τ reconstruction in the Muon Collider project

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LIP - Laboratório de Instrumentação e Física Experimental de Partículas

- **Current state analysis**
- **Plan for the analysis**

Current state analysis

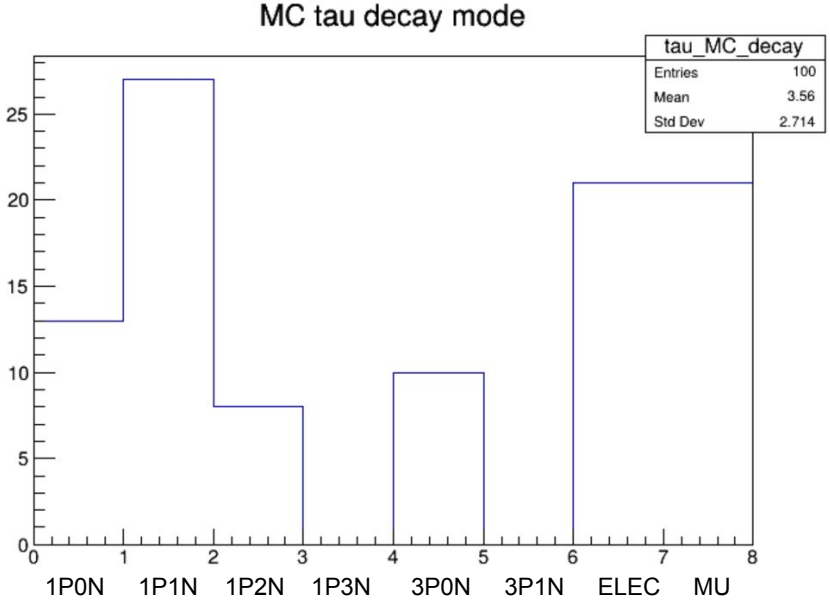
Successful run of Ethan's code:

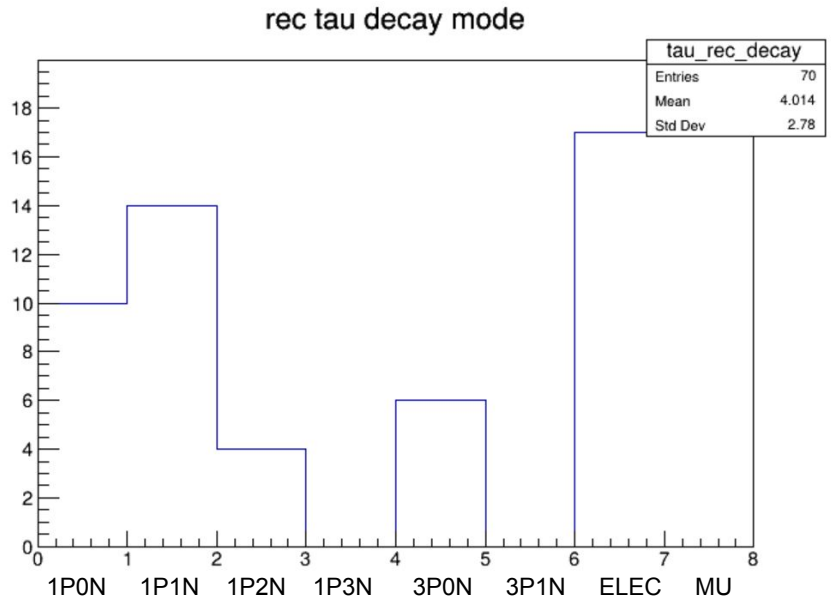
- Using singularity 2.9 version: apptainer run /cvmfs/unpacked.cern.ch/gitlab-registry.cern.ch/muon-collider/mucoll-deploy/mucoll:2.9-alma9
- The geometry of MAIA at 10 TeV
- Currently 100 τ events generated as a test:
  - $0 \leq \varphi \leq 2\pi$ rad
  - $10^\circ \leq \theta \leq 170^\circ$
  - $20 \leq pT \leq 320$ GeV/c

Current state analysis

τ decay Mode comparison between MC & Reco:

- ~ Efficiency of 70% in total
- Concordance with τ normal decay branching ratio for MC



