

Low p_T Muon Trigger with ROD: Status and Plans

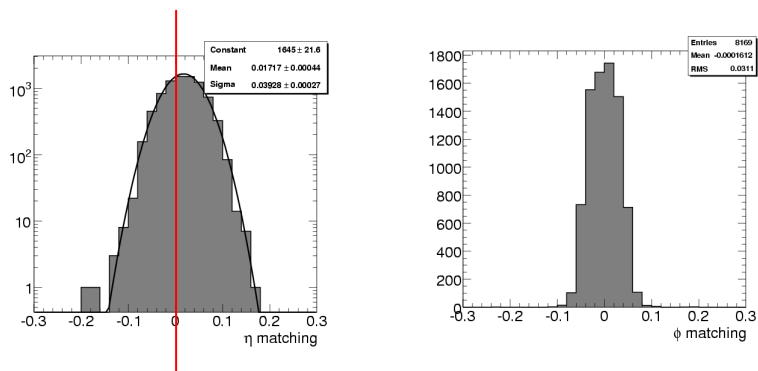
Arantxa Ruiz Martínez
TileCal Valencia meeting
December 17th, 2007

TrigTileMuld status

- TrigTileMuld algorithms:
 - TrigTileLookForMuAlg
 - TrigTileRODMuAlg
- Muon identification criteria:
 - Tight selection: the condition $\text{Thr}_{\text{low}} \leq E_{\text{cell}} \leq \text{Thr}_{\text{high}}$ is fulfilled for the 3 cells
 - Loose selection: $E_{\text{cell}} > \text{Thr}_{\text{high}}$ for one of the three cells
- Studying performance of both algorithms with MC samples (athena rel 12.0.X) for CSC note using the algorithms:
 - TileMuld/TileLookForMuAlg:
equivalent to trigger algorithm TrigTileMuld/TrigTileLookForMuAlg, used for offline reconstruction
 - TileL2Algs/TileRawChannelToL2:
emulates the muon tagging processing at the ROD DSPs

Spatial resolution

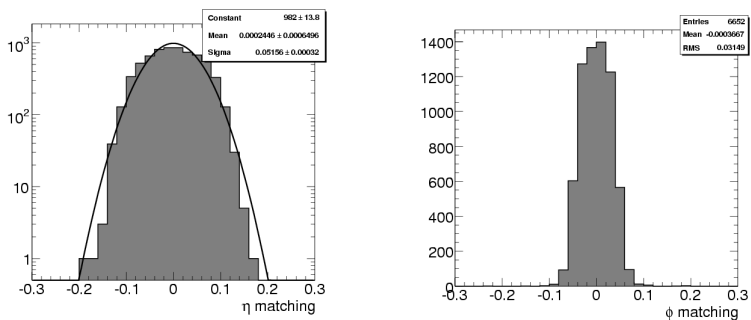
TrigTileLookForMuAlg $\rightarrow \Delta\eta \times \Delta\phi = 0.12 \times 0.16$



