Comparison of Powheg Box and Pythia MC's using ZZ-> eeee+mmmm Channels

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Selection Rules

Cuts:

M(l) > 5GeV and |eta(l)| < 2.5

M(ll) > 10GeV

Z veto: 66GeV < M(ll) < 116GeV

Plots are scaled by a factor of 10000/nEvts for comparison between PowHeg Box and Pythia MC's

nEvts = total no. of events for successfully finding two di-lepton candidates

Normalization

Scenario 1:

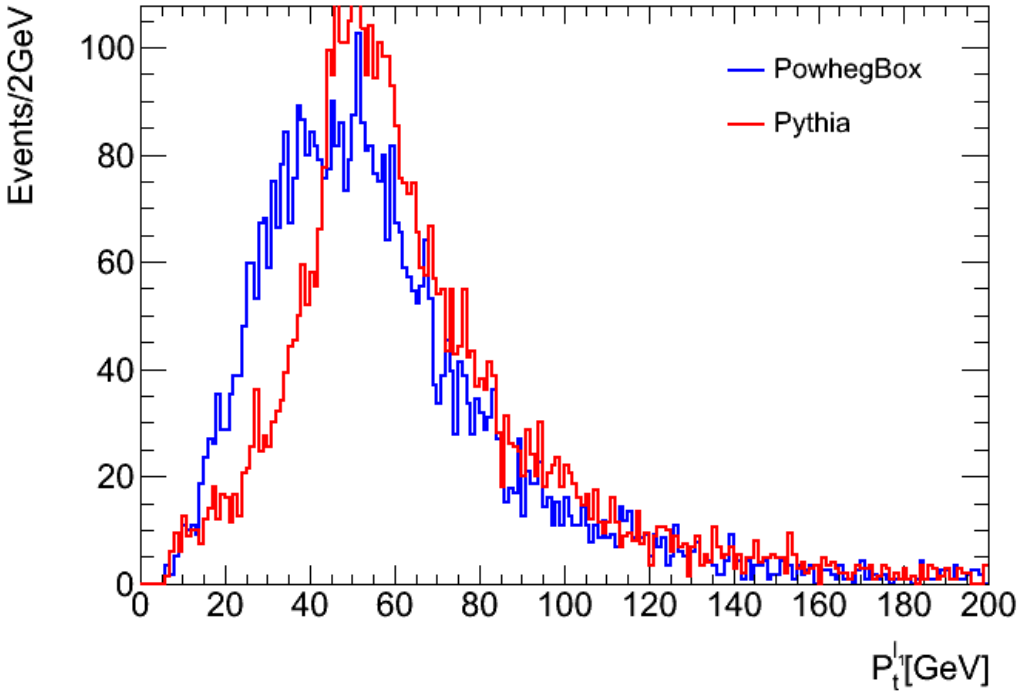
- We calculate the total no. of events for successfully finding two di-lepton candidates for Powheg Box and Pythia separately where there is no restriction on M(ll).

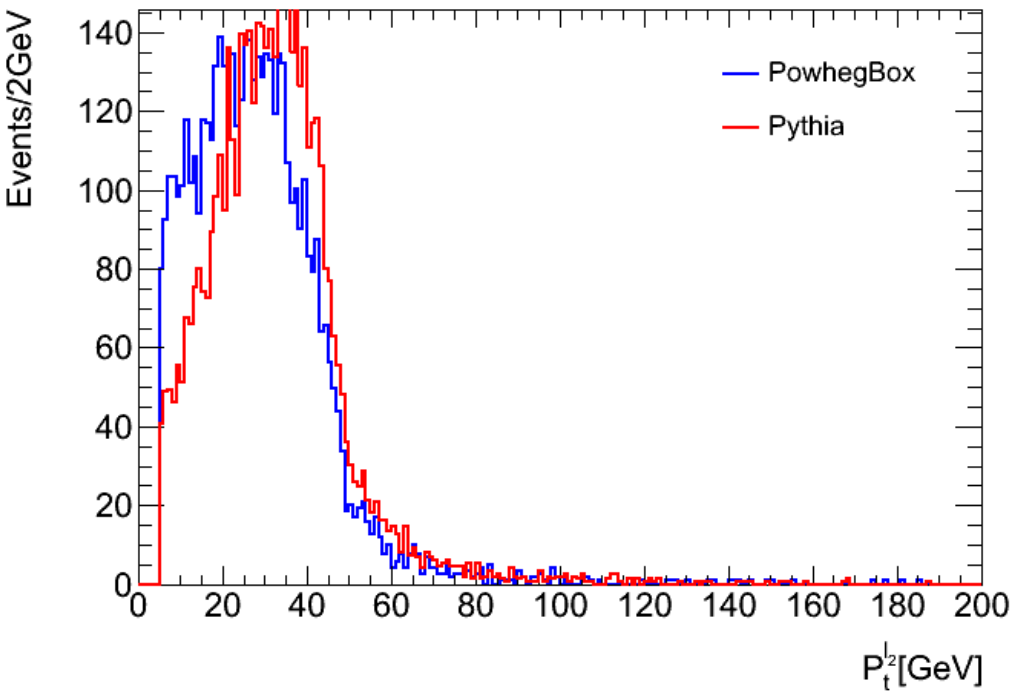
Scenario 2:

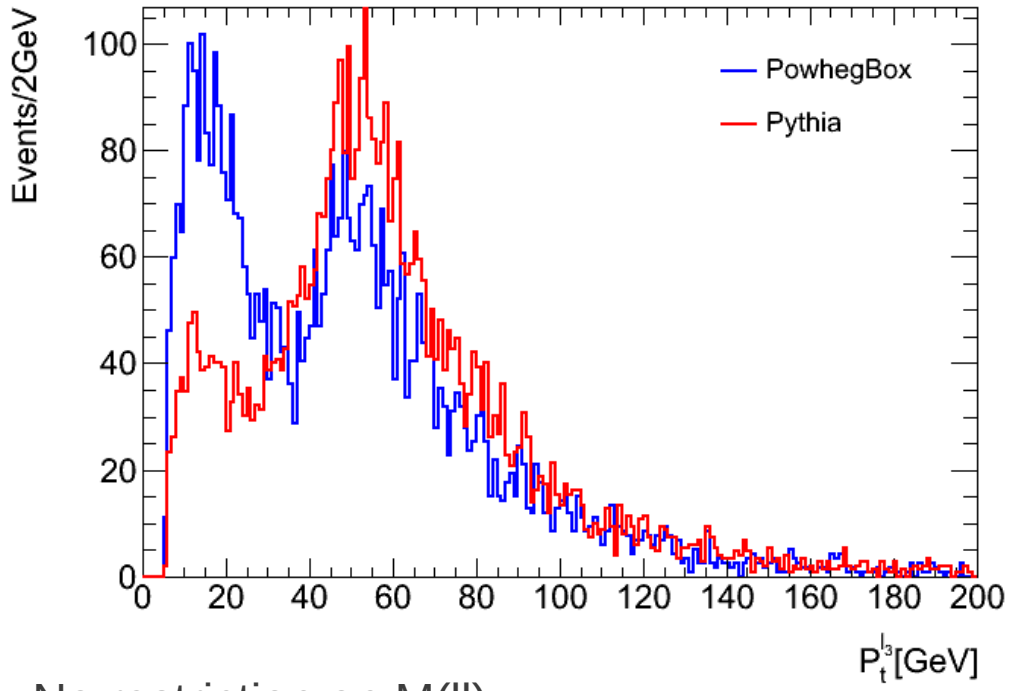
- We calculate the total no. of events for successfully finding two di-lepton candidates for Powheg Box and Pythia separately where M(ll) has to be between 66GeV and 116GeV.

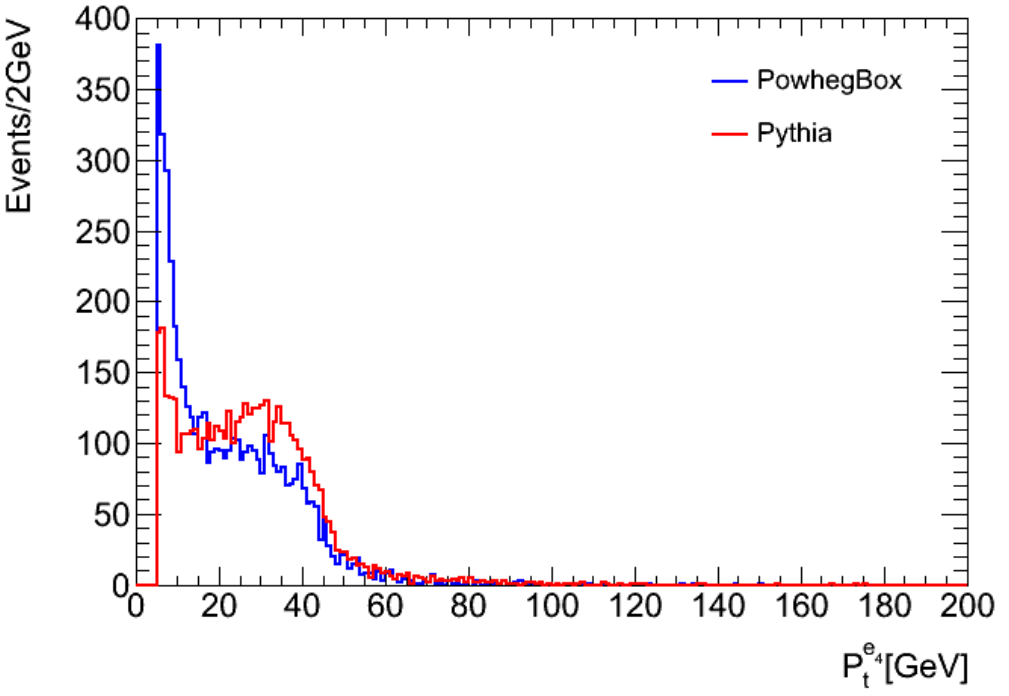
Scenario 1: Normalized using nEvts w/o Z veto

