HLT L2.5 pixel-only btag efficiency & L3 (regional all-silicon) track properties

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HLT_BTagIP_Jet trigger paths

6.3.2 Implementation

HLT_BTagIP_Jet80

This trigger is structured in four levels:

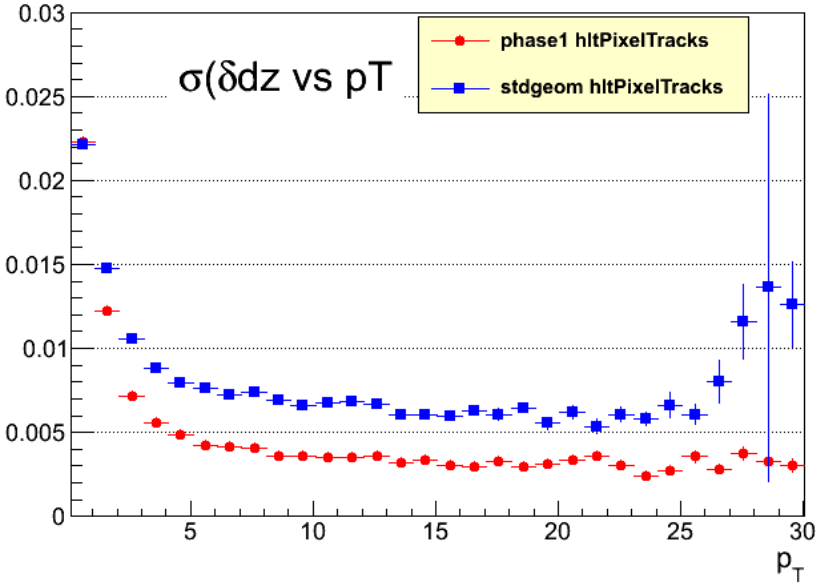
- at Level-1, the trigger is seeded by the single jet Level-1 trigger `L1_SingleJet70`.
- at Level-2, regional jet reconstruction is performed, requiring one jet with $E_T > 80\,\text{GeV}$ and $|\eta| < 3.0$.
- at Level-2.5, the pixel subdetextor is used to reconstruct pixel-only tracks, and the event primavy vertex; a first b-tagging step is performed, requiring at least two pixel tracks with a signed 3D impact parameter significance above 2.5.
- at Level-3, regional and partial tracking is performed, and a second b-tagging step is performed, requiring at least two regional tracks with a signed 3D impact parameter significance above 3.5.

