

Muon Efficiency Monitoring



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MC offline analysis {DaVinci v24r4} on

626775 B inclusive

MC09 production

120771

selected by the Muon LO triggers

51269

confirmed by HL T1 Muon Alley

[Physics_320Vis_300LO_10Hlt1_Aug09]

Preselection



- @ select *long tracks* with $P > 3 \text{ GeV}/c$
- @ each track is extrapolated through the 5 stations of the muon detector with the *TrackMasterExtrapolator procedure*
for each extrapolated track *impact points* (x, y)
errors $(\text{err}_x, \text{err}_y)$
that take into account the Multiple Scattering contribution
- @ select tracks within the muon detector acceptance
- @ for each station look for the *closest hit* to the *impact point*
 $\{ (|x_{\text{hit}} - x| < \Delta x) \ \&\& \ (|y_{\text{hit}} - y| < \Delta y) \}$
 $\Delta x = \text{pad}_x + 3 \cdot x \text{ err}_x$
 $\Delta y = \text{pad}_y + 1.5 \cdot y \text{ err}_y$
- @ the track is selected as a *μ candidate* if we found ≥ 3 stations with *one hit associated to the track* (M2, M3, M4, M5)

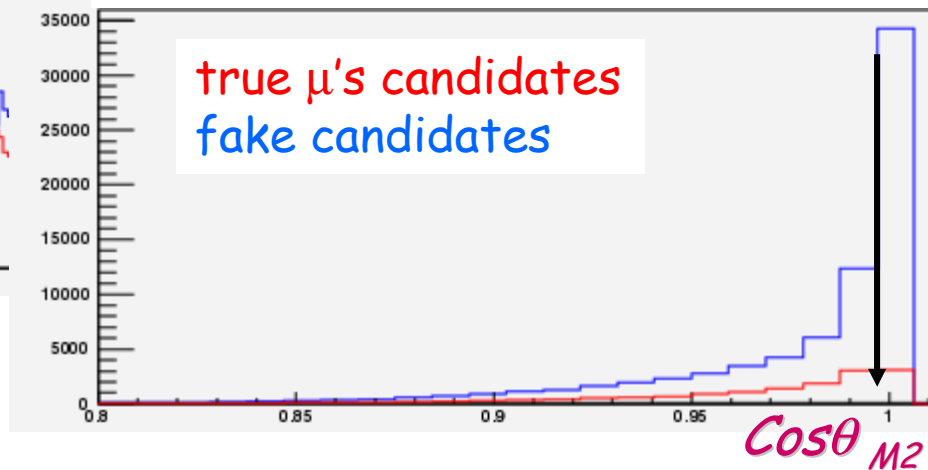
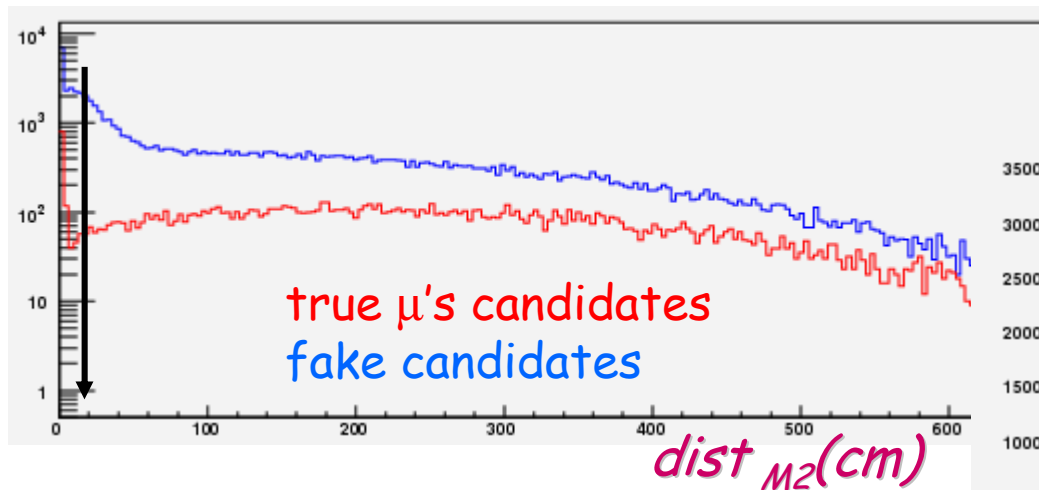
Selection (I)



