HLT Iterative Tracking

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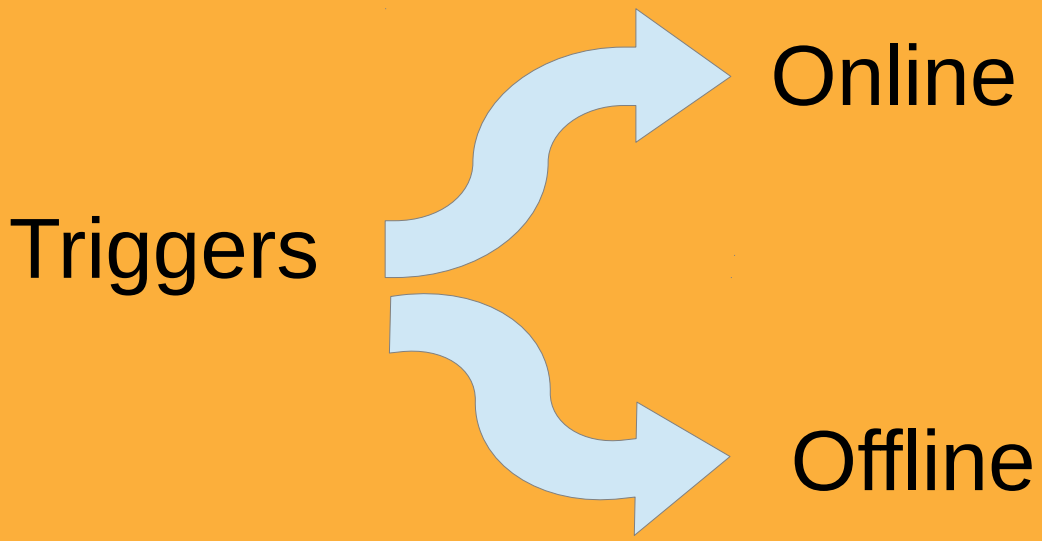
Introduction

- There are collisions at LHC every 25 ns ---> 40 millions per second
- Roughly 20-25 events in each collision
- So around 1 billion events per second!
- Therefore we must reuse the silicon layers every 25 ns

We need Triggers!



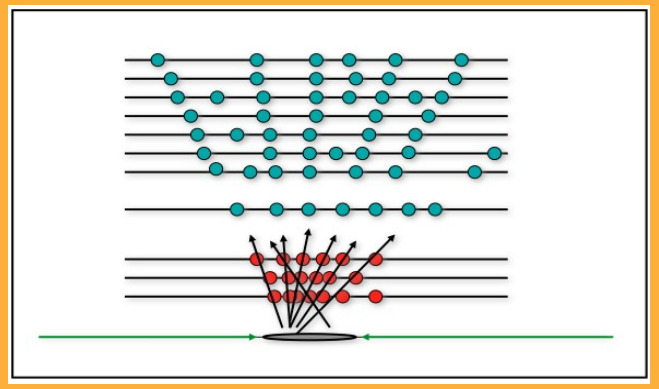
HLT is an online one.

Let's talk about tracks!

There are 5 important parameters for each track

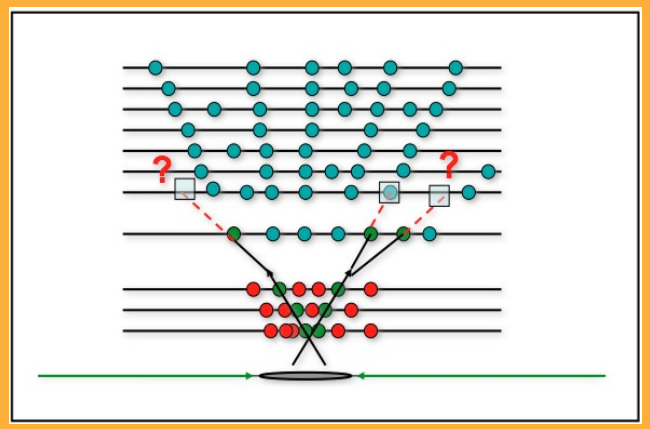
- Radius of curvature ----> Transverse momentum(Pt)
- Angle of trajectory with respect to transverse plane(Phi)
- Angle of trajectory with respect to beamline(Theta)--->Eta
- “impact parameter" relative to beamspot , in the plane transverse to the beamline(Dxy)
- impact parameter relative to beamspot perpendicular to the beamline(Dz)

