SVT studies

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Outlook

- Proper time resolution: FastSim vs PravdaMC for $B^0 \rightarrow \pi^+\pi^-$
- Some consideration for TD measurements for special B decay modes as $B^0 \rightarrow K_sK_s$
- Detector geometry optimization: discussion of possible criteria
Proper time resolution vs layer $X_0$ (%)

$B_0 \rightarrow \pi^+ \pi$ decay mode $\beta\gamma = 0.28$ beampipe $X_0 = 0.424\%$

hit resolution = 10 $\mu$m

- Reasonable agreement between PravdaMC and FastSim results.
- Main result is that proper time resolution is adequate for time dependent measurements.
Small boost reduction scenario

- There is an outstanding request to reduce the CM boost to improve by a large amount the electron polarization efficiency.
- The request is to move from $\beta\gamma=0.28$ (7 vs 4 GeV) to $\beta\gamma=0.25$ (6.8 vs 4.12 GeV).
- Proper time resolution reduction (10% worst, checked on FastSim) is no critical for time dependent measurements.
Time dependent measurements: some considerations

- B decays, with neutrals and \( K_S \), do not benefit of layer_0 measurements. Require special attention for proper time resolution. Example for \( B^0 \to K_S K_S \)

\[
\begin{align*}
\tag{z} \sim 100 \mu m & \quad & \tag{z} \sim 100 \mu m \\
\langle \Delta z \rangle \sim 250 \mu m & \quad & \tag{z} \sim 125 \mu m \\
\tag{z} \sim 35 \mu m & \quad & \tag{z} \sim 85 \mu m \\
\end{align*}
\]

Tag vertex resolution improves: MS dominating \( \sigma_{Tag}(z) = r_{L0} \cdot \sqrt{X/X_0} \). 

Reco vertex: small improvement thanks to more precise kinematical constraints from tag side
Proper time resolution for $B^0 \rightarrow K_S K_S$

Proper time resolution is comparable with BaBar one. As expected, (almost) no relation with layer0 solution (for reco vertex).
Proper time error vs Ks XY flight length

SuperB scenario

Svt internal geometry could be optimized in order to improve Ks reco efficiency and proper time determination.
Proper time error vs $K_s$ XY flight length

BaBar scenario

Within the SVT tracking volume, $\Delta t$ error is dominated by Tag vertex uncertainty. Less dependence of $\Delta t$ error wrt SuperB from the internal Svt geometry.
$B^0 \rightarrow K_s K_s$ efficiency vs $K_s$ XY flight length

- Enlarging the Svt tracking volume would improve $K_s$ reconstruction and $\Delta t$ measurement.
Criteria for Svt geometry optimization

- Layer0 related: B-D vertex separation, vertexing in tau decays, continuum bkg suppression, tagging performances with vertexing info,...

- Internal SVT geometry: \( K_S \) reconstruction efficiency, \( \Delta t \) resolution in special B decay modes: \( B^0 \rightarrow K_S K_S, B^0 \rightarrow K_S \pi^0(\gamma) \) (See Gabriele’s talk), soft pion reconstruction efficiency,...
Back up
**K_s** proper time check

Naive fit to proper time, assuming constant reco efficiency, gives a lifetime of 2.6 cm