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

R. Mumford, S. Behari, P. Maksimovic, M. Martin, J. Pursley, M. Schmidt
Johns Hopkins University
D. Litvinsev
FNAL

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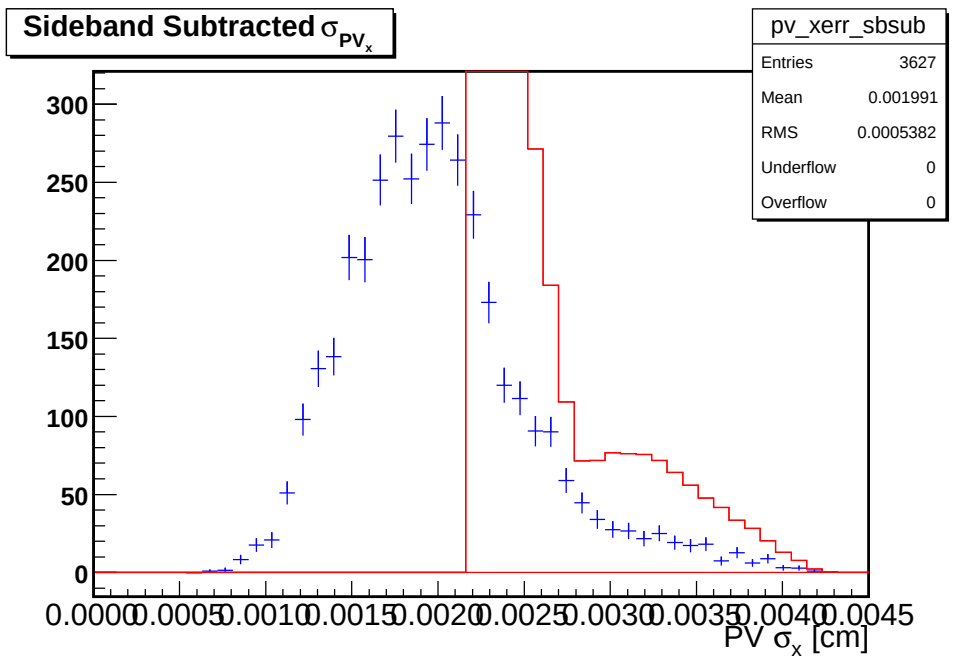
Talk Outline

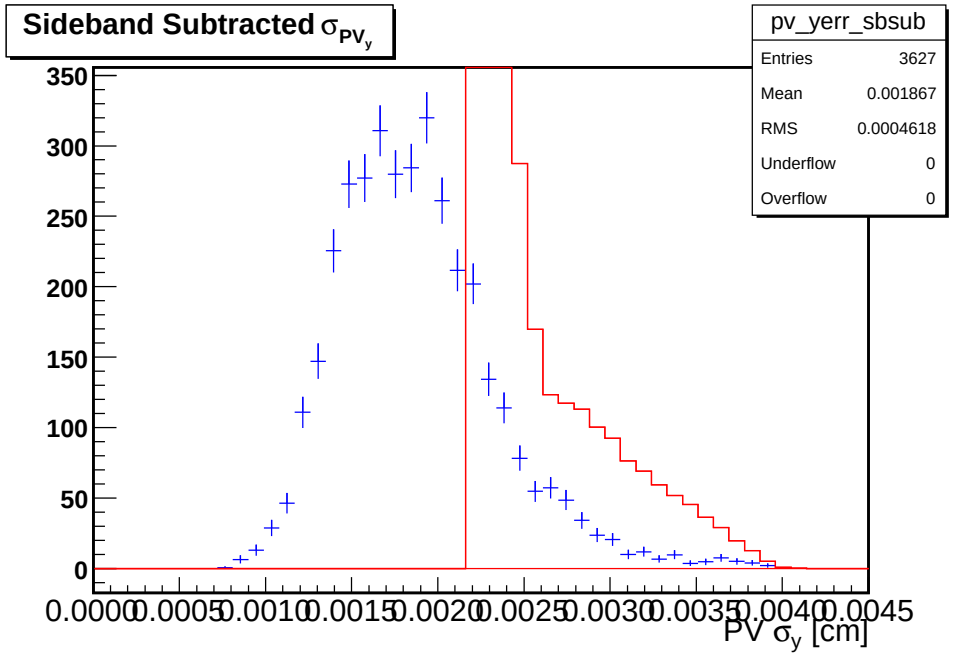
- Data vs. MC comparison
- Updated ct Resolution
- Updated fit Results

Primary Vertex in HQGen

In data, Event-by-event primary vertexing is used.
This is impossible in Monte Carlo because primary tracks are missing.
We see that the PV errors disagree between Data and MC.