Track Reconstruction



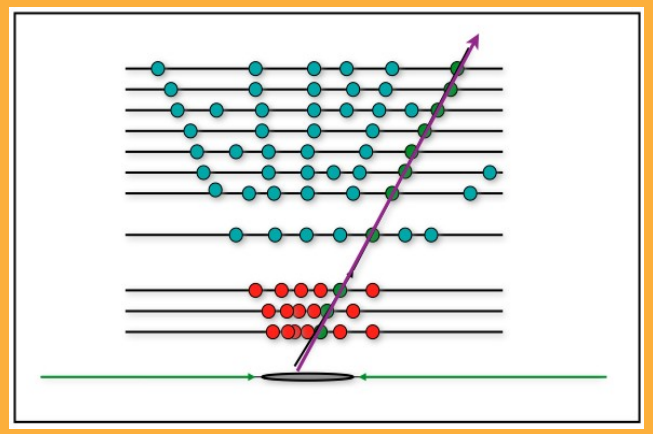
SEEDING

- *starts from the pixel tracks (triplets or pairs)*
- *seeds not compatible w/ the beamspot or PV are discarded*



TRAJECTORY BUILDING

With a rough estimate of track parameter,it goes up layer by layer to gather more hits to find whether it can be a track or not

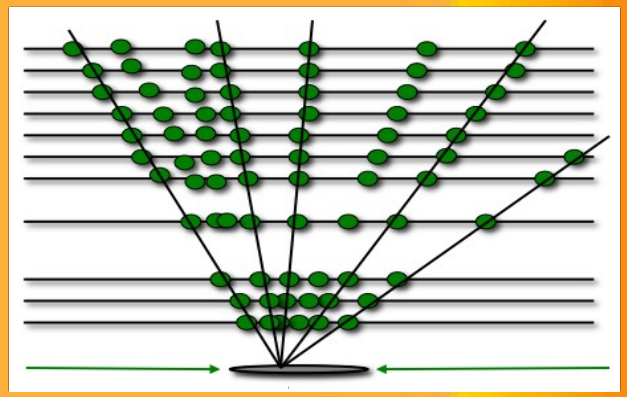


TRAJECTORY FITTING

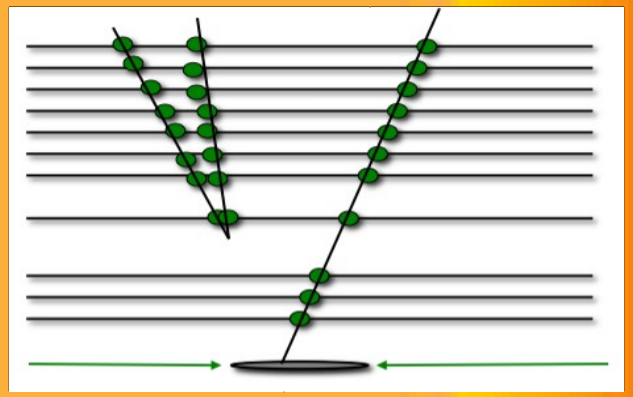
- *more hits are added and the track parameters estimation is updated every time a new hit is found*
- *a final fit is performed to obtain the track parameters at the interaction point*

