KalmanSPS fi{l,t}ter update

Eric Church, 2-May-2012

This approach uses Spacepoints

- We rely on SpacepointServices to produce 3D spacepoints and their errors from sensible clusters. Then we run a Kalman-filtered track through those points.

Accomplishments

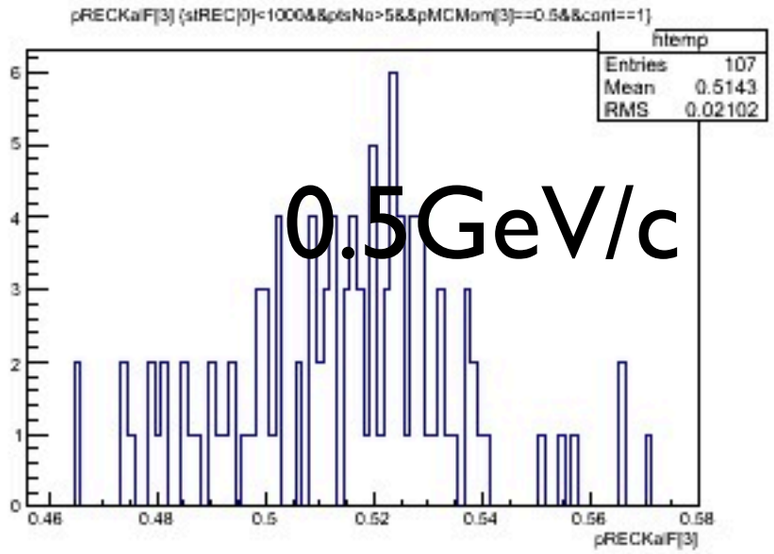
- Code is now full of user settable parameters
- Works under “arbitrary” PDG hypothesis, not just muon
- Puts Track()s on the event.

Rules

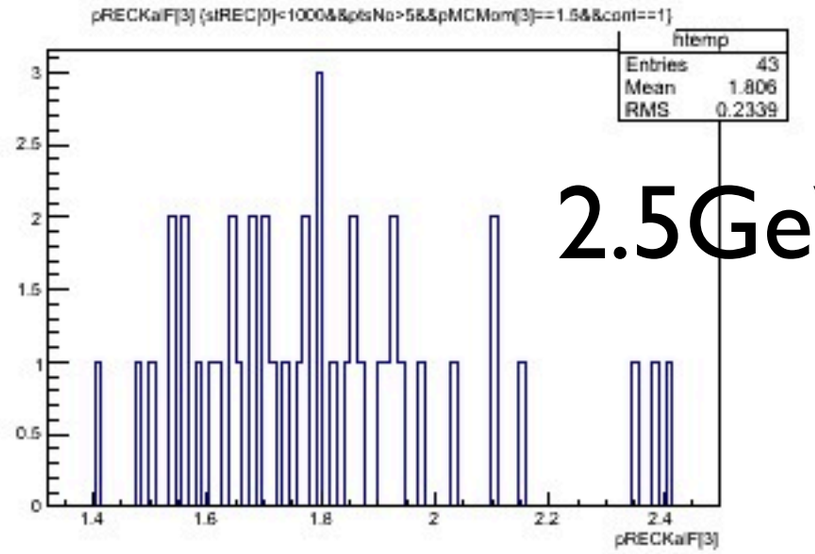
- For contained tracks, initial momentum guess is simply spacepoint length * dEdx_species.
- For uncontained tracks I multiply that by 3.
- Results are sensitive to upper limit imposed on the Kalman update. This is justified by recognizing only 98% of scattering is inside Moliere expectation. But still, ...
- I am using only 1/50-100 spacepoints in order to have a chance to measure angular deflections. Makes life hard, but also room for improvement here.

