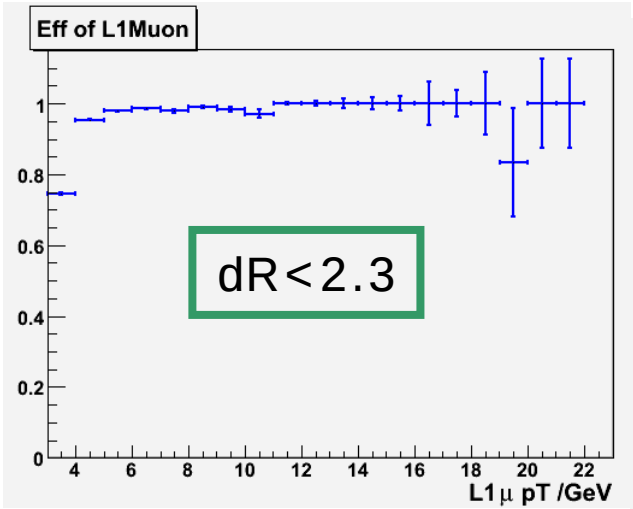
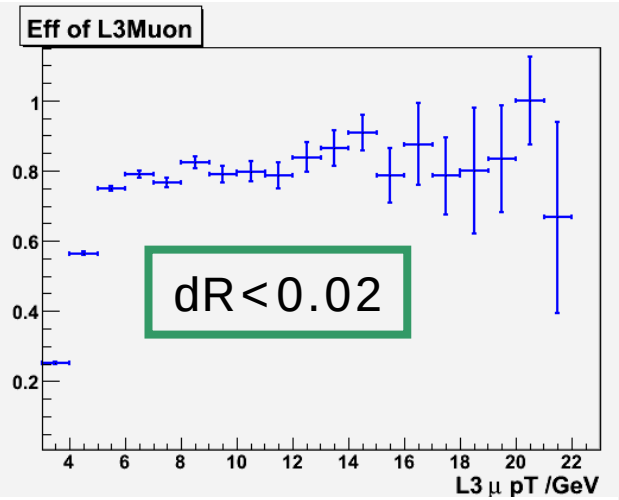
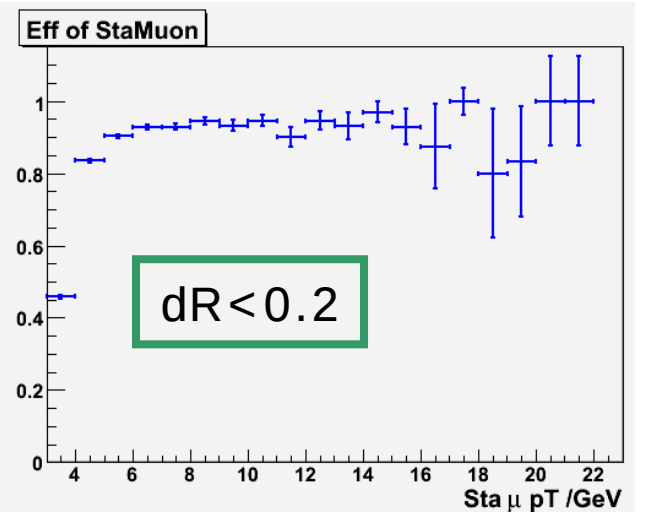
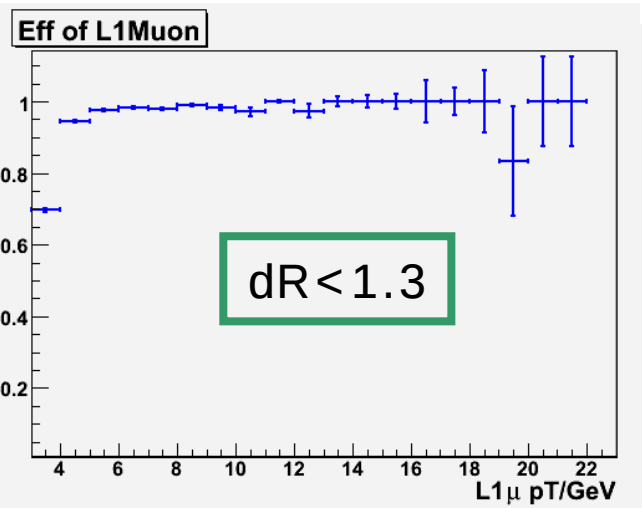
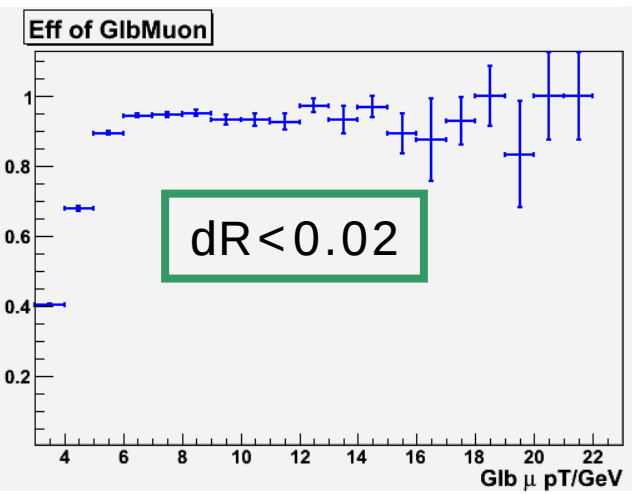
L1 , L1*L3, Sta,Glb & Tk: muon Eff. vs. pT