Iteration process

Iteration 0



Iteration 1



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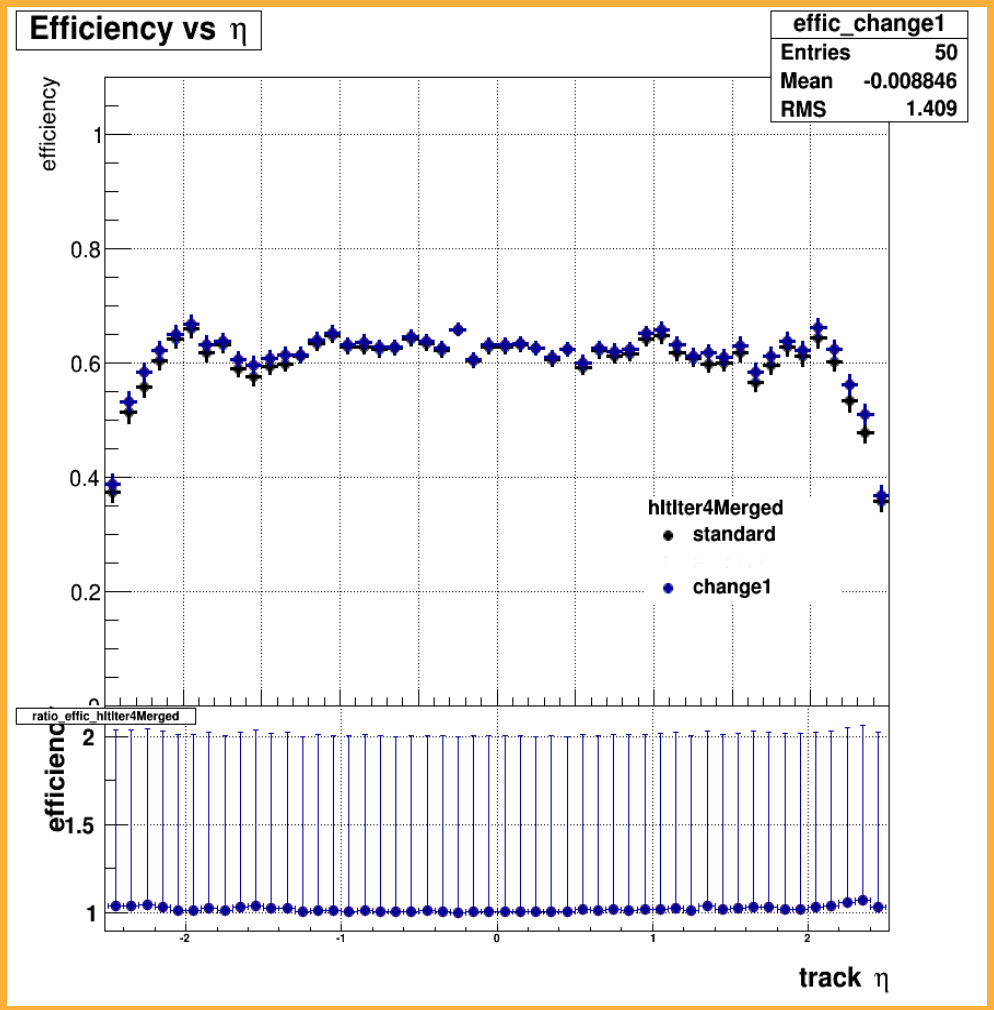
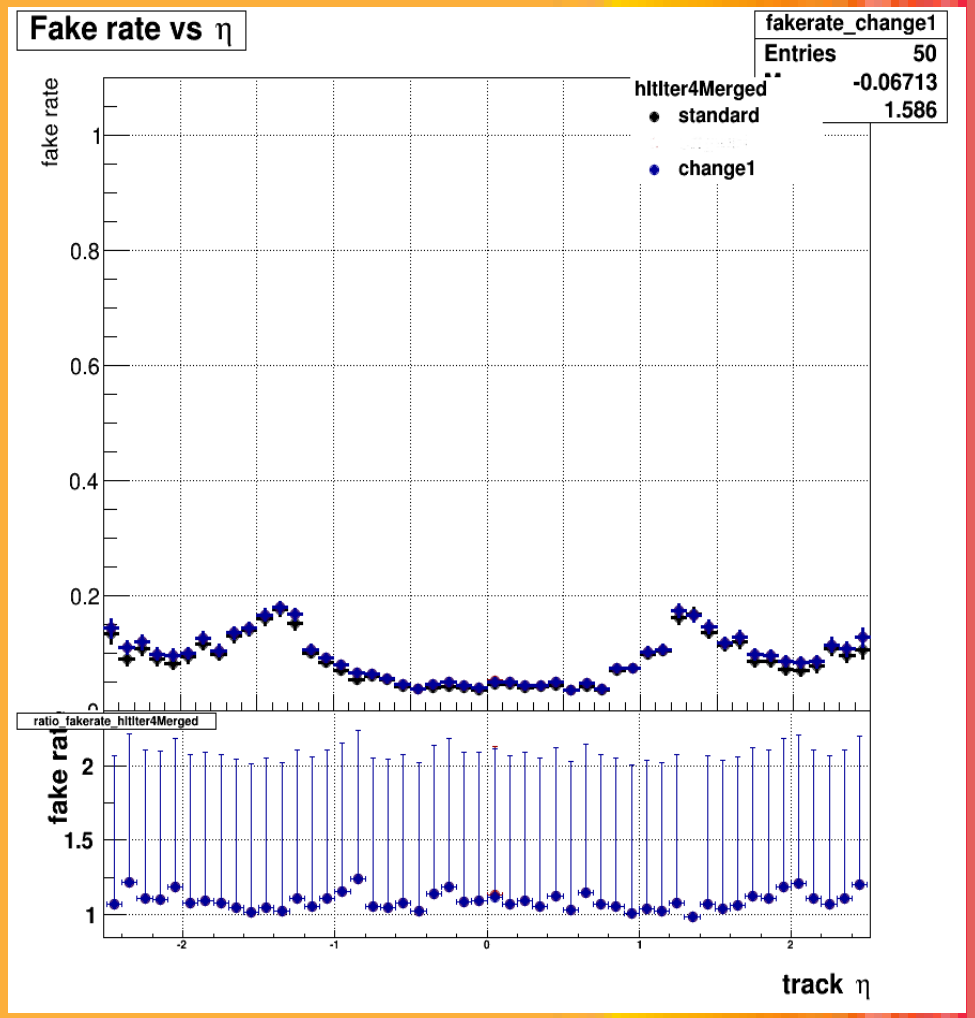
My work!