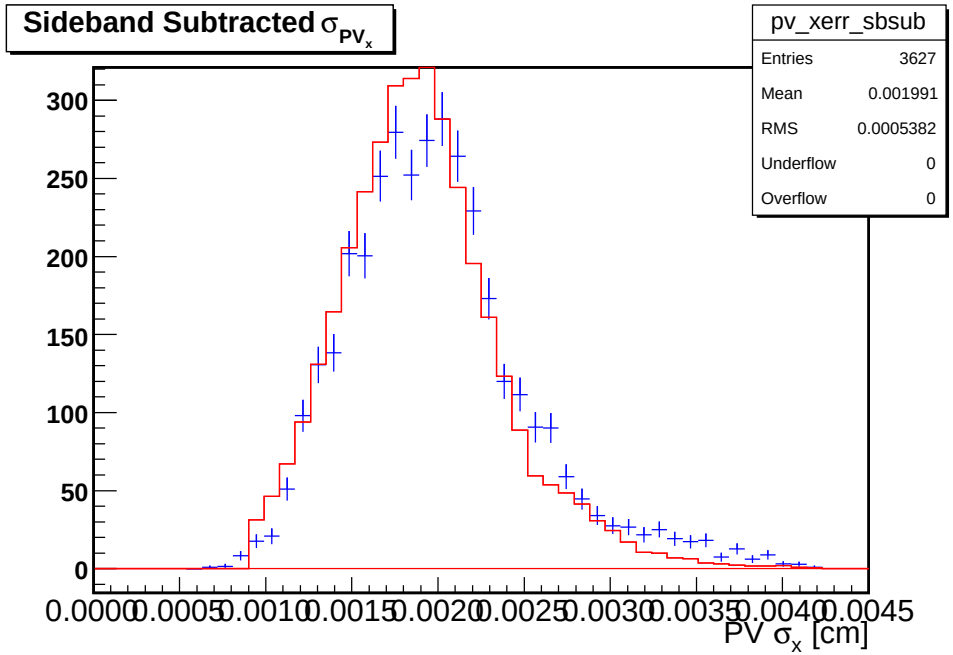
$PV\sigma_x$

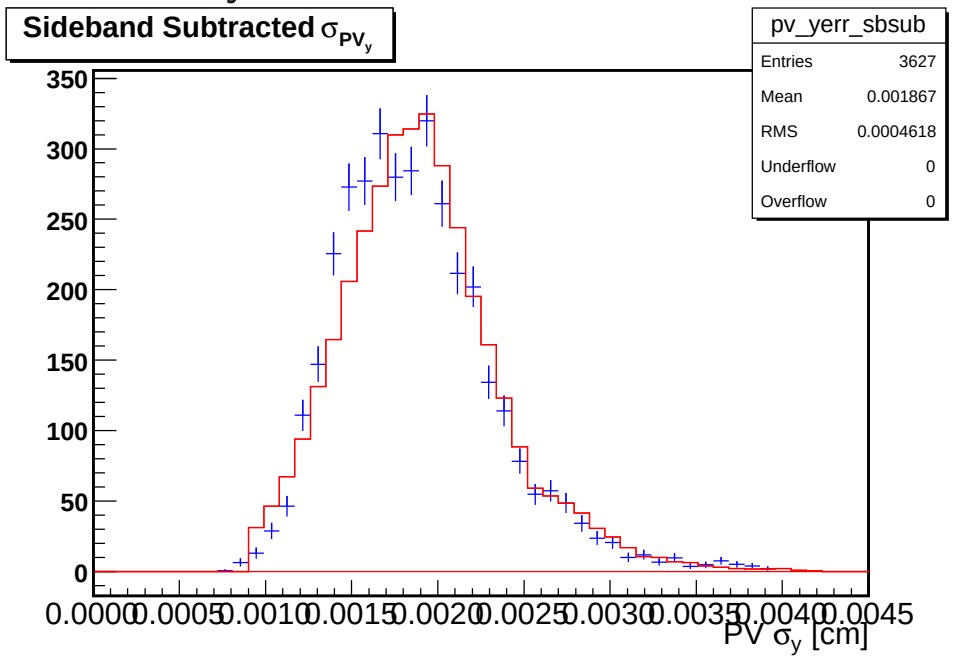


$PV\sigma_y$

Generate PV X and Y Errors

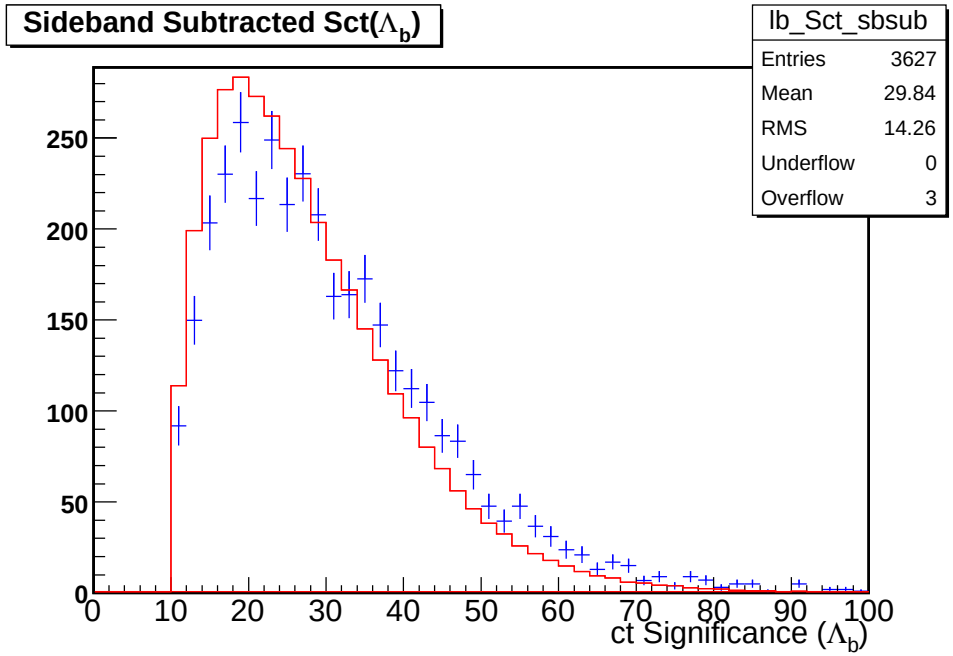
Generate PV errors based on fits to sideband-subtracted Data.
