

# Performance of Standalone Muons in Run 3



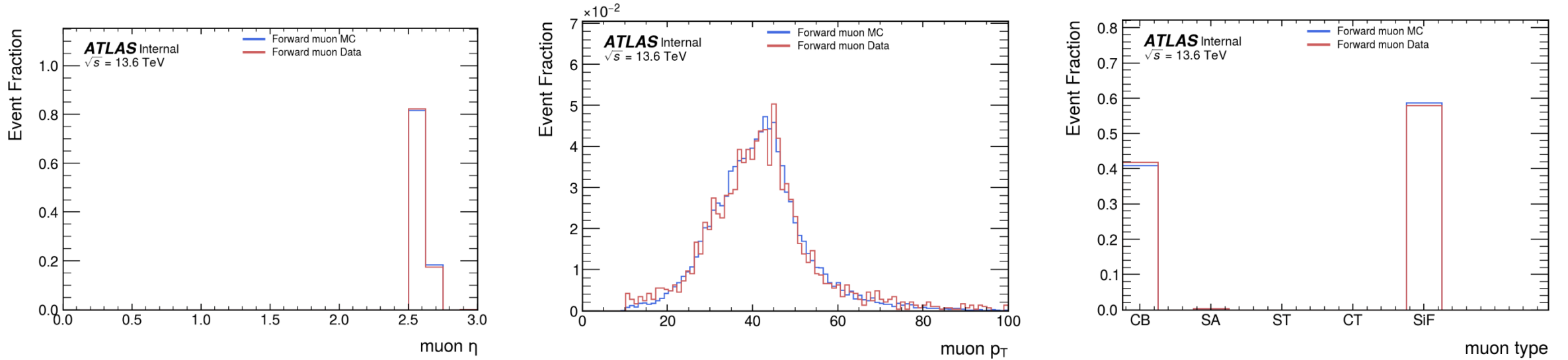
**Analysis Meeting**  
30/07/24  
**Celine Stauch**

# Introduction

- Investigating the reconstruction efficiency and resolution of Standalone (SA) muons in Run 3 (QT study)
- Open Items from [previous presentation](#):
  - use MuonxAOD to investigate the distributions for SA muons
- Today: First Plots with MuonxAOD

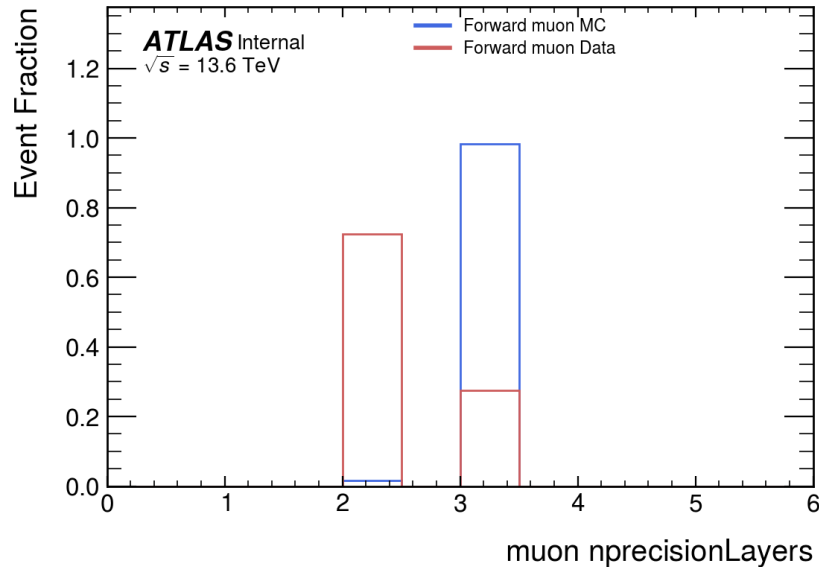
# Datasets and Muon selection

- Samples used for this study:  
data23\_13p6TeV.00451094.physics\_Main.merge.AOD.r14858\_p5785  
data23\_13p6TeV.00451140.physics\_Main.merge.AOD.r14858\_p5785  
mc23\_13p6TeV.601190.Py8EG\_AZNLO\_Zmumu.recon.AOD.e8514\_s4159\_r14799
- Analysis done on ntuples produced from these samples with [MuonxAODAnalysis](#)
- Selected Muons (based on [arXiv:2012.00578v2](#)):
  - Central Muon:  $p_T > 25 \text{ GeV}$  and  $|\eta| < 2.5$
  - Forward Muon:  $p_T > 10 \text{ GeV}$ ,  $|\eta| > 2.5$  and  $n_{\text{precisionLayers}} > 2$



