



Muon Isolation Efficiency Studies

Efficiency versus p_T in Different ΔR Regions

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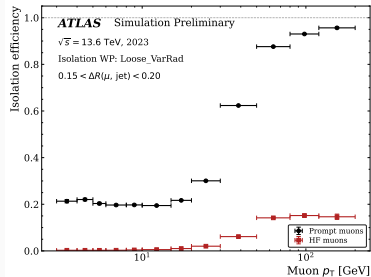
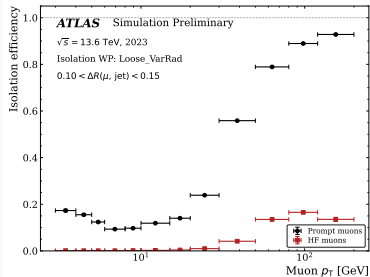
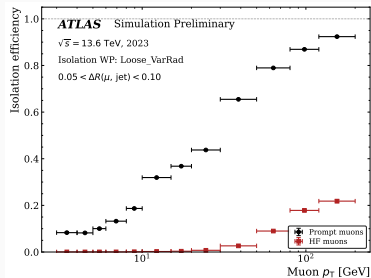
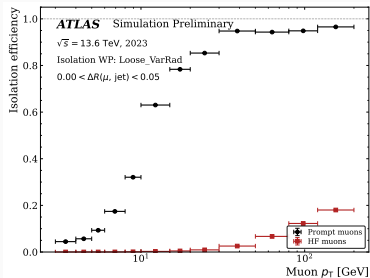
Mohammed V University in Rabat

Motivation

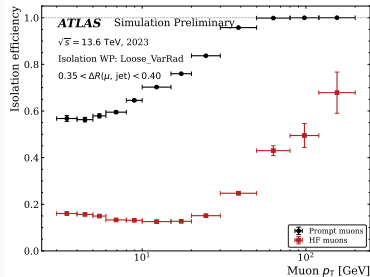
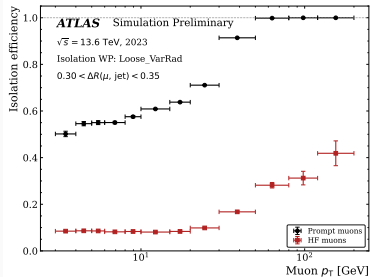
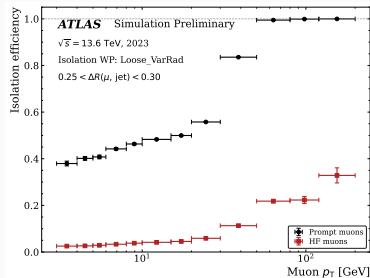
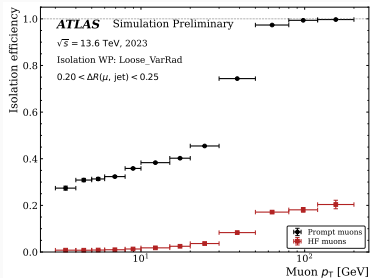
- Study the muon isolation efficiency as a function of transverse momentum p_T .
- Evaluate the efficiency in different $\Delta R(\mu, \text{closest jet})$ regions.
- Compare the behaviour of prompt muons and heavy-flavour muons.
- Understand the topology dependence of isolation performance.
- Optimise muon isolation working points for Run-3 analyses.