⊙ for each event collects more than one track only if they are *well separated*

$dist_{M2}$ xy distance of the impact points on M2 of extrapolated tracks

$cos\theta_{M2}$ opening angle on M2

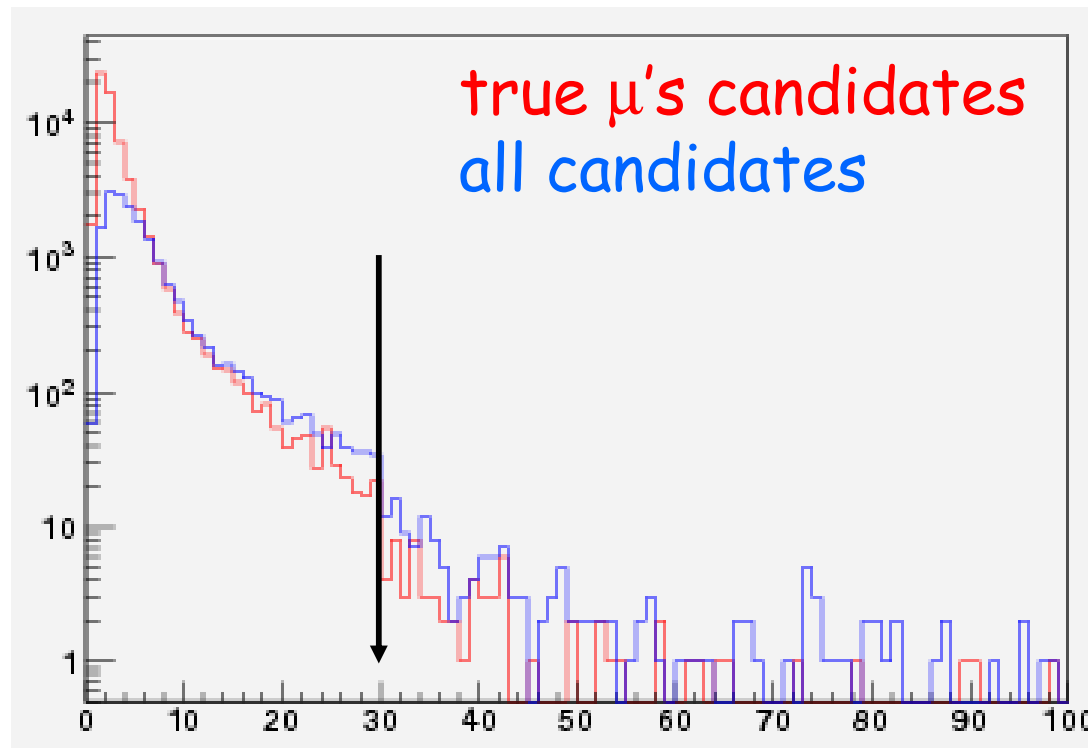


Selection (II)



@ for each track

$$\chi^2\text{-like} = \chi^2/\text{ndf} \{ \text{long tracks} \} + \sum_S \{ (x_{\text{hit}} - x)^2/\text{err}_x^2 + (y_{\text{hit}} - y)^2/\text{err}_y^2 \} < 30.$$

