Preliminary Seed Finding and Kalman Tracking in ArgoNeuT

Ellen Klein

LarSoft Tracking Meeting
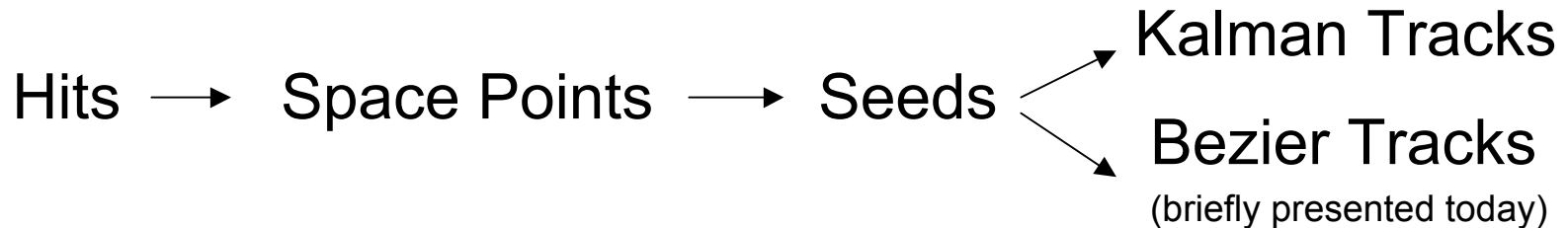
June 27, 2012

Small Print

All work presented here is *very preliminary* - proof of concept

Most parameters are not tuned for ArgoNeuT geometry yet

SeedFinder and BezierTracker are being updated

Reconstruction Chain

Hits $\longrightarrow$ Space Points $\longrightarrow$ Seeds $\Big\langle$ Kalman Tracks

Bezier Tracks

(briefly presented today)