Loose Working Point

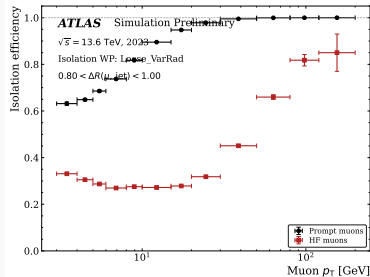
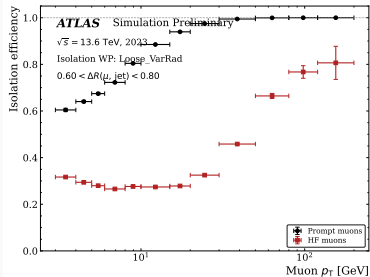
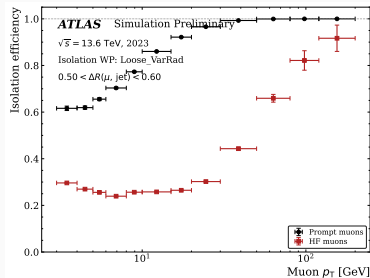
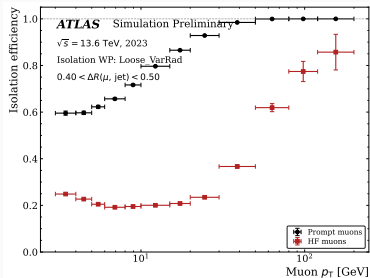
Loose WP: $\Delta R = 0.00 - 0.20$



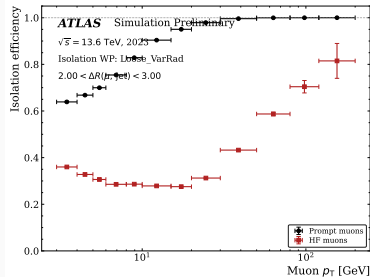
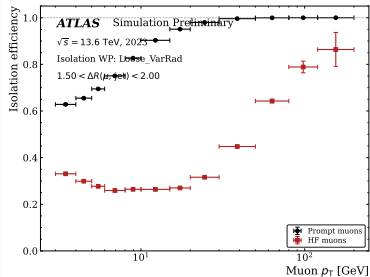
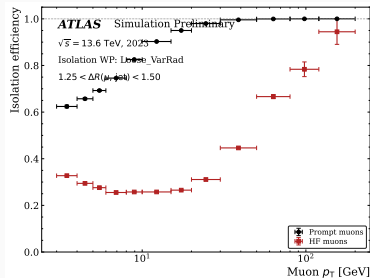
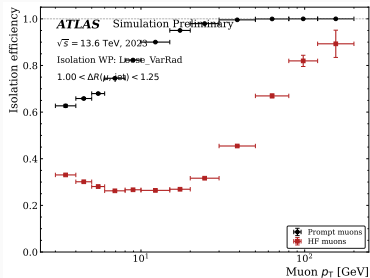
Loose WP: $\Delta R = 0.20 - 0.40$



