Bo Resolution

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Outline

- Description of LArSoft
- Displays of data from Bo
- Description of hit finding
- Initial attempts at position resolution

LArSoft - Reconstruction & Analyssis Software

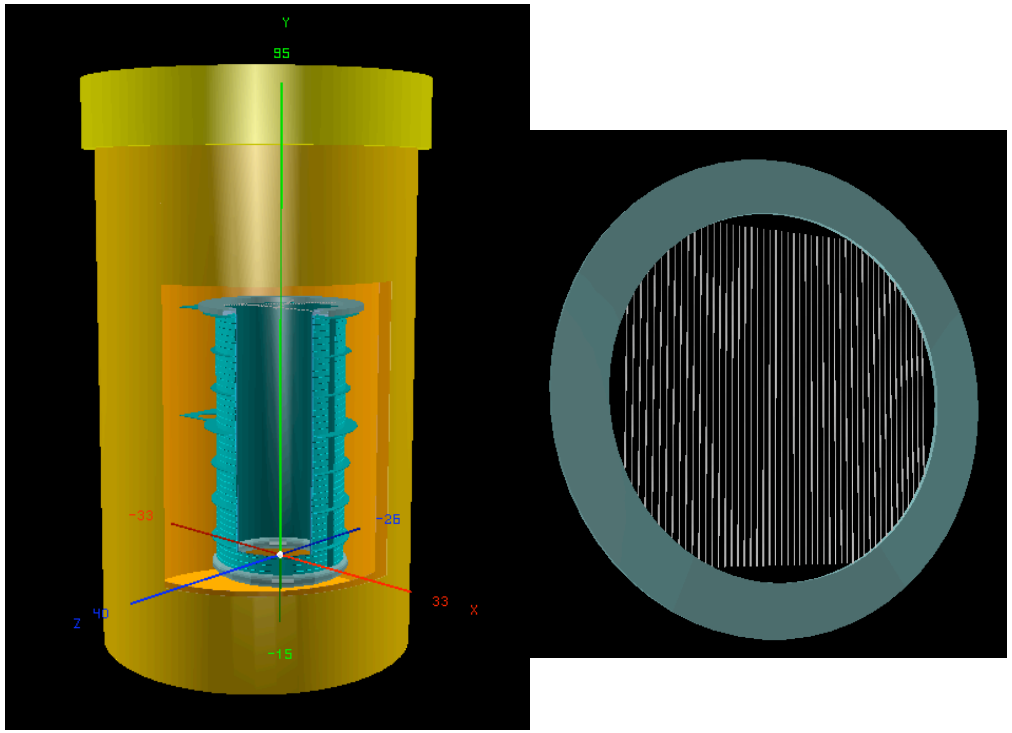
- LArSoft is a C++ software framework based on ROOT and FMWK
- FMWK is a generic framework for HEP experiments developed by M. Messier for MIPP, used by NOνA, SciBooNE
- Handles all I/O, job processing, event display basics
- Requires users to write experiment specific code
  - Detector geometry - description and navigation
  - Reconstruction and analysis routines
  - Detector specific Monte Carlo routines
- LArSoft is available on afs - see http://projects-docdb.fnal.gov:8080/cgi-bin/ShowDocument?docid=345 for details

