Available Vertex Fitters

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Vertexing Goals

- Find common origin for a set of tracks
- Update Four-Momenta
- Available: `PndVtxPoca`, `PndVtxPRG`, `PndKinVtxFitter`

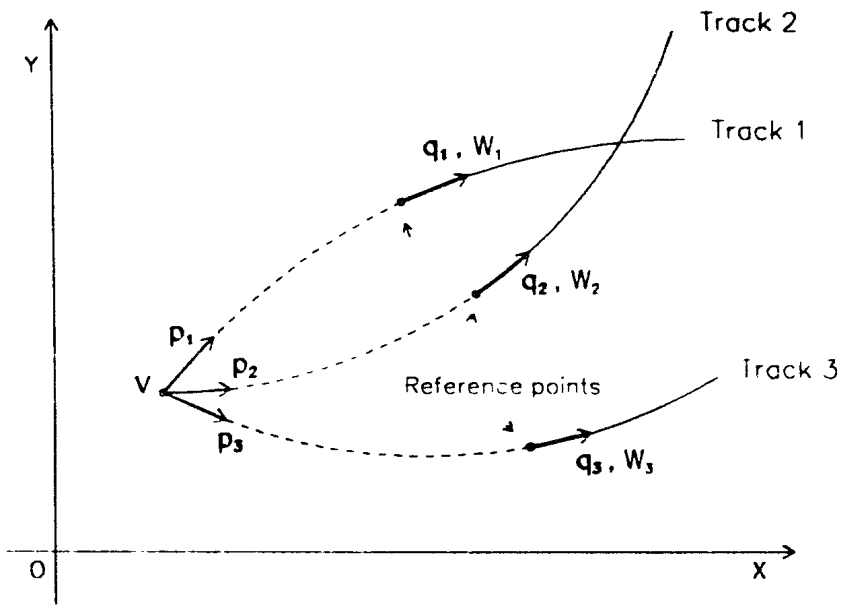


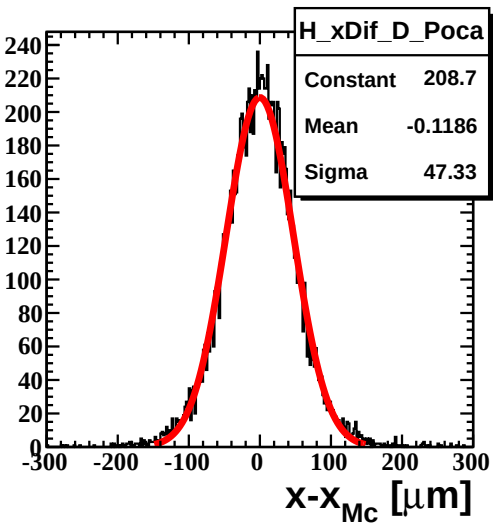
Fig. 1. Relation between q_i and (V, p_i) in a vertex fit.

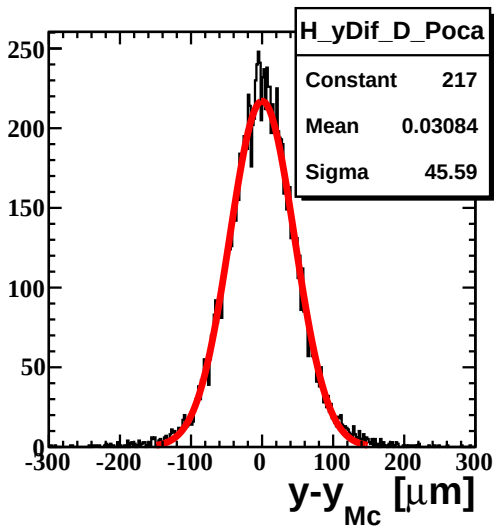
Figure: from P.Billoir, S.Qian, NIM A311 (1992)