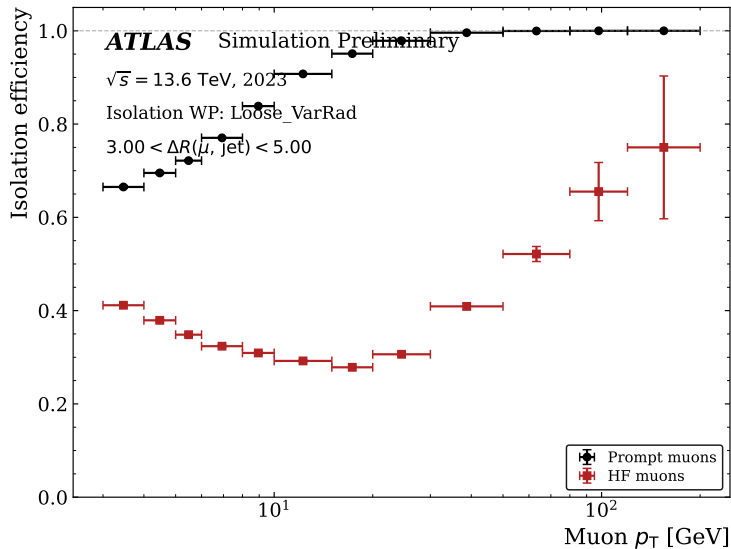
Loose WP: $\Delta R = 0.40 - 1.00$



Loose WP: $\Delta R = 1.00 - 3.00$

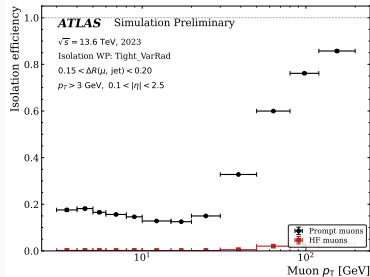
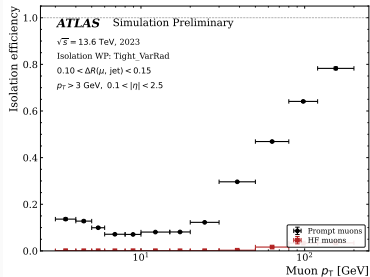
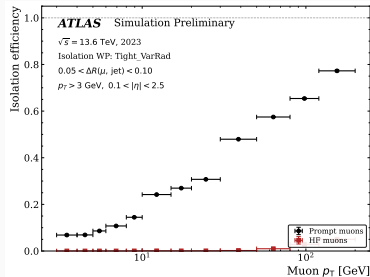
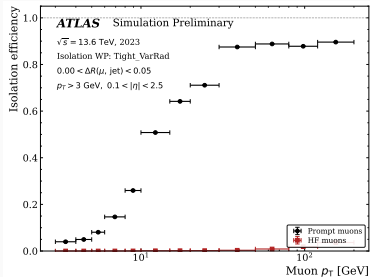


Loose WP: Very Large ΔR

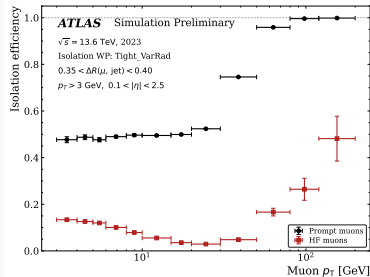
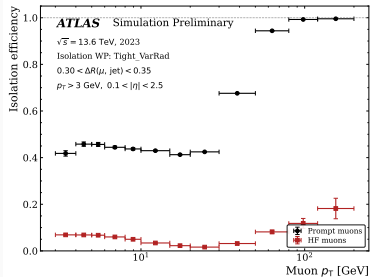
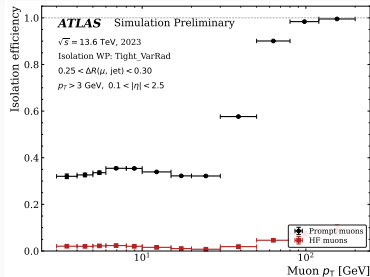
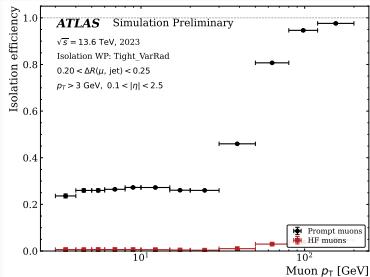


Tight Working Point

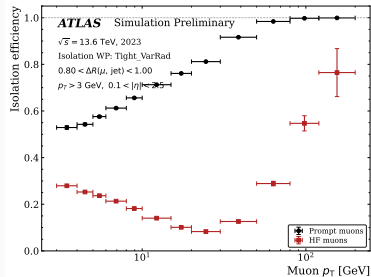
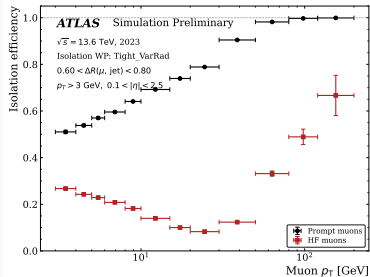
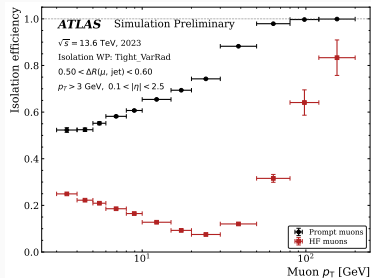
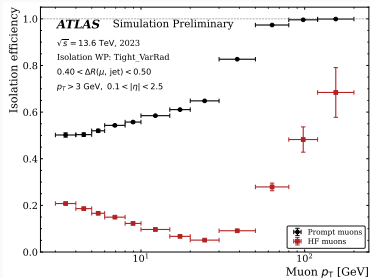
Tight WP: $\Delta R = 0.00 - 0.20$



