Muon Collider Full Simulation Studies

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April 15, 2022

Updates

- BIB substraction in ECal.
- Trying out regional tracking to reduce fake jets.

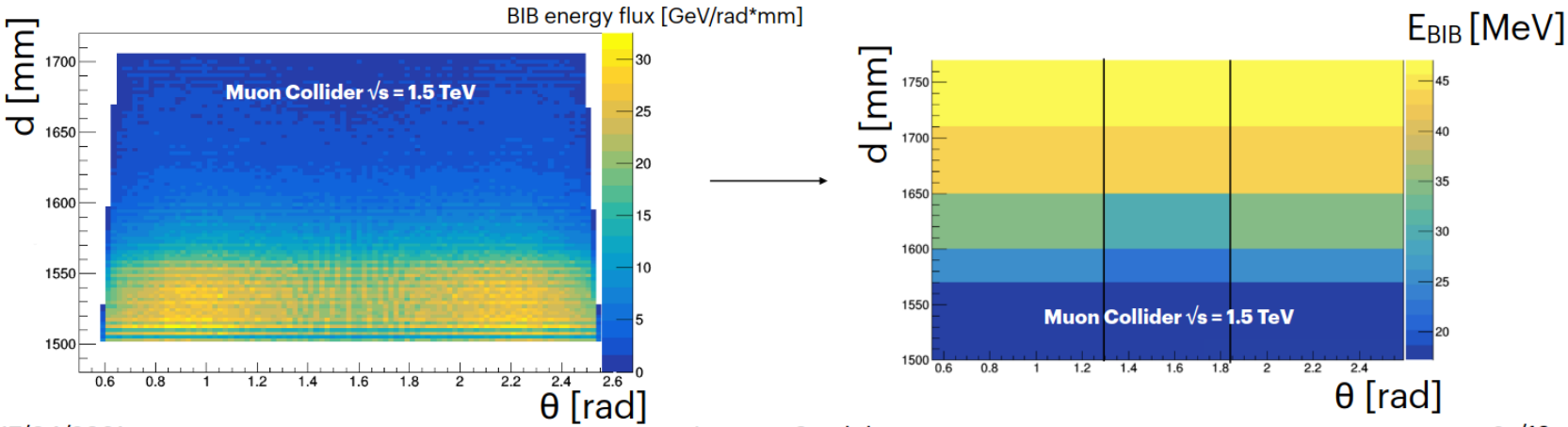
Studying $\mu^+\mu^- \rightarrow \nu\bar{\nu}H, H \rightarrow b\bar{b}$ process at 1.5 TeV with BIB overlaid at 1.5 TeV.

BIB substraction in ECal

Using DDCaloDigi_BIB processor instead of DDCaloDigi

BIB subtraction in ECAL for jet reconstruction

- ECAL is divided in **(θ,d) regions**: **θ** angle wrt z-axis, **d** distance wrt beam axis.
- In each region the average BIB hit energy E_{BIB} and standard deviation σ_{BIB} is determined.
- In signal+BIB reconstruction an ECAL hit is accepted if $E_{HIT} > E_{BIB} + 2\sigma_{BIB}$.
- The energy of the accepted hit is corrected: $E_{HIT} \rightarrow E_{HIT} - E_{BIB}$.



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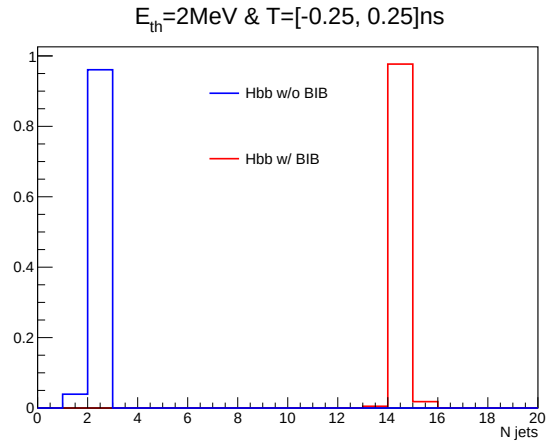
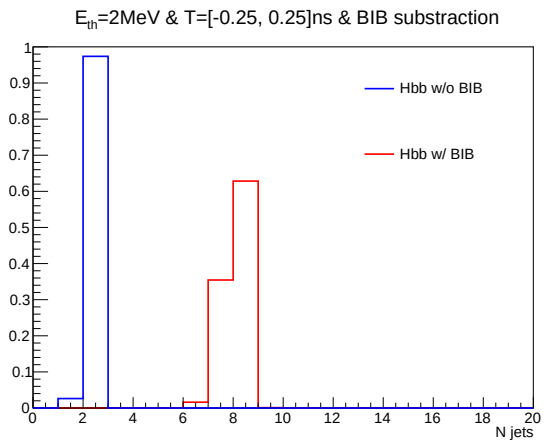
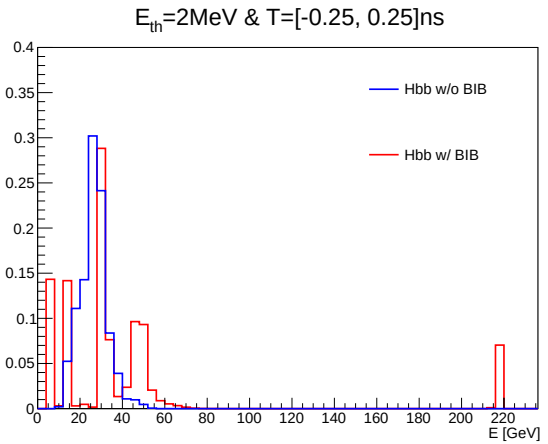
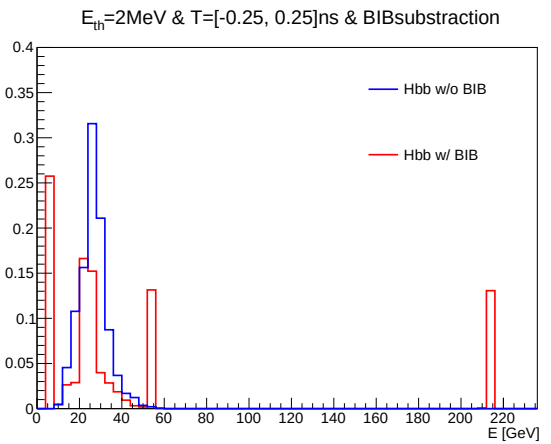
- The E_{BIB} and σ_{BIB} are provided in DDCaloDigi_BIB.cc file

