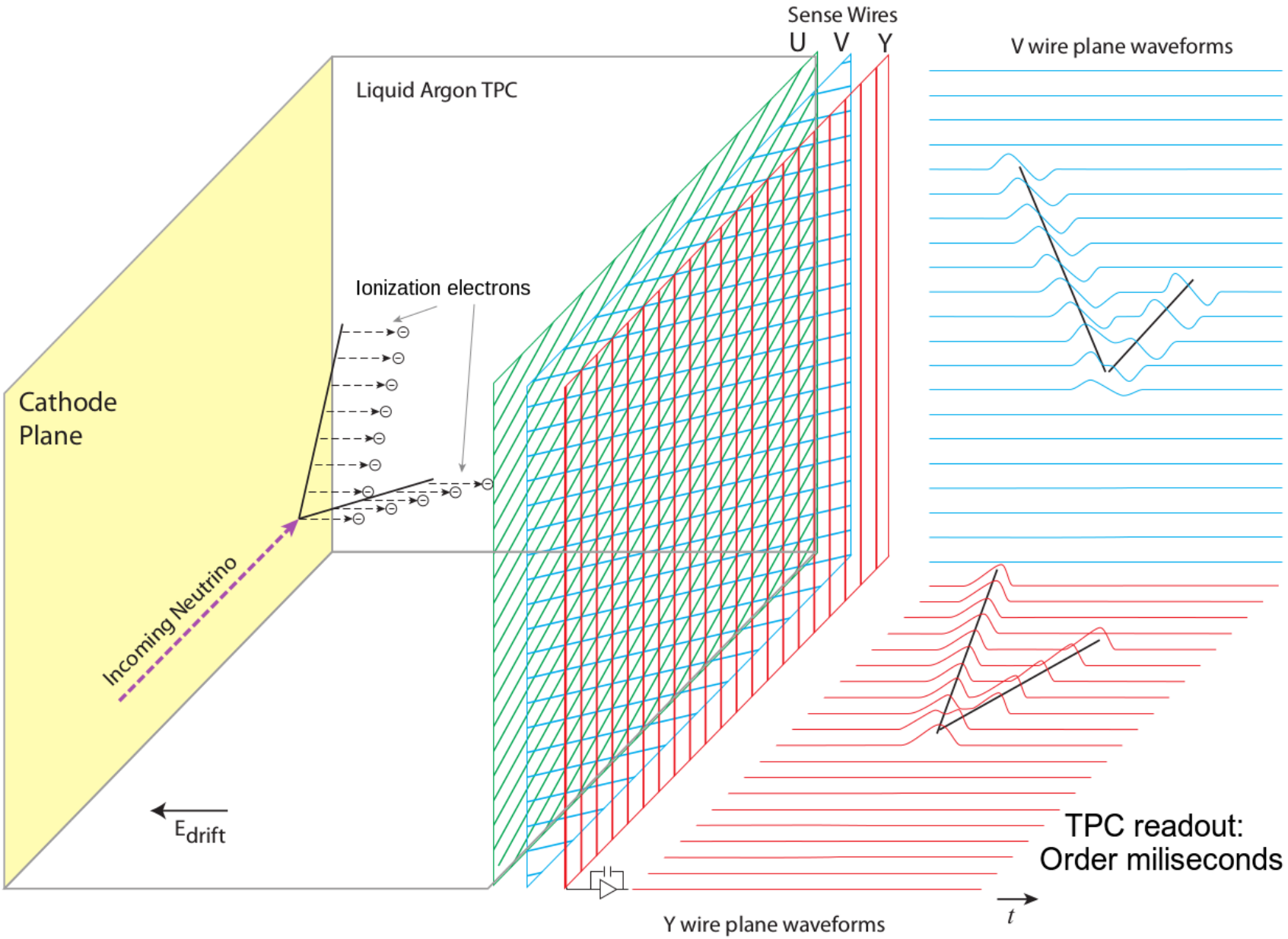
Liquid Argon Time Projection Chamber



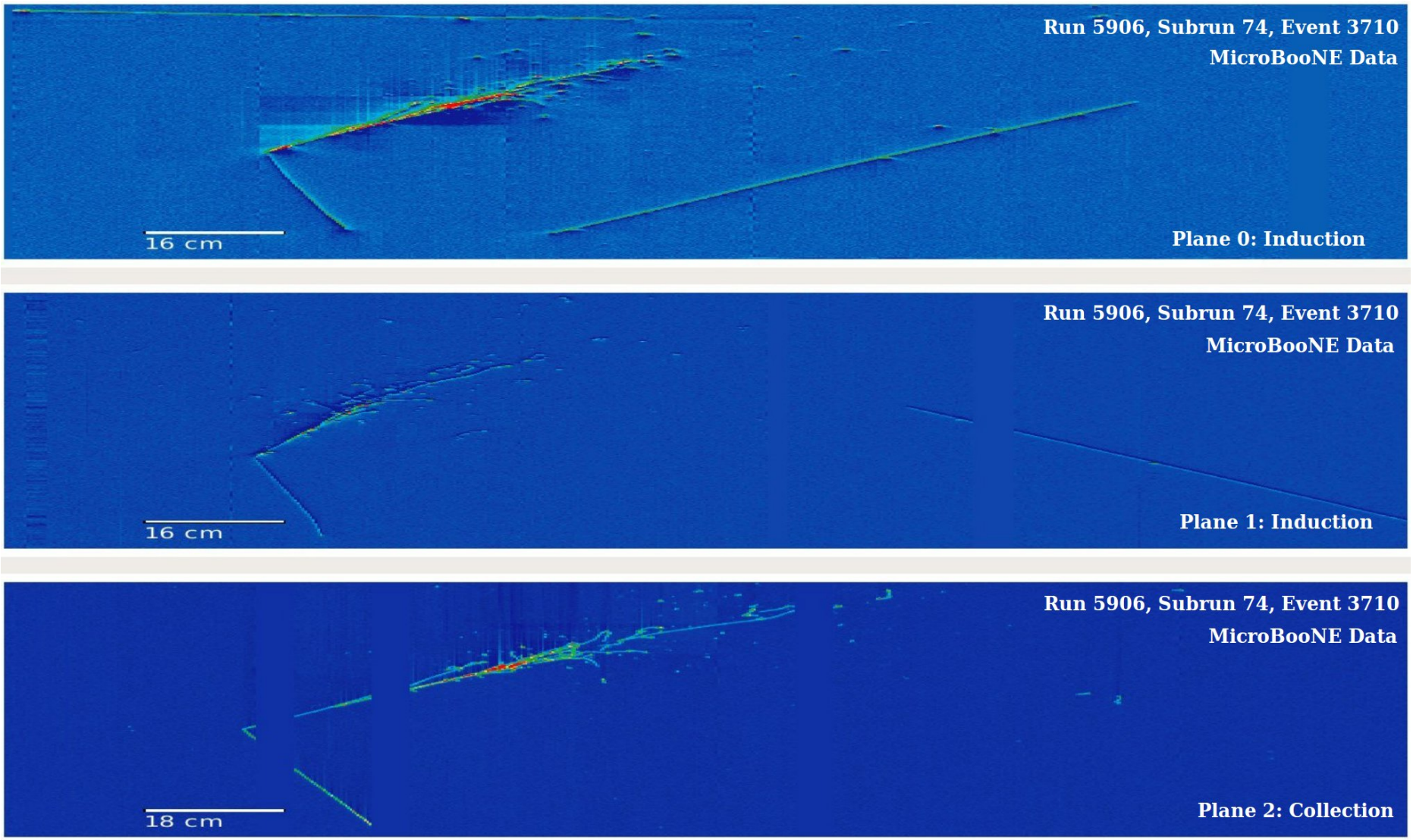
Liquid Argon Time Projection Chamber



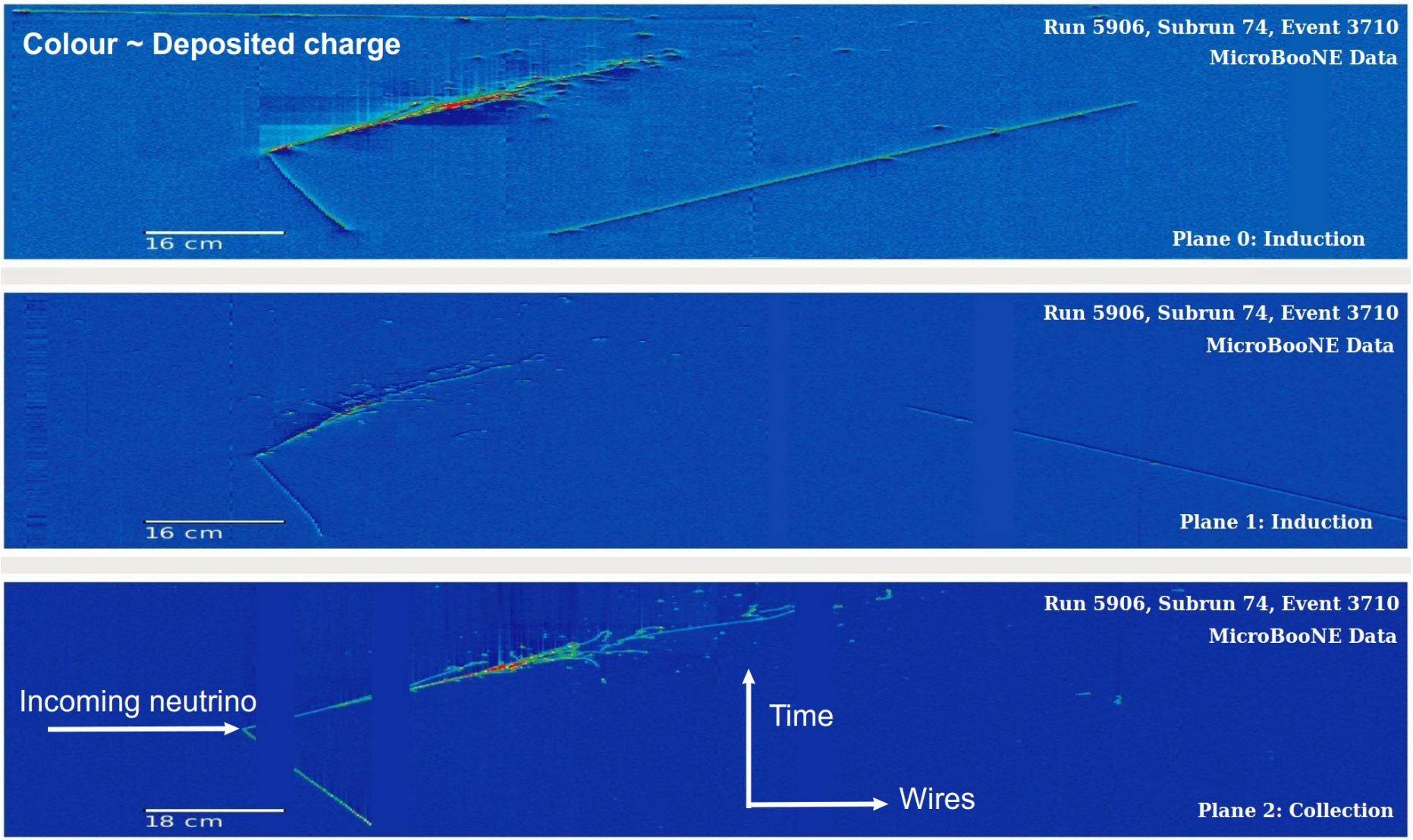