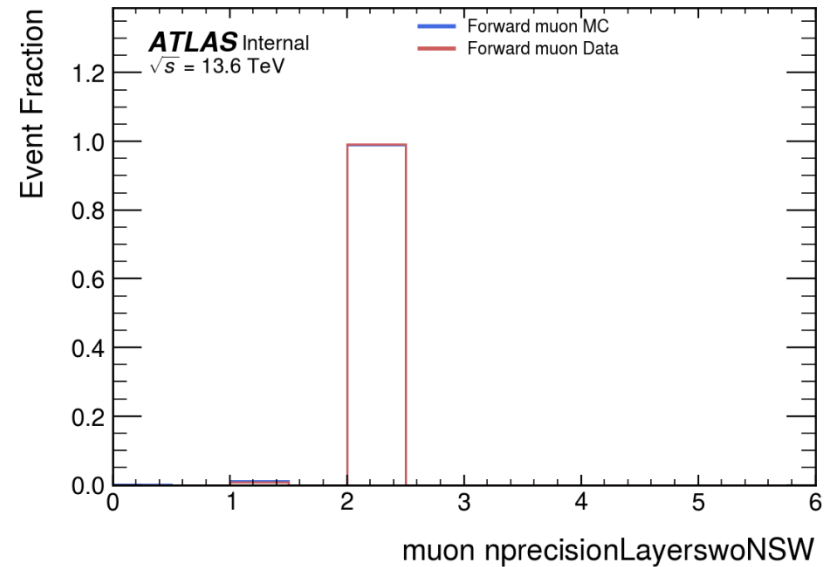
-> Plots for these and other variables overlap for MC23c and Data23