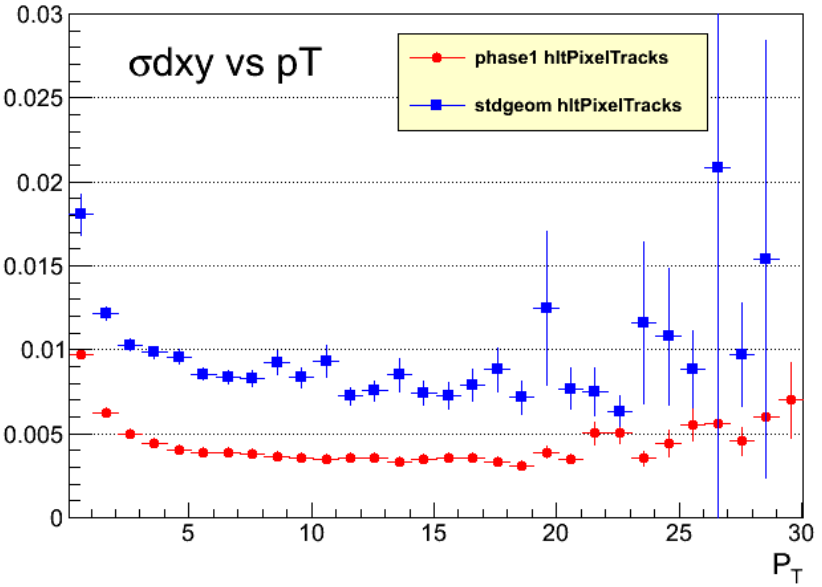
next step: L3

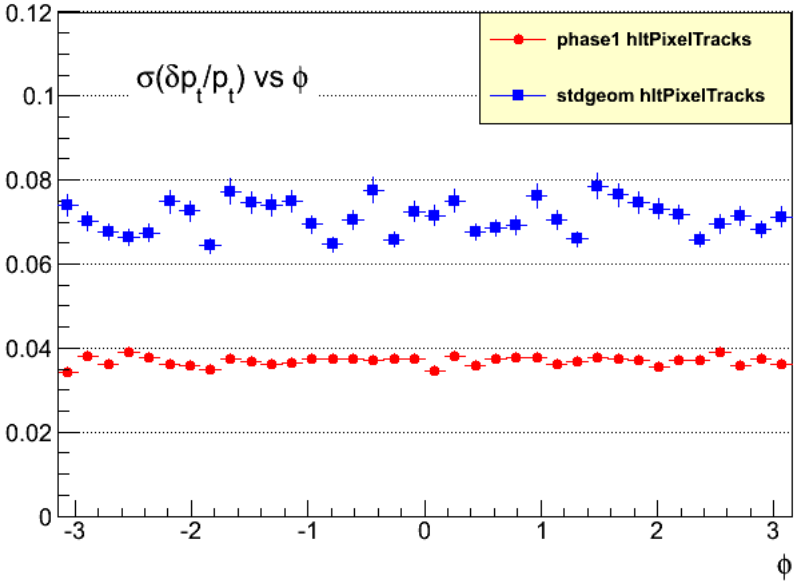
- regional all-silicon tracking
- CkfWithMaterialTracks

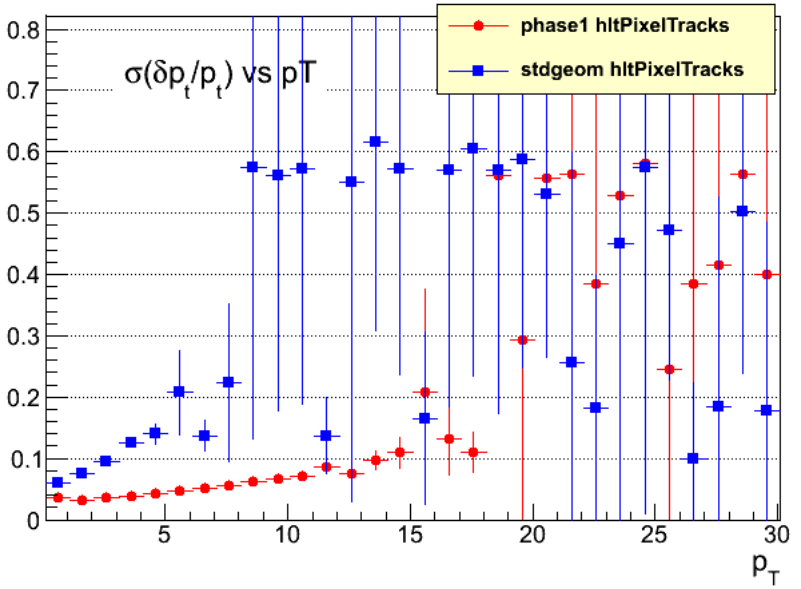
L2.5 (pixel-only) track properties

stdgeom (triplets) phase1 (quadruplets)





