University of Chicago

Argonne NATIONAL LABORATORY

LAPPD

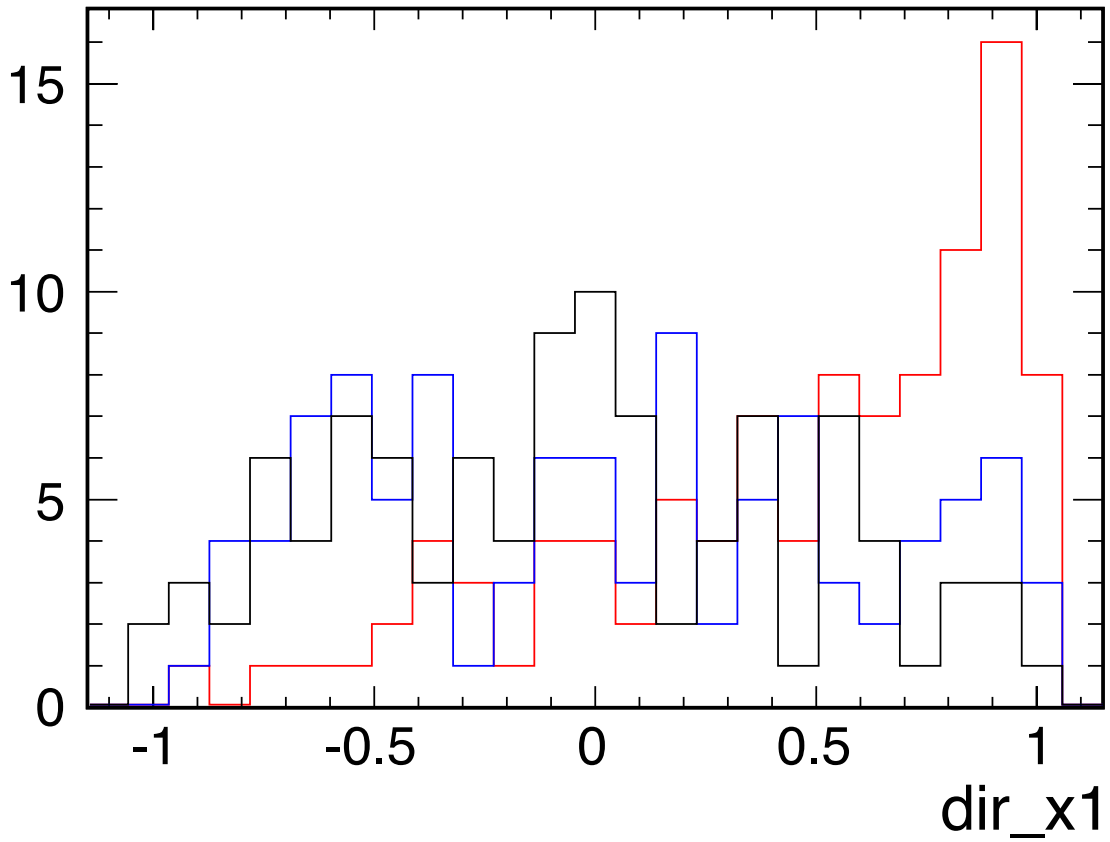
ANNIE Reconstruction Update

Sept 18, 2013

U.S. DEPARTMENT OF ENERGY

Looking at Muons

~70% of the first 500 events have a muon...



Muon Reconstruction Strategy

general strategy: search for the earliest emission time-bin, with >N photons projecting back to the same point along the hypothesized track