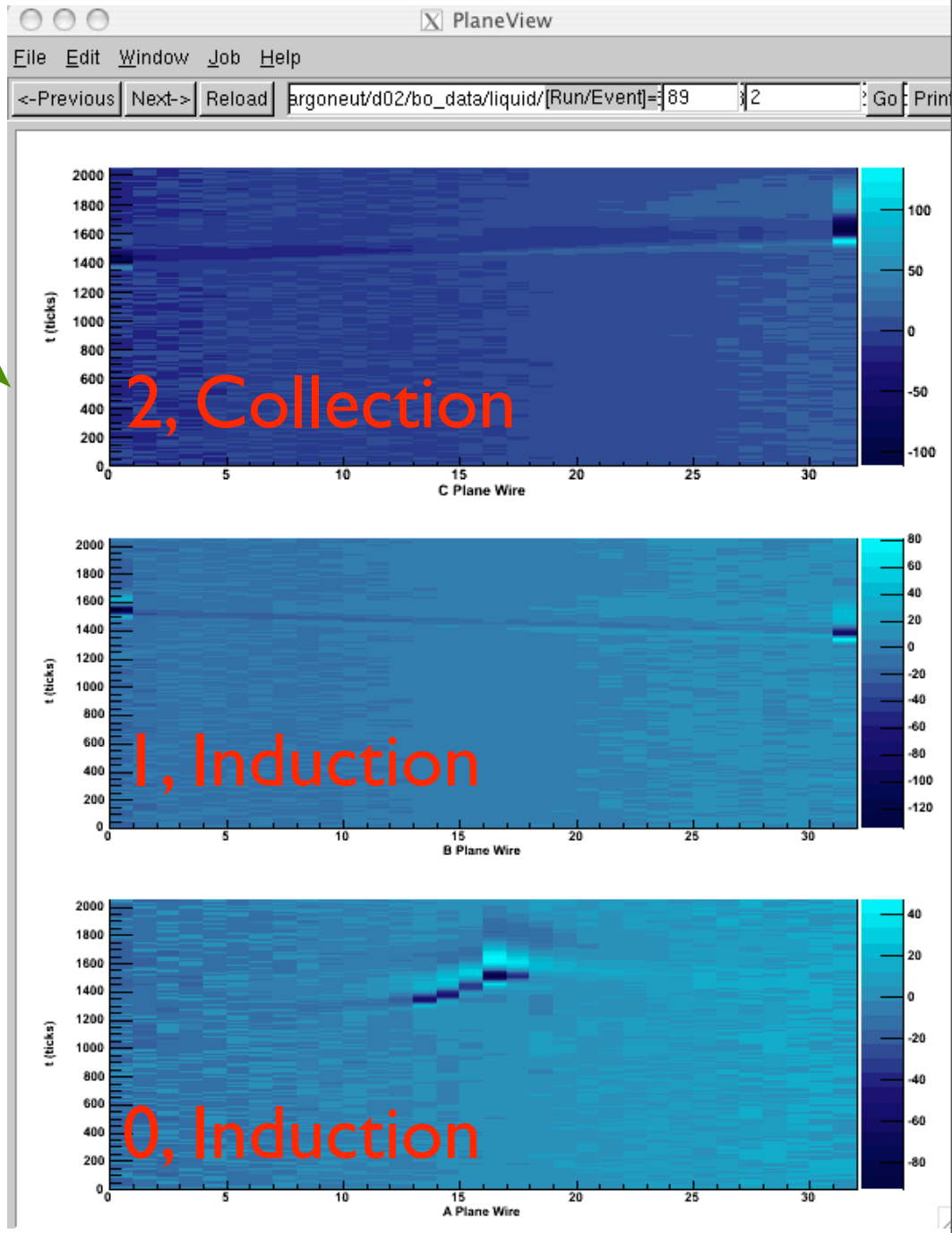
LArSoft - Reconstruction Objects

- General hierarchy for reconstruction objects is
  - RawDigits - one for each wire
    - stores: ADC and timing information, channel number, status bits
  - Wires - one for each wire
    - stores: pedestal, signal, reference to raw digit
  - Hits - one for each region of time from a wire where signal is read out
    - Stores: total signal, start time, center time, end time, transverse position, reference to Wire object
  - Clusters, tracks, showers (not defined yet)

Bo Events

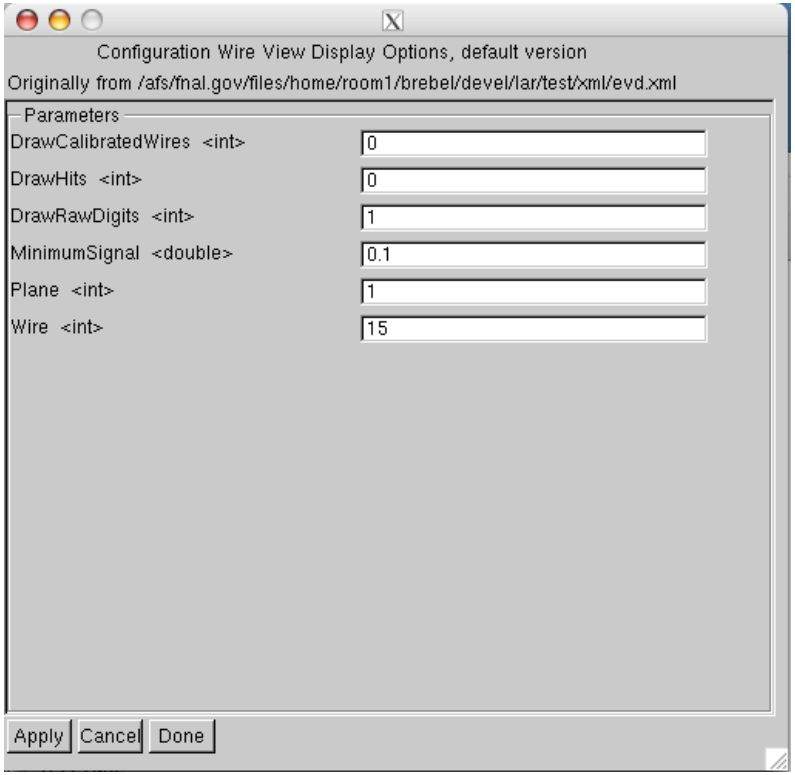
- Event displays made in LArSoft
- PlaneView shown has time vs wire for each plane
- Color of box indicates size of signal

