



PacTauUser a package for τ decays analysis



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Outline

- Brief overview of τ physics case and event topology
- PacTauUser package structure
- Ntuple structure
- Future Plans

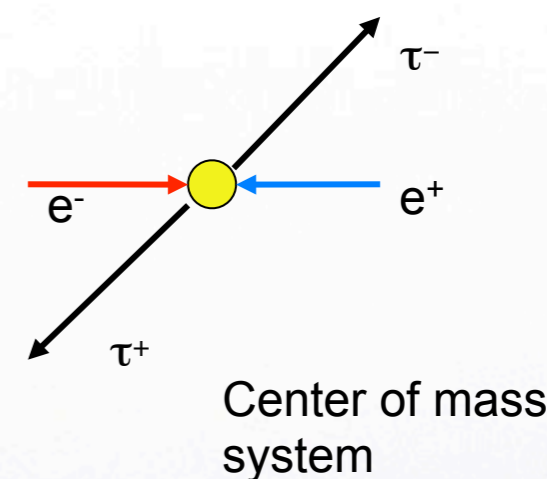


τ events in a nutshell

Events characterized by low charged multiplicity, even number of tracks, high track momenta.

Two main classes of interest at the moment
1-1 topology (LFV in $\mu\gamma$ and $g-2$ measurement) and 1-3 topology (LFV in 3 leptons)

Very few channels do not fall in the aforementioned topologies so the Package could be used for most tau decays



