τ reconstruction at the Muon Collider

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July 30th, 2025

LIP - Laboratório de Instrumentação e Física Experimental de Partículas

Introduction: Plan for the analysis

Version 2.9 Singularity MAIA Geometry 10 TeV

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 ⇐ **(Current Phase)**

Jets study:

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

Samples

What I will show:

9900 H→ $\tau\tau$ & **1200 Z→ $\tau\tau$** events generated with MadGraph 10 TeV

I can reach **40000 H→ $\tau\tau$** & **40000 Z→ $\tau\tau$** for the poster

Limitations:

- the size of **Z→ $\tau\tau$** outputs that can reach up to 2,6 GB
- Time to process invariant mass plots 1200 **Z→ $\tau\tau$** (~1 hour)

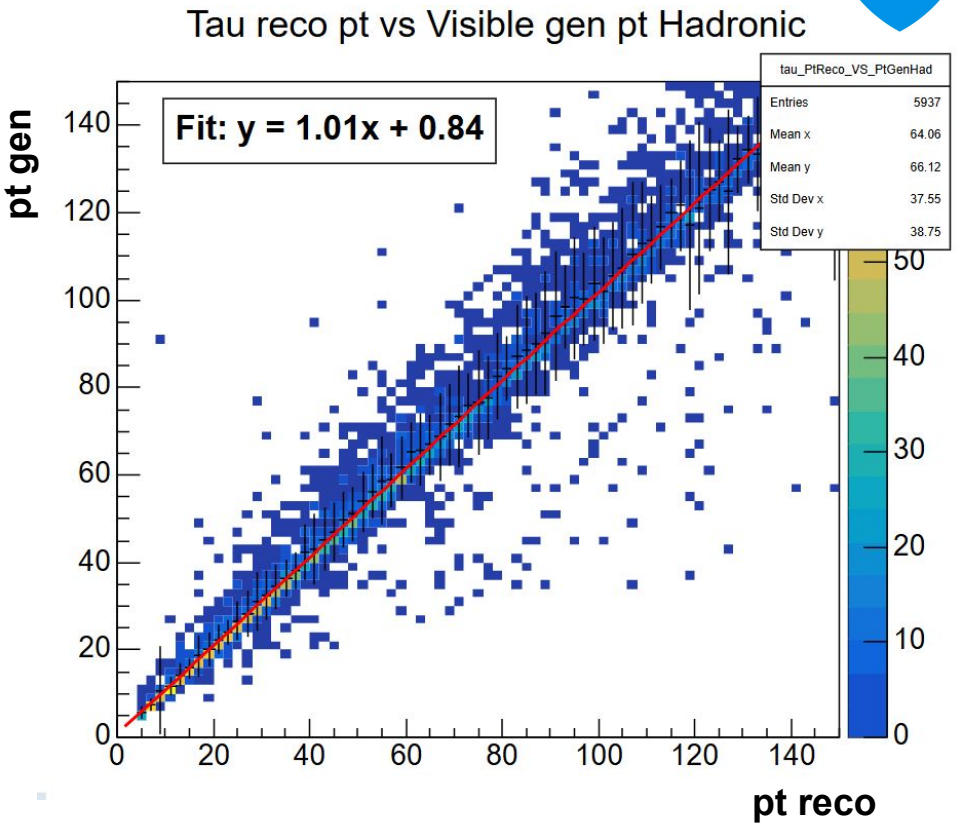
τ energy correction from Tauguns

I will apply energy correction:

Ecorr = 1.01*E_raw + 0.84

On Hadronic decay mode including 1 prong and 3 prong

The next plot I will show are not corrected yet

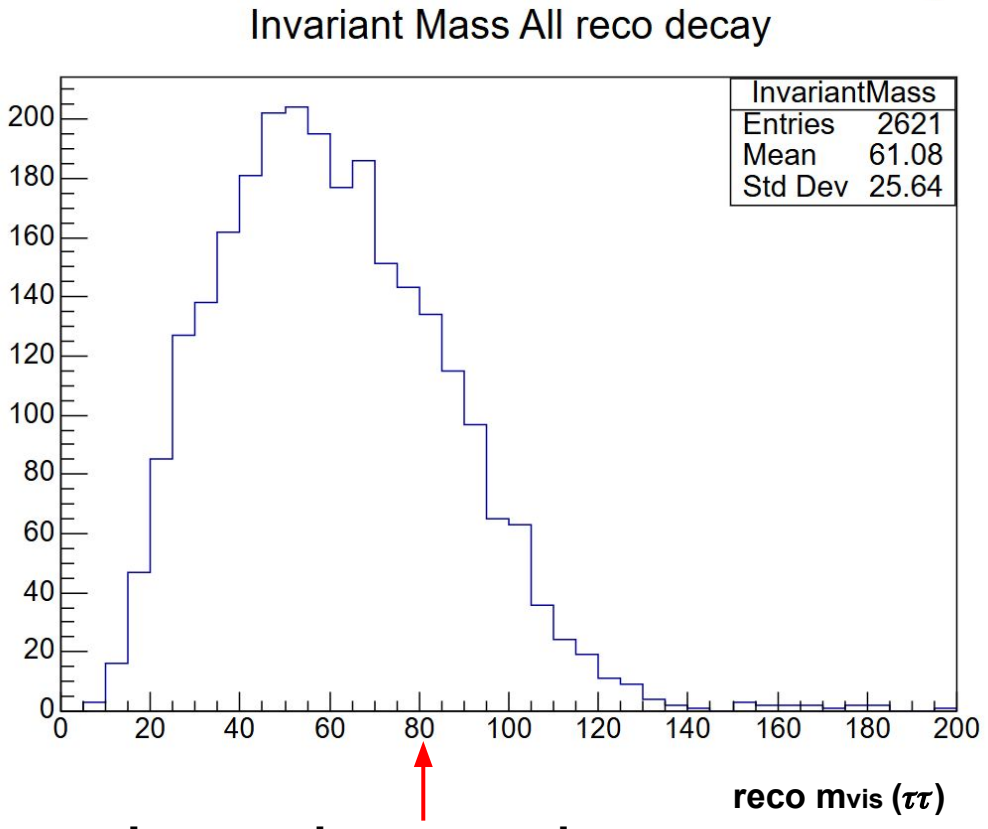


Reconstructed Invariant mass (all decay)

$$H \rightarrow \tau\tau$$

Compared to Lorenzo's calculus at 3 TeV:

- Lower invariant mass
- Width 1,6 times larger
- Presence of two pics



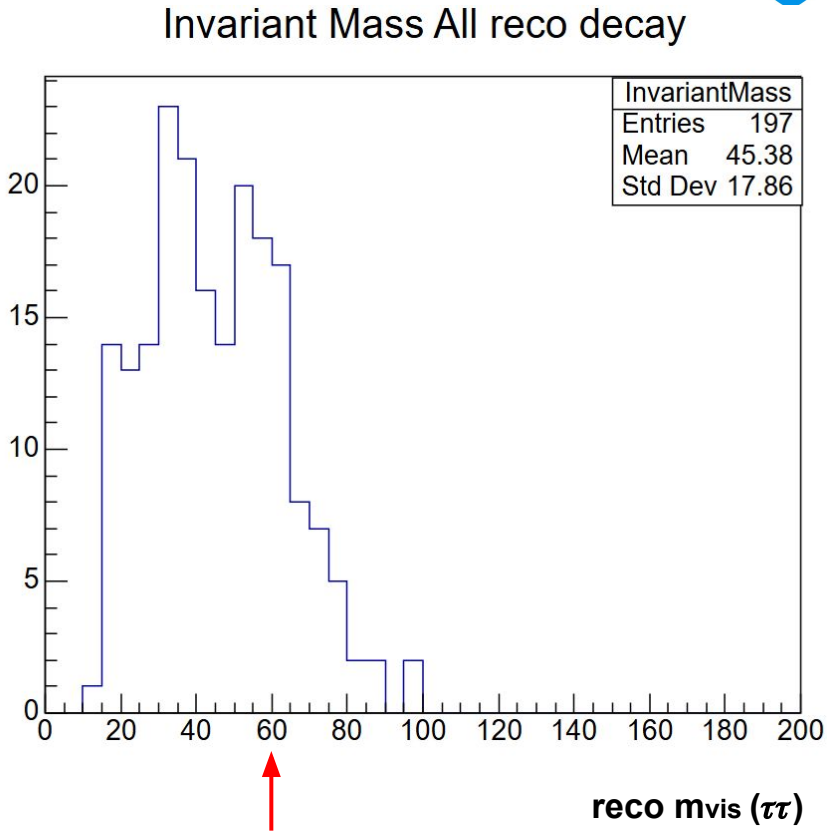
Reconstructed Invariant mass (all decay)