Seeds are a 3D object that contain

• Position

• Position Error

• Direction

• Direction Error

• Validity Flag
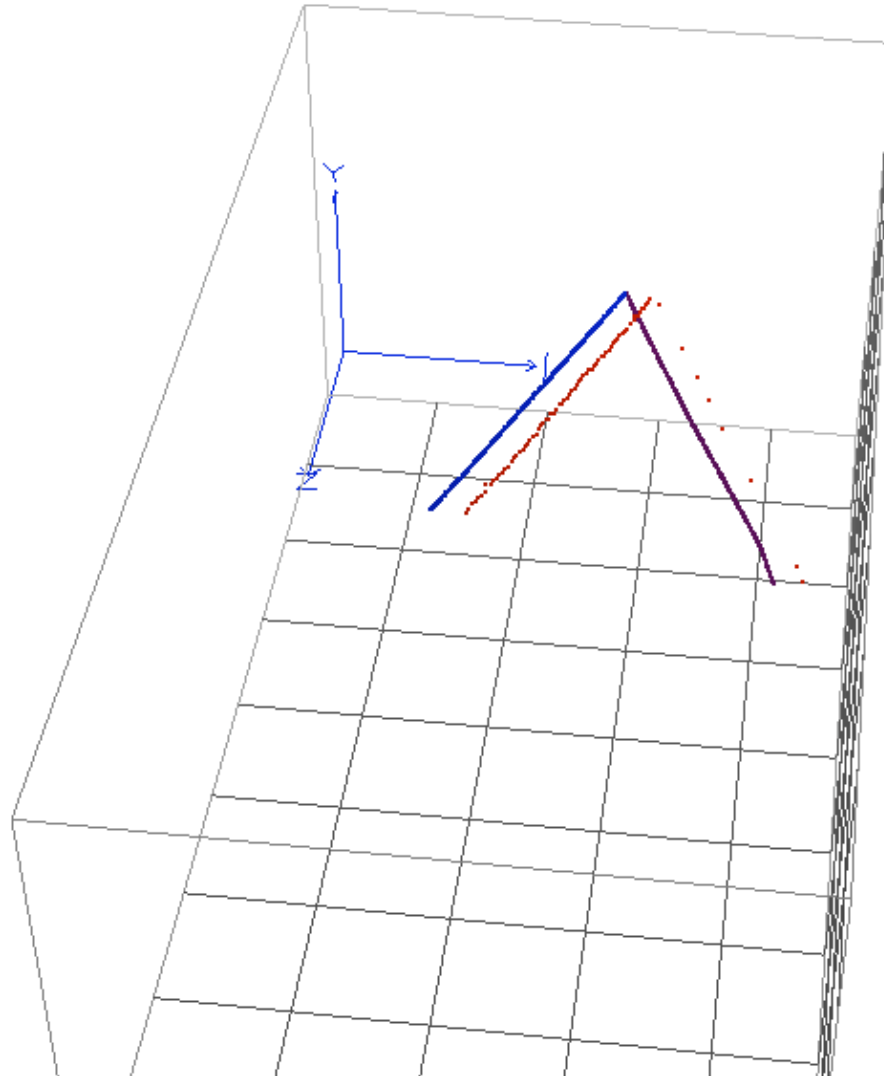
B. Jones

More information is on the LarSoft redmine.

Kalman Tracks: "Starting from 3D seed tracks use Kalman filter to define a road for adding Hits. Use Kalman fit to update estimates of track parameters."
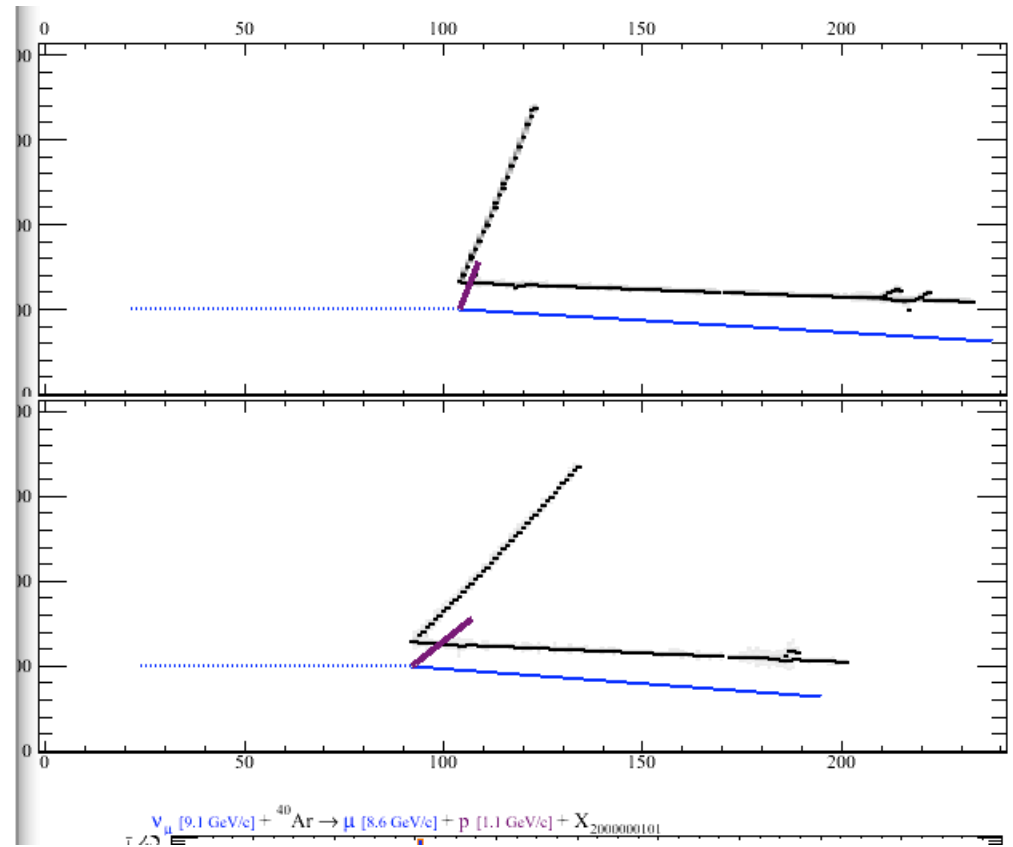
- "A Proposed Kalman Filter Track-Finding Algorithm and Toolkit" H. Greenlee

CCQE
Space Points

CCQE
Space Points (2)

