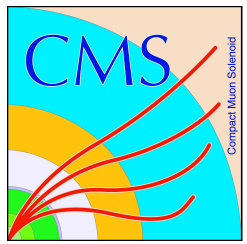
Status of the W + jets & $t\bar{t}$ Working Group

Classical Lost-Lepton Method
$\not{H}_T$ Extrapolation Approach
τ_{Had} Estimation Method
Lepton/Isolated Track Efficiencies

Arne-Rasmus Dräger(Uni Hamburg)

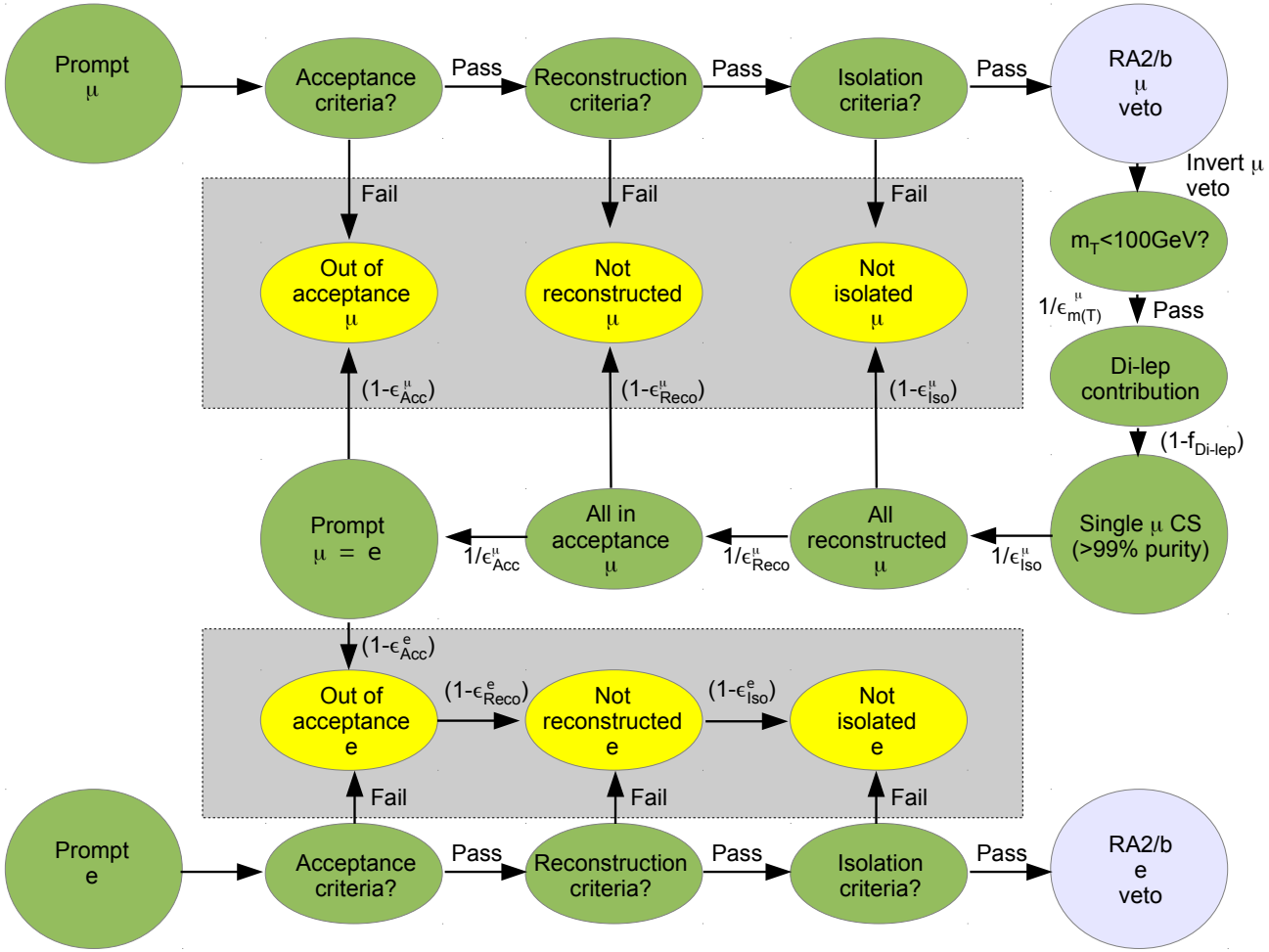
June 10, 2015



Classical Lost-Lepton Method

Arne, Christian & Simon

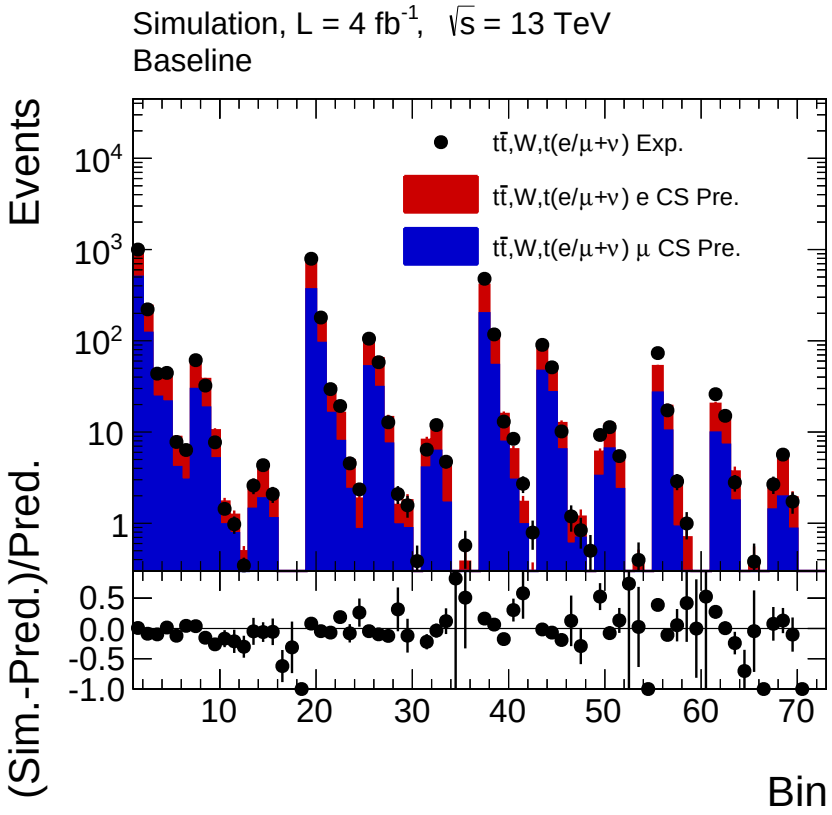
Classical Lost-Lepton Procedure



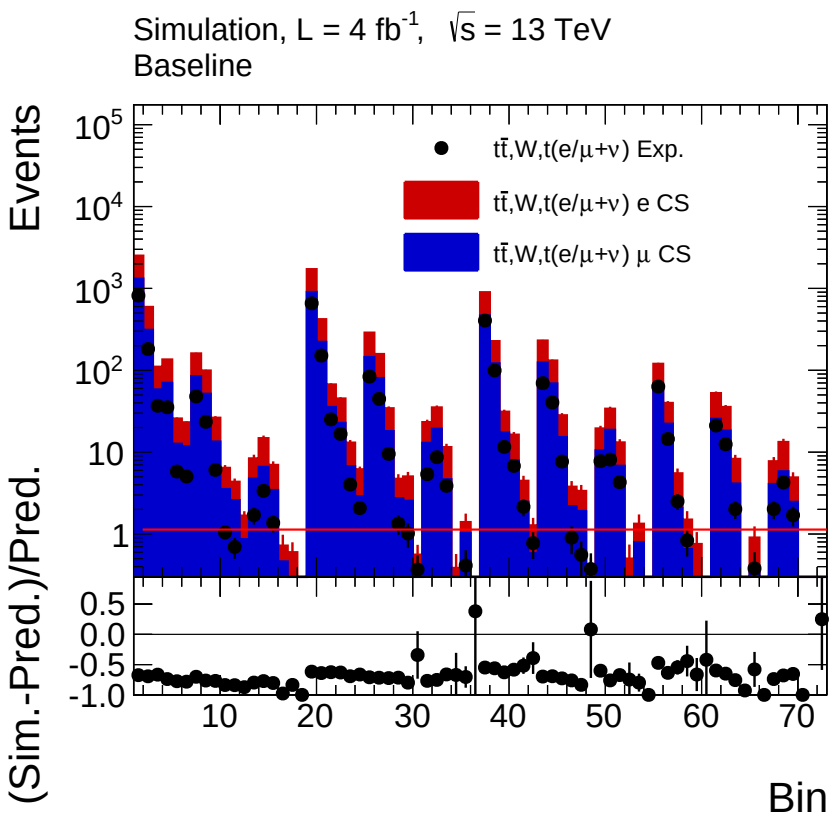
Efficiencies parametrization

- Choise of Efficiencies parametrization is very crutial for the sucess not only of the classical lost-lepton method but also for extrapolation (varification) and τ_{Had} estimation method.
- Isolation, reconstruction of electron & muon and also isolated electron, muon & pion tracks are parametrizated in p_{T} and Activity
