

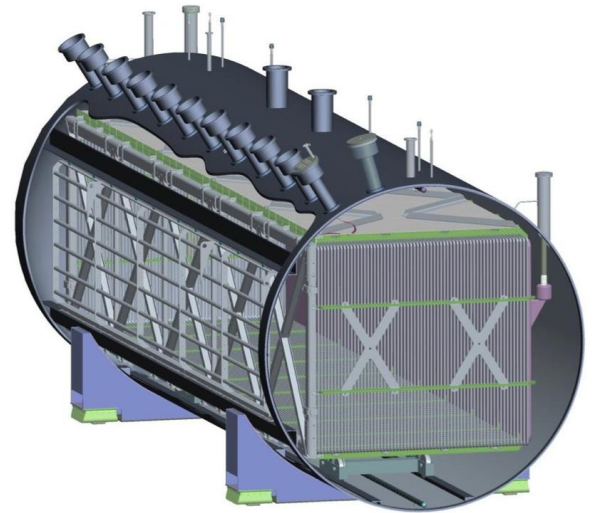


Laser-Based Cathode-to- Anode Drift Velocity Measurement

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MicroBooNE Detector at Fermilab

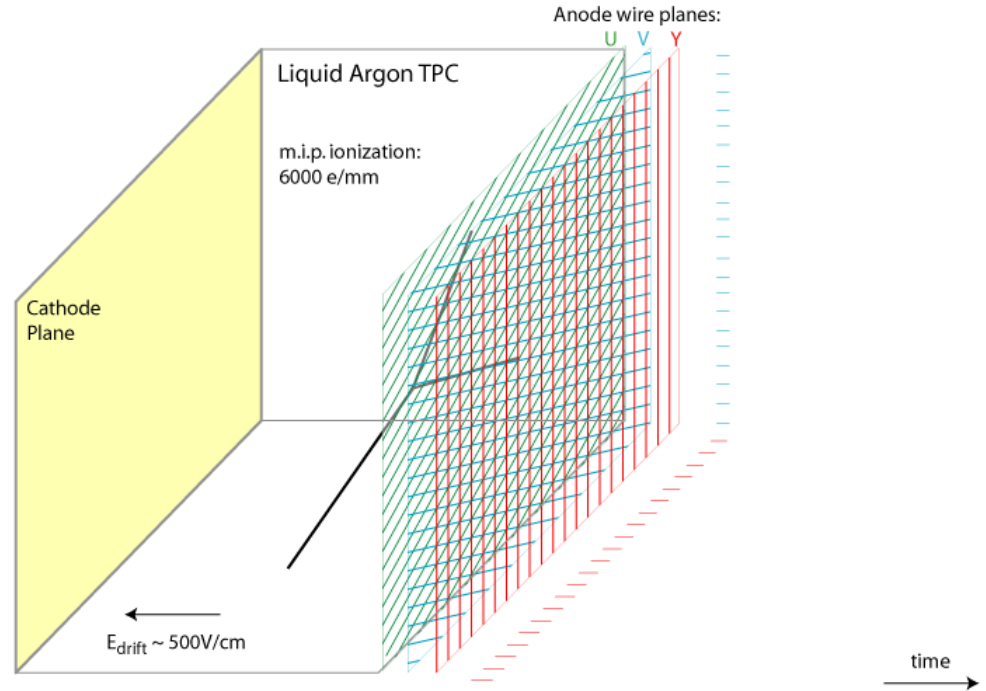
- MicroBooNE is a 170-ton liquid-argon time projection chamber (LArTPC)
- Was built to do experiments that study neutrino interactions
- Criss-Crossing wires detect the electrons from the ionization of the Argon



