Update on tau status

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Tau toy MC v3

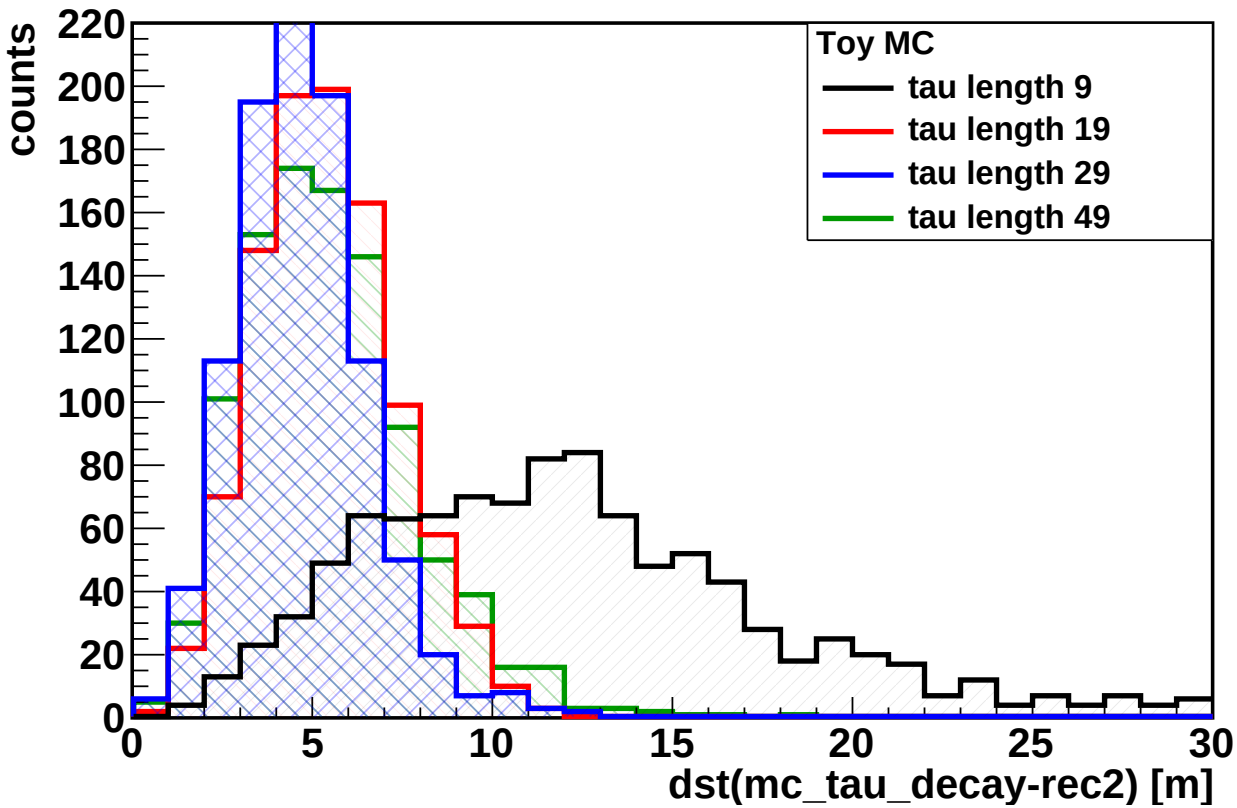
Method

- Added flight length calculation from event energy
- Reduced tau shower energy to be 75 % of tau energy (neutrino)

Small steps to full toy (simulate some energy spectrum and draw random bjorken y)