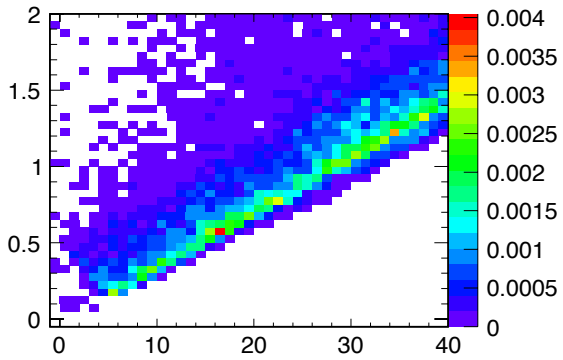
Muon Reconstruction Strategy

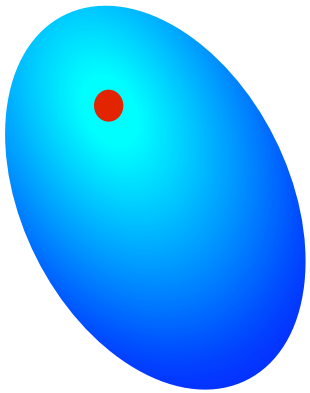
general strategy: search for the earliest emission time-bin, with >N photons projecting back to the same point along the hypothesized track

2 Approaches

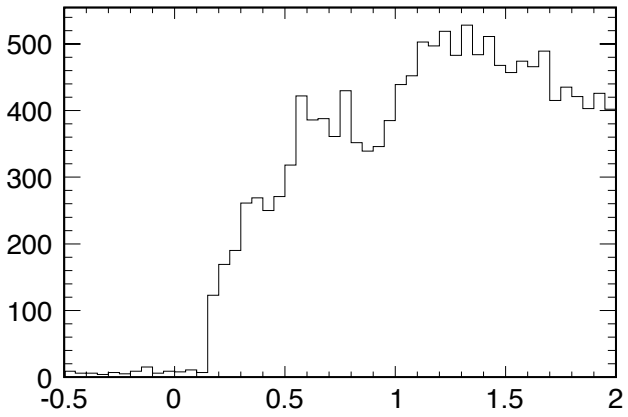
Use the track direction (and intercept) as determined by the MRD

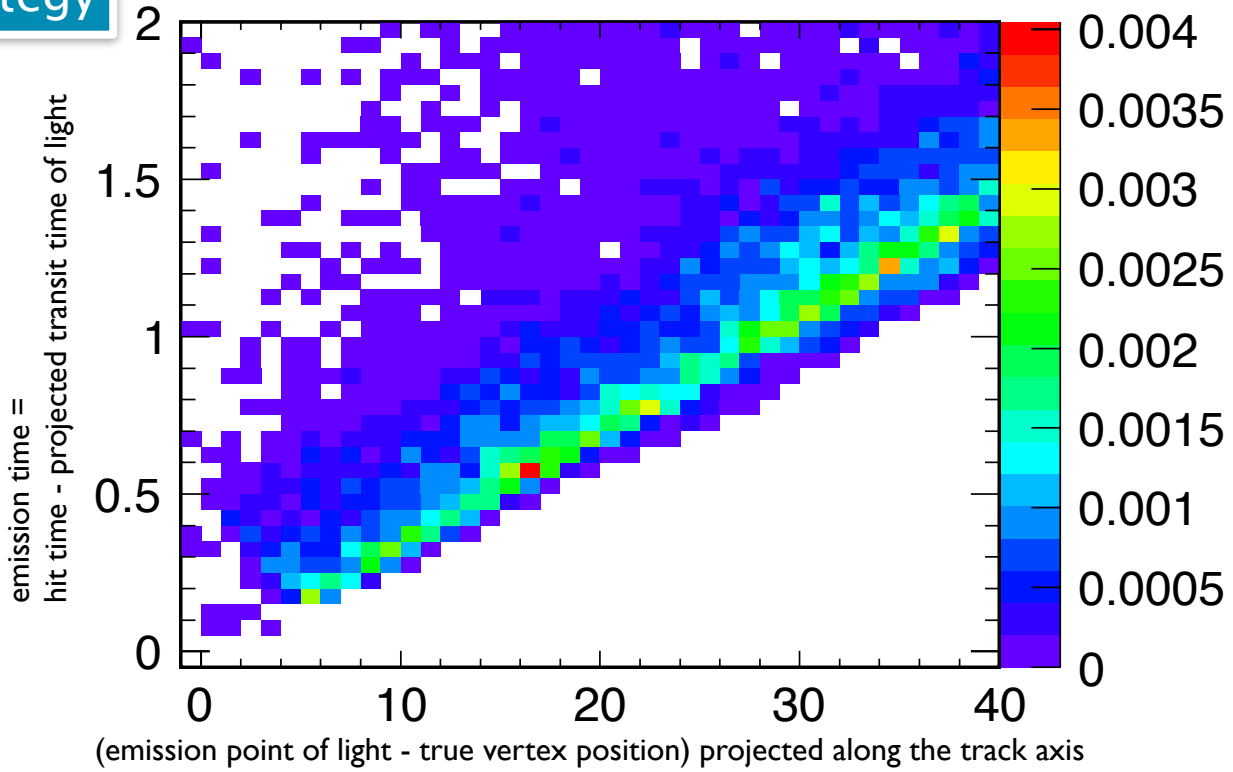
Use the track direction determined by dr/dt dphi working backwards from the earliest arriving light -H. Frisch