eeee channel: lepton Pt distribution



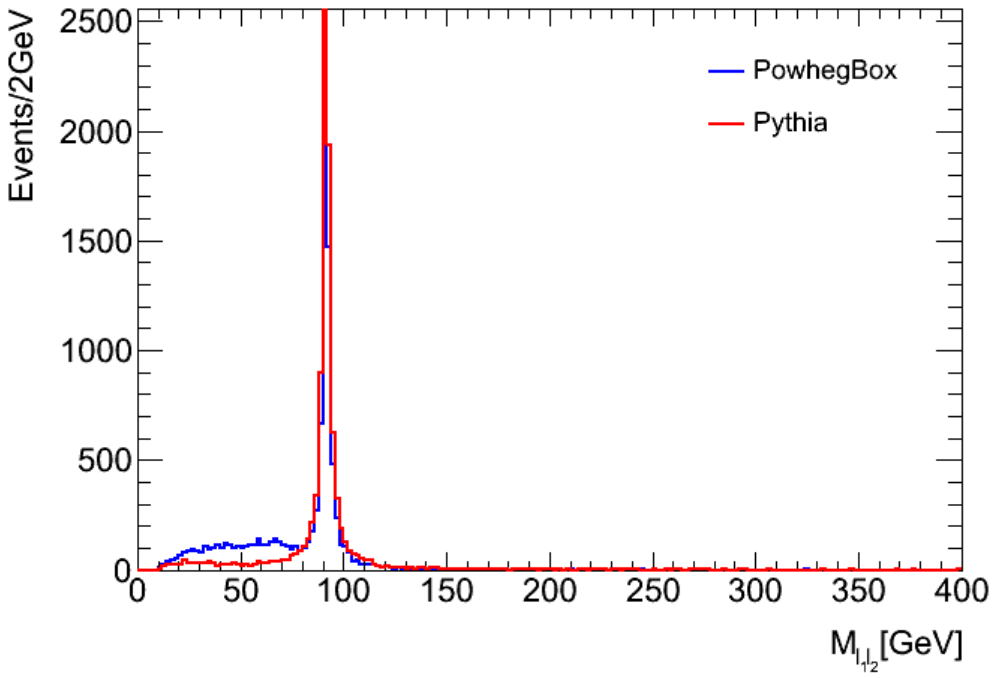


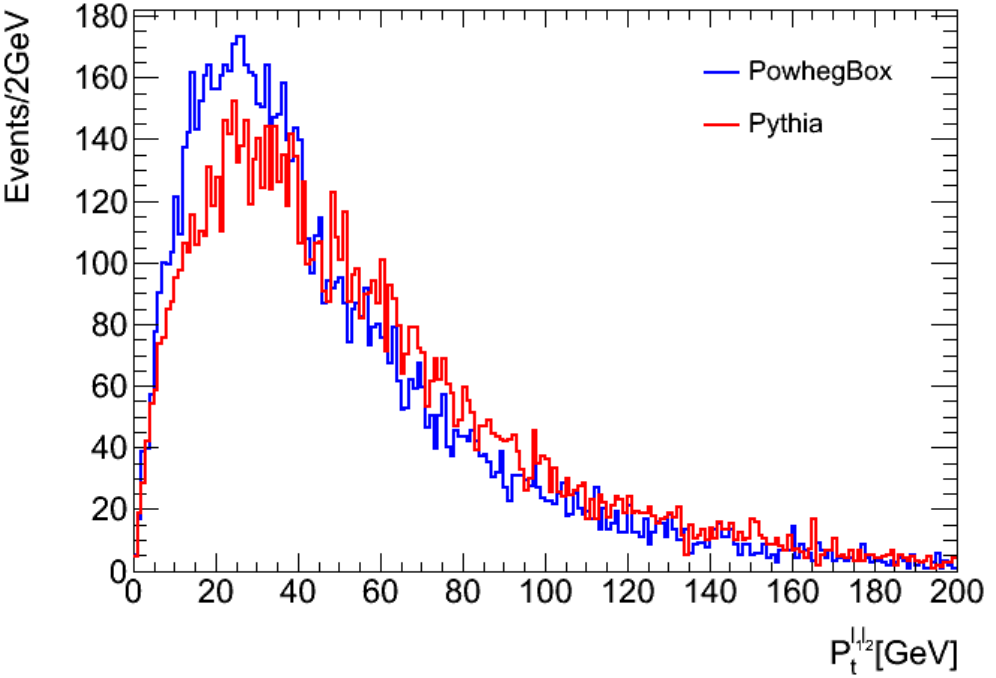


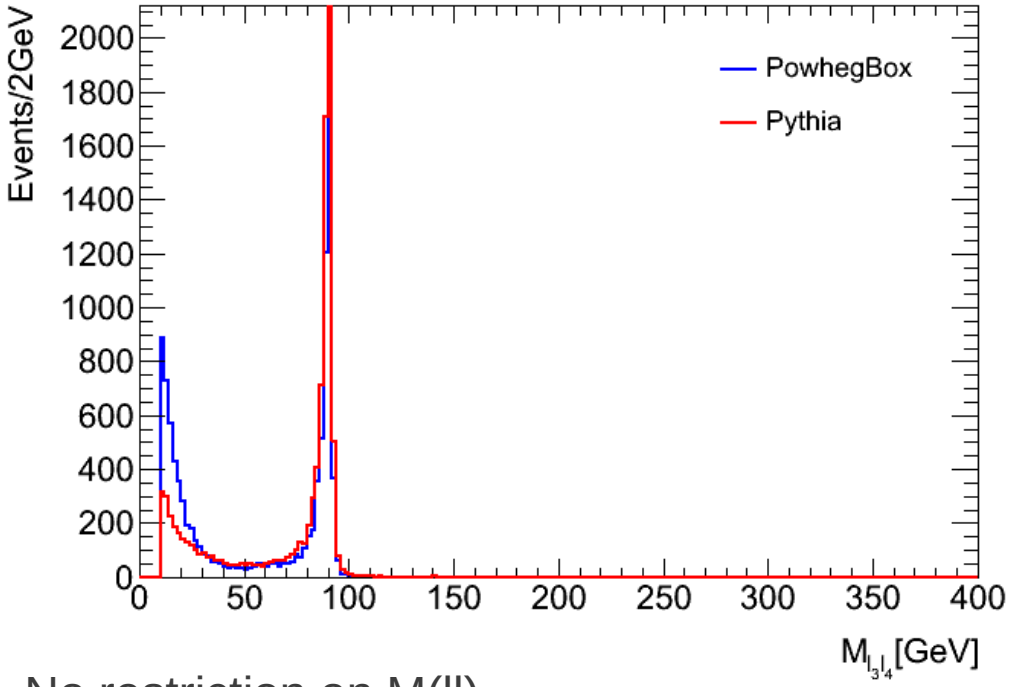


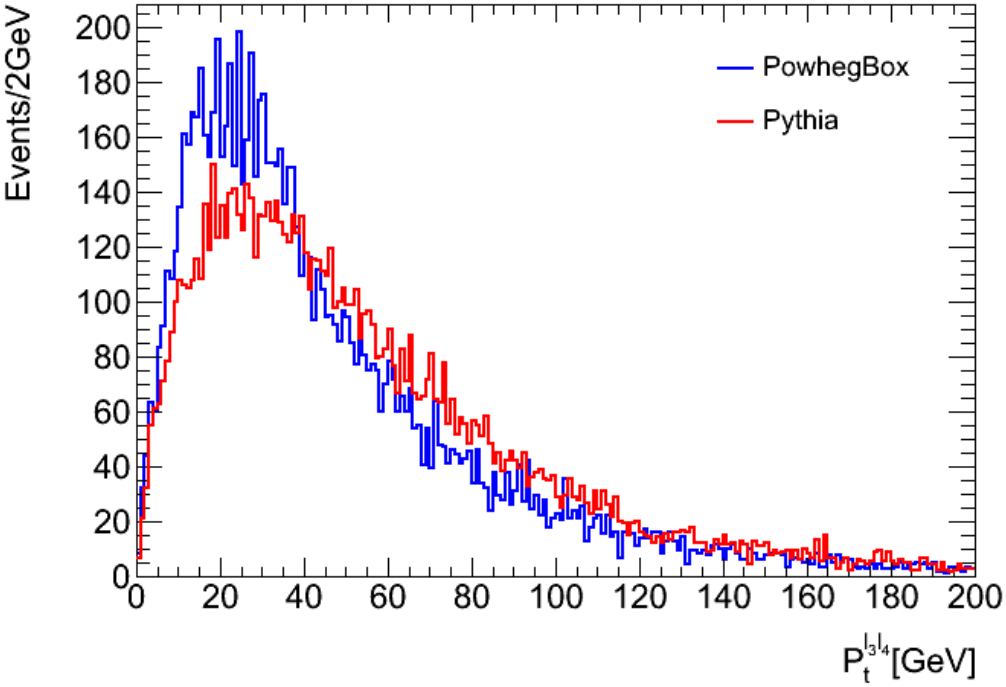
No restriction on M(ll)

