Pixel-only vertex resolutions

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Tracker upgrade simulations technical meeting

Vertex resolutions

- Samples & versions:
  Phase1: CMSSW_4_2_3_SLHC2
  Stdgeom: CMSSW_4_2_3_SLHC4
  5k events ttbar, PU50, HLT only

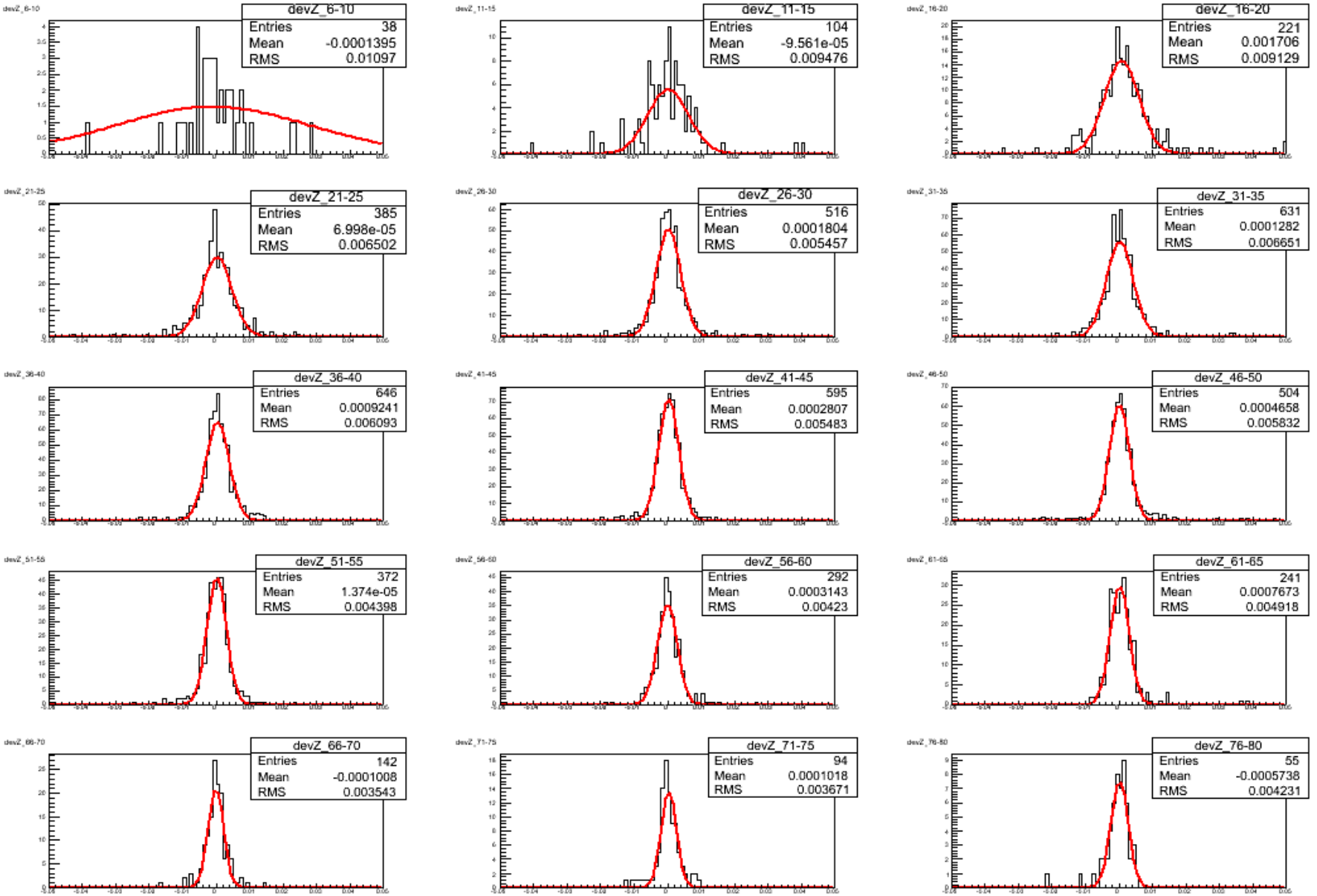
- Validation/RecoVertex package with updates from Jae Chul (ntuples)
  → provides **residuals δx, δy, δz** and **nRecoTrack** for hltPixelVertices