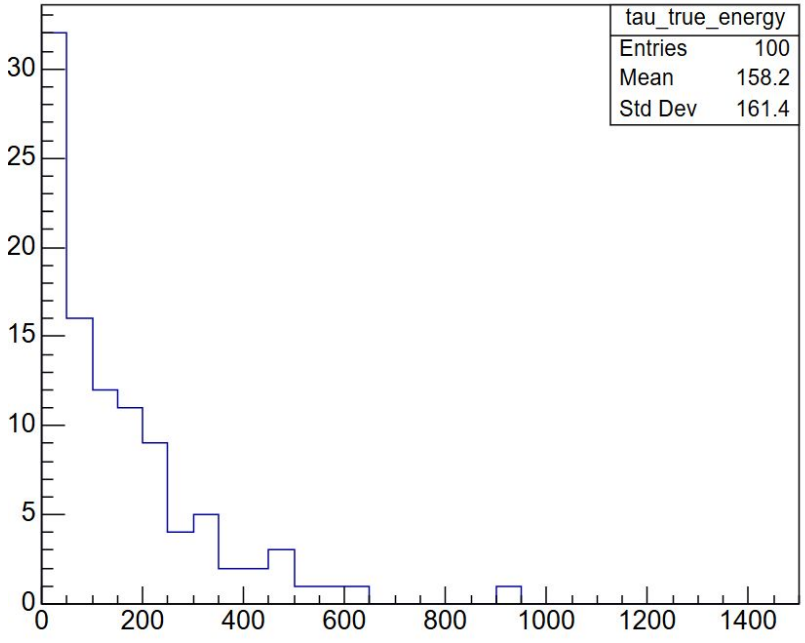


Current state analysis

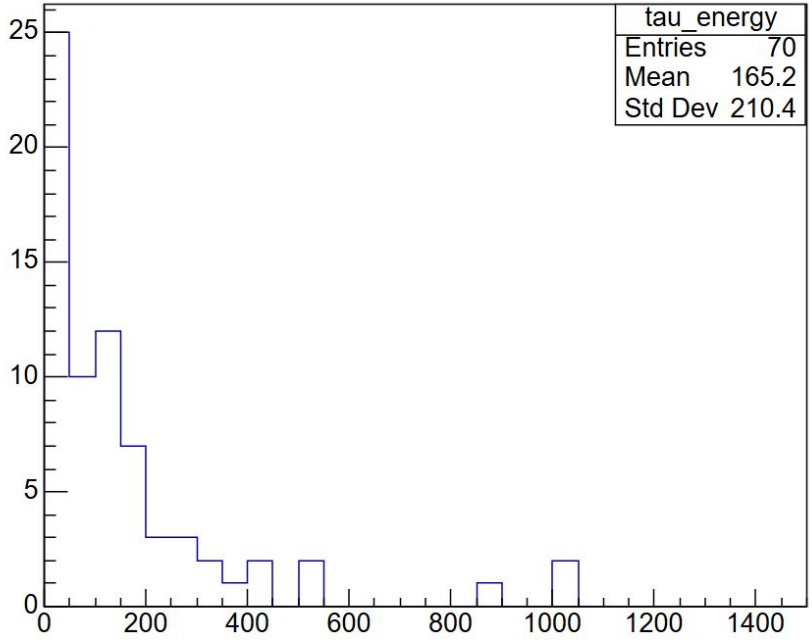
τ energy comparison between MC & Reco:

- ~ Efficiency of 70% in total

True Tau Visible Energy



Reconstructed Tau Energy



Plan for the analysis

τ energy correction:

- Fit on the distribution of MC τ energy in function of Rec τ energy done separately for different reconstructed τ decay modes

Physics Channel:

- Generate and reconstruct $Z \rightarrow \tau\tau$ and $H \rightarrow \tau\tau$
- Correct τ energy
- Compare invariant mass distributions

Jets study:

- For $Z \rightarrow jj$ and $H \rightarrow bb$
- See how many jets are seen as τ

