τs in Data

- τ's can decay into leptons, as e.g. μs
- use the "macchina" output with muons pT $>$ 6 GeV
- define "signal" and background samples as non-isolated μ sample and isolated μ sample
- for p10.14, require run to be in CalMuCD list v1.11
- for p10.15, no cal list, require μ to be C or D quality
- sample is p10.14 unless tracking variables are used/considered

The Muon

tight μ:

Scintillator hits in A+BC layer

wire hits: A layer $>$ 2, BC $>$ 3

converged fit χ^2 >0

-5 $<$ A scinillator time $<$ 10

signal: reject events with second tight μ

tight μ with $\Delta\phi\mu\tau$ >2.5 (p_T τ >10 GeV)

The τ is a narrow jet, thus:

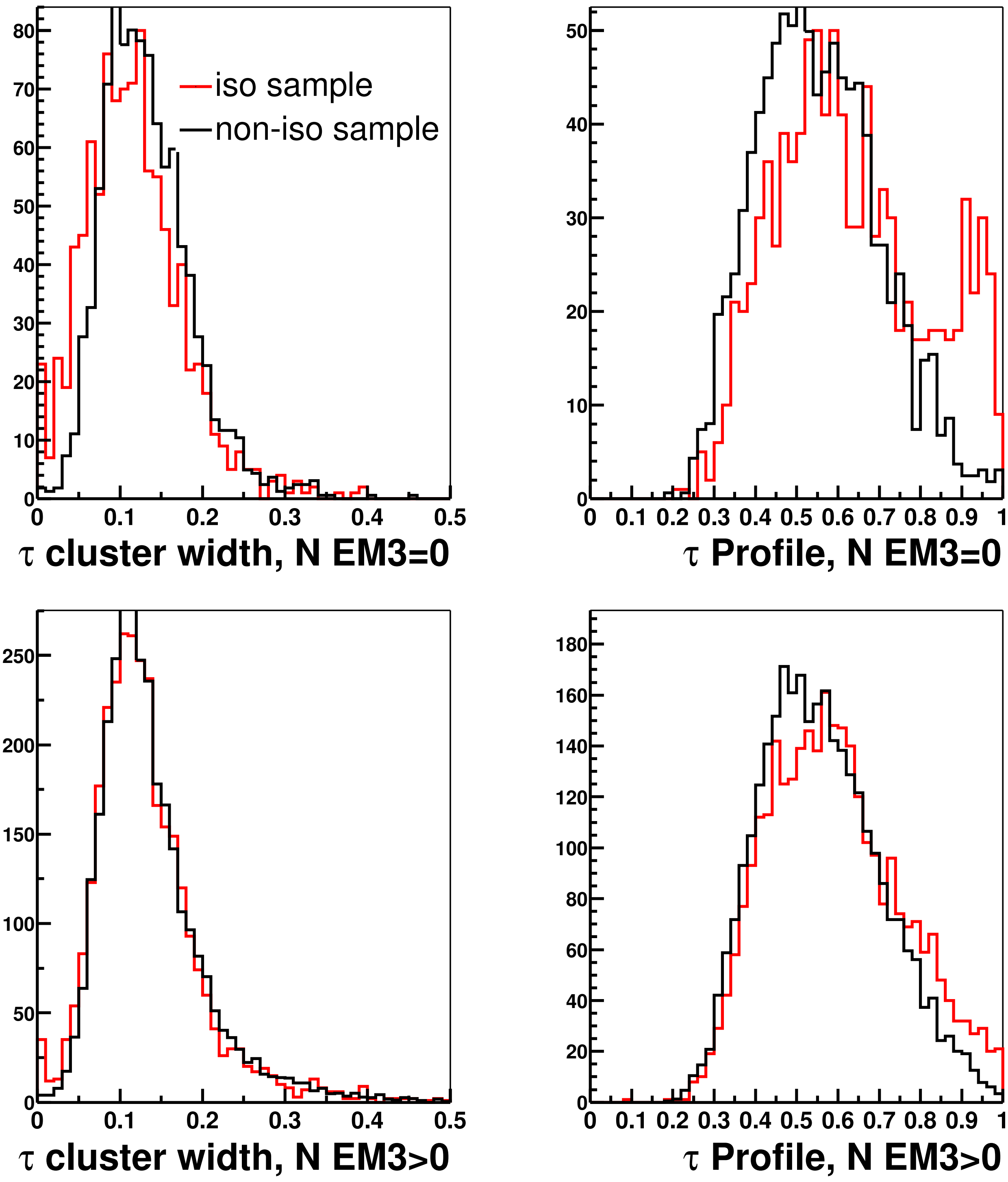
the CAL width $(\Sigma E_T \Delta(\phi/\eta)/\Sigma E_T)$ is smaller than for jets