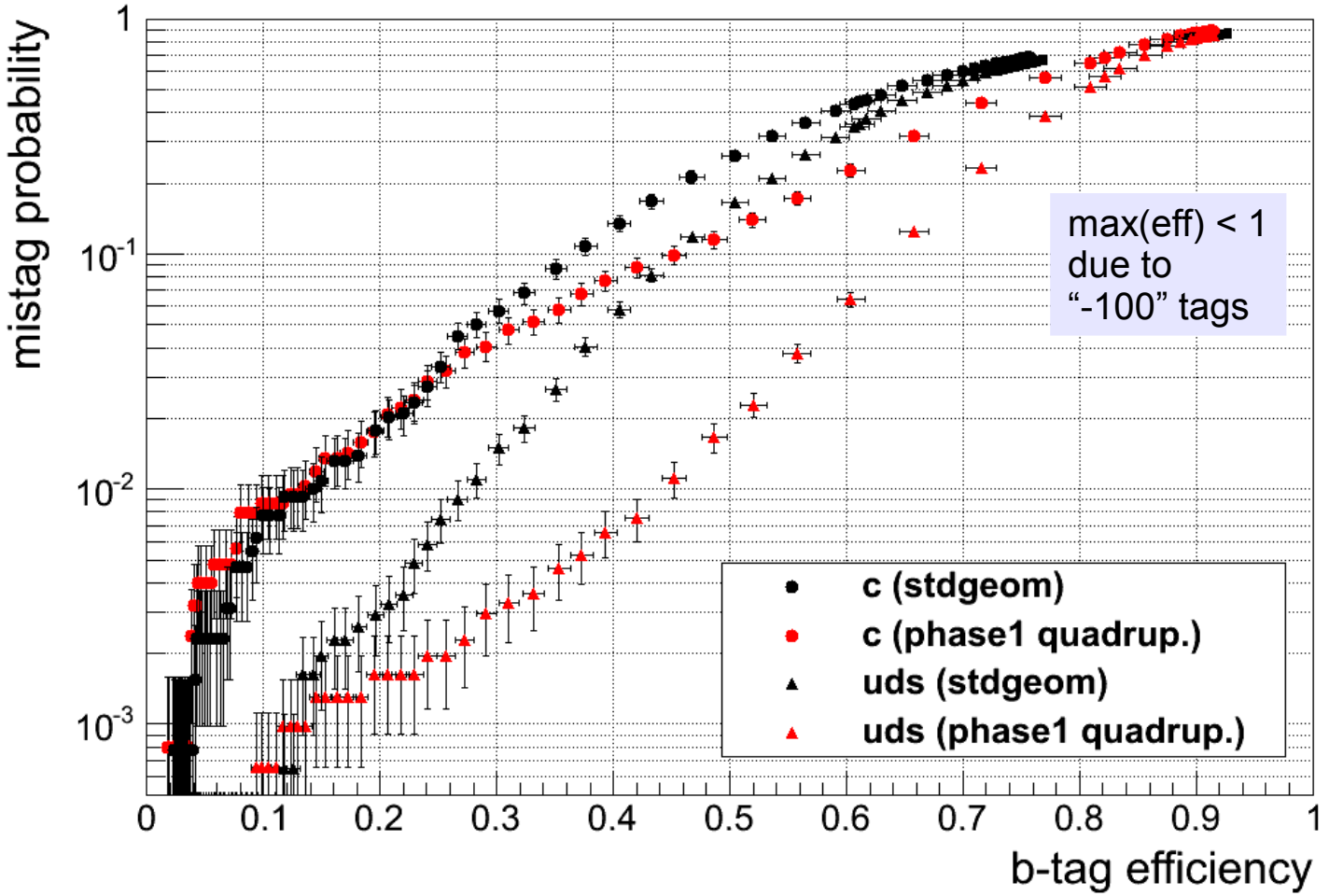




L2.5 (pixel-only) b-tag performance

CMSSW_3_6_3: pixel-only vertexing now takes beam spot into account:

```
bool DivisiveVertexFinder::findVertexesAlt( const reco::TrackRefVector &trks,
                                            reco::VertexCollection &vertexes,
                                            const math::XYZPoint & bs );
```



Also updated jet <> flavor MC association: "algorithmic" instead of "physics" definition, has much better performance (low fake)

B-tag eff/fake improvement now consistent with better tracking performance in phase1

→ L2.5 "understood"

HLT_BTagIP L3 trigger path

HLT_BTagIP_Jet Level3 -