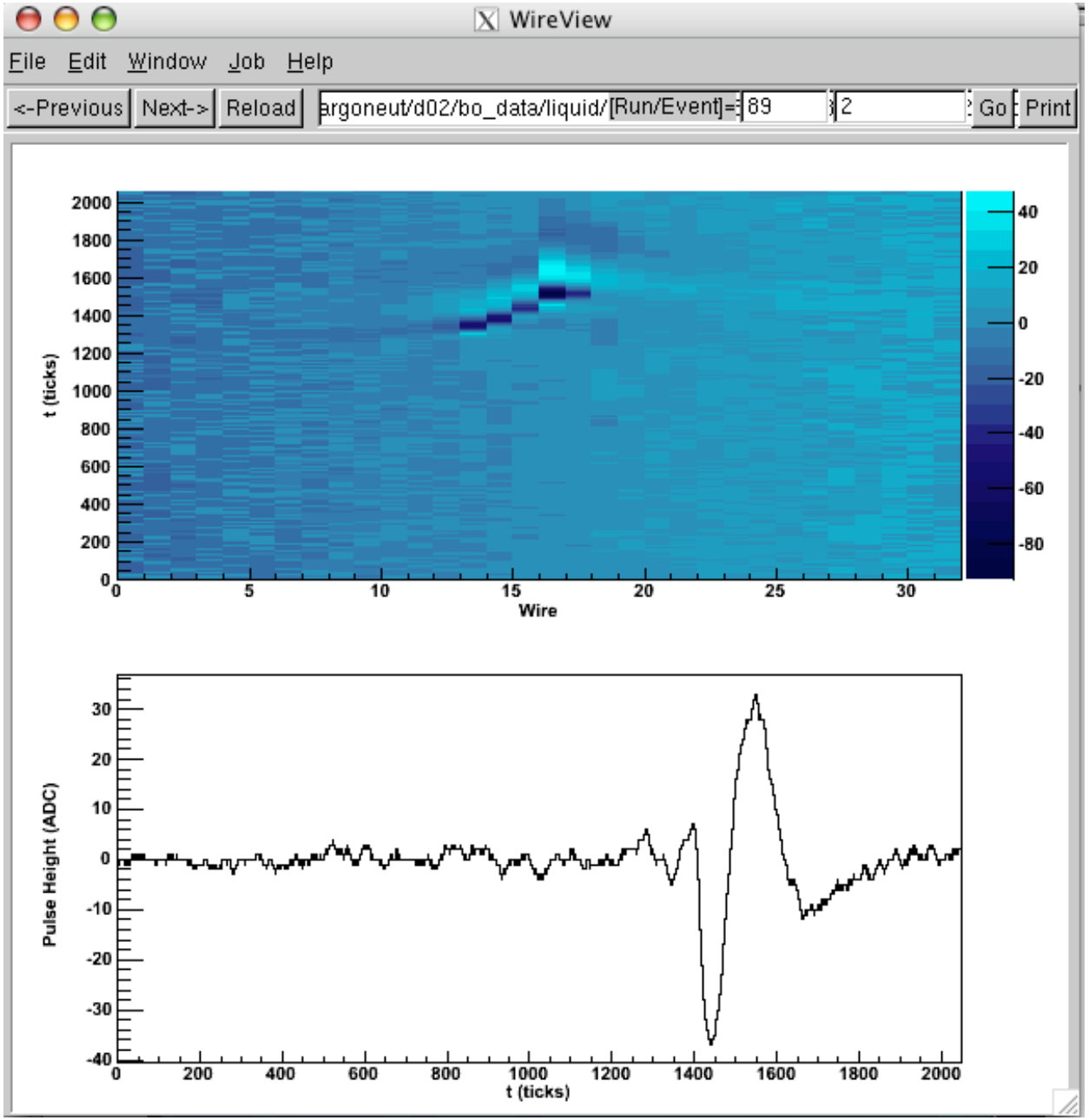




Bo Events

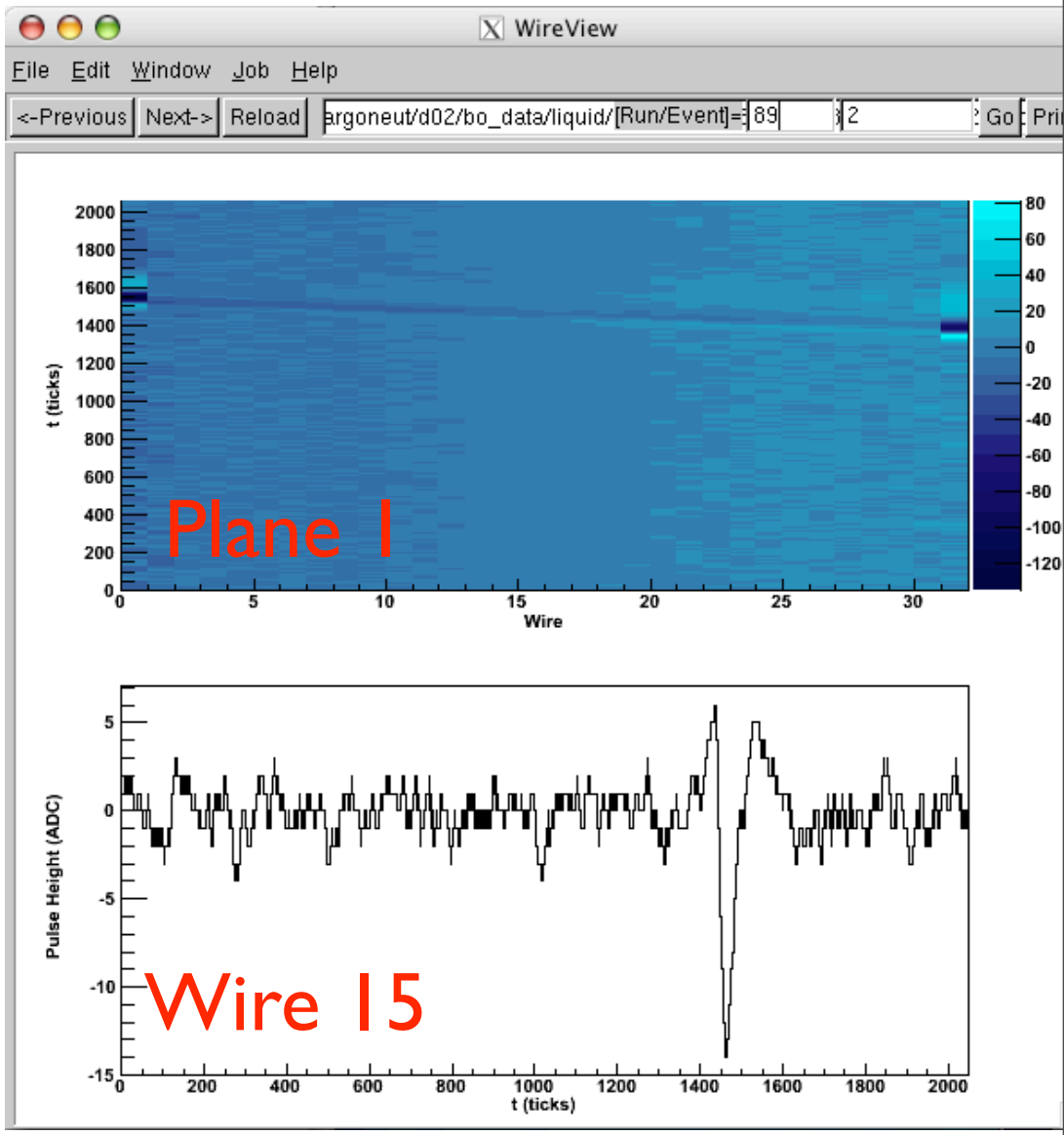
- WireView shows all wires for plane in top panel, signal vs time in bottom for one wire
- Can select wire using dialog boxes
- Plane 0, wire 15

