

The taus, what about the taus?

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A summary to the tau reconstruction

Method

- Perform single shower M-estimator prefit
- Perform 2nd single shower prefit with residual hit selection
- Perform cluster hit selection based on prefits (more later)
- Do a two shower PDF based likelihood fit

A clusterize algorithm

Implementation

JPP method based on the clique algorithm (for more information see `$JPP_DIR/software/JTrigger/JAlgorithm`). Implemented in AAnet by Aart and me.

- Find causality condition between two hits for your event type (modified single shower condition to fir two showers)

Clique:

- For each hit determine the number of causally related partner hits
- Throw away the hit with the least partners
- Continue until the hit with the least causally related partner hits has as many partners as hits are left in the selection

Two shower position fit performance

Performance on toy MC double contained events

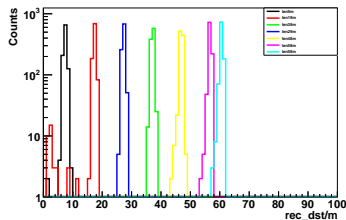


Figure : Distance between two reconstructed vertices with clusterize on prefit hitselection

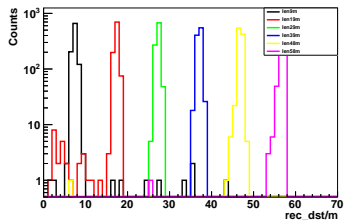


Figure : Distance between two reconstructed vertices with clusterize on likelihood

Toy MC iteration

Toy so far had always a Λ at nu vertex and a electron at tau vertex, for better comparing put electron at both vertices

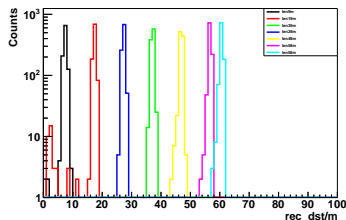


Figure : nu shower with Λ and tau shower with elec

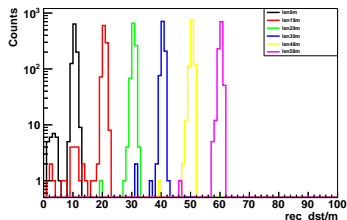


Figure : nu shower with elec and tau shower with elec

Two shower position fit on nueCC

Run Belle Star on 10 nueCC files

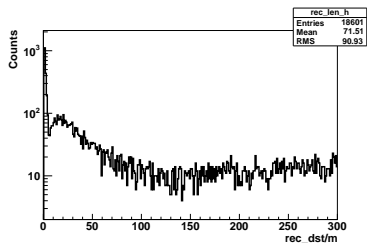


Figure : Distance between two reconstructed

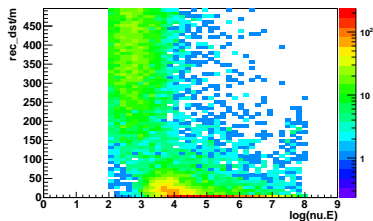


Figure : Distance between two reconstructed vs sim nu.E

Two shower position fit on nueCC

Run Belle Star on 10 nueCC files

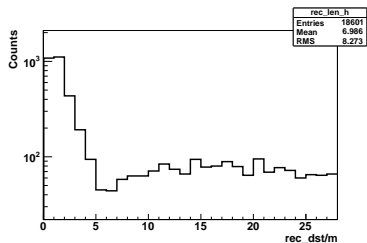


Figure : Distance between two reconstructed zoomed

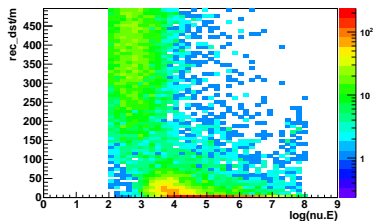


Figure : Distance between two reconstructed vs sim nu.E

Two shower position fit on numuCC

Run Belle Star on 10 numuCC files

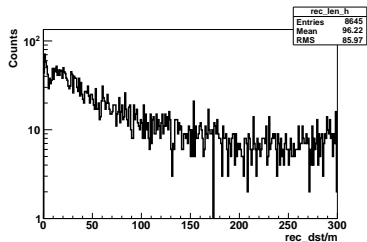


Figure : Distance between two reconstructed

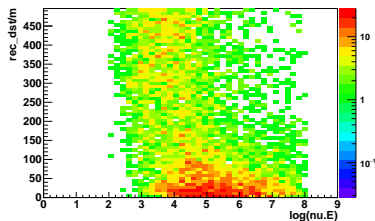


Figure : Distance between two reconstructed vs sim nu.E

A likelihood ratio approach

Idea

Compare the output of the likelihood fits of Belle Star and JGandalf to discriminate double band and muon events

Ratio: $\text{lik}(\text{BelleStar})/\text{lik}(\text{JGandalf})$

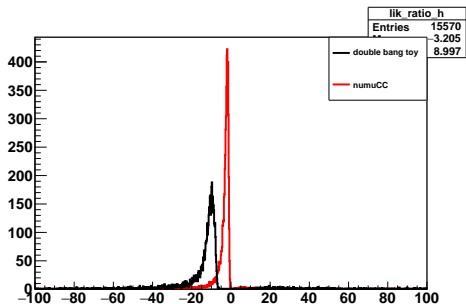


Figure : lik ratio, tau toy to numuCC

Actual tau MC

Fresh from the press, guaranteed bug free (or close, or maybe just a little, we really do not know at the moment)

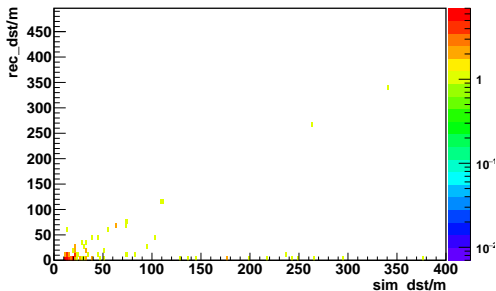


Figure : rec len vs sim len for a small small sample