

RED35 update and more

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Components of RED35

- There are basically **three components** in RED35
 - **A converter** to convert sim/reco files to a event tree for offline reading
(dependent on LarSoft)
 - ▶ ~~git flow feature pull origin chaoz_ctree~~ CTree has been updated and merged into develop branch
 - ▶ `lar -c ctree35t.fcl [sim/reco root file]`

Planned Future Improvements

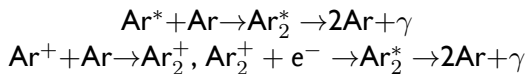
- ✓ • Show the true trajectories (instead of start-end lines) and the reco tracks in the 2D display (already so in the 3D display)
- ✓ • Add photon detector information
 - How to install and run (on your own computer) ← Up-to-date
<https://github.com/czczc/RED35>

For more information please refer to Chao's previous talk:

[*http://lbn2-docdb.fnal.gov:8080/cgi-bin/RetrieveFile?docid=10435&filename=red35.pdf&version=1](http://lbn2-docdb.fnal.gov:8080/cgi-bin/RetrieveFile?docid=10435&filename=red35.pdf&version=1)

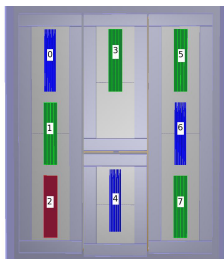
Scintillation light in LAr

- Charged particles create excited argon atoms as they pass through LAr, following which two processes can happen:



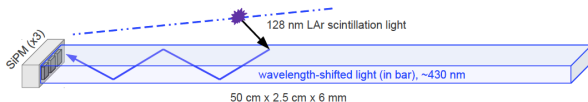
- Both cases result in an emission spectrum of vacuum ultraviolet (VUV) photons narrowly peaked at 128 nm.
- The argon dimer can be excited to either a singlet ($^1\Sigma_u^+$) or a triplet ($^3\Sigma_u^+$) with different lifetimes: $\tau_S \approx 6$ ns, $\tau_T \approx 1.4$ μ s.
- The leading edge of the light pulse from the singlet decay provides sub-mm accuracy in the reconstruction of the absolute position of the event along the drift coordinate; supernova trigger; particle ID (highly ionizing particles create a higher local density of electrons than minimum ionizing muons, resulting in more singlet decays); reject cosmic-ray background.

35Ton photon detectors



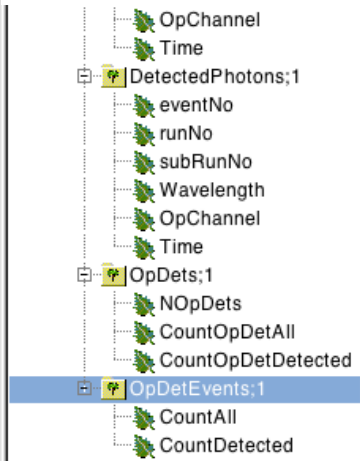
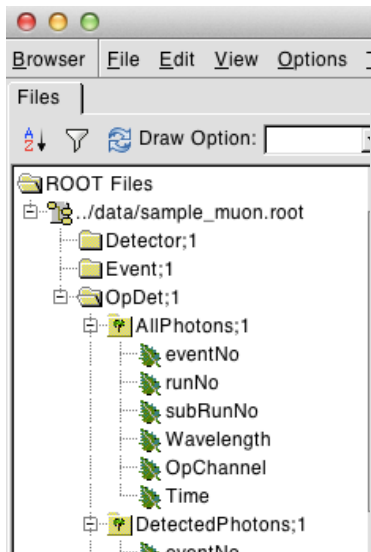
Fiber
Bar
Plank

