

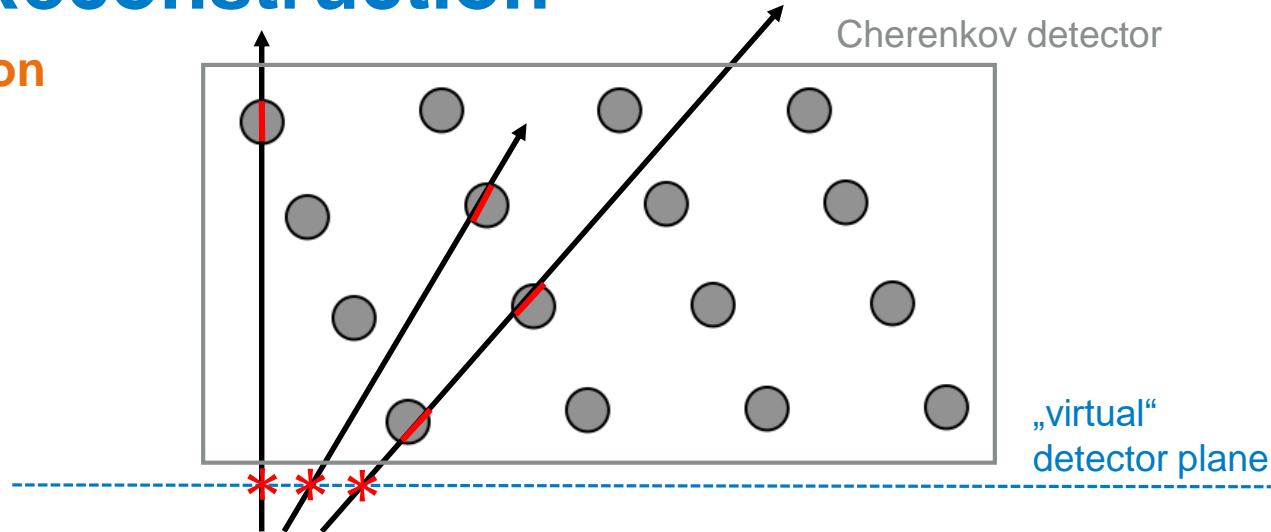
Straw Reco in Geant 4

Ruth Jacobs

LUXE DESY meeting
14th July 2022

Cherenkov Reconstruction

Samples and selection



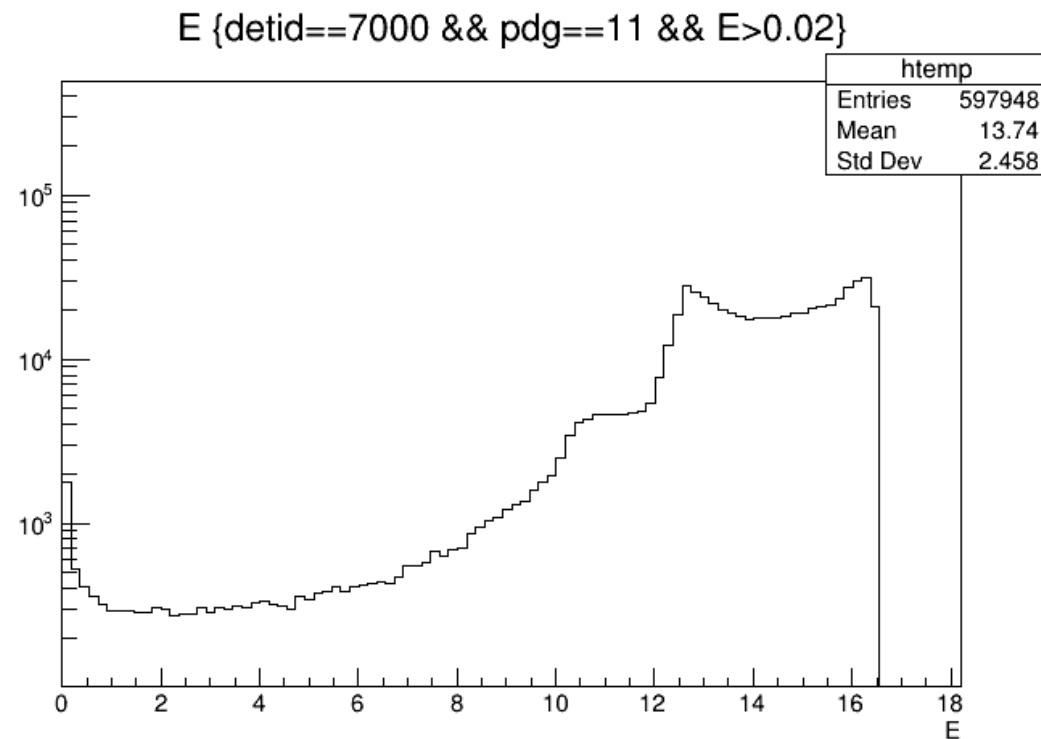
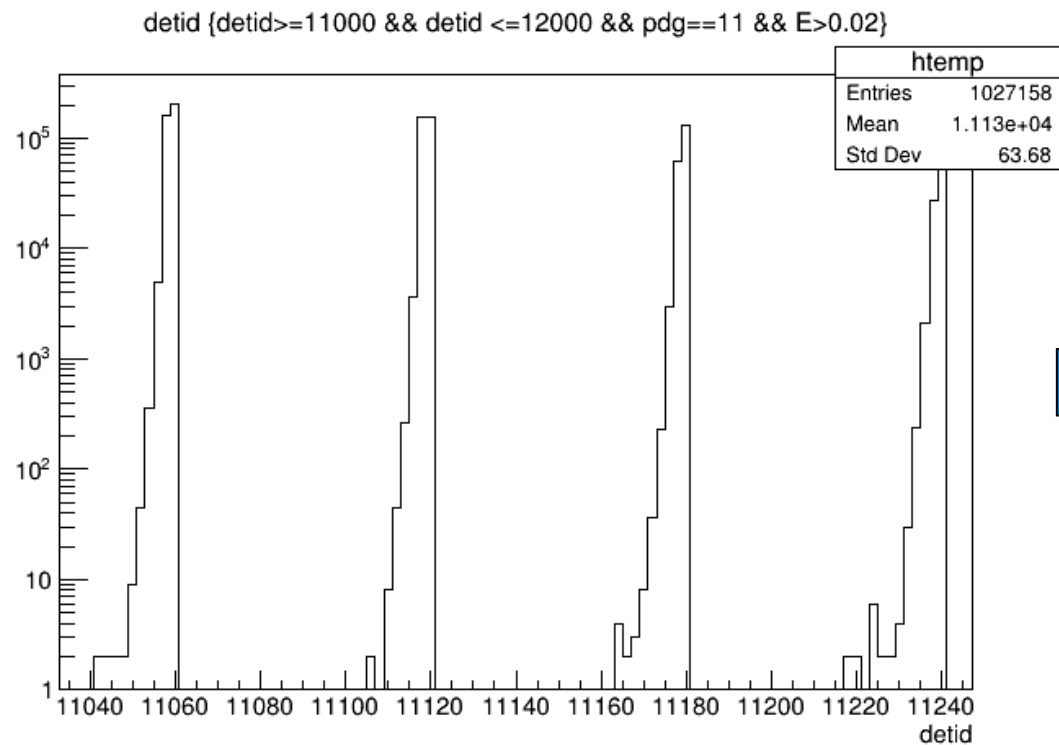
Selection:

- Require primary electron in the event (pdg=11 , detid=-1 (signal sample) or detid=100 (flat sample))
- Virtual detector plane hit: detid=7000, $E > 0.02$, pdg=11
- Straw hit: $11000 < \text{detid} < 11240$, $E > 0.02$, pdg=11
- Note: each straw pass leaves 2 tracks (entering and leaving) → find pair patterns
- get path length in straw → proportional to light yield
- „Truth Matching”: Match straw hits to closest front plane hit (in x plane)

