Optimisation of isolation WPs in Run3

MOHAMMED EL ALLAM
Local supervisor: Farida Fassi
Technical supervisor: Matteo Bauce

April 30, 2026

Outline

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 $Z \to \mu\mu$ 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

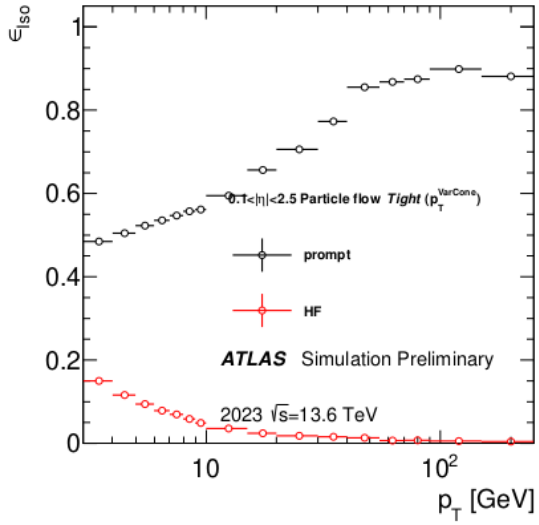
Variables

- We measure the isolation efficiency of muons from $Z \to \mu^+\mu^-$ decays as a function of the average number of interactions per crossing ($\langle\mu\rangle$).
- We measure the efficiency of muons from $t\bar{t}$ decays as a function of transverse momentum (p_T).
- Working points: Loose, Tight, PFlowLoose, PFlowTight.

Technical details

- Software: AnalysisBase,25.2.89
- ROOT Version: 6.36.04
- MC23d, tag:r15530, DAOD_MUON1 format, DSID: 601190.
- Generator:Pythia ,Sherpa
- Data23, Run number: 455975, 451094, 455924, 456749 Stream: physics_Main, physics_BphysDelayed, calibration_BphysPEB Period: 2023 G, F.
- Package:fastMuonChecker

Isolation efficiencies for prompt and non-prompt muons



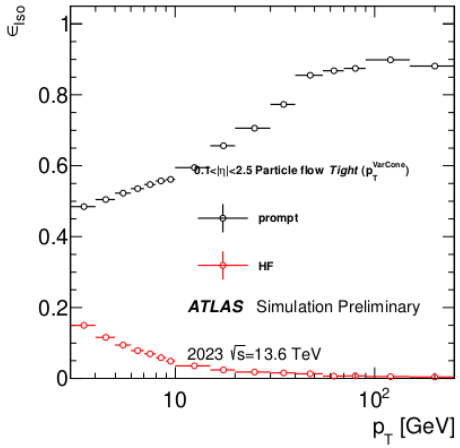
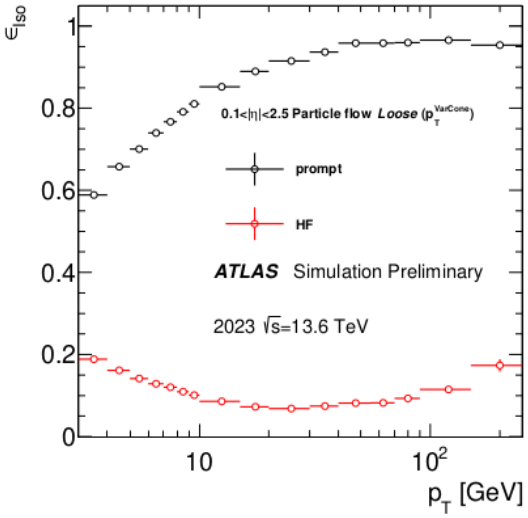


Figure: Reproduced plot

Isolation efficiencies for prompt and non-prompt muons



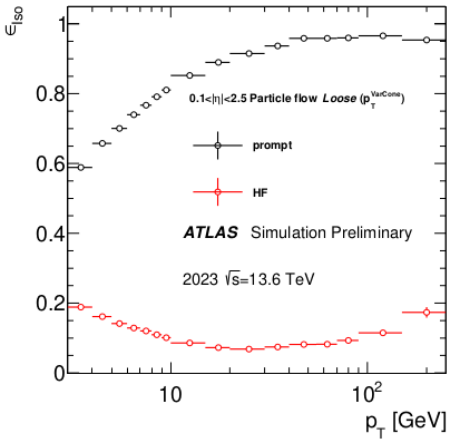


Figure: Reproduced plot

Figure: Original plot

Isolation efficiency for interactions muons satisfying the Tight isolation criteria

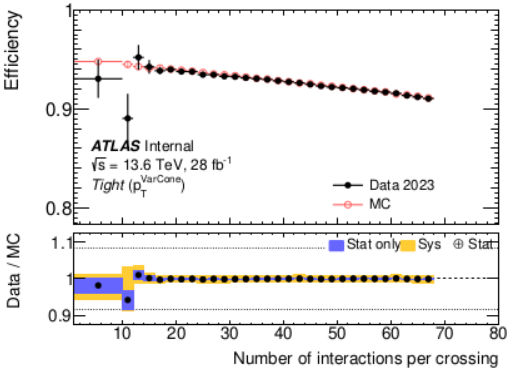


Figure: Original plot

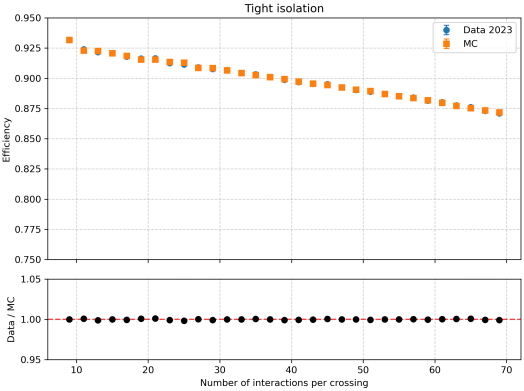


Figure: Reproduced plot

Back Up

Instructions to reproduce the results

setupATLAS
voms-proxy-init -voms atlas
lsetup pyAMI panda rucio
asetup AnalysisBase,25.2.89