$$Z \rightarrow \tau\tau$$

Compared to Lorenzo's calculus at 3 TeV:

- Lower invariant mass
- Presence of two pics

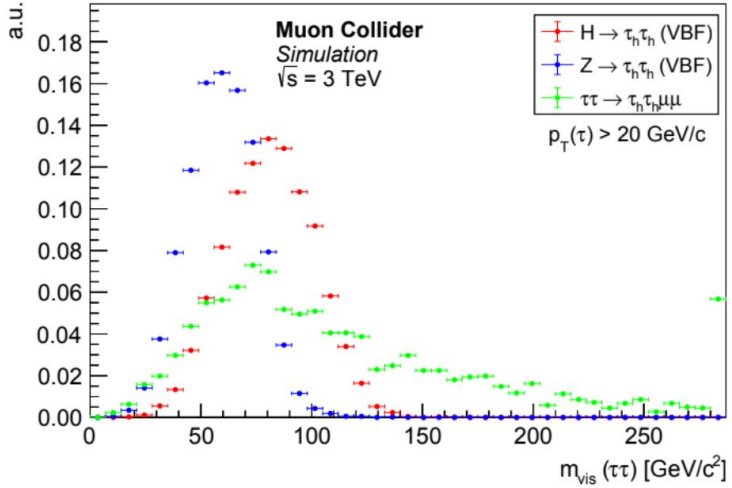
Really low statistics



Summary

I can reach **40000 H→ $\tau\tau$** & **40000 Z→ $\tau\tau$** for the poster according to **several limitations**

The goal is to obtain a plot superposing H and Z invariant mass pic for hadronic decay modes such as **Lorenzo's thesis plot** below