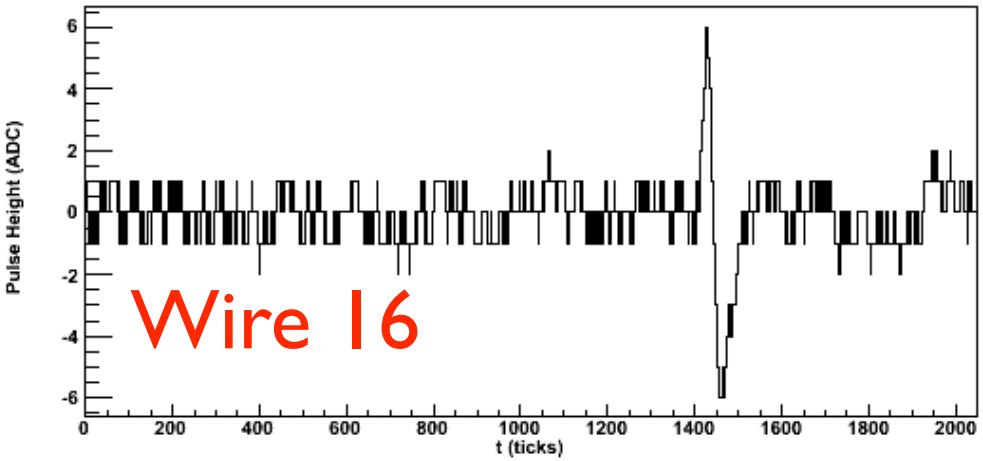




Bo Events

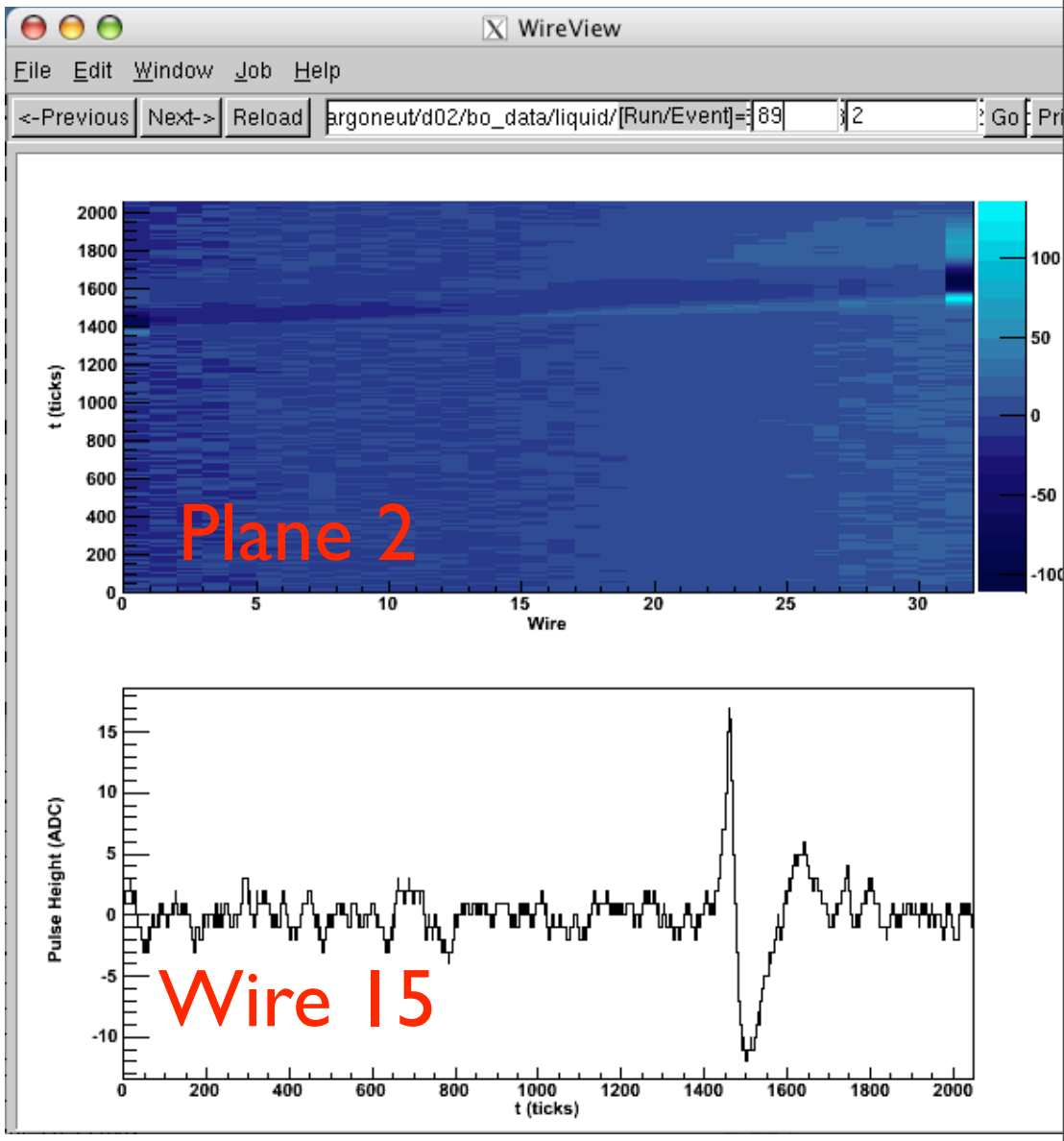
- Plane 1, wire 15 shown at right
- Plane 1, wire 16 shown below
- Recall wires 0-15 and 16-31 have different electronics

