Updates: March 27

- Jet energy correction applied to reco jets with BIB.
- Higgs reconstruction and kinematics.
- Invariant mass plot and comparison with IMCC paper.

Jet Energy Correction (JEC)

Correction scale factors derived in Energy and Eta bins (total of 19 $\times$ 10).

E bins: [10, 20, 30,..., 180, 190, 200] $\rightarrow$ 19 regions

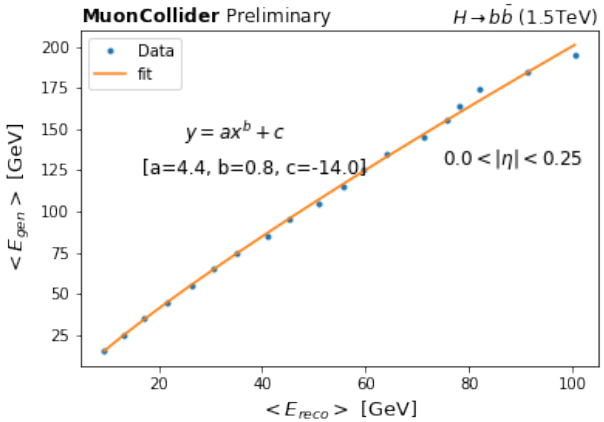
$|\eta|$ bins: [0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.5] $\rightarrow$ 10 regions

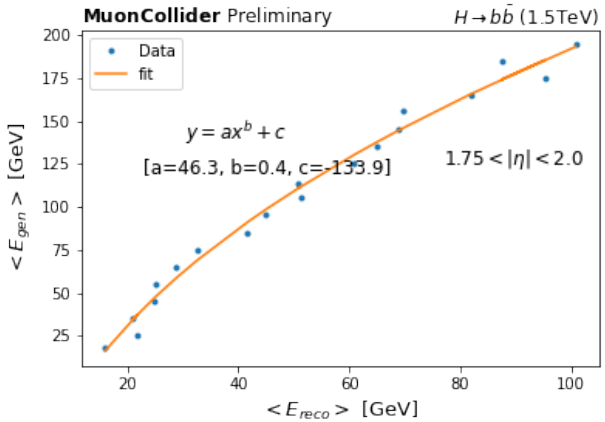
Transfer function found using curve fitting: $y = ax^b + c$,

where $x =< E_{gen} >$ and $y =< E_{reco} >$ in 10 Eta regions.

Fitted curve $f(x, \eta)$: y vs x data points $\rightarrow$ 10 functions.

Examples:





For reco jets (**without BIB**): $sf = \dfrac{f(E_{reco}, \eta_{reco})}{E_{reco}}$

This scale factor applied to all components of the jet 4-momentum

$P^{\mu}(corrected\_reco\_jet) = sf \,.\, P^{\mu}(reco\_jet)$

Jet Energy Correction (JEC) for jets with BIB overlaid

Match reco jets with BIB to reco jets without BIB in min dR of 0.25

Use the same transfer functions as before: $f(x, \eta)$

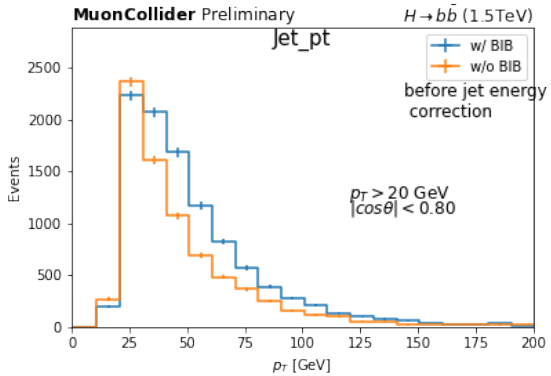
For reco jets (**with BIB**): $sf = \frac{f(E_{recoBIB}, \eta_{reco})}{E_{recoBIB}}$