Pattern recognition sense



TrigTileRODMuAlg $\rightarrow \Delta\eta \times \Delta\phi = 0.12 \times 0.2$



Pattern recognition sense

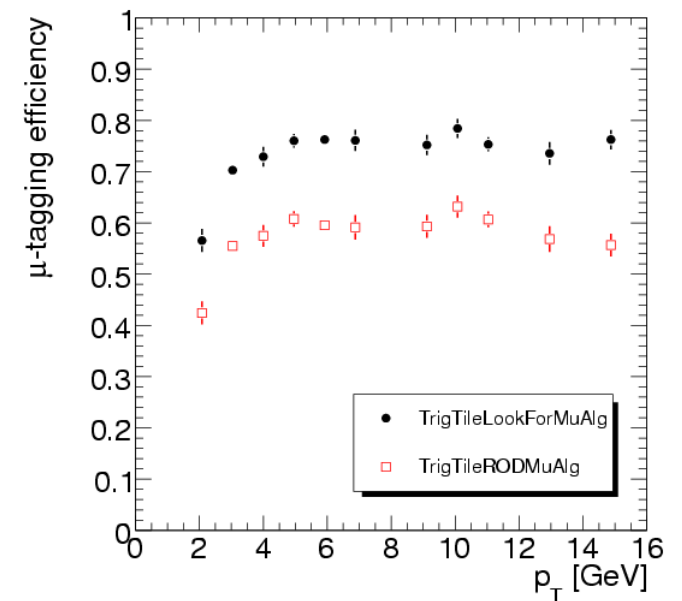
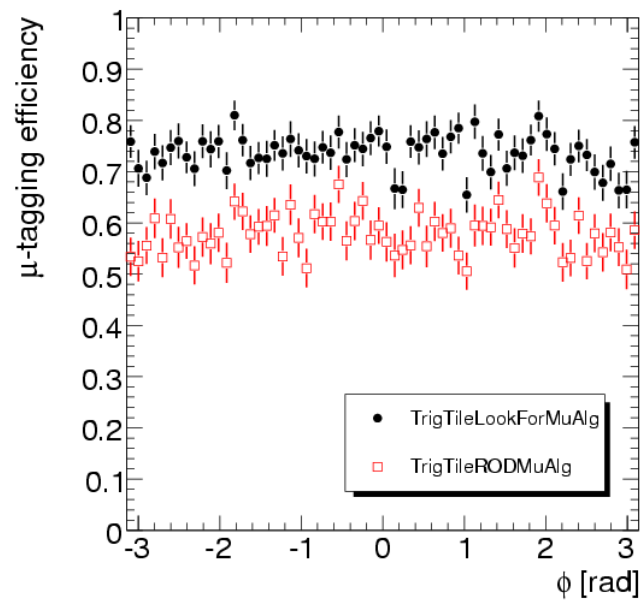
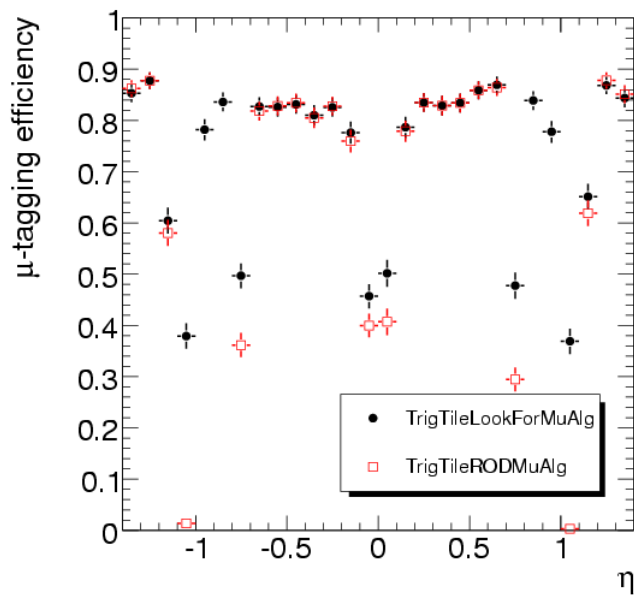


TrigTileLookForMuAlg biased to η positive values understood \rightarrow to be corrected

Efficiency

- Studying differences between TrigTileLookForMuAlg and TrigTileRODMuAlg performance (tight selection)
- Cuts applied: $|\eta| \leq 1.4$ and $p_T \geq 2$ GeV
- $\text{Thr}_{\text{low}} = 80$ MeV