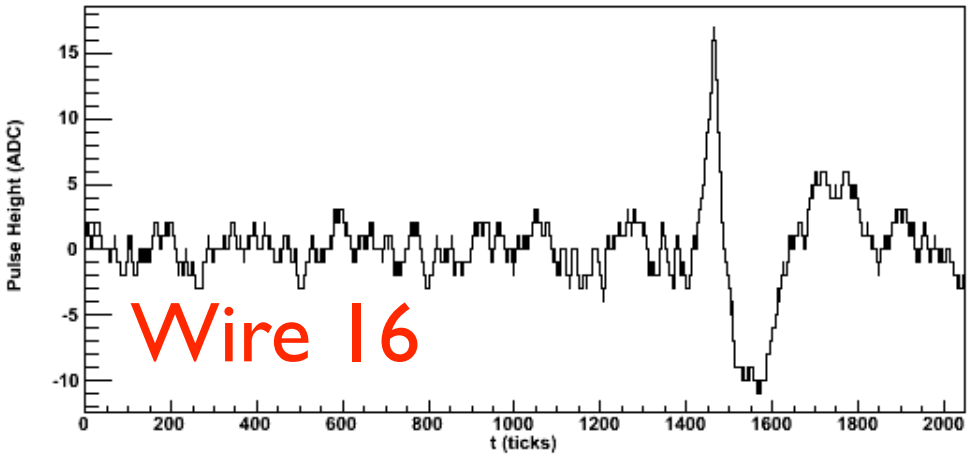




Bo Events

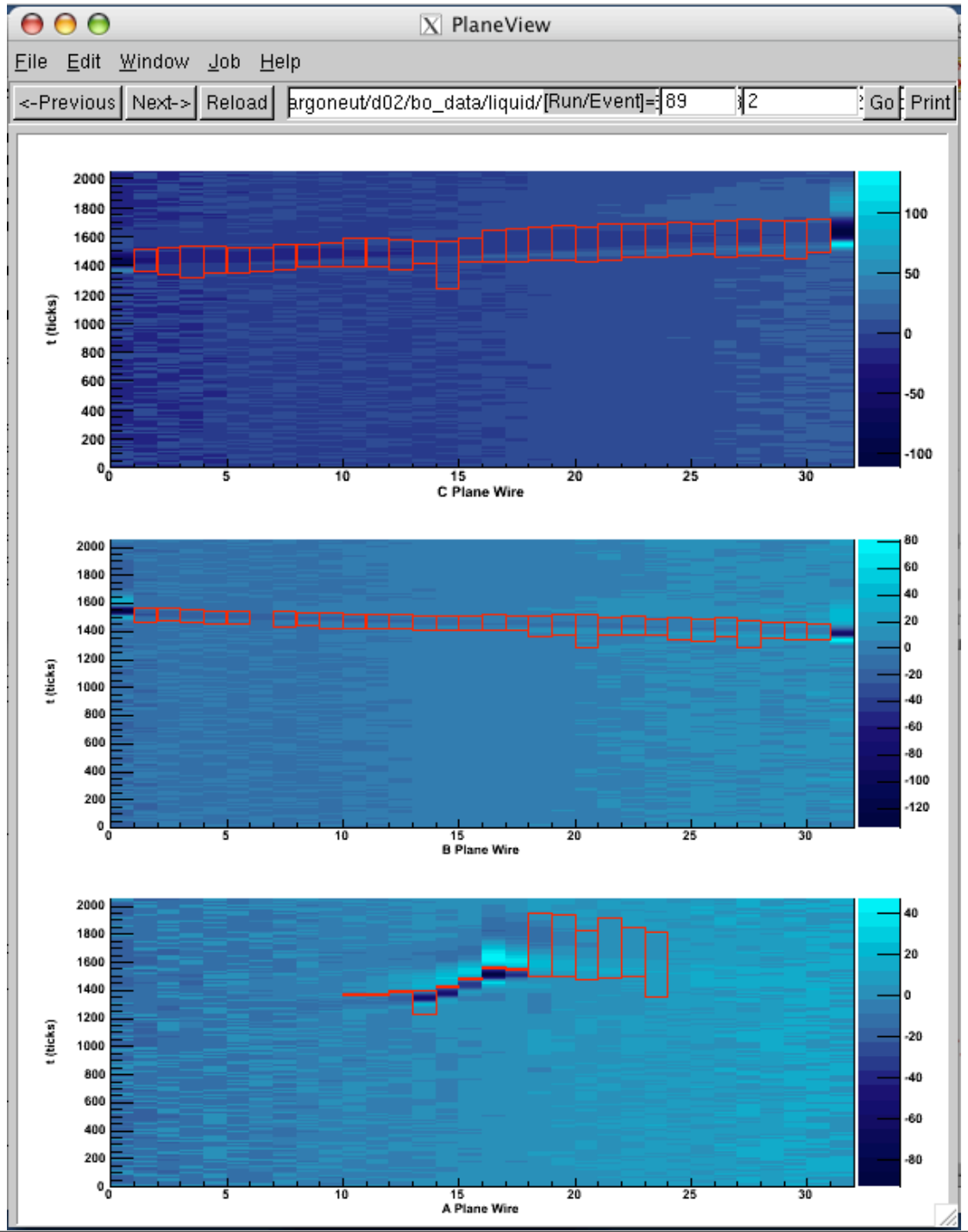
- Plane 2, wire 15 at right
- Plane 2, wire 16 below





