

Muon Performance in the Autumn Reprocessing

*Muon Combined Performance WG
O. Kortner (MPI), W Liebig (Bergen)*

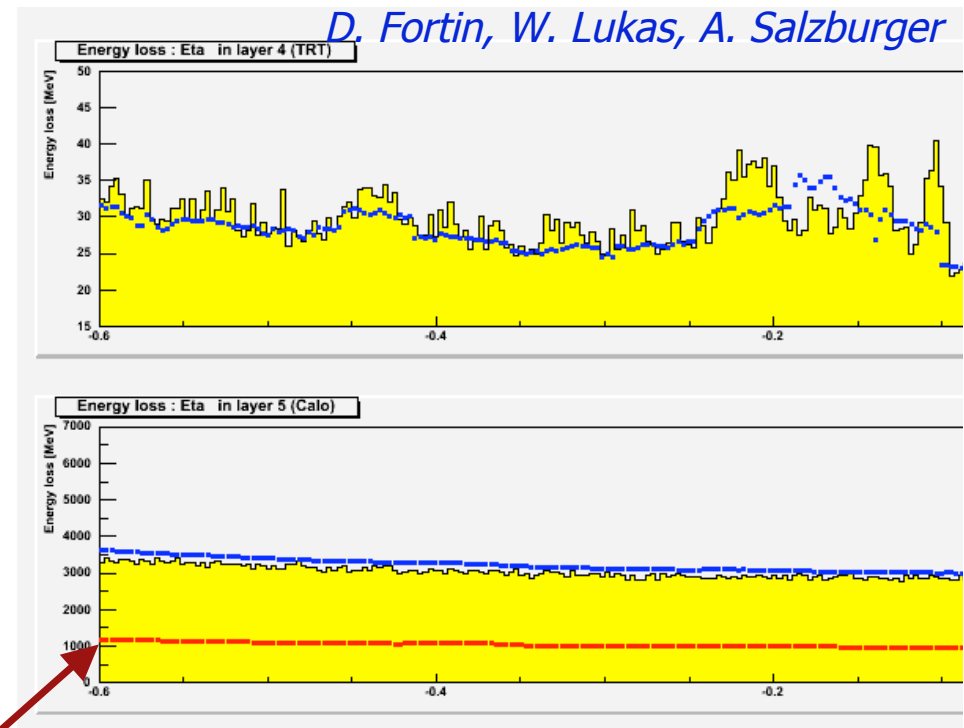


Muon Identification in Rel 16

Changes in Rel 16 affecting muons in StacoMuonCollection:

Full list of changes in talk by A.Ouraou
<http://indico.cern.ch/event/109084>

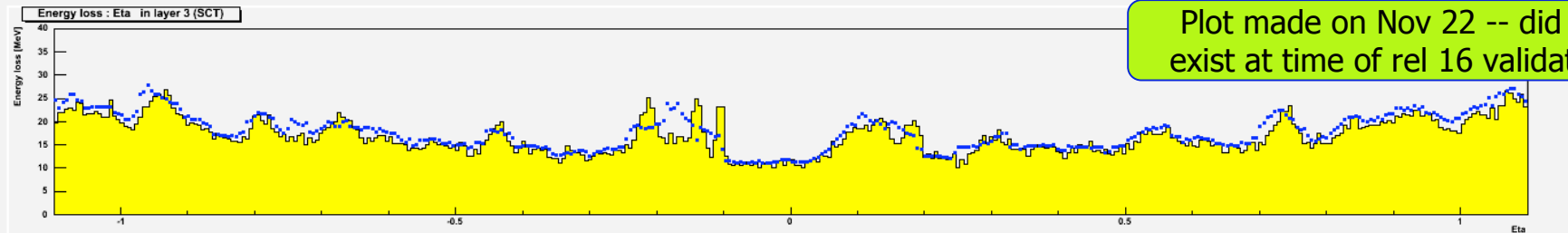
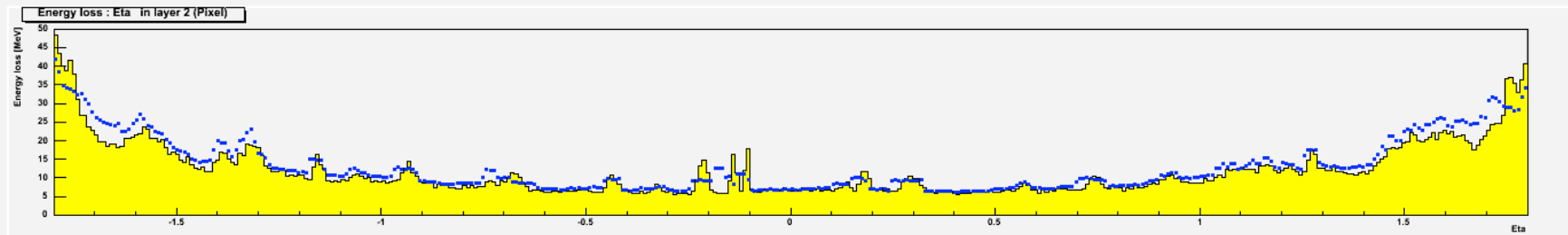
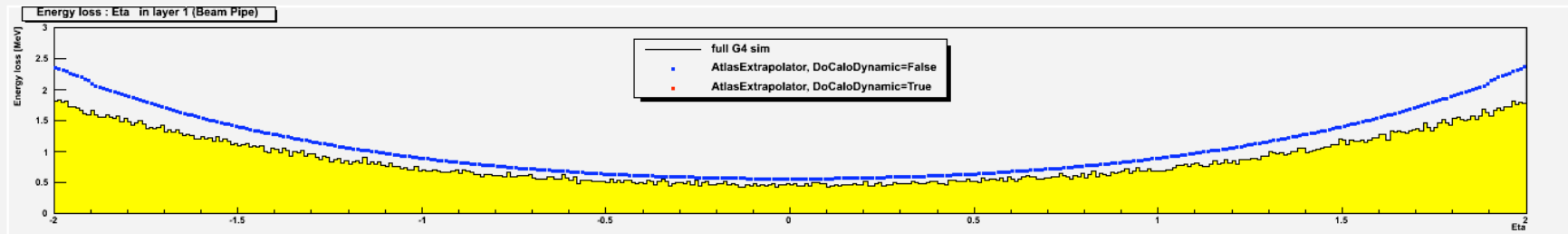
- Staco upgraded to better reject bad matches and decays-in-flight through construction of outside match chi2
 - employs extrapolation engine rest of Staco uses internal propagation
 - MuTag also uses extrapolation engine (unchanged)
- Reprocessing uses new ATLAS Geometries
- bug 75645 in Extrapolator
 - E-loss in calorimeter drastically underestimated for $> \text{GEO-10}$
- Not affected: MuidCB/MuGirl and fatras
 - Different tools or extrapolator setting



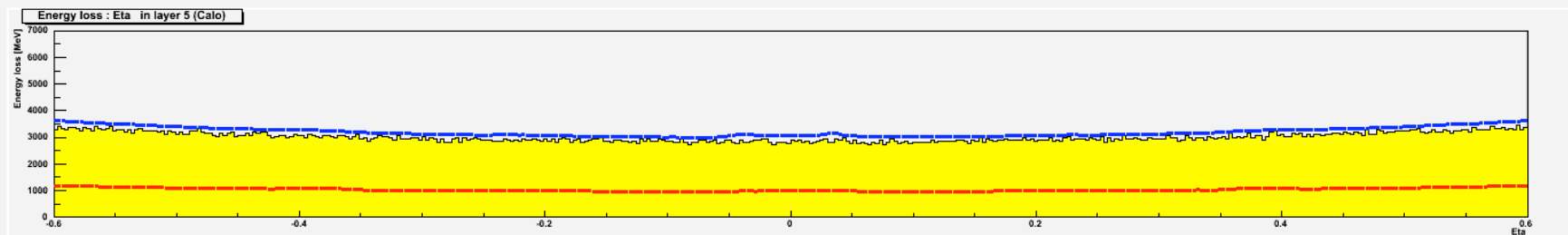
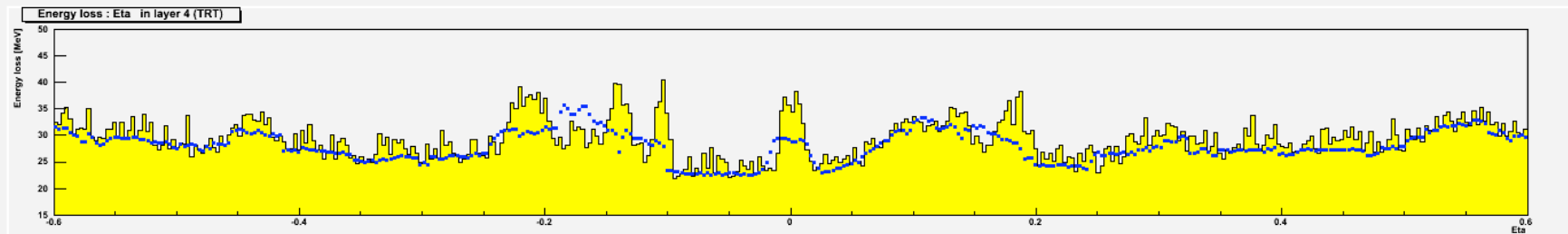
*~ 1 GeV avg E-loss instead of ~ 3 in **all** extrapolations through Calo* ²