Liquid Argon Time Projection Chamber



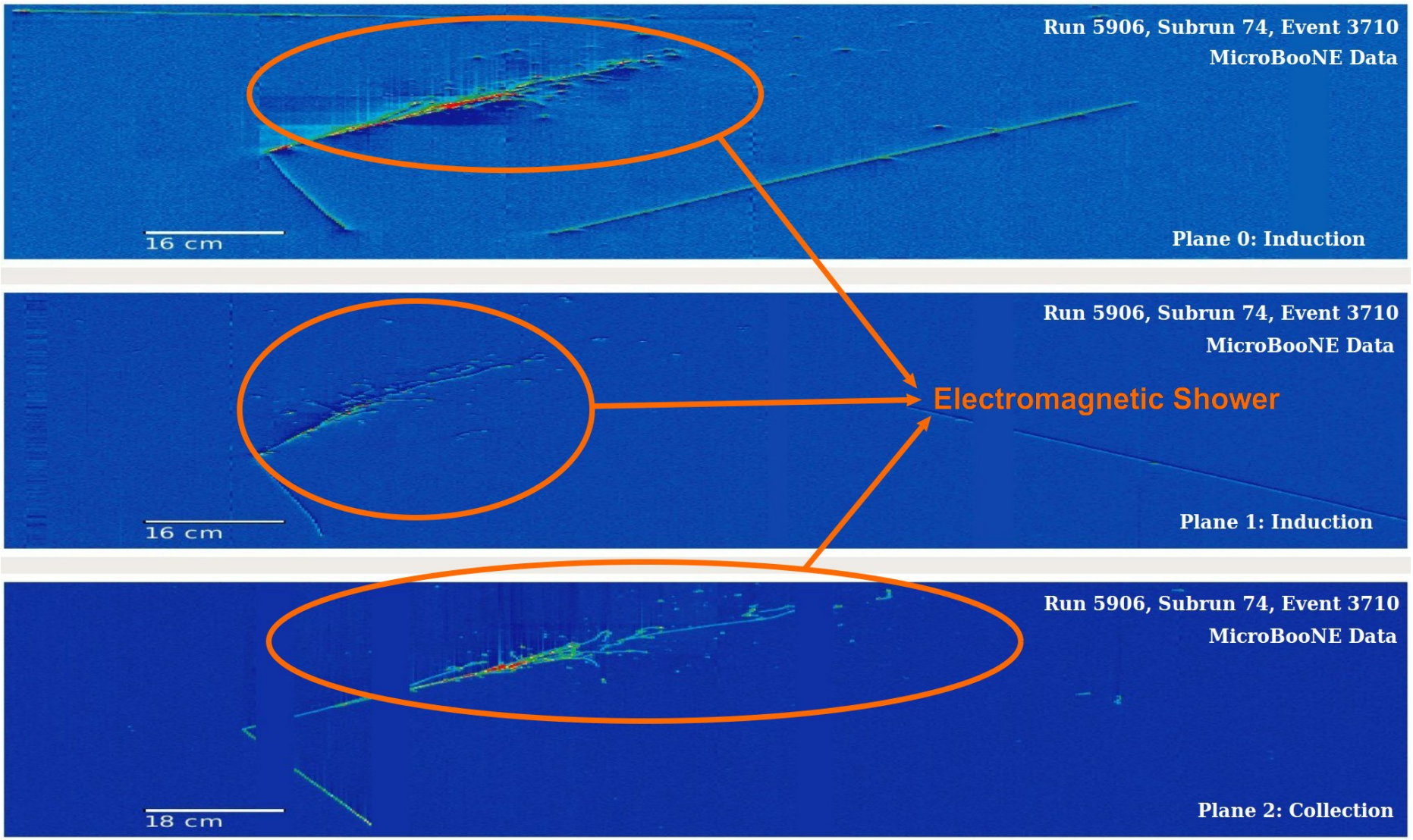
MicroBooNE Data Event



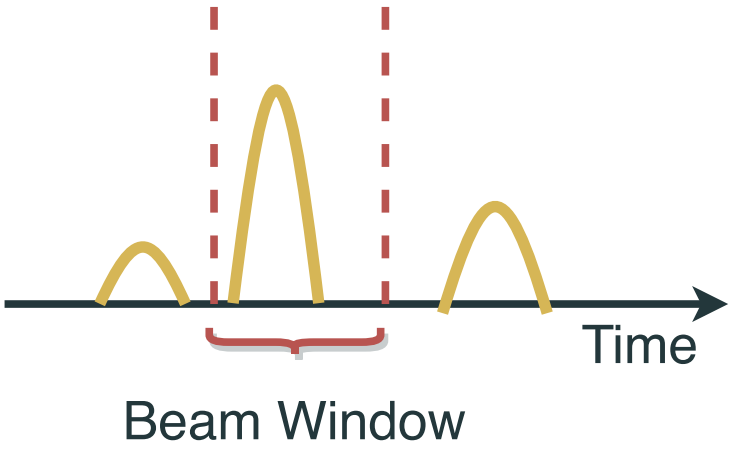
MicroBooNE Data Event



MicroBooNE Data Event