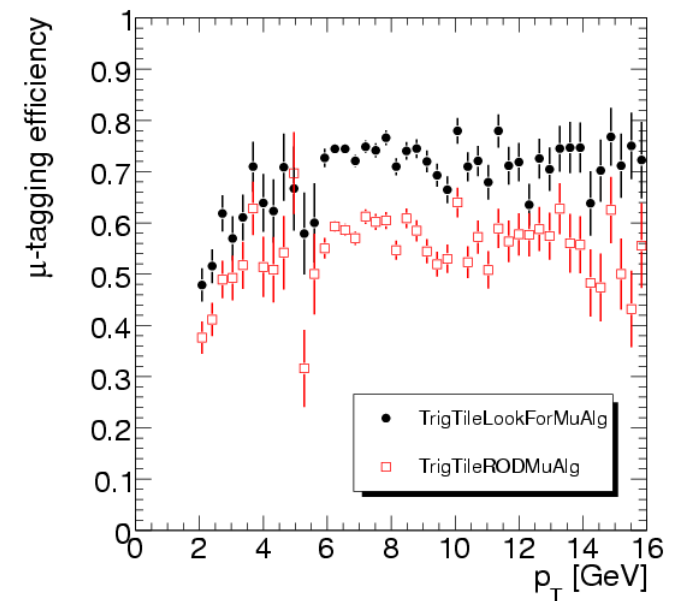
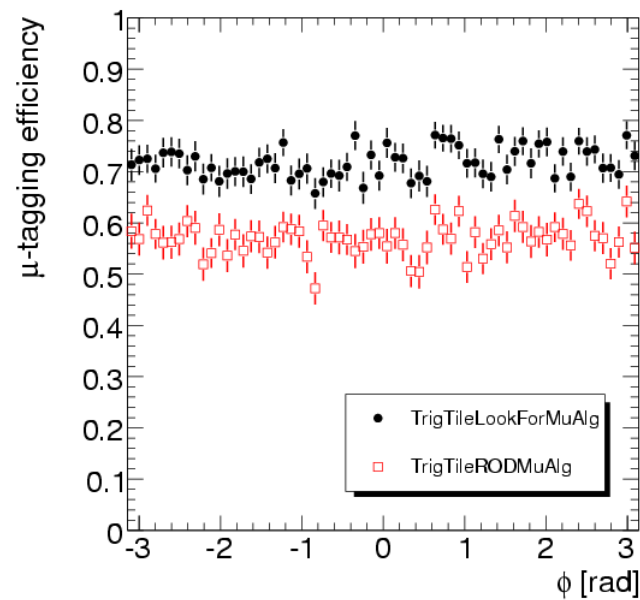
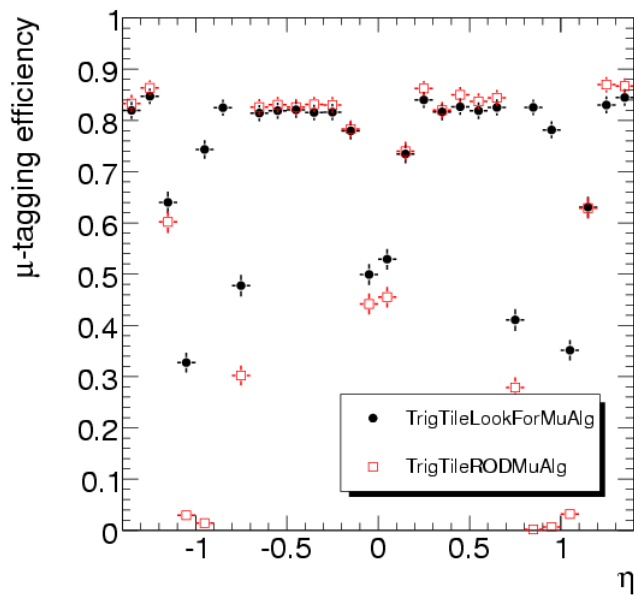
Single muons ($2 \leq p_T \leq 15$ GeV)