eeee+mmmm channel: di-lepton mass and Pt distribution



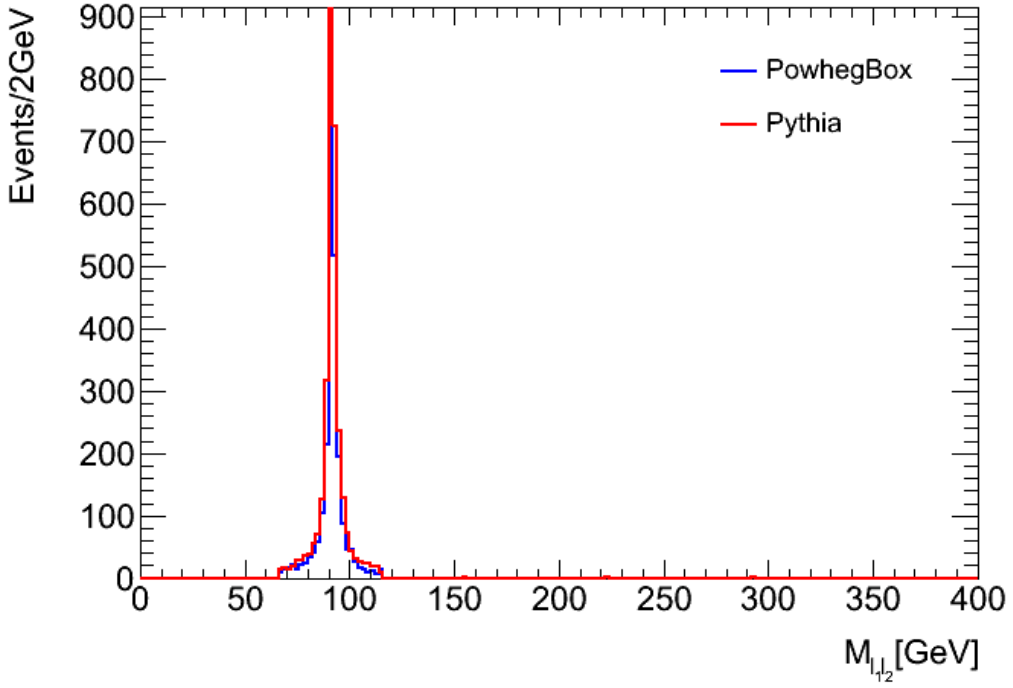


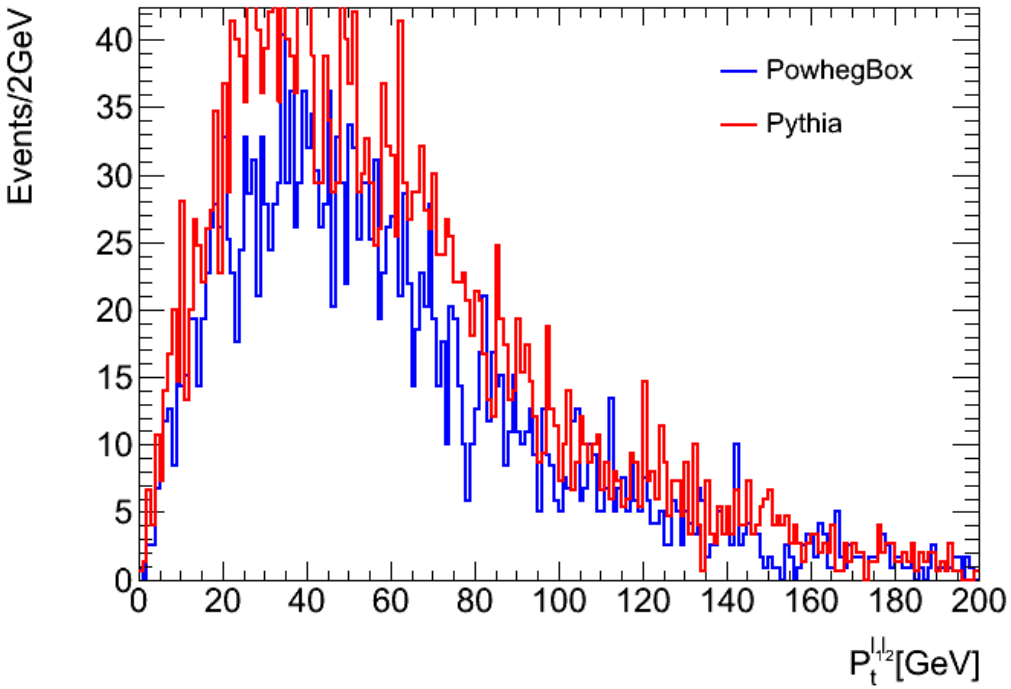


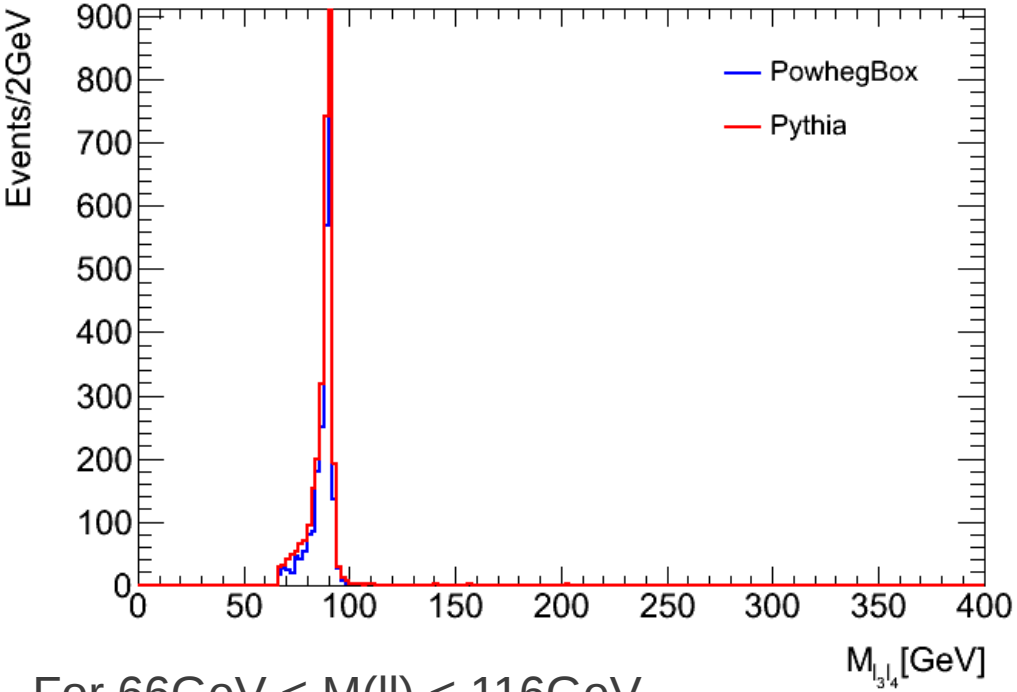


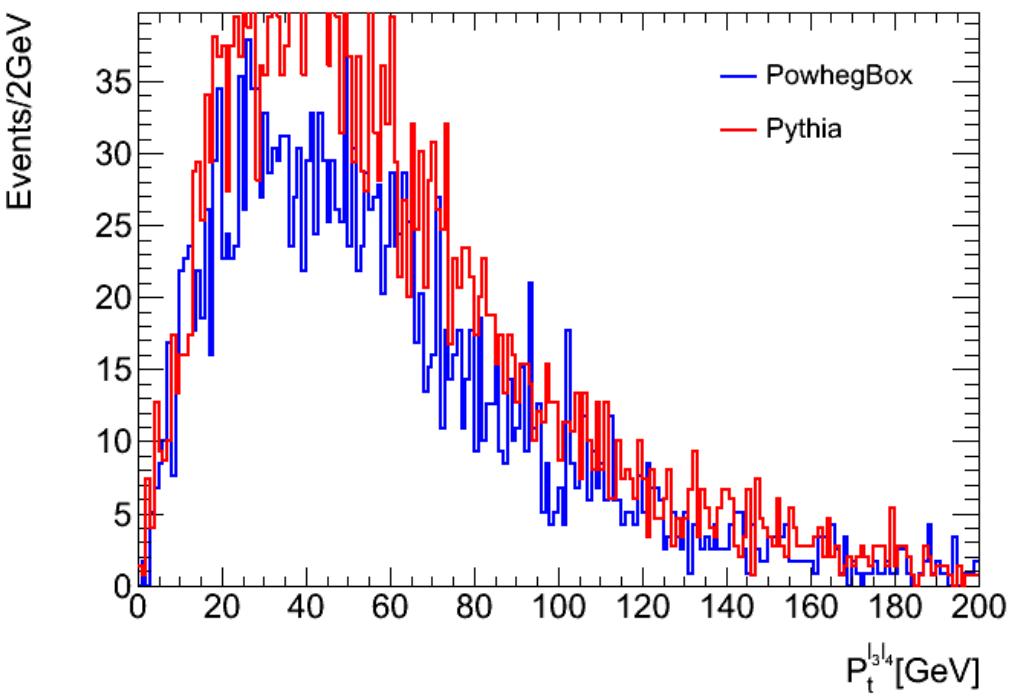
No restriction on M(ll)