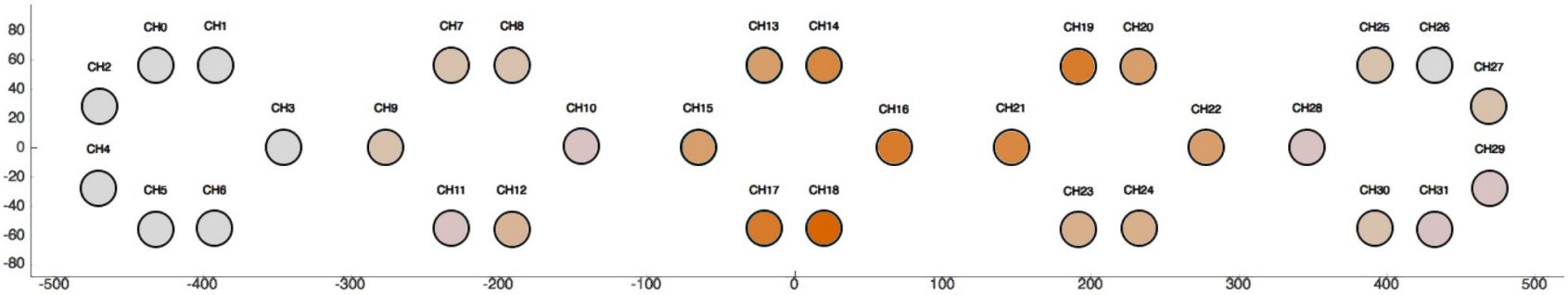


Optical pre-selection: Light reconstruction



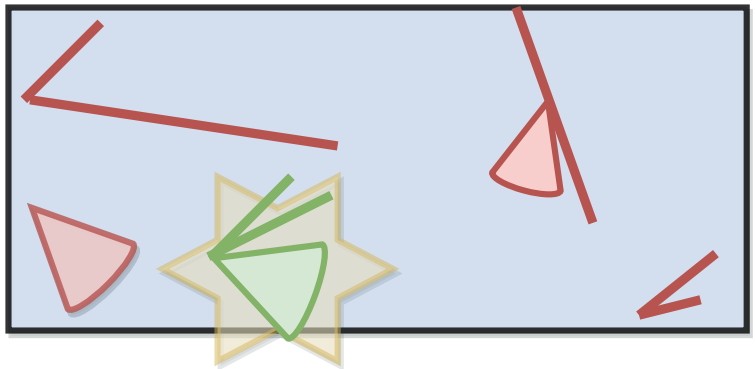
Flash selection

- Reconstruct a *Flash* **coincident with the neutrino beam**.