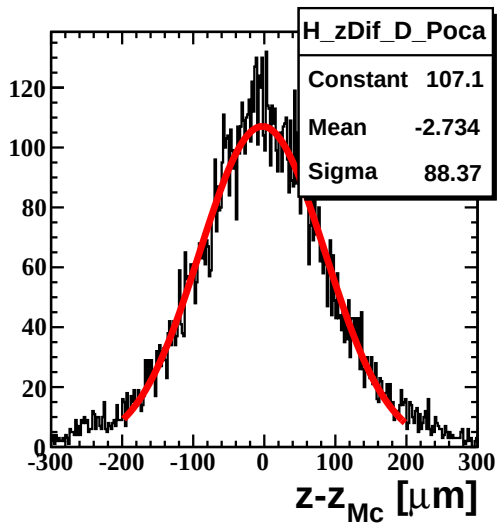
PndVtxPoca:

- Point of closest approach of two helices (2D)
- $1/d$ - weighted average for more than 2 tracks
- Output: Vertex position only

```
TVector3 vecC;
PndVtxPoca* vtx = new PndVtxPoca(*recocand);
Double_t num = vtx->GetPocaVtx(vecC);
```



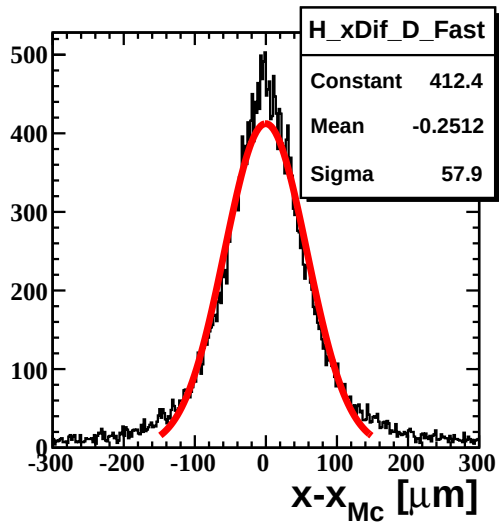


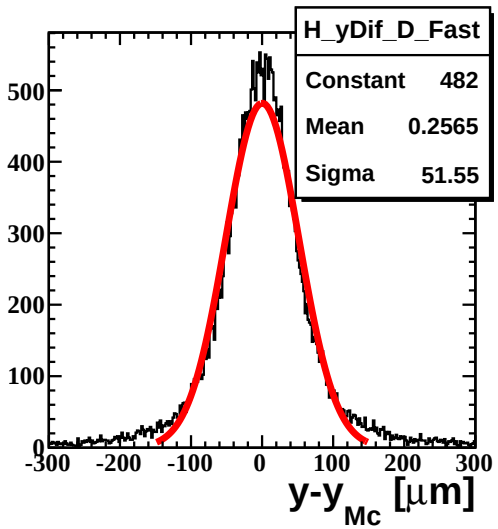


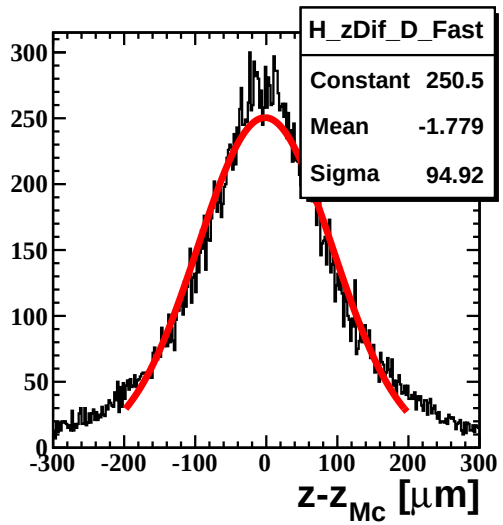
PndVtxPRG:

- Vertex Finding/Fitting and Vertex constrained Momentum fit
- Linearized fitting algorithm with linearized helices[1]
- Output: Vertex position, Momenta angle update & Cov

```
TMatrixD vtxcov(3,3); TVector3 vecC;
PndVtxPRG vtxfitter(*recocand);
Double_t chiq = vtxfitter.FitVertexFast(vecC,vtxcov,skipcov);
// Double_t chiq = vtxfitter.FitVertexFull(vecC,vtxcov,nIter);
```





