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Track extrapolation and muon identification using GEANT4E in event reconstruction in the Belle II experiment

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I will describe the charged-track extrapolation and the muon identification modules in the Belle II data analysis code library. These modules use GEANT4E to extrapolate reconstructed charged tracks outward from the Belle II Central Drift Chamber into the outer particle-identification detectors, the electromagnetic calorimeter, and the K-long and muon (KLM) detector embedded in the iron yoke surrounding the Belle II solenoid. using the detailed detector geometry that was developed for the simulation module. The extrapolation module propagates the position, momentum, 6-dimensional covariance matrix, and time of flight from the interaction point to permit comparison of the extrapolated track with the hits detected in the outer detectors. In the course of track extrapolation into the KLM, a Kalman fitting procedure is applied that adjusts the track parameters using the matching hits in each of the crossed detectors. The muon identification procedure then compares the longitudinal and transverse profiles of the extrapolation and the matched hits in the KLM and, for the low-momentum tracks, the extrapolated and matched crystals in the electromagnetic calorimeter, to distinguish between the muon and hadron-like hypotheses. Several modifications were made to permit GEANT4E to interoperate with GEANT4 and to expand the number of particle species that can be extrapolated.

Summary

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