### nprecisionLayers with NSW



Filled from MuonHitInfo

### nprecisionLayers without NSW

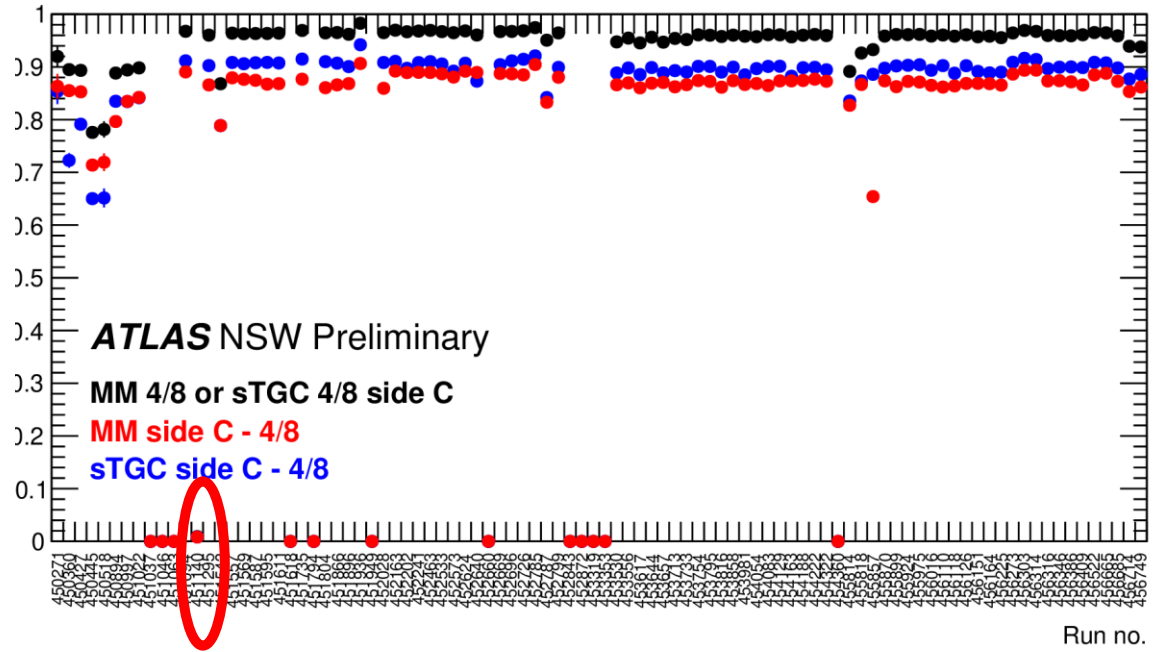
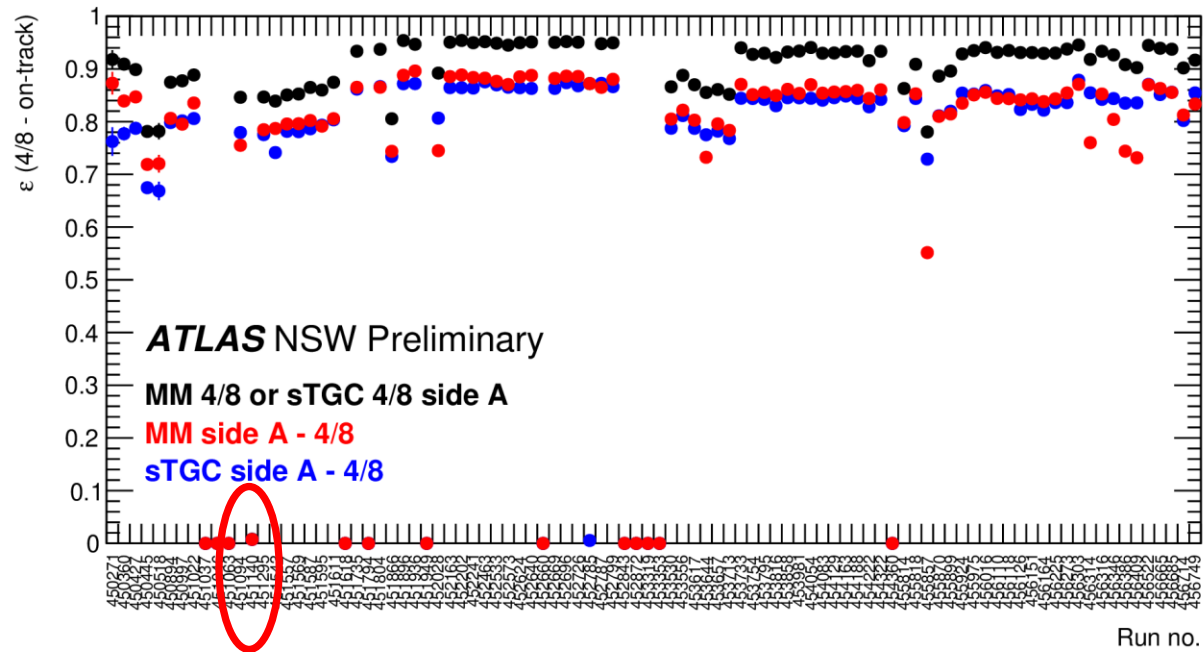


Filled using:

$(\text{middleHitsS} > 2 \parallel \text{middleHitsL} > 2) +$   
 $(\text{outerHitsS} > 2 \parallel \text{outerHitsL} > 2) +$   
 $(\text{extendedHitsS} > 2 \parallel \text{extendedHitsL} > 2)$