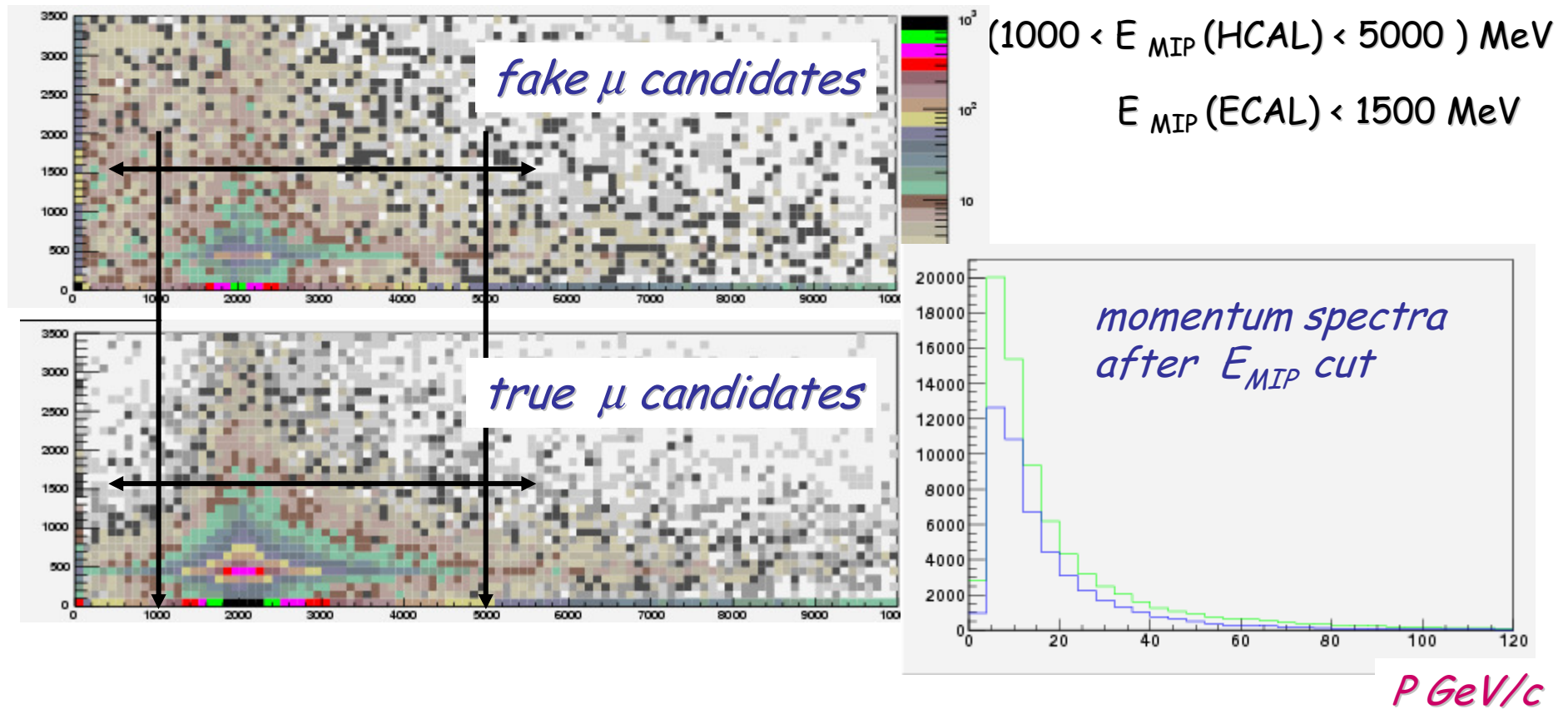


@ selection cuts $\chi^2\text{-like} < 30.$ && $\text{Cos}\theta_{M2} < 0.98$ && $\text{dist}_{M2} > 20.$ cm

Selection (III)



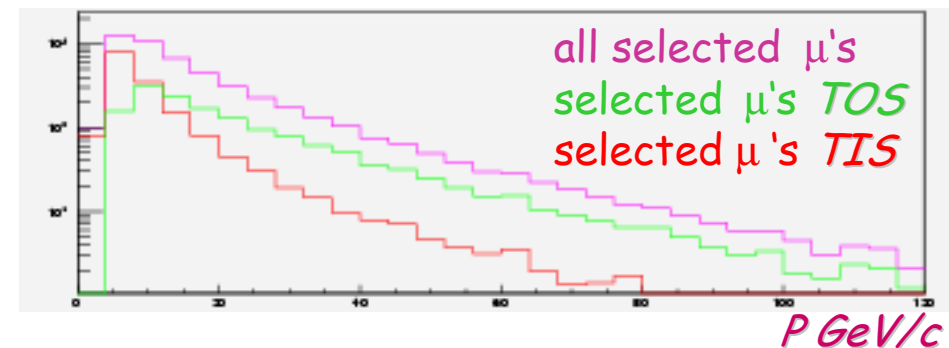
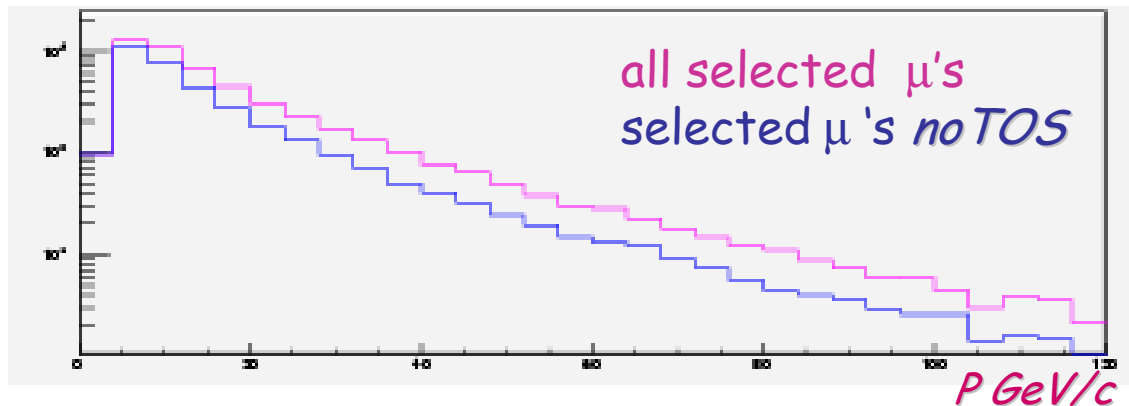
@ look at the energy released by the μ 's candidates, *Minimum Ionizing Particles*, in ECAL and in HCAL