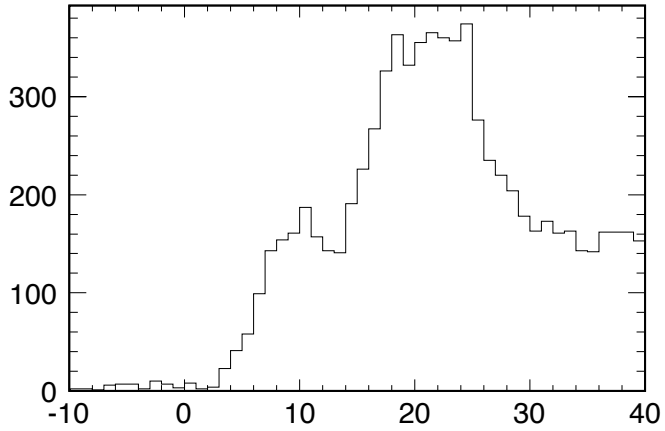




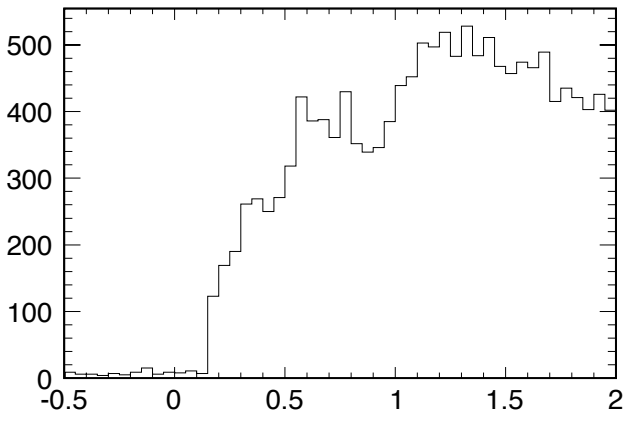
Muon Reconstruction Strategy