- Activity has the beaty to be directly transferable from varificatino topology DY $\rightarrow$ $\mathrm{t\bar{t}}$ & W + jets signal region (see isolation in backup)
- Acceptance needs to come from MC parametrizated in $\not{H}_{\mathrm{T}}$, & N(jets)
- Small corrections: $m_T$cut $\not{H}_{\mathrm{T}}$, N(jets)... etc updated me

Closure Test



Control-Sample vs Expectation



- Overall good closure observed in all search bins.
- We expect about two single lepton control sample events for each lost lepton!
- In extreme phase-space low statistics of control-sample expected for

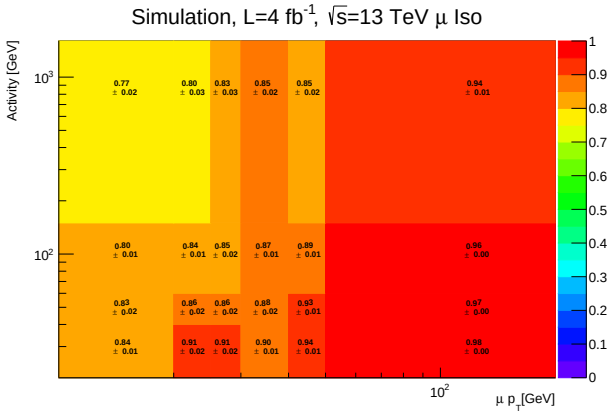
To do for classical lost-lepton method

- Lost-lepton method is in good shape. Classical lepton veto, and isolated track veto incorporated
- Plan is: Use Efficiencies from MC for prediction. Use Tag and probe in MC and Data to obtain uncertainties and if necessary scale factors.
- Muon and electron isolation Efficiencies in good shape (see backgup) as well as ID check.
- Reco under study but can be taken from POG see backup for non dependency on H_T,$\not{H}_T$,N(jets),B(tags) UPDATE ME
- Isolated tracks: This is under heacy study right now. If i get some decent results we should show them if not make the statement: Tag and probe method shows first promising results enableing us direct validation in data using DY events. (Note details that we plan to do this probably only for iso e and mu tracks and will study similarities to pion tracks for indirect validation)