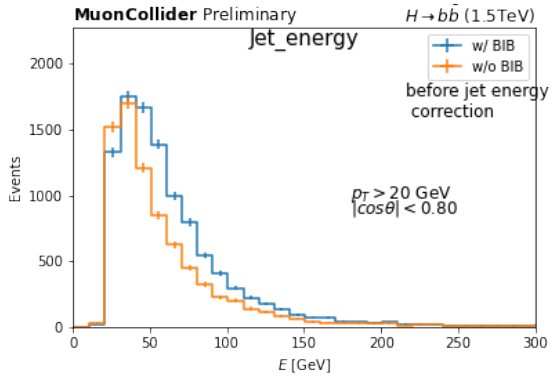
This scale factor applied to all components of the jet 4-momentum

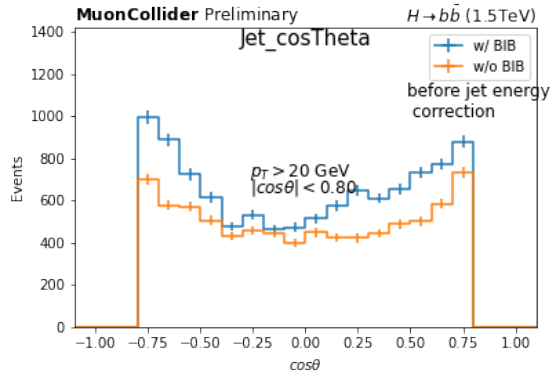
$P^{\mu}(corrected\_reco\_BIBjet) = sf \,.\, P^{\mu}(reco\_BIBjet)$

Jets kinematics

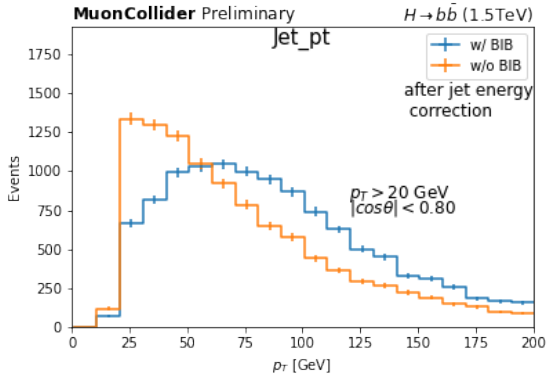
Before JEC:

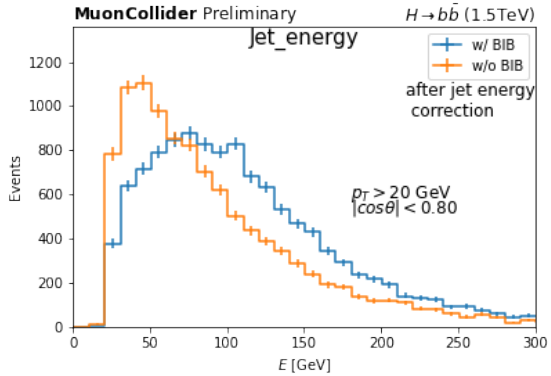


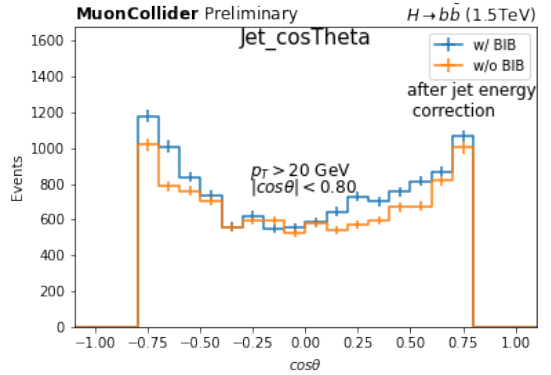




After JEC:

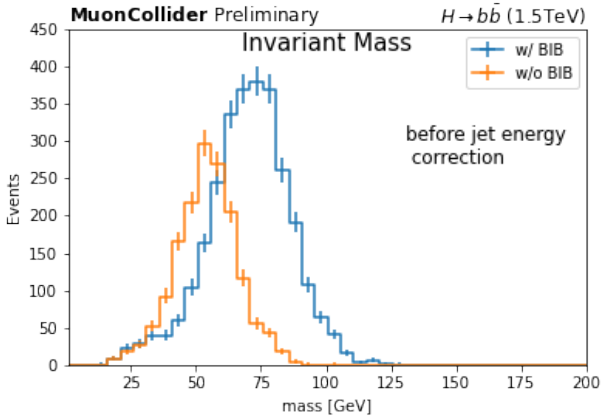


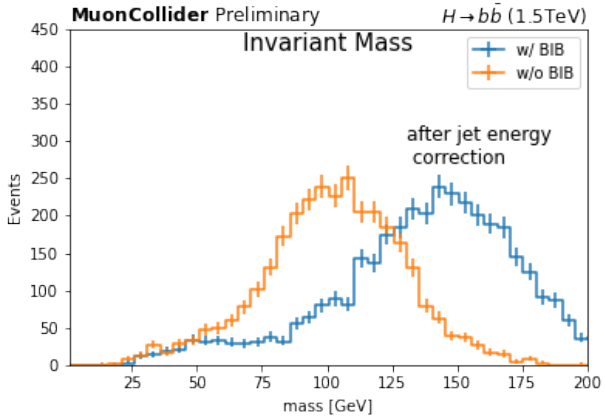




Invariant Mass before and after JEC

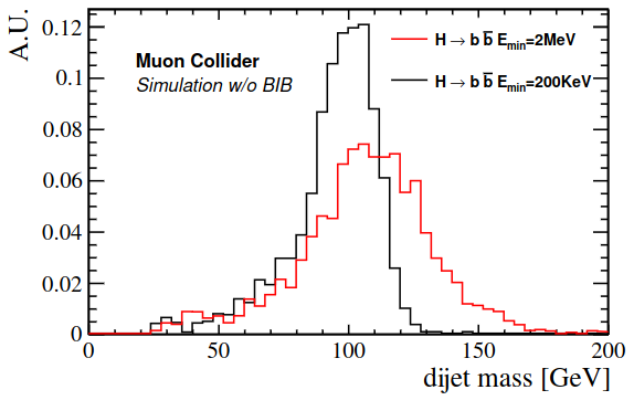
My analysis: with 2MeV calorimeter hit energy threshold





From IMCC paper: Simulated Detector Performance at the Muon Collider

arXiv:2203.07964 [hep-ex]



