


Merging wire-cell information with LArSoft

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Introduction

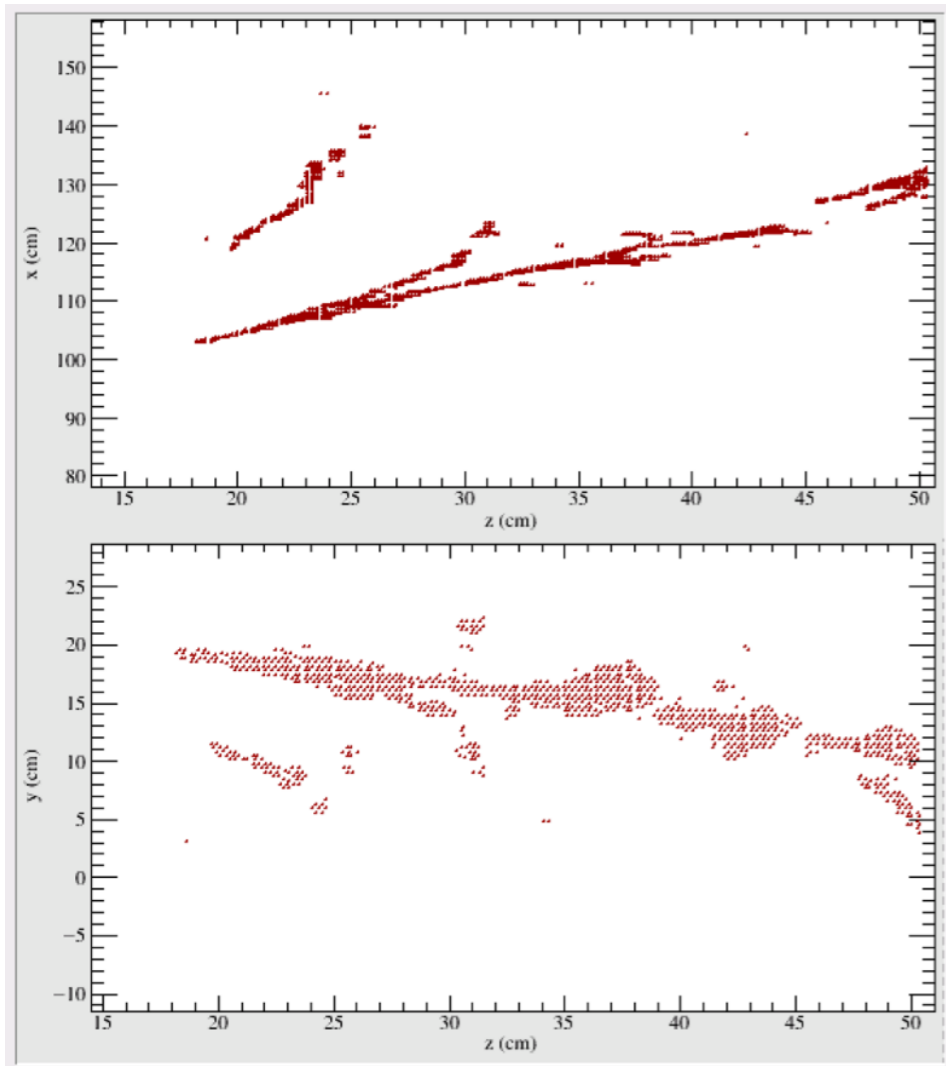
- Wire-Cell is a novel reconstruction - Xin Qian, Chao Zhang, Brett Viren
<http://www.phy.bnl.gov/wire-cell/>
 - TPC Signal Processing
 - In a good shape, to be validated with real data
 - **3D event imaging with both time and charge** 
 - In a good shape, speed can be improved
 - Pattern recognition with 3D points
 - Initial development is promising
 - Physics (PID, kinematics ...)
 - To be worked out
- We would like to save information from Wire-Cell into LArSoft data products.
- This would help comparison and development of algorithms.