- triggered by step 2.5 (which requires 1 jet with tag > 2.5)
- originally uses pixel **pair seeds**, changed to quadruplets now (will try triplets also)
- regional all-silicon tracking in direction of CaloJet

```
HLTBTagIPSequenceL3Startup = cms.Sequence(
  HLTDoLocalPixelSequence
  + HLTDoLocalStripSequence
  + hltBLifetimeL3JetsStartup
  + hltBLifetimeRegionalPixelSeedGeneratorStartup
  + hltBLifetimeRegionalCkfTrackCandidatesStartup
  + hltBLifetimeRegionalCtfWithMaterialTracksStartup
  + hltBLifetimeL3AssociatorStartup
  + hltBLifetimeL3TagInfosStartup
  + hltBLifetimeL3BJetTagsStartup
)
```

pixel seeds:
pairs → quadruplets

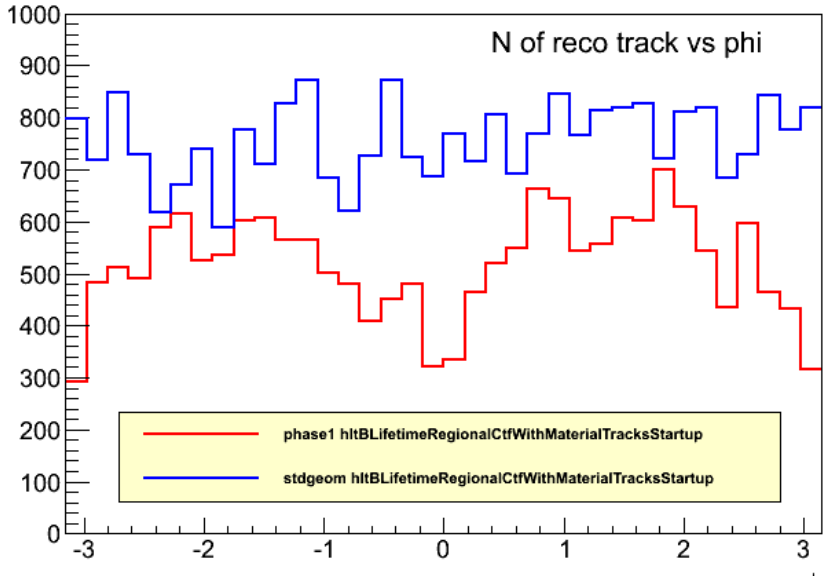
regional all-silicon
CtfWithMaterialTracks

