

Optimisation of isolation WPs in Run3

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April 16, 2026



Outline

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Qualification task

Title: Optimisation of isolation WPs in Run3

Description

- Distinguish muons from prompt sources from non-prompt and fake ones.
- Improve robustness against higher pile-up while maintaining good performance for prompt muon selection.
- explore possible dependencies on event topology such as $Z \rightarrow \mu\mu$ and $t\bar{t}$ events.

OTP task ID: 532774 sub-task ID: 556633.

Proposed beginning of qualification: 01/02/2026

<https://its.cern.ch/jira/browse/ATLASMCP-295>



Introduction

In this presentation, I worked on subsection 8.3, "Studies on jet modelling uncertainty: Powheg+Pythia vs. Powheg+Herwig vs. Sherpa," from the documentation: [here](#)

- $Z \rightarrow \mu^+ \mu^-$
- Run 2

Variables

- Dimuon invariant mass $m_{\mu\mu}$
- Muon transverse momentum p_T
- Muon pseudorapidity η

I'm still working on Run3 MC data...



Technical details

- Software : AnalysisBase,25.2.89
- MC20.
- ROOT Version: 6.36.04
- DAOD_MUON1 format.
- Package:[fastMuonChecker](#)
- Generator:Pythia ,Sherpa



Run2



Distributions for the dimuon mass in Run2

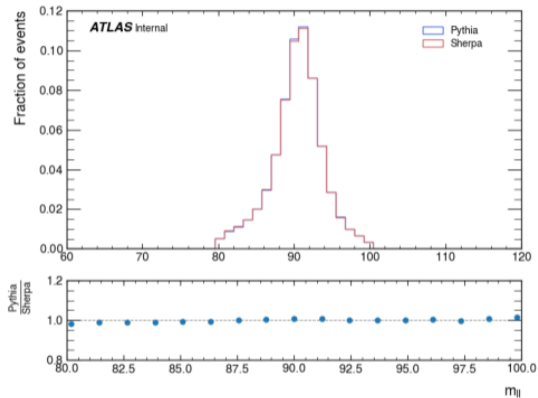


Figure: Original plot

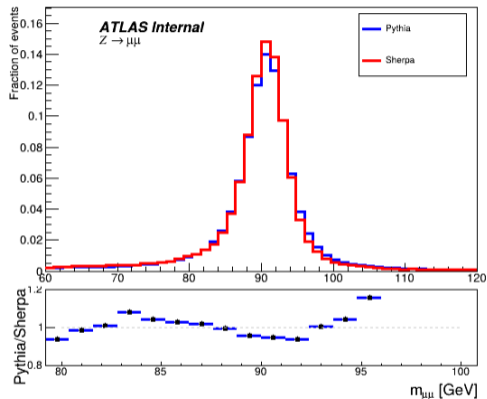


Figure: Reproduced plot

Distributions for muon transverse momentum in Run2

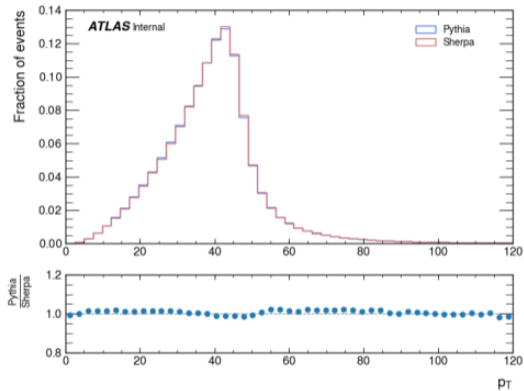


Figure: Original plot

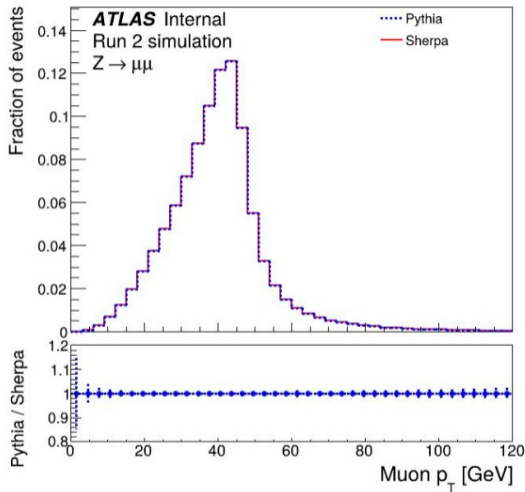


Figure: Reproduced plot

Distributions for muon pseudorapidity in Run2

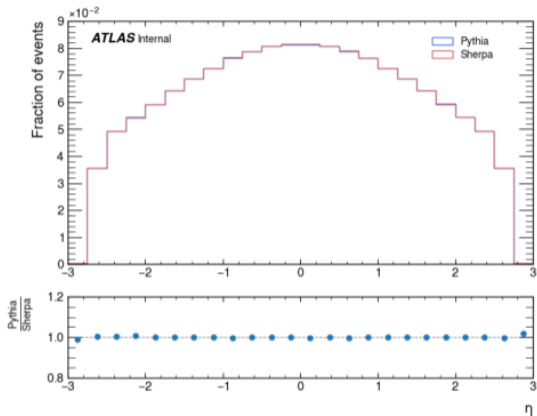


Figure: Original plot

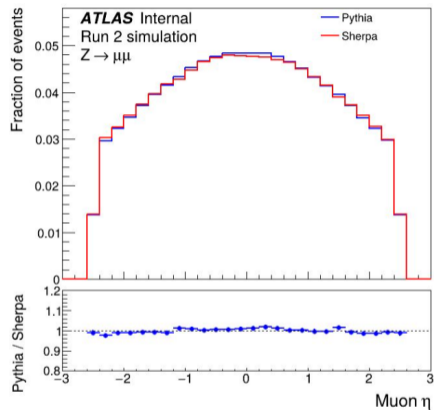


Figure: Reproduced plot

Conclusion

- The MC data was successfully processed and the main distributions were reproduced.
- Some limitations were encountered during the analysis.
- Next step: advanced studies.



Back Up



Instructions to reproduce the results

setupATLAS

voms-proxy-init -voms atlas

lsetup pyAMI panda rucio

asetup AnalysisBase,25.2.89

Grid Submission Command (prun):

```
1 prun --exec "python fastMuonChecker.py -i %IN --run Run2" \  
2 --inDS "mc20_13TeV.361107.PowhegPythia8EvtGen_AZNLOCTEQ6L1_Zmumu.deriv.DAOD_MUON1.  
   e3601_s3681_r13145_r13146_p6232" \  
3 --outDS "user.melallam.pythia_zmumu_run2_t1" \  
4 --outputs "output_tree.root" \  
5 --containerImage "docker://atlas/analysisbase:latest" \  
6 --nJobs 50 --nGBPerJob 4 --noBuild .  
7
```