BIB substraction in ECal





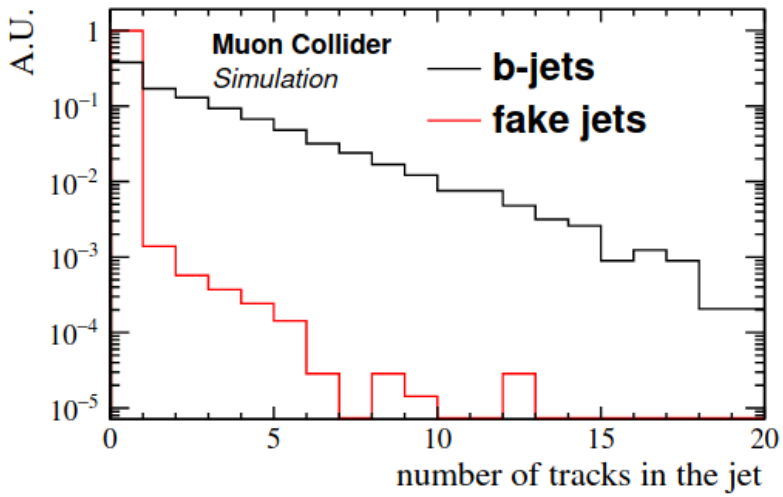




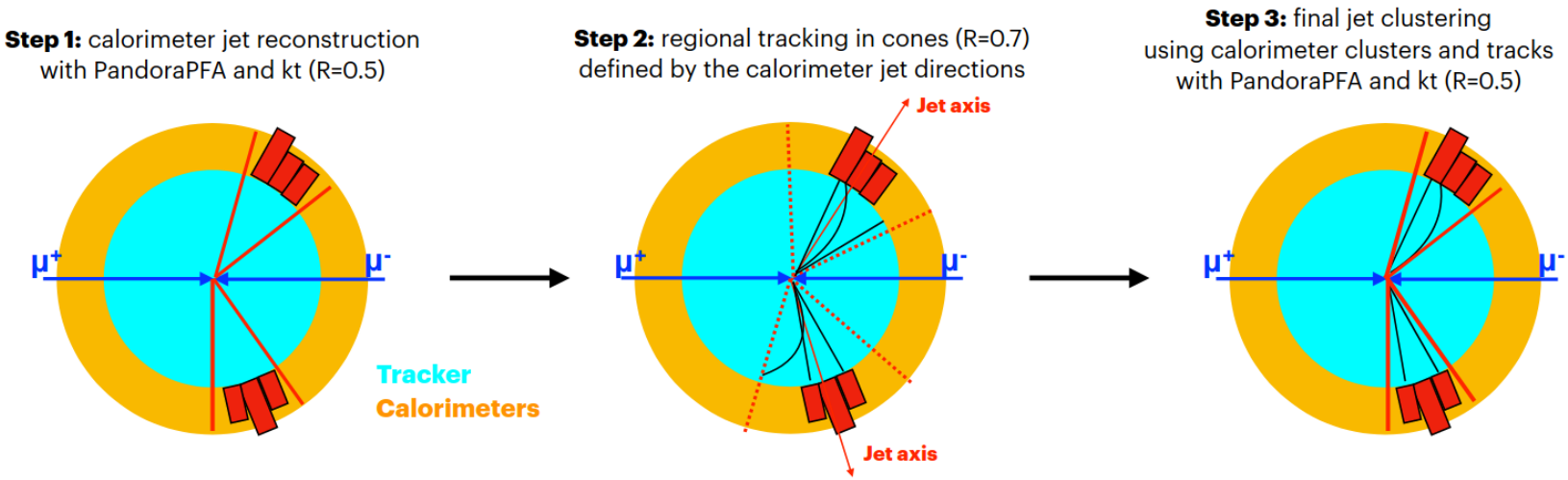
Fake jets reduction but reconstructed b-jets also have lower energy.
Need to explore further jet cleaning.

Regional Tracking

IMCC report suggests using #tracks to reduce fake jets.
Want to explore this feature.



Regional Tracking



Number of tracks with BIB fraction after [step1, step2, step3] for various reconstructed 'cones'

10% BIB	50% BIB	100% BIB
[10,10,10]	[10,10,10];[10,263,263];[263,450,450]	[10,10,10] [10,10,10] [10,3543,3543];[3543,6771,6771]...
[9,9,9]	[9,9,9];[9,215,215];[215,413,413]	...

Need to check further..

Next step:BIB mitigation at Calo level

- Is run time with regional tracking reasonable?
If not, develop BIB mitigation at Calo level.

Use jet particle info (jet substructure) and energy distribution within jet particles to reduce fake jets.