

Physics Benchmark for the PXD Optimization

Kolja Prothmann
Burkard Reisert
Andreas Moll
Max-Planck-Institut für Physik

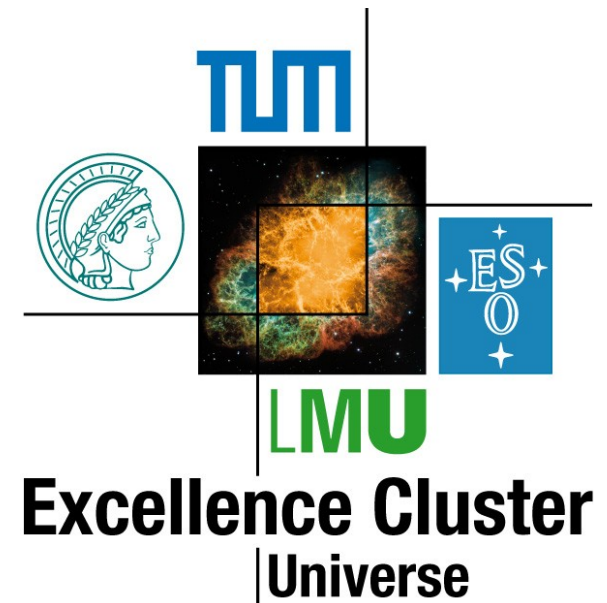
Zbynek Drasal
Charles University Prague



Max-Planck-Institut für Physik
(Werner-Heisenberg-Institut)



PXD meeting 8.9.2009



- Introduction
- Physics channel
- Benchmark plots
- Summary and Outlook

- Simulations up to now (using **ILC software**):
 - Residuals in the PXD ladder
 - Impact Parameter studies after Tracking
- Next step – real physics!
 - vertex resolution important for all channels in CP violation
 - Simple analysis as benchmark to optimize the vertex resolution
 - So we use “golden channel”:

$$B^0 \rightarrow J/\Psi K_S$$

1. Establish analysis in Belle framework (BASF)

- using Belle Geometry

2. Implement analysis in ILC framework

- using Belle Geometry
- using the same generated events as for the Belle analysis
- using MarlinRave as Vertex fitter

3. After validation of ILC framework

- start optimization of Belle II PXD in ILC framework



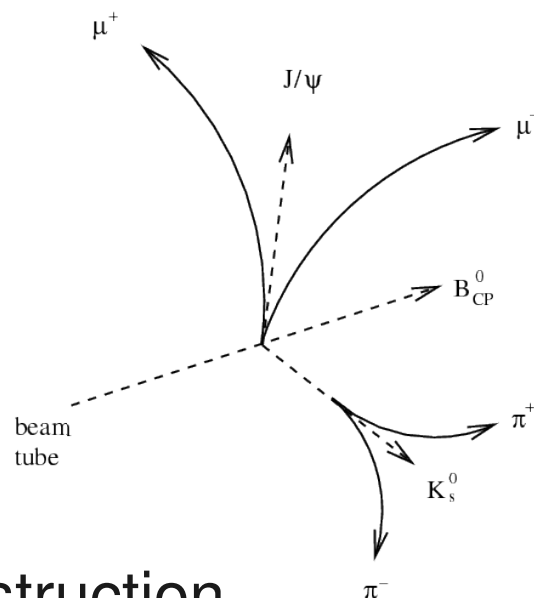
$$\Delta t \approx \frac{\Delta z}{\langle \beta \gamma \rangle c}$$

 $B^0 \bar{B}^0$ produced at $\Upsilon(4S)$

Asymmetric collider (boost)