https://www.researchgate.net/figure/Schematic-diagram-of-MicroBooNE-detector_



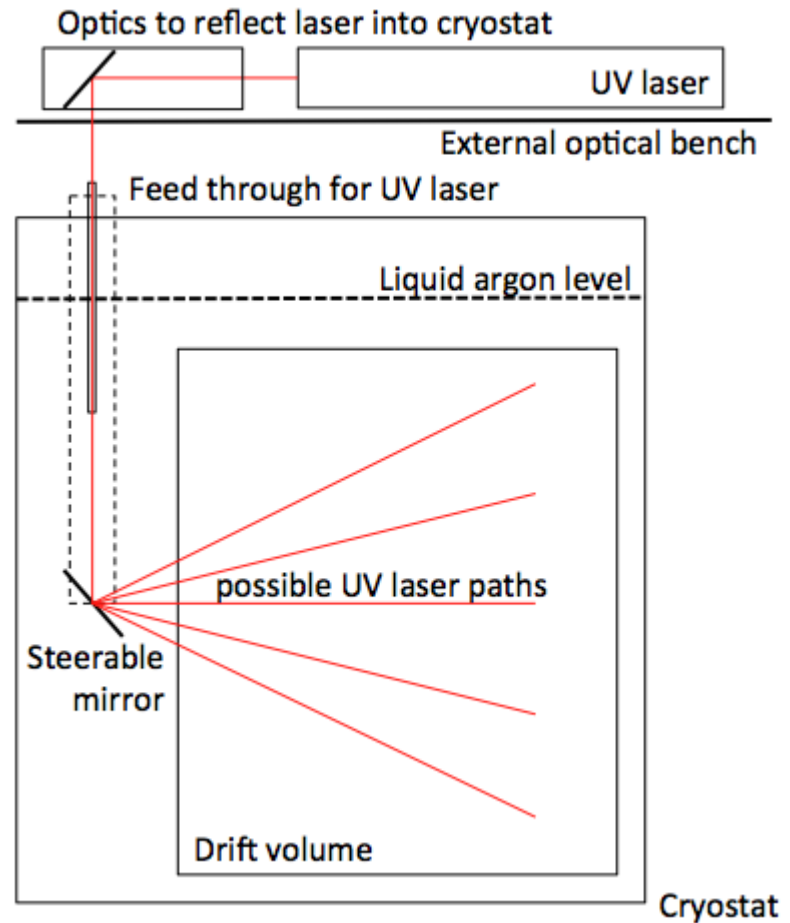
- Event occurs in the Argon and the electrons drift because of the applied electric field