Efficiency

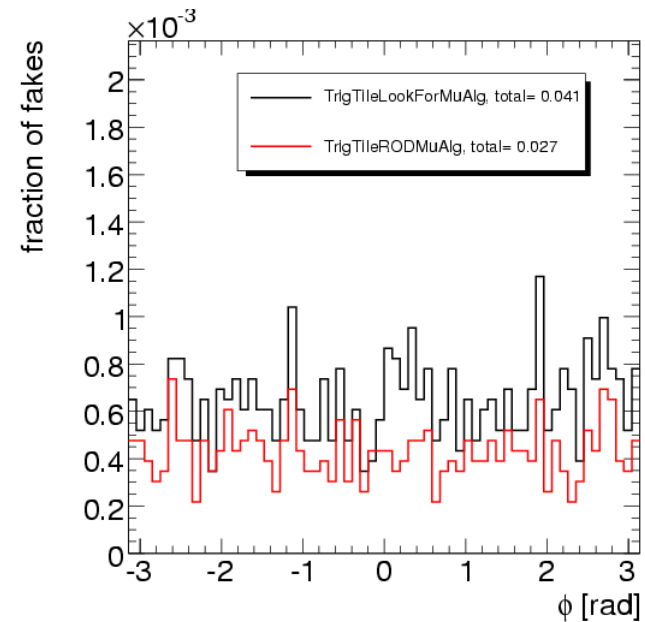
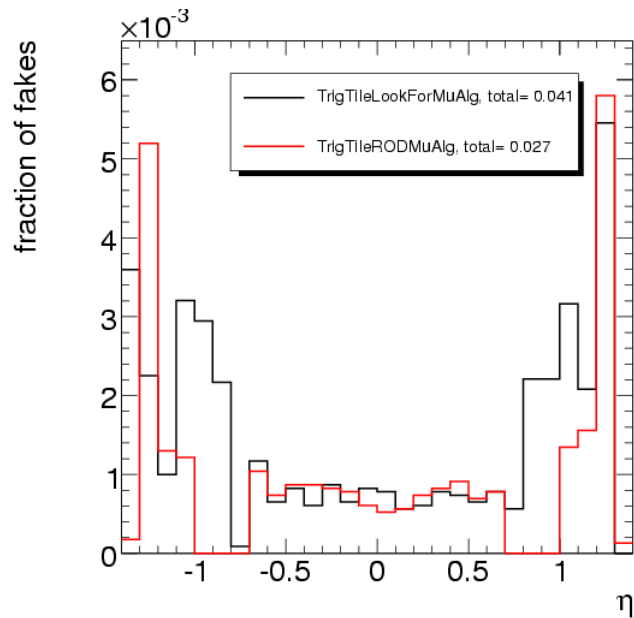
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$$b\bar{b} \rightarrow \mu(6)X$$