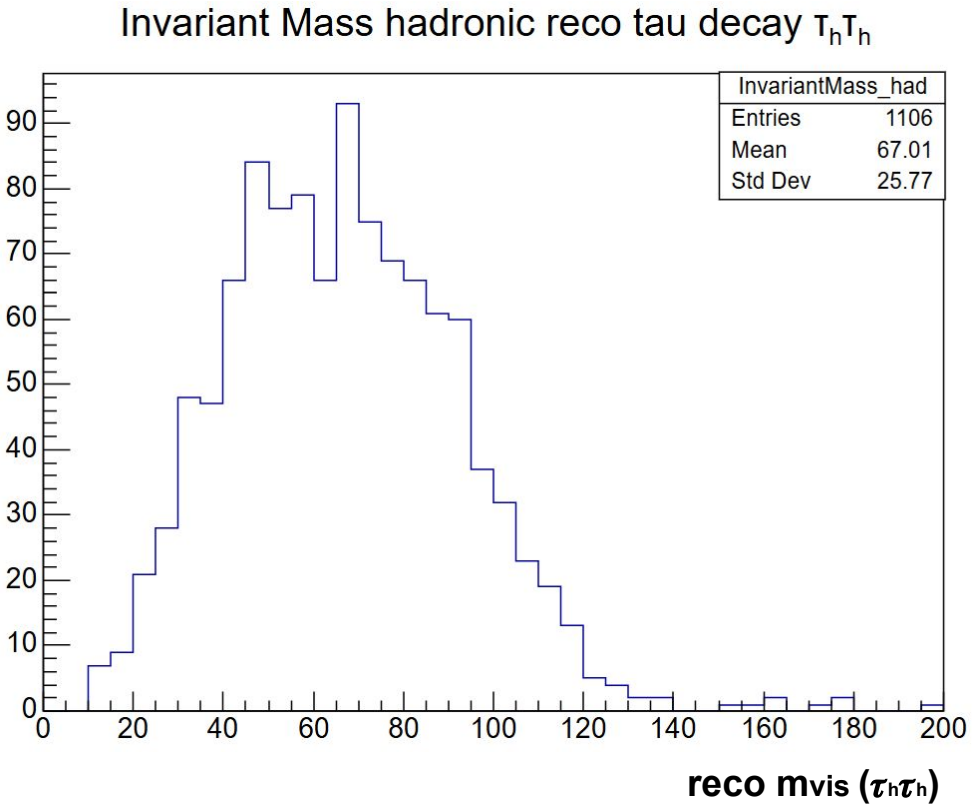


Thank you for your attention

$$H \rightarrow \tau\tau$$

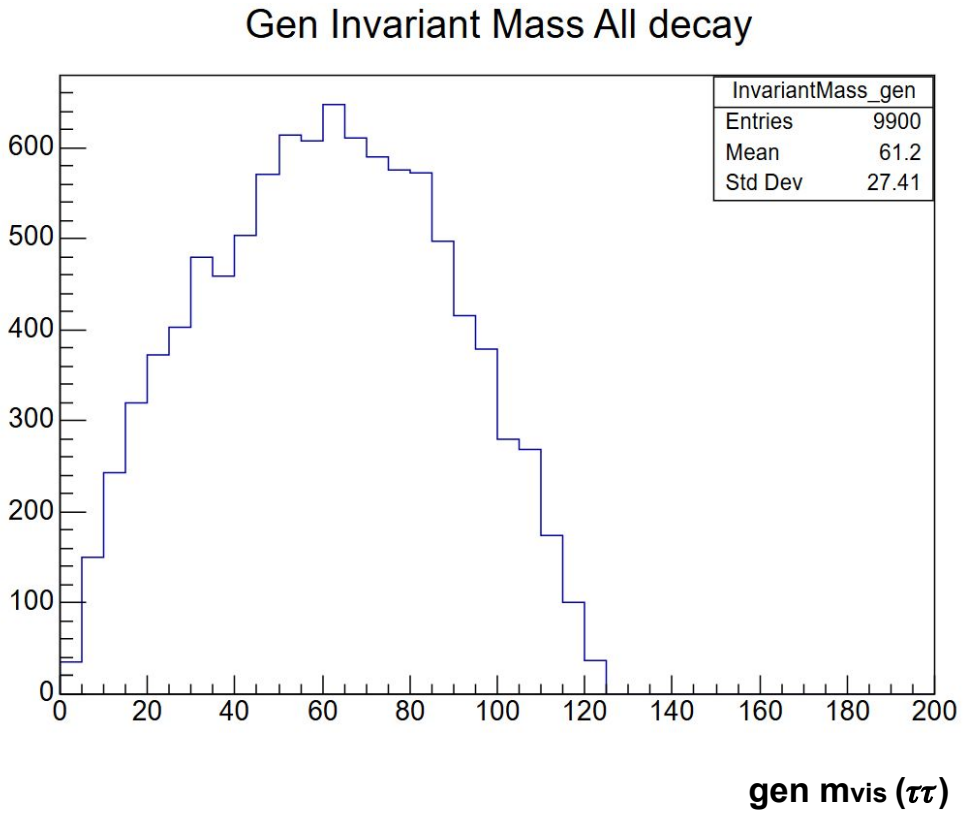
Reconstructed Invariant mass (hadronic)