<https://www.phy.bnl.gov/wire-cell/>

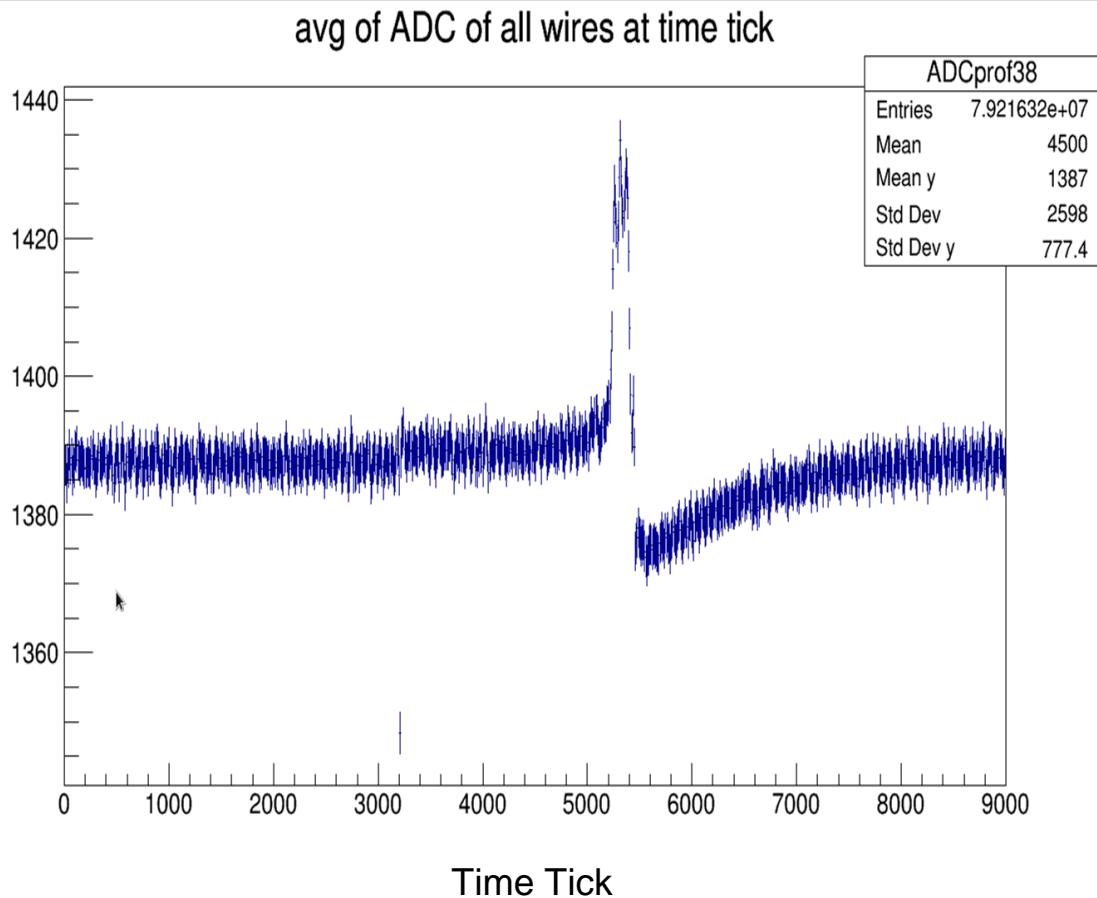


- UV laser ionizes the Argon



Laser Data

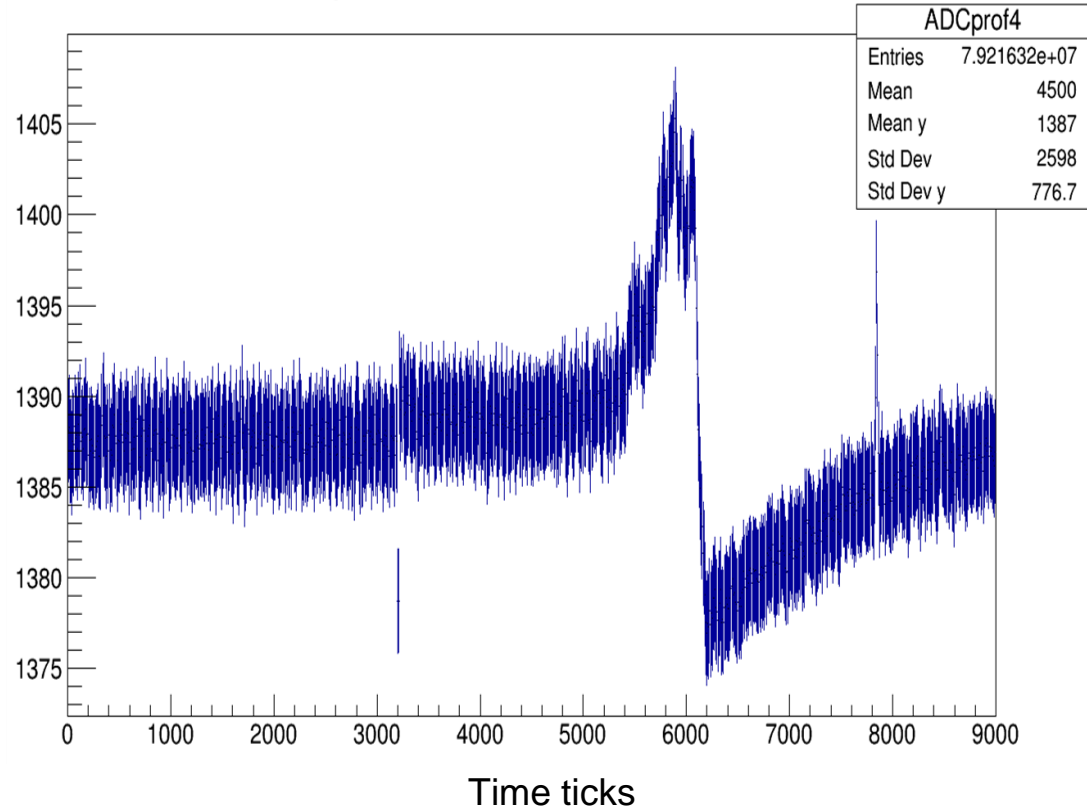
- Average Drift Time
- Averaged over all wires