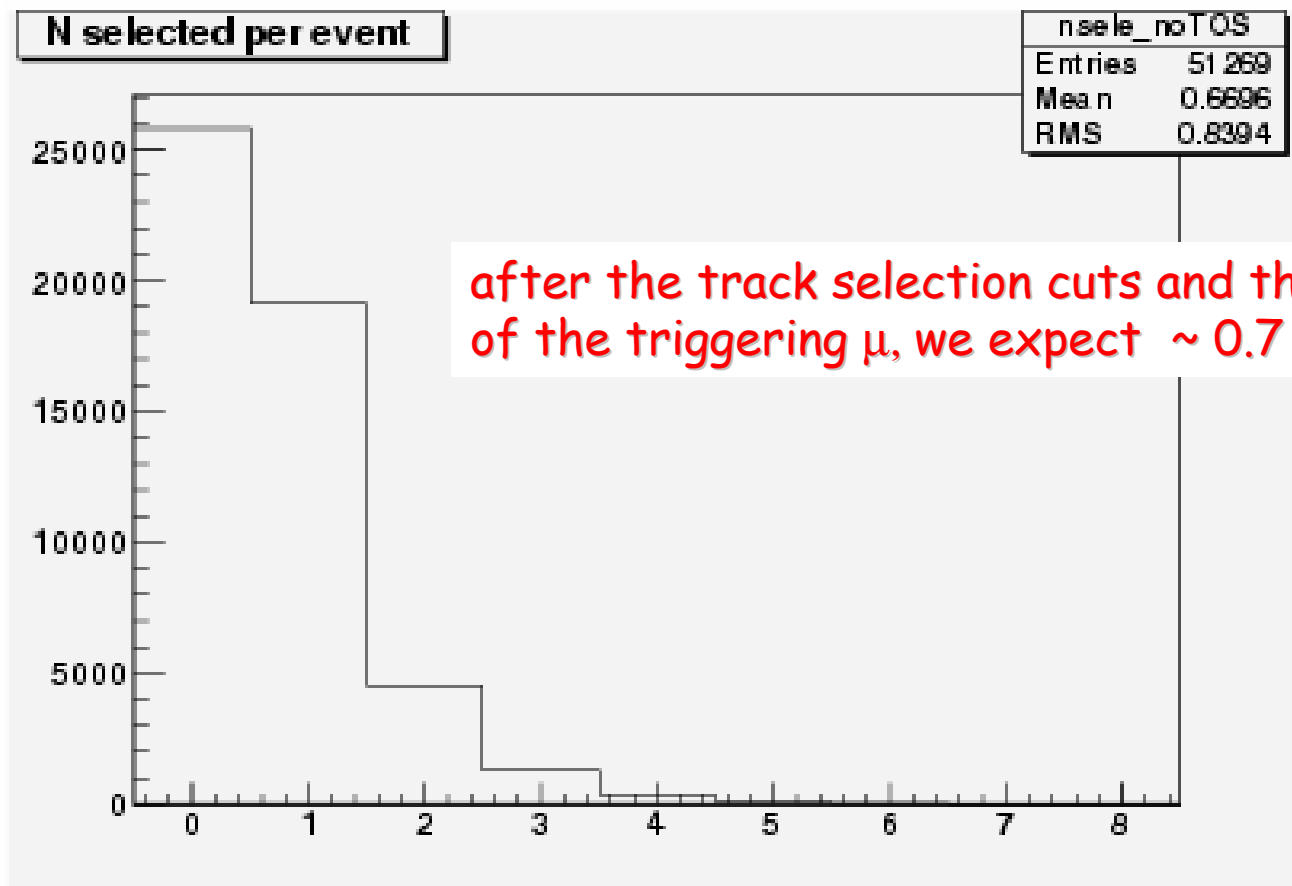
Triggering muon



- ⊙ the triggering μ is identified using the *ITriggerTisTos tool*
the "*offline input*" is defined as the
selected track + the list of associated μ hits
- ⊙ the triggering μ corresponds to the "*offline input*" identified as *TOS*