# Update to Current Issues

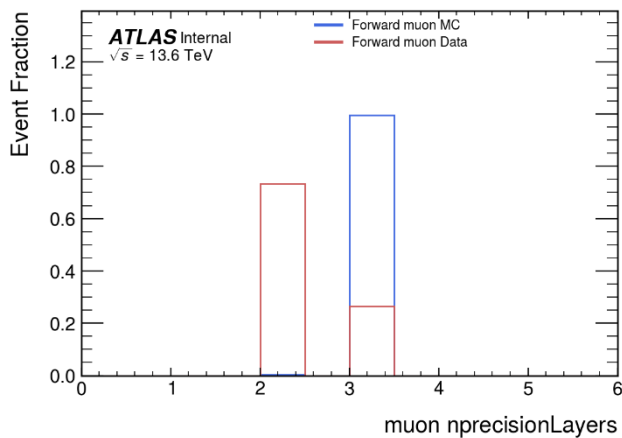
Reached out to P.Scholer and J.Jungeburth -> NSW down for run 451140



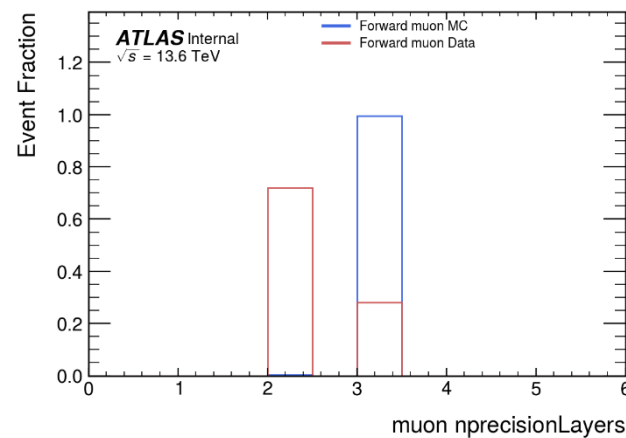
➔ Use different run

# Additional Investigations

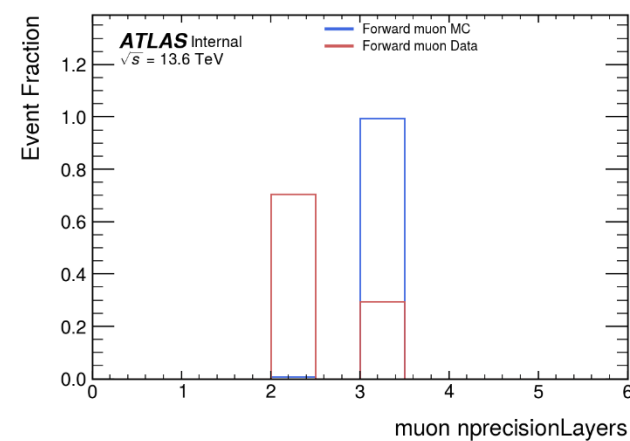
- Additional suggestions:
  - Make sure muons are from the Z resonance -> included
  - Look at triggers and identification WPs -> not investigated yet (dicussing with Giorgia when it is useful)
  - Investigate High eta region in smaller steps if this issue arises only towards the very forward region