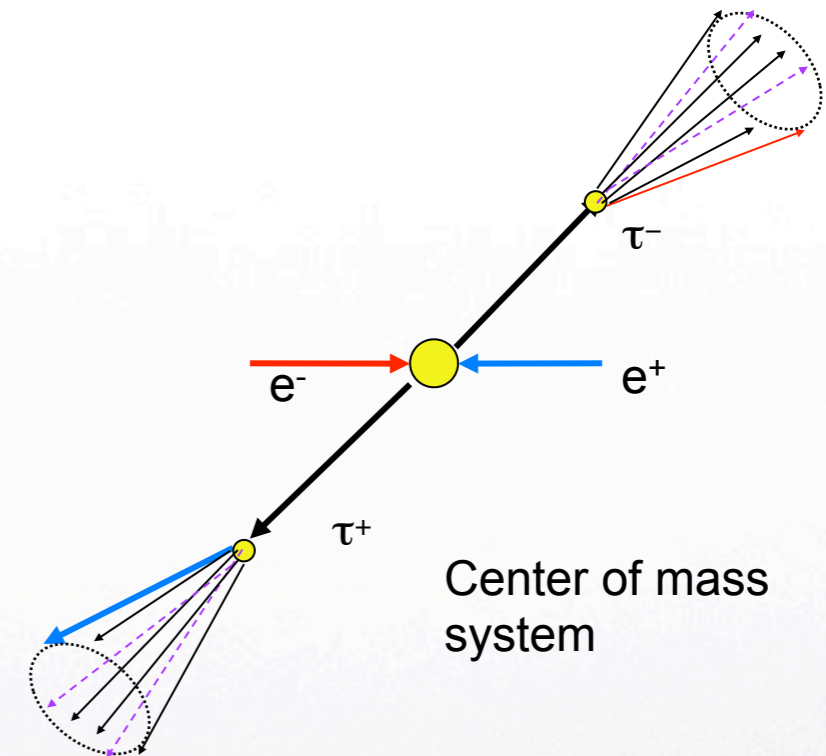


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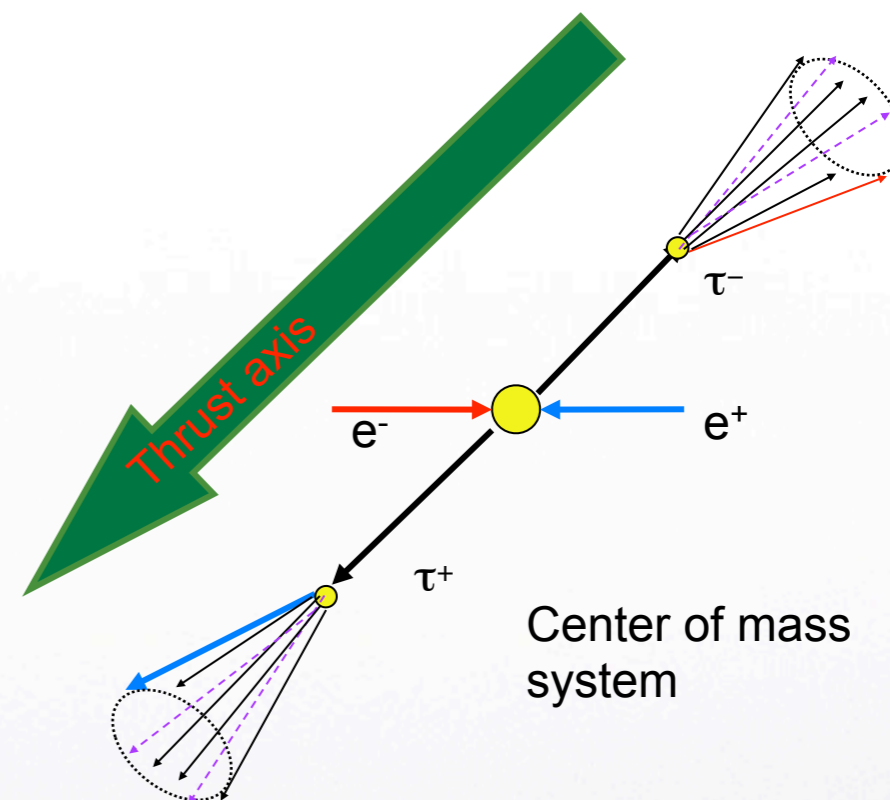