the "profile" is larger (profile $= (E_{T,1} + E_{T,2})/\Sigma E_T$)

for τ candidates without an EM3 subcluster (single π candidates), the em fraction in layer 1+2 is very small

for those candiates, e/p should be about 1

τ specific variables, # EM3 ==0 and >0 seperate



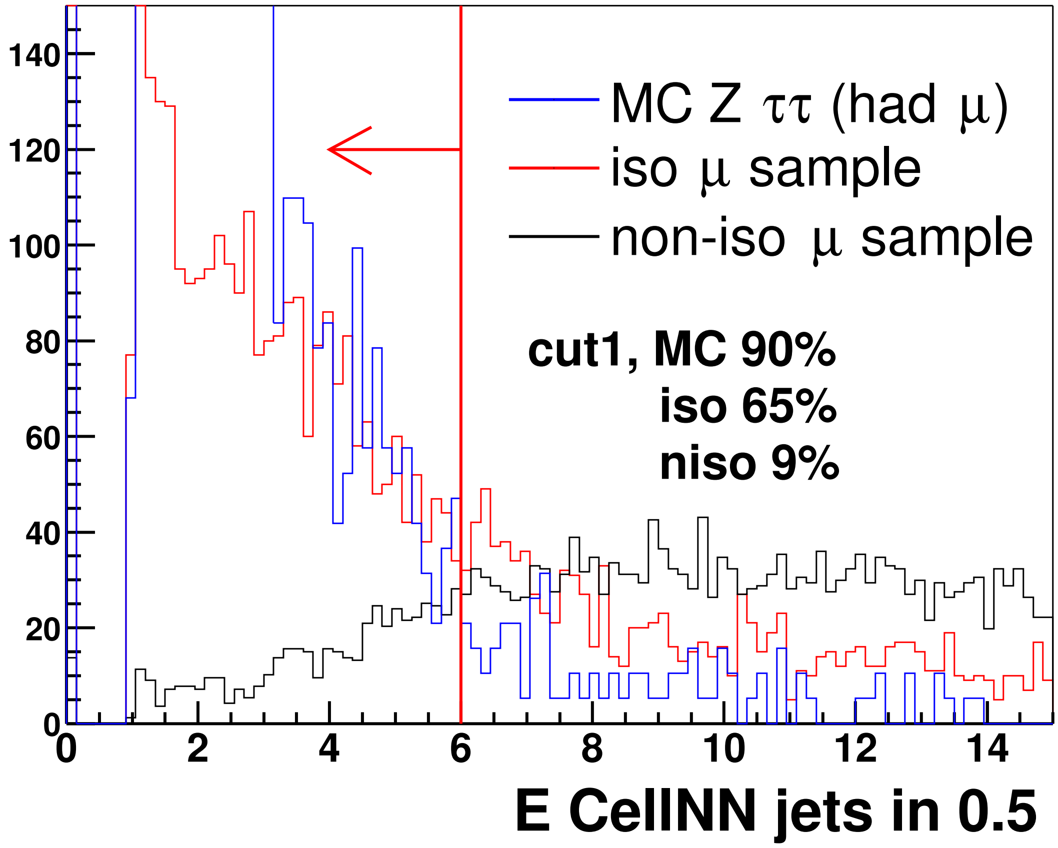
first look at candidates without EM3 clusters (possible single π candidates)

The Muon - Isolation

no jets around (sample definition)