eeee+mmmm channel: di-lepton mass and Pt distribution



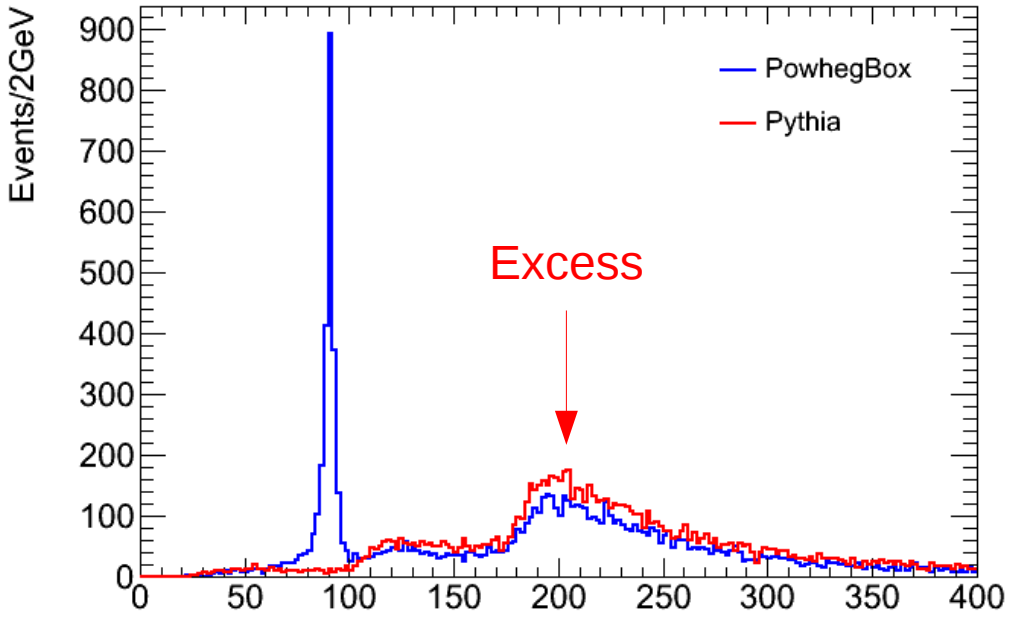


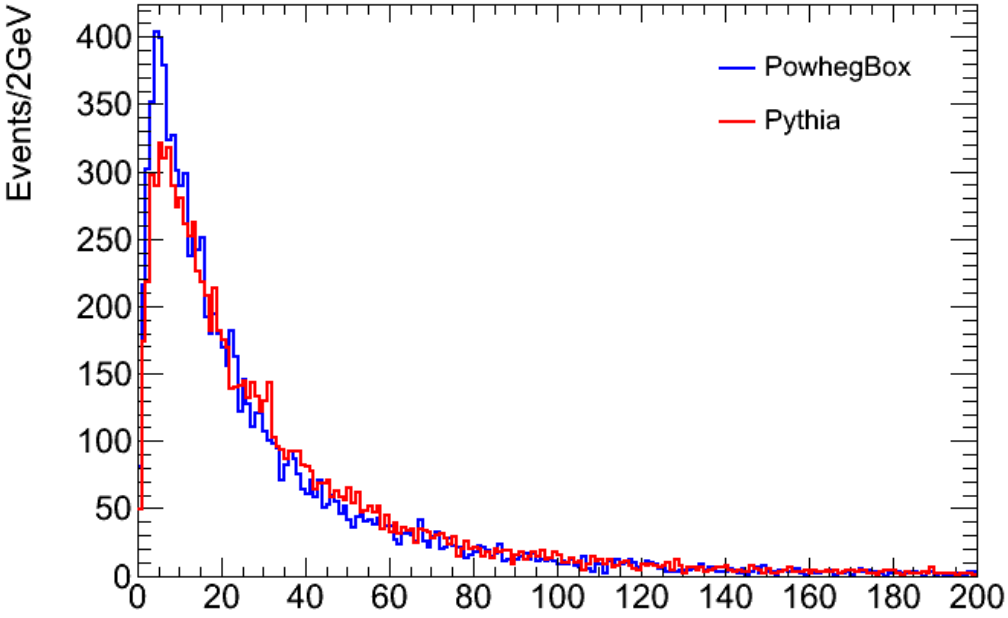




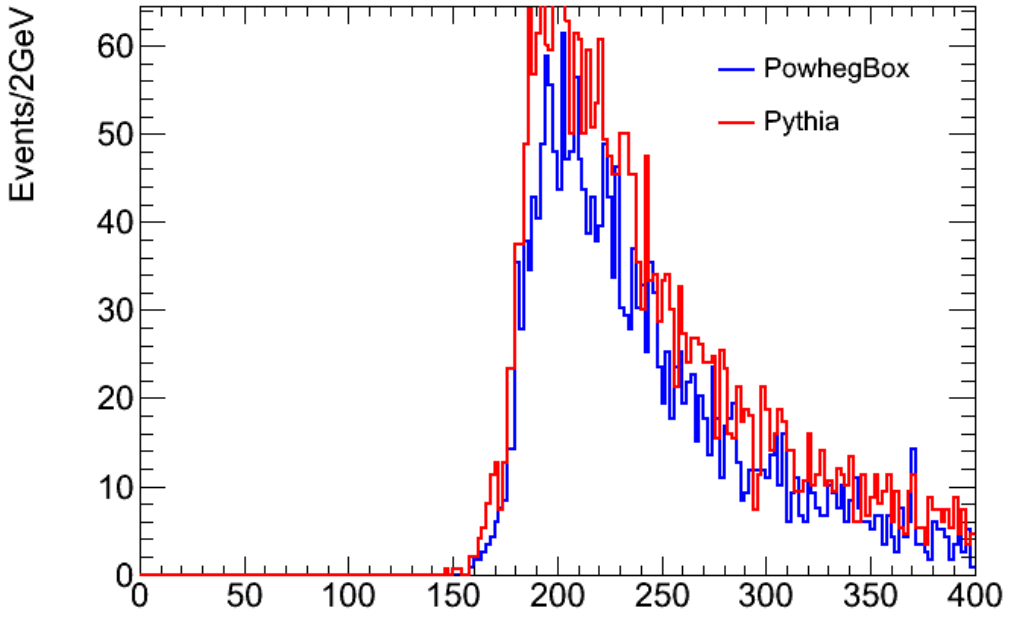
For 66GeV < M(ll) < 116GeV

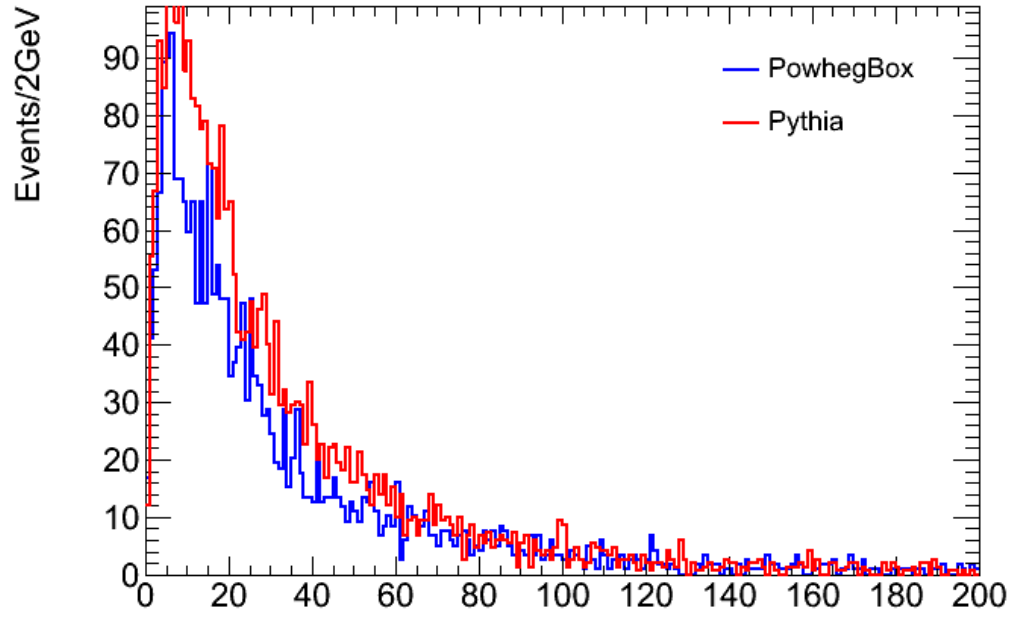
eeee+mmmm channel: 4-lepton mass and Pt distribution





