

$\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ Lifetime Measurement

R. Mumford J. Pursley, M. Martin, M. Schmidt, S. Behari, P. Maksimovic

Johns Hopkins University

D. Litvinsev

FNAL

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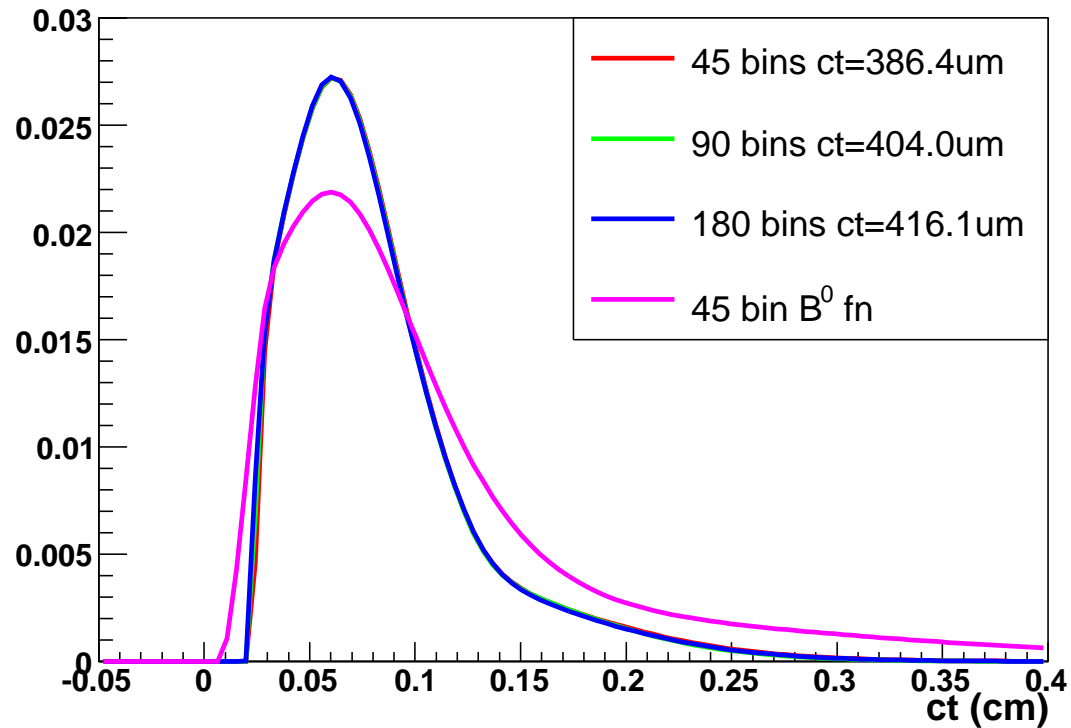
Brief Status Report

- SVT efficiency function update

Recap: SVT Efficiency Instability

Very small differences in Λ_b^0 SVT eff. fn. \rightarrow big lifetime differences

SVT Efficiency Function



bins	blinded Λ_b^0 lifetime (DATA)
45	$385.6 \pm 10.4\mu m$
90	$404.0 \pm 11.1\mu m$
180	$416.1 \pm 11.6\mu m$
bins	Λ_b^0 MC: $c\tau = 369\mu m$
45	$363.5 \pm 1.2\mu m$
90	$381.4 \pm 1.3\mu m$
180	$391.7 \pm 1.3\mu m$
bins	B^0 lifetime
45	$452.1 \pm 17.81\mu m$
90	$455.8 \pm 18.09\mu m$
180	$456.7 \pm 18.15\mu m$

SVT Efficiency Function

SVT efficiency fn. corrects for lifetime bias introduced by TTT.
Up until now we have used technique described in cdfnote 7386

SVT efficiency is a histogram defined by:

$$\epsilon(ct) = \frac{Histo^{TTT}(ct)}{\sum_i \exp(ct_i, c\tau^{MC}) \otimes Gauss(\sigma_{ct}^i)}$$