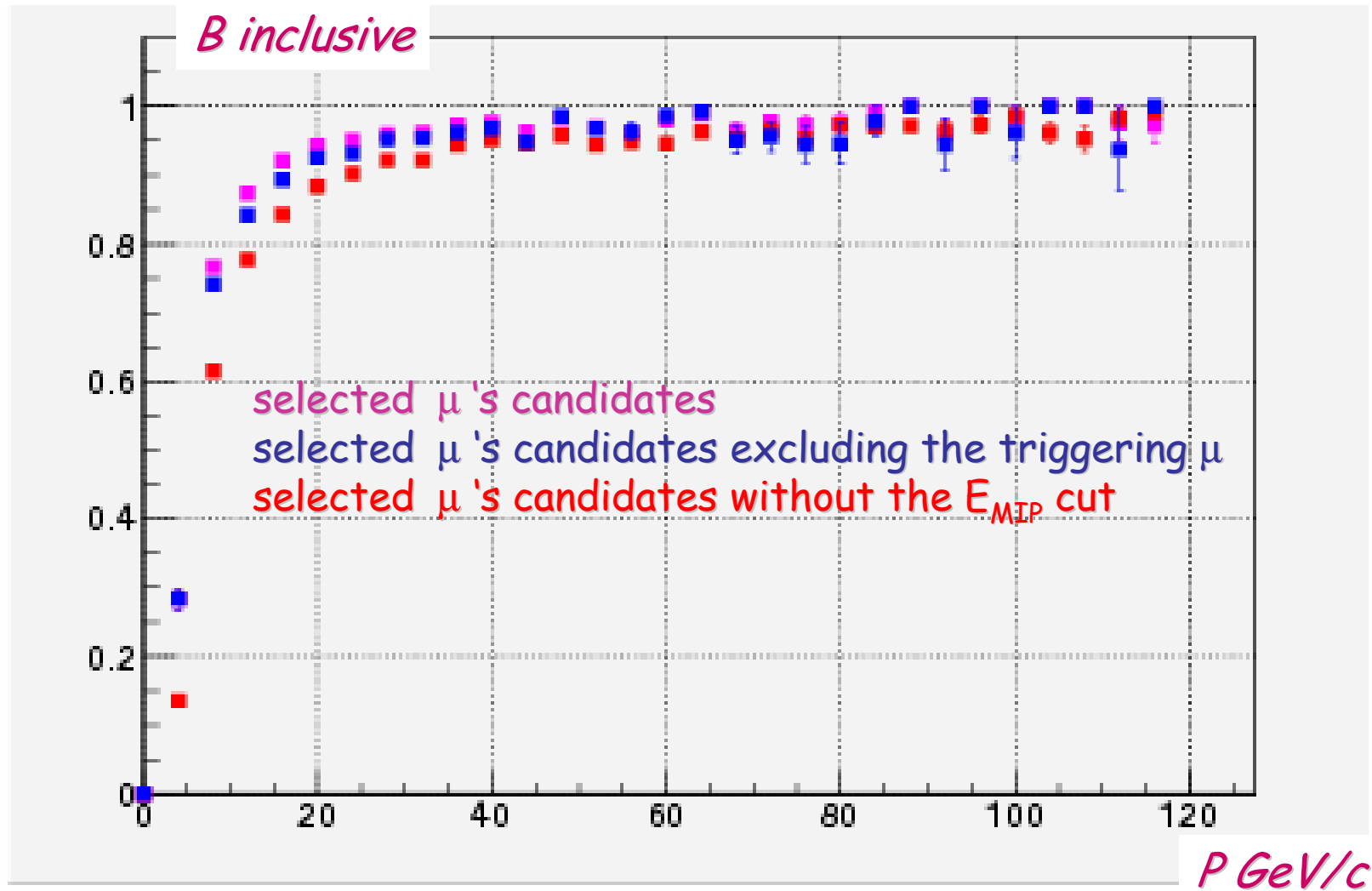


rates



~ 0.5 track/minimum bias event (15700 HLT1 μ -alley minimum bias events)

Purity of the μ candidates sample (I)



Purity of the μ candidates sample (II)