No restriction on Mll

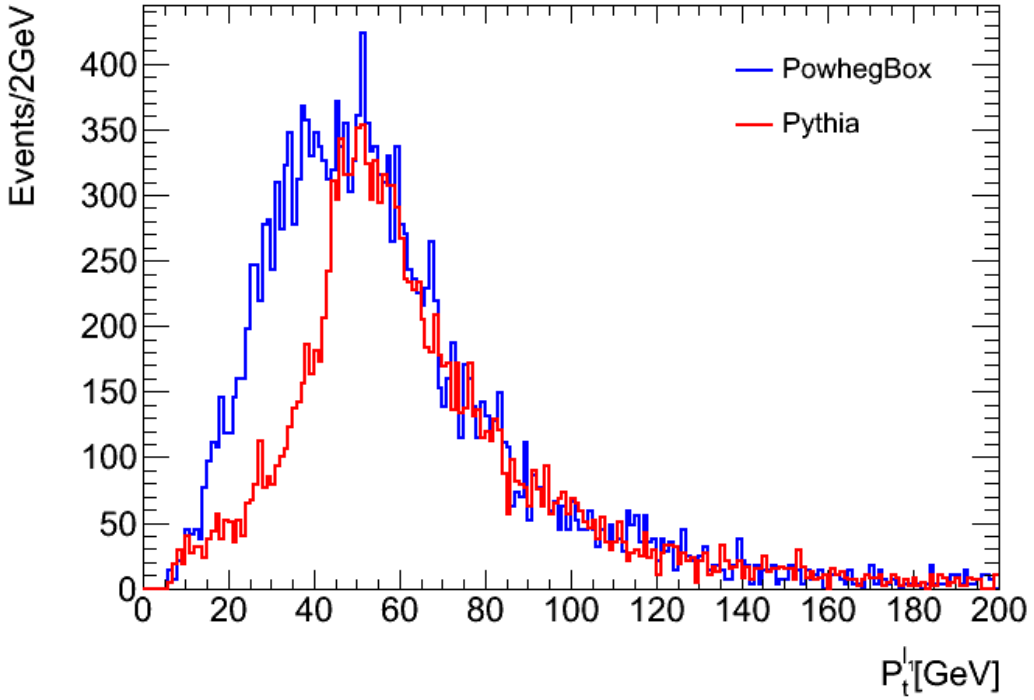


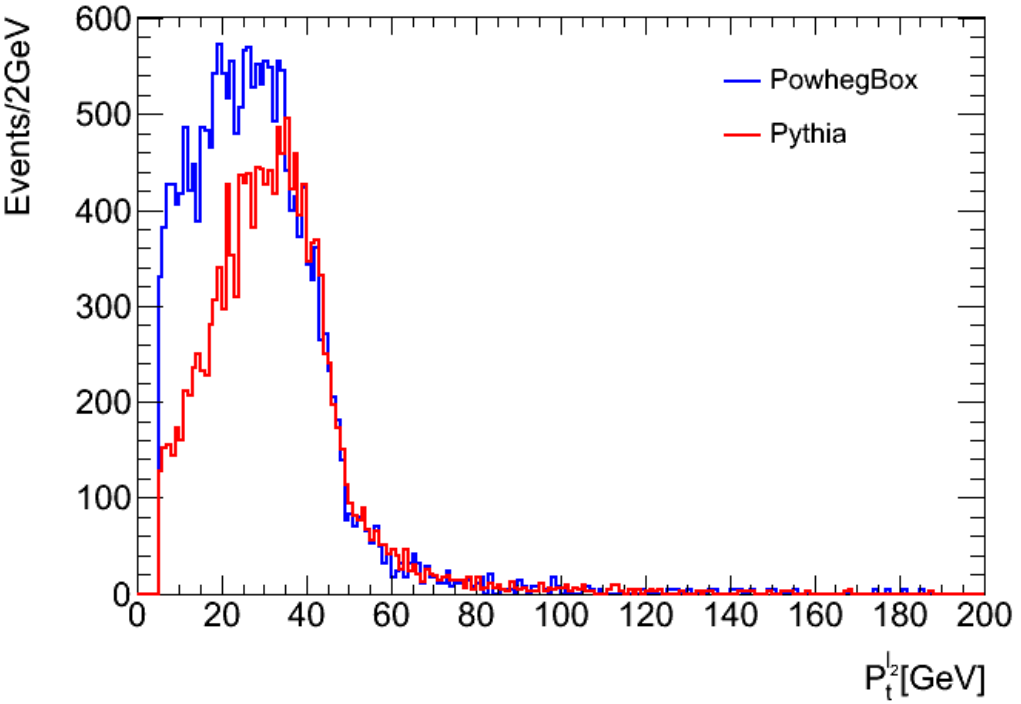


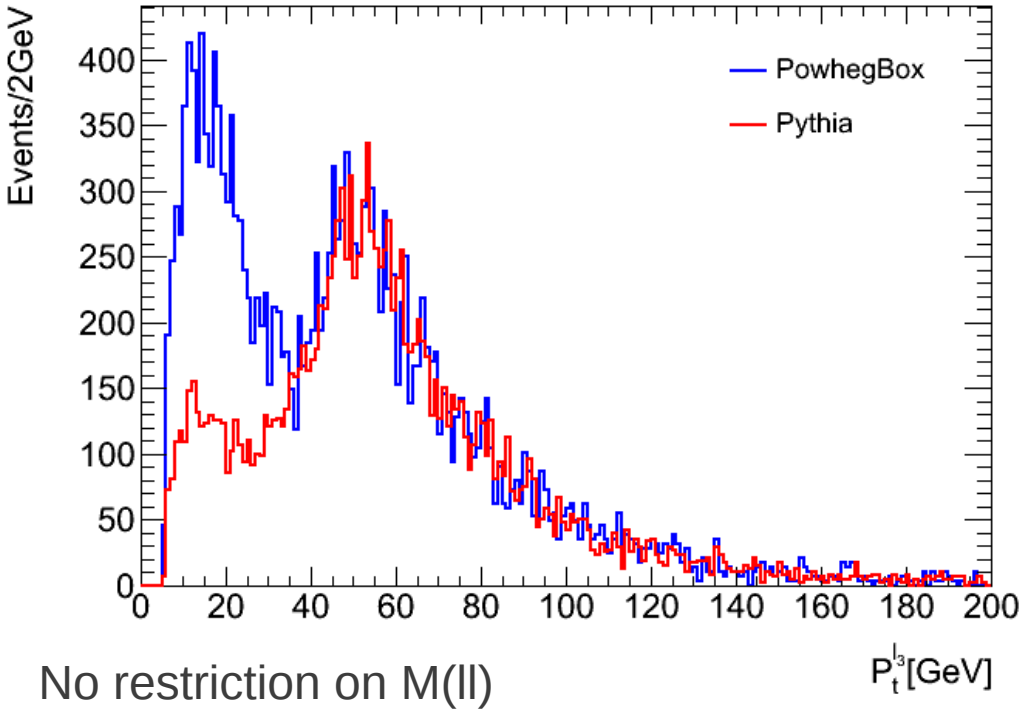
For 66GeV < M(ll) < 116GeV

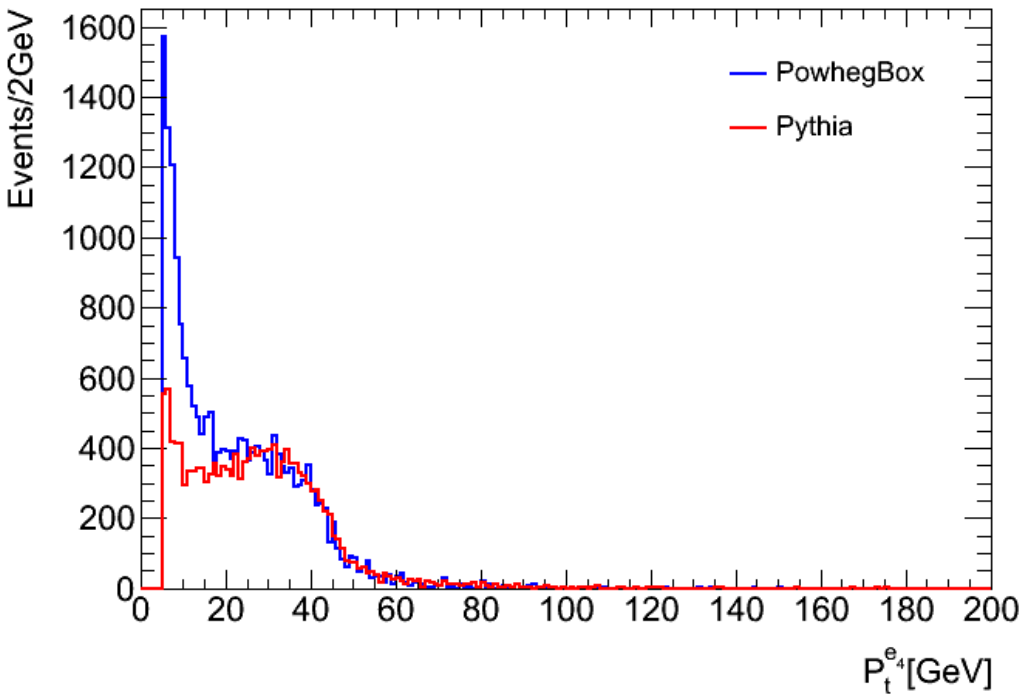
Scenario 2: Normalized using nEvts w/ Z veto