Same random number used to sample the x and y fits.
Parametric simulation of the Primary Vertex errors.



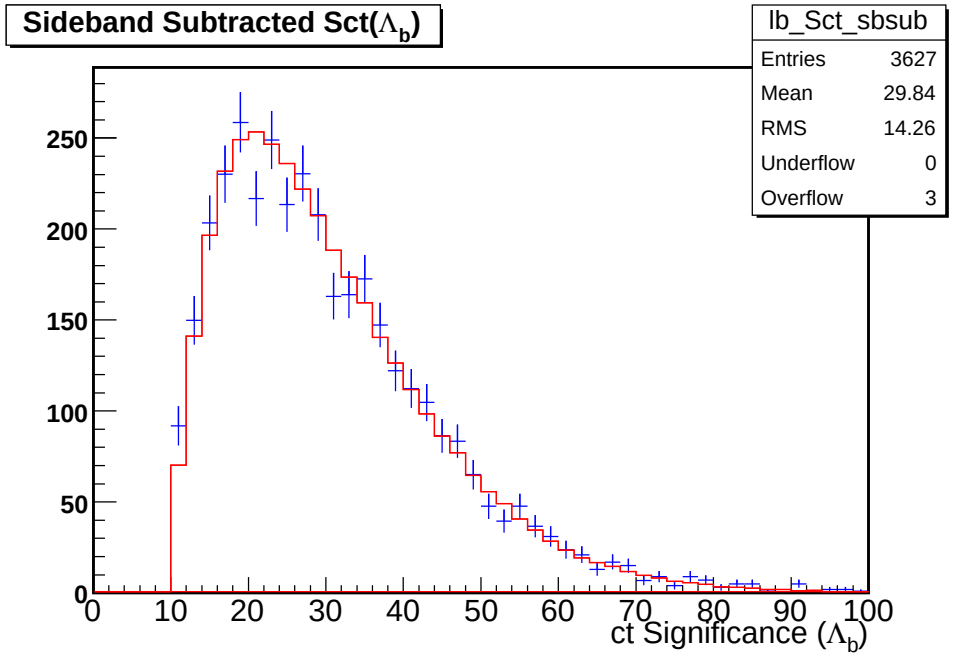


This change improves Data vs. Monte Carlo agreement in many variables.