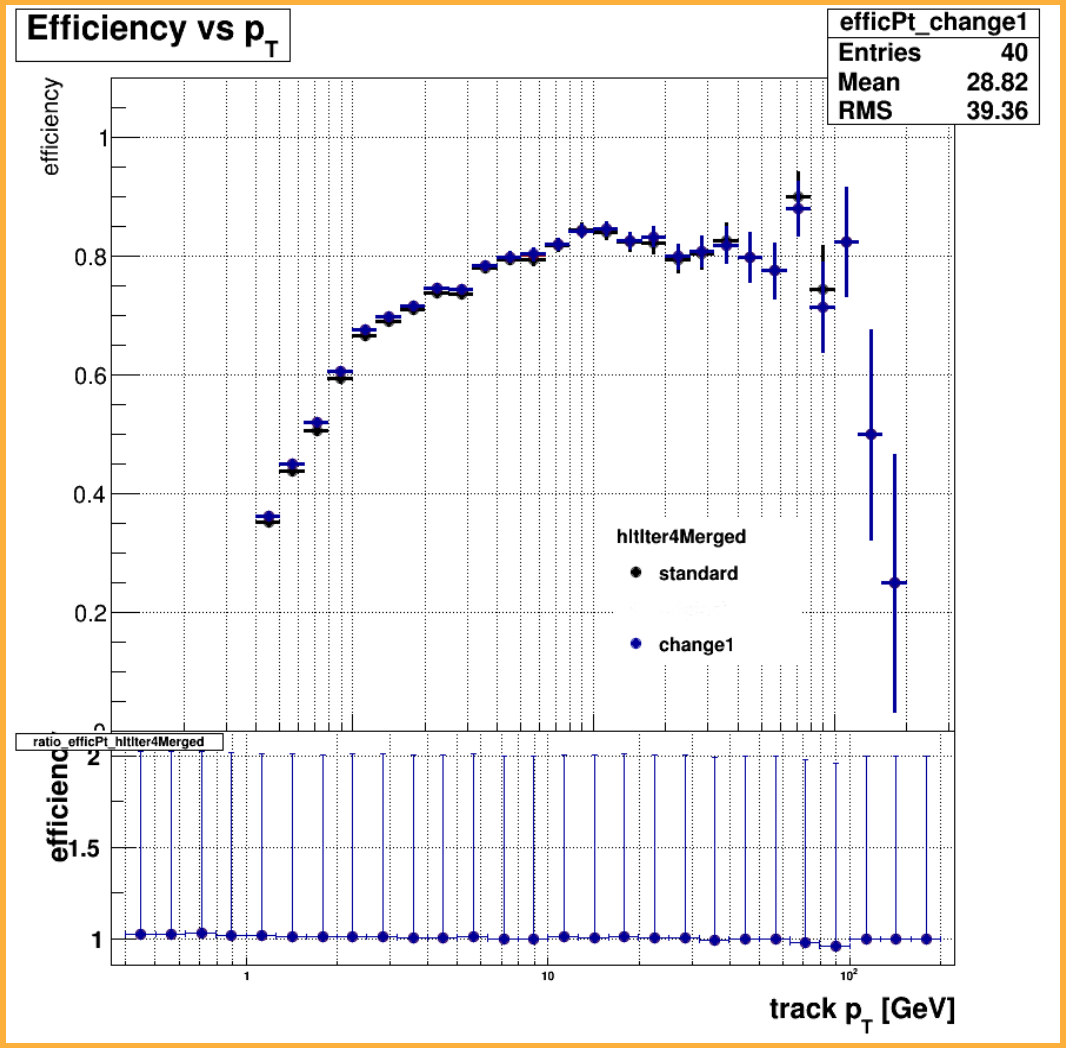
- Analytical Track Selector--->Multi Track Selector
- Using simulated events
- Efficiency and Fake Rate