Energy Loss Performance in Rel16



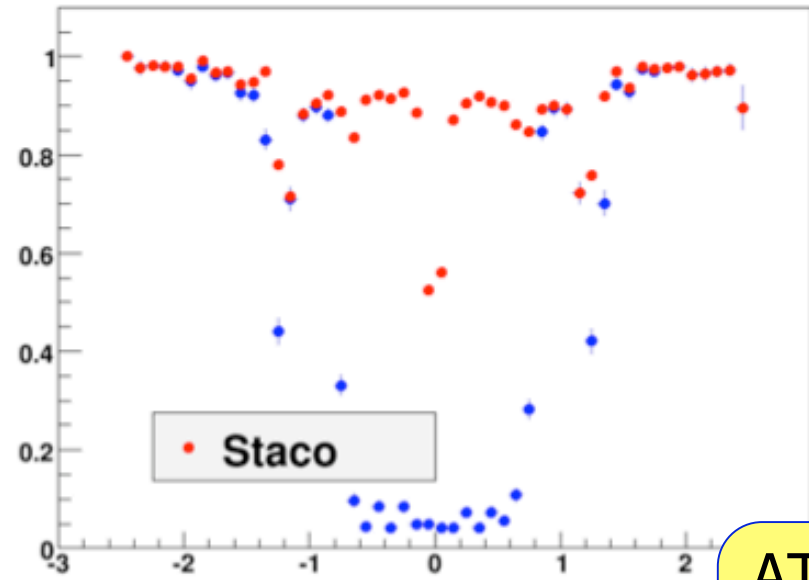
Plot made on Nov 22 -- did not exist at time of rel 16 validation