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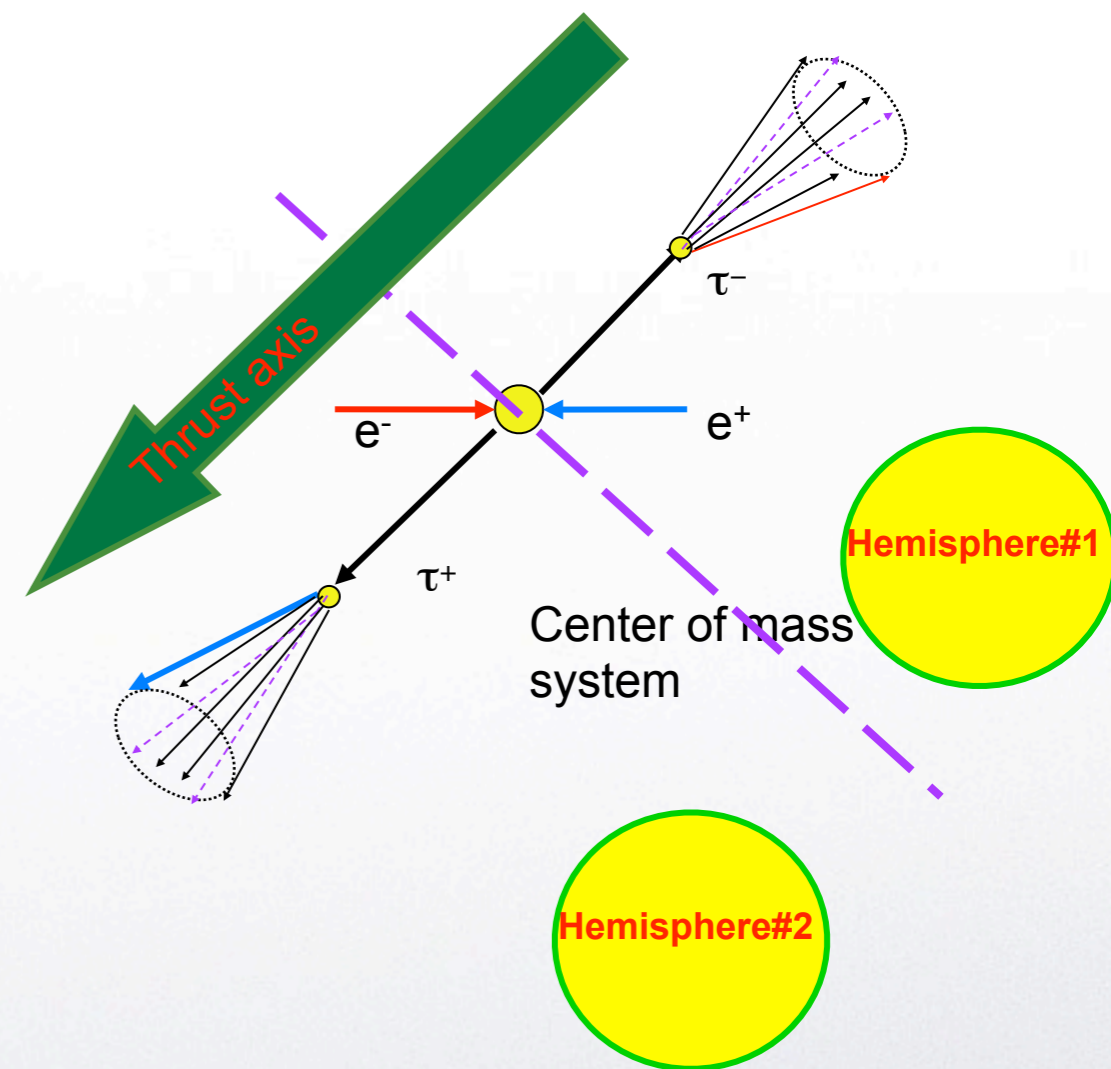