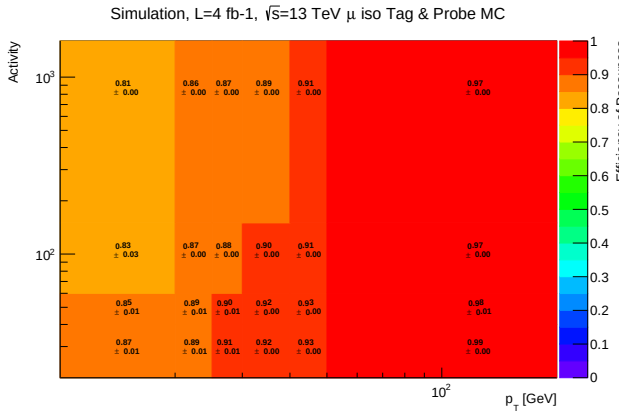
Backup

Comparison $t\bar{t}$ & W + jets vs DY Tag & Probe μ Iso Efficiencies

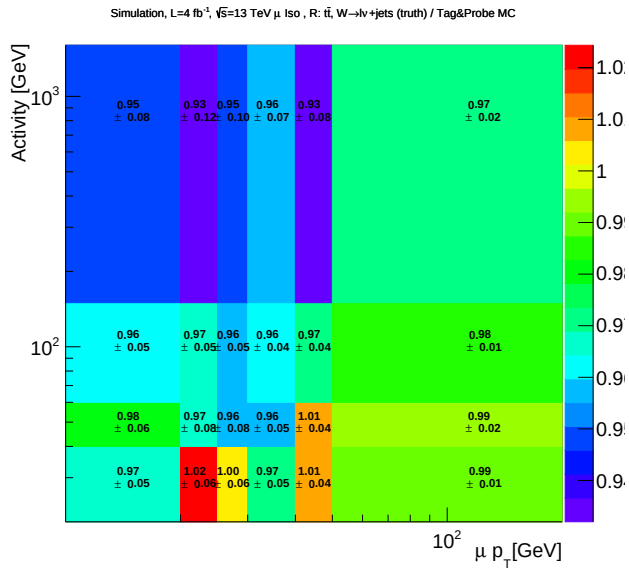
- μ Iso $t\bar{t}$ & W + jets eff. (truth info.)



- μ Iso DY eff. (Tag & Probe)



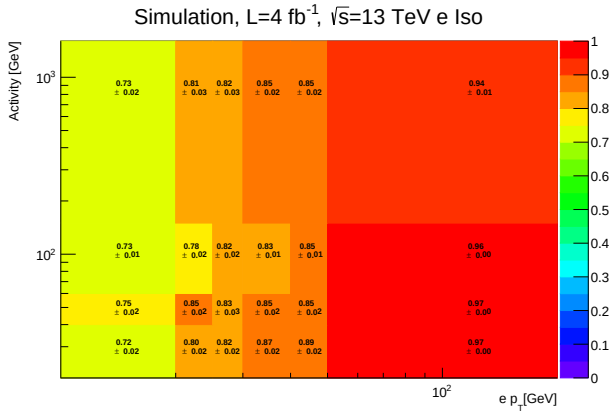
- μ iso radio



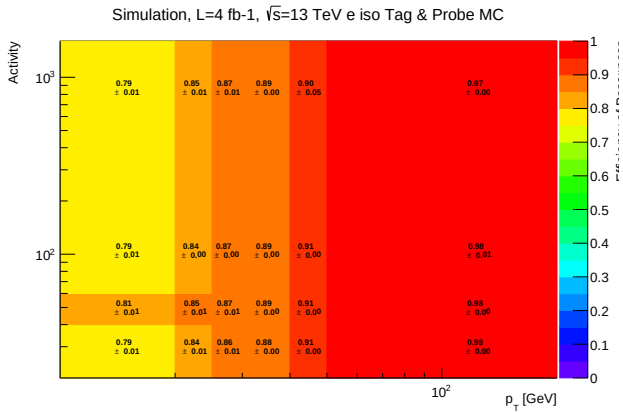
- Efficiencies obtained (using truth information) from $t\bar{t}$ & W + jets and DY are in good agreement
- Lepton p_T and activity are sufficient topology independent to be transfered from DY to signal region! (Confirm Florent)
- Overall the efficiencies from DY are slightly higher. (No cuts applied to DY $t\bar{t}$ & W + jets baseline applied)