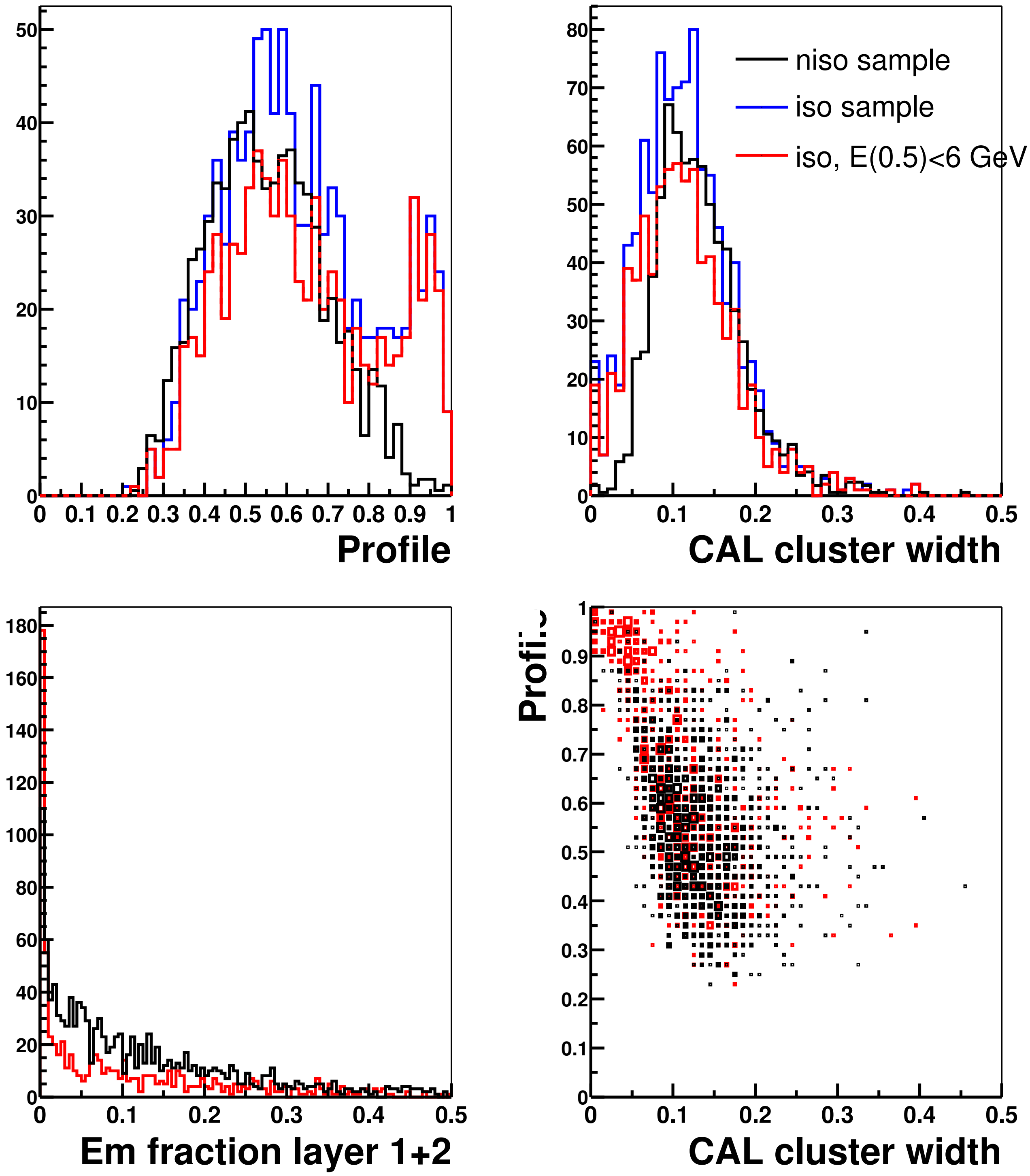
jet have $E_T > 8$ GeV threshold, cellNN jets don't

