Outer-detector track extrapolation (ext/muid) recent updates

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Belle II Tracking Meeting, June 2, 2017

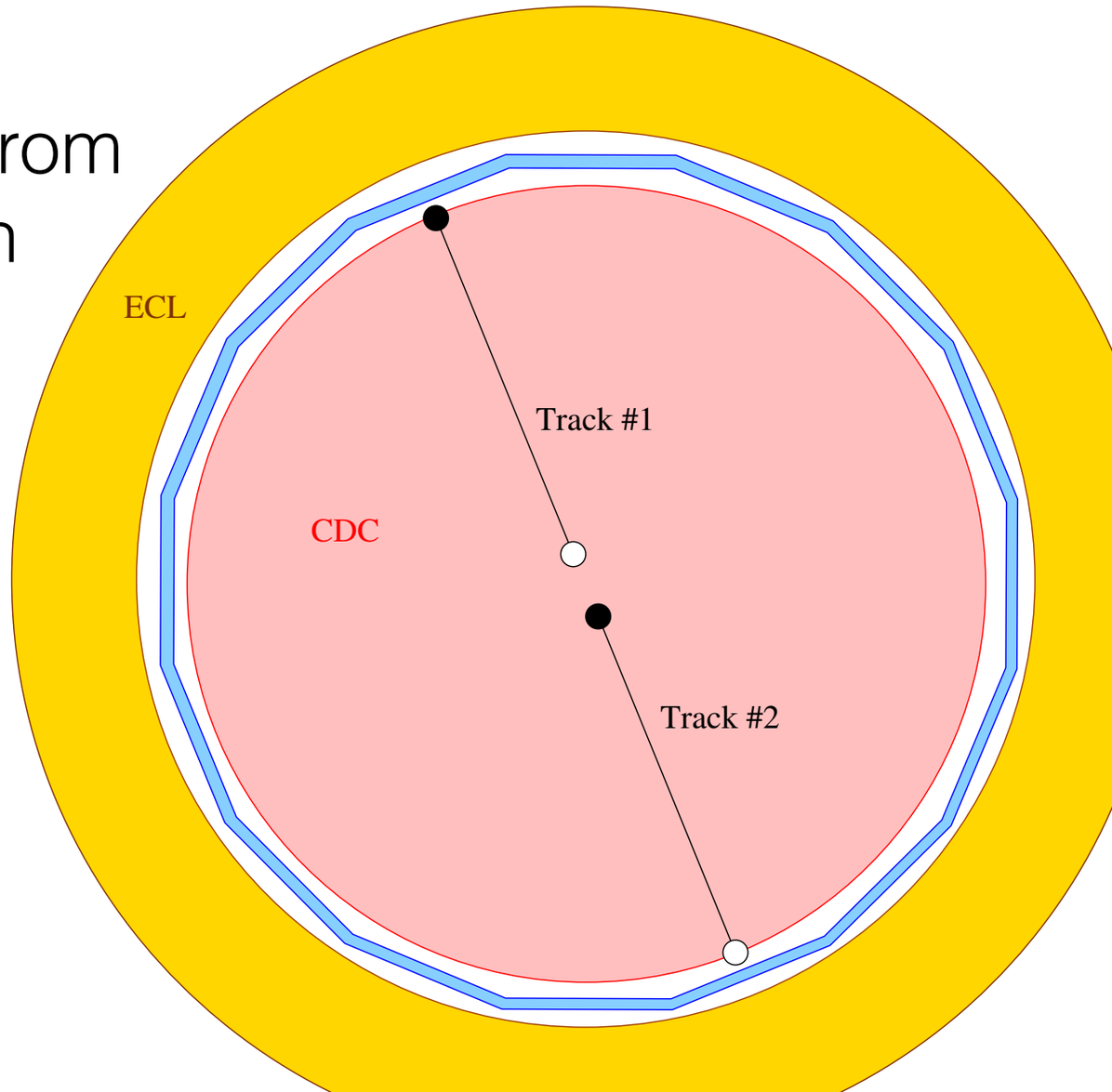
1) Cosmic-ray extrapolation (in ext and muid)

(requested by Karim Trabelsi and Yinghui Guan)

Implement the back-propagation feature of geant4e to extrapolate the upper-half Track of a cosmic ray ("Track #1" in the cartoon).

ext/muid typically extrapolates from the "end" point ∘ in the direction of the momentum vector.

For cosmic-ray upper-half track, extrapolate from the "start" point • in the direction opposite the momentum vector (i.e., upward for Track #1).



2) KLMCluster – track association (in muid)

(requested by Jo-Frederik Krohn and Phill Urquijo)

Improve/regularize the matching between extrapolated track and KLMCluster(s) – write a TrackClusterSeparation object and relations Track→TrackClusterSeparation plus KLMCluster→TrackClusterSeparation.

No longer a 1–1 map between KLMCluster and TrackClusterSeparation (with some separation distances equal to “infinity”).

Instead, only valid (finite-distance) TrackClusterSeparations are now written, and it is possible to have multiple (or zero) relations connecting one KLMCluster to Track(s) and Track to KLMCluster(s) via the TrackClusterSeparation relations.

3) ECLCluster – track association (in muid)

(requested by Torben Ferber and Chris Hearty)

Add code for matching between extrapolated track and ECLCluster(s) – write a new ExtHit object and relations Track→ExtHit plus ECLCluster→ExtHit.

ExtHit with status = EXT_ECLCROSS is written at the point where the extrapolated track crosses the imaginary sphere whose radius is given by the ECLCluster. Add methods getErrorTheta() and getErrorPhi() for this crossing.

ExtHit with status = EXT_ECLDL is written at the point of closest approach of the extrapolated track to the radial line through the ECLCluster centroid. Add method getLength() for the track length (in radiation lengths) up to this point. This will be used for low-momentum charged-particle ID.

4) Miscellaneous

(requested by Chunhua Li, Marko Starič, Anze Zupanc, others)

Add code to protect against genfit exception when retrieving Track's start/end points.

Change from geometry/BFieldMap to framework/geometry/BFieldManager for access to magnetic field. *Needed to detect extrapolation with B=0.*

Add code to permit stable extrapolation with B=0. *Needed for KLM geometry alignment with Millipede framework.*

Prepare code to associate one {B,E}KLMHit2d with at most one extrapolated track. *(work in progress)*