New WireCell package

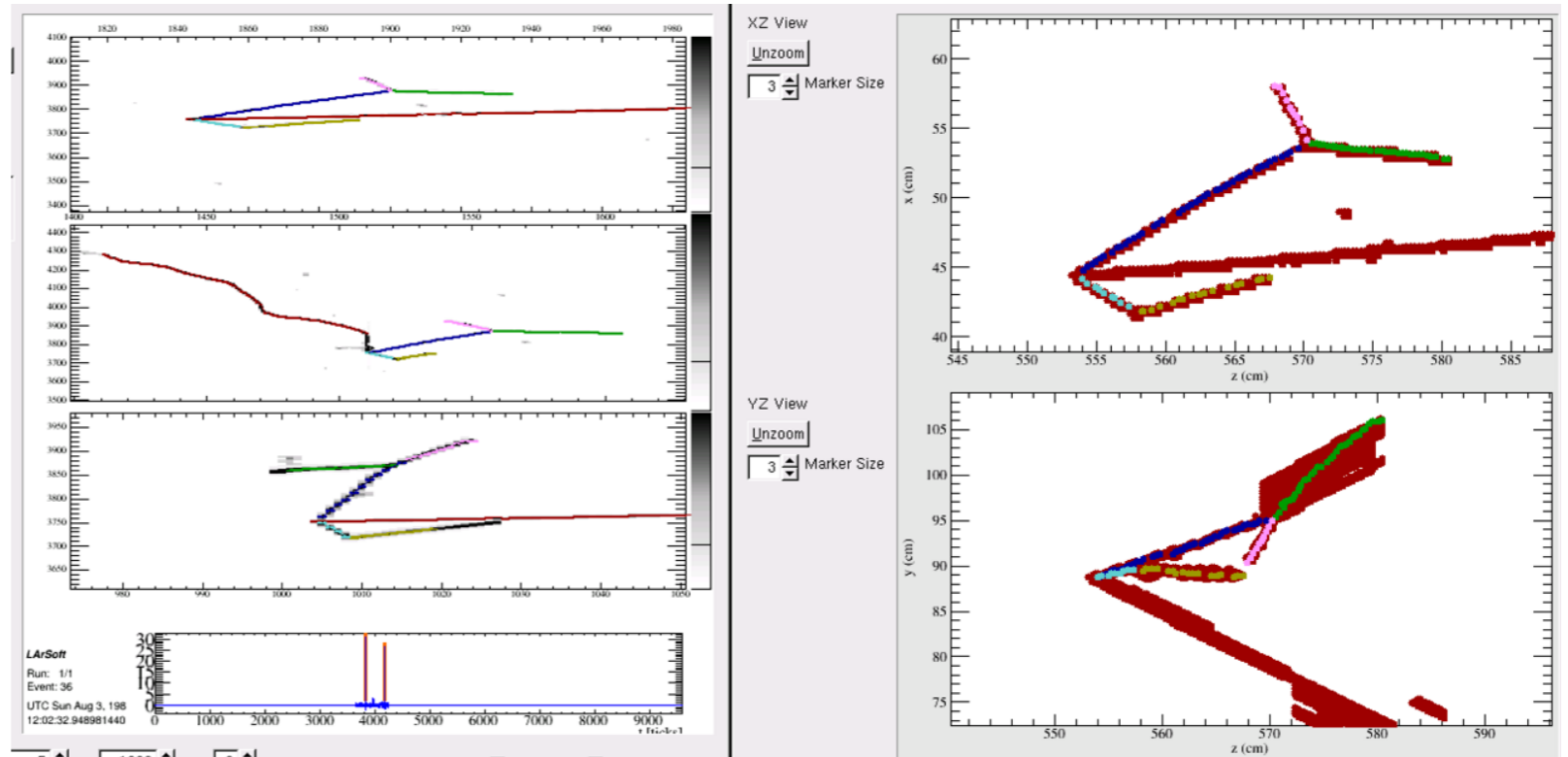
- We added a new package, WireCell, in larreco.
- MergeWireCell_module.cc
 - Merge WireCell information with larsoft root file.
- CellTree_module.cc
 - Convert larsoft file into a format that can be viewed by BEE event display.

Merging WireCell information

- 3D event imaging provides spacepoints with charge. Each space point is constructed using one time-slice (4 ticks) on each wire plane.
- I make `recob::SpacePoints` and save time-slice as `recob::Hits` (starttick and endtick correspond to the beginning and end of time-slice). I also make associations between `recob::SpacePoints` and `recob::Hits`.
- The charge of space point is save as `fChisq`. Shall we add another data member to save charge?
- Drop WireCell root files (from Xin) to a directory. Specify the directory in `mergewirecell_uboone.fcl` or `mergewirecell_35t.fcl` as `WireCellInput` and run the fcl file on the larsoft root file.



Pi0 in 35t



Neutrino in uboone
 Thick red points are from WireCell.
 Colored points are from trackkalmahit.

Introduction to BEE

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

- BEE is a web-based application for interactive display of LArTPC events
 - *No setup*
 - *Cross-platform*
 - *For LArTPC* : Tomographic mode, projections, multiple geometries, ...
 - *For developers* : User uploads, multiple algorithms, MC truth, customizable overlay, ...
 - *For public* : Explore the large preset samples of different neutrino interactions in LArTPC!