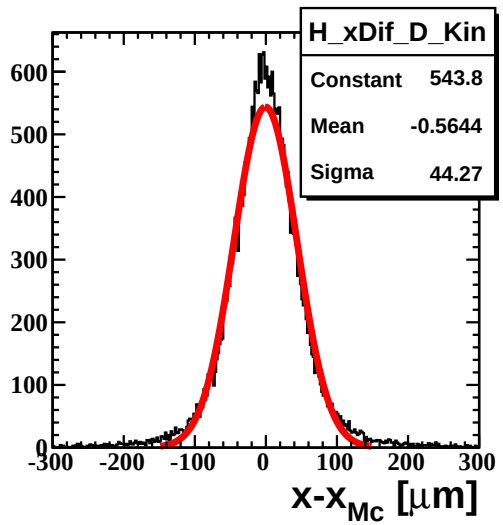


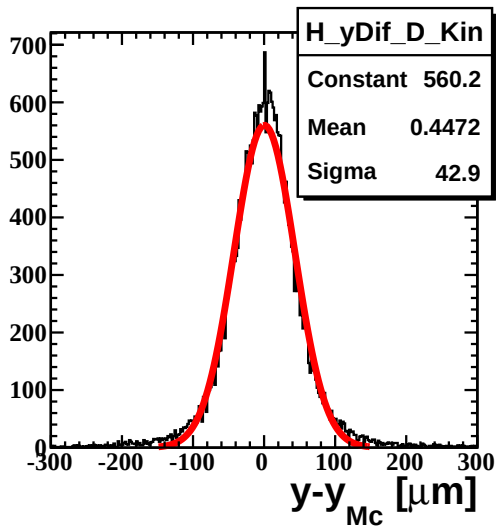
[1] P.Billoir, S.Qian, NIM A311 (1992)

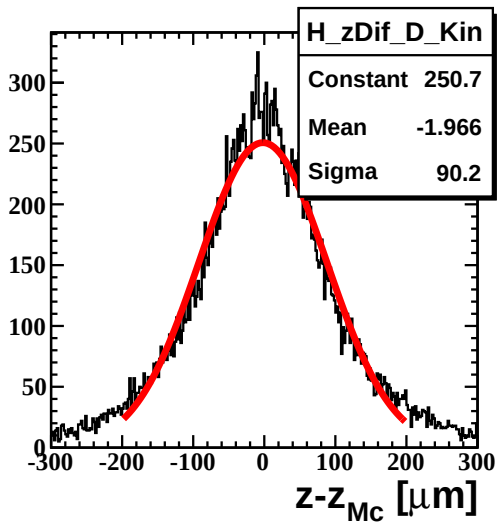
PndKinVtxFitter:

- Vertex and Momentum fitting
- Driect fit of all tracks simultaneously[2]
- Output: Vertex position, Momenta update & Cov

```
PndKinVtxFitter *fit = new PndKinVtxFitter(*recocand);
fit->Fit();
fitted = fit->FittedCand(*recocand);
TVector3 vecC = fitted->GetPosition();
```







[2] Paul Averey track fitting papers (1991-1992).

$\sigma_v/\mu m$	Poca	PRG	VtxKin
x	47.3	57.9	44.3
y	45.6	51.6	42.9
z	88.4	94.9	90.2

Table: D^0

$\sigma_v/\mu m$	Poca	PRG	VtxKin
x	56.9	86.1	46.9
y	56.3	84.8	46.1
z	113	125	93.2