eeee+mmmm channel: lepton Pt distribution



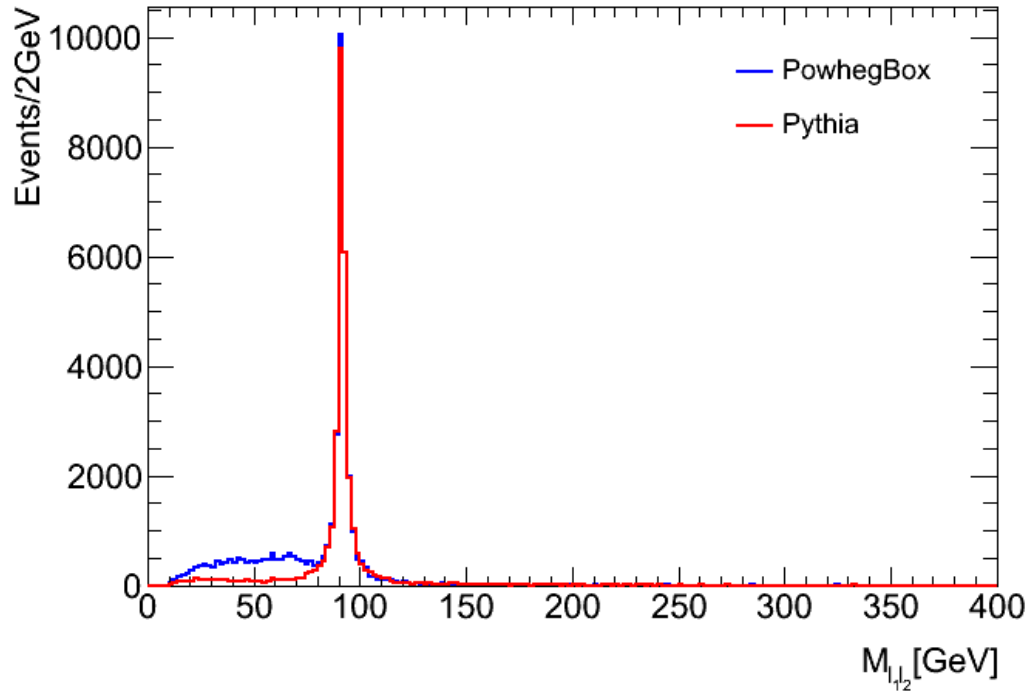


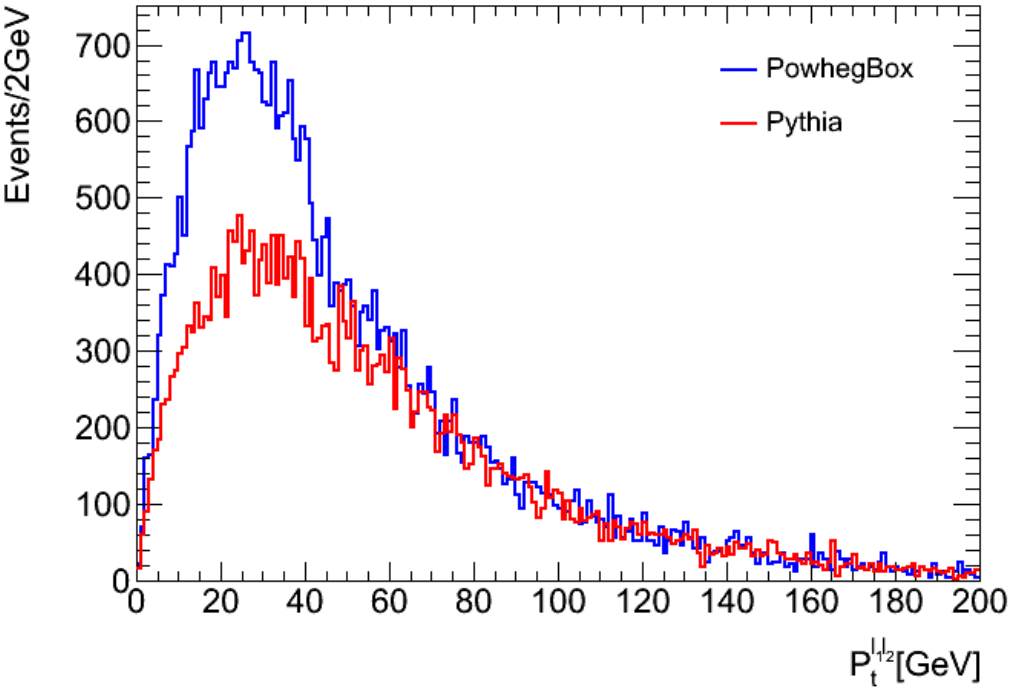


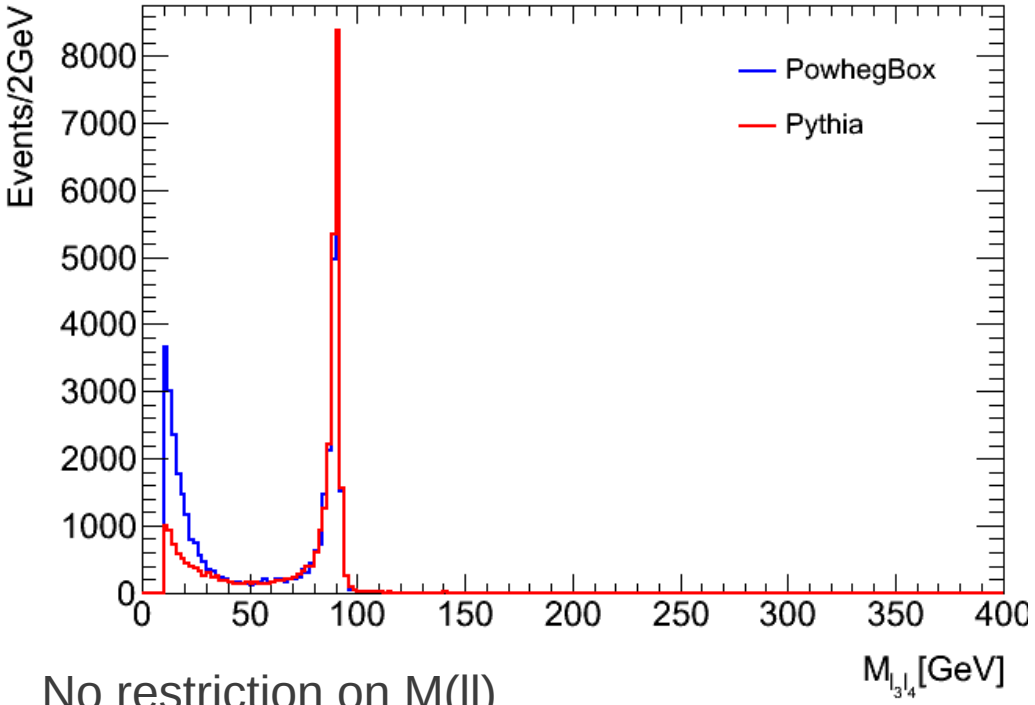


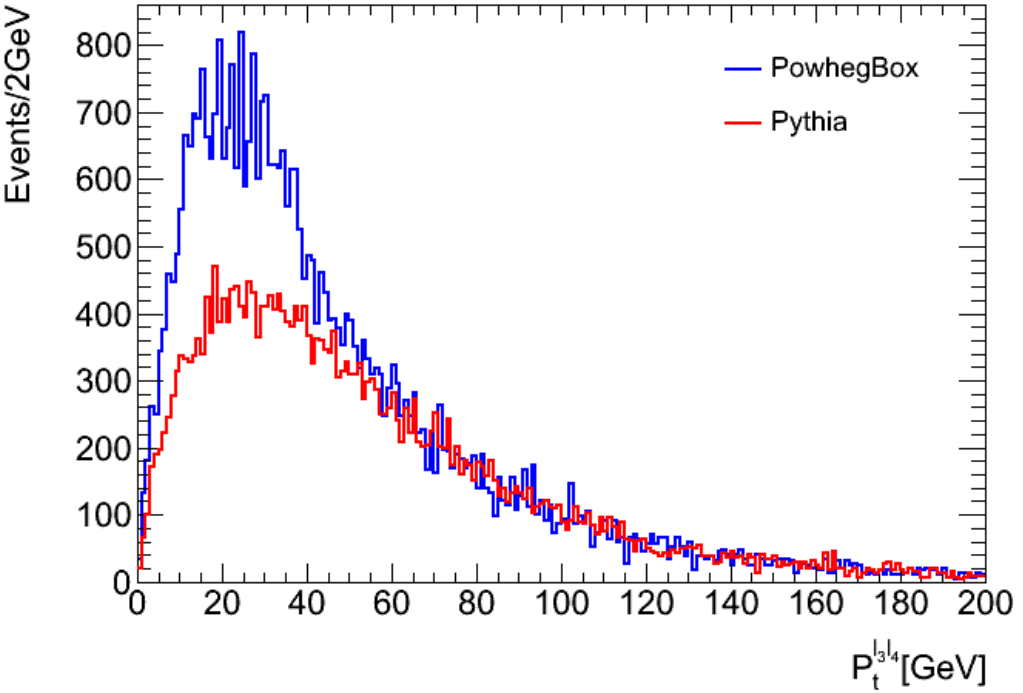
No restriction on M(ll)

