Karlsruhe Institute of Technology

mdst dataobjects

TrackFitResult, HitPatternCDC, HitPatternVXD

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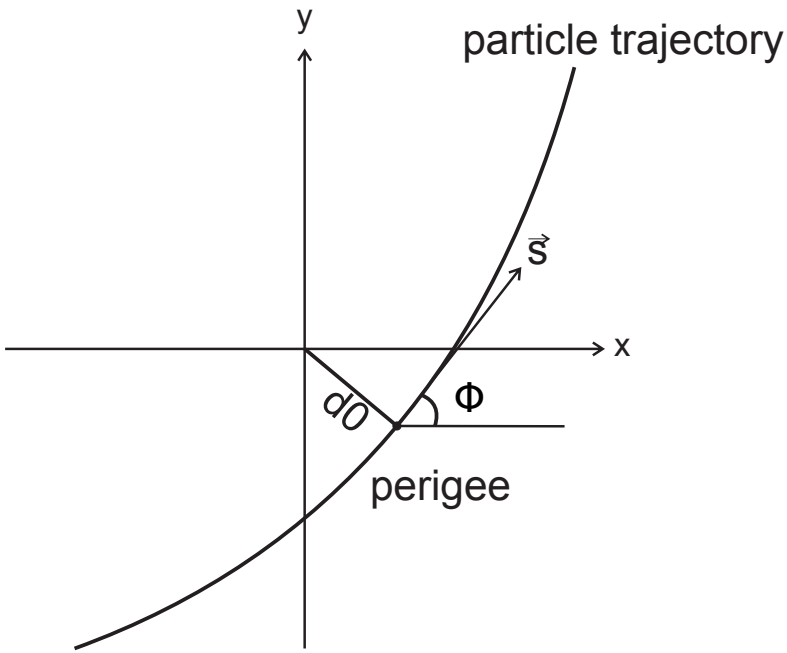
INSTITUT FÜR EXPERIMENTELLE KERNPHYSIK (IEKP)

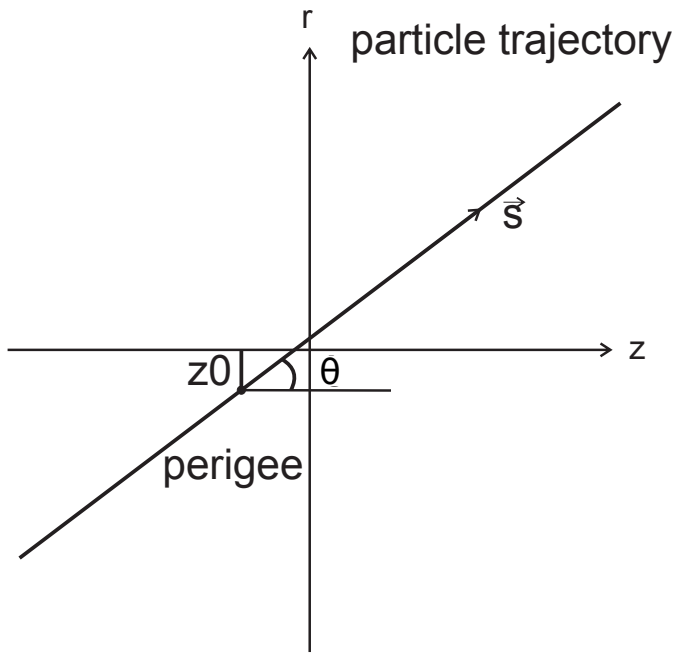
Perigee Parameters I

- Signed distance from perigee to origin in the x-y plane. Positive (negative) when the angle between $\vec{d_0}$ and $\vec{p_t}$ is $+\pi/2$ ($-\pi/2$).
  $|d_0| = \sqrt{x^2 + y^2}$
- Angle of $\vec{p_t}$ in the x-y plane.
  $\phi_0 = \arctan\left(\frac{p_y}{p_x}\right) \in [-\pi, \pi]$
- Signed curvature q/R.
  $\omega = \frac{Q}{\alpha \cdot p_t}$
- Z coordinate of the perigee in the r-z plane.
  $z_0 = z$
- Inverse slope of the track in the r-z plane.
  $\cot\Theta = \frac{p_z}{p_t}$

with $\alpha = 1/(1.5 \cdot 0.00299792458)$, obtained from c and the magnetic field strength of $1.5\,\mathrm{T}$ and the transverse momentum $p_t = \sqrt{p_x^2 + p_y^2}$

Perigee Parameters II





Error Propagation

The perigee and cartesian coordinates are given by

$$\vec{\tau} = (d_0, \phi_0, \omega, z_0, \cot\theta)\,,$$
$$\vec{x} = (x, y, z, p_x, p_y, p_z)\,.$$

To propagate the error matrix we calculate the Jacobians

$$(A)_{ij} = \frac{\partial \tau_i}{\partial x_j},$$
$$(B)_{ij} = \frac{\partial x_i}{\partial \tau_j}.$$

with $\dim(A) = 5 \times 6$ and $\dim(B) = 6 \times 5$. Covariance matrix can be propagated between the two parametrizations by

$$C^{5\times5}_{\text{perigee}} = A^{5\times6} \cdot C^{6\times6}_{\text{cartesian}} \cdot A^{T,6\times5},$$
$$C^{6\times6}_{\text{cartesian}} = B^{6\times5} \cdot C^{5\times5}_{\text{perigee}} \cdot B^{T,5\times6}.$$

TrackFitResult

- Class is now able to store the track parameters correctly.
- Class is doing much more than just storing the track parameters:
  - Parameter conversion between perigee and cartesian.
  - Extrapolation to the real perigee.
- $\Rightarrow$ extract the functionality into a helix class?

HitPattern

For the CDC:

- 64 bits available to store information
  - 1 bit for each of the 56 layers
  - 8 bits to store the total number of hits (to a maximum of 255)

For the VXD:

- 32 bits available to store information.
  - 2 bits for each of the 8 layers
  - For now 16 unused bits, any ideas? E.g. total number of hits.