- Generated events: 100 000



- Reconstruction

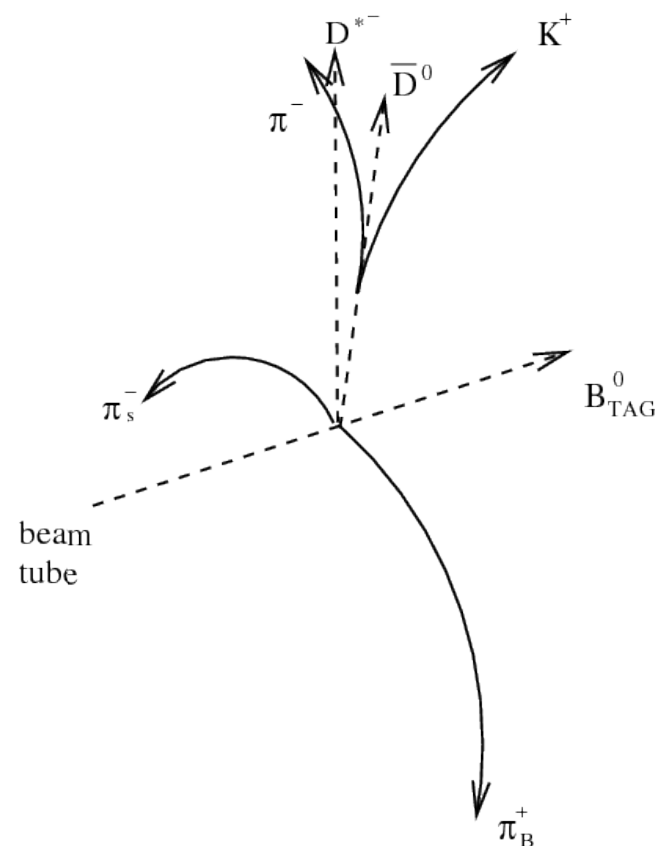
- CP side vertex: $\mu^+\mu^-$

- Tag side vertex: D^0/D^0 bar vertex and momentum

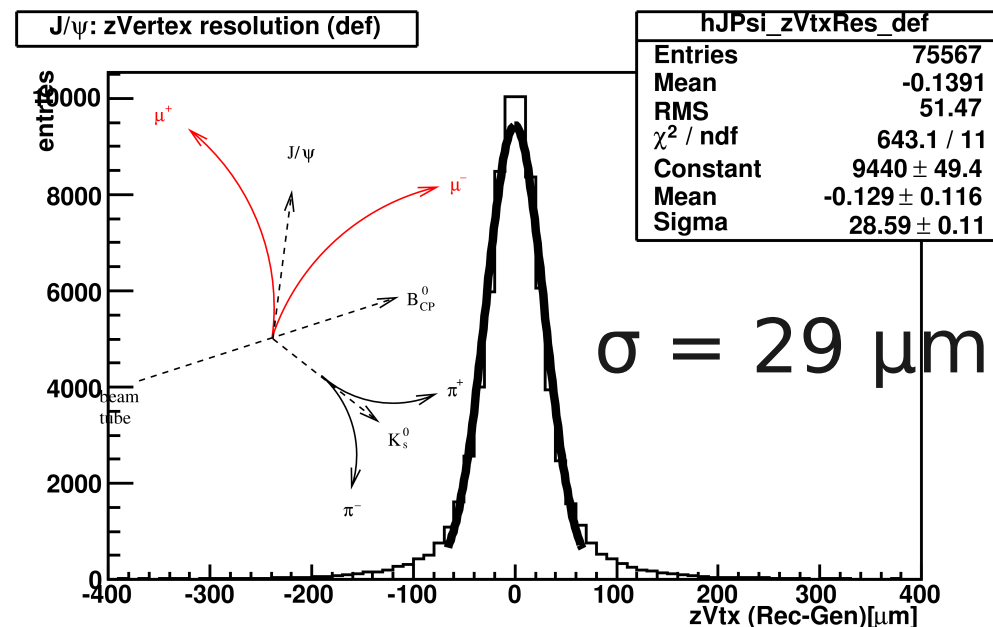
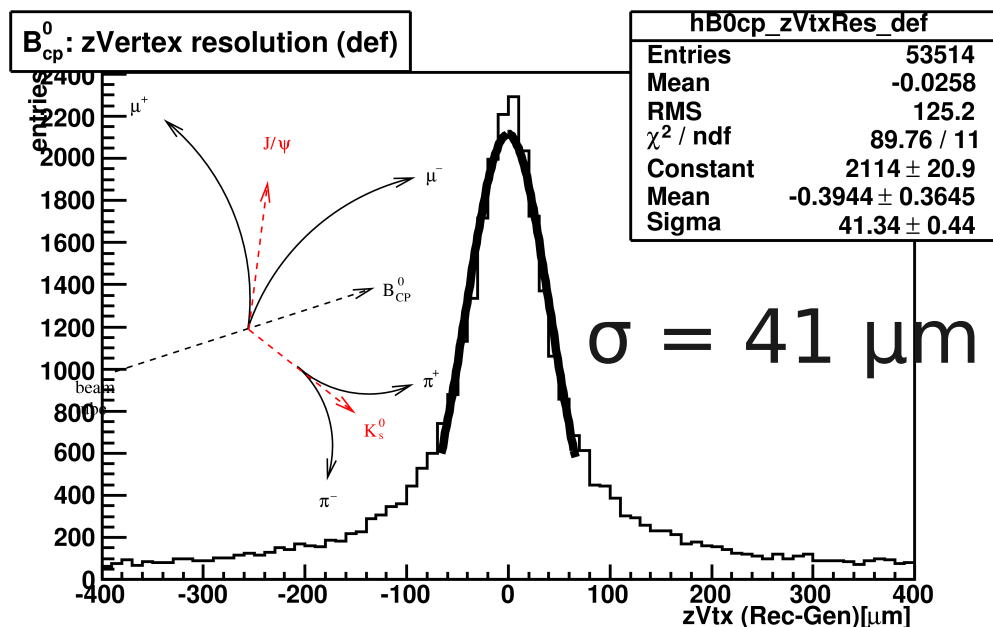
- Find point of closest approach (P.C.A.) to the beam tube
- Project P.C.A. onto the beam tube