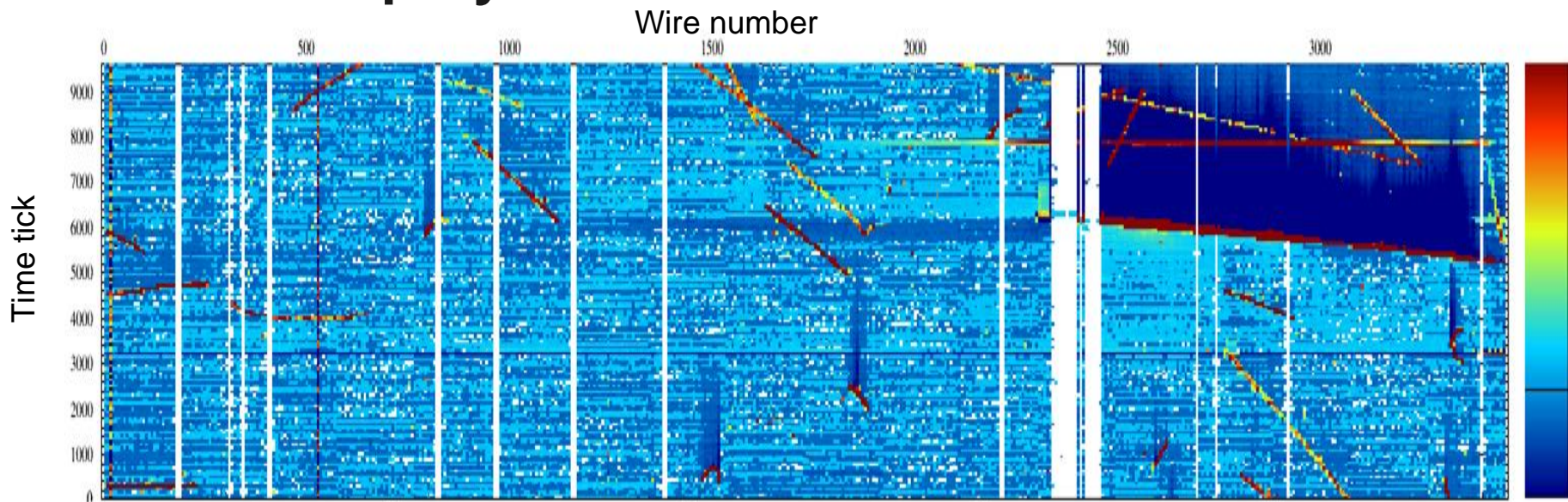
Cathode Splashing

- Electrons liberated from the cathode plane via the photoelectric effect
- $1.103 \mu\text{m}/\text{ms}$ at $\sim .273 \text{ kV}/\text{cm}$