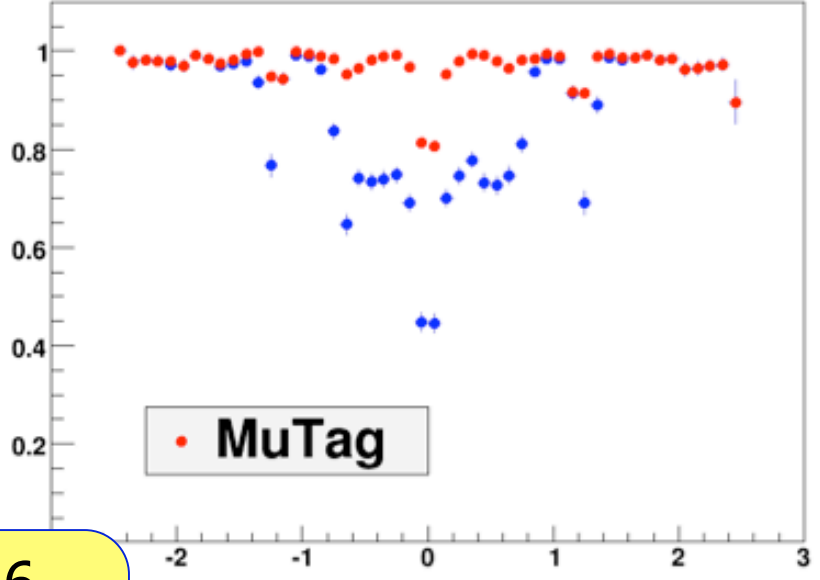
Effects on Low-Pt muons

J.F Laporte,
A. Ouraou,
F. Rauscher

effic vs eta pt5



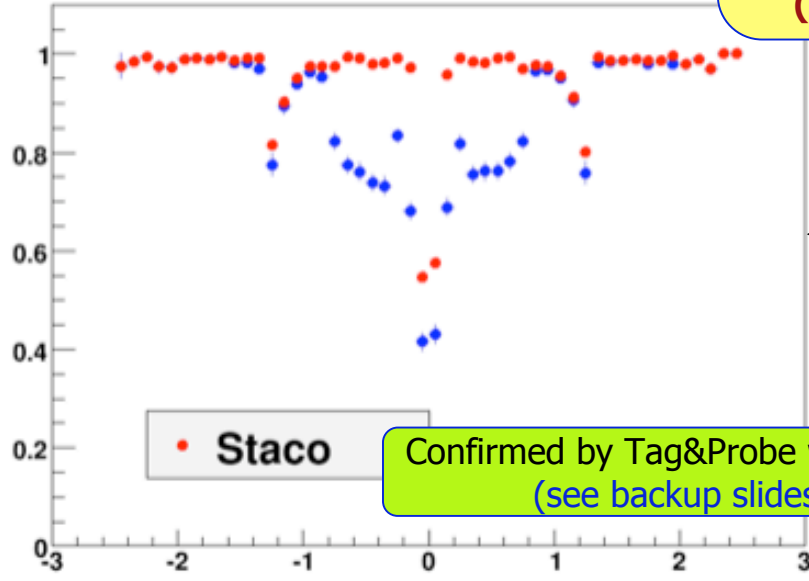
effic vs eta pt5



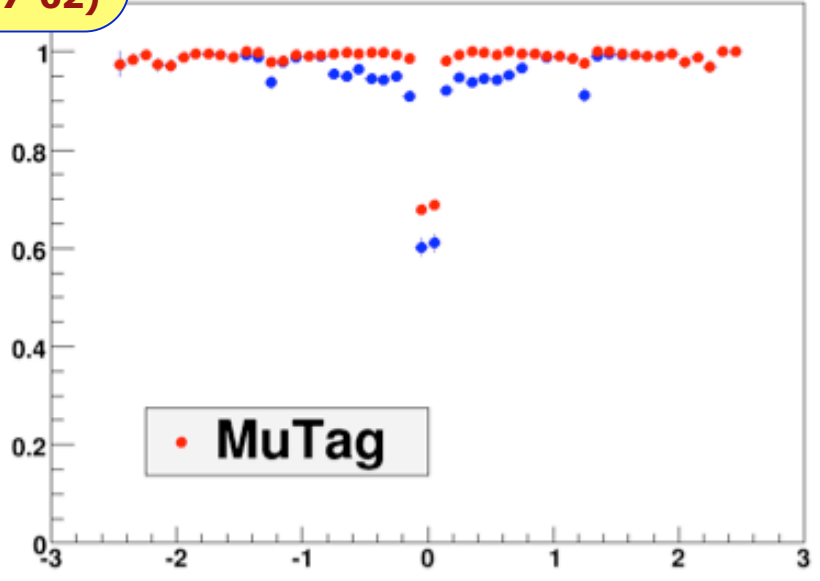
5 GeV
single μ

ATLAS GEO-16
● reprocessing
● proposed fix
(TrkExTools-02-37-62)

effic vs eta pt10



pt10



10 GeV
single μ

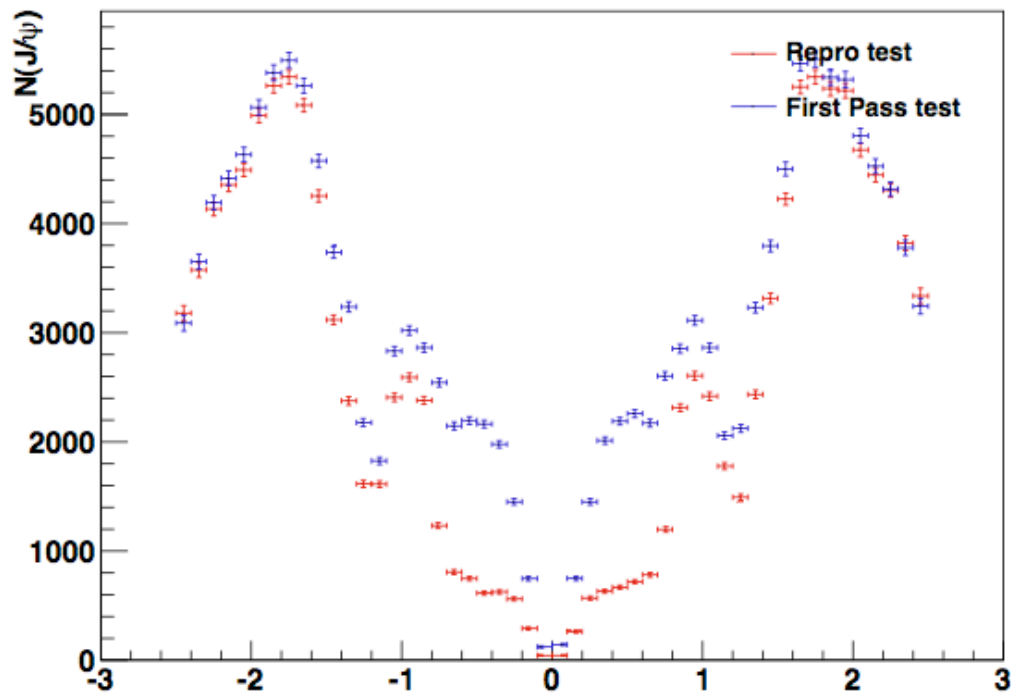
Confirmed by Tag&Probe with J/PSi
(see backup slides)



Effects on J/Psi

- Catastrophic loss of J/Psi eff.