- determine the B-tag from the sign of the Kaon

- Histogram Δz of the vertex separately for the B-tag



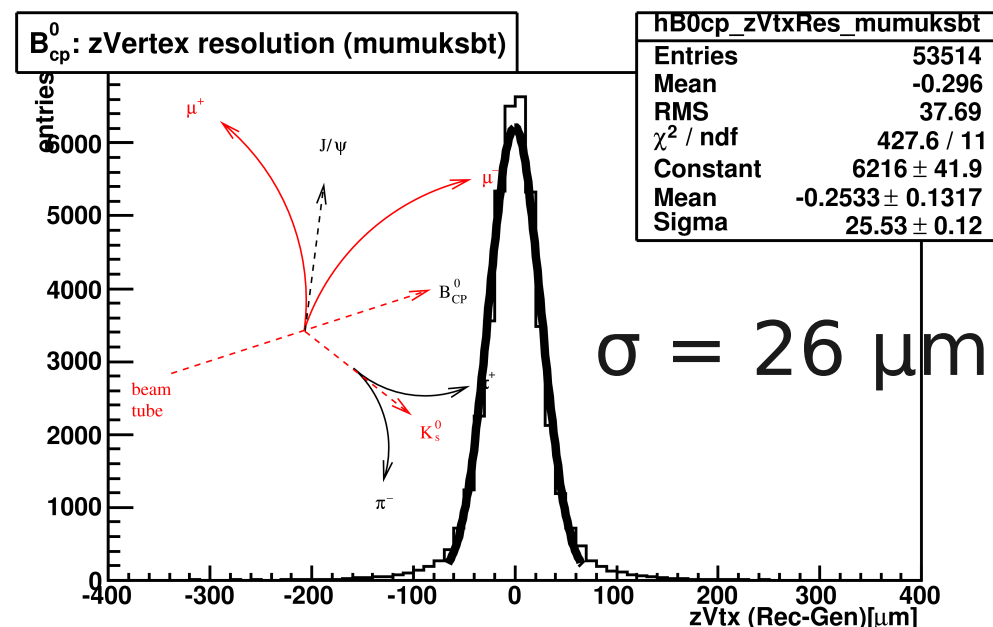
Simulation in BASF



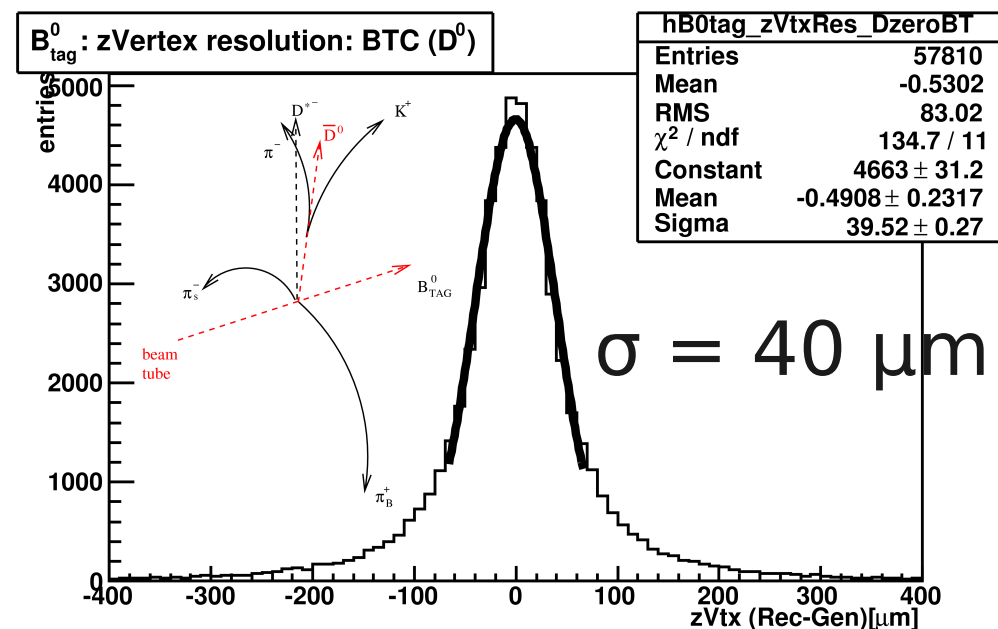
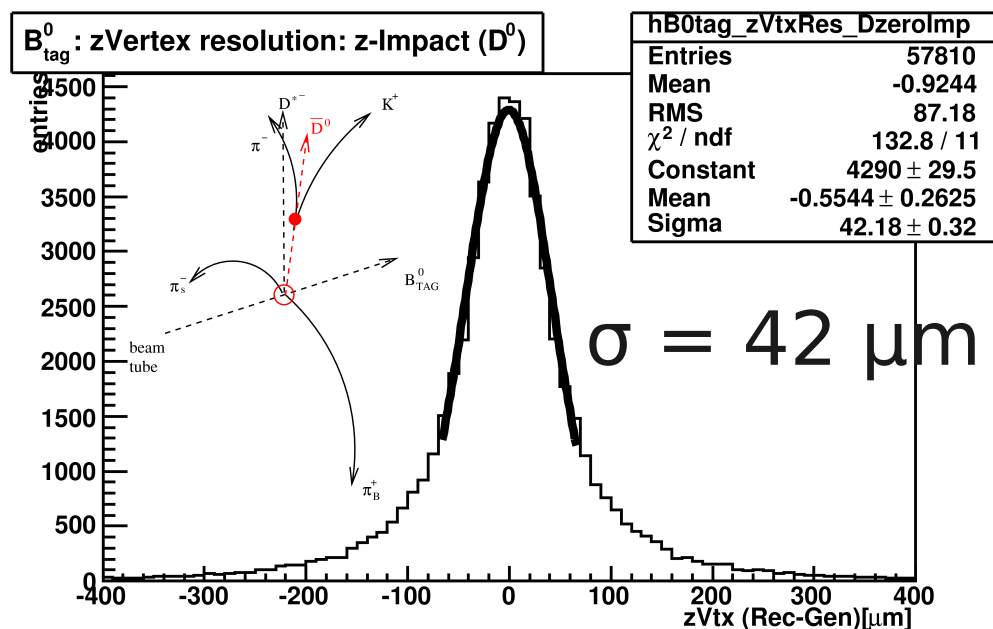
Fitting range: 66.6 μm