look for Cellnn jets in cones around μ



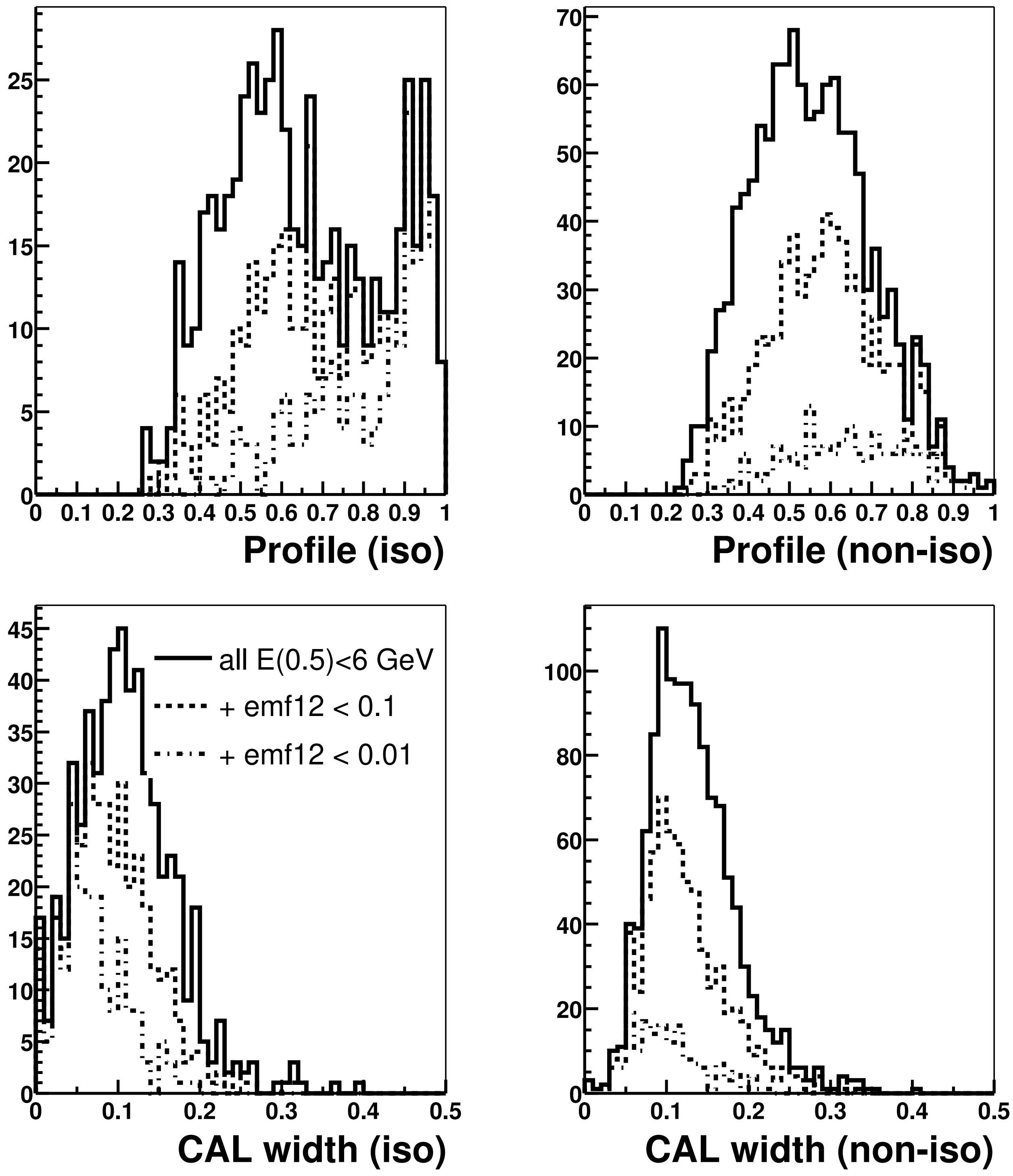
cut at $E_{0.5} < 6$ GeV

τ variables, μ isolation cut



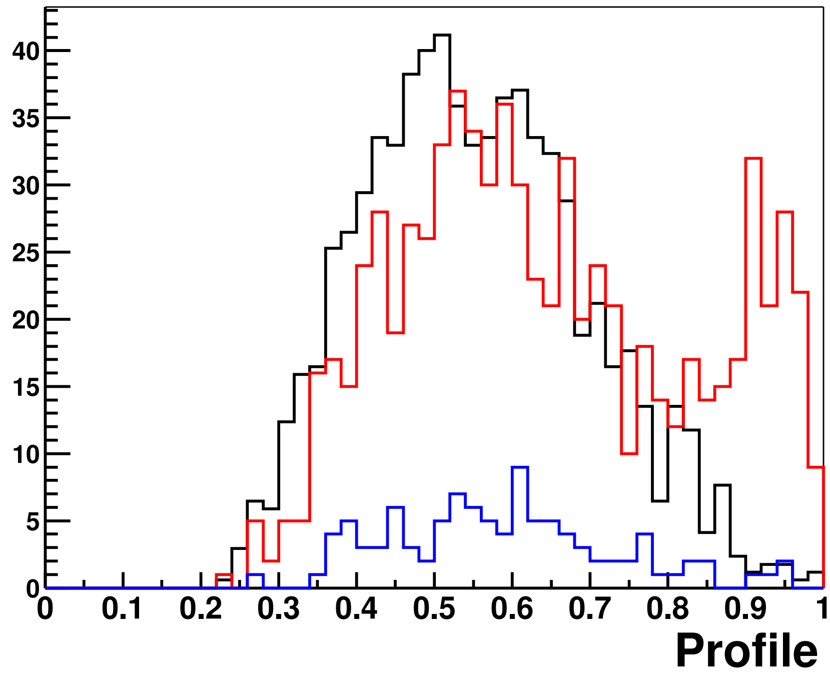
the cuts on the μ isolation clean the sample up

