Status of Histogramming Track Finder

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-> htf as a package

-> htf as an algorithm

-> plans

relevant D0 notes:

D0 3778 (algorithm description)

D0 3845 (track finding performance)

D0 3855 (i.p. b-tagging performance)

the algorithm description

strategy A

- o begin with (3D) SMT hits, perform the (x,y)->(rho,phi) Hough transform
- o clean the template sample (Nh >= 4)
- o for every template, perform the (r,z)->(z0,C) Hough transform
- o clean the template sample
- o apply eta-splitter (check hypotheses eta>0 and eta<0)
- o build SMT tracks with 3D Kalman
- o extrapolate to CFT

the algorithm description (2)

strategy B

- o begin with 2D r-phi CFT hits, perform the (x,y)->(rho,phi) Hough transform
- o clean the template sample (Nh >= 7)
- o apply 2D Kalman, build 2D CFT tracks
- o make all possible 3D hits out of 2D hits assigned to 2D CFT tracks
- o for every track, perform the (r,z)->(z0,C) Hough transform
- o clean the template sample
- o apply r-z Kalman, clean it more
- o build CFT tracks with 3D Kalman
- o extrapolate to SMT

htf as a package

gtr_htf package

- o in cvs since autumn 2K
- o in releases since t01.43.00
- o recently got broken
  - *ClusCylPhi -> CftTrfClusPhi*
  - - problem in p09
  - - fixed in the next release
- o not linked to d0reco (trivial)

htf as a package (2)

package features to improve:

- o controls (switches & knobs)
  - s: strategy, timing, debug prints...
  - k: pt_min, eta_max, chi2_max...
  - make it more rcp'ed
- o automated geometry loading
  - mostly improtant for run2b
- o protection against f.p.e.
  - to be moved to the public version

algorithm performance defs

track selection

- charged, stable, primary tracks (include b and c decay products)
- p_t > 0.5 GeV

reco -> mc match

- > 50 % of all hits come from MC track
- all track parameters are matched by chi2/NDF < 10

in the following results, >=2 SMT hits are req'd

- o the results were obtained with p07

algorithm performance defs (2)

mc track →	???	track not found
mc track →	reco track	track found, no fakes, no ghosts
mc track →	reco track 1 ... reco track N	track found, N-1 fakes
??? →	reco track	a ghost

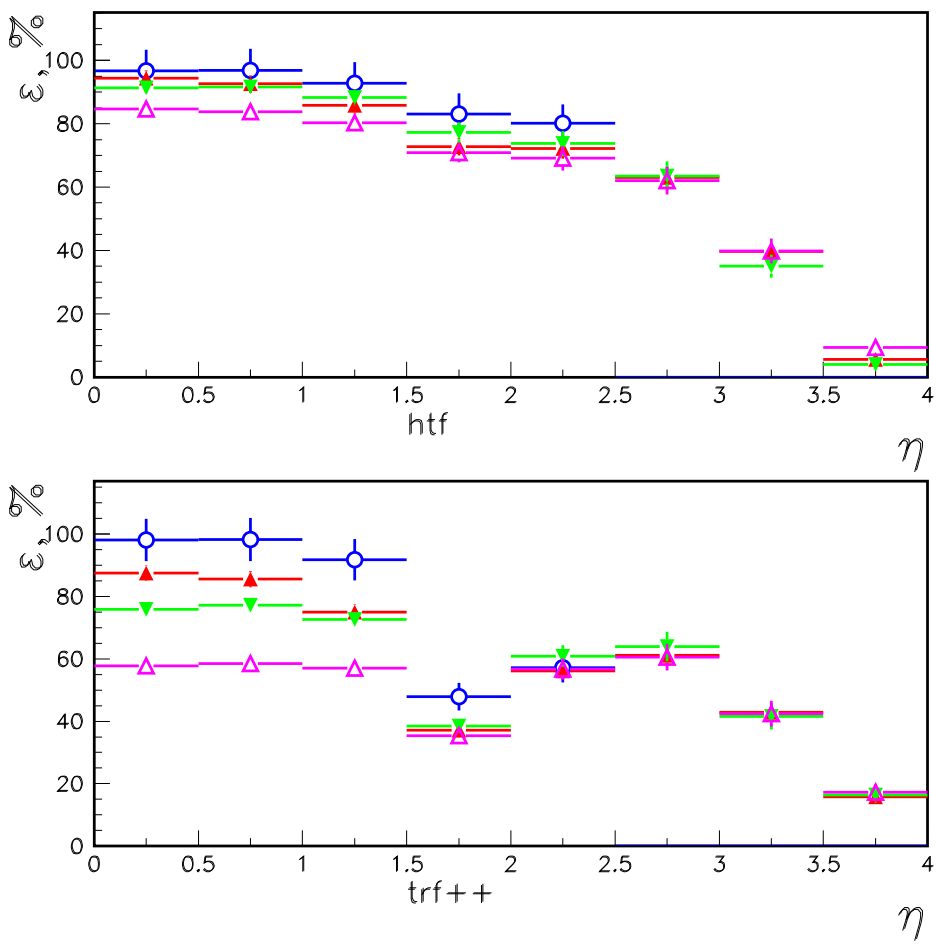
$$\text{efficiency} = \frac{\#\ \text{MC tracks matched to >=1 reco track}}{\#\ \text{MC tracks}}$$

$$\text{fake rate} = \frac{\#\ \text{fake reco tracks}}{\#\ \text{reco tracks}}$$

$$\text{ghost rate} = \frac{\#\ \text{ghost reco tracks}}{\#\ \text{reco tracks}}$$