Samples:

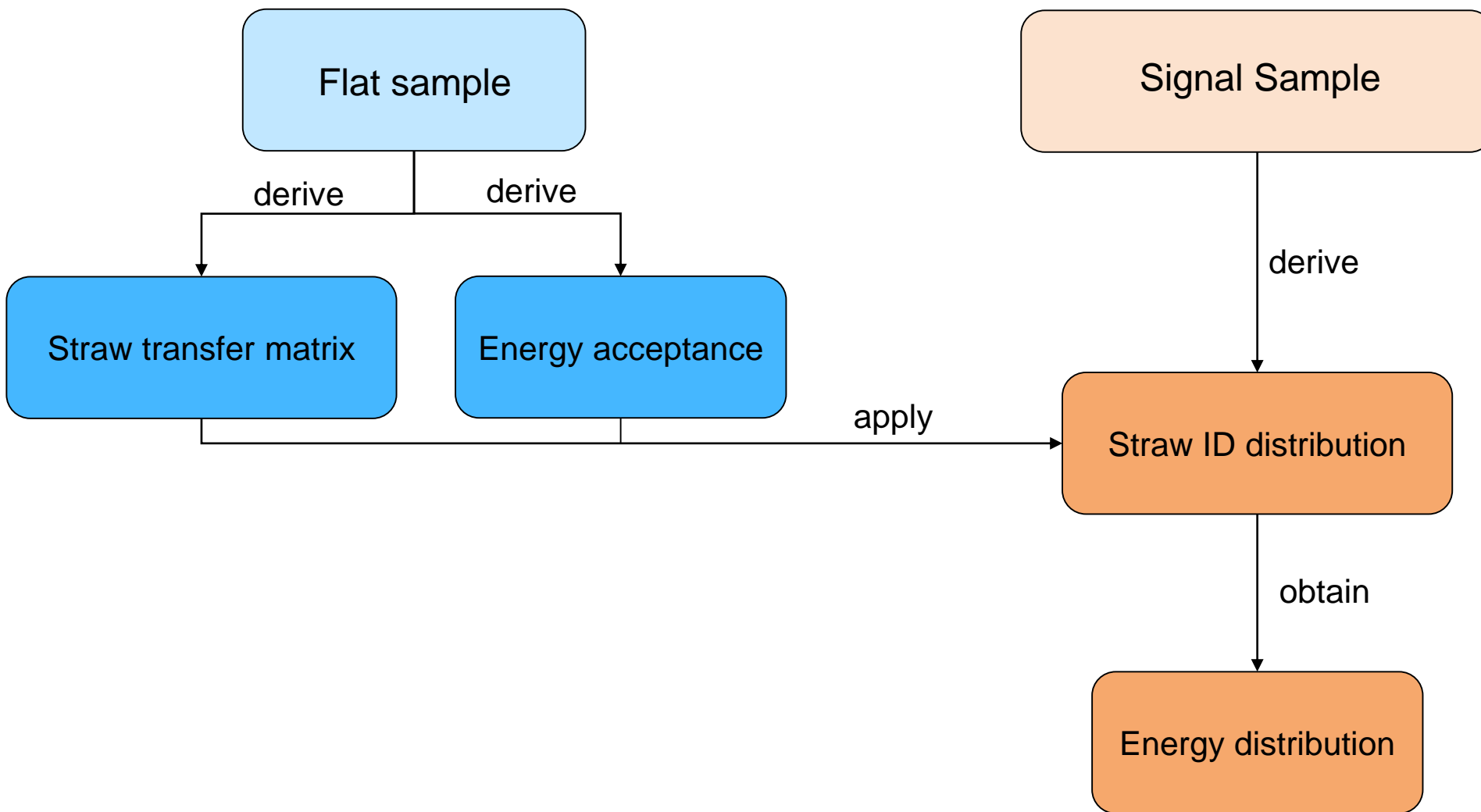
- Using John's [lxsim-eds](#) , produced by Louis on NAF
- High statistics flat-energy spectrum: /nfs/dust/luxe/user/lhelary/CherenkovScreenGeant4/build/Signal/run_*/lxsim_eds_xi0.5_*.root
- Signal sample: /nfs/dust/luxe/user/lhelary/CherenkovScreenGeant4/build/Signal/run_*/lxsim_eds_xi0.5_*.root