$H \rightarrow \tau\tau$



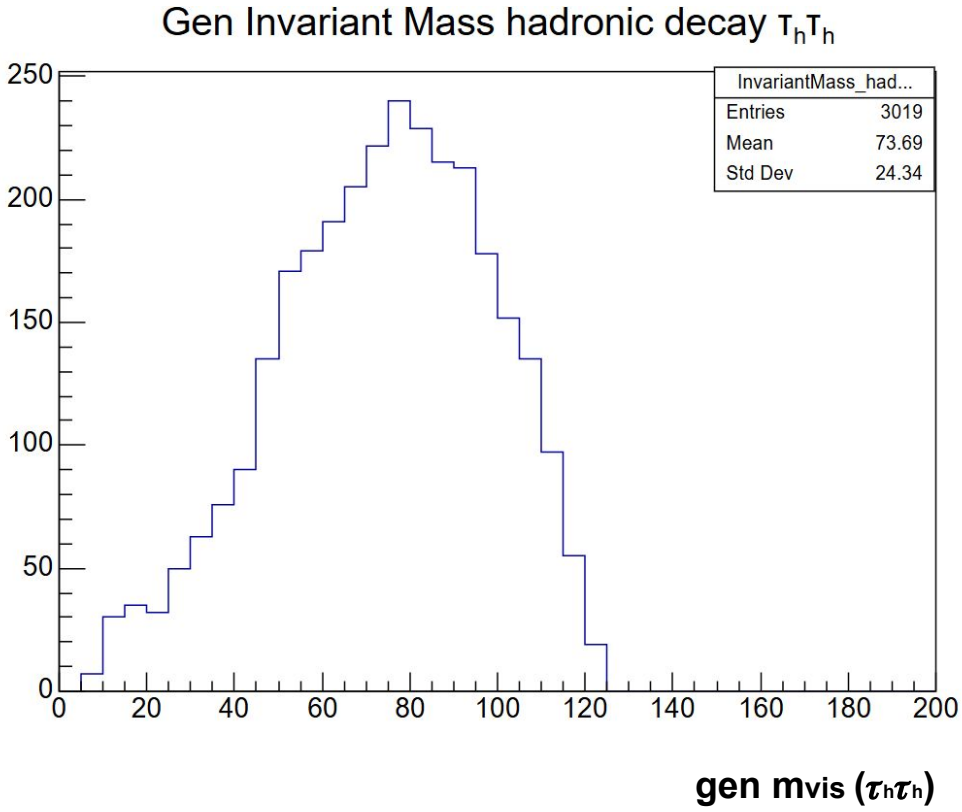
Generated Invariant mass (All decay)

$\mathbf{H \rightarrow \tau\tau}$



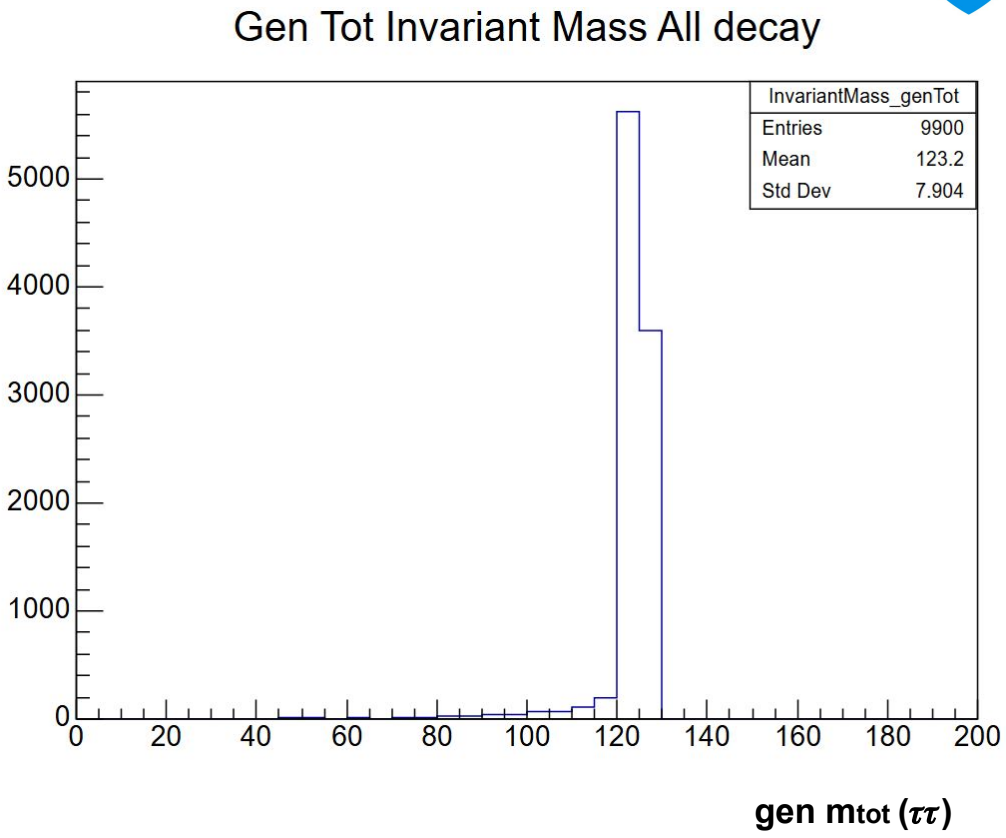
Generated Invariant mass (hadronic)