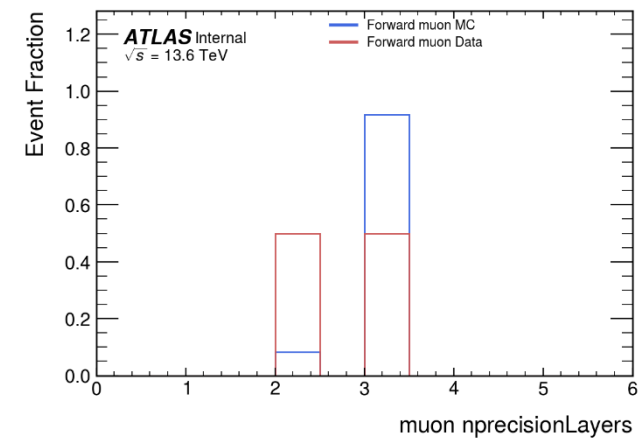
$|\eta| \geq 2.4$



$|\eta| \geq 2.5$



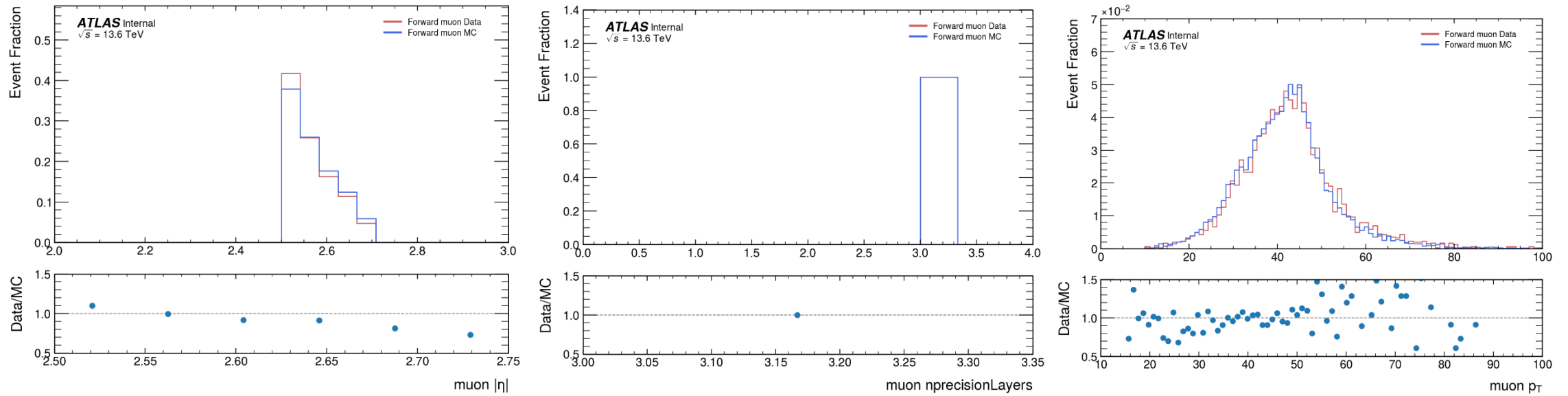
$|\eta| \geq 2.6$



$|\eta| \geq 2.7$

# Additional Investigations

- Switched to data23\_13p6TeV.00452163.physics\_Main.merge.AOD.r14858\_p5785
- Include mass cut: dimuon Mass = [81, 101] GeV



nprecisionLayers overlaps now and better statistics needed for reasonable ratio plots