Cherenkov Reconstruction

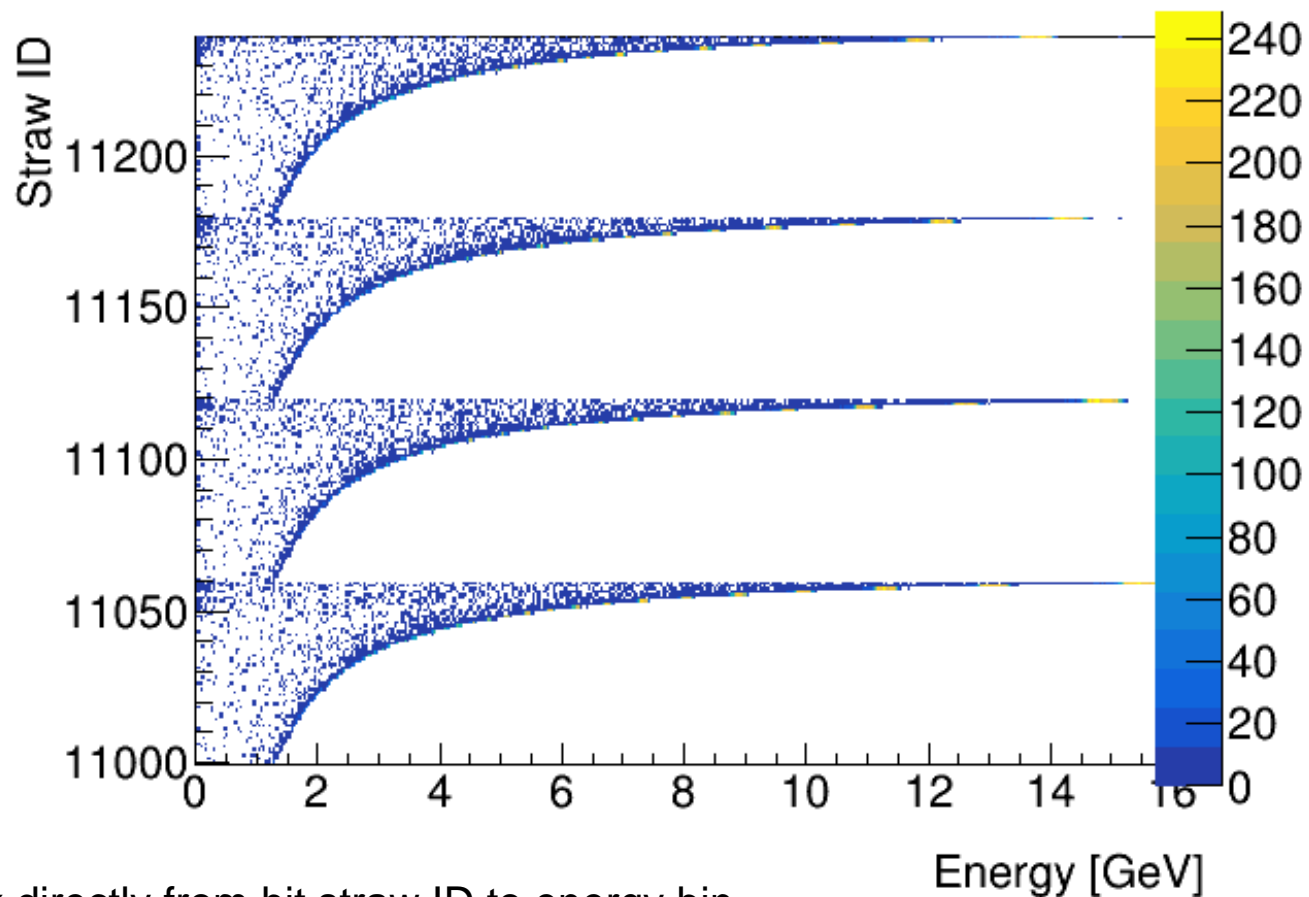


- Transform directly from hit straw ID to energy bin

Reco procedure



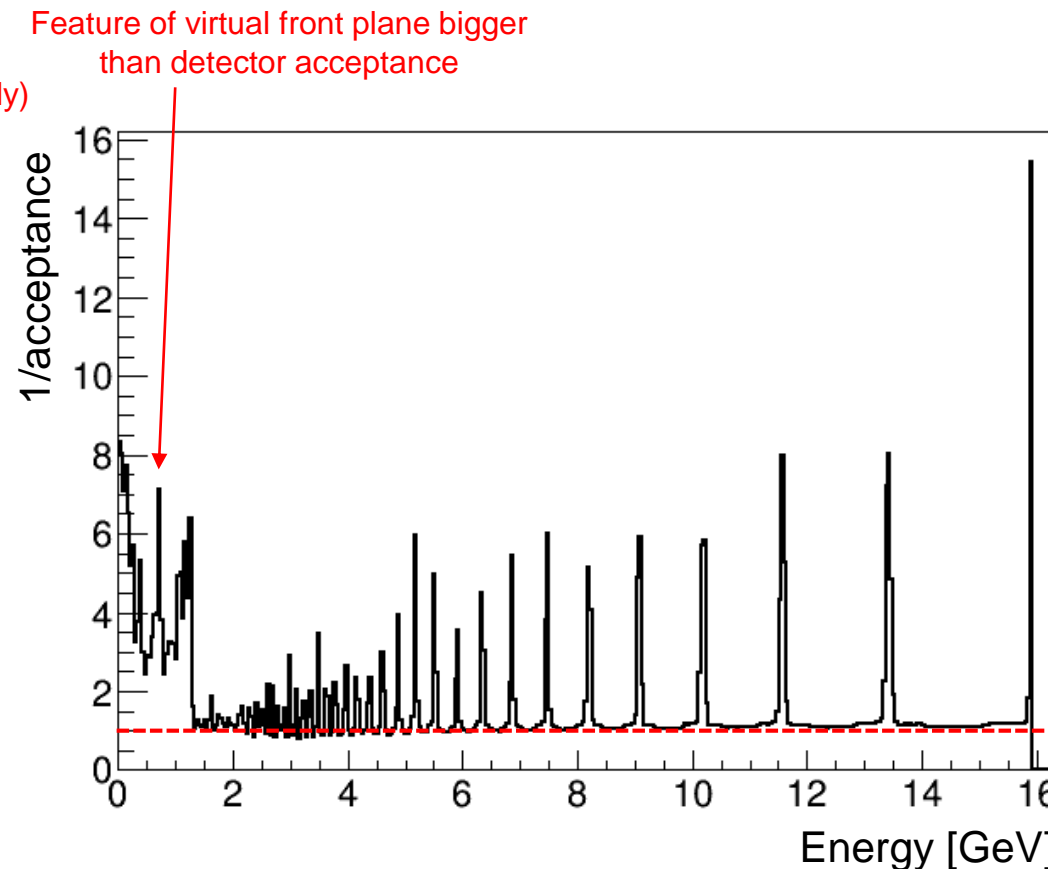
