Tracking Pseudo-Efficiency

New development and Future Plan
What is Pseudo-Efficiency?

- It used to be called “SVT-based efficiency”.
- Knowing tracks in SVT, measure DCH efficiency.
  \[ e = \frac{n_{\text{GTL}}}{n_{\text{GTVL}}} \]
  - GTVL (GoodTracksVeryLoose) does not require DCH hits.
  - GTL (GoodTracksLoose) require 12 DCH hits.
- Not really true any more.
  - SVT and DCH are not independent.
  - DchHitAdder and SvtHitAdder add tracks with each other.
- Then is it useful? – The answer is YES!!
  - Gives us good “Data/MC ratio” -> correction tables
    - R12/R14 : validated by the tau method.
  - Efficiency itself is useful for validation
    - Pseudo-efficiency was the only clue which lead us to G4 bug.
Pseudo-Efficiency : R12/R14

- Data
- MC
Systematic Uncertainty R12/R14

- What was done in R12/R14
  - Trk quality requirement (nSvt, Vertex) : 0.2 %
  - MC composition (selection bias) : 0.33 %
  - Track Hit Adders : 0.86 %
  - Consistency with tau method : 0.18 %

- We need to reconsider these...
New Development: new code

- TrkPseudoEff package
  - Create tables and plots for pseudo-efficiency.
  - Script to make plots are included.
  - Use ROOT.
  - No more Fortran.
  - More control
    - Can easily change binning.
    - Can easily change cuts.
    - Can make plots for validation.
      - Number of tracks per bin
      - nDch, nSvt, pT, nDch vs theta, etc...
      - Plots for pion tracks from BtaPidKsSamplePions list
New Pseudo-efficiency plots: R16
Use of Pseudo-Eff (1): SP8 tuning

- Tuning of DCH simulation parameters.

Before tuning

After tuning
Use of Pseudo-Eff (2): SP8 validation

- But Data-MC agreement is still not as good as SP5/6
Comparison of R16 and R18

R16 (SP5/SP6)
Data efficiency: 96.09%
MC efficiency: 96.98%
Data/MC ratio: 0.9908
(1 % difference)

R18 (SP8)
Data efficiency: 96.21%
MC efficiency: 96.45%
Data/MC ratio: 0.9975
(0.3 % difference)
Future Plan

- R18/SP8 correction tables.
  - As soon as all Run1 – Run4 Data is reprocessed and all Run1 – Run5 SP8 is done.
- New systematic study
  - How to deal with effect of HitAdders?
  - Other systematic to be considered?
  - Consistency with tau method is the key.
- New pseudo-efficiency?
  - Check the possibilities of
    \[ e = \frac{nGTL}{nCT} \quad e = \frac{nGTVL}{nCT} \]
  - Use of track history?
    - SVT- efficiency?