- true μ 's candidate from the MC truth

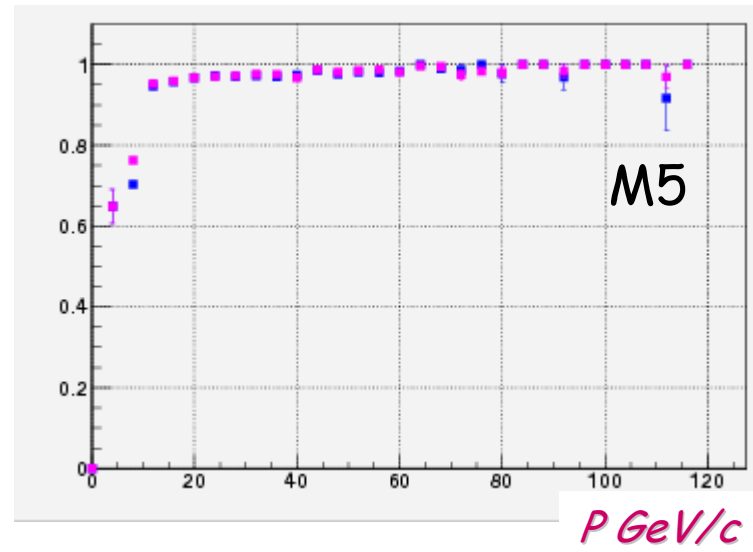
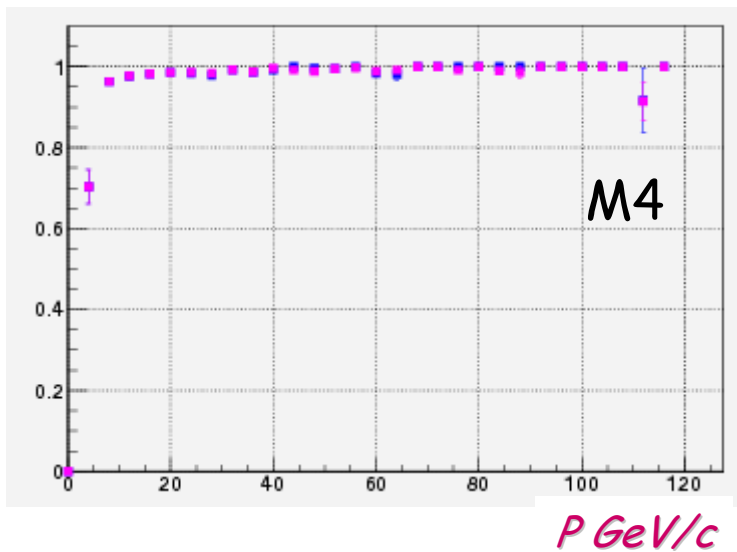
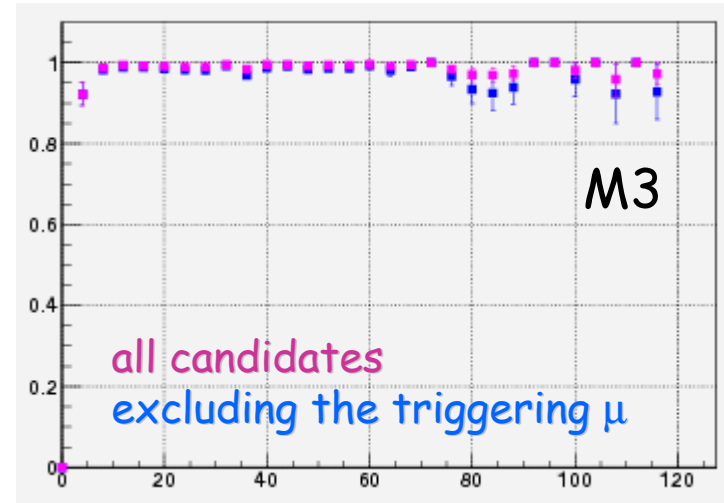
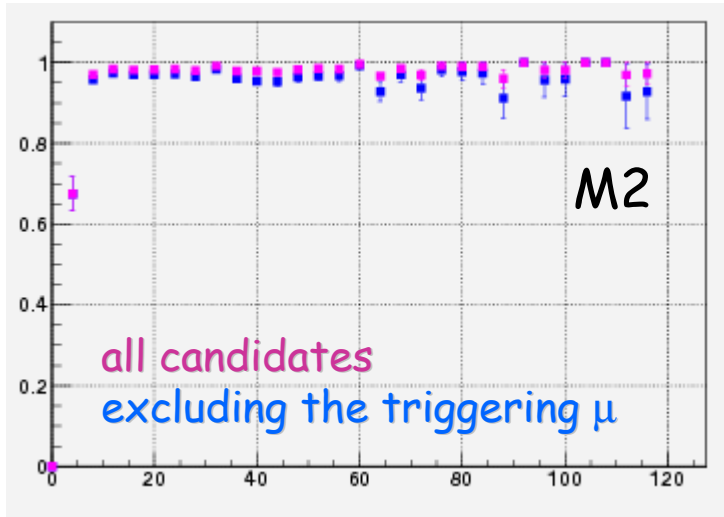
muons from the Interaction Region