Fraction of fakes

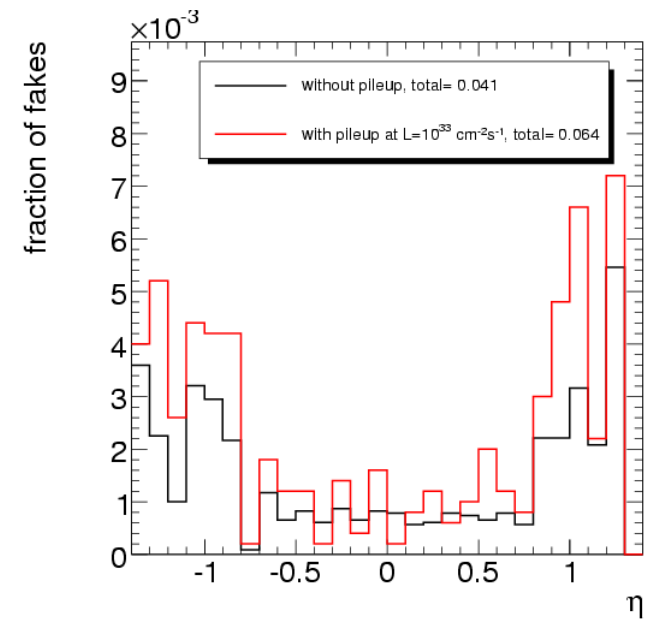
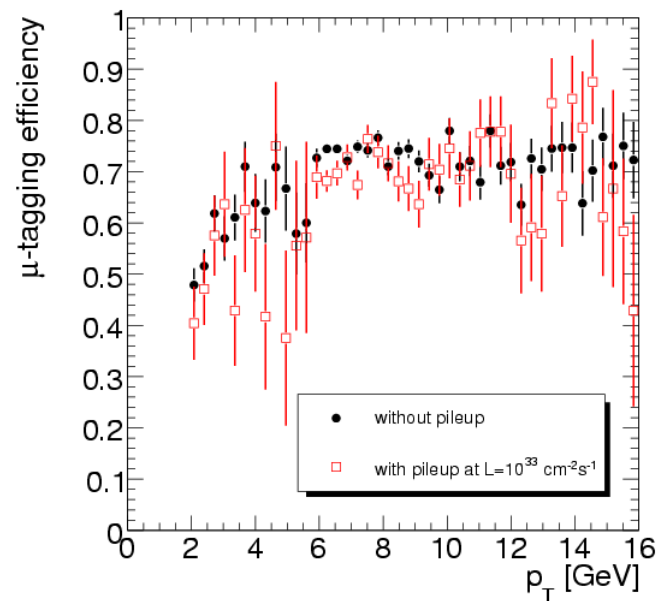
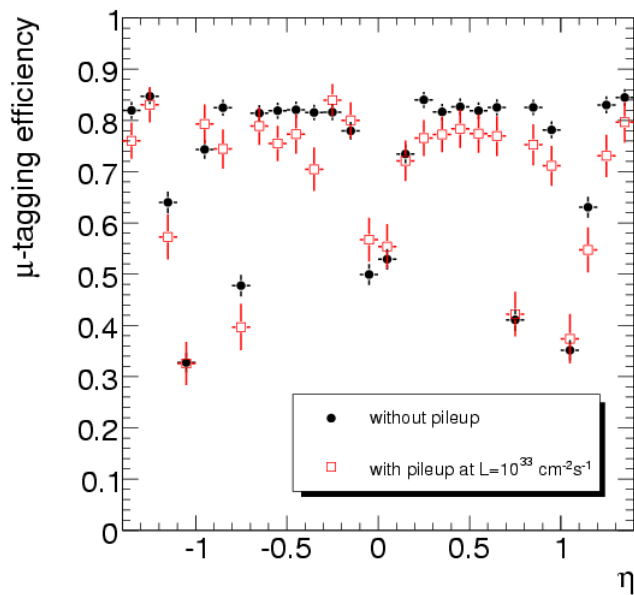
$$b\bar{b} \rightarrow \mu(6)X$$



	Efficiency [%]		Fraction of fakes [%]	
	tight selection	loose selection	tight selection	loose selection
TrgTileLookForMuAlg	71.8 ± 0.4	82.4 ± 0.3	4.14 ± 0.14	6.06 ± 0.17
TrgTileRODMuAlg	56.9 ± 0.4	61.6 ± 0.4	2.74 ± 0.11	3.14 ± 0.12