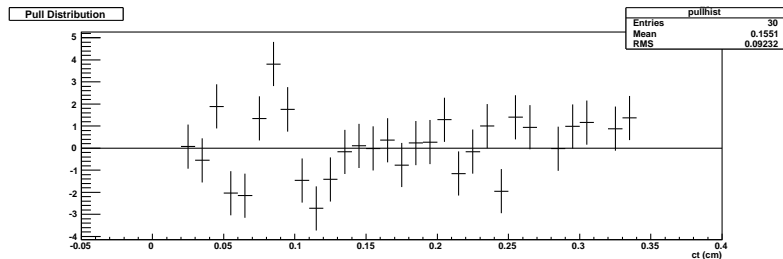
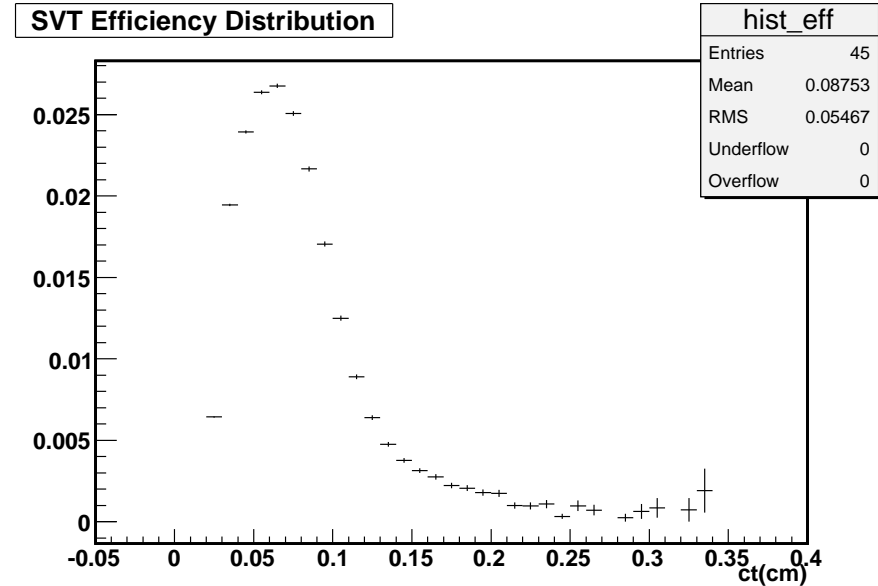
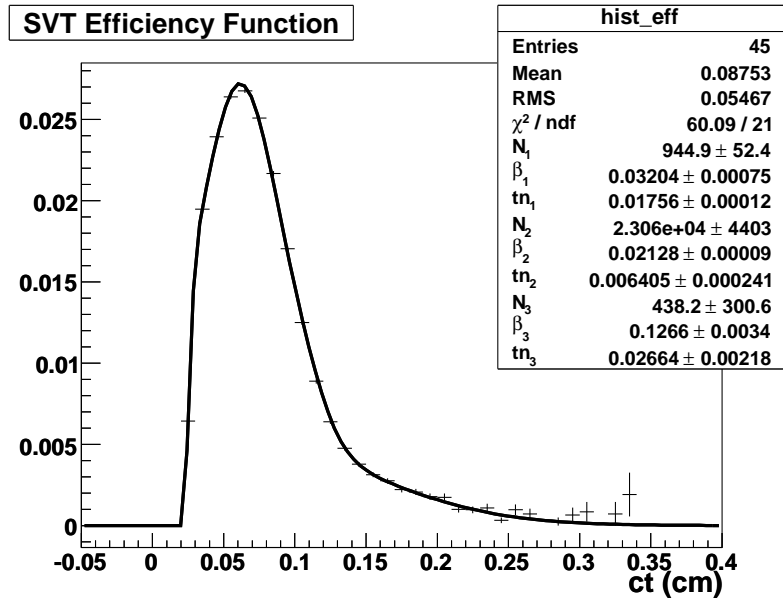
that is fit to get “efficiency function”;

$$\epsilon_{TTT}(ct) = \sum_{i=1}^{i=3} N_i \cdot (x - \beta_i)^2 \cdot e^{-x/\tau_i} \cdot (x > \beta_i)$$

Instead of fitting for the efficiency fn, we want to use the histogram directly in the lifetime fit.