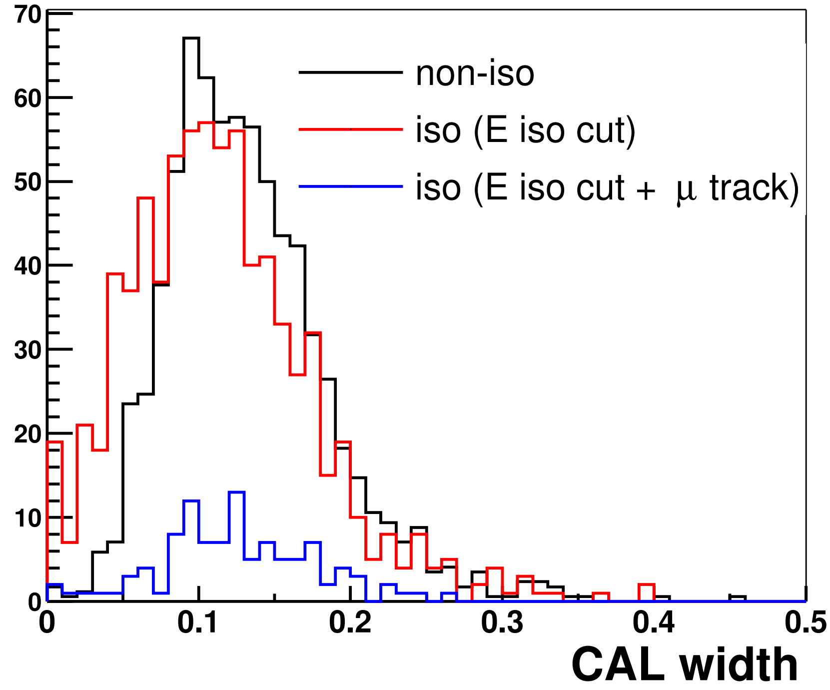
τ variables, cut on EM12 fraction



more single π like after emf12 cut

τ sample with a μ and a track match

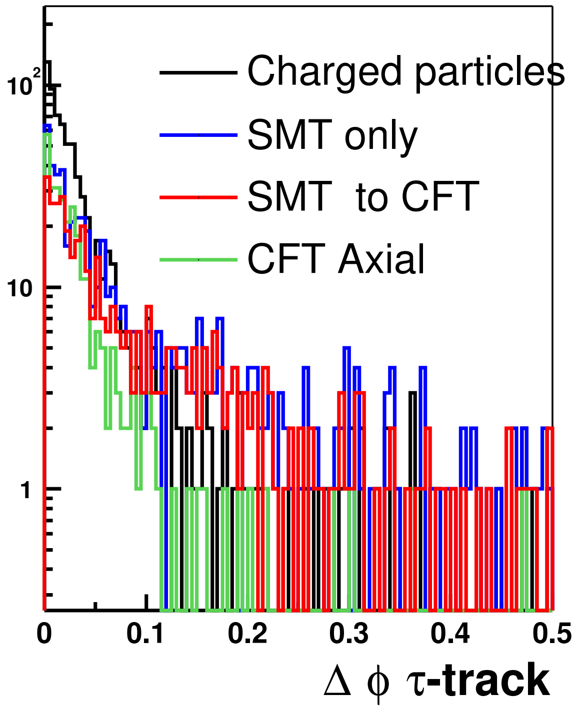


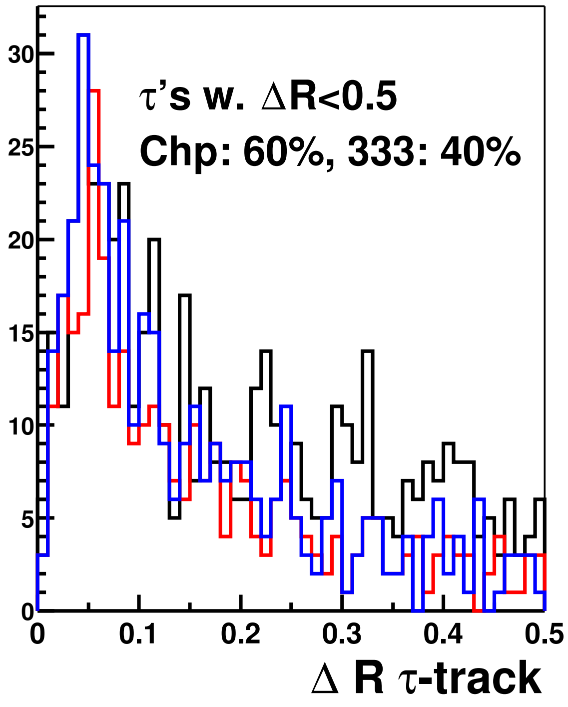


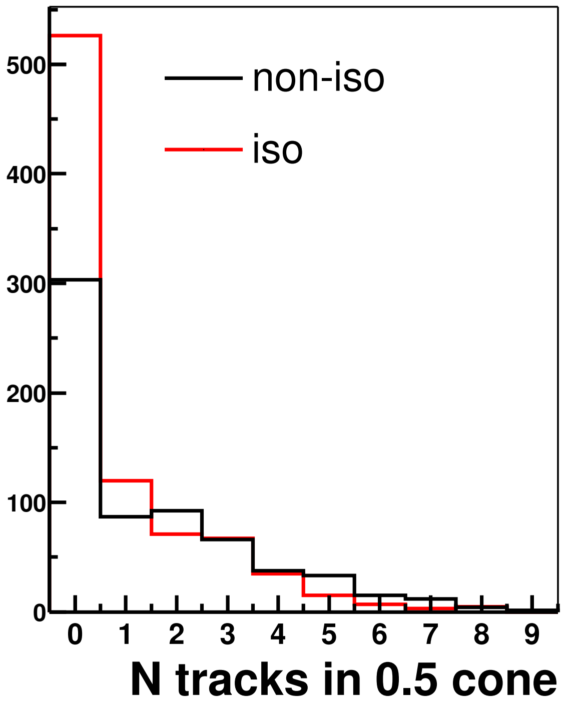