ν_μ [9.1 GeV/c] + ^{40}Ar → μ [8.6 GeV/c] + p [1.1 GeV/c] + X $_{2000000101}$
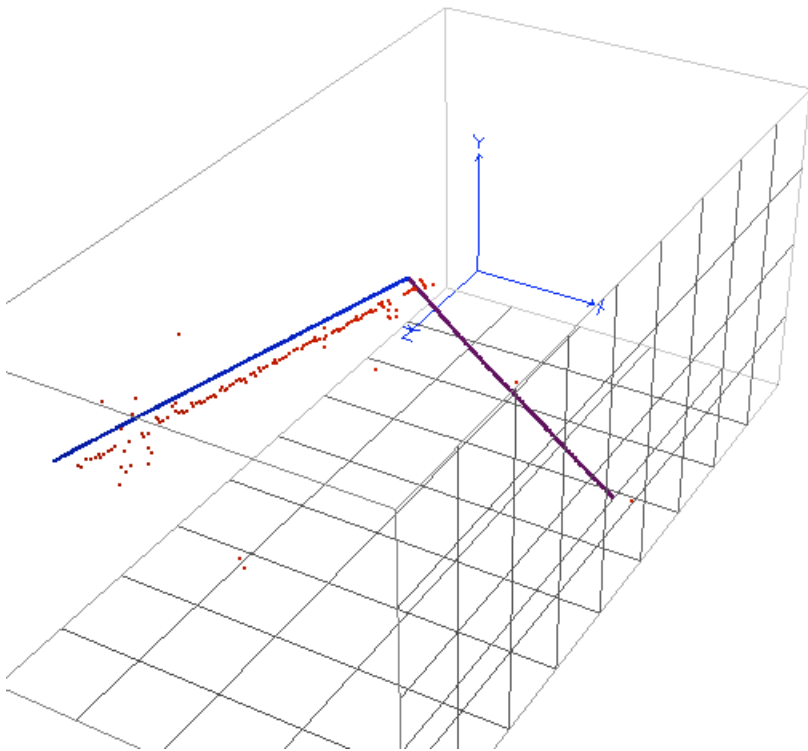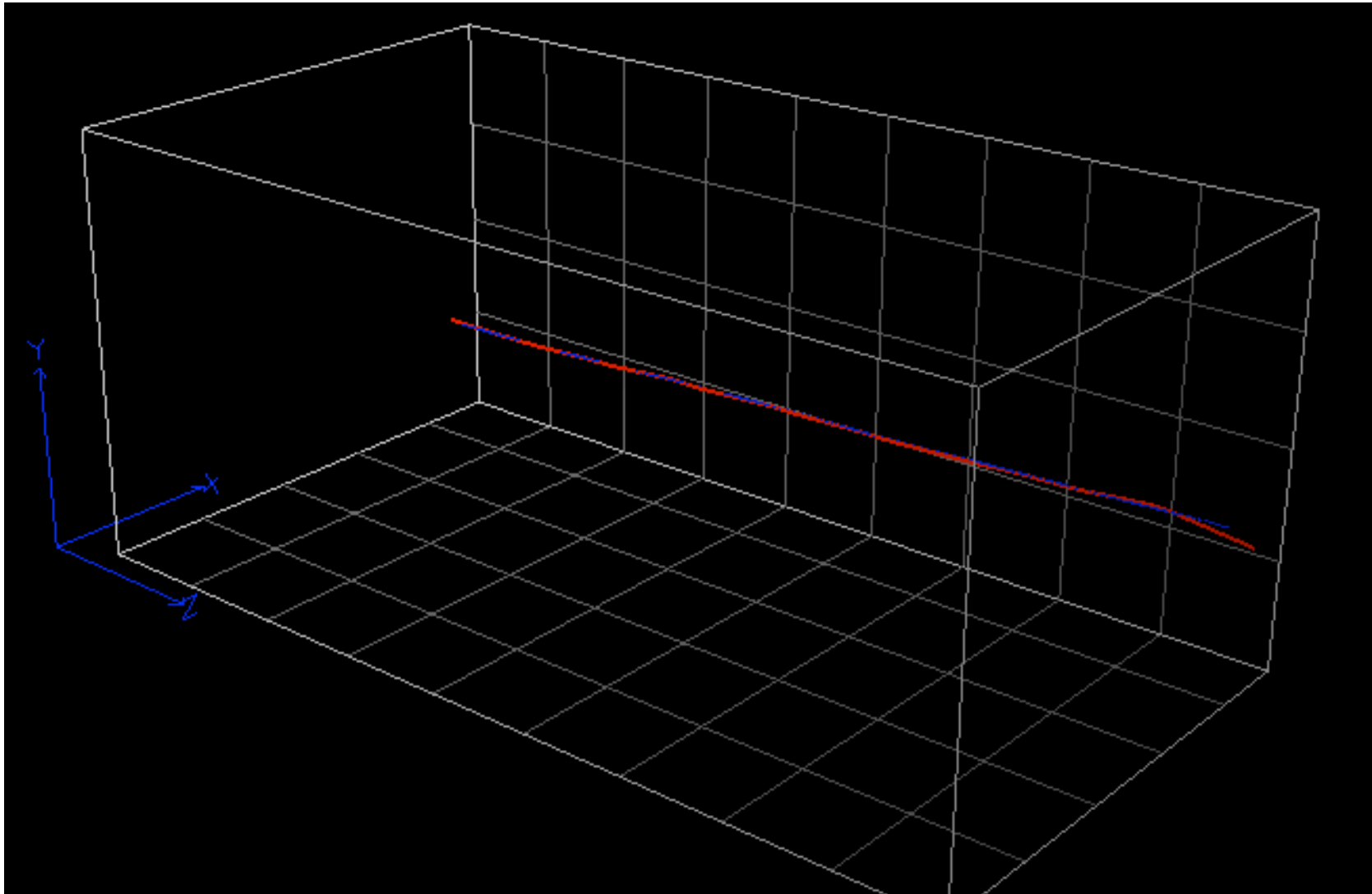
Ghost Space Points
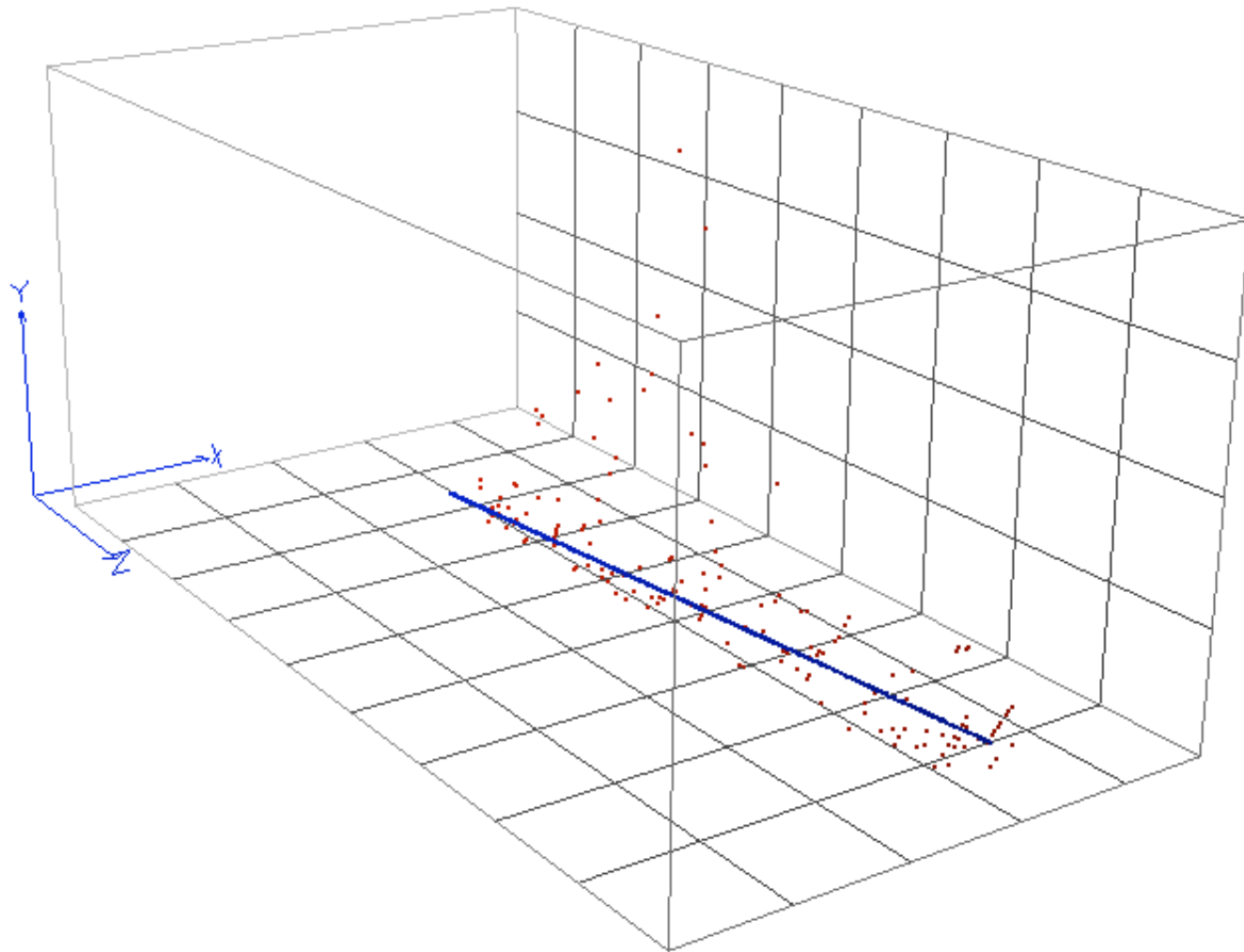
