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Decay Chain Reconstruction in Belle II

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The Belle II detector will begin its data taking phase in 2018. Featuring a state of the art vertex detector with innovative pixel sensors, it will record collisions of e+e- beams from the SuperKEKB accelerator which is slated to provide luminosities 40x higher than KEKB.
This large amount of data will come at the price of an increased beam background, as well as an operating point providing a lowered Lorentz boost when compared to Belle.

This leads to new challenges for analysts seeking to perform precision measurements, as increasingly precise vertex position reconstruction and background rejection power is needed to take advantage of the unprecedented statistics provided. I will discuss the decay reconstruction techniques available to make such measurements possible.

I will present an approach to particle decay reconstruction based on the global fit of the full decay chain, implemented using a Kalman filter. Unlike traditional reconstruction workflows where vertices are individually reconstructed, this technique (first used in BaBar [arXiv:physics/0503191]) is able to fit underconstrained vertices by exploiting well resolved elements elsewhere in the decay chain; this is especially well suited to the treatment of processes with neutral decays. It simultaneously allows for more precise vertex position resolution (directly impacting e.g. time-dependent CP violation measurements), improved background rejection, and increased statistical power through the incorporation of a larger number of decay modes.

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