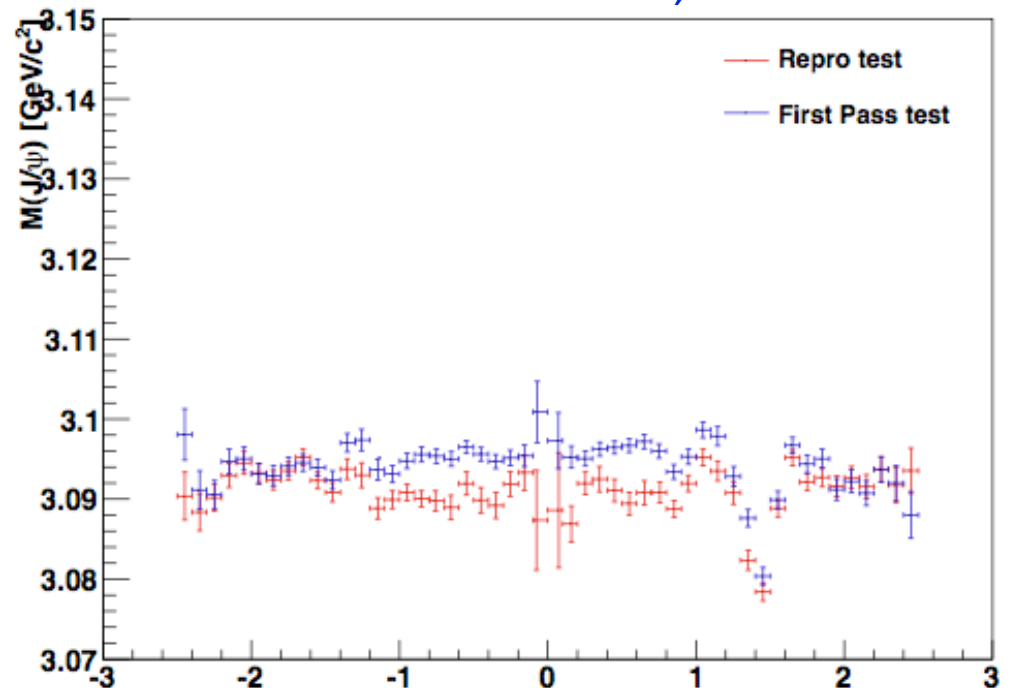
pEtaMax N



Analysis use at least one CB muon
Details <http://indico.cern.ch/event/114338>

- Mass shift -6 MeV
– compared to -2 MeV (Staco rel15)
and -2.5 MeV (Muid, rel 16)

pEtaMax μ



J. Catmore, M. Smizanska



Performance at High Pt

- We expect the effect of the bug is suppressed with increasing pT
 - in fact an efficiency drop was not noticed in the MCP preview processings for the Z- $\rightarrow\mu\mu$ workshop
- Needs to be further quantified in exact 15-16 comparison
 - studies started in Exotics Di-lepton subgroup
- Muon parameters and resolution are not affected
 - Staco combination made with internal extrapolation



Solutions

- Original bug fixed by TrkExTools-02-37-62
 - Being deployed to Tier0 (Pb-Pb)
 - Not yet scheduled for physics analysis and 2011 pp-collision cache (“frozen tier0”)
- Efficiency loss can be repaired from information on the AOD
 - algorithm in preparation by Saclay
 - testing & documentation ongoing
- Yet to be studied
 - Muon Isolation (uses Extrapolator, ALL muons)
 - Missing ET muon term for StacoMuonCollection



Post-Mortem (PRELIMINARY)