Contained and UnContained muons

(No fixing |p|) for contained

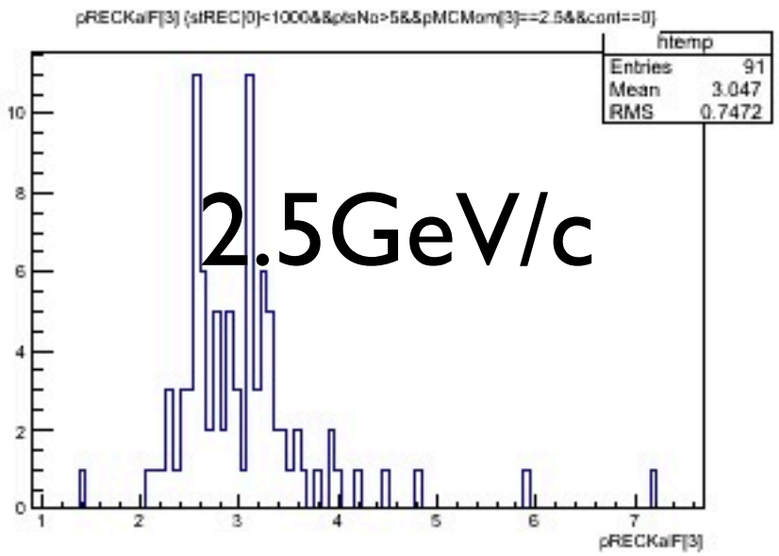


0.5GeV/c

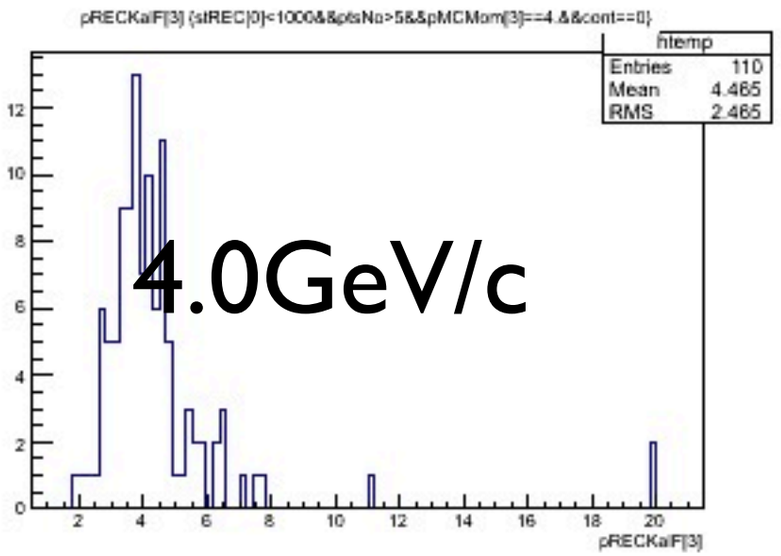


2.5GeV/c

uncontained



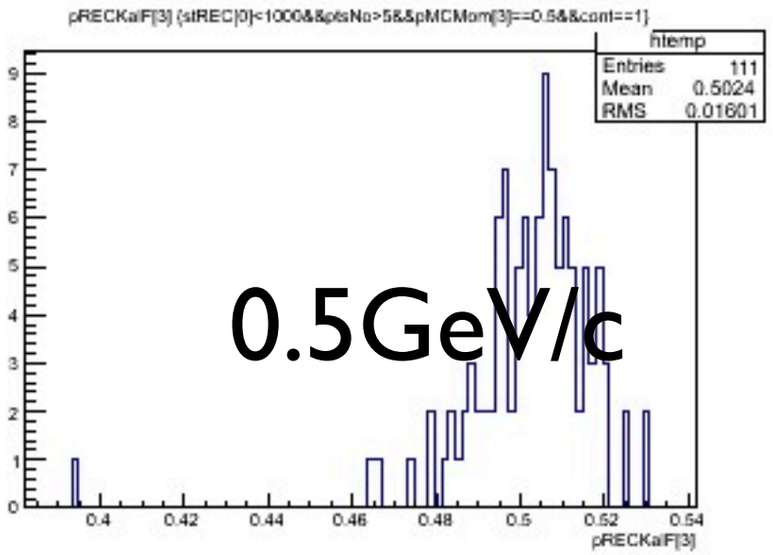
2.5GeV/c



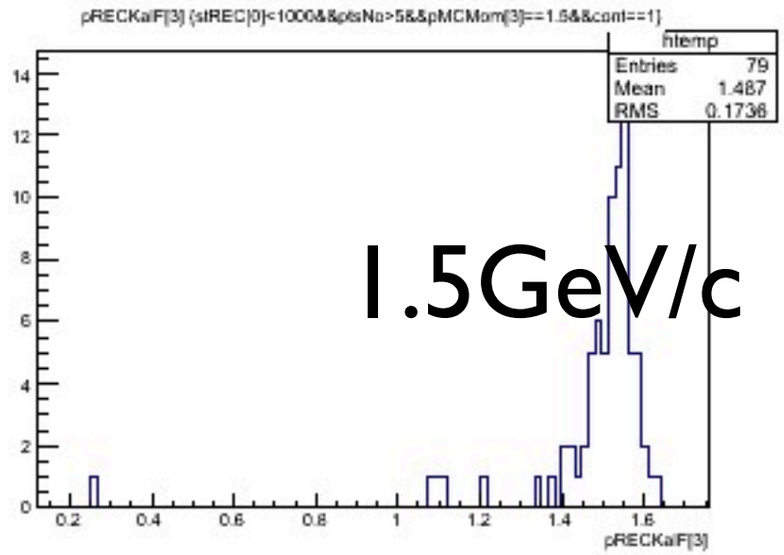
4.0GeV/c

Contained and UnContained muons