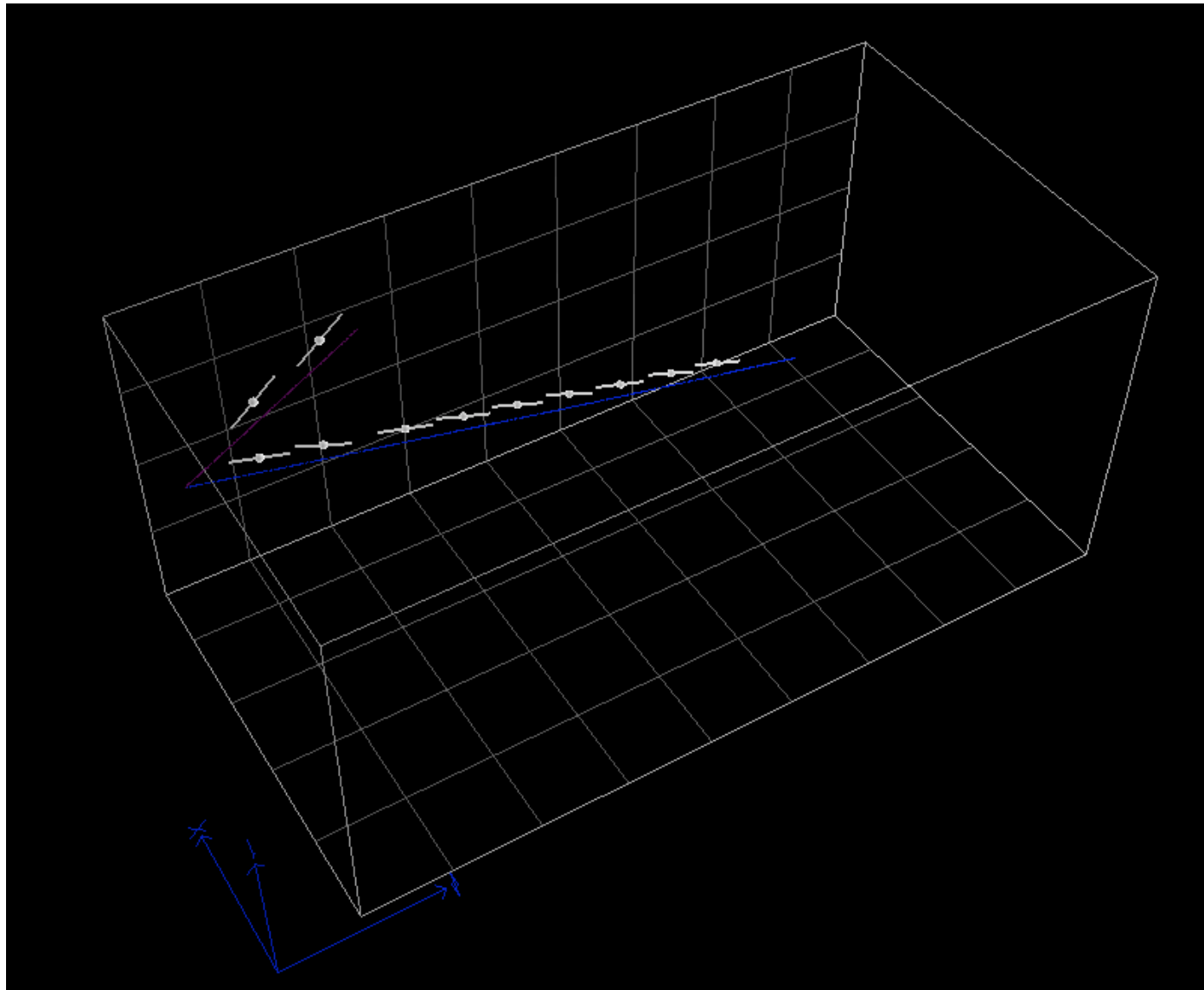# Single Muon
seeds
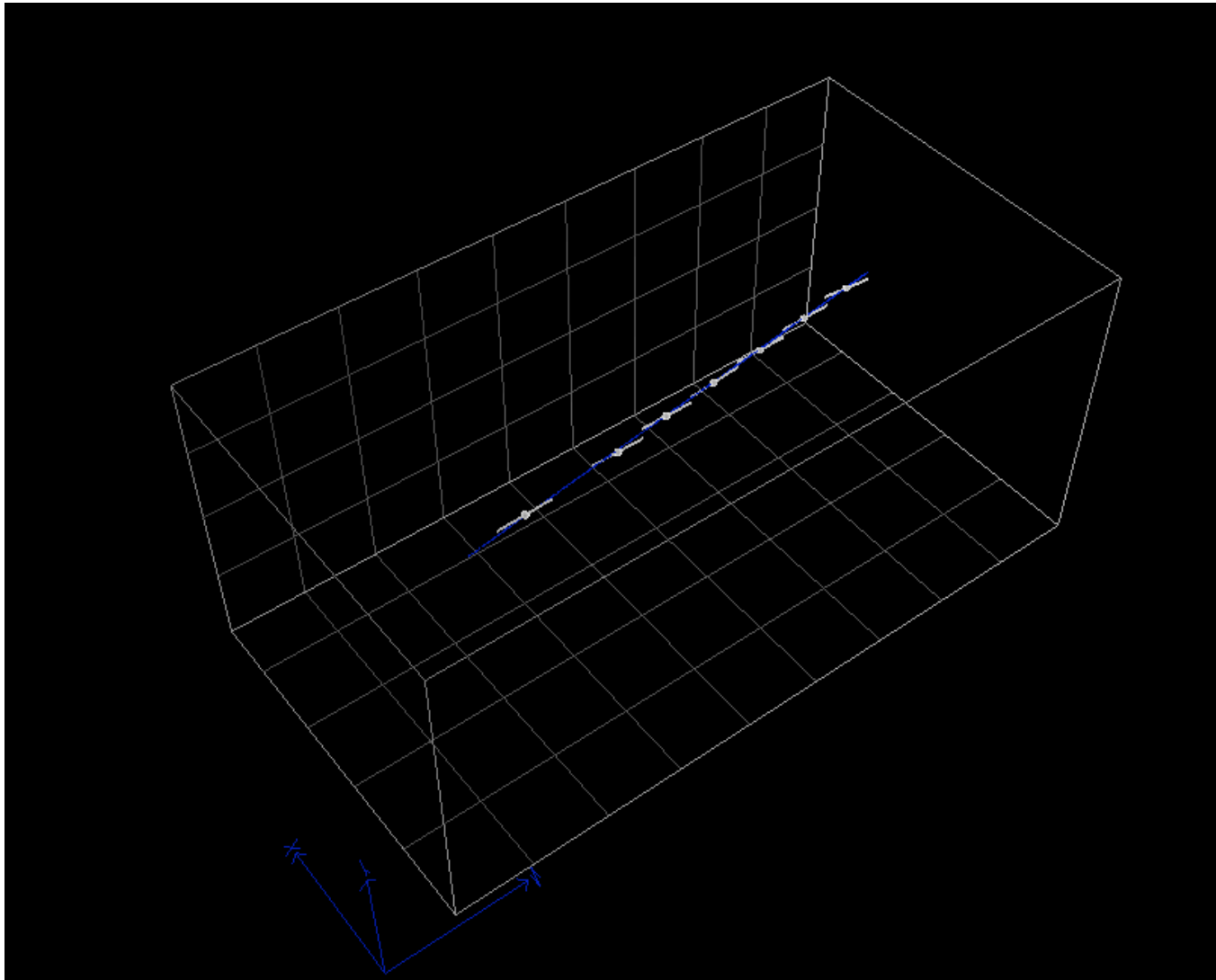
Single Muon
Kalman
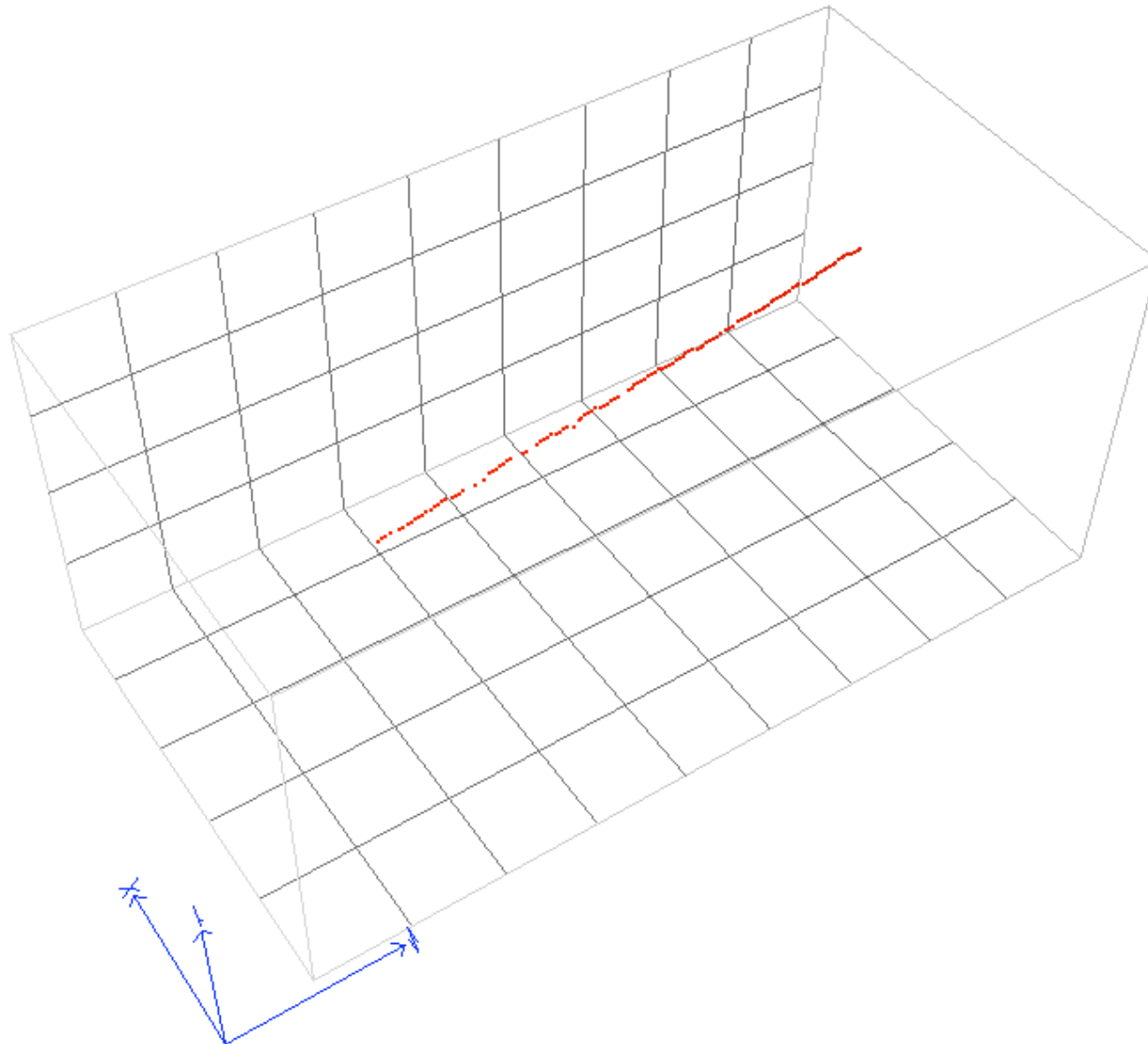
Single (low energy) Muon