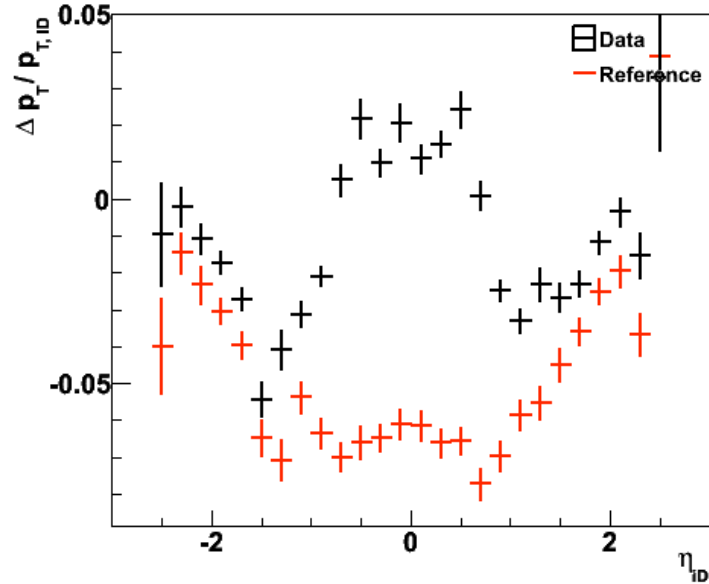
- Developer preparation of R16 **PASSED**
 - All based on Geo-08
- Extrapolation Validation of R16 **PASSED**
 - Tracking Geometry correctness is monitored, but not all its uses in Extrapolator
- Physics Validation of Sample-A **PASSED**
 - MC based on Geo-08
 - Data: small loss at the Z reported, compatible with expected tightening
- (MCP RTT) - under construction
- MCP Offline DQ **PASSED**
 - reduction of number of low pT CB muons reported and misinterpreted as over-tightening working point,
 - report not reproduced on MC with old GEO (no assumption of GEO-dependent bug)