With the current statistic, requiring a track matched to the muon does not cleaup the sample

μ track: use the μ-id matched track or 333-chunk track with a Δ R match

τ and track







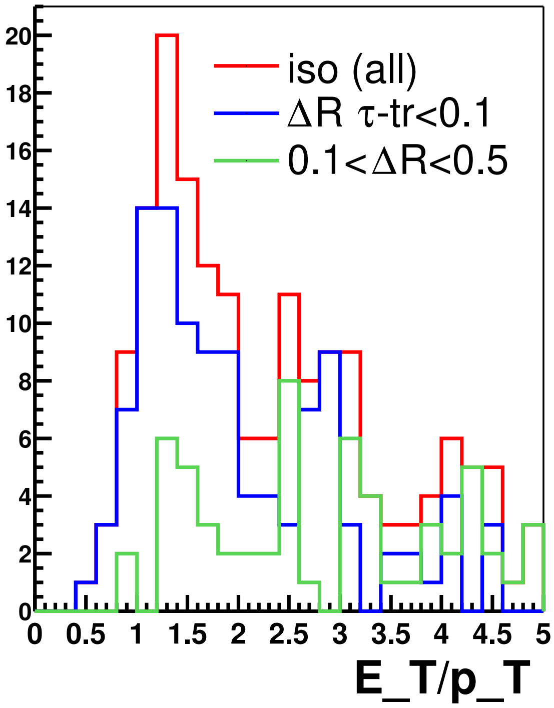
use SMT to CFT tracks with at least 11 hits