- Residuals plotted in slices of nRecoTrack & fitted with Gaussian
  (see next slide)

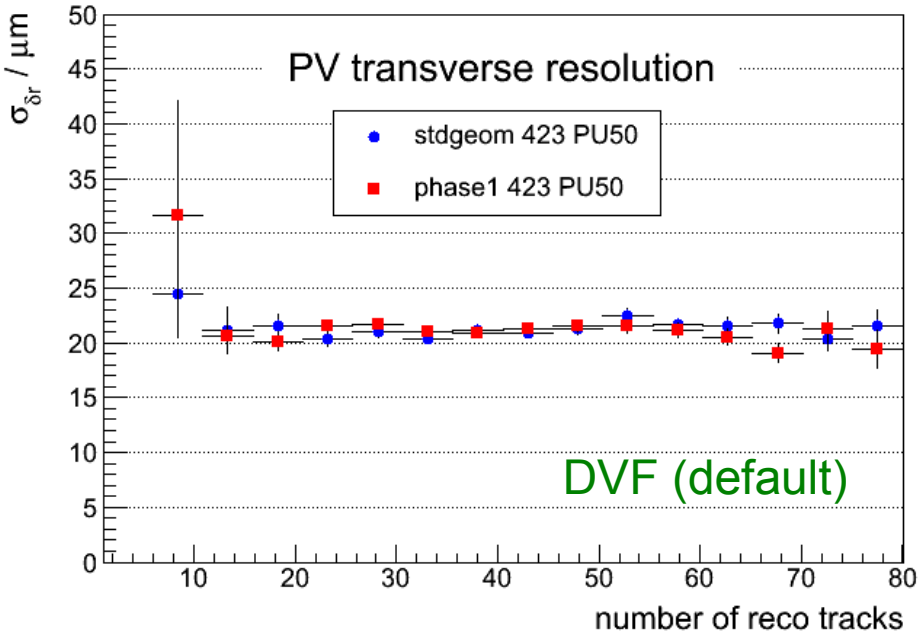
- Gaussian width taken as resolution + parameter error from fit
  (geometric mean of x,y for transverse resolution + error propagation)

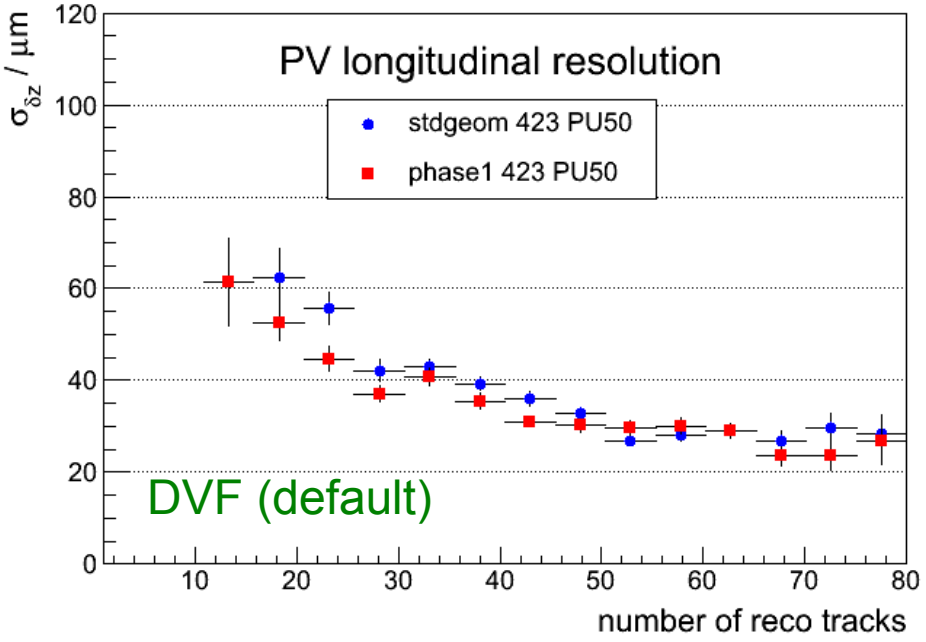
Residual slice fitting

fitted slices (5 nTrack intervals) for δz



Pixel-only vertex resolutions: no data loss





Transverse:

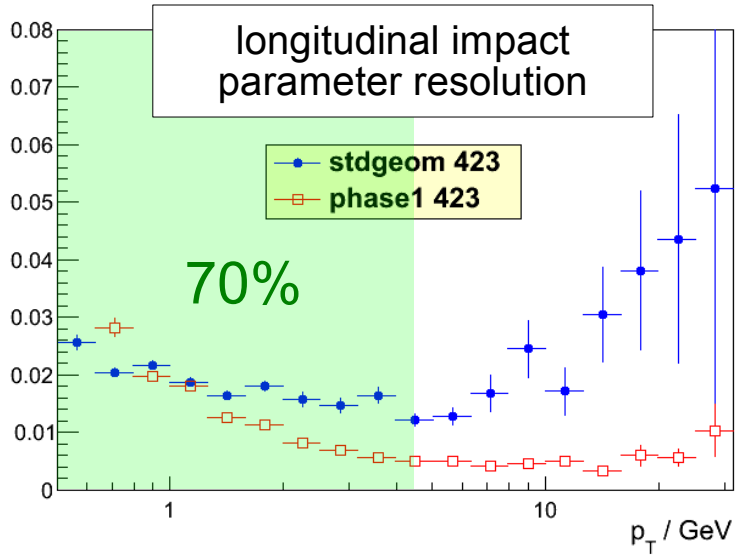
- no difference stdgeom <> phase1
- no deterioration with low #Track/jet

looked a bit deeper:
DVF pixel vertices have x=0, y=0 !

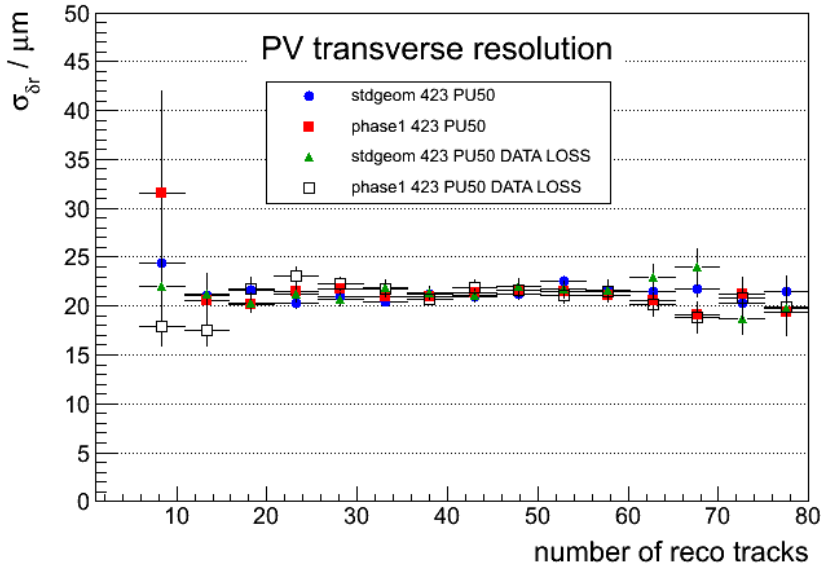
→ vertex resolution is basically beam width

Longitudinal:

- no difference stdgeom <> phase1

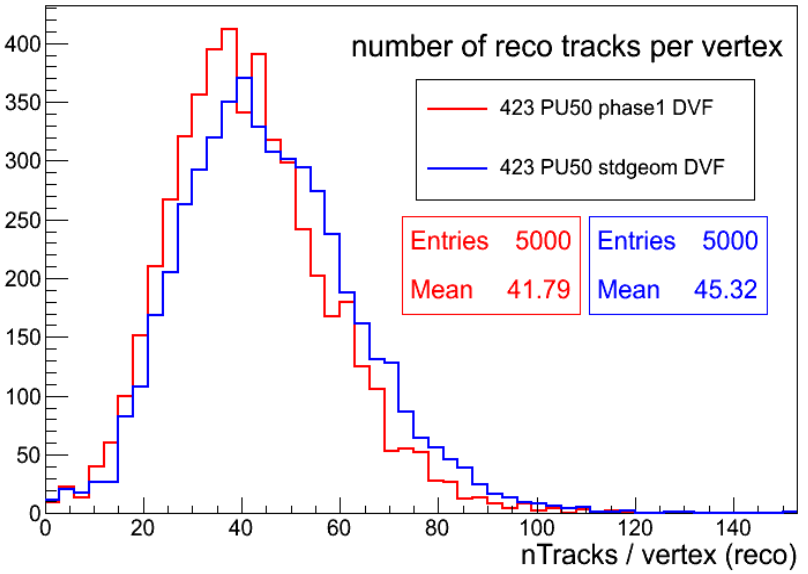


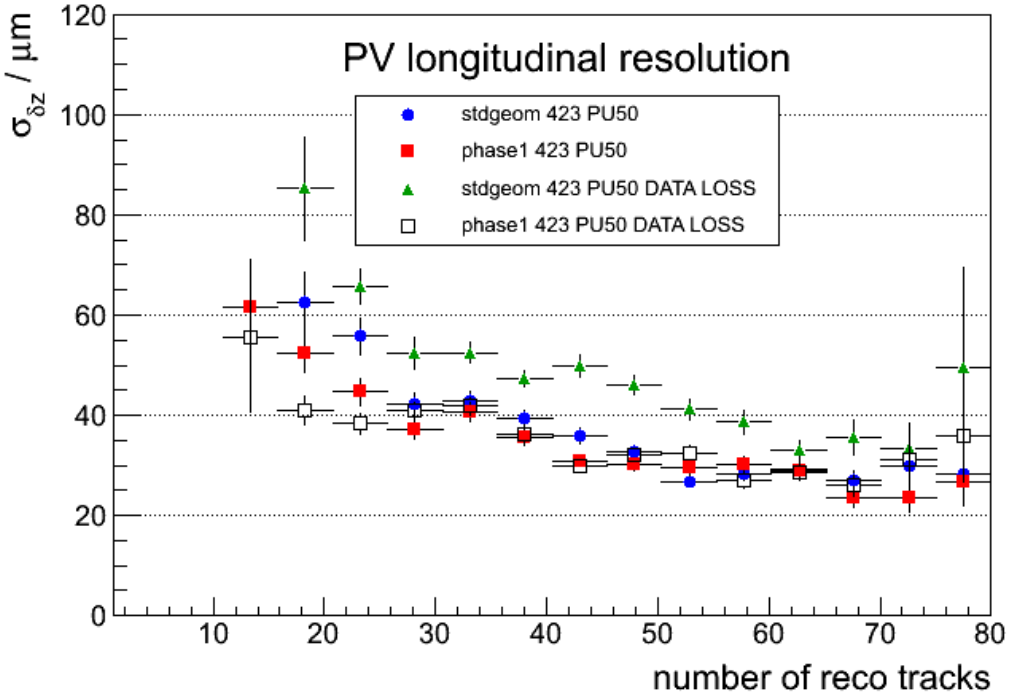
Pixel-only vertex resolutions: with data loss



Transverse:

- no effect as expected





Longitudinal:

- stdgeom shows resolution deterioration (about 20%)