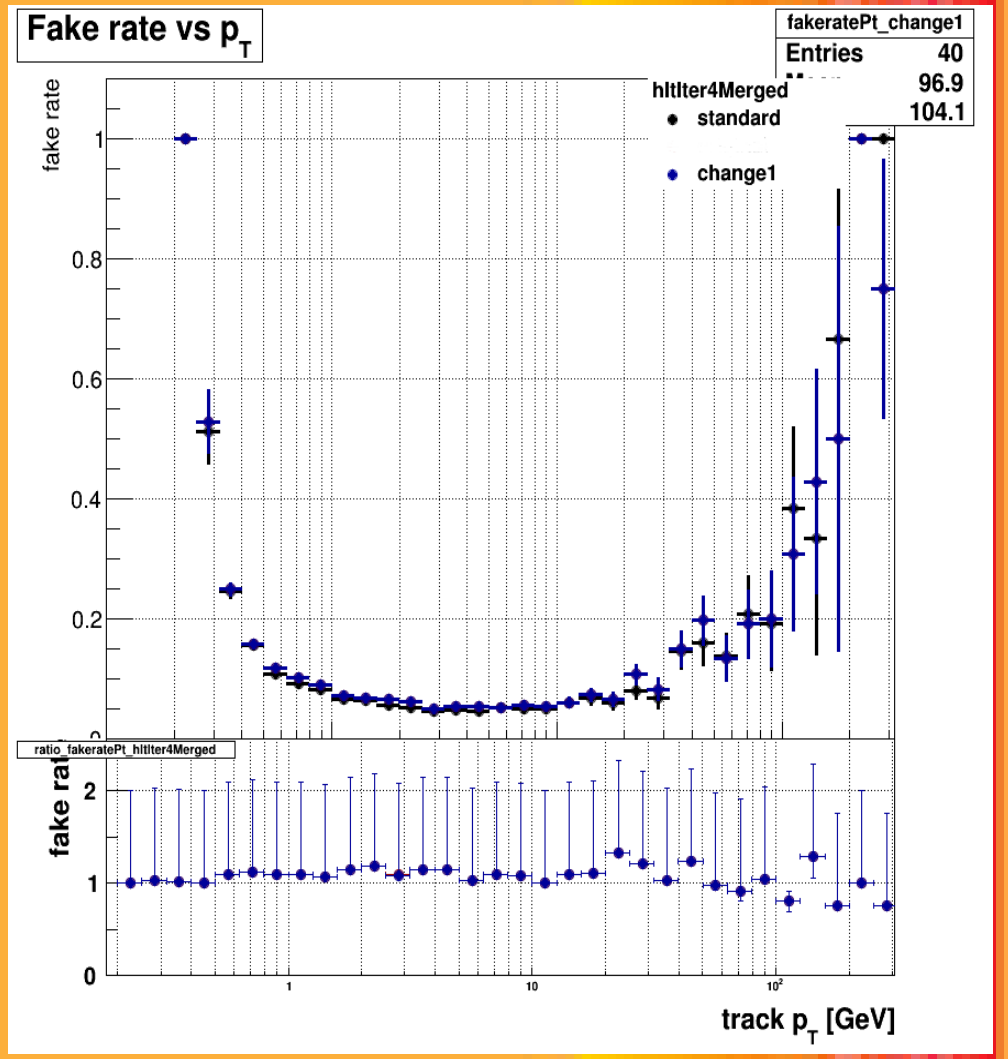
Eta


Efficiency vs η
effic_change1
Entries 50
Mean -0.008846
RMS 1.409
efficiency
hltIter4Merged
standard
change1
ratio_effic_hltIter4Merged
track η


Fake rate vs η
fakerate_change1
Entries 50
-0.06713
1.586
fake rate
hltIter4Merged
standard
change1
ratio_fakerate_hltIter4Merged
track η

Pt


Efficiency vs p_T
efficPt_change1
Entries 40
Mean 28.82
RMS 39.36
efficiency
hItIter4Merged
standard
change1
ratio_efficPt_hItIter4Merged
track p_T [GeV]


Fake rate vs p_T
fakeratePt_change1
Entries 40
96.9
104.1
fake rate
hItIter4Merged
standard
change1
ratio_fakeratePt_hItIter4Merged
track p_T [GeV]

Thank you