



Vertexing

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The impact parameter

The impact parameters: D0 and Z0

- defined as the projections of distance from the point of closest approach to the origin
- good measure of the overall performance of the tracking system
- used to find the optimal tracker configuration



Time dependent measurements



Vertexing: Breco side

Two vertex fitters used in Belle II for kinematic vertex fits

Kfit : used in Belle ۵.

 $J/\psi \rightarrow \mu \mu$

RAVE: a CMS tool, see https://rave.hepforge.org/)

Quasi identical results



Rave: Adaptive Vertex Fitter

Down-weights outliers dynamically, instead of using hard cutoffs (important for 3+ track vertices).



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Tag side fit constraints



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Tag side vertex resolution



∆t distribution

$$\mathcal{P}(\Delta t, q) = \frac{e^{-|\Delta t|/\tau_{B^0}}}{4\tau_{B^0}} \bigg[1 + q \bigg(\mathcal{A}_{CP} \cos \Delta m_d \Delta t + \mathcal{S}_{CP} \sin \Delta m_d \Delta t \bigg) \bigg]$$



∆t resolution



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CPV measurements in D mesons



Removal of D from B decays (p* cut):

- reduce combinatoric background
- allows to assume that D* are produced at the interaction point
 - precise reconstruction of decay and production vertices required for time-dependent analyses

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of the D⁰

D* decay

vertex

D* Vertex and Flight time resolution

$\mathsf{D}^{**} \to [\mathsf{D}^{\scriptscriptstyle 0} \to \mathsf{K}^{\scriptscriptstyle -} \, \pi^{\scriptscriptstyle +}] \; \pi^{\scriptscriptstyle +}$



Fits : BS D⁰ + slow π , BS slow π , D⁰ + slow π



Summary

- With the upgrade of KEKB to SuperKEKB a new pixel detector is required for Belle II
 - Increase of background
 - Boost reduced
 - Maintenance the same Belle vertex separation capability
- The Belle II Pixel Vertex Detector (PXD) is crucial for the Belle II physics program
 - Time dependent measurements in B⁰ decays
 - Mixing and CP violation measurements in D⁰ decays
- PXD performances are being studied in Monte Carlo simulation
 - Requested performances look to be satisfied
 - Belle II software is under strong development
 - MC 3.5 used for these studies
 - A lot of space for improvement