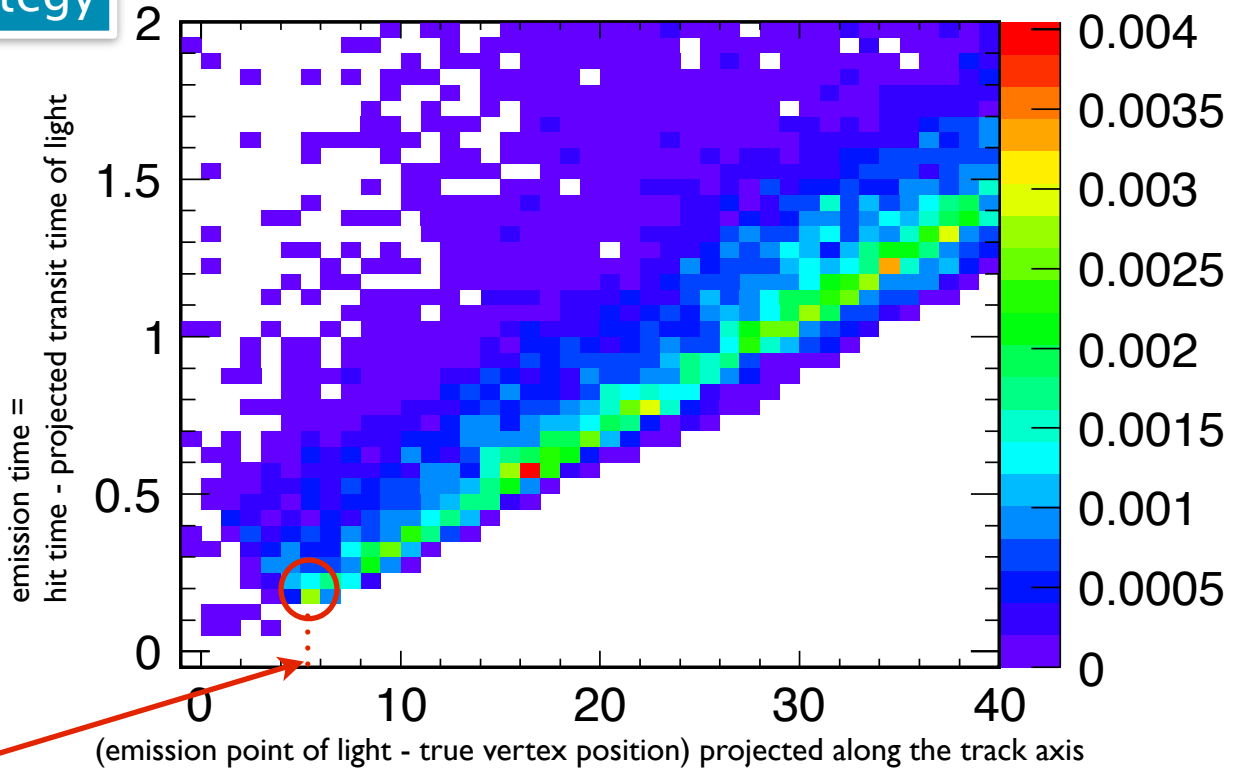




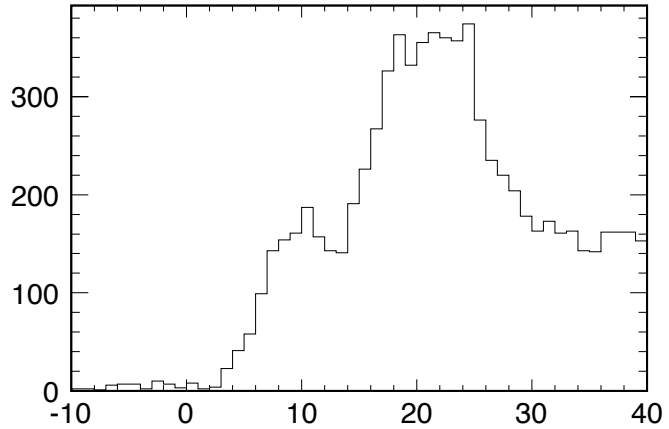


Muon Reconstruction Strategy