eeee+mmmm channel: di-lepton mass and Pt distribution



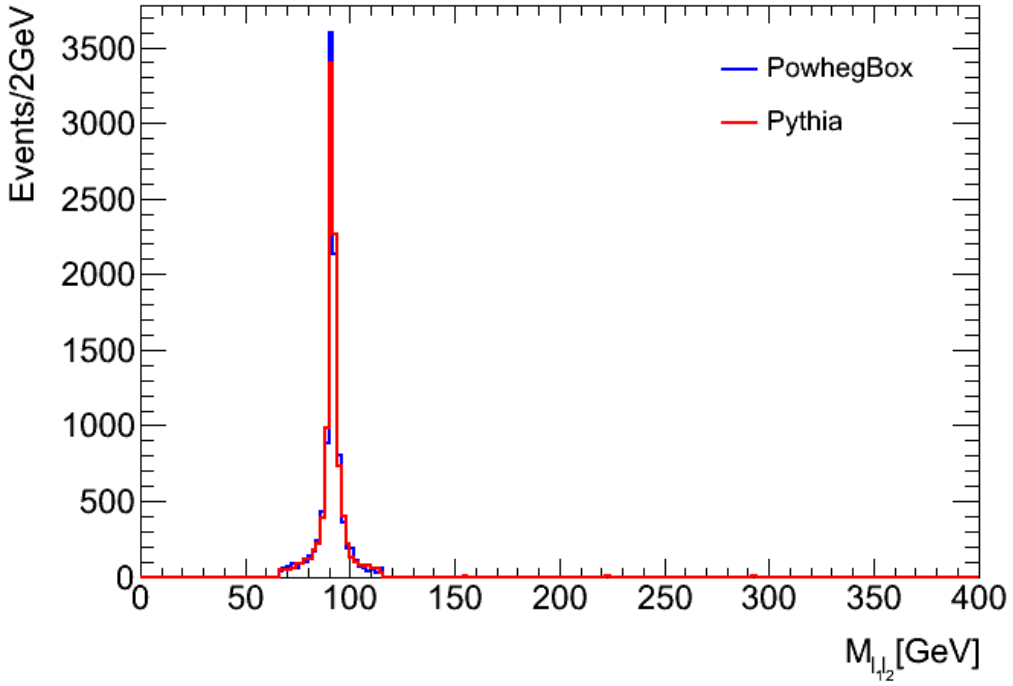


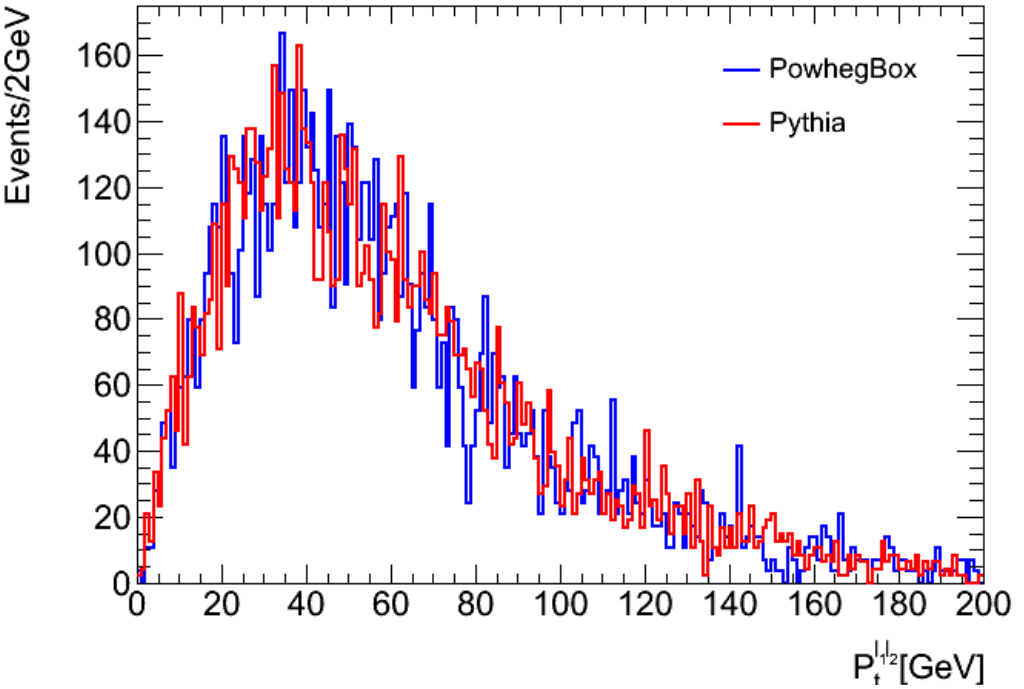


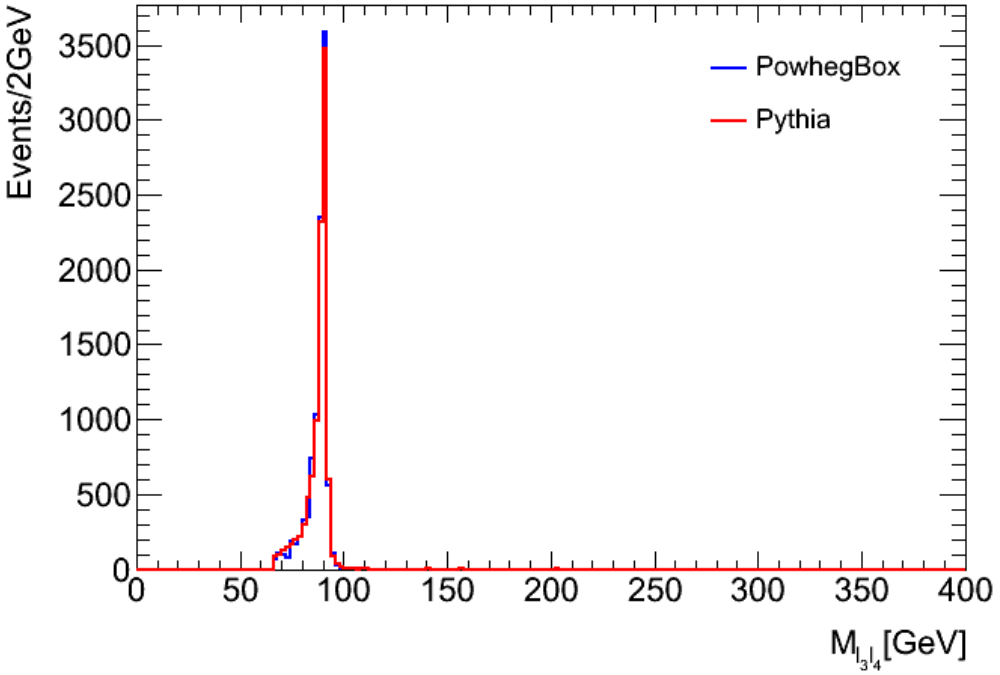


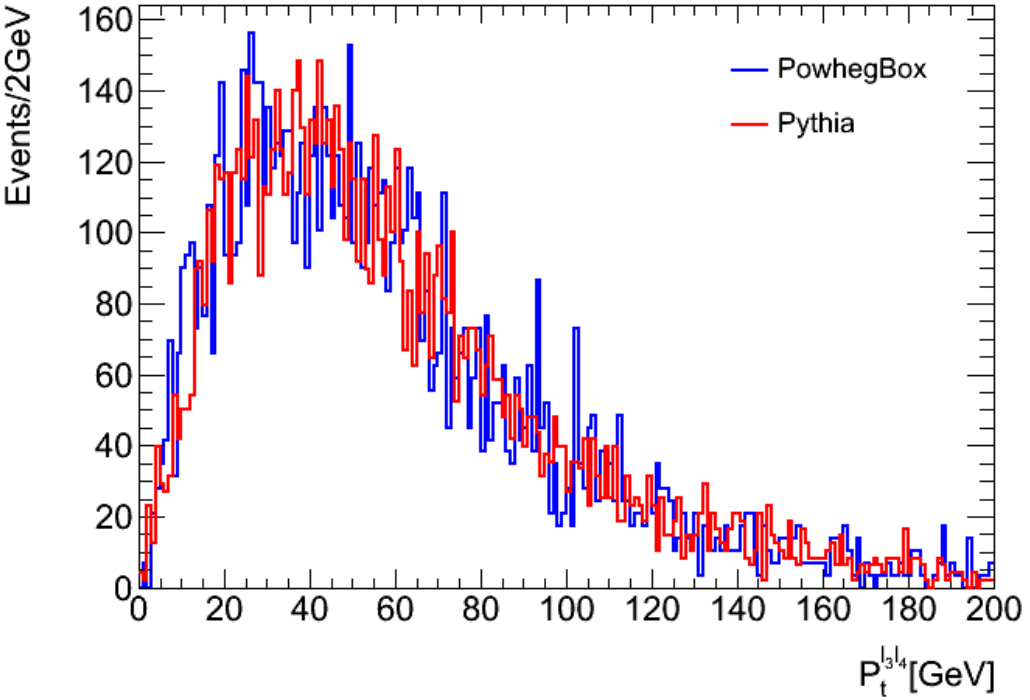
No restriction on M(ll)