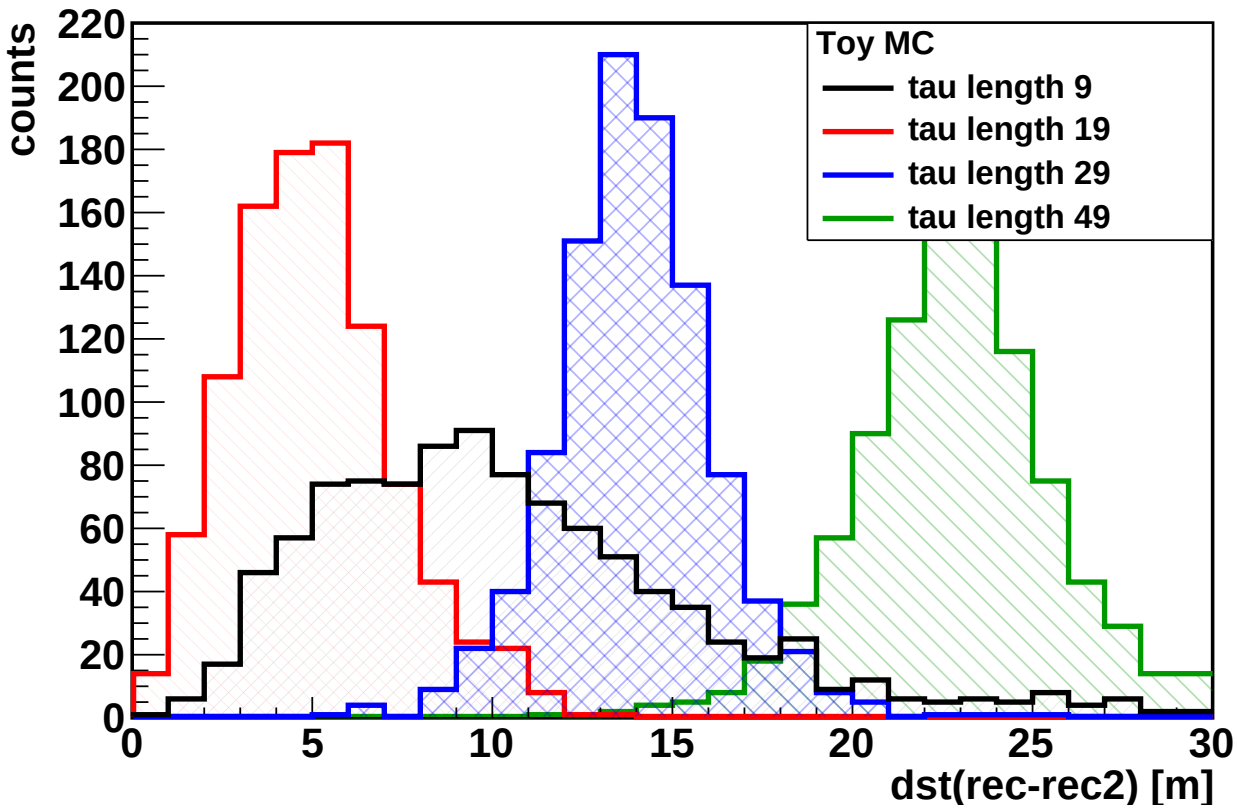
Default aashowerfit on toy

Applying aashowerfit on the toy MC we find for second vertex resolution



Default aashowerfit on toy

Applying aashowerfit on the toy MC we find for distance between reco vertices



Two shower position fit

Method

Perform a simultaneous log likelihood fit for a two shower event based on time residuals

$$L = log(P(\text{hit}_{t1}|\text{vertex}_1) + P(\text{hit}_{t1}|\text{vertex}_2) + P(\text{hit}_{t1}|\text{bkg}))$$

Extract $P(\text{hit}_{t1}|\text{vertex}_1)$ from histogram via spline fit, extract $P(\text{hit}_{t1}|\text{bkg})$ from difference between simulations with and without bkg (and compare to expected result form calculation)
Fit start parameter are taken from single shower fits.

Spline fit

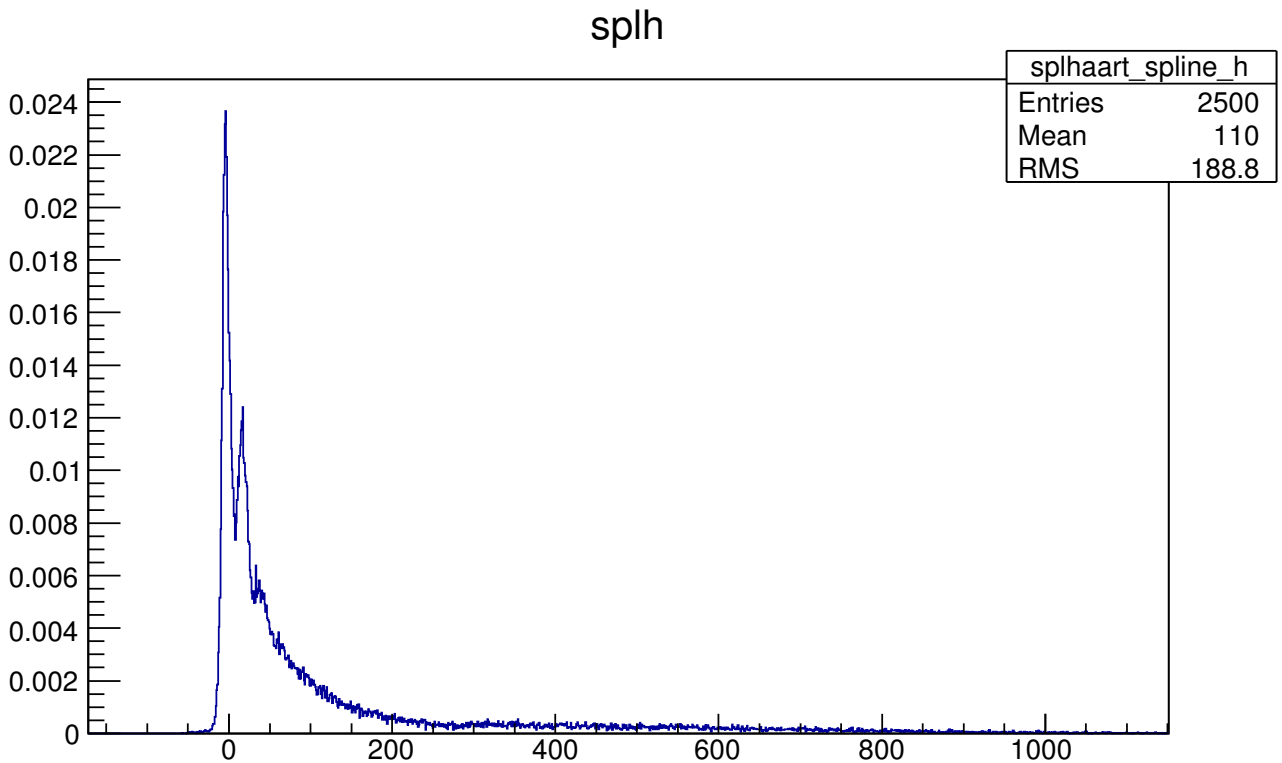
- use method Aart gave me (spline fit which can be forced to be monotonous)
- use simulated single e.m. shower events (n 100) without bkg simulation
- calculate residuals to shower maximum (since we reconstruct shower maximum and this should make it $\approx$ energy independent)
- use same hit selection as in reconstruction

Hit selection

- Merge all hits on PMT within 300 ns
- Make a L1 selection with $\Delta t \leq 20$ ns
- all L1 within ± 800 ns from input shower

Why not simply all hits? Computing time in order of 5 min per event...

Spline fit


splh
splhaart_spline_h
Entries 2500
Mean 110
RMS 188.8
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0
200
400
600
800
1000

Two shower fit performance