Table: D^+

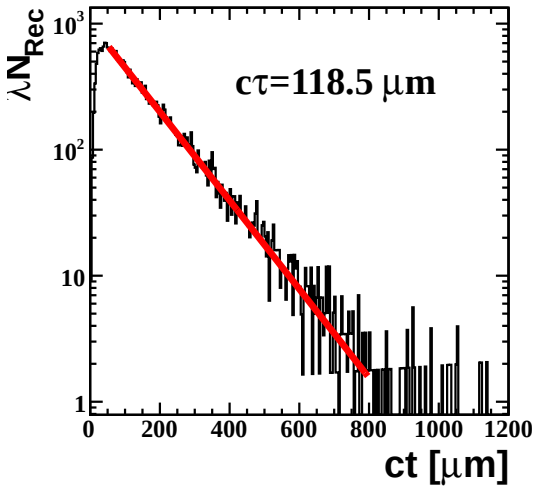
$\sigma_v/\mu m$	Poca	PRG	VtxKin
x	47.5	58.3	44.6
y	46.3	51.9	43.5
z	88.4	94.1	89.3

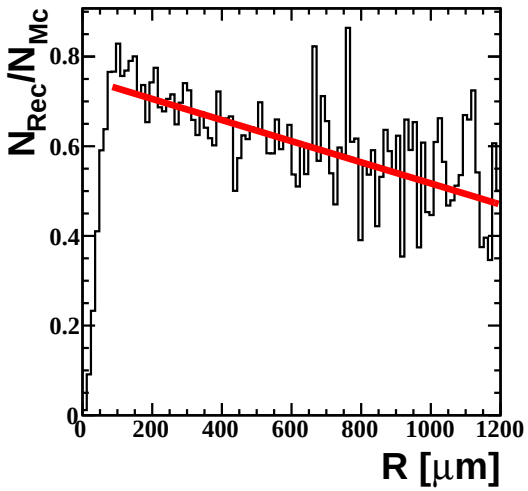
Table: $\overline{D^0}$

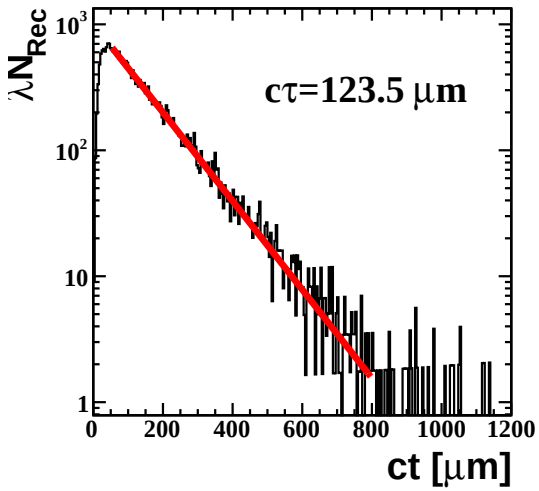
$\sigma_v/\mu m$	Poca	PRG	VtxKin
x	57.4	85.3	46.3
y	56.0	84.4	45.7
z	110	123	94.1

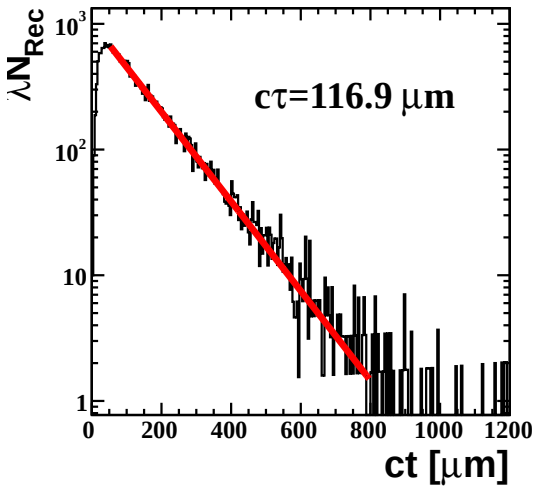
Table: D^-

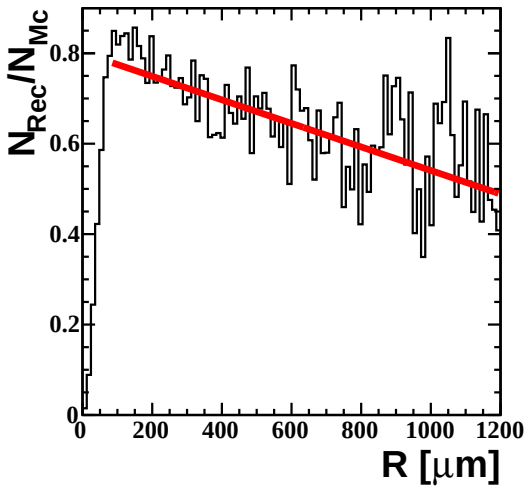
Decay lengths of D^0 and $\overline{D^0}$ ($c\tau = 122.9\mu m$)