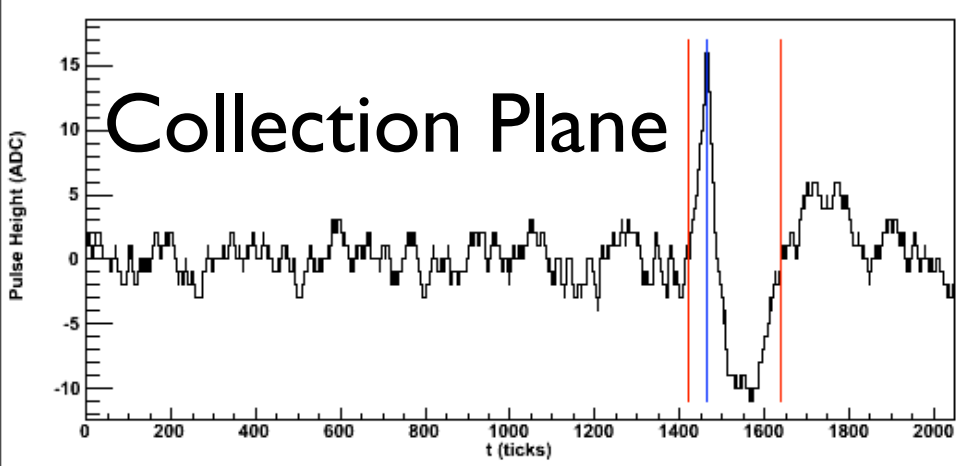
Bo Events - Reconstructed Hits

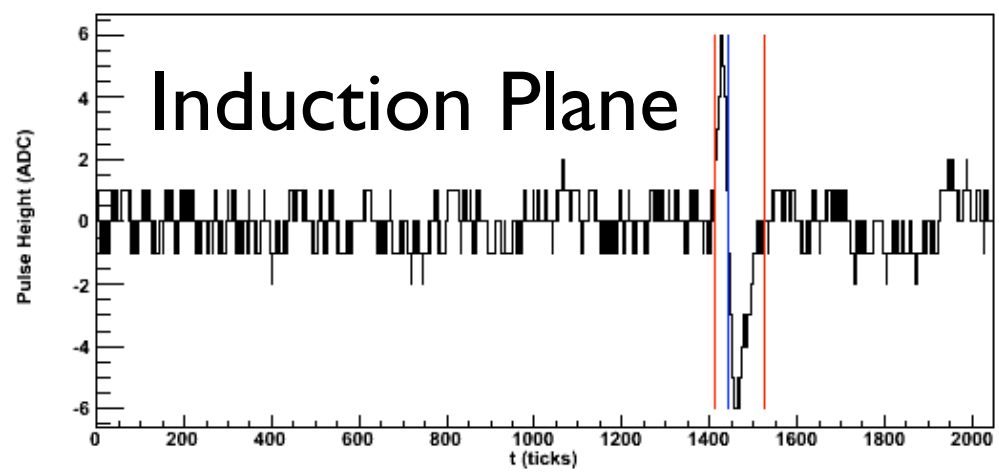
- Each red box is a hit
- Ignore wires 0 and 31 as those channels read out multiple wires
- Current hit finding is very primitive
- Using raw signal only to find hits



Bo Events - Reconstructed Hits

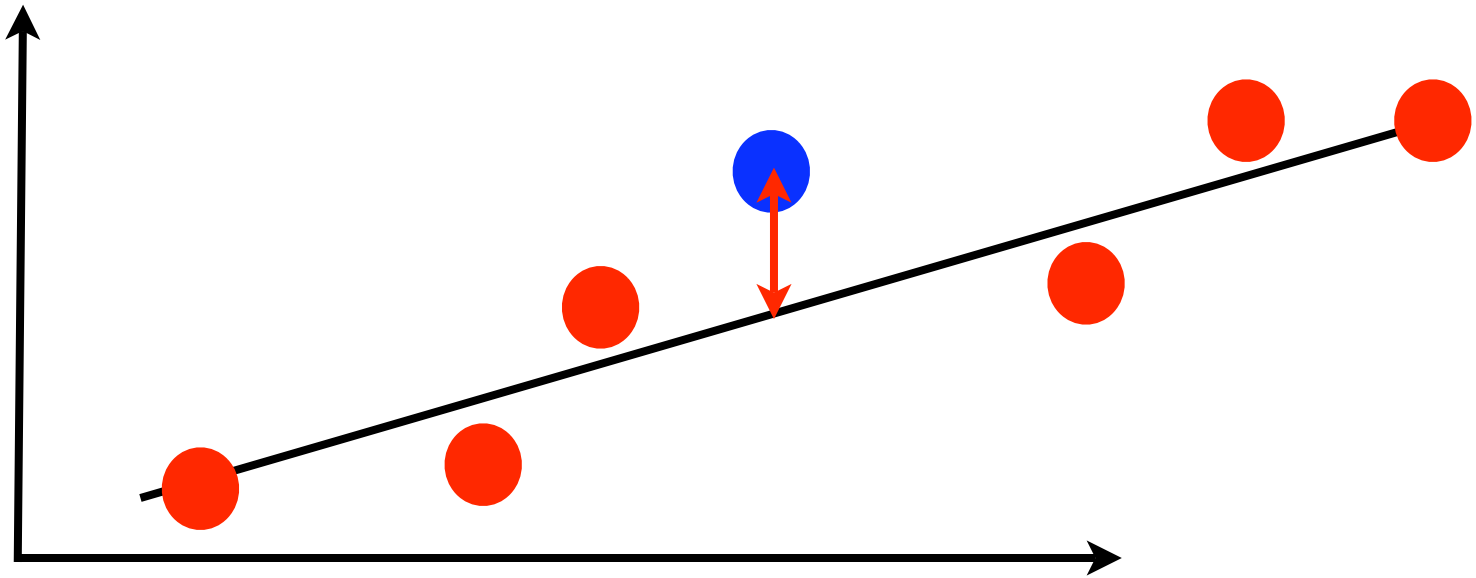
- Look for time of maximum signal at least 5 counts above wire pedestal and also find minimum signal
- Find earliest time before maximum where signal is above pedestal and latest time after minimum where signal is above pedestal - hit is defined to be between these times
- Hit time is time of maximum signal for collection planes and mean of start and end times for induction planes