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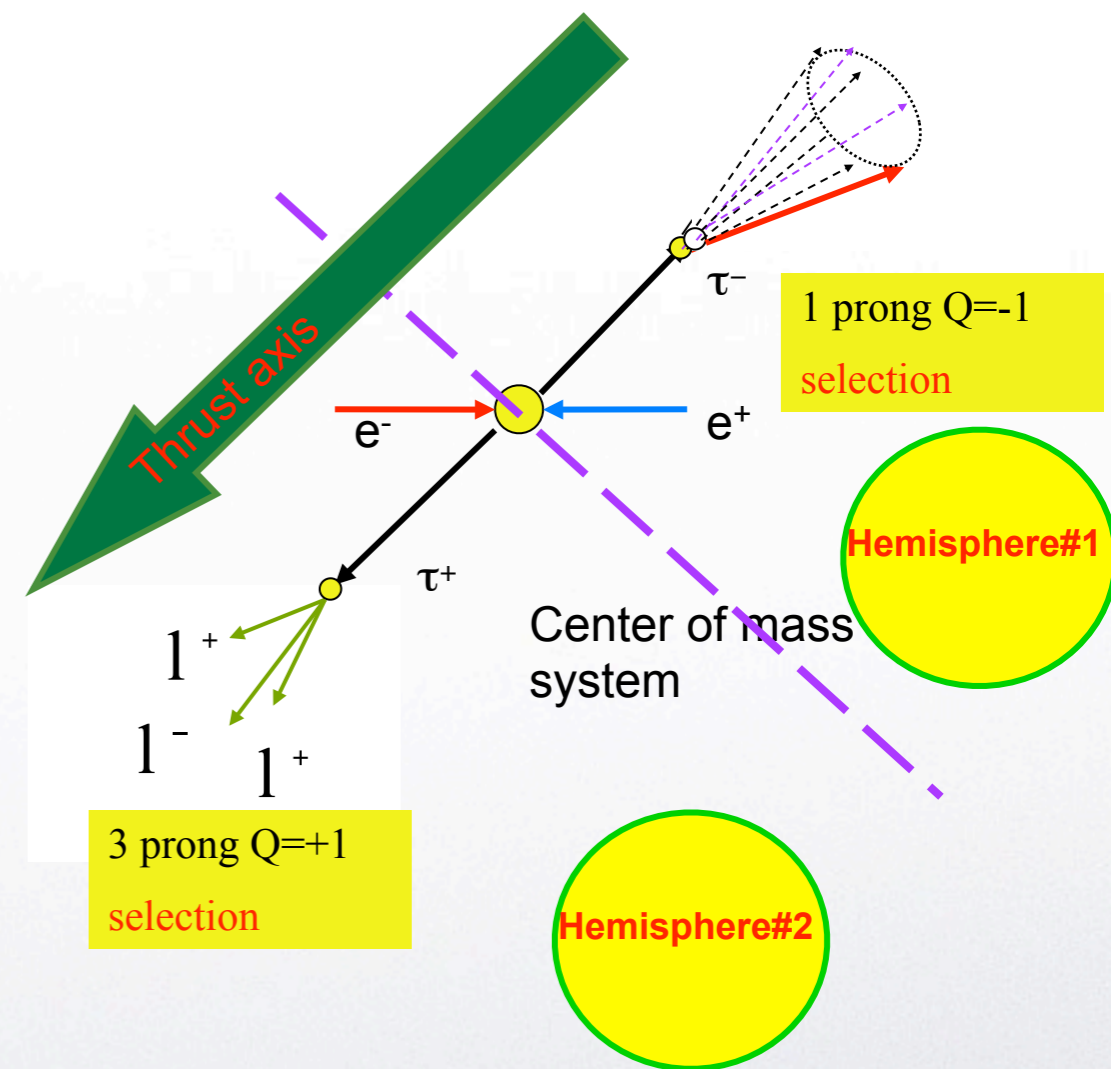