Data vs. Monte Carlo Comparison I



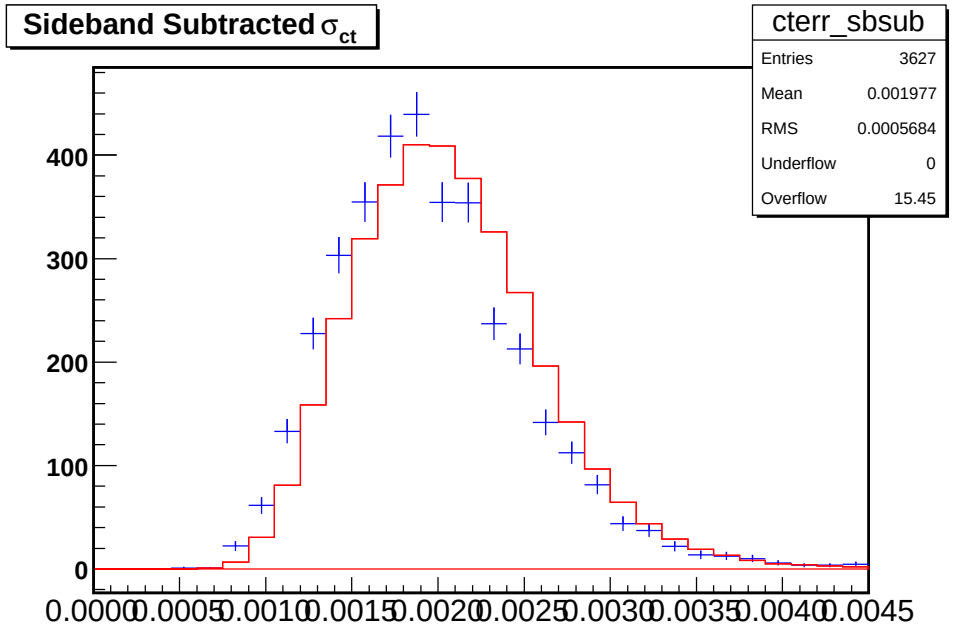
Old $ct(\Lambda_b^0)/\sigma_{ct}$.



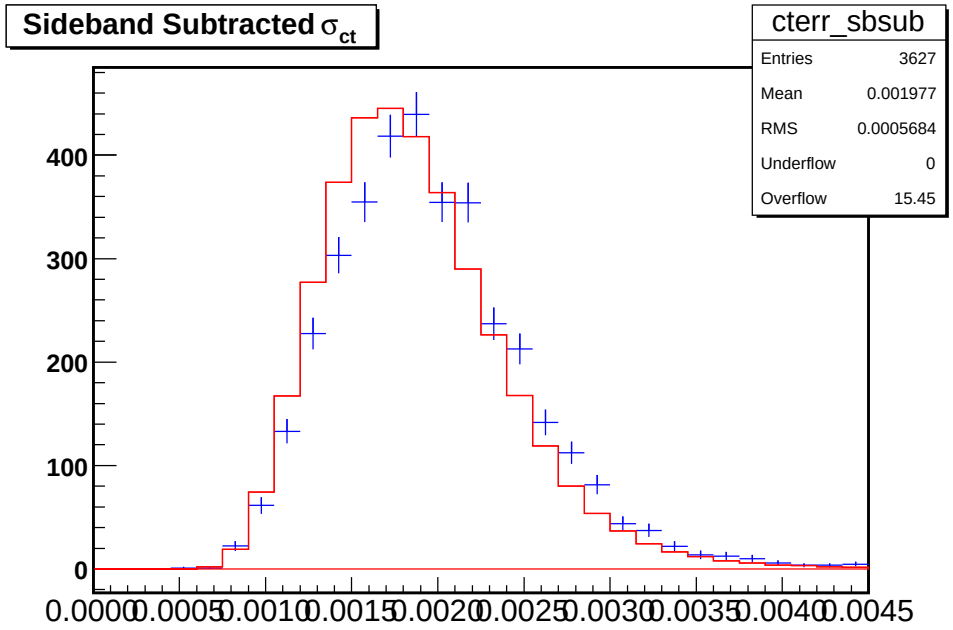
New $ct(\Lambda_b^0)/\sigma_{ct}$.

Important to the kinematics because we cut at $ct(\Lambda_b^0)/\sigma_{ct} > 10$.