"bad" = fake + ghost

track finding efficiency

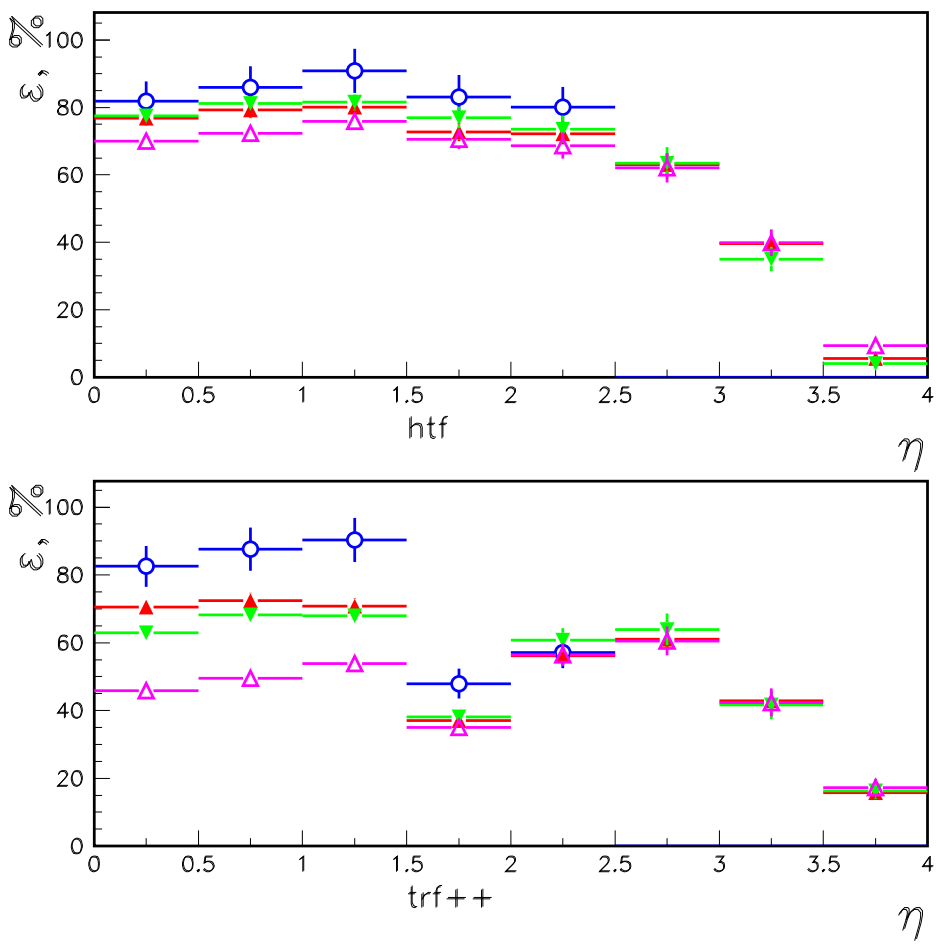


top: htf, bottom: trf++

any # SMT hits

- single μ (50 GeV)
- Z -> bbar
- ttbar + 0 mb
- ttbar + 4 mb

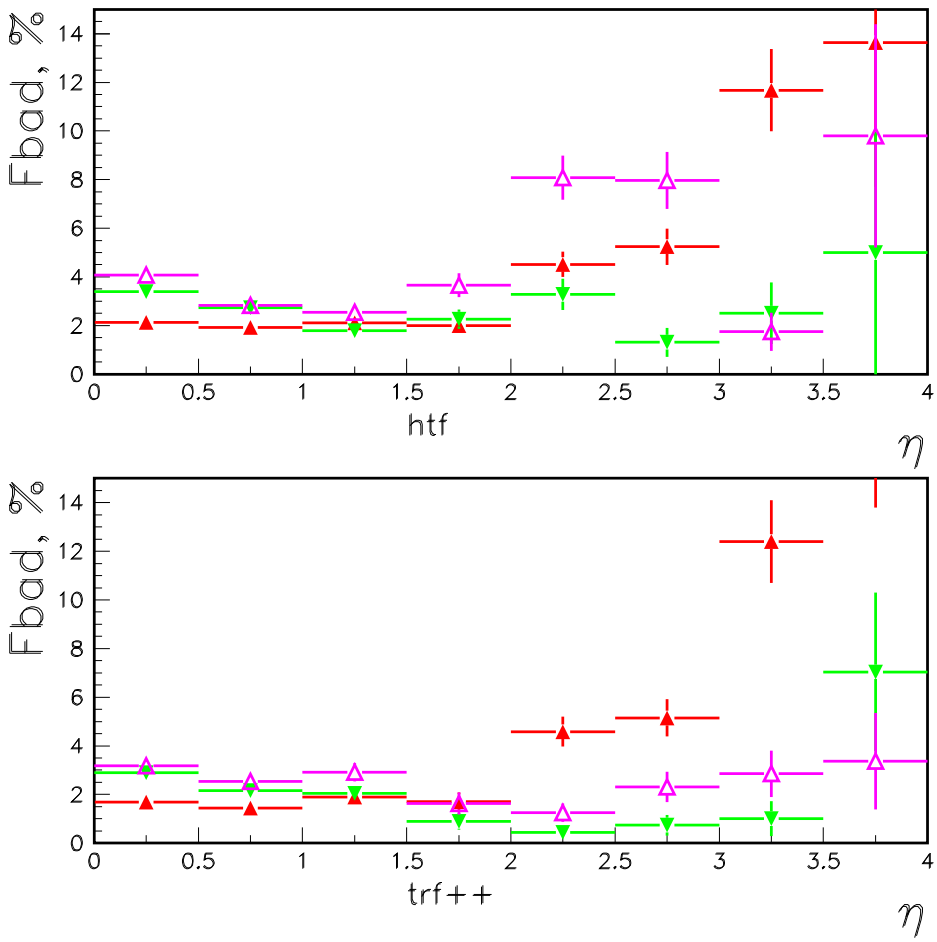
track finding efficiency



top: htf, bottom: trf++

- single μ (50 GeV)
- Z -> bbar
- ttbar + 0 mb
- ttbar + 4 mb

fraction of bad tracks