SVT Efficiency Fn. vs Histogram

Replace relatively poor fit to $\sim 350k$ events w/ Histogram



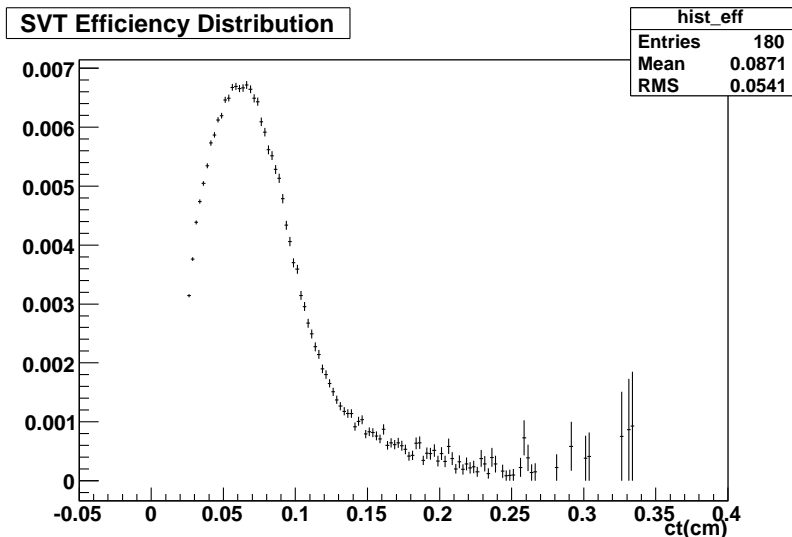
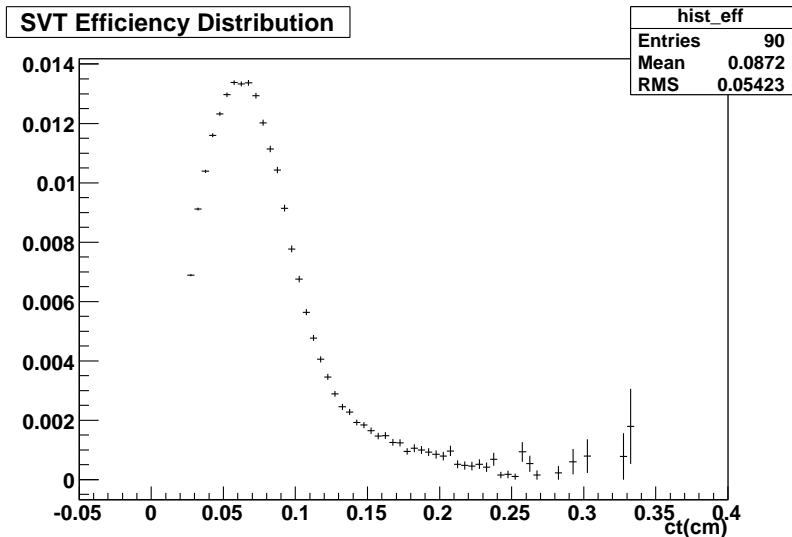
45 bin Histo. ; $ct = 369.6 \pm 1.0 \mu m$

Signal only MC Λ_b^0 lifetime fit

MC generated w/ $369 \mu m$ lifetime!

45 bin Histo. w/ SVT fit; $ct = 363.5 \pm 1.2 \mu m$

MC Lifetime Fit



Lifetime still not consistent when binning is varied

Results when using SVT Efficiency Histogram

bins	Λ_b^0 lifetime
45	$369.6 \pm 1.0 \mu m$
90	$361.6 \pm 1.0 \mu m$
180	$361.5 \pm 1.0 \mu m$

Plan to create smoothed histogram to approximate a continuous function

Conclusions

- Machinery in place to use raw SVT efficiency histo. in lifetime fit
- Histogram method looks promising
- Much more stable than previous SVT parameterization method
- The fit is slower because now we numerically integrate
- Ongoing studies to understand our sensitivity to the SVT efficiency distribution
- Still some issues to understand

Outlook...

- Finalize the SVT efficiency distribution issue
- Method for calculating systematic errors changes significantly
- Update cdfnote 8578