eeee+mmmm channel: di-lepton mass and Pt distribution



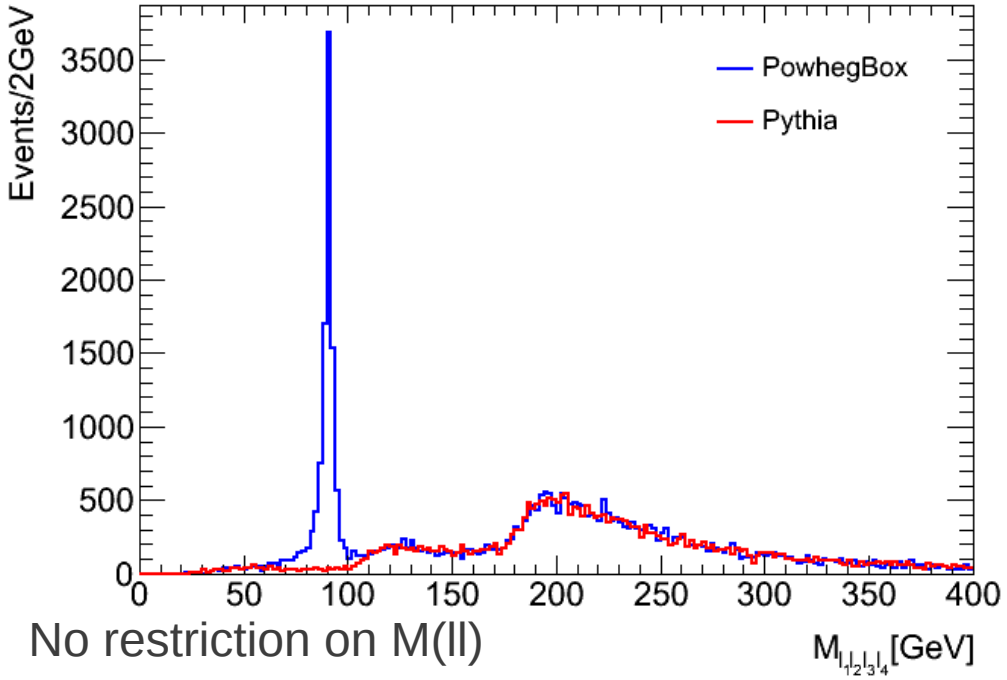


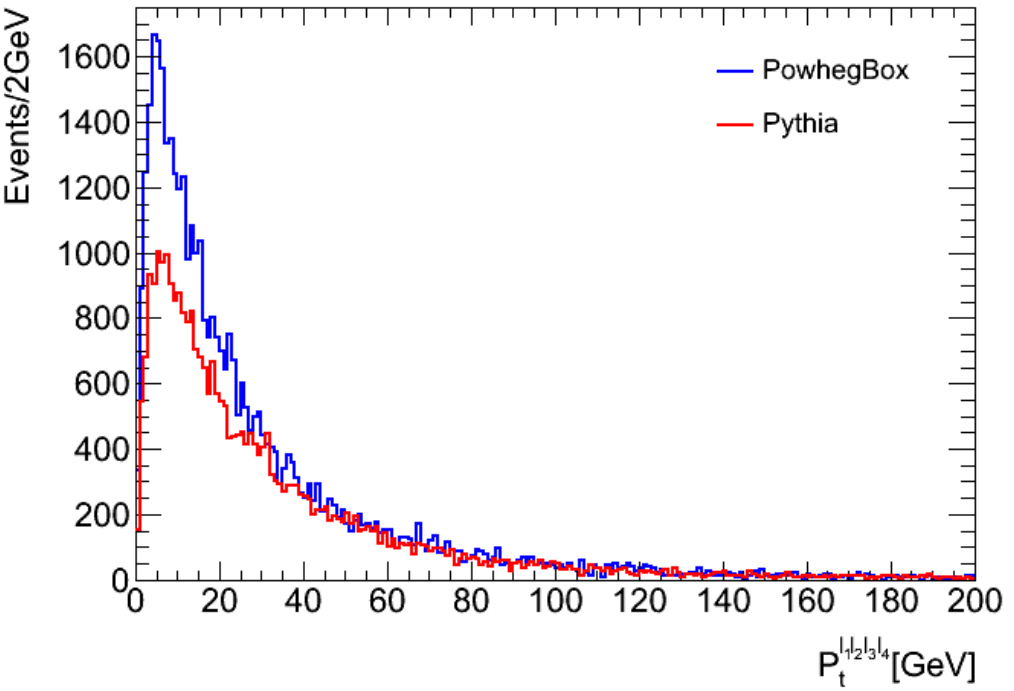




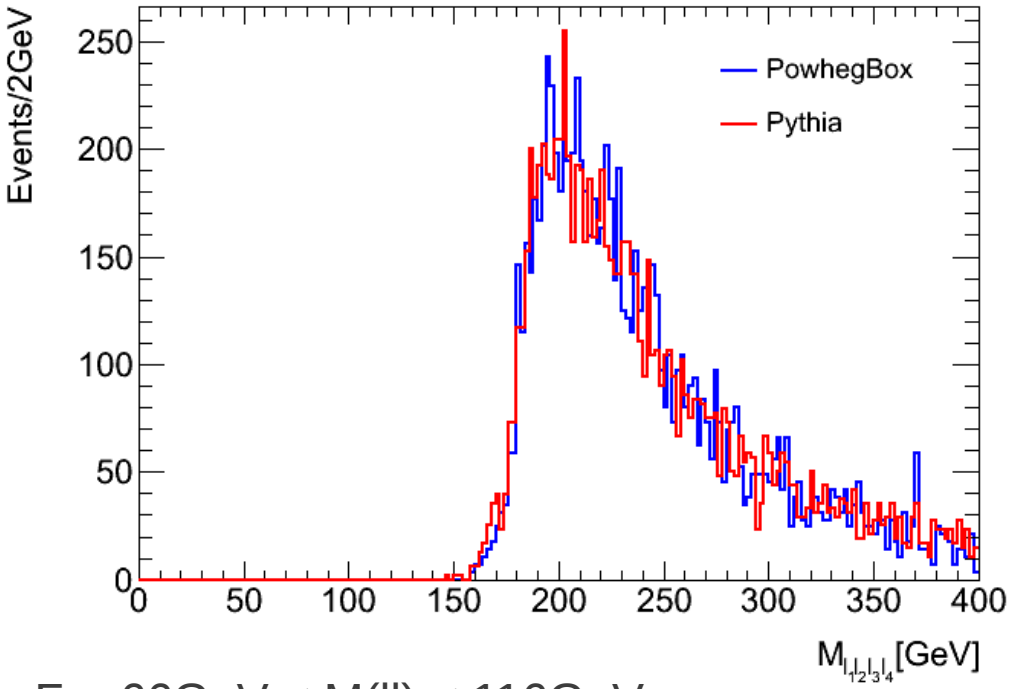
For 66GeV < M(ll) < 116GeV

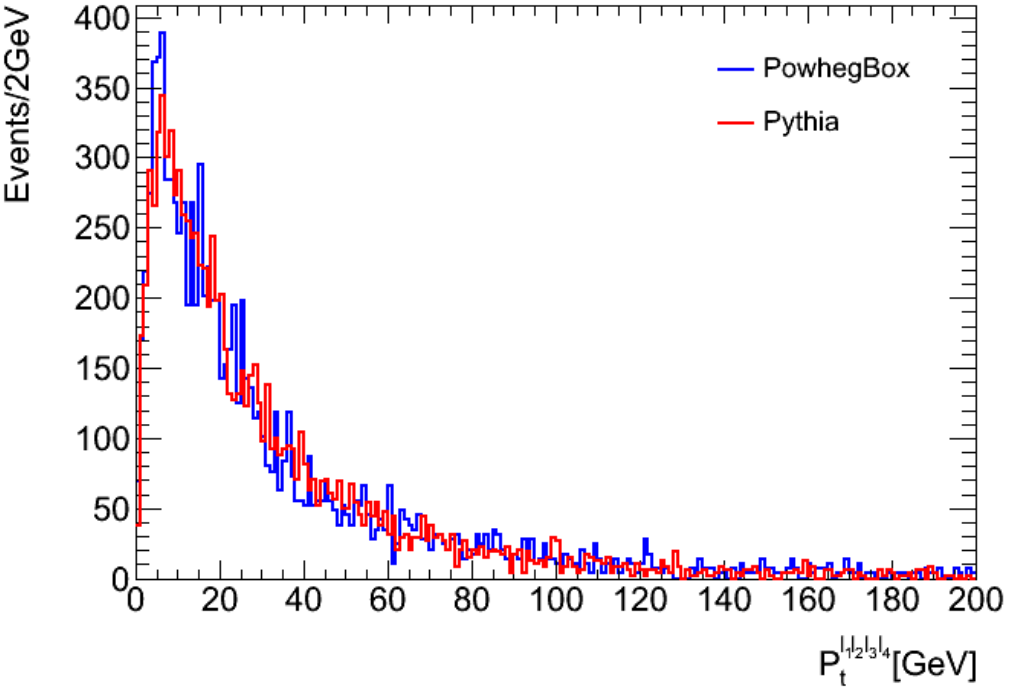
eeee+mmmm channel: 4-lepton mass and Pt distribution





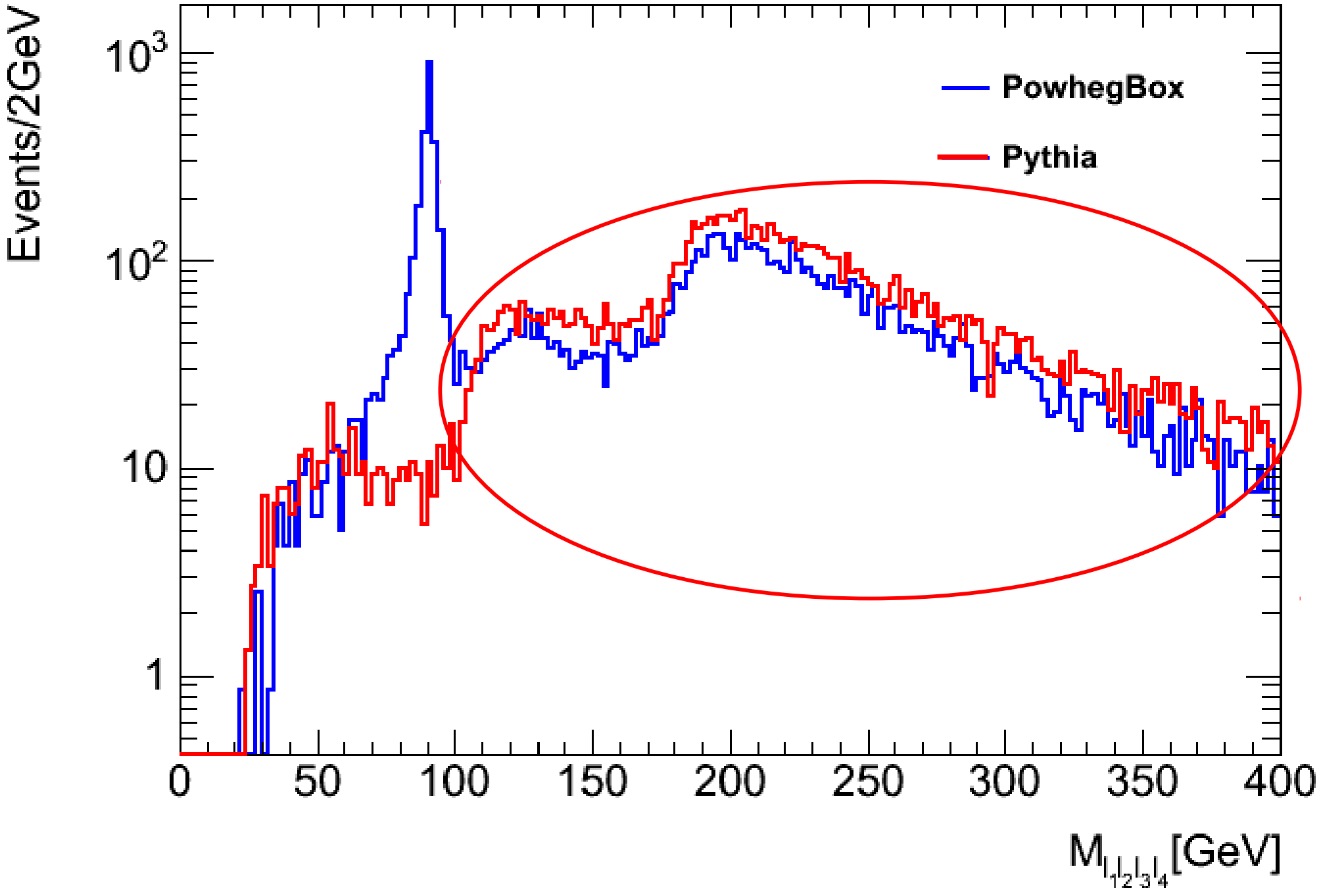
No restriction on M(ll)



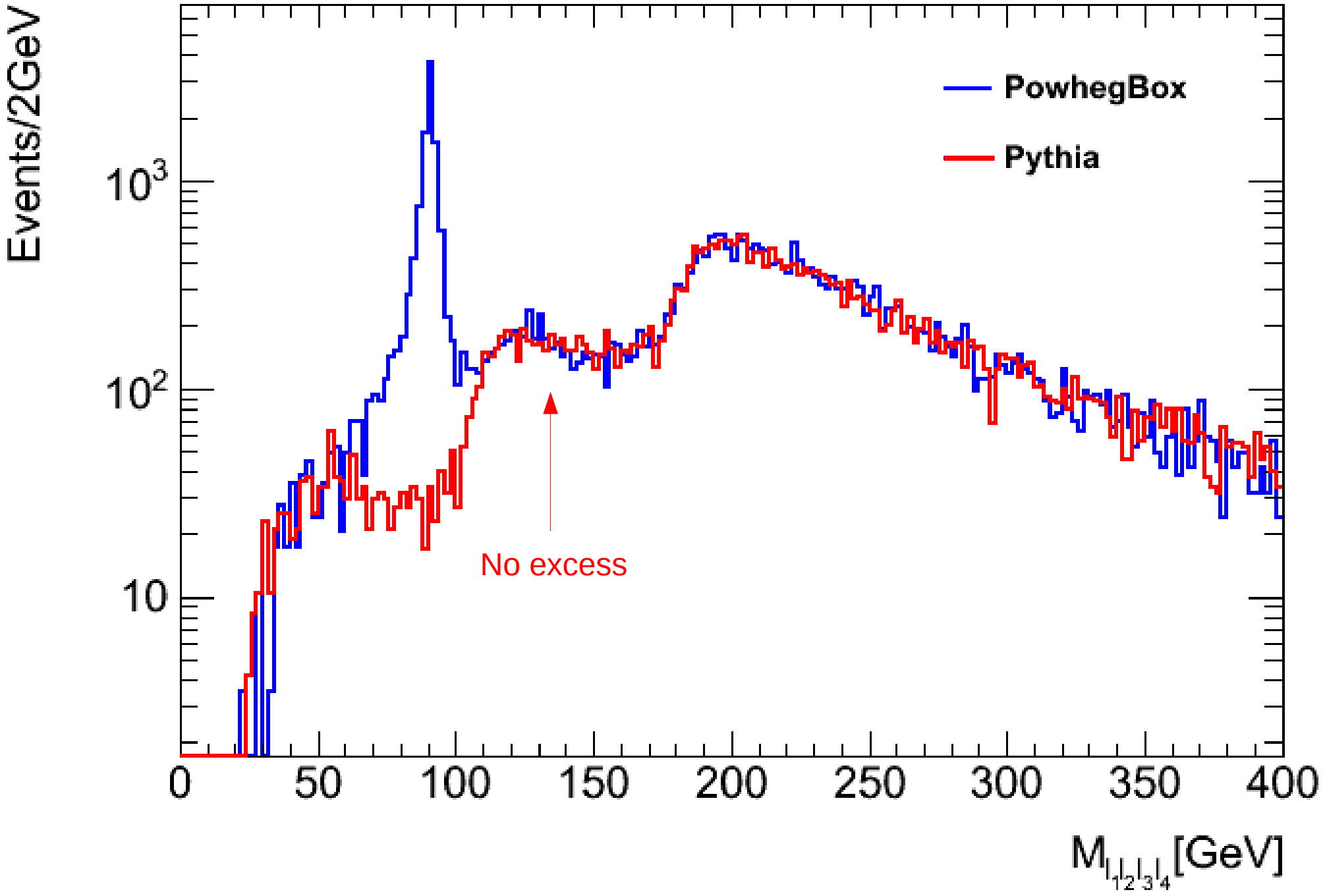


For 66GeV < M(ll) < 116GeV

Comparing M4l plots



Normalized using nEvts without Z veto



Normalized using nEvts with Z veto

Conclusion

Normalizing the Pythia and Powheg Box MC's using the total number of events restricting M(ll) to be within a mass window (i.e. excluding contribution from Z->4l where at least one M(ll) came from a virtual Z) gives roughly an excess in Pythia MC over Powheg Box MC in the region M(4l) > 100GeV.