Study performance with minimum bias pileup events

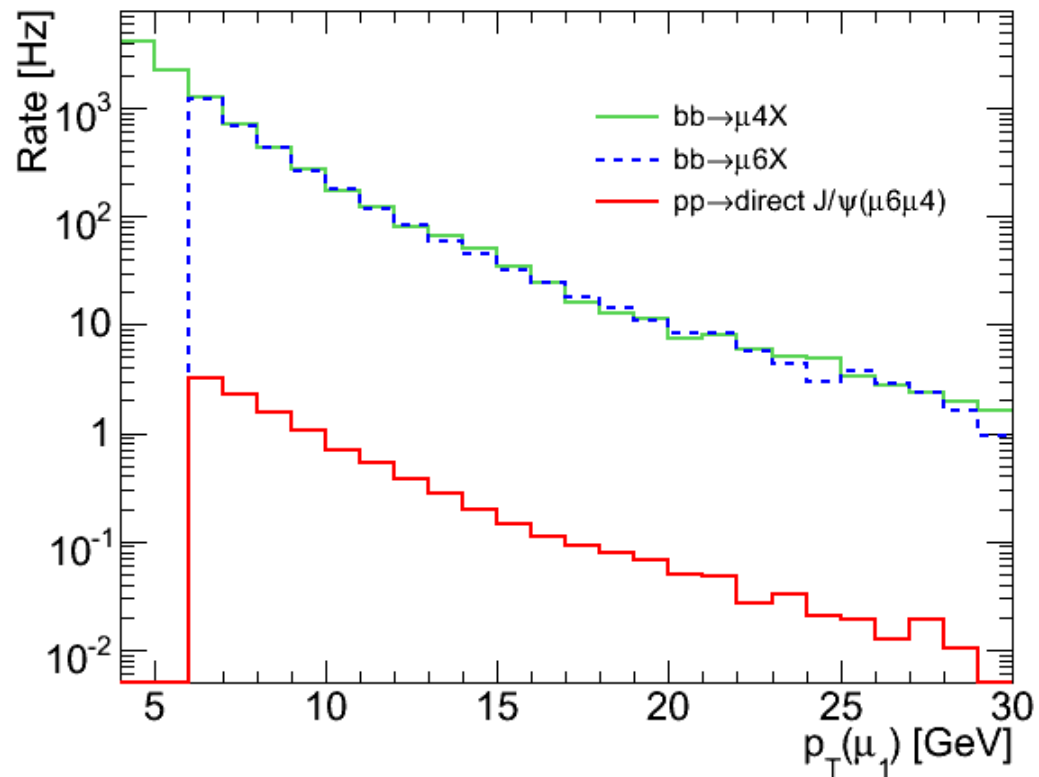
- TrigTileLookForMuAlg results: same efficiency and larger fraction of fakes at large values of η
- $bb \rightarrow \mu(6)X$ at $L=10^{33} \text{ cm}^{-2}\text{s}^{-1}$ ntuples with TrigTileRODMuAlg information not yet reconstructed



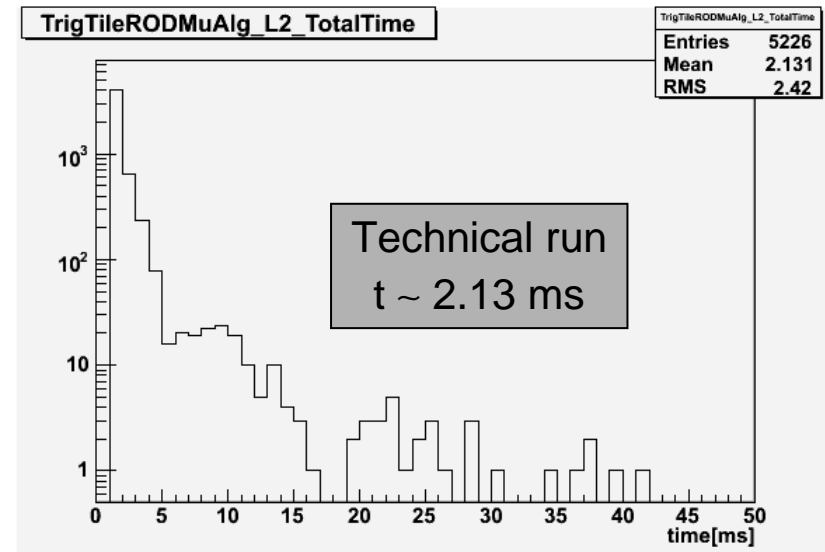
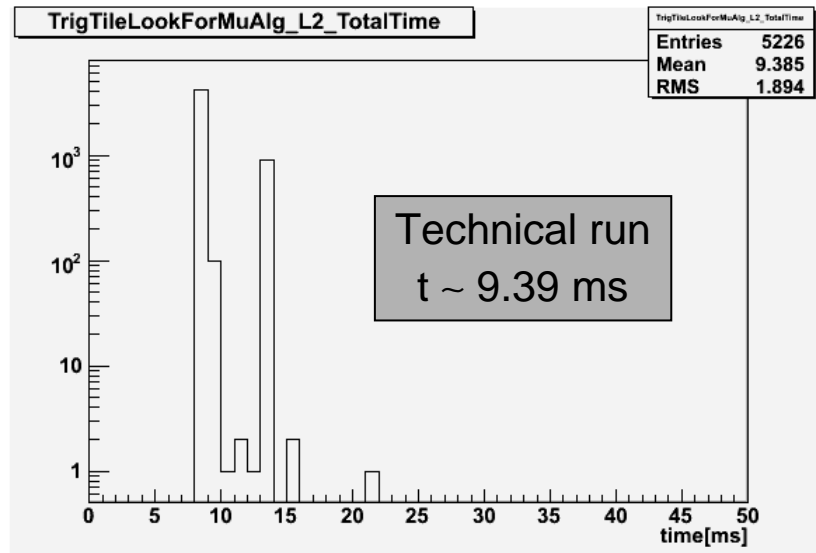
Rates