- Contains a **PMT photo-electron spectrum** corresponding to an interaction in the TPC.

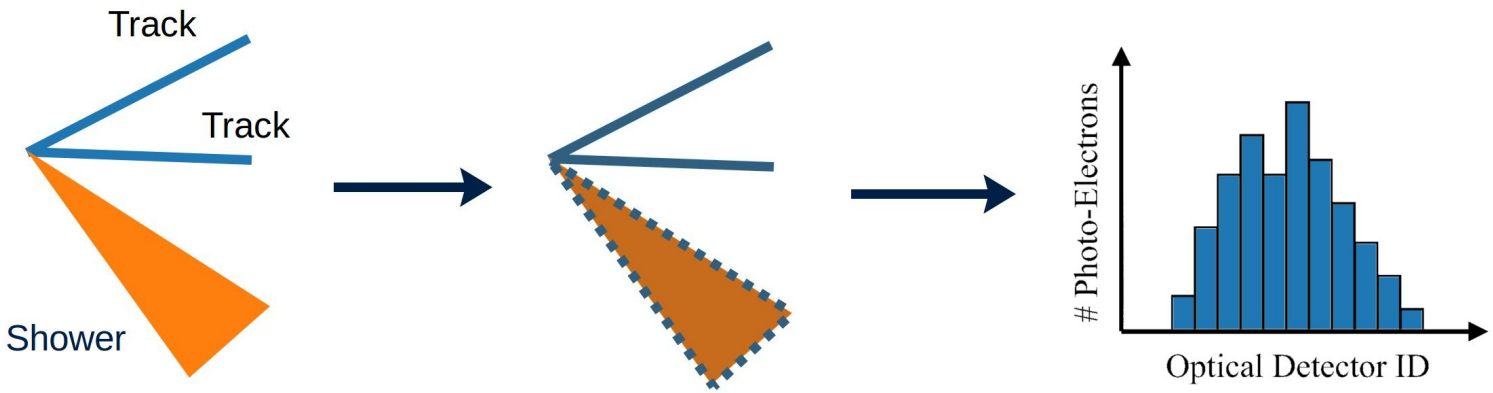


Optical pre-selection: Match light to reconstructed candidates

Pandora reconstruction framework creates multiple candidate interactions in the TPC. Only a neutrino interaction will likely coincide with the flash inside the beam window.