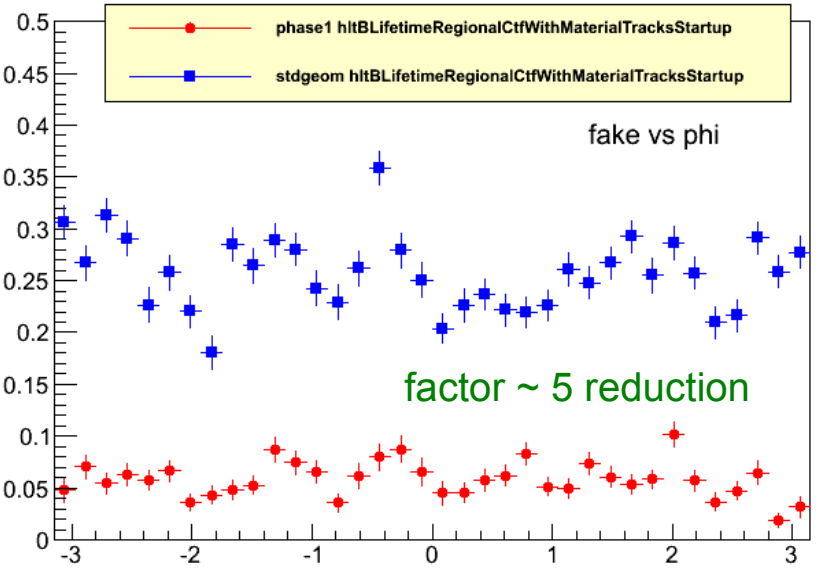
Sequence is a bit more complicated than L2.5 -

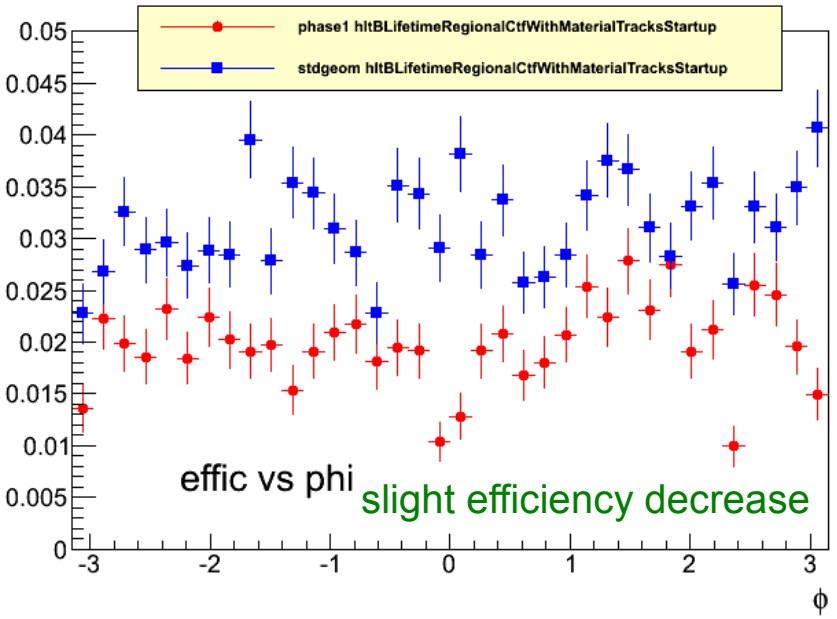
- need some more insight in candidate/ctfTracking procedure with strips

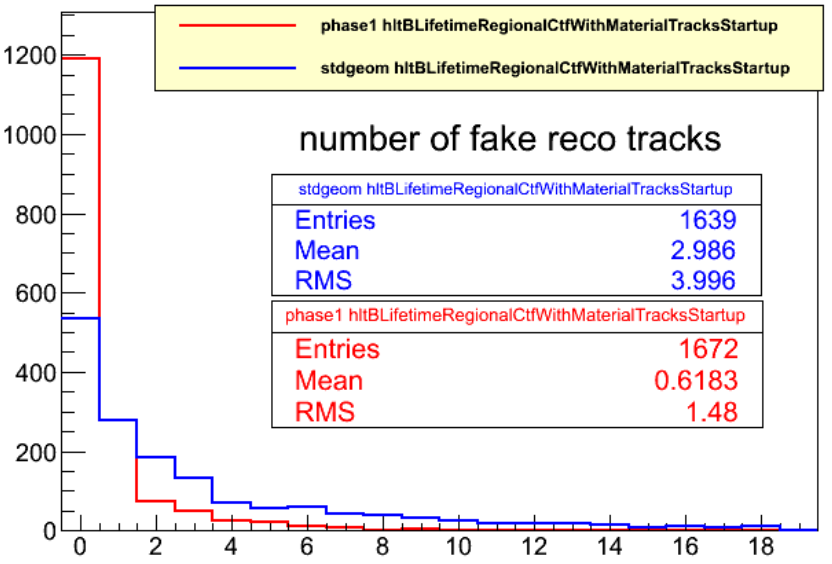
CtfWithMaterialTracks from HLT L3

stdgeom (pair seeds) phase1 (quad seeds)