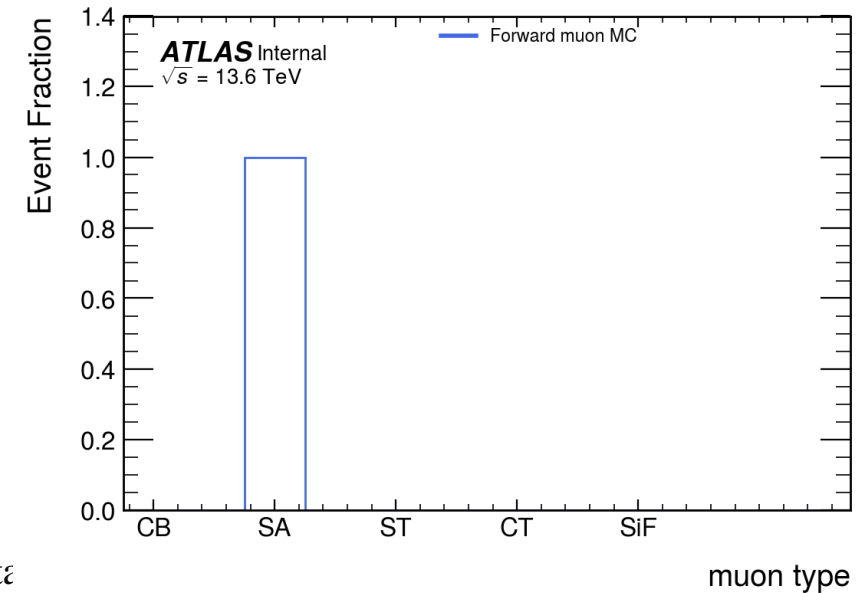
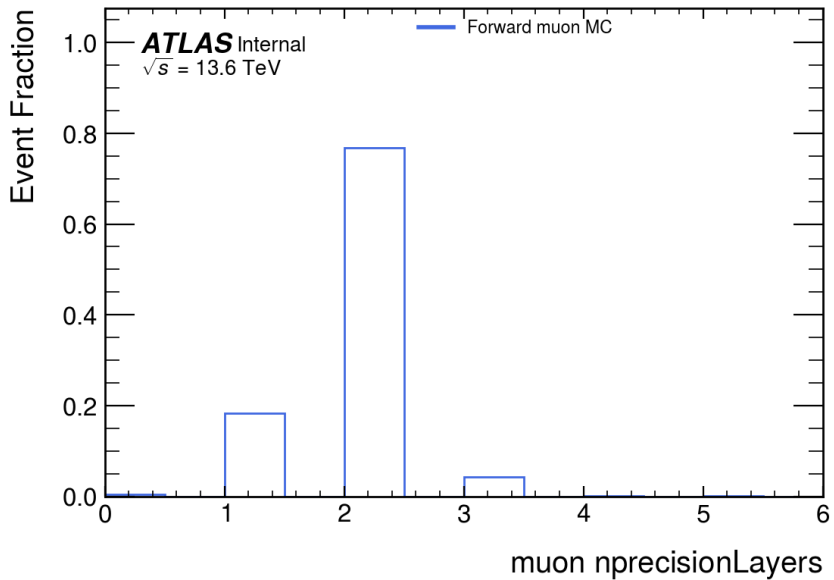
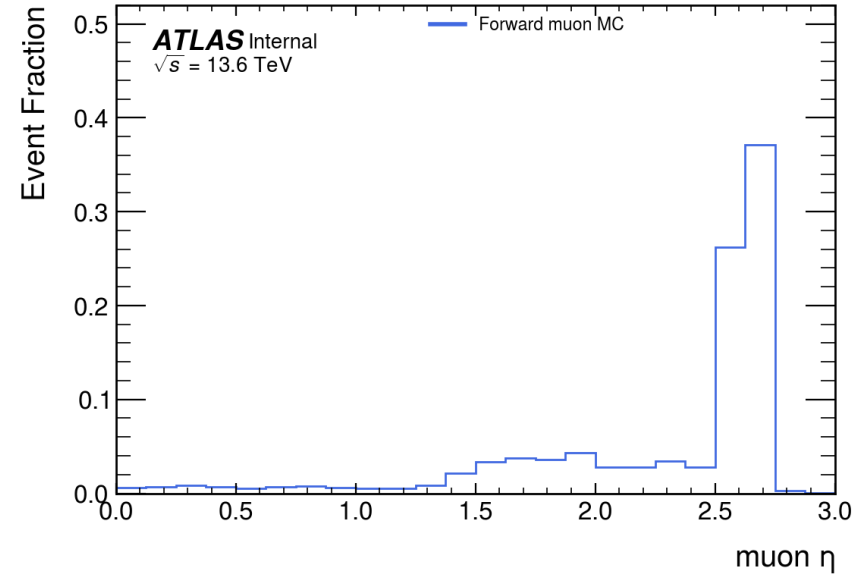
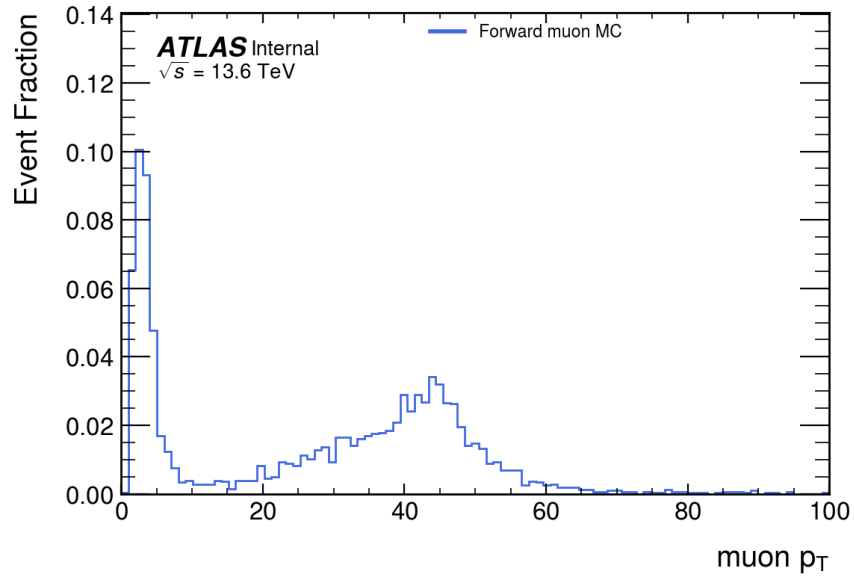