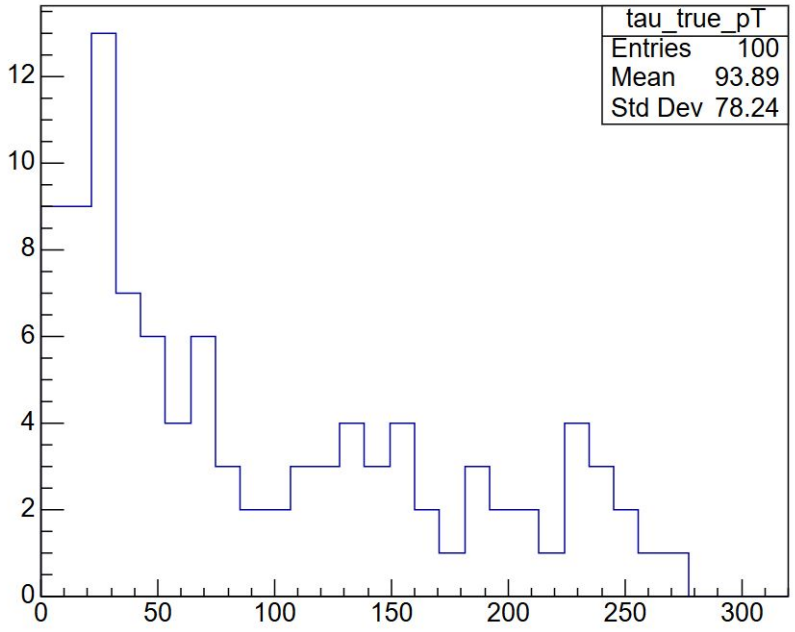
Thank you for your attention

Current state analysis

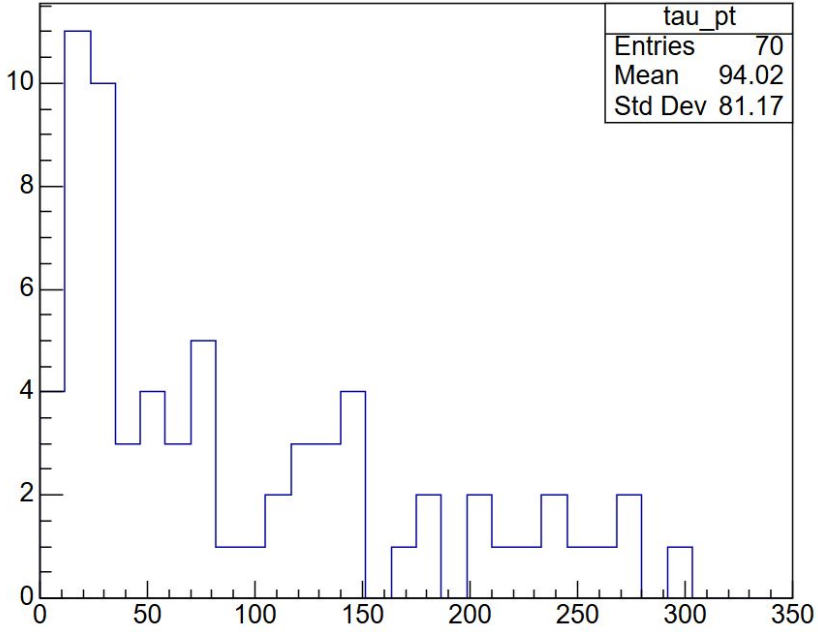
Tau pt comparison between MC & Reco:

- ~ Efficiency of 70% in total

True Tau Visible Pt



Reconstructed Tau Pt

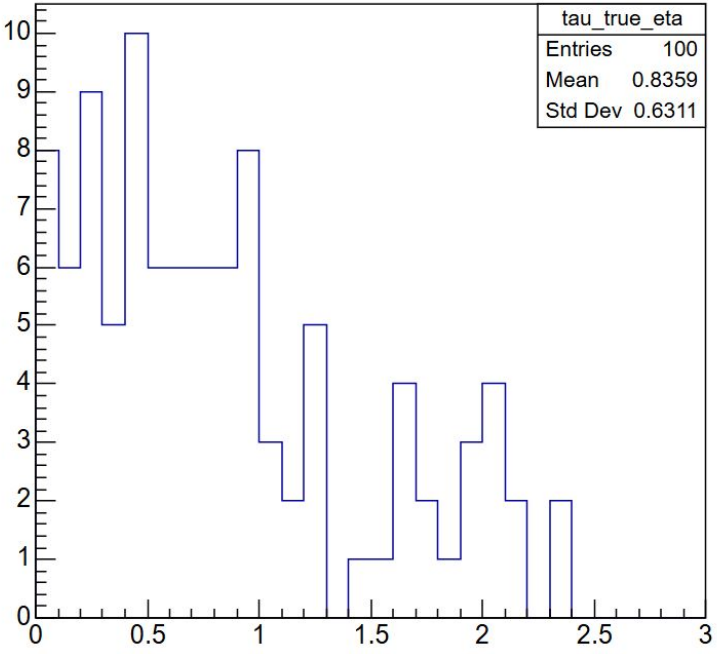


Current state analysis

Tau eta comparison between MC & Reco:

- ~ Efficiency of 70% in total

True Tau Visible Eta



Reconstructed Tau Eta