Look back at DQ

$\Delta p_T/p_{T,ID}$ vrs η_{ID}

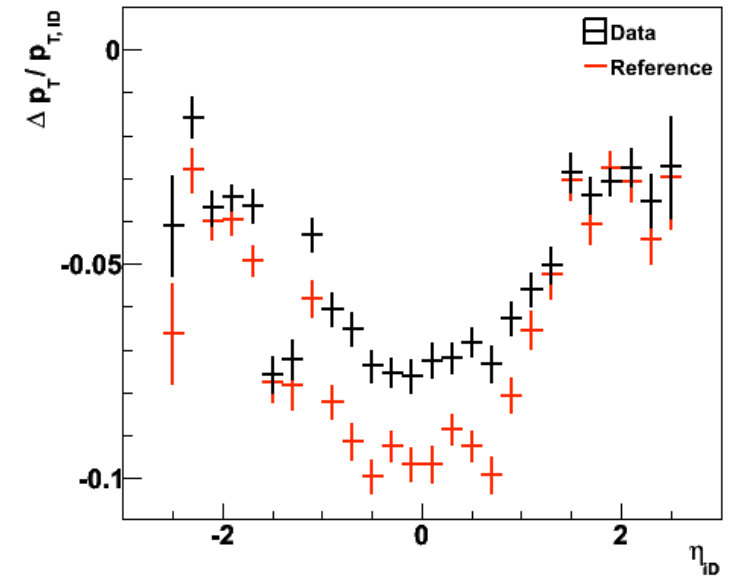
Staco



Run 166097, 301774/express_express
/MuonCombined/AllHists/Staco/mucbrk_dpTvseta

$\Delta p_T/p_{T,ID}$ vrs η_{ID}

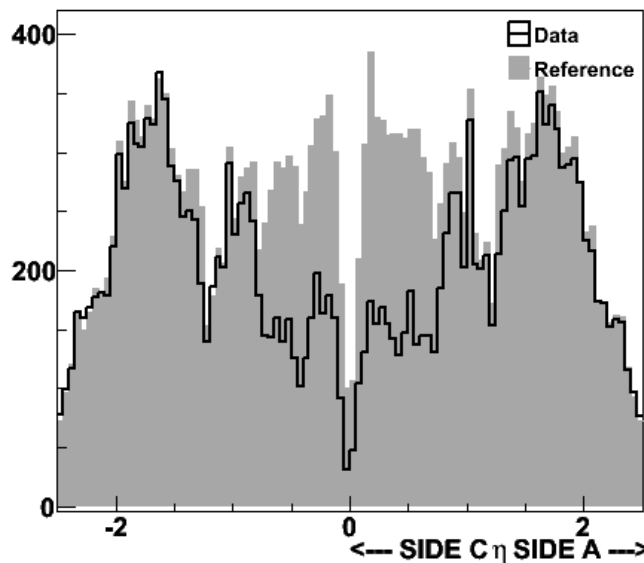
MuidCB



Run 166097, 301774/express_express
/MuonCombined/AllHists/MuidCB/mucbrk_dpTvseta

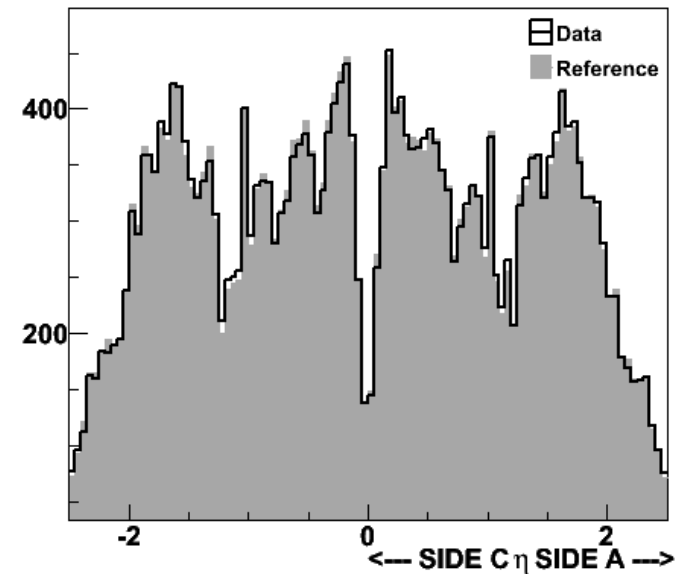
~ expected
better decay-in-flight rejection

η for combined muons



Run 166097, 301774/express_express
/MuonCombined/AllHists/Staco/mucbrk_Rec_eta

η for combined muons



Run 166097, 301774/express_express
/MuonCombined/AllHists/MuidCB/mucbrk_Rec_eta

← One of very few existing repro DQ plots that expose effects of bug

Actions towards physics analyses

- Preparation of an AOD fix
 - recuperate MuTag from segments + ID track particles
 - re-create lost Staco muons from MuTag+Muonboy “broken” muons
 - run in a release with TrkExTools fixed
 - re-calculate dependent physics objects (Missing ET...)
- Note this is a first serious deployment of an AOD fix
 - generally foreseen by MCP, thus info present on AOD
 - repeating ESD->AOD part of repro prohibited by MC (10% ESD kept)
- Once ready, plan is to deploy as pre-Include for central DPD making jobs plus TrkExTools tag
- Deployment to “frozen” 16.0.x.y release?
Preferrably
 - if performance on fixed AOD equivalent to new data (2011) with fix
 - avoid writing buggy collection for expected high statistics in spring 2011