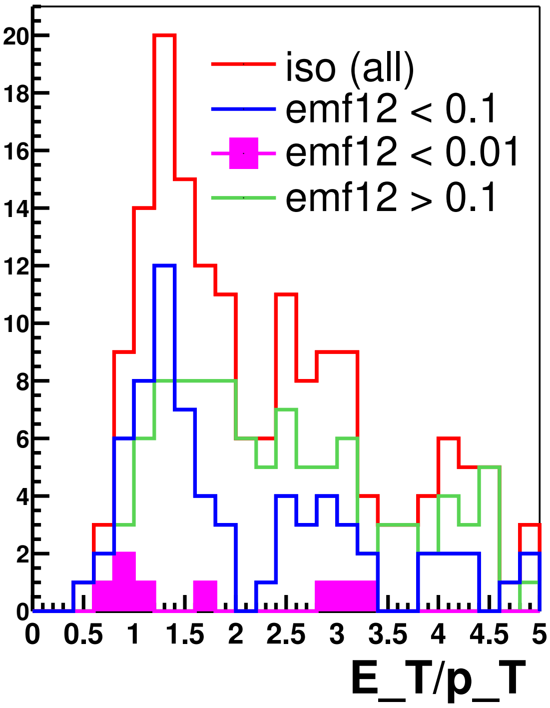
in non-iso sample, the jet tends to have more track within ΔR <0.5

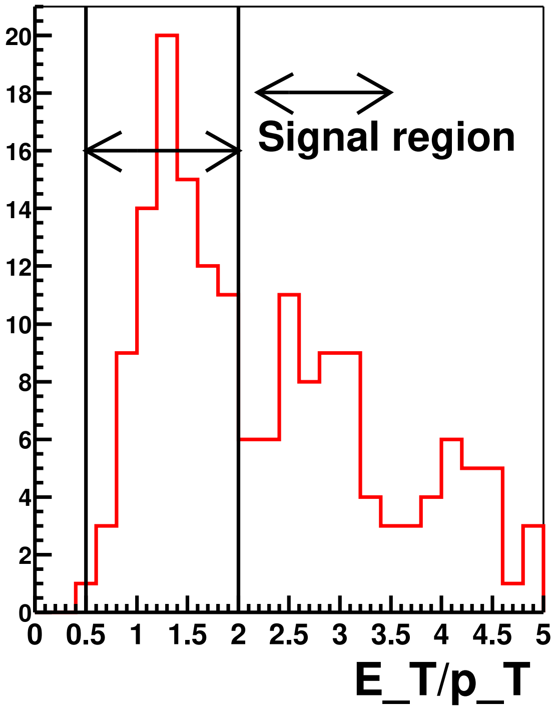
still, the tracking efficiency is low...

τ with track matches - E over p

$(E_{T,cal}/p_{T,track})$







333 tracks, match:
niso: 30%
iso: 52%

niso signal: 41%
iso signal: 50%
iso, ΔR<0.1: 61%
iso, emf12<0.1: 62%

Peak around 1, enhanced by ΔR cut or cut on emf12

Status + Plans

The distributions for signal- and backgroundsamples hint that the signal might actually contain τs
A first clean-up using calorimeter only makes the signal cleaner

cuts on e.g. the em-fraction in layers 1+2 makes the remaining event look more "signal"-alike
This behaviour doesn not hold for the same cuts aplied on the background sample (or it is much weaker)

Looking at tracks:
requiring a μ with track match does not help (at least not within current statictics)
Looking on the τ side, matched tracks within ΔR <0.1 show a(n anhanced) peak at slightely above 1 for $E_{T,cal}/p_{T,track}$

Next: look at invariant mass