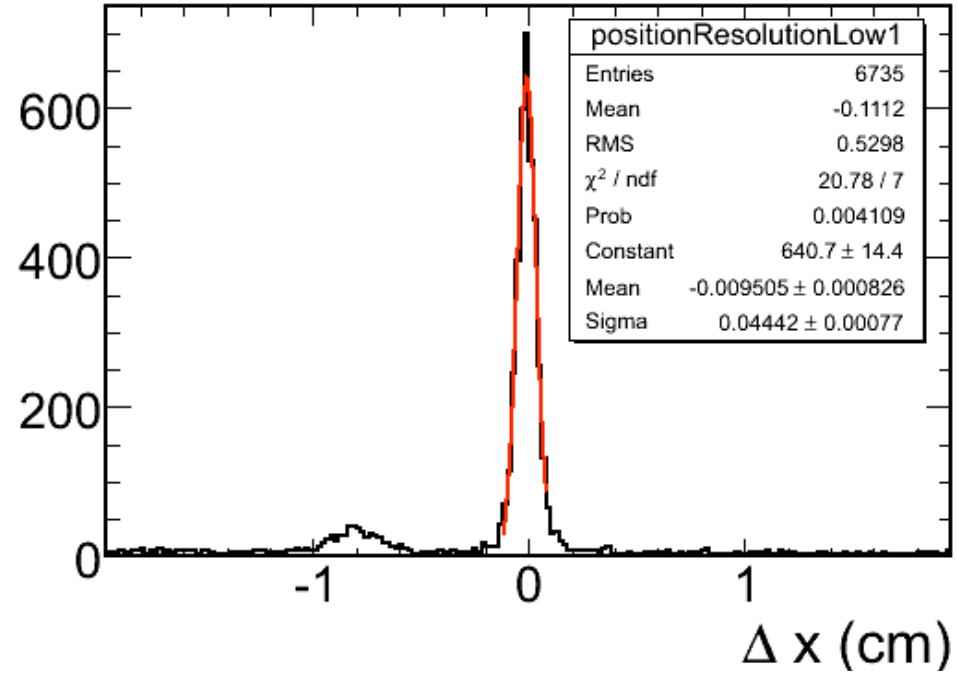
Bo Resolution

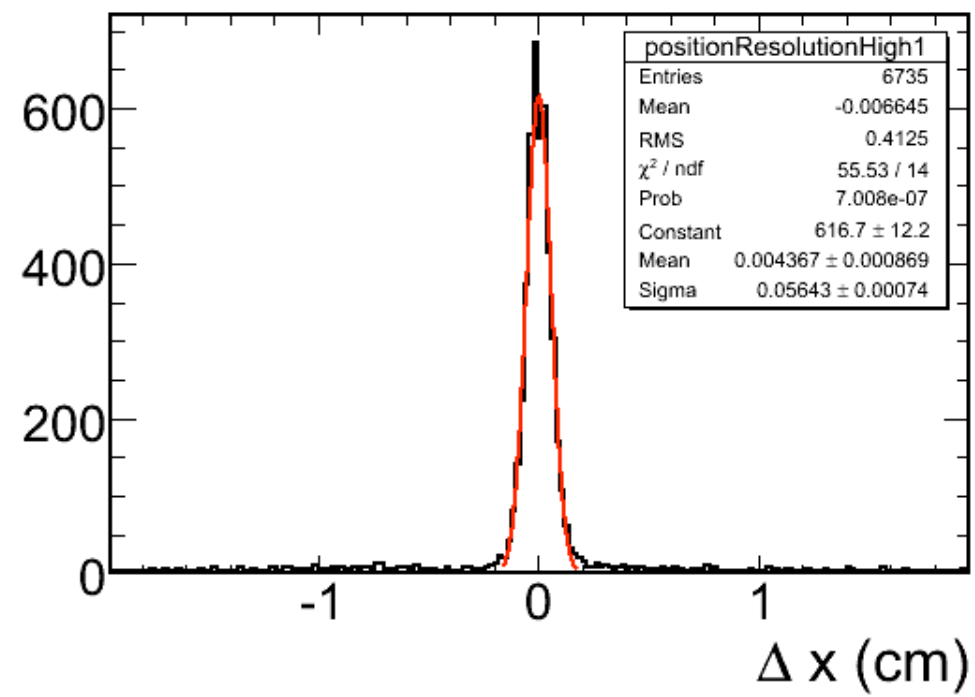
- Use window of 6 nearest neighboring wires to determine resolution for a given hit
- Each wire measures a position in the direction orthogonal to the wire axis (transverse position)
- Use hits to determine distance e- traveled to plane
- Plot transverse position vs distance traveled and fit line to it
- Resolution for a given hit is the residual between the measured position and the fit using the other wires