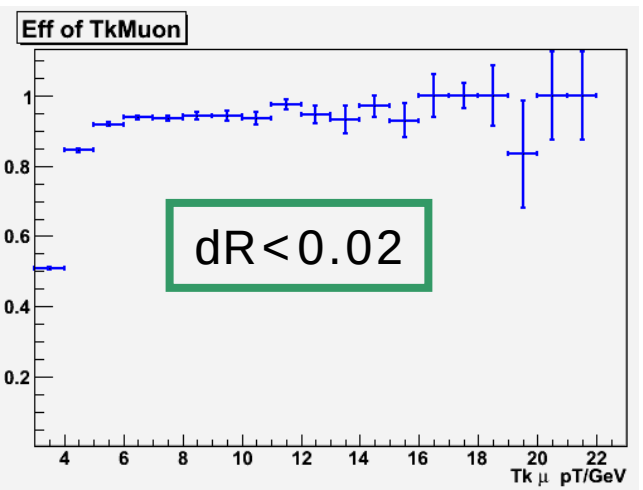




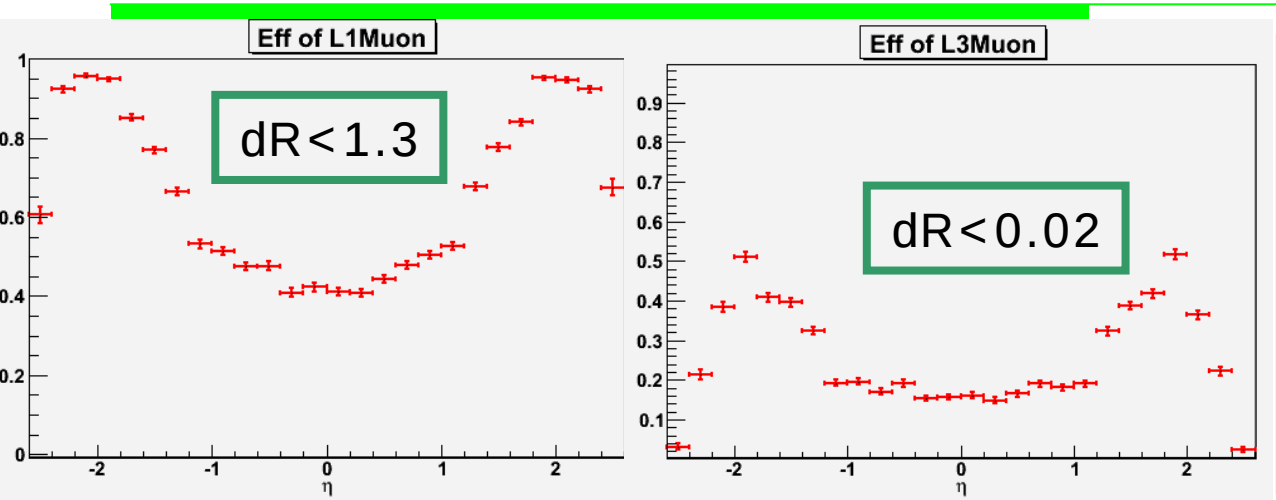


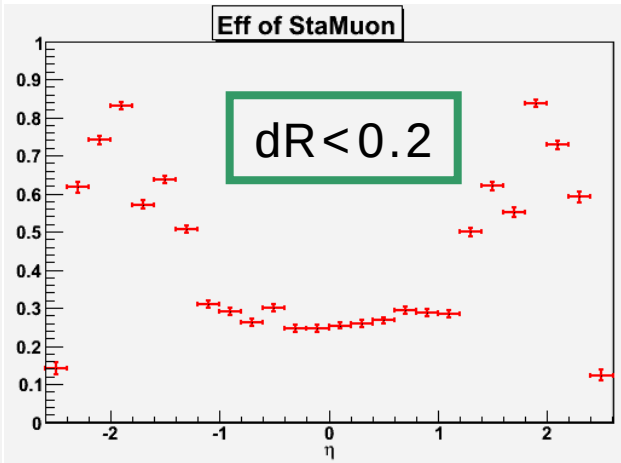


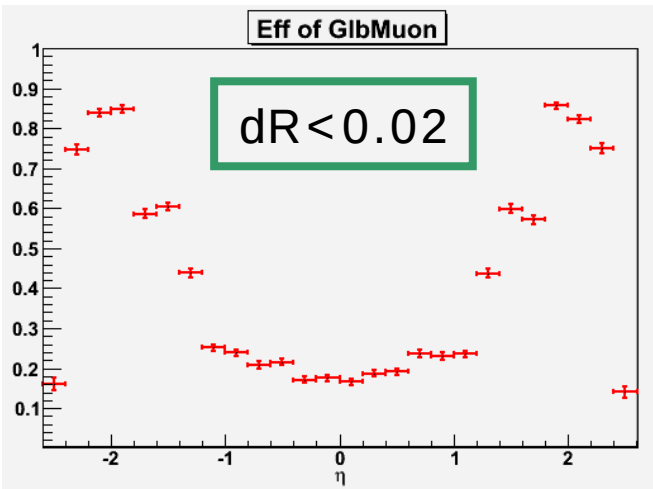


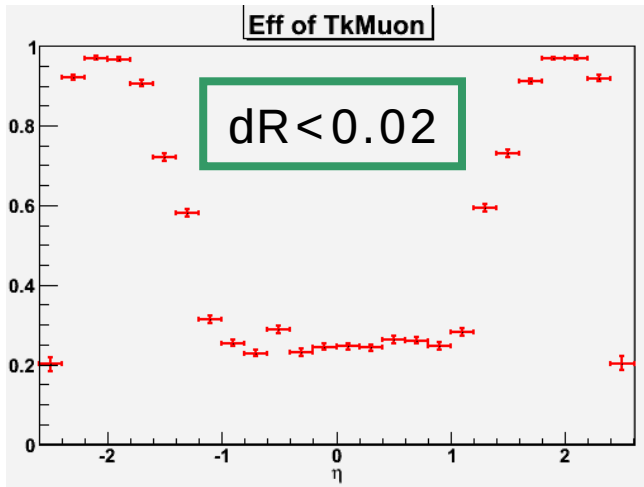


L1 , L1*L3, Sta,Glb & Tk: muon Eff. vs. η









Efficiency Measurements

- **The overall dimuon efficiencies of the measurement are assumed to be the product of several parts**

$$\varepsilon = \varepsilon_{\text{acceptance}} \times \varepsilon_{\text{trigger}} \times \varepsilon_{\text{offline}}^{2}$$

$$\varepsilon_{\text{trigger}} = \varepsilon_{\text{L1}} \times \varepsilon_{\text{HLT}}$$

$$\varepsilon_{\text{offline}} = \varepsilon_{\text{global}} \times \varepsilon_{\text{isolation}}$$

$$\varepsilon_{\text{global}} = \varepsilon_{\text{standalone}} \times \varepsilon_{\text{tracker}} \times \varepsilon_{\text{matching}}$$

- Choose a *tag* muon
  - A “high quality” reconstructed muon
- Choose a *probe* track
  - A probable muon in tracker or muon system