$\mathbf{H \rightarrow \tau\tau}$



Generated Total Invariant mass (All decay)

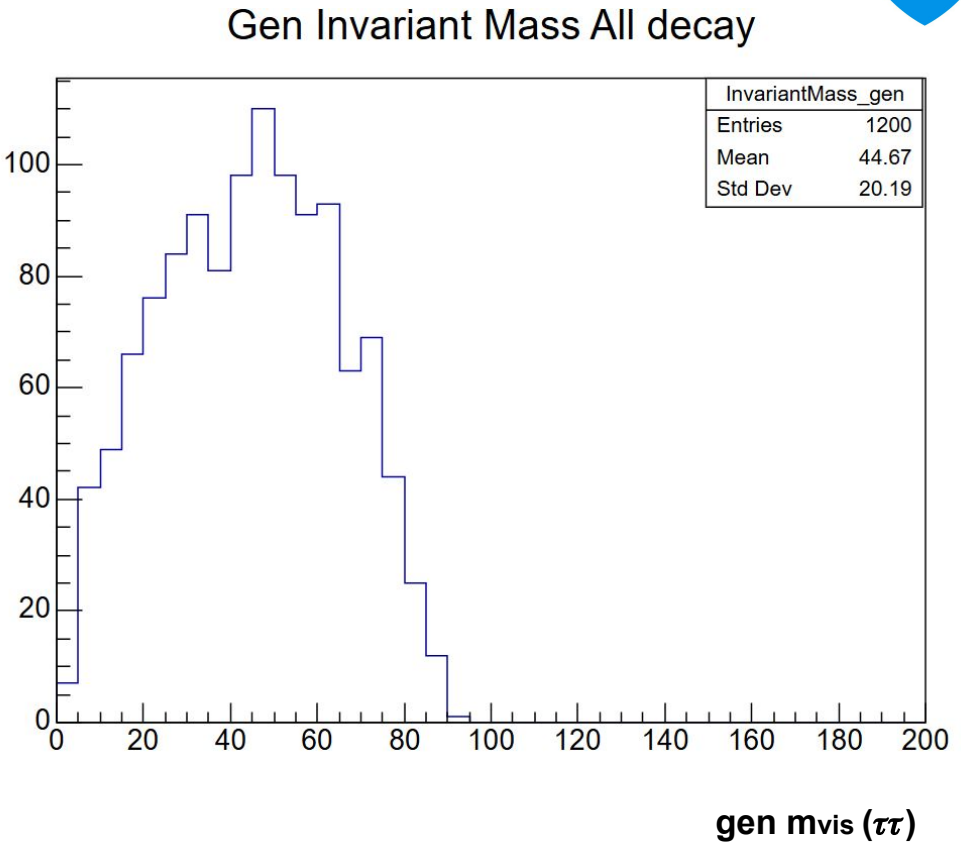
$H \rightarrow \tau\tau$



$$Z \rightarrow \tau\tau$$

Generated Invariant mass (All decay)

$Z \rightarrow \tau\tau$



Generated Total Invariant mass (All decay)

$Z \rightarrow \tau\tau$