muons from the decays in flight of π 's and K's

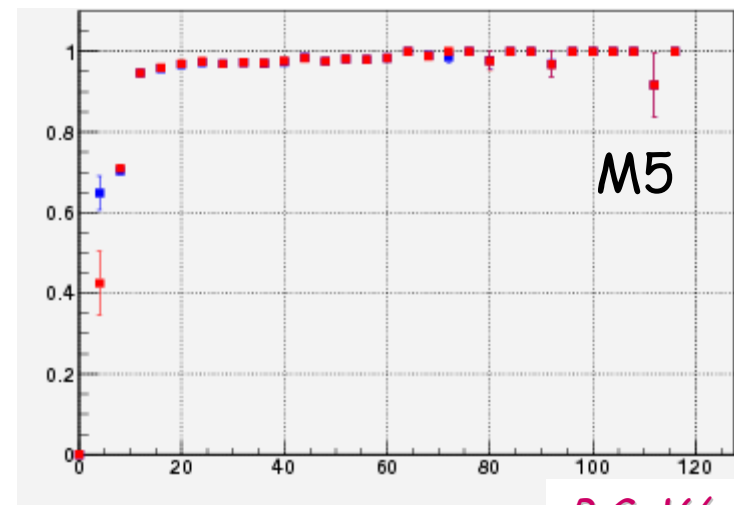
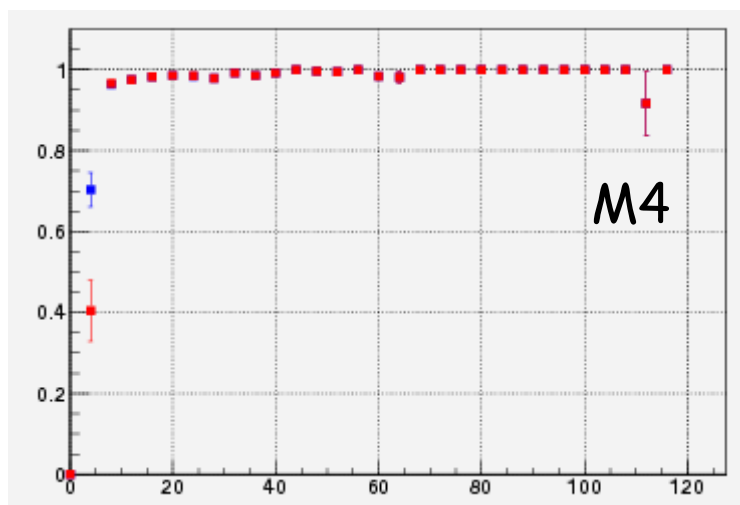
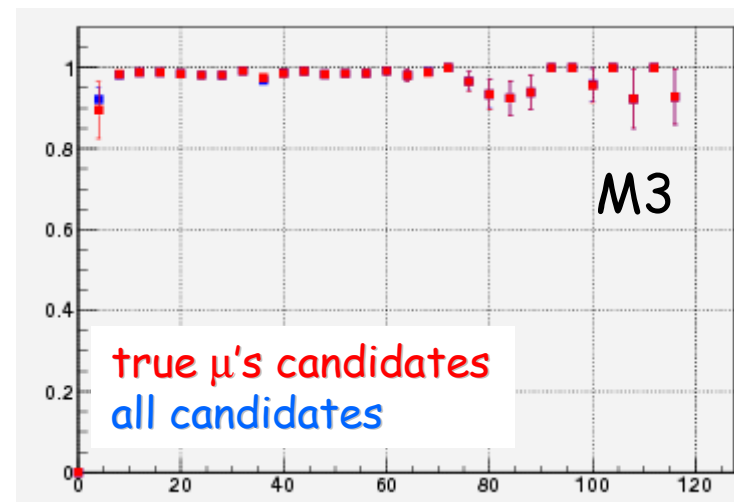
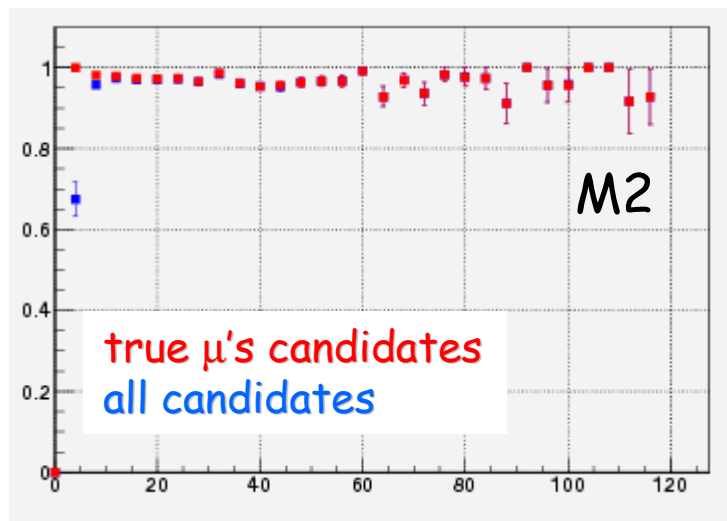
- fake μ 's candidate due to