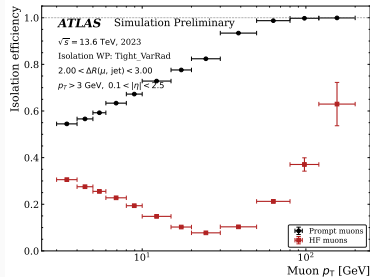
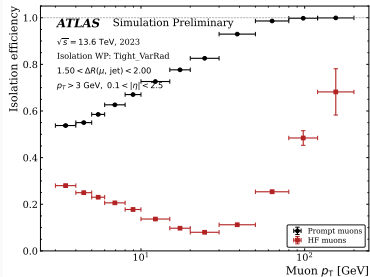
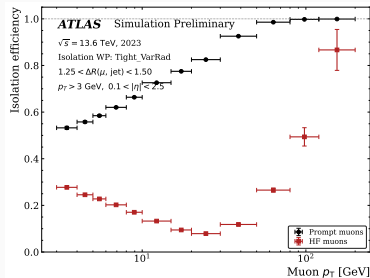
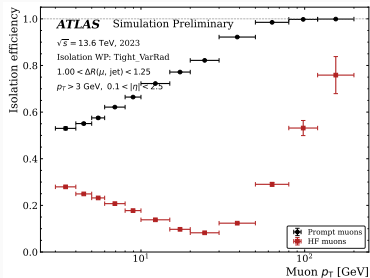
Tight WP: $\Delta R = 0.20 - 0.40$



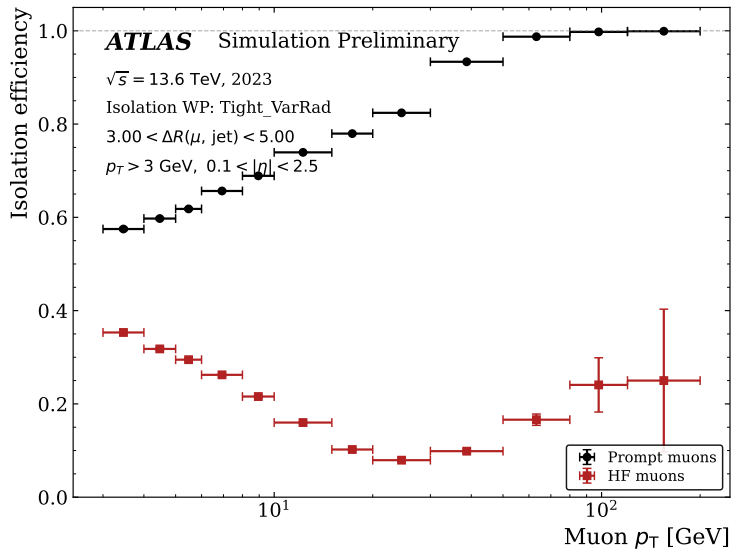
Tight WP: $\Delta R = 0.40 - 1.00$



Tight WP: $\Delta R = 1.00 - 3.00$



Tight WP: Very Large ΔR



- Isolation efficiency strongly depends on the topology of the event.
- Small ΔR regions correspond to dense environments where muons are close to jets.
- Heavy-flavour muons are more affected by nearby hadronic activity.
- The Tight working point provides stronger rejection but can reduce efficiency.
- At large ΔR , both working points become more stable.

- Muon isolation efficiency was studied in multiple ΔR regions.
- Both Loose and Tight working points were investigated.
- Clear topology dependence was observed.
- The comparison between working points helps optimise Run-3 muon selections.
- These studies are important for precision ATLAS analyses involving muons.

Thank You