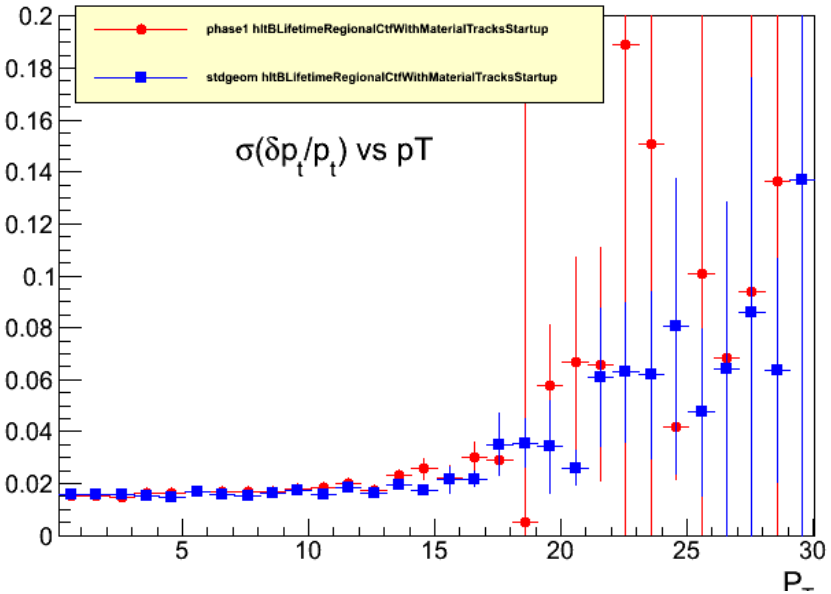


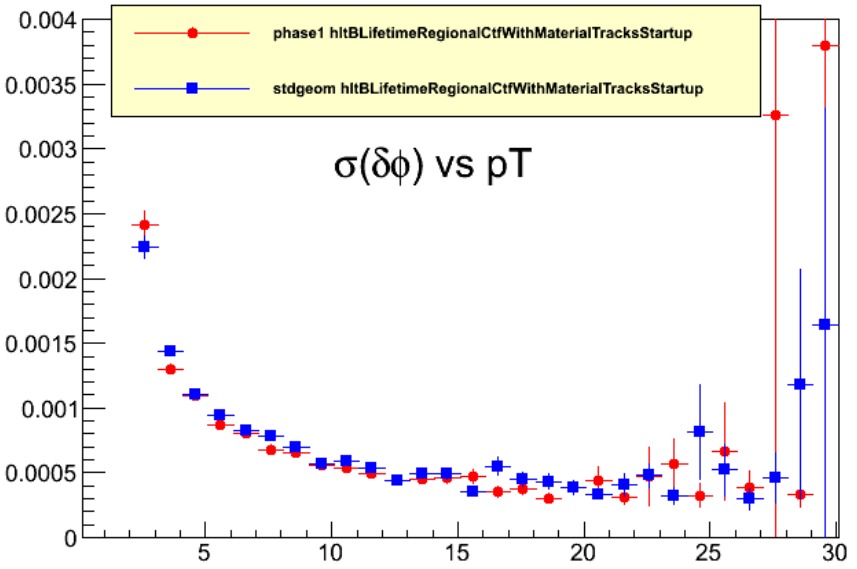


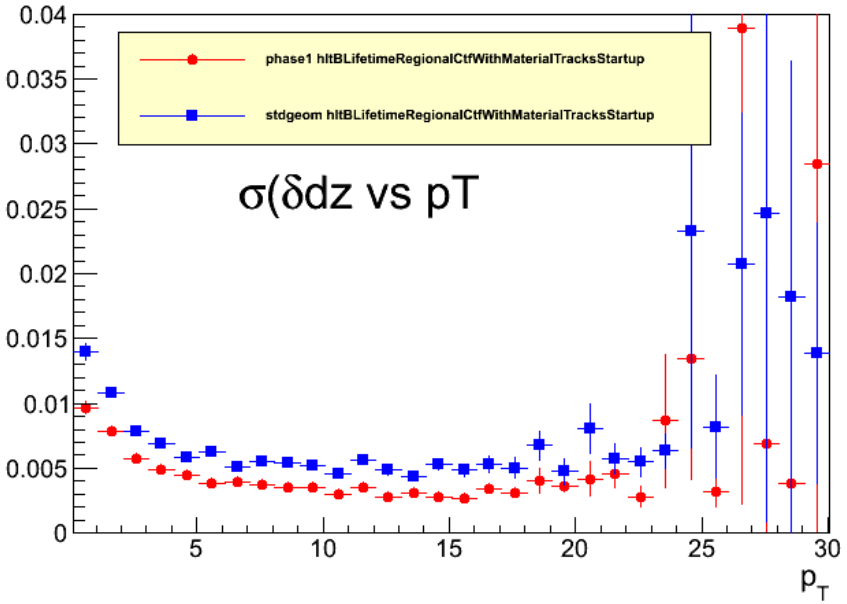


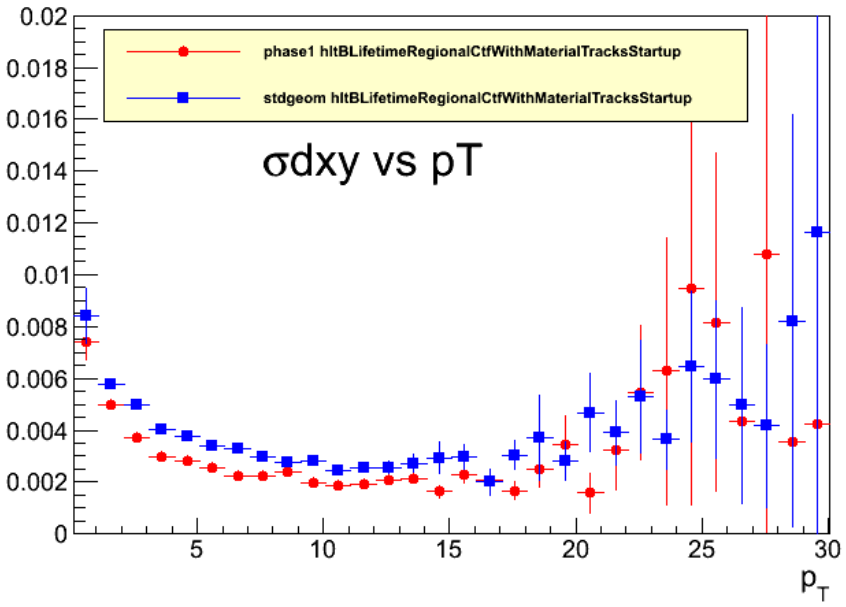
CtfWithMaterialTracks from HLT L3 (cont'd)

stdgeom (pair seeds) phase1 (quad seeds)