avg of ADC of all wires at time tick



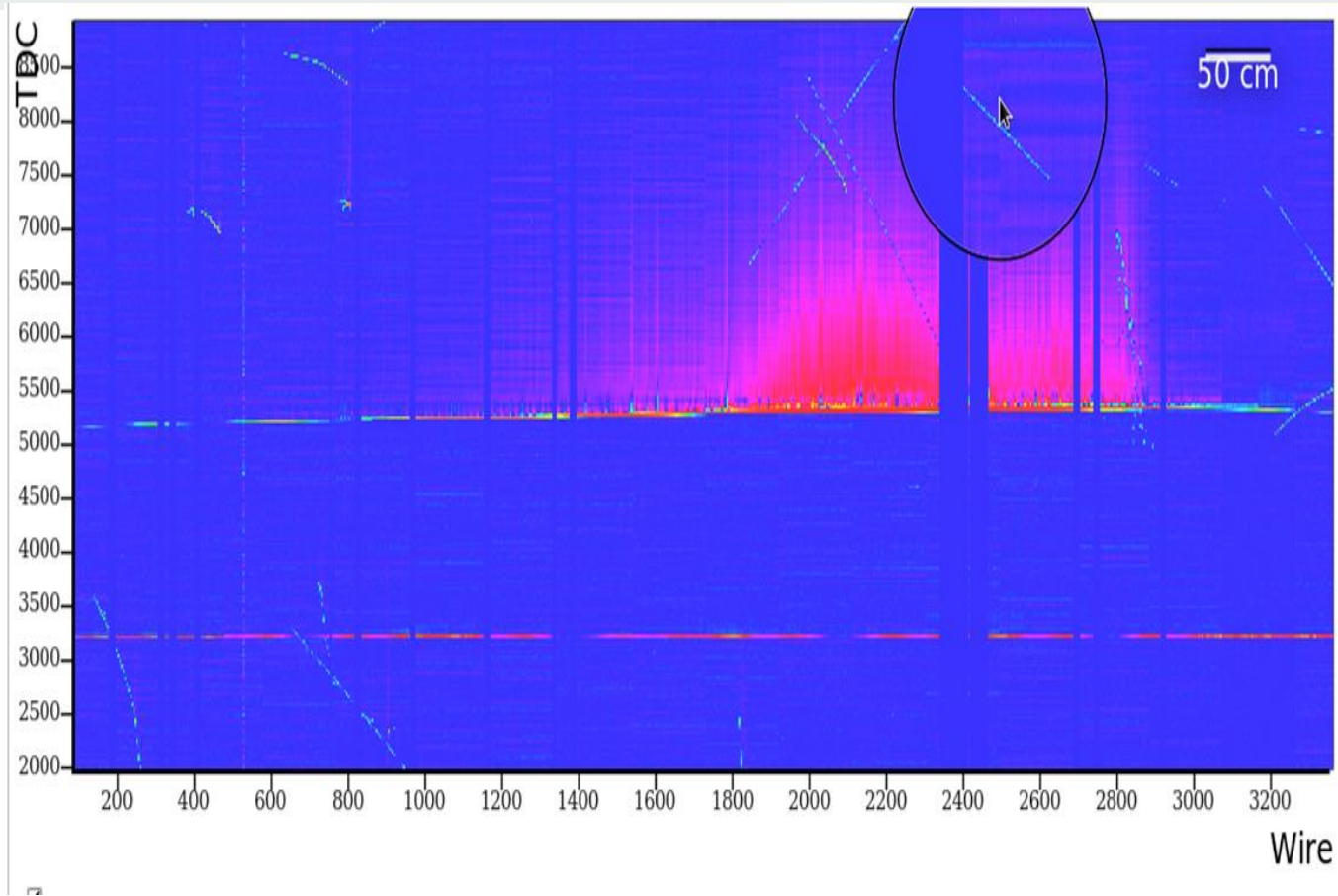
Event Display



Event from run 1591

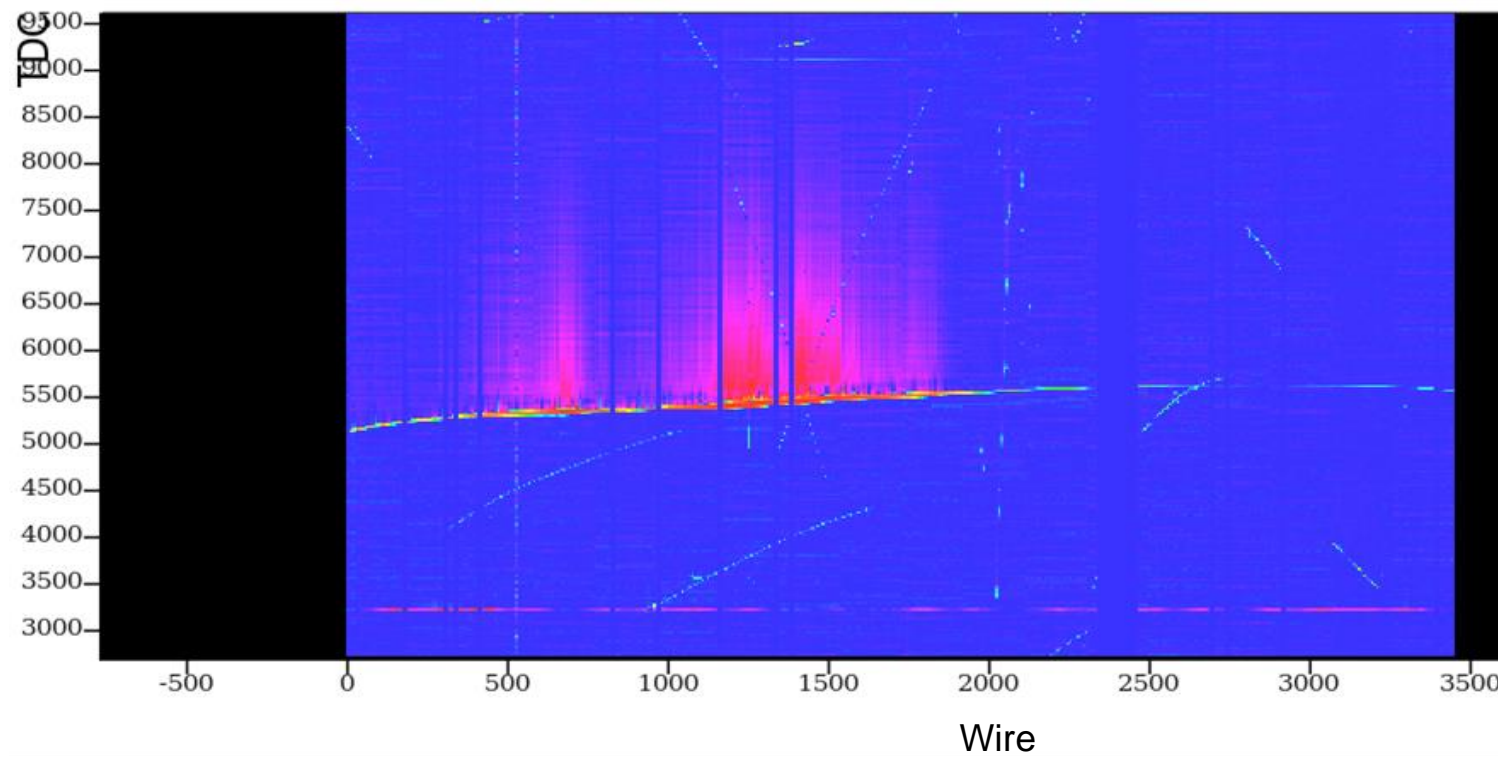


.234 kV/cm



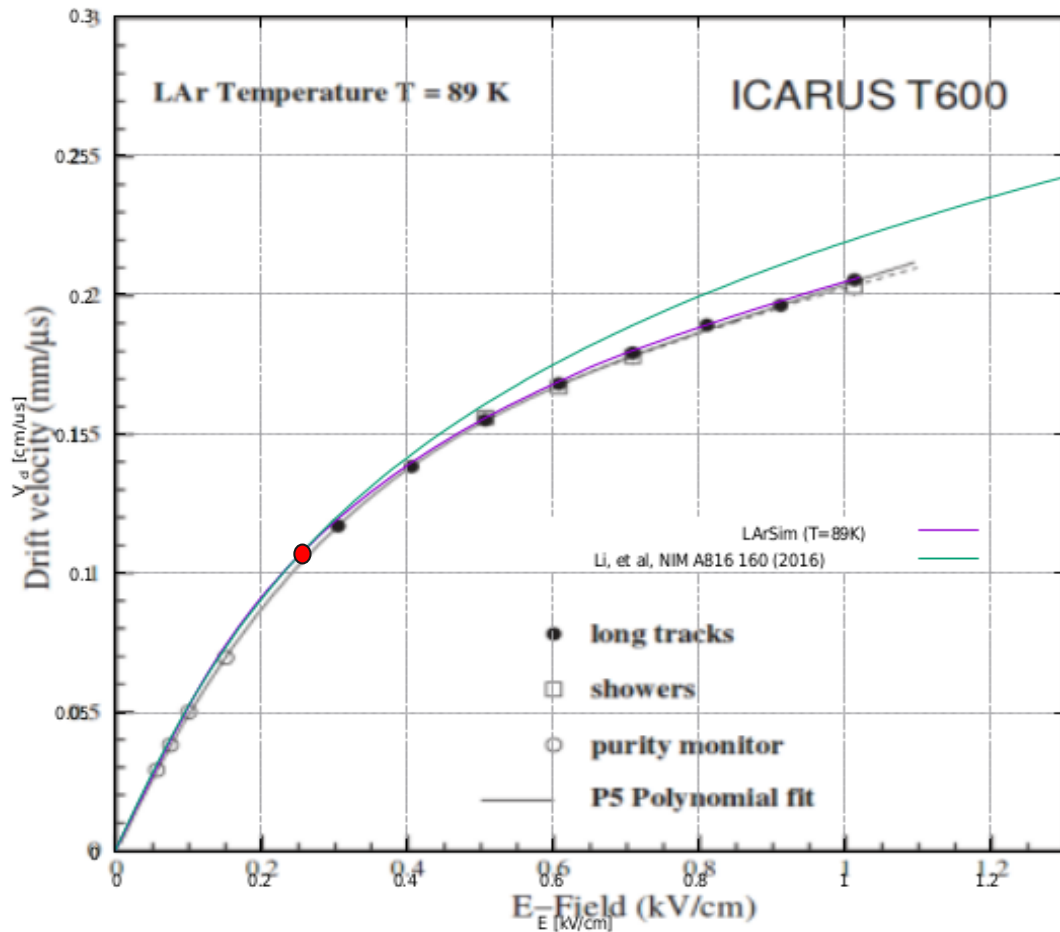


.195 kV/cm



Drift Velocity

Amoruso, et al., NIM A, 516, 68-79
Li, et al, NIM 816 160 (2016)
MicroBooNE-doc-16311
LArSoft





Future Directions

- E-fields of strength between .195 ~.273 kV/cm
- Possible error sources to investigate
 - Measurement of Length from Anode to Cathode
 - Flatness of Cathode
 - The E-field is not uniform due to Space Charge



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