ghost tracks (no relation with the MC truth) ~ 72%
 π 's ~ 25%
K's ~ 3%

μ stations efficiency *B inclusive sample*



μ stations efficiency *B inclusive sample*



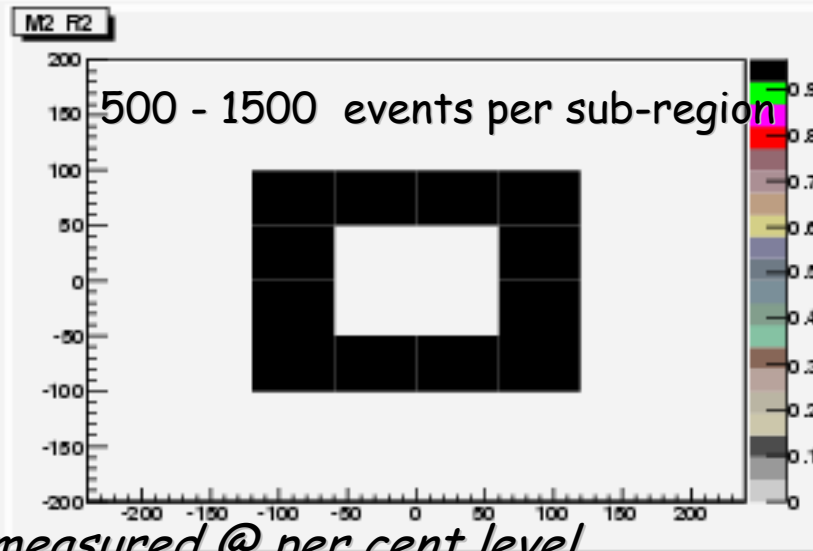
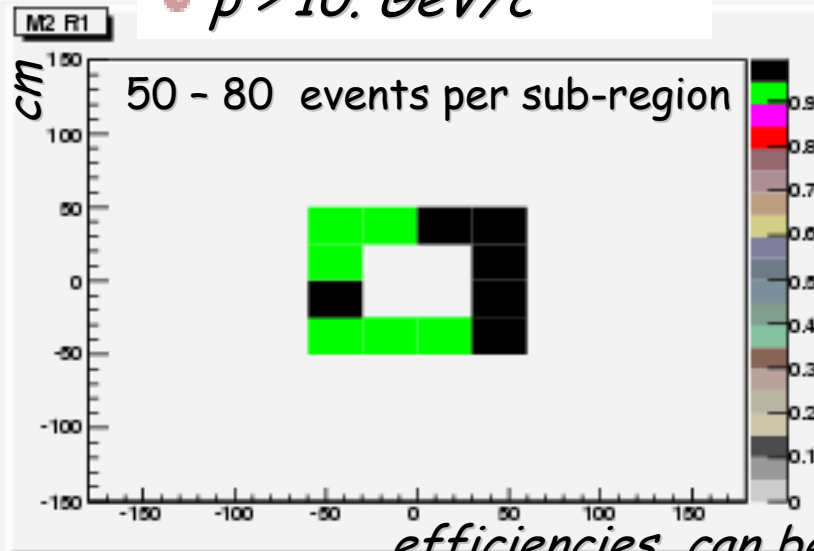
P GeV/c

P GeV/c

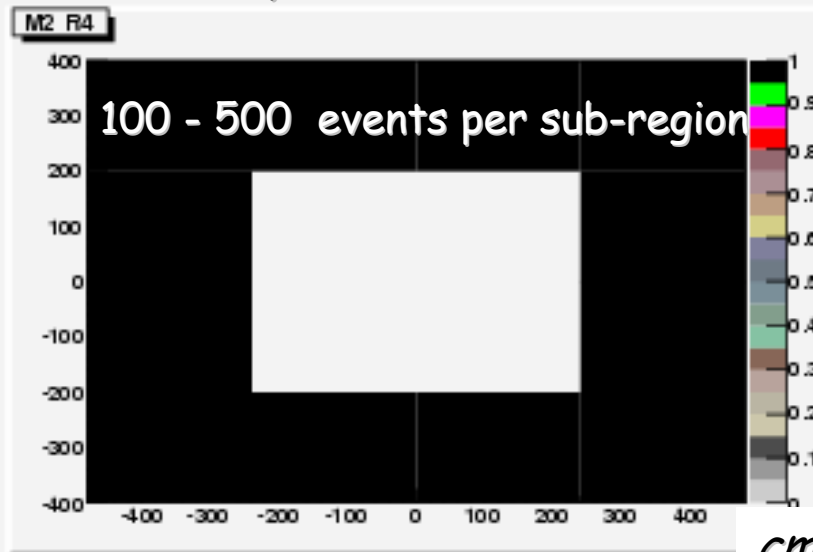
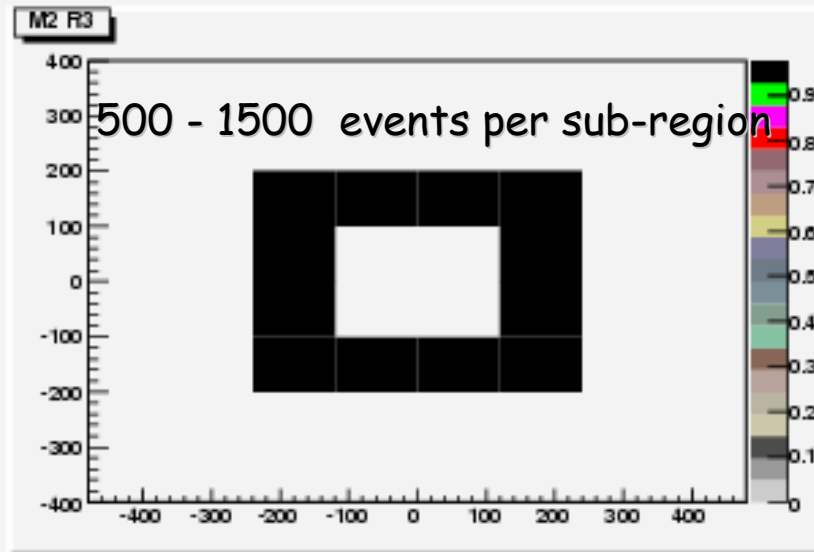
example: μ efficiency monitor M2



$p > 10. \text{ GeV}/c$



efficiencies can be measured @ per cent level



.. working on



Muon candidates from the **MuonID** package

→ *MuonTracks with 3 hits over 4*

● to port the procedure to evaluate
the chamber efficiency in **MuonTrackMonitor**