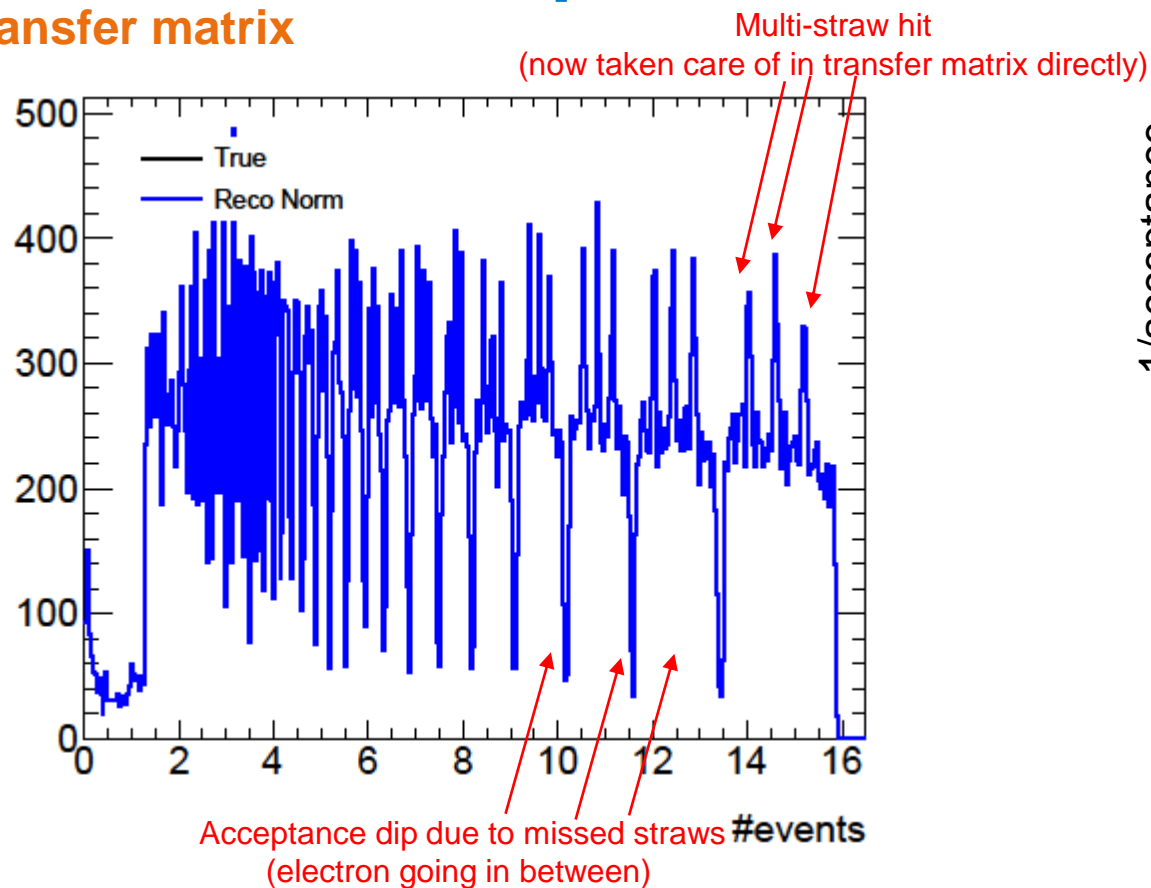
Transfer Matrix



- Transfer matrix directly from hit straw ID to energy bin
- Encodes:
 - conversion of straw ID \rightarrow Energy using straw geometry and dipole field
 - acceptance due to round straw profile
 - treatment of multi-straw hits (truth matching, (weight=path length/total path length) of all straw hits)