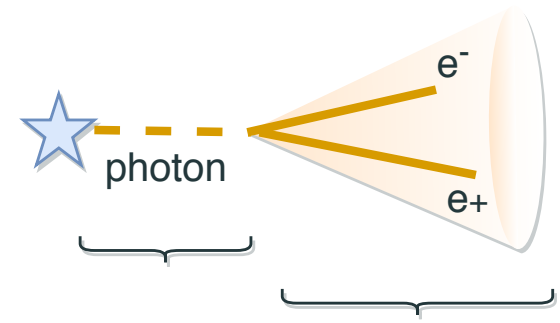
For all candidates, a **flash hypothesis** is created and **compared with the optical flash**.



Shower reconstruction and e/γ identification after pre-selection

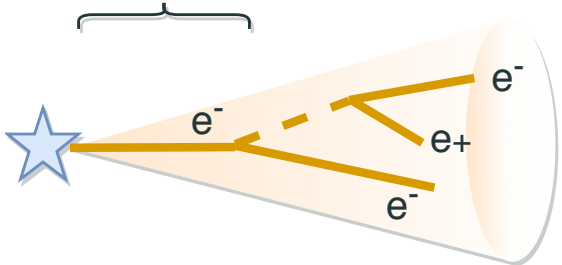
Photon shower:

displaced vertex and ~4 MeV/cm at start



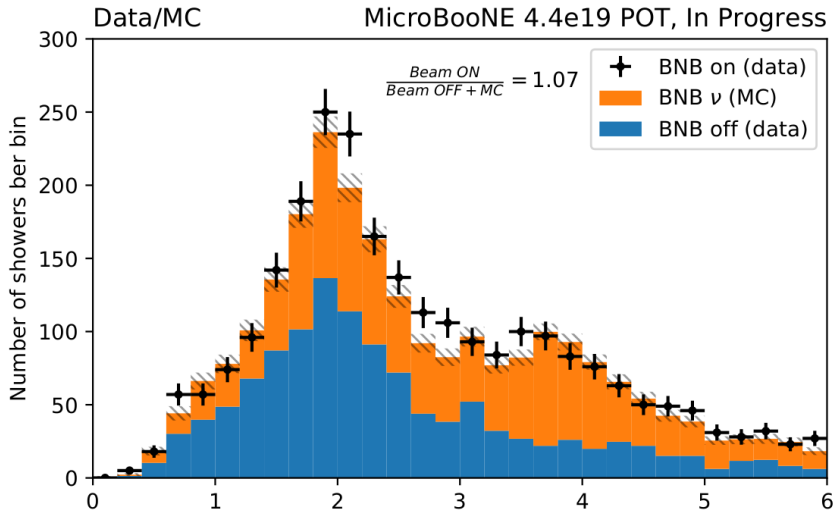
Different

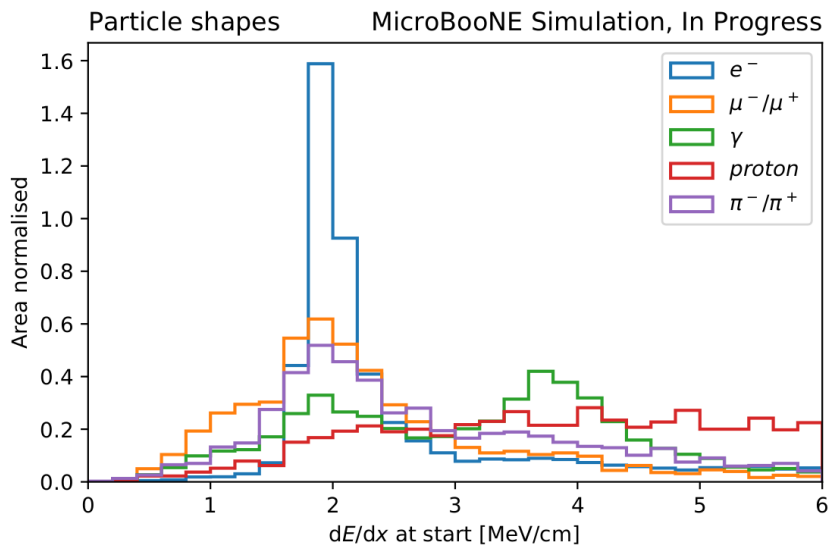
Similar



Electron shower:

vertex at interaction and ~2 MeV/cm at start





Conclusion

- MicroBooNE just passed its third year of stable data-taking.
- Progress being made towards the low-energy excess result.
- Optical information essential to reduce cosmic backgrounds.
- Electromagnetic shower reconstruction capabilities of LArTPC fully exploited.

Visit my poster for more results!