contained
fix |p| using range

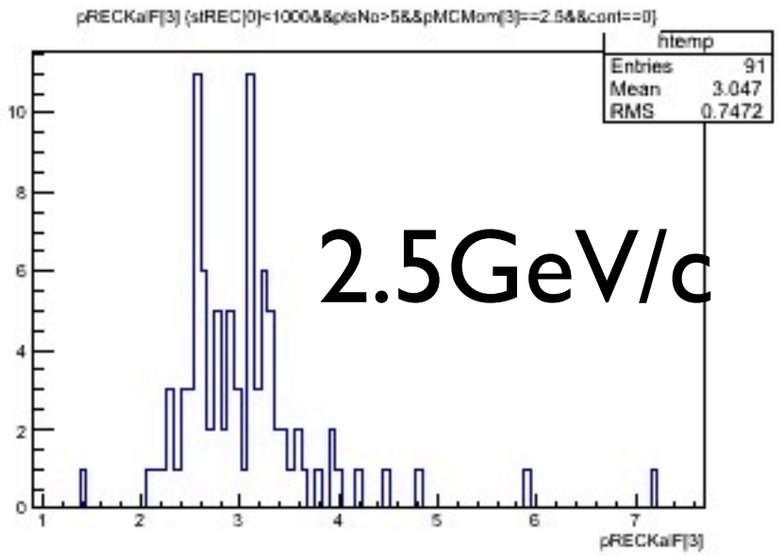


0.5GeV/c

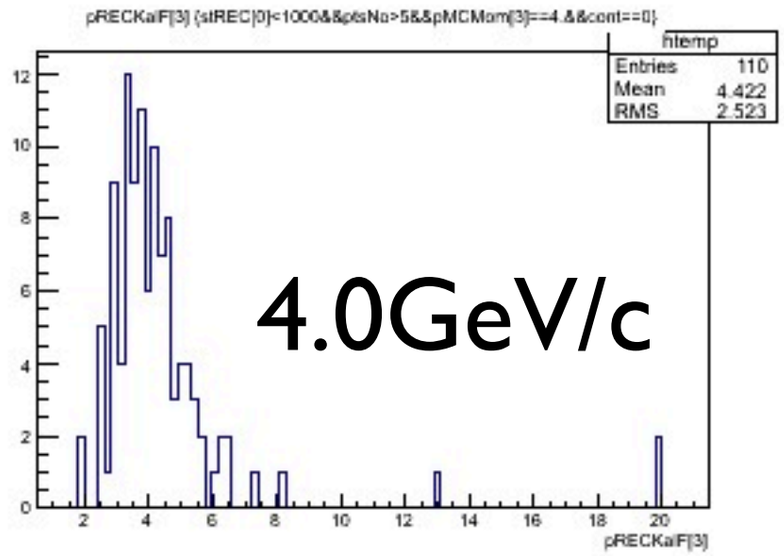


1.5GeV/c

uncontained



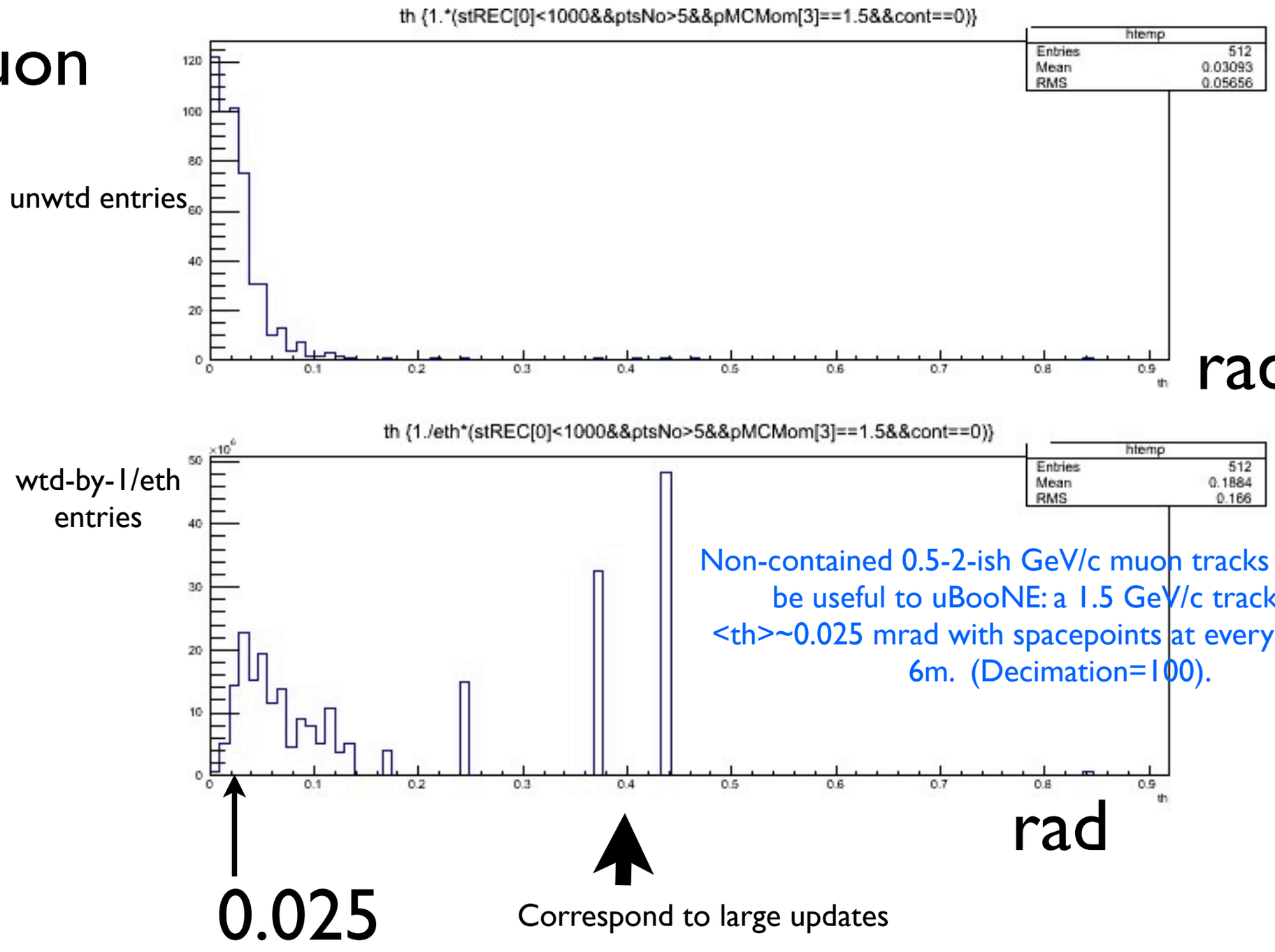
2.5GeV/c



4.0GeV/c

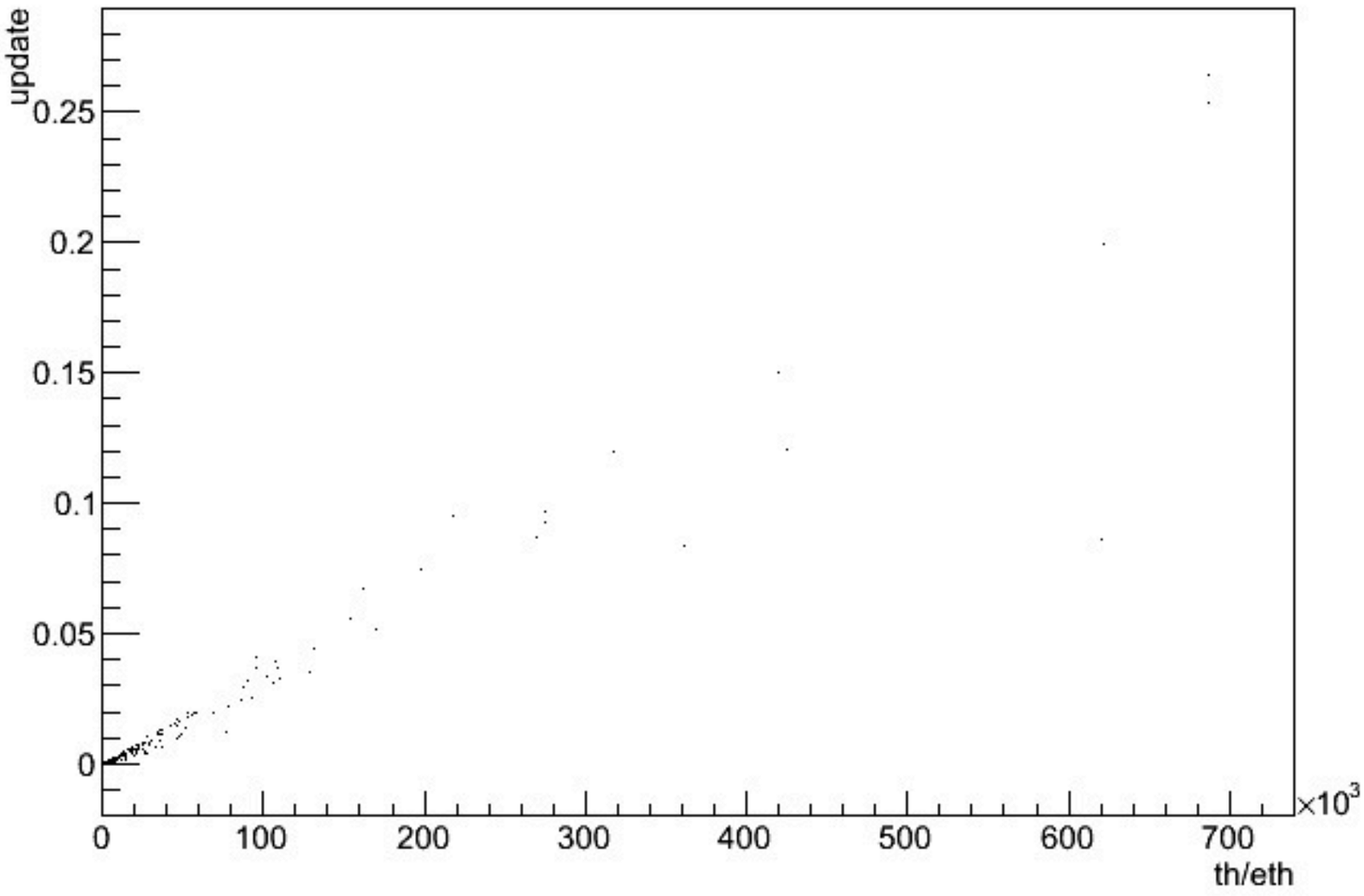
theta & theta wtd by 1/eth

Uncontained 1.5 GeV/c muon