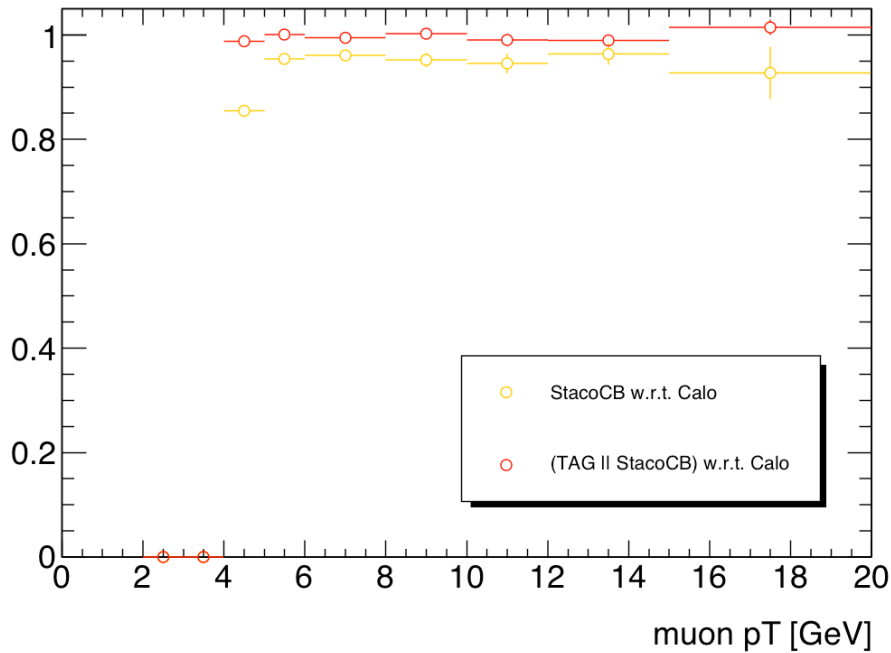
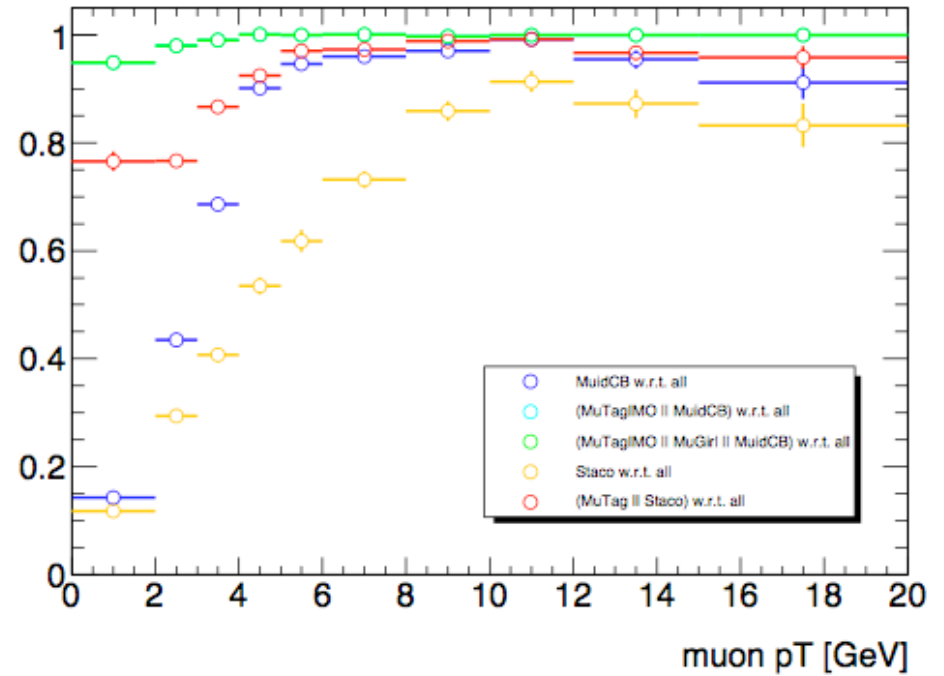
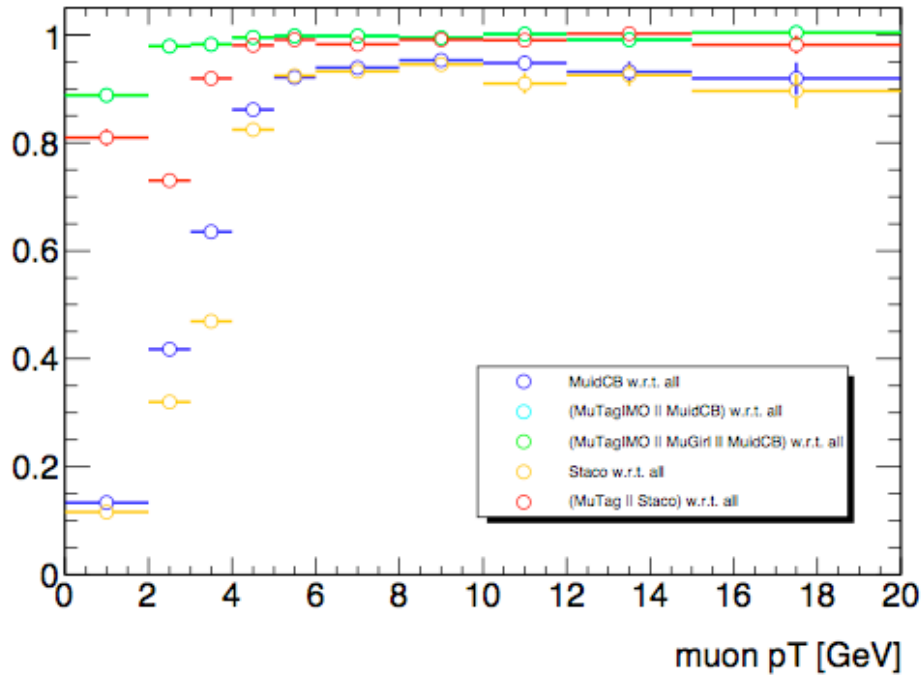


Actions towards validation process

- Improving offline data-quality
 - move some of the expert plots to general shifter use, add simple efficiency calculations to monitoring
- Re-deploy a MuonCombined RTT
- Physics Validation ?
 - e.g. add plots from slide 5 to physics validation
- Guidelines for selecting muons in rel 16 are under preparation



BACKUP: More studies on Low-Pt μ



← With TrkExTool fix