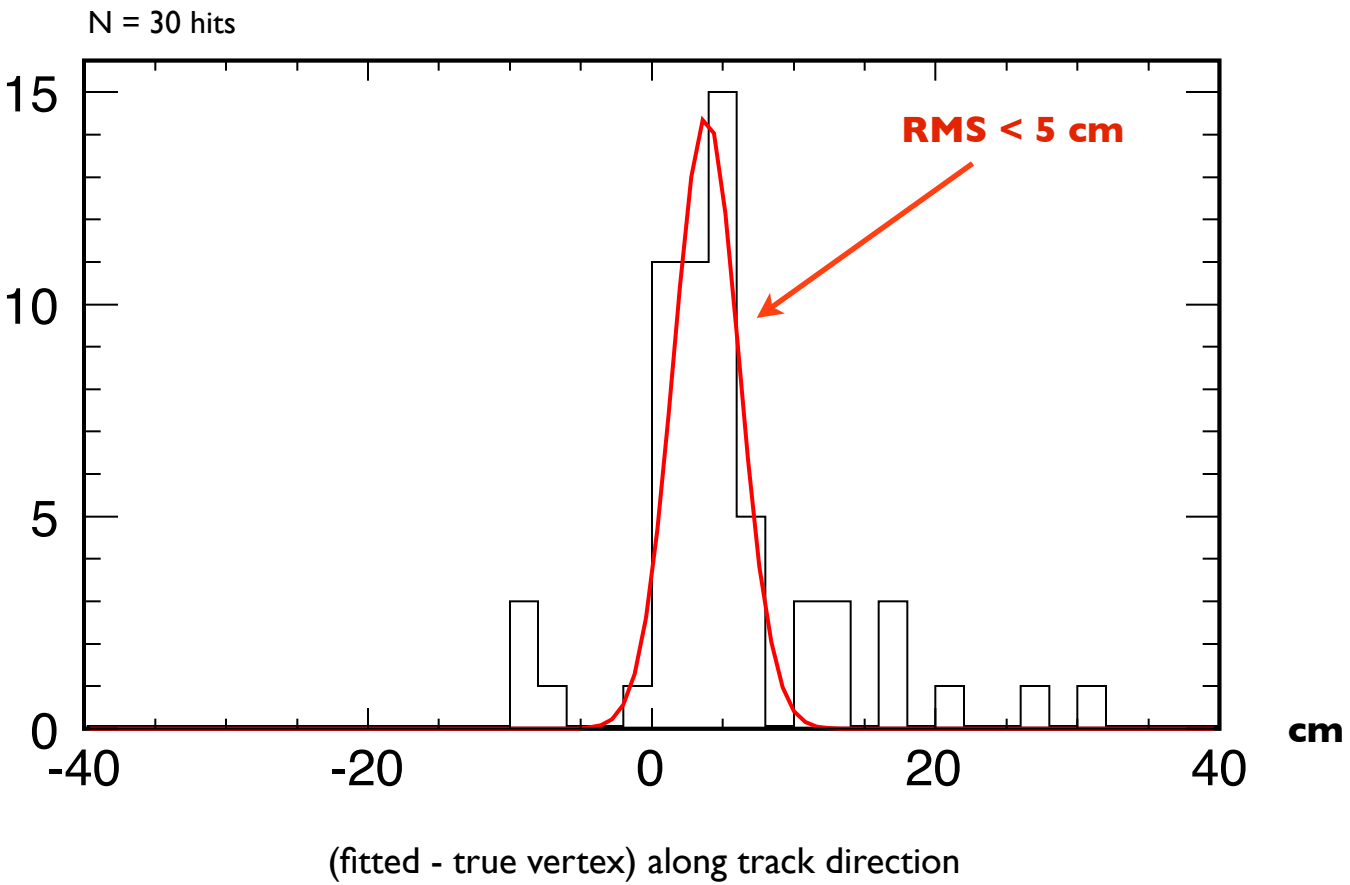




fitted vertex location

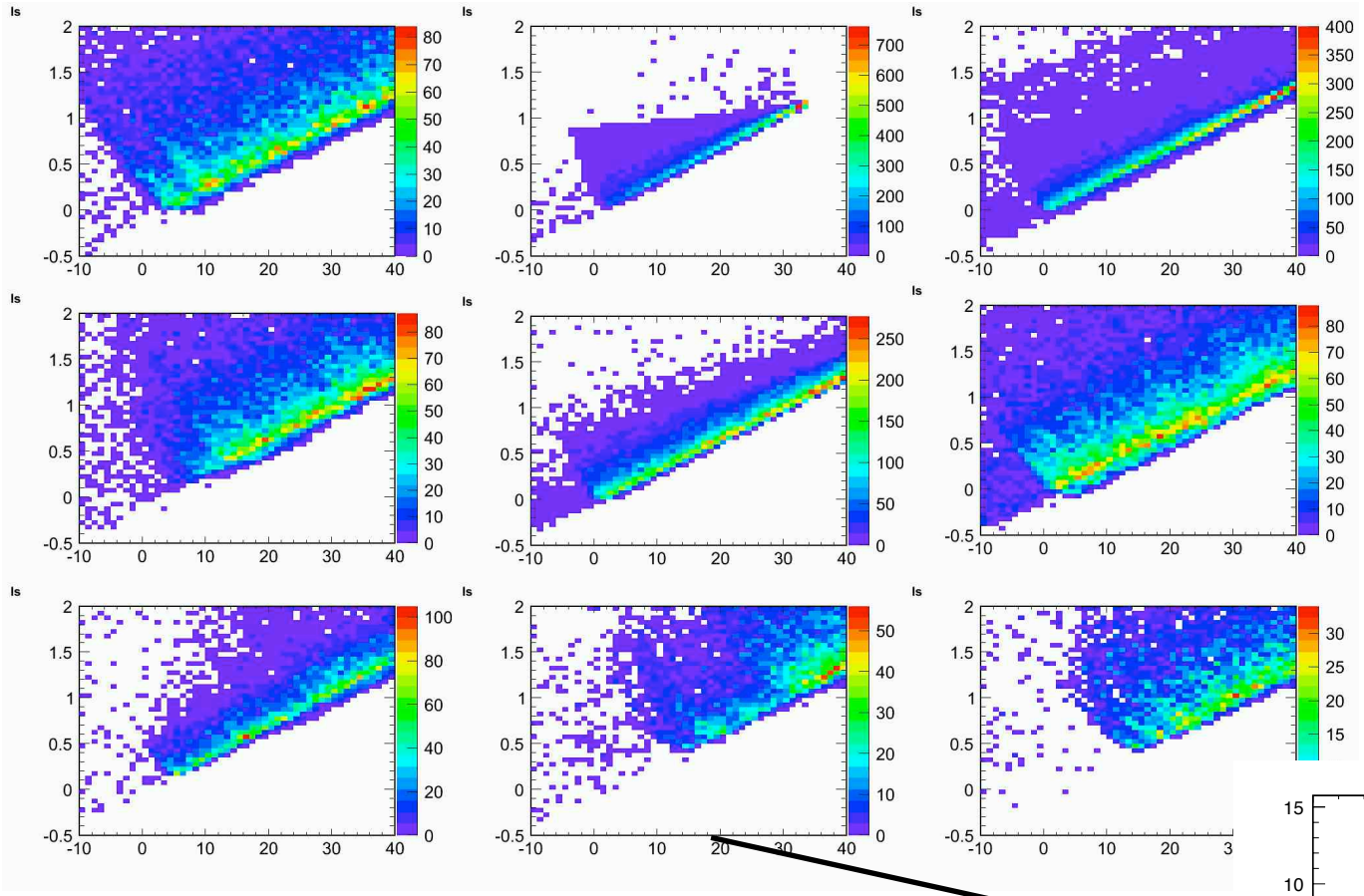


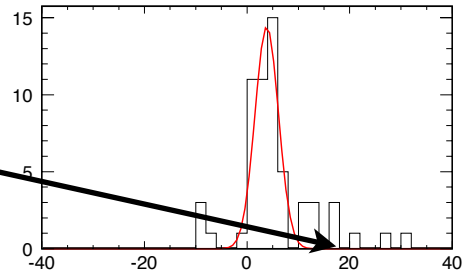
Muon Reconstruction Strategy – Result of 60 fits