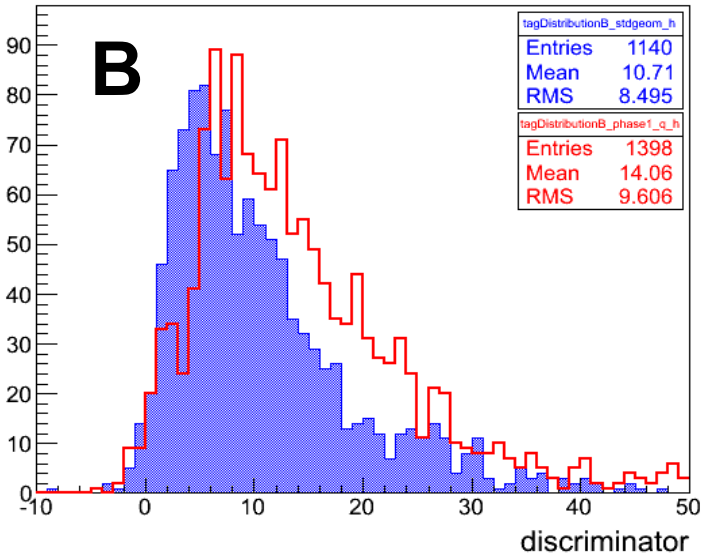


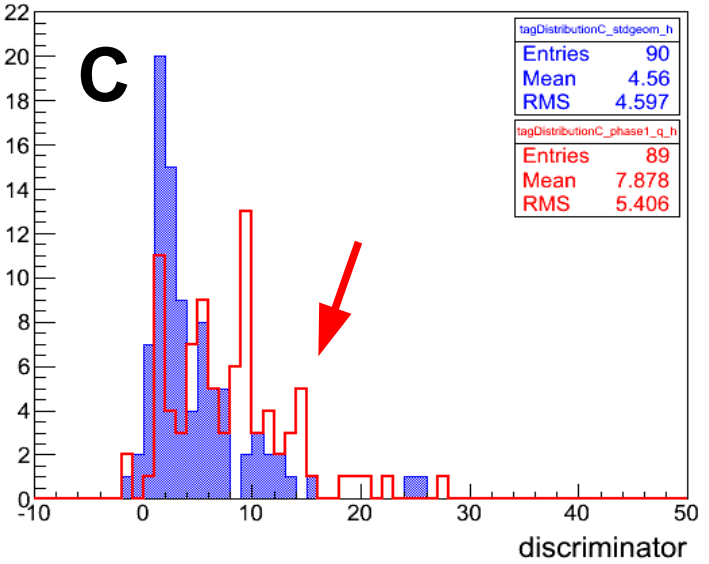


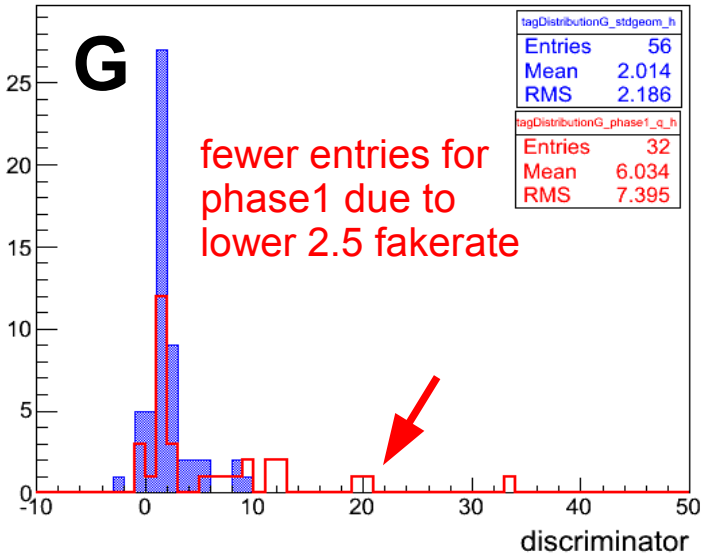


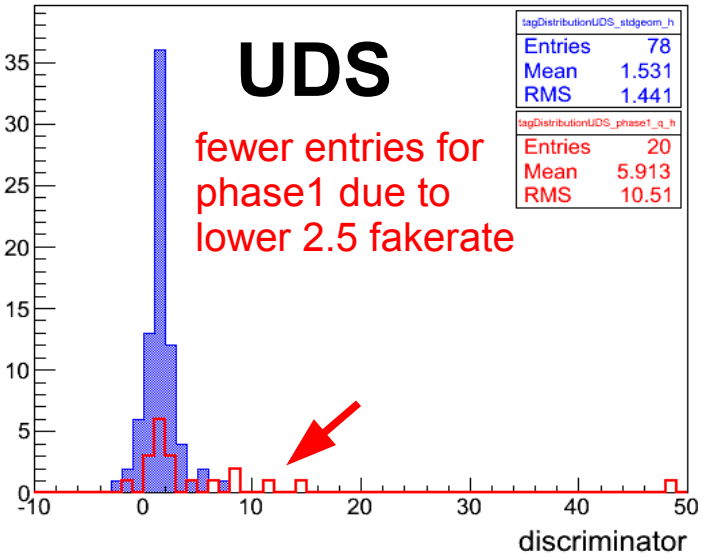
HLT L3 b-tag performance

b-tags from CtfWithMaterialTracksStartup (trackCounting 3D2nd)









Phase1: "scatter" in the light parton tag distributions spoils the b-tag performance