- Requiring $M_{\mu\mu}$ consistent with $M_{J/\Psi}$ yileds a high-purity and almost unbiased sample of *probe* muons

Description of TAG and PROBE

TAG	**Global muon with p_T > 5GeV** **Associated to a L3 muon**

Probe Type	Description
Golden	Global muon that is also a TAG
Matched	Global muon that is not a TAG
Unmatched	Tracker track AND Standalone muon found, but they are not associated with a Global Muon
Tracker Only	Only a tracker track
Stand Alone Muon	Only a standalone muon

With the five types of probes, we get five combinations of tag-and-probe: GG, GM, GU, GS, GT

Tracking and Matching Efficiencies

- Standalone, Tracking, and Matching efficiencies calculated with simple event counting

$$\varepsilon_{\text{standalone}} = \frac{2N_{GG} + N_{GM} + N_{GU}}{2N_{GG} + N_{GM} + N_{GU} + N_{GT}}$$

$$\varepsilon_{\text{tracker}} = \frac{2N_{GG} + N_{GM} + N_{GU}}{2N_{GG} + N_{GM} + N_{GU} + N_{GS}}$$

$$\varepsilon_{\text{matching}} = \frac{2N_{GG} + N_{GM}}{2N_{GG} + N_{GM} + N_{GU}}$$

Glb Muon efficiency: Preliminary