Comparison $t\bar{t}$ & W + jets vs DY Tag & Probe e Iso Efficiencies

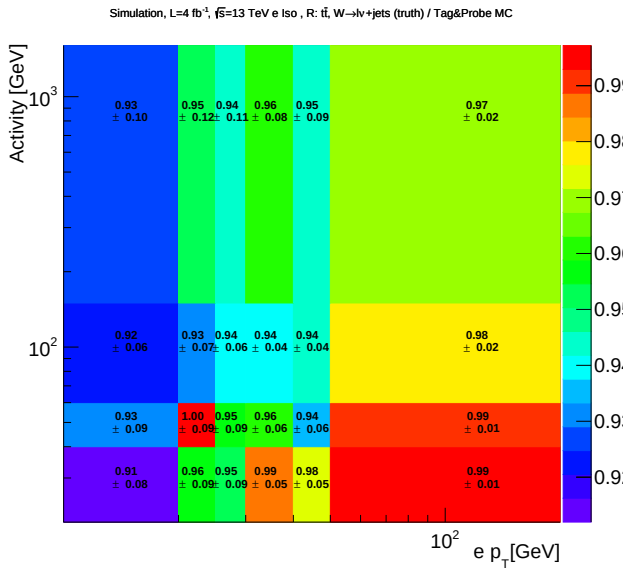
- e Iso $t\bar{t}$ & W + jets eff. (truth info.)



- e Iso DY eff. (Tag & Probe)



- e iso radio

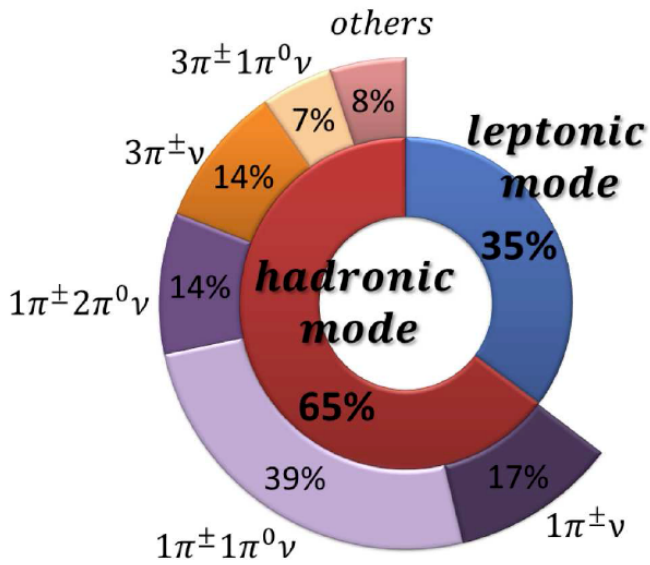


- Efficiencies obtained (using truth information) from $t\bar{t}$ & W + jets and DY are in good agreement
- Lepton p_T and activity are sufficient topology independent to be transfered from DY to signal region! (Confirm Florent)
- Overall the efficiencies from DY are higher. (No cuts applied to DY $t\bar{t}$ & W + jets baseline applied)

Isolated Elec & Muon Tracks

- Muon, Electron Tracks:
  - Charged PFCand, $p_T > 5GeV$, $m_T < 100GeV$ ask for pdgID=11,13
  - Iso: $\Sigma(p_T(Tracks)\Delta R < 0.3)/(p_T\,Track) < 0.2$ (with $dz < 0.05$)
- Tag & Probe:
  - Tag: Isolated μ/e (high purity RA2b definition)
  - Probe:
    - ★ Desirable Probe: chargedPFCands $\rightarrow$ iso Mu/Elec Track (not possible too high background)
    - ★ Instead Probe: chargedPFCands with pdgID=11,13 (cant test for pdgID)
    - ★ Still small statistics due to deriving efficiencies of isolated tracks to failing isolated leptons (not applied yet)
    - ★ Problem: No $m_T < 100GeV$ applicable (maybe treat tag lepton as neutrino emulate W $\rightarrow$ lν)

- Tag&Probe on chargedPFCands has too high bkg
- Idea: Use similarities of isolated μ/e & π tracks (to be evaluated)



- $\tau \to \pi^- + \nu(17\%)$ These should behave like μ/e tracks!? If so, give us rough idea on track eff. uncertainty
- $\tau \to \pi^- + 1/2\pi 0 + \nu(53\%)$ Still only one charged track. Similar to $\tau \to \pi^- + \nu$? If so same approach, inflated uncertainty.
- What fraction of 3 prong τ get selected by isolated track? Rather small (10%), if so, assigning high uncertainty would be practical.