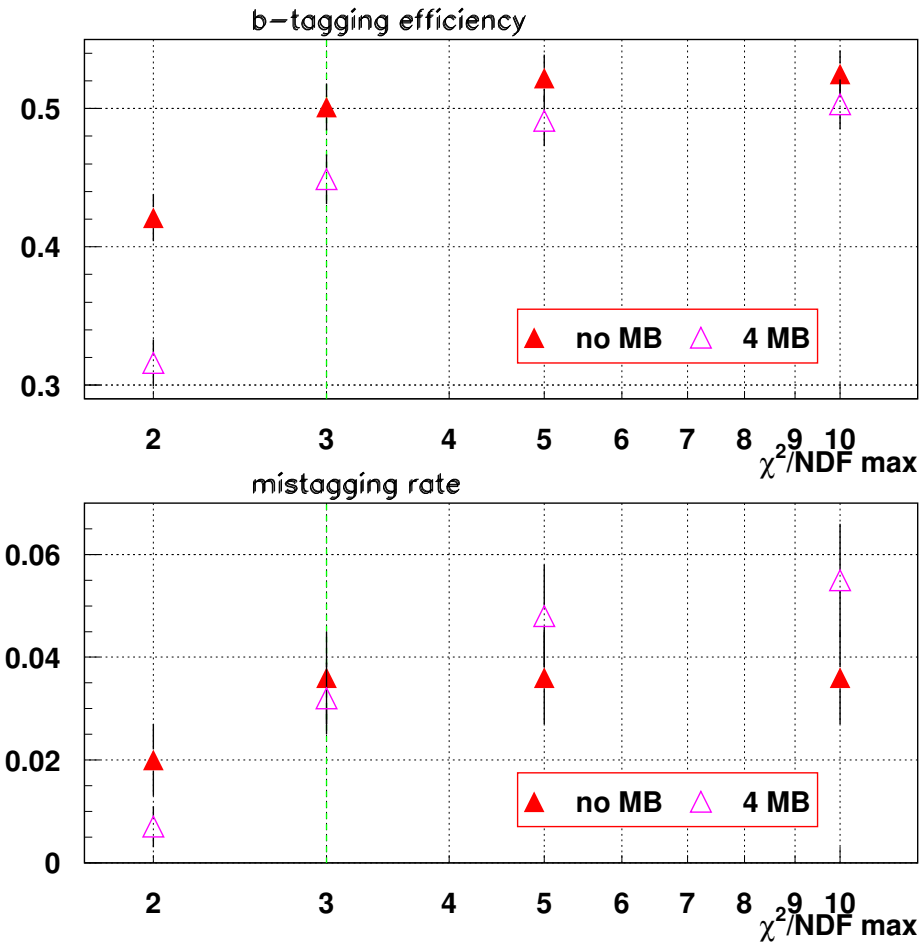
top: htf, bottom: trf++

▲ Z -> bbar

▼ ttbar + 0 mb

△ ttbar + 4 mb

b-tagging performance



b-tagging efficiency (top) and mistagging rate (bottom) for ttbar events with and without MB vs chi2/NDF cut

- more sensitive for busy events !

Plans

- do "official" comparison tests
- use it widely for physical studies
- begin looking at real data