# Conclusion

- Started using MuonxAOD to produce the investigated ntuples
- Most distributions overlap for Data23 and MC23c
- nprecisionLayers fixed
- New mass cut implemented
  
- Next steps:
  - Investigate further variables
  - Test other selections

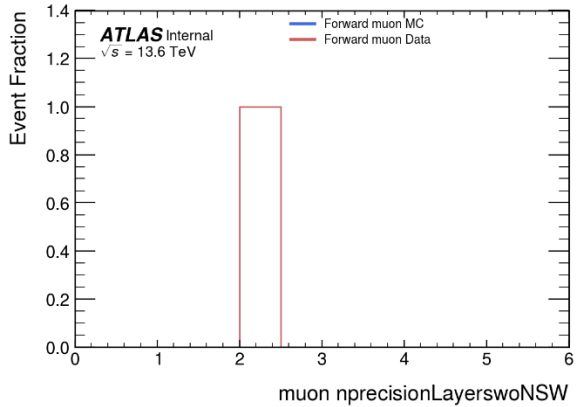
**BackUp**

# Additional Plots – SA Muon Type

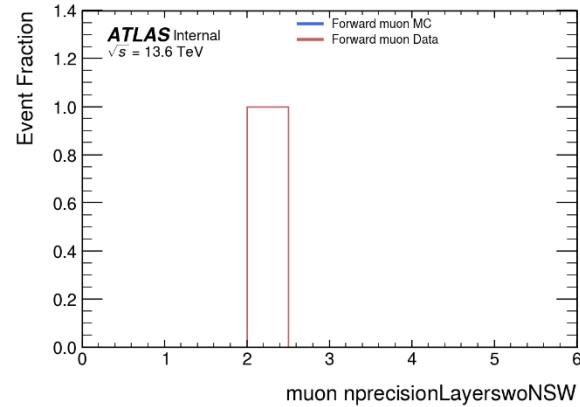