Bo Position Resolution - Plane 1

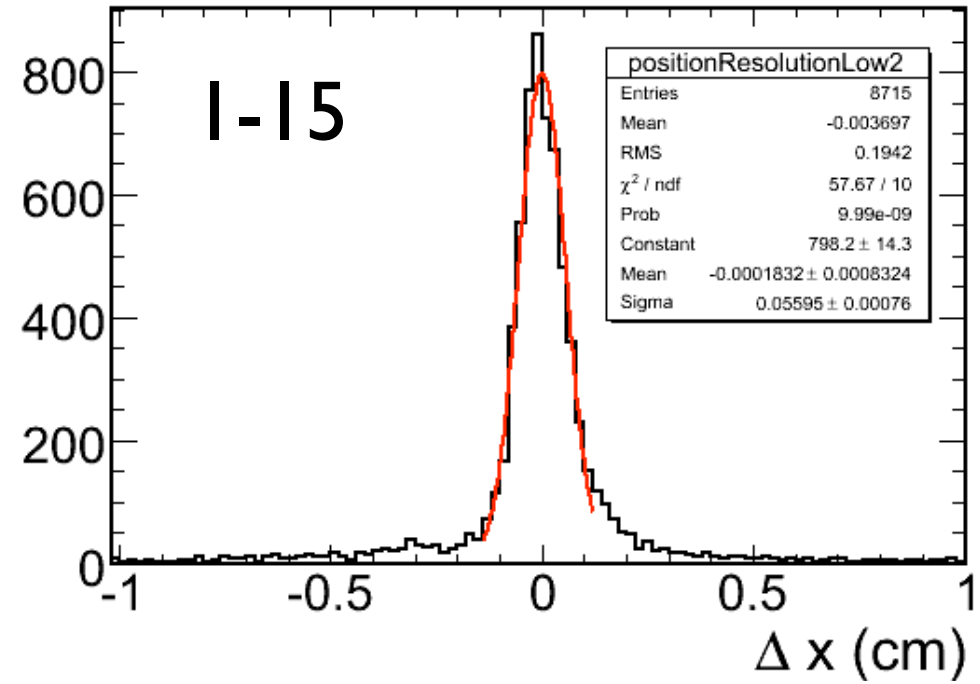
- Checked total resolution for each plane, as well as for each set of electronics
- Use only events where all wires on plane had hits
- Low numbered wires on top, high numbered wires on bottom
- Central region of distributions are reasonably gaussian- σ = 0.044 and 0.056 for low and high wires respectively
- Bump in upper plot due to different electronics+delta rays?

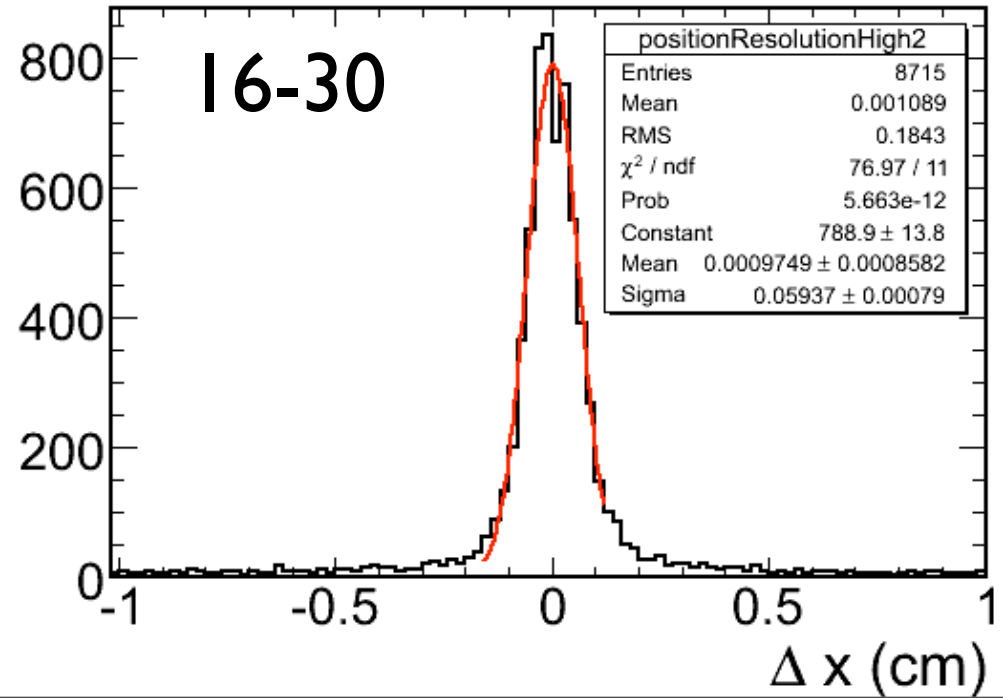




Bo Position Resolution - Plane 2

- Plane 2 resolution better than plane 1
- Not surprising given the hit definition
- σ is 0.056 and 0.059 cm for gaussian part of low and high numbered wires respectively





Conclusions

- LArSoft framework is up and running
- Position resolution somewhat broader than expected, likely due to hit finding method
- Working with MSU folks to get more sophisticated hit finding
- Easy to swap out methods in LArSoft once better method is ready