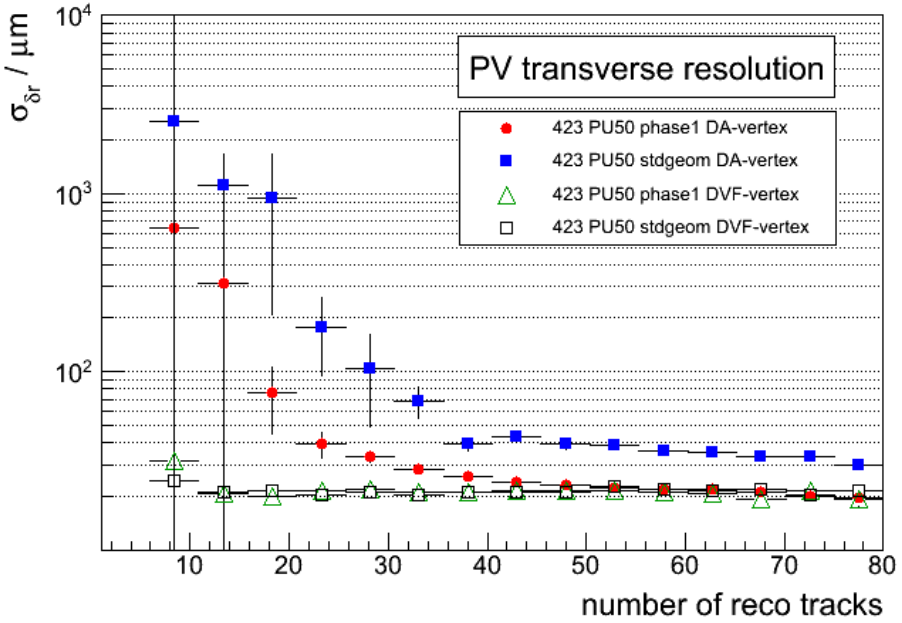
Pixel-only vertex resolutions: DA

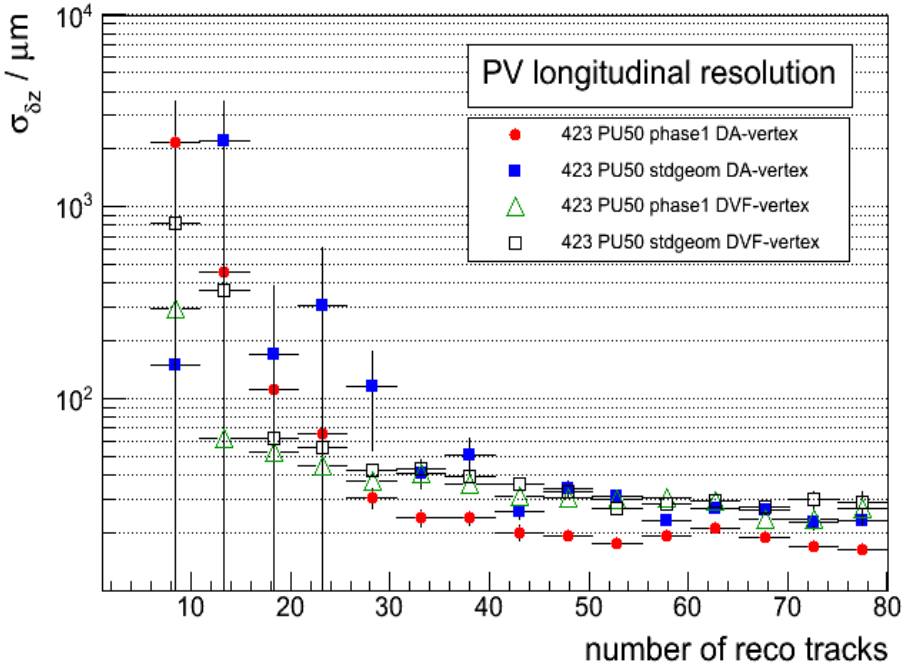
DA algorithm for HLT pixel-only tracks, cfg as proposed by Carlotta (04/2011)

```
process.hltPixelVertices = cms.EDProducer("PrimaryVertexProducer",
   PVSelParameters = cms.PSet(
    maxDistanceToBeam = cms.double(2)
   ),
   verbose = cms.untracked.bool(False),
   algorithm = cms.string('AdaptiveVertexFitter'),
   minNdof  = cms.double(0.0),
   TkFilterParameters = cms.PSet(
     algorithm=cms.string('filter'),
     maxNormalizedChi2 = cms.double(100.0),     #
     minSiliconLayersWithHits = cms.int32(0), # none
     minPixelLayersWithHits = cms.int32(3),   # >= 2
     maxD0Significance = cms.double(100.0),   # keep most primary tracks
     minPt = cms.double(0.0),  # better for softish events
     trackQuality = cms.string("any")
   ),
   beamSpotLabel = cms.InputTag("hltOnlineBeamSpot"),
   # label of tracks to be used
   TrackLabel = cms.InputTag("hltPixelTracks"),
   useBeamConstraint = cms.bool(False),
   # clustering
   TkClusParameters = cms.PSet(
     algorithm   = cms.string('gap'),
     TkGapClusParameters = cms.PSet(
       zSeparation = cms.double(0.1)
     )
   )
)
```

Pixel-only vertex resolutions: DA

(no data loss simulated)





Transverse:

- 3D vertex information!
- stdgeom DA becomes worse
- phase1 DA can only keep up for #track > 40

Longitudinal:

- phase1 DA performs slightly better than default DVF (for #track > 30)