# Additional Plots – Test Eta Range

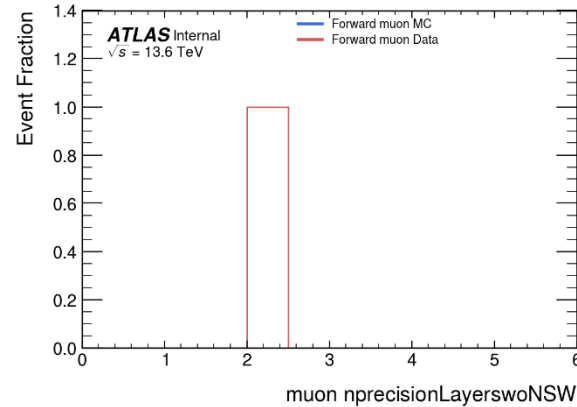
$|\eta| \geq 2.4$



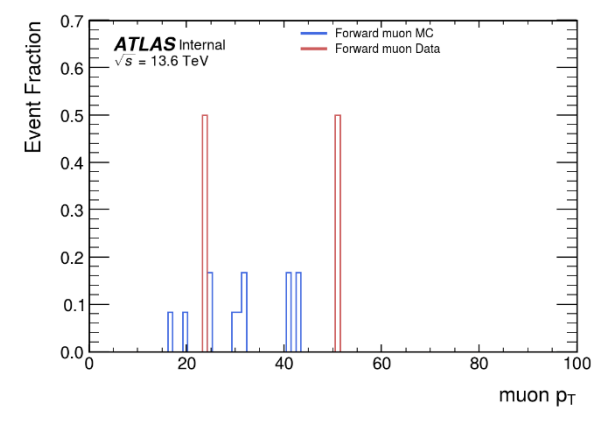
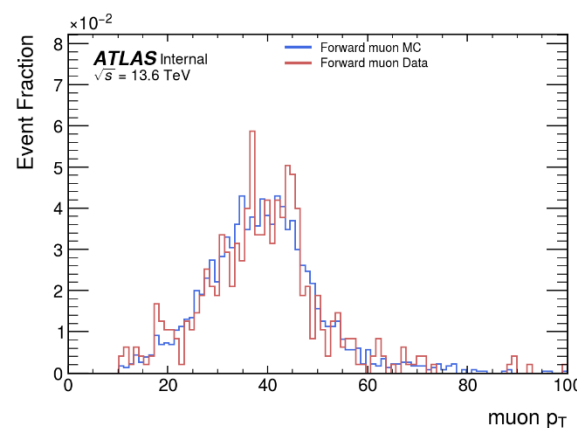
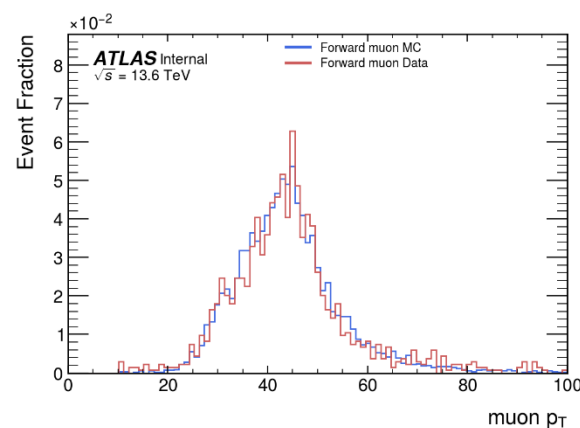
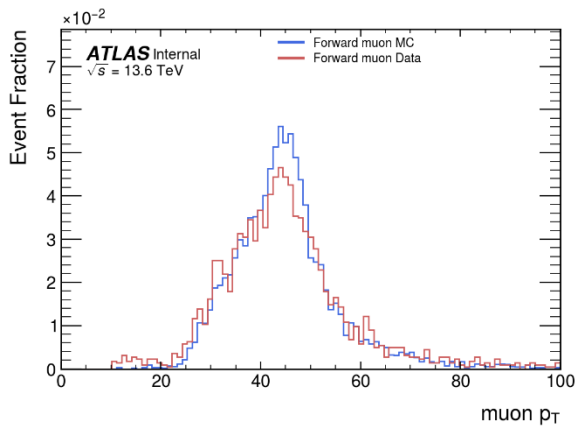
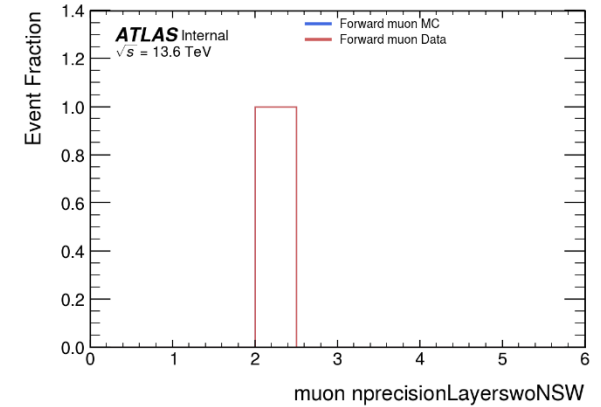
$|\eta| \geq 2.5$



$|\eta| \geq 2.6$



$|\eta| \geq 2.7$



# Previous Presentations

- [July 10th 2024](#)
- [July 24th 2024](#)