- Design based on lightguides imbued with a wavelength shifting compound

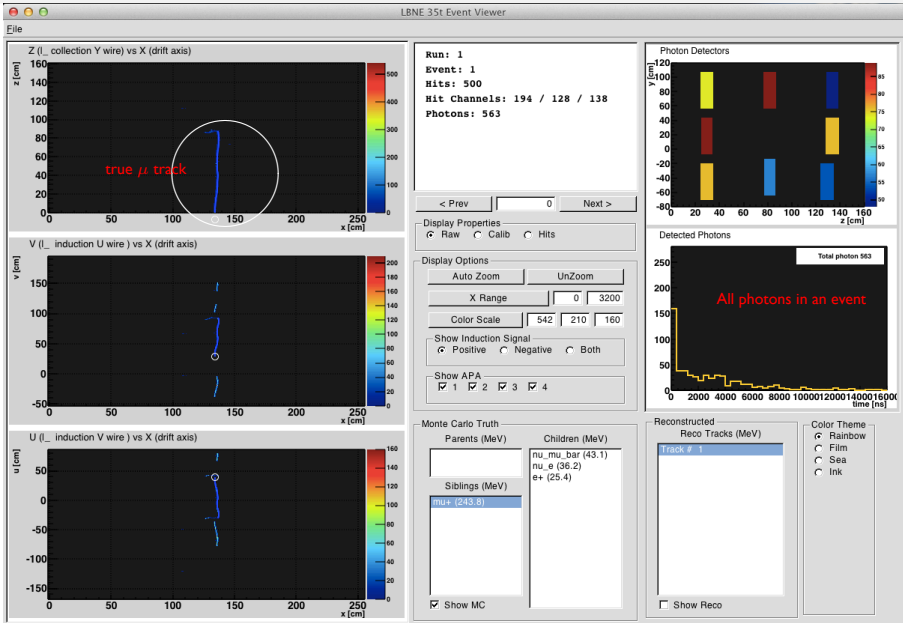


- Array of silicon photomultipliers at end
- High gain and low dark noise at 87 K
- Different lightguide designs are being carried out and test
- Simulation: Photon Library method adapted from MicroBooNE.

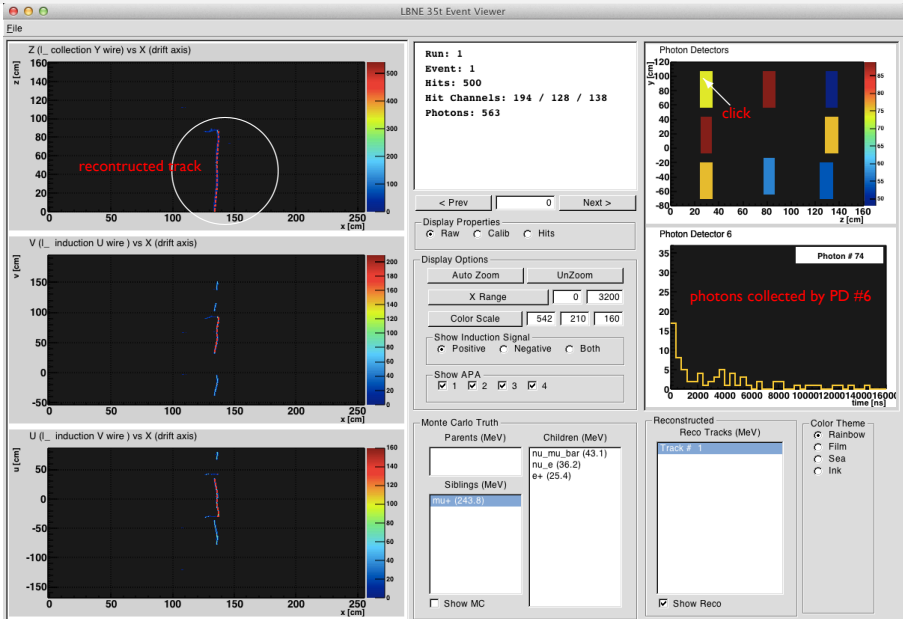
Photon info in the TTree



2D display

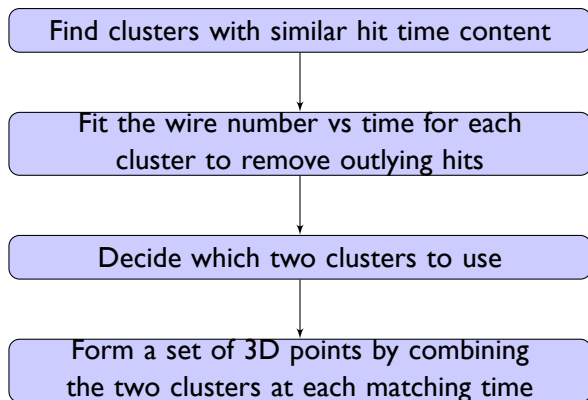


2D display



DEMO

Cosmic muon track finder



When reconstruction fails...

- When a track is parallel to wire planes (i.e. parallel to the APA plane)