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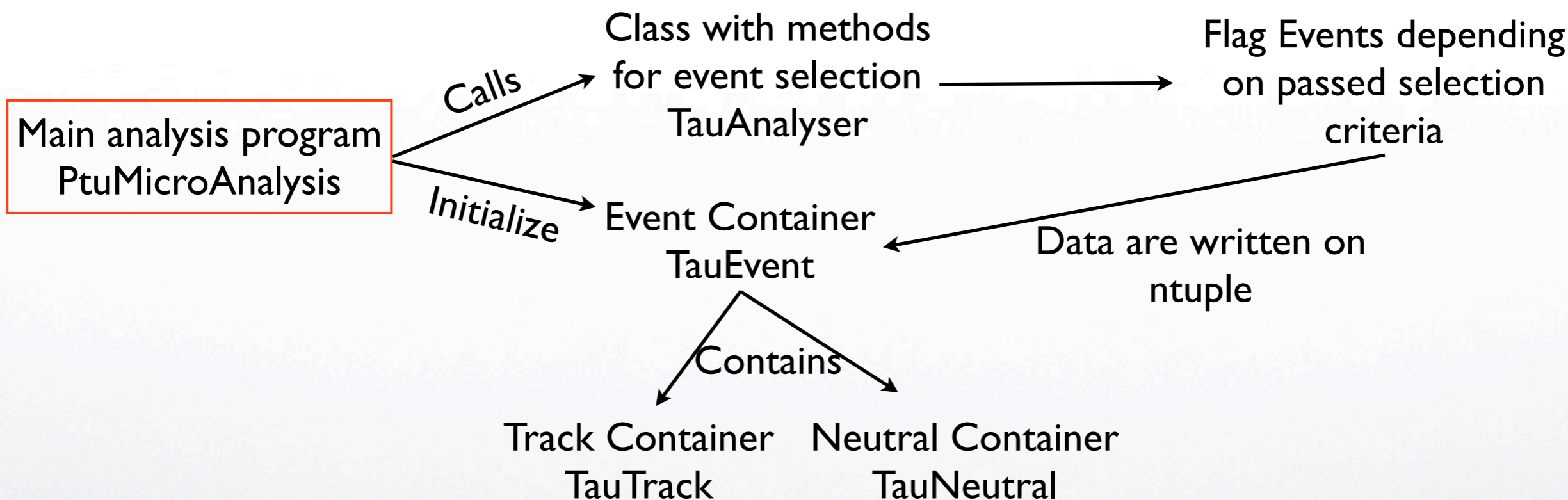
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Package structure