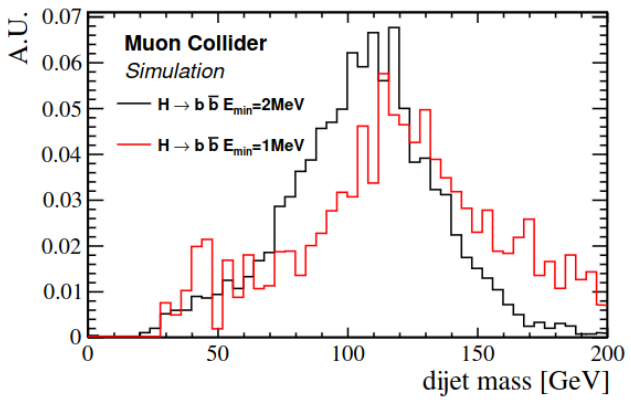
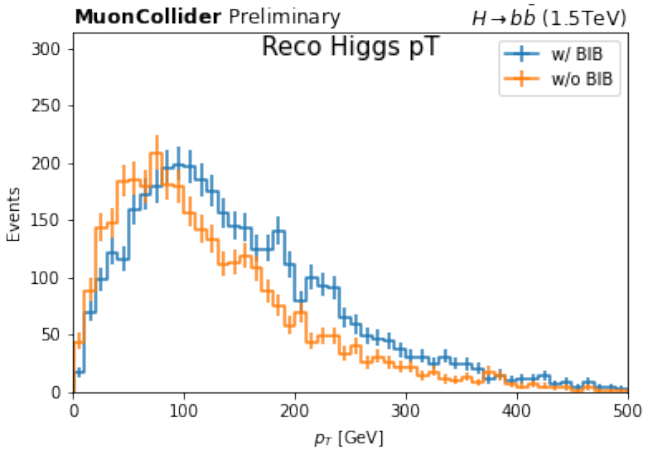
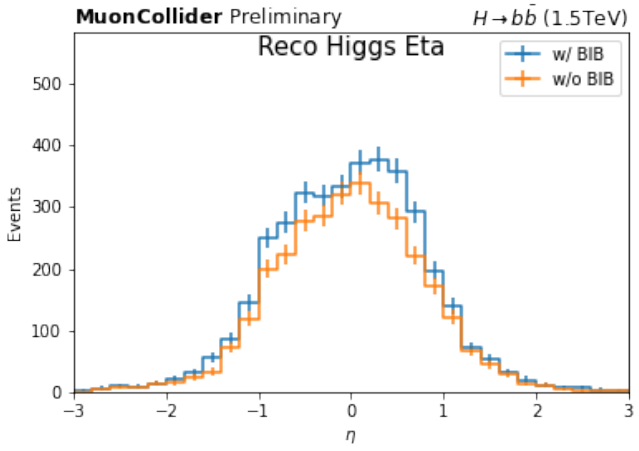
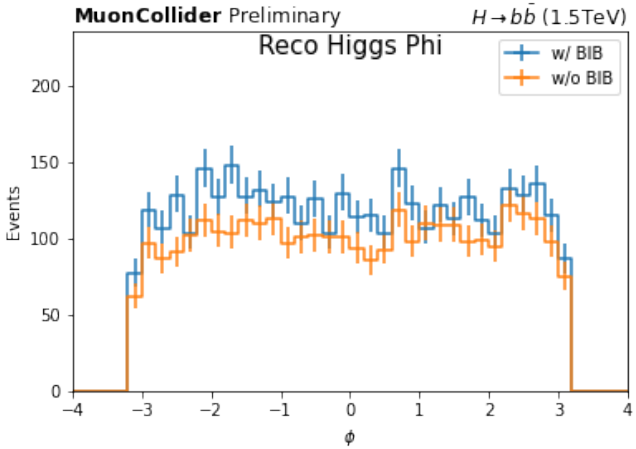


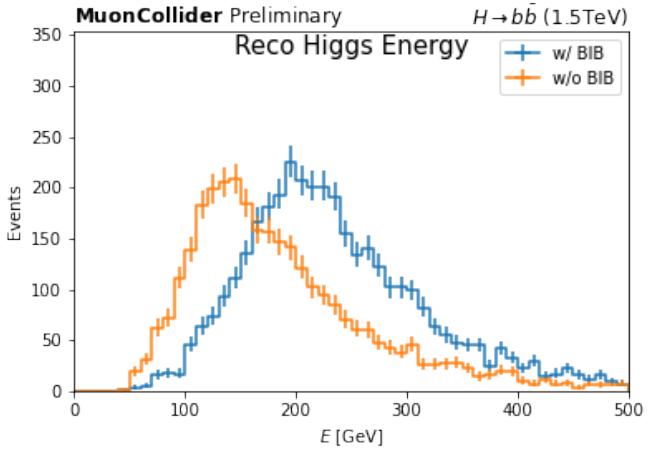
Fig. 29: Left: $H \to b\bar{b}$ dijet invariant mass, reconstructed without the presence of the BIB and with 2 MeV and 200 KeV calorimeter hit energy thresholds. Right: $H \to b\bar{b}$ dijet invariant mass reconstructed with 2 MeV and 1 MeV thresholds. Distributions are normalized to the same area.

Reconstructed Higgs kinematics with and without BIB









Next steps

- Summarize progress so far and prepare slides for prelim prep.