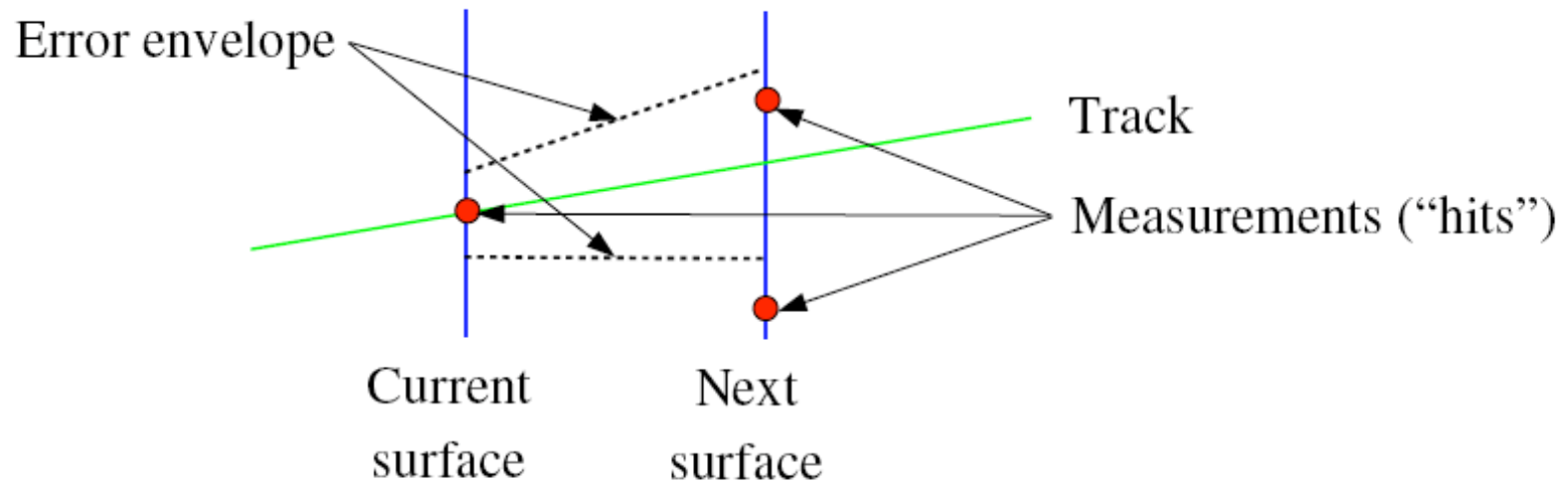## bezier

CCQE

Seeds

Next Steps

- Tune seed finder and kalman tracker parameters for ArgoNeuT geometry. Under progress.

- Write an algorithm to find tracks with one set of parameters, throw away hits associated with those tracks, try again with a new set of parameters.

- Other ideas?

Backup Slides

Kalman Filter

- Propagate track from current surface to next surface containing candidate measurements.

- Find measurements within road defined by track error.

- Use measurement to refine track parameter estimates.

- Kalman filter is a tool for both pattern recognition and track fitting.

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"A Proposed Kalman Filter Track-Finding Algorithm and Toolkit" H. Greenlee

Not a Perfect Solution

ν_μ [7.6 GeV/c] + ^{40}Ar → μ [7.4 GeV/c] + p [0.5 GeV/c] + X