All Events are stored, tracks, neutral, and event are flagged, with flags based on selection criteria which are satisfied

Selection criteria may be both hard coded in TauAnalyser class (deprecated) or read from configuration files and stored before running



Tau Analyser

Tau Analyser is a class built to provide methods involving the other classes. Some of the methods include

Topology identification

1 prong identification (or charged tracks identification)

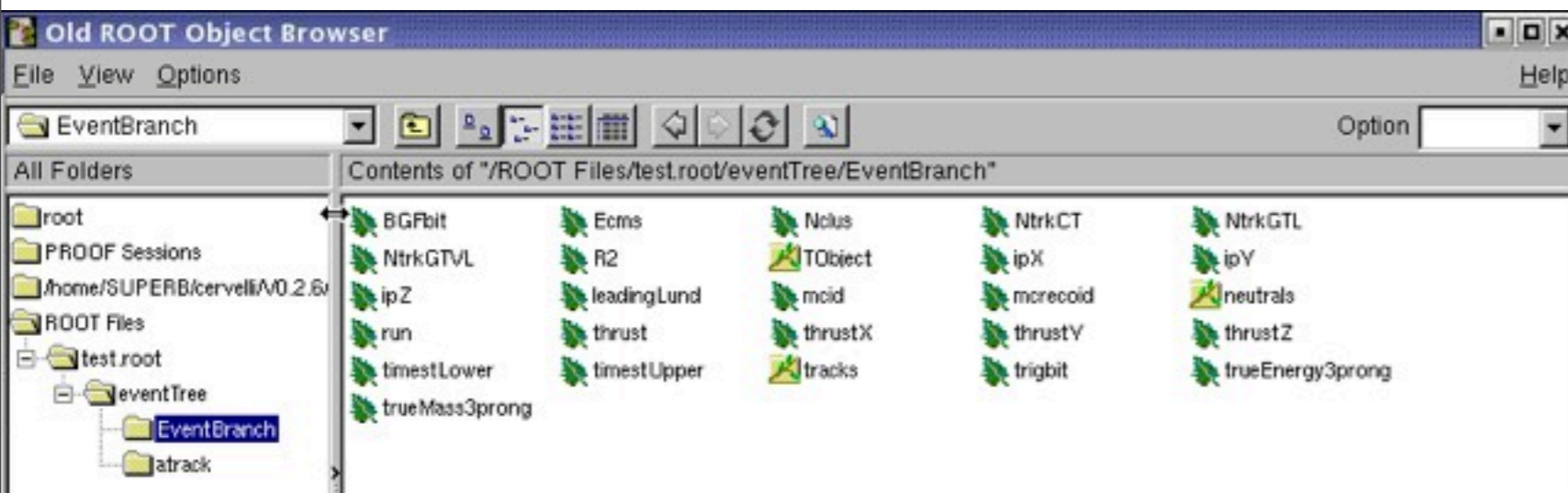
Missing mass calculation

Invariant mass calculation

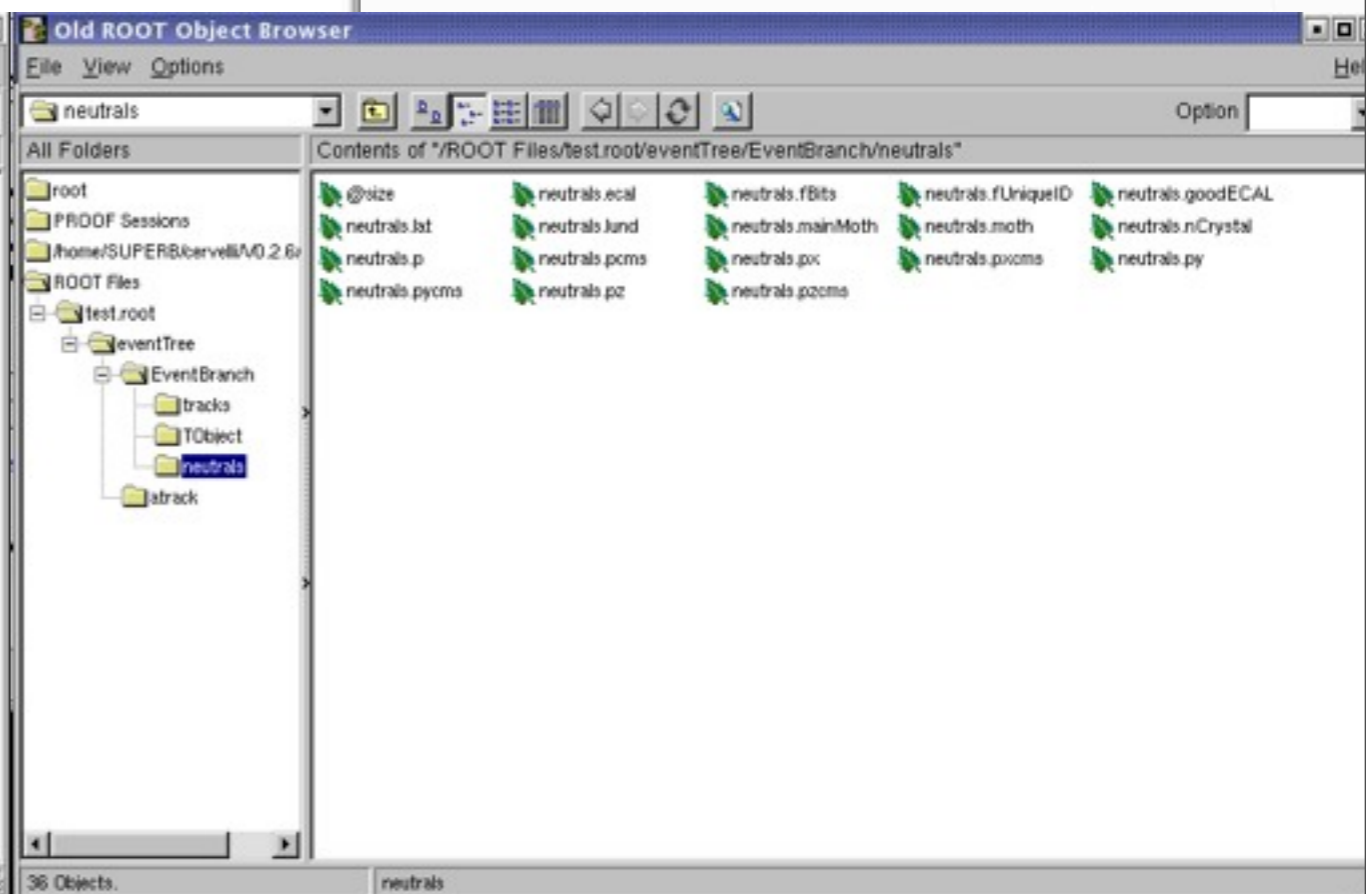
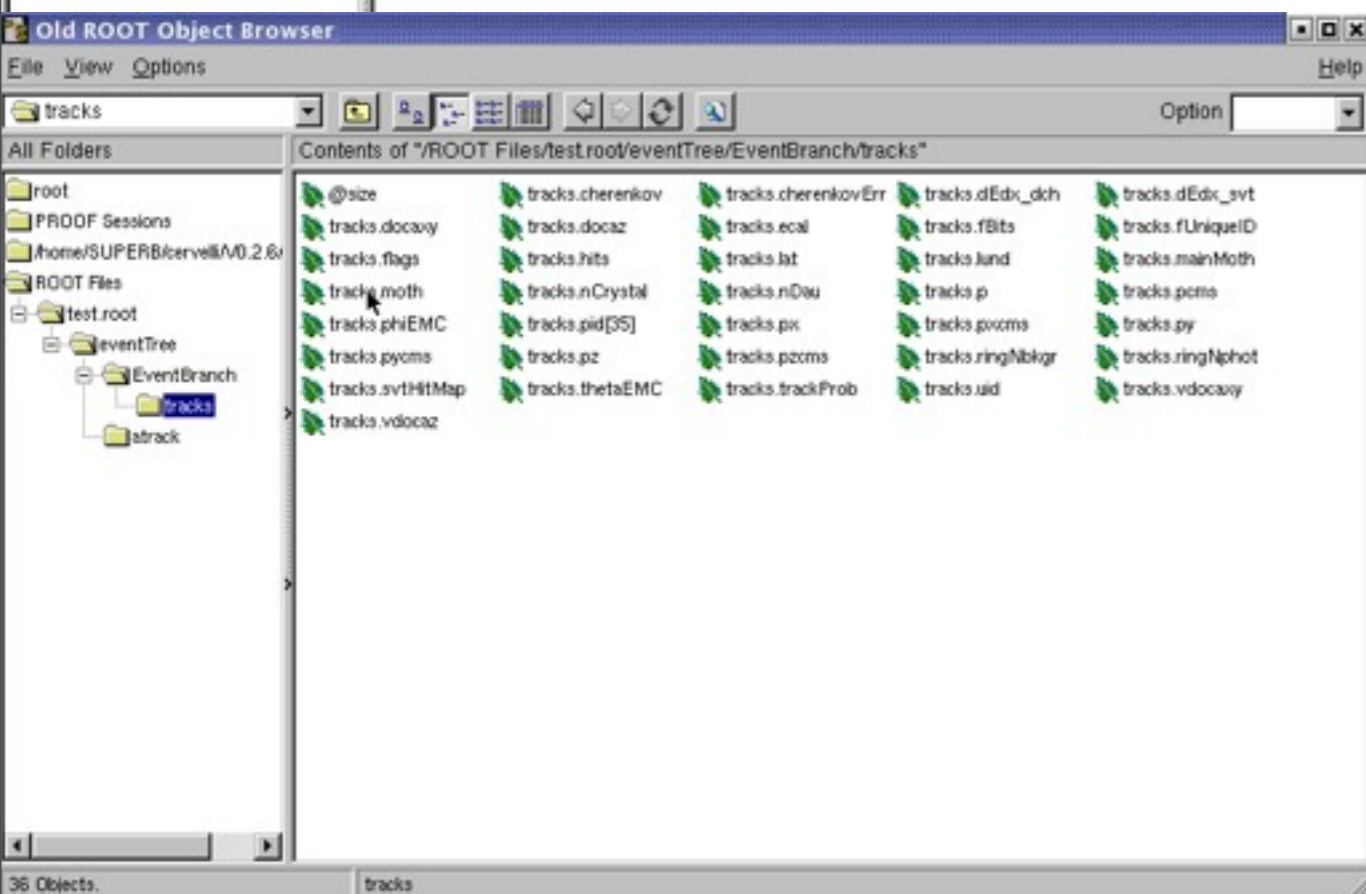
Invariant mass calculation for both hemispheres

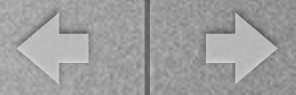


Tau Ntuple structure



Tracks and neutral branch are TClonesArray templates (GClonesArray) of the Track or neutral Class.





Tau Ntuple structure

- Ntuple structure is versatile, by acting on the Event, track, and neutral container classes new information could be easily stored from the analyst.
- Analyser is modular, each method is, in principle, independent, new methods could be added easily to improve the selection capabilities
- The package does not make differences in selection between 1-1 and 1-3 topology so it could be used for different channels.
- With minor improvements the package is designed to produce general purpose ntuples for tau studies.



Plans for the future

- Trigger performance is crucial for tau selection, in babar trigger and BGF reduced the backgrounds of a factor ~ 2 . F. Nguyen should come in to help in creating modules reproducing trigger selection.
- PID was present in the old code inherited from babar, however it has not yet been implemented in the package, will be introduced as soon as possible
- Some polishing of the code needs to be done.
- Documentation should be added to include a proper tutorial on running PacTauApp
- QA plots ideas needed, some ideas?



*Thanks for your
attention*