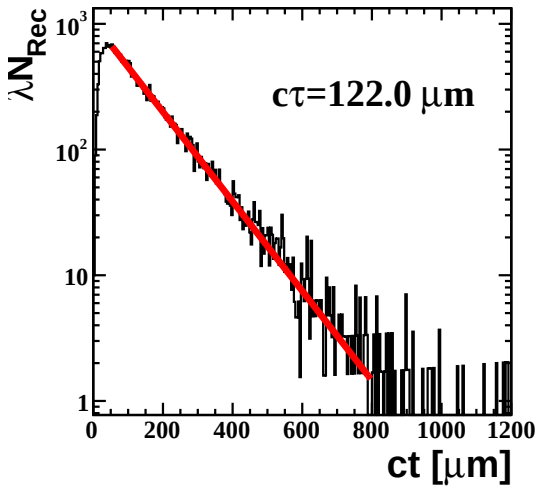




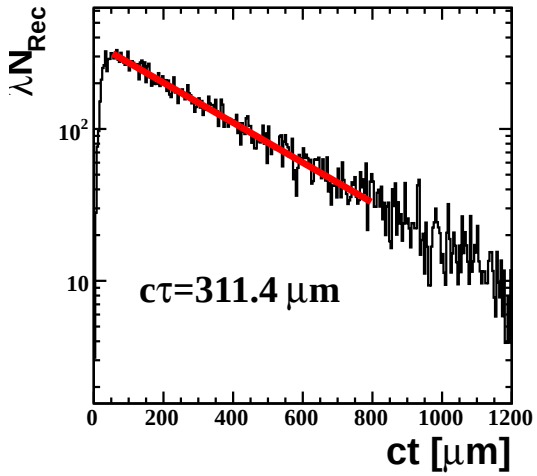


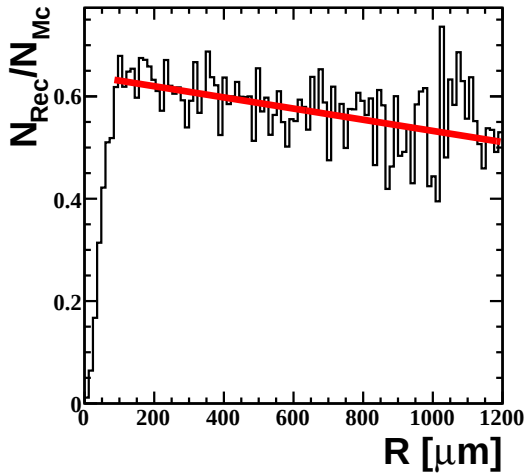


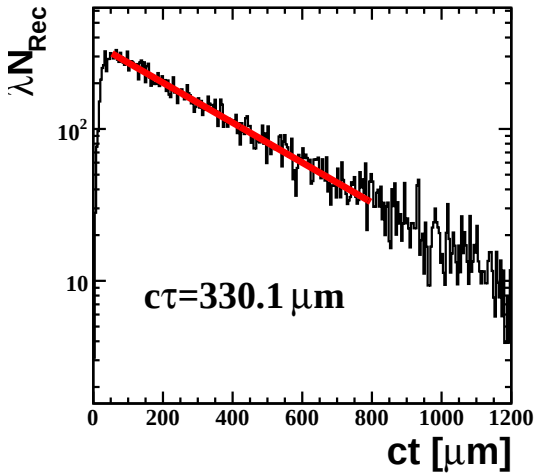


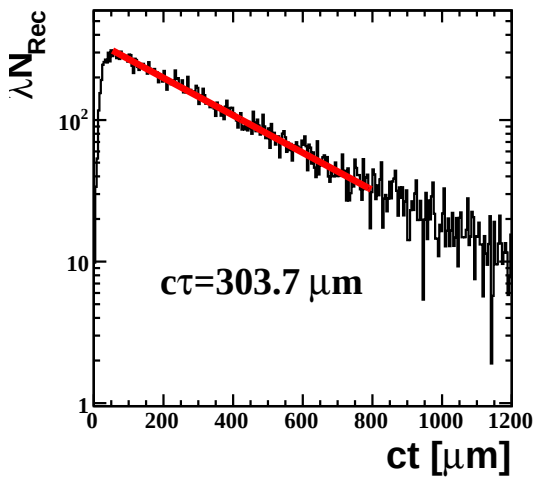


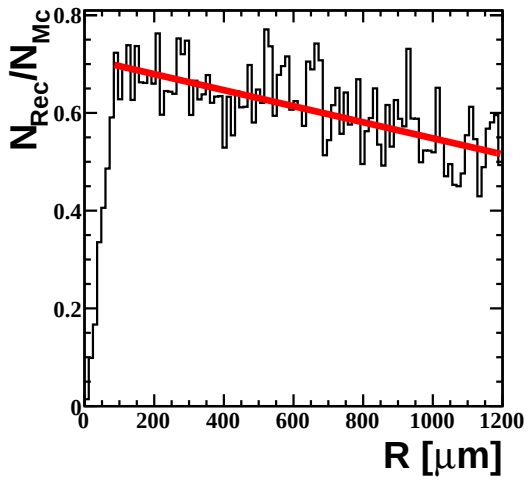
Decay lengths of D^+ and D^- $(c\tau = 311.8\mu m)$

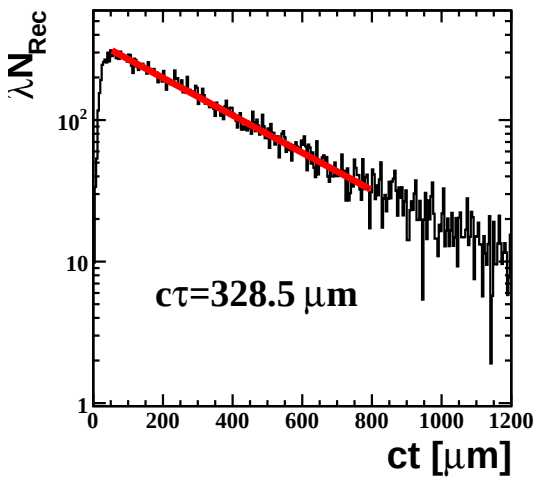












Remarks

- `PndVtxPoca`:
  - Tracks need to be extrapolated to get proper momenta: `PndAnalysis::PropagateToPoint(TCandidate*, TVector3*)`
- `PndVtxPRG`:
  - To do: Adding/subtracting of Tracks
  - To do: Steering automatism
  - Possible: Pointing constrained fit.
  - Possible: Progressive detection of secondary decays
- `PndKinVtxFitter`:
  - Not tested, just used.
- All particles go to the disks and forward spectrometer
- Forward Tracking: Ideal with $\sigma_v = 200\mu m$

X-Y Discrepancy in the Barrel:

Events: $2\pi^+2\pi^-1GeV/c$ from IP, $\Theta = 10° - 130°$
Vertexfinder: POCA

$\sigma_v/\mu m$	Poca	$90°$ Poca
x	88.3	69.5
y	69.5	88.3

With constant field in specified angular regions (Disks & Barrel, no FWD)

$\sigma_v/\mu m$	$30° - 40°$	$60° - 70°$
x	47.2	80.2
y	45.7	67

Ideas:
Geometry - central frame?
Tracking - we used STT and the PR in rev. 12727

Thanks for listening.