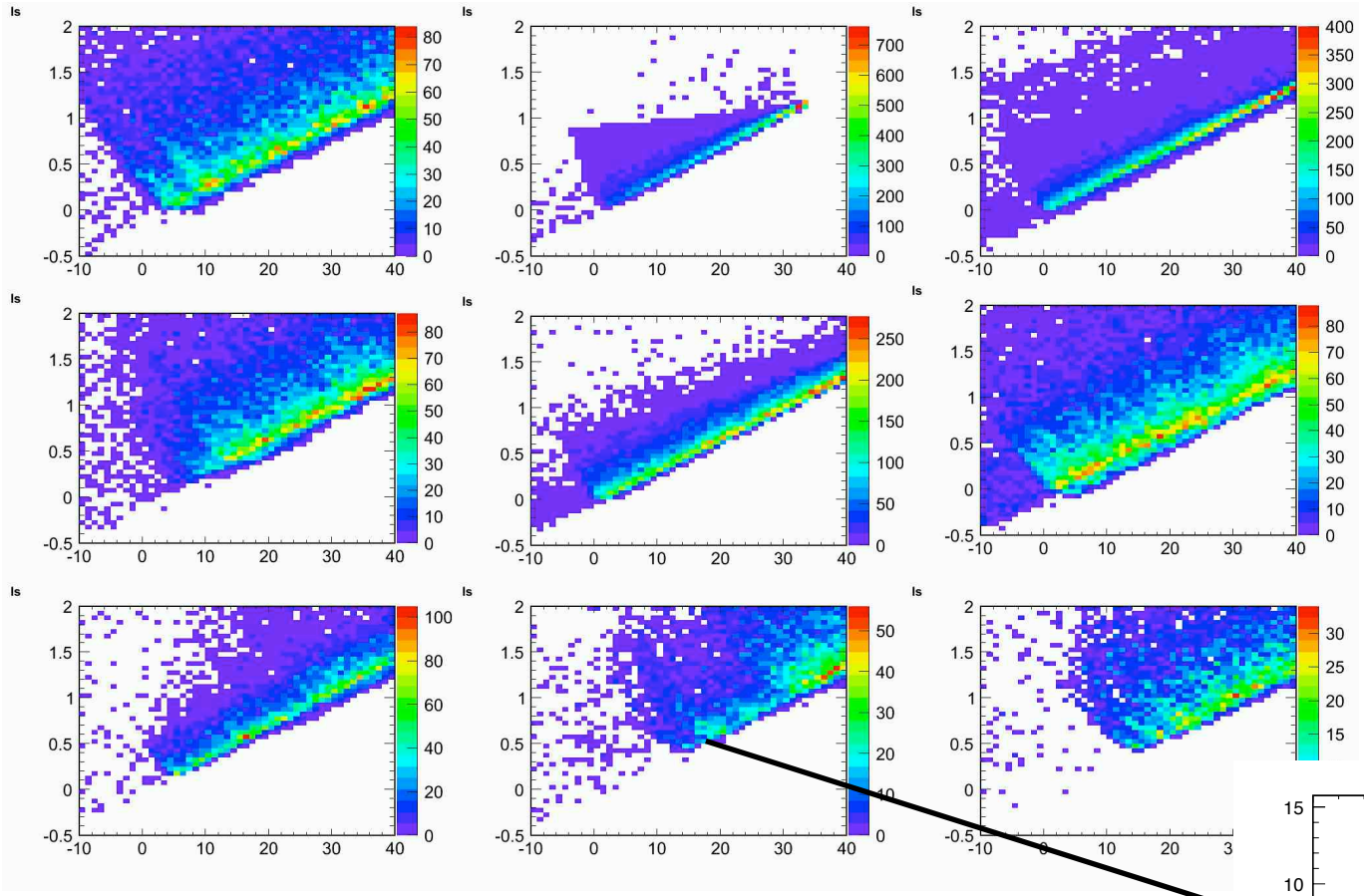
Slight forward bias, but most events fall into a narrow distribution. Some events fall far from the true vertex. A few events cause a catastrophic crash. Looking into that....

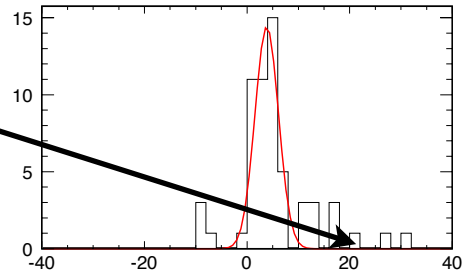
Lmuon Vs Time Residual – first 9 events





Lmuon Vs Time Residual – first 9 events





Multiscattered muon?
Would project incorrectly on the the true track.

Muon Reconstruction Strategy – Next Steps

- Better algorithm for finding earliest light
- Find out why some fits are failing catastrophically
- Use track parameters derived from MRD
- Finish implementation of “working backward” approach
- Test algorithm on a single wall, instrumented with LAPPDs
- Test algorithm on sparse coverage.

Proposed method For a Full Turn of the Crank -

Hit locations in MRD -> select “good events”
Run WC simulation on good events
Fit vertices
Select events with good vertices
Plot the true kinematics of passing events