Using double Gaussian to fit also tails
Important for characterising effect of
multiple scattering

Two muon vertex fit simple model is
easy to implement in **ILC software**



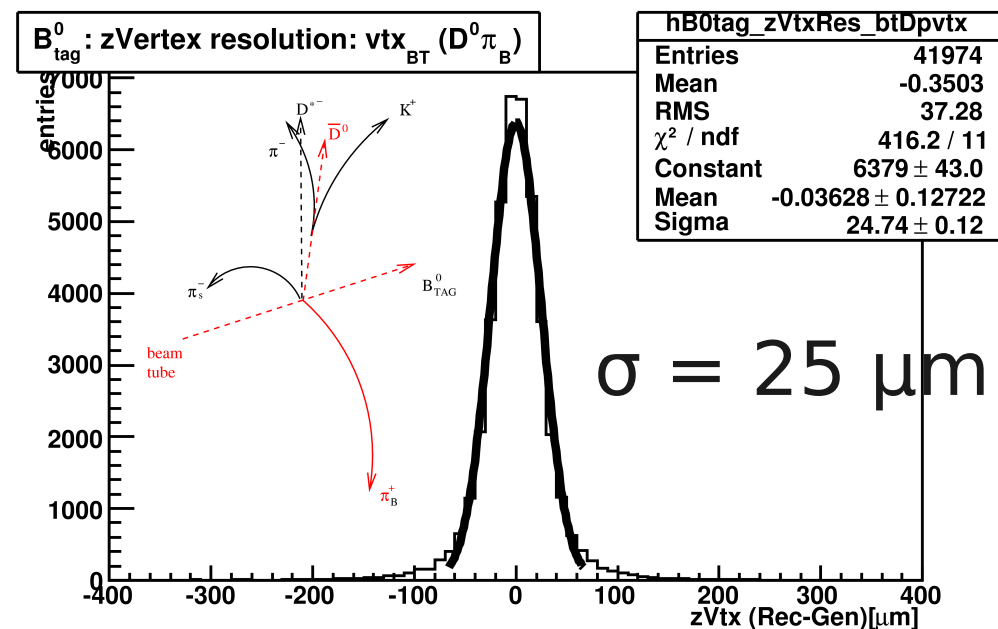
Simulation in BASF



Fitting range: $66.6 \mu\text{m}$

Using double Gaussian to fit also tails
Important for characterising effect of
multiple scattering

K+ pi vertex fit simple model plus
extrapolation is easy to implement
in **ILC software**



- Summary
 - Benchmark analysis in the Belle framework running
 - ILC framework in good shape to start implementing analysis
- Outlook
 - Planned to have first results of the BASF and ILC framework probably for B2GM in November
 - Maybe also first studies of the PXD geometry for Belle II

**Thank you for your
attention!**