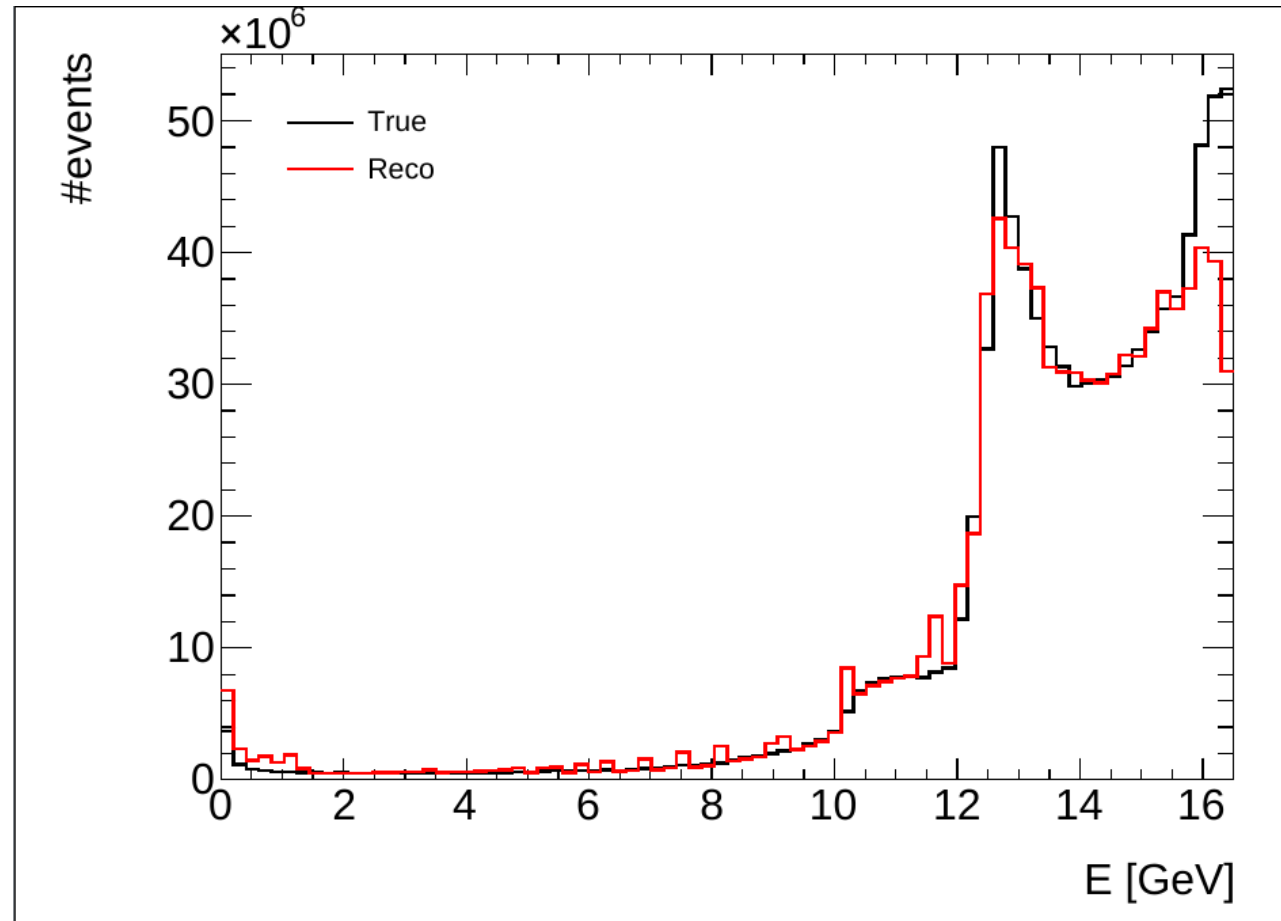
Additional Acceptance Effect

Transfer matrix



- Get pronounced acceptance dips, because for some front plane hits we don't get a straw hit at all
- When we don't get a straw passing at all, this doesn't show up in the transfer matrix
- Solve for now by deriving additional acceptance factor as function of energy
→ with improved straw geometry these dips should go away!

Result



- Ok for very simple reco technique and suboptimal geometry
- Should be good enough as starting point to do some geometry optimization and think further about reco