- Rate computed for TrigTileLookForMuAlg (soon TrigTileRODMuAlg)

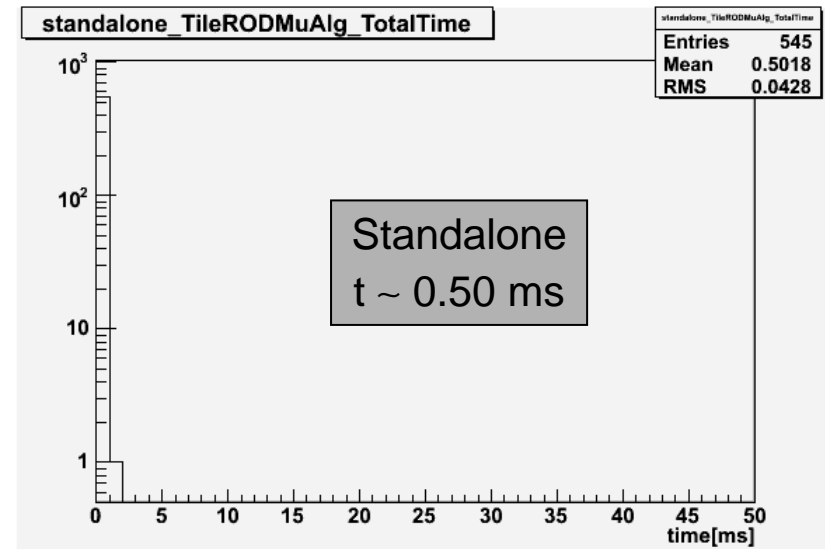
PRELIMINARY



LVL2 timings



- Boths algorithms running succesfully during technical run (reprocessing cosmics runs)
- We observed large tails in TrigTileRODMuAlg running inside cosmics slice:
Memory leak → to be corrected



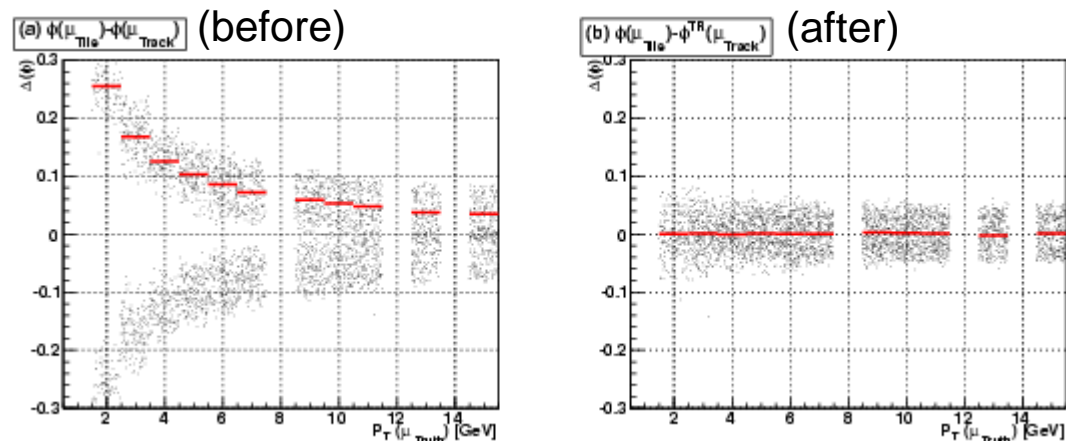
Combined performance with ID

- Strategy at LVL2 trigger (to measure muon p_T):