Currently investigating …

Associator?
- jet <> flavour
- jet <> track

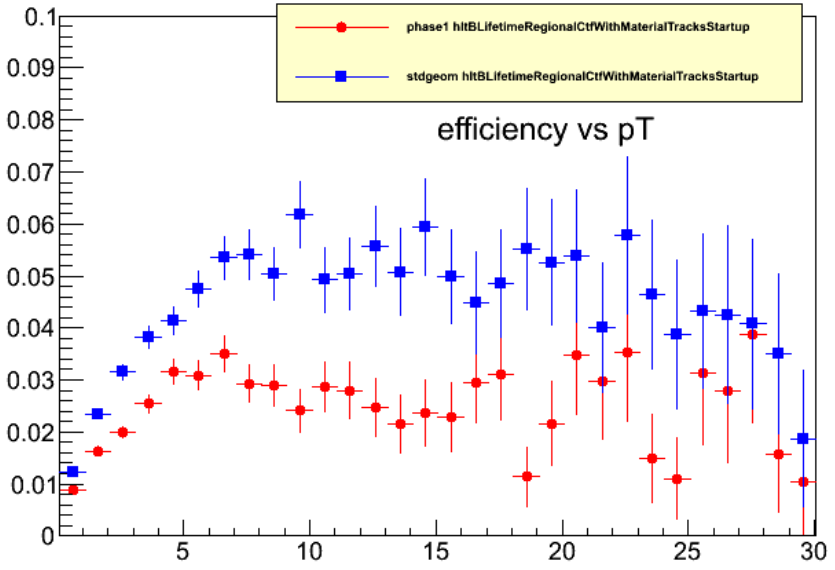
Vertexing?
- beamspot

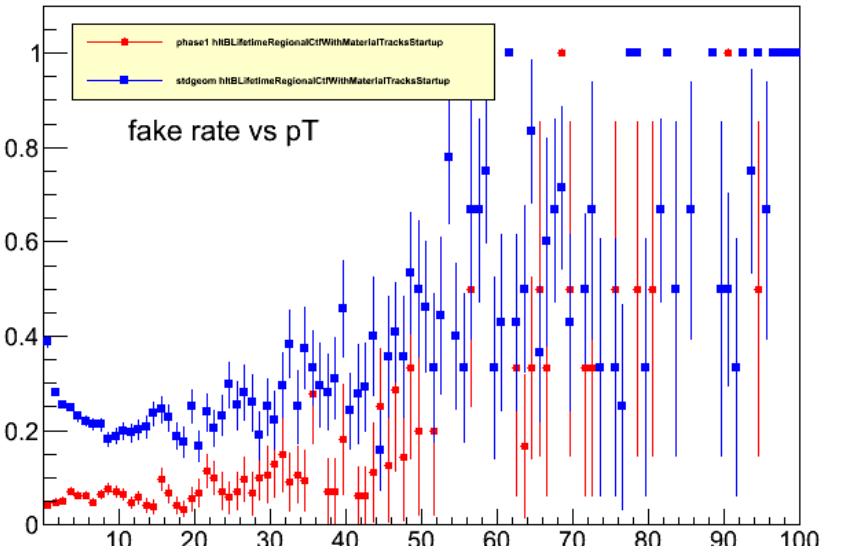
Tracking/Seeds?

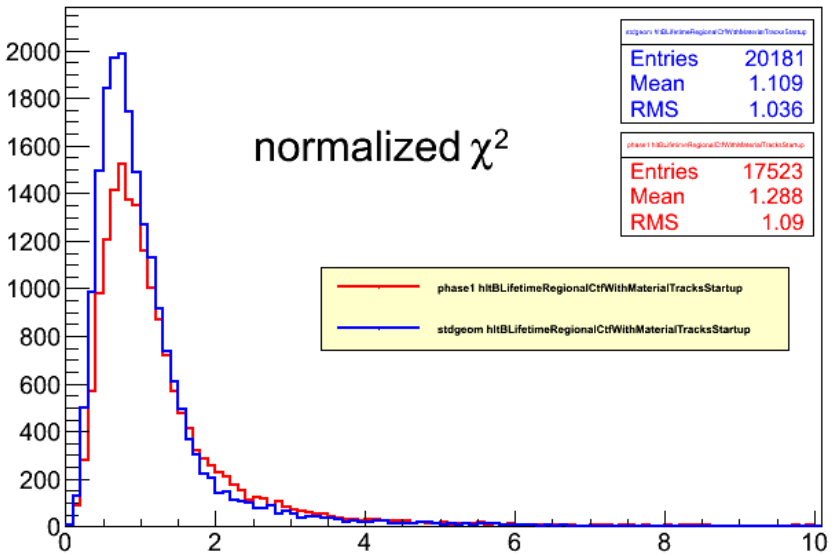
- more plots -

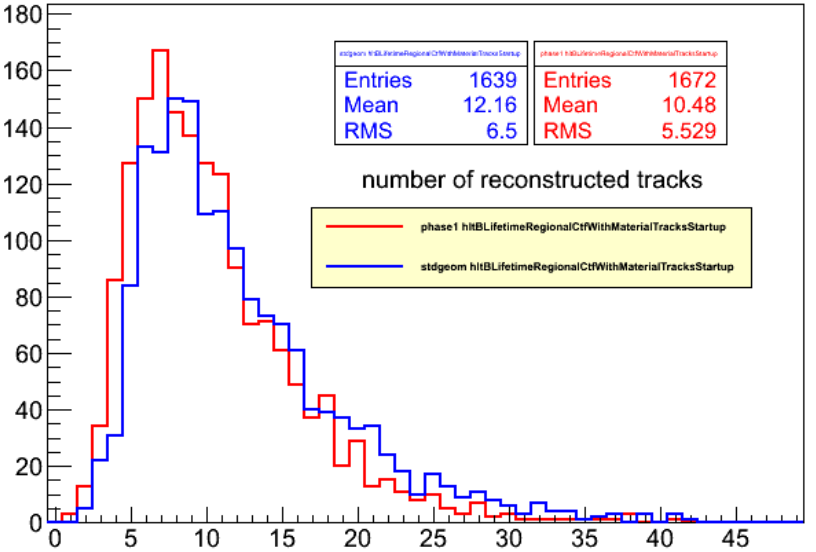
CtfWithMaterialTracks from HLT L3 (cont'd)

stdgeom (pair seeds) phase1 (quad seeds)









CtfWithMaterialTracks from HLT L3 (cont'd)

stdgeom (pair seeds) phase1 (quad seeds)