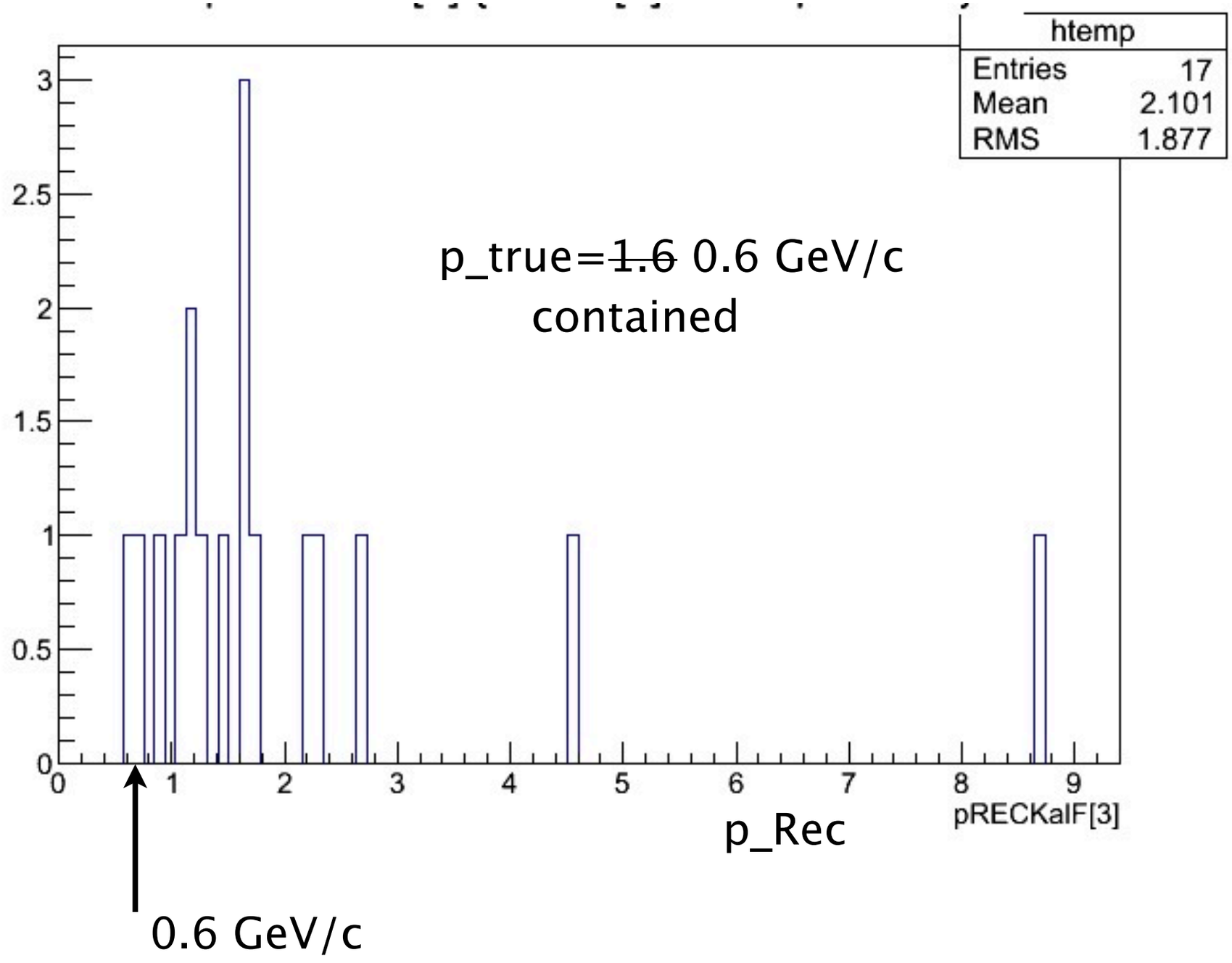


Non-contained 0.5-2-ish GeV/c muon tracks is what will be useful to uBooNE: a 1.5 GeV/c track gives <th>~0.025 mrad with spacepoints at every 30 cm for 6m. (Decimation=100).

th/eth:update



~~1.6~~ 0.6 GeV/c protons (KE=~~80~~ 174MeV)



Fragile

- Algorithm is sensitive to Kalman Update_max cutoff. Especially sad little stubby tracks, like .6 GeV/c protons.
- Decimation value: low energy tracks, once decimated, give 5-8 spacepoints from which to measure angular deflections and thus, |p|

To Do

- Generate muons of reasonable angles from reasonable start points using GausHitFinder, etc.
- Need to add errors to Tracks at desired points, not just Kalman covariance matrix.
- Need to fix Chi2
- Feed BJPJones's sampled Bezier curves in.

Summary

- It is true that the uncontained, sub-1.5 GeV/c muons are what Kalman filter has to be useful for.

- This still looks hard. Maybe we can get there.