Data vs. Monte Carlo Comparison II



Old σ_{ct}

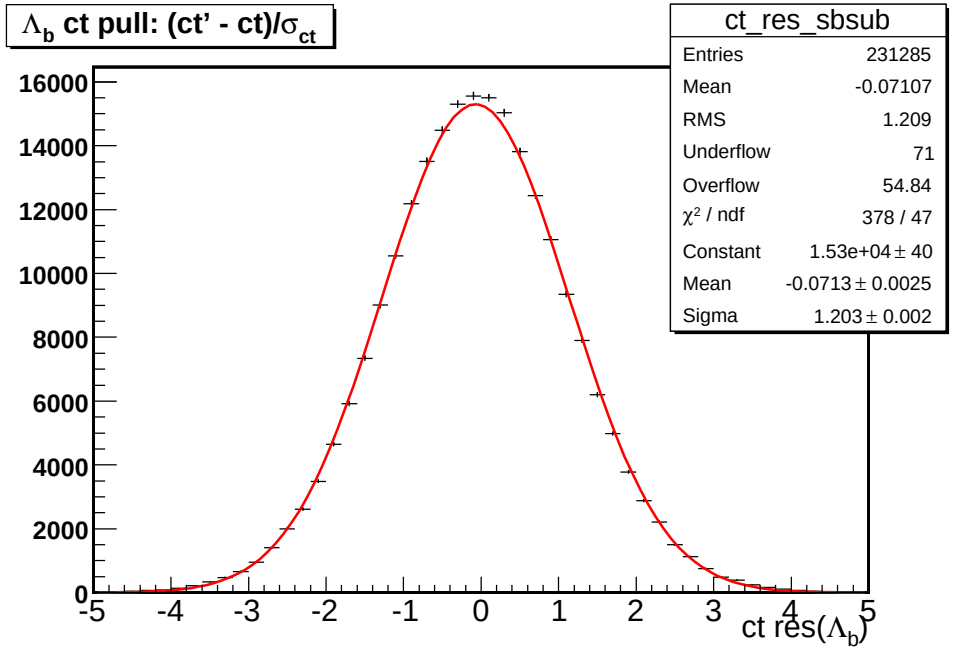


New σ_{ct}

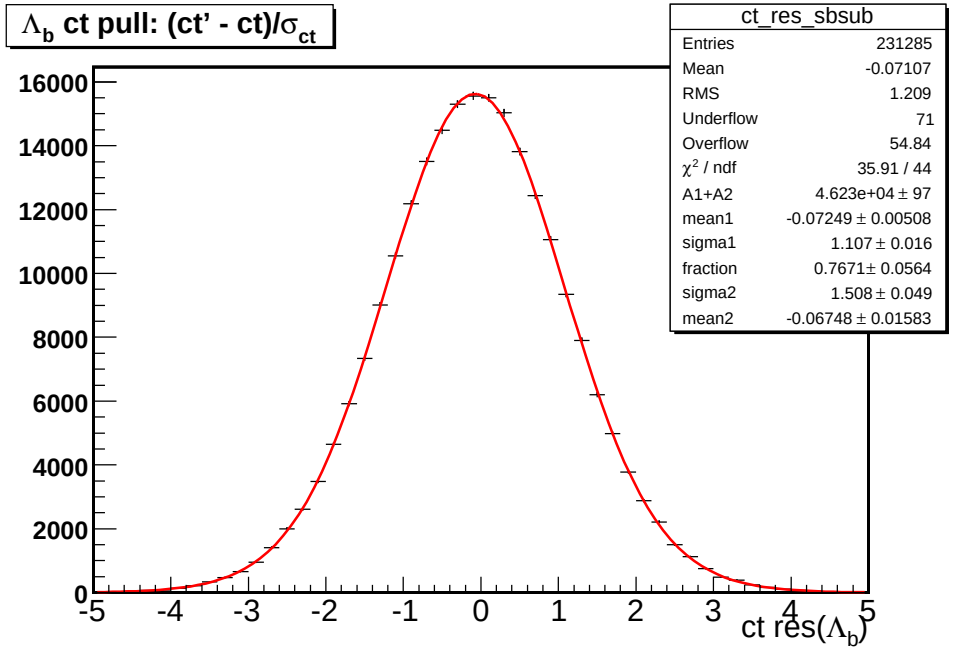
More Data vs. Monte Carlo comparison plots will be available in the updated note that will be posted by the end of the week.