<http://www.phy.bnl.gov/wire-cell/bee/set/8/event/99/>

WireCell-charge

Size

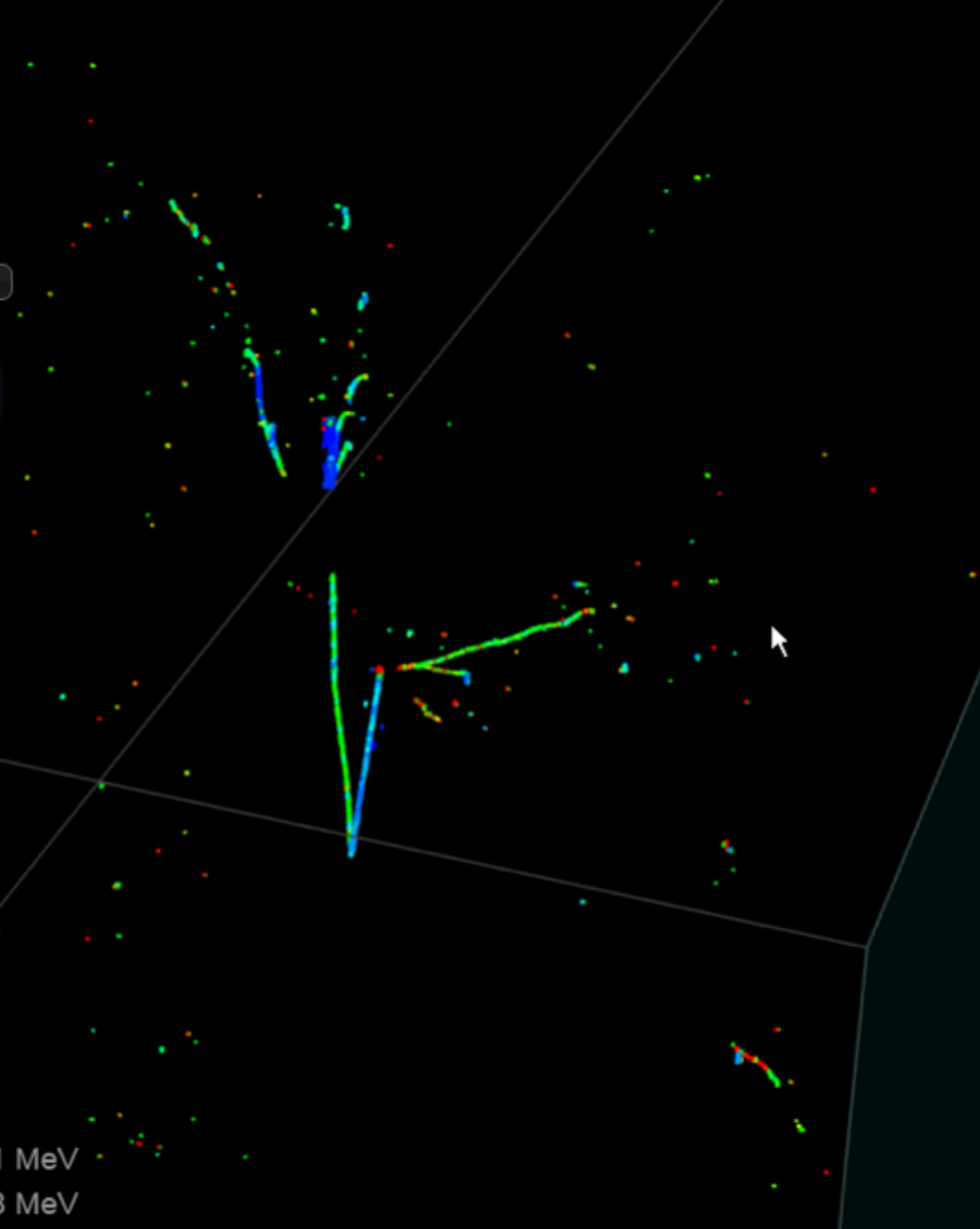
1 8

Opacity

0 1

Plain Color

- nu_mu 1396 MeV
- proton 796 MeV
- neutron 238 MeV
- pi- 402 MeV
- pi0 225 MeV
 - gamma 191 MeV
 - gamma 168 MeV



General

Event 99

Display WireCell-charge

Theme dark

Show Charge

Show TPCs

Show Axes

Color Scale 1

Recon

- WireCell-charge
- truth
- WireCell-simple
- WireCell-deblob

Slice

sliced mode

opacity 0.05

width 0.32

position -128

Camera

Center to Event

Ortho Camera

2D View YZ

Reset

Close Controls

How to Use BEE

- Just start to use it
- Some documentations can be found at <http://bnlif.github.io/wire-cell-docs/viz/bee/>
- Requirements
 - A modern web browser that supports WebGL (<http://caniuse.com/#feat=webgl>). We recommend [Google Chrome](#) for best experience.
 - An internet connection.
 - A relatively good graphic card. A discrete GPU greatly enhances the performance.

How to View Your Own Results

- Documentation about user uploads can be found at <http://bnlif.github.io/wire-cell-docs/viz/uploads/>
- For LArSoft users, follow <http://bnlif.github.io/wire-cell-docs/viz/uploads/#convert-larsoft-output-to-bee>
- `lar -c celltree_dune35t.fcl [filename]`



Memorize the following hotkeys for efficient navigation in BEE!

Command	Hotkey	Command	Hotkey
Toggle MC	m	Toggle Charge	q
Next Event	Shift+n	Prev Event	Shift+p
Next Recon]	Prev Recon	[
Next Slice	k	Prev Slice	j
Center to Event	c	Reset Camera	r
X-U view	u	X-V view	v
X-Z view	z	Y-Z view	c
Zoom in	Shift+Up	Zoom out	Shift+Down
Select Recon	1 - 9	Unselect All	Esc
Increase Opacity	=	Decrease Opacity	-
Increase Point Size	+	Decrease Point Size	-