TrigTileMulD → TrigIDSCAN

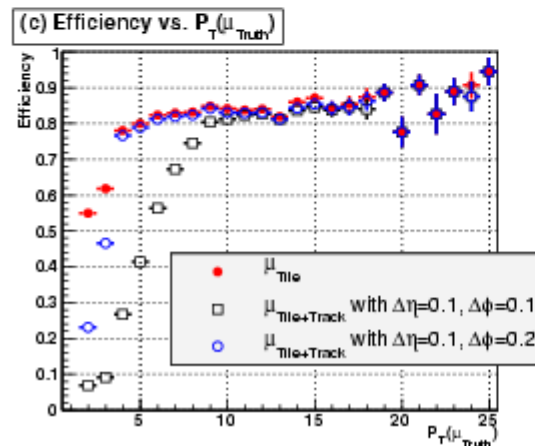
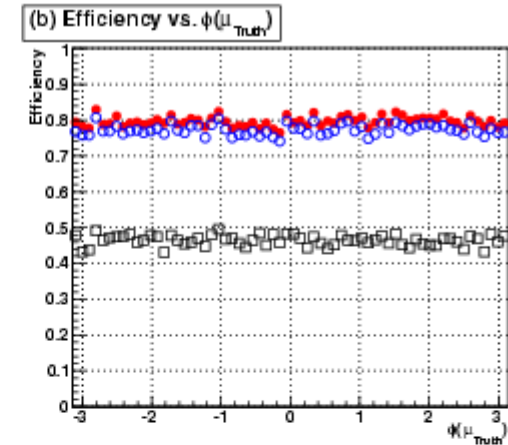
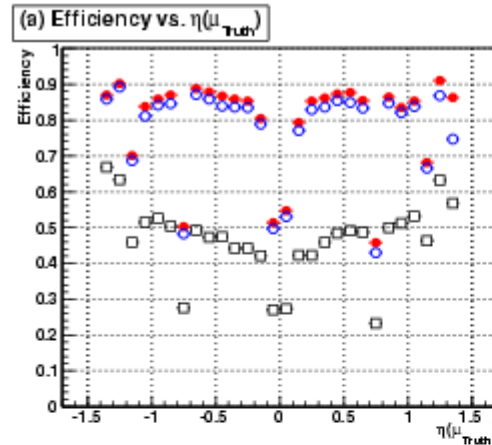
- TrigIDSCAN → track reconstruction at LVL2 trigger using SCT and Pixel Detector
- Parametrization to extrapolate to the TileCal Radius:

$$\phi^{\text{TR}}(\mu^\pm) = \phi^{\text{Truth}} \mp 0.000123 \mp \frac{0.507}{p_T^{\text{Truth}}}$$



Combined performance with ID

- SRoIs of muons produced by TrigTileLookForMuAlg were used to seed the ID track reconstruction algorithm (TrigIDSCAN)
- Comparisons of the efficiencies obtained for:
 - TileMuld
 - TileMuld+TrigIDSCAN ($\Delta\eta\times\Delta\phi=0.1\times0.1$)
 - Low eff at $p_T < 8$ GeV
 - TileMuld+TrigIDSCAN ($\Delta\eta\times\Delta\phi=0.1\times0.2$):
 - Almost same efficiencies
- $\Delta\eta\times\Delta\phi=0.1\times0.2$ is chosen



$$b\bar{b} \rightarrow \mu(4)X$$

TrigTileLookForMuAlg
(loose selection)

$$\text{Thr}_{\text{low}} = 80 \text{ MeV}$$

Summary

- Big progresses done:
 - TrigTileRODMuAlg running online in HLT in M4 and M5 weeks
 - TrigTileLookForMuAlg and TrigTileRODMuAlg running in Technical run
- ROD MuID variables now available in Tile ntuples as well as ATLAS official ones
- Still missing: include MuID ROD info by default in MC ntuples
- Analysing/comparing results from cosmics
- Preparing new DSP version to be tested during this week
 - New ByteStream format
 - Deal with noisy channels
- Preparing new TileByteStream tag for decoding new format
- Collaborating very close to Giulio and Heuijin