Updated ct Resolution

Still use Double-Gaussian fit to ct pull to obtain resolution



Fit with Gaussian



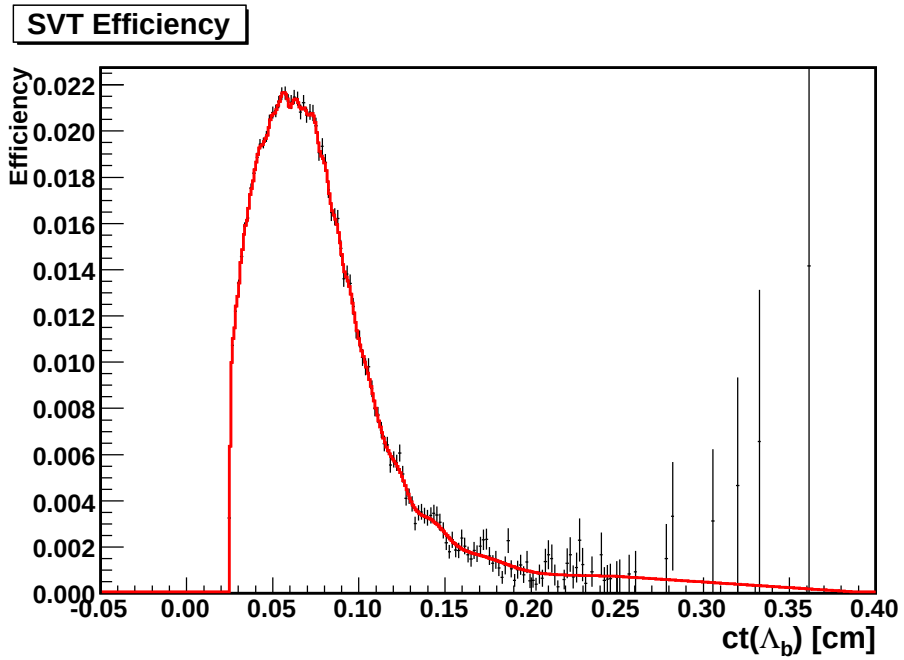
Double Gaussian

$$R(ct, \sigma_{ct}) = f \cdot Gauss(S_1\sigma_{ct}) + (1-f) \cdot Gauss(S_2\sigma_{ct})$$

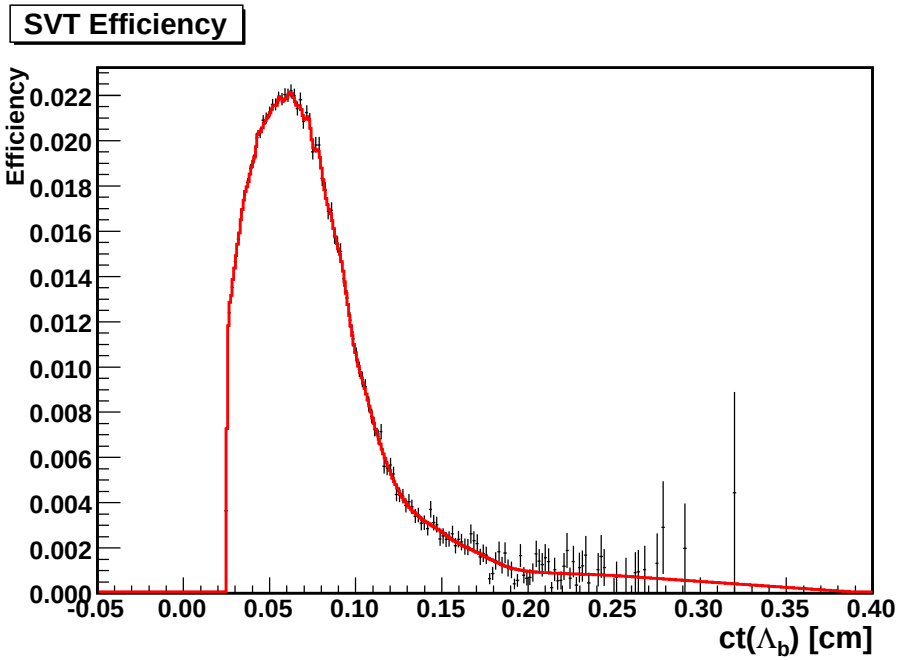
$$S_1 = 1.107,\ S_2 = 1.508,\ f = 0.7671$$

(compared to old values: $S_1 = 1.335$,$S_2 = 3.305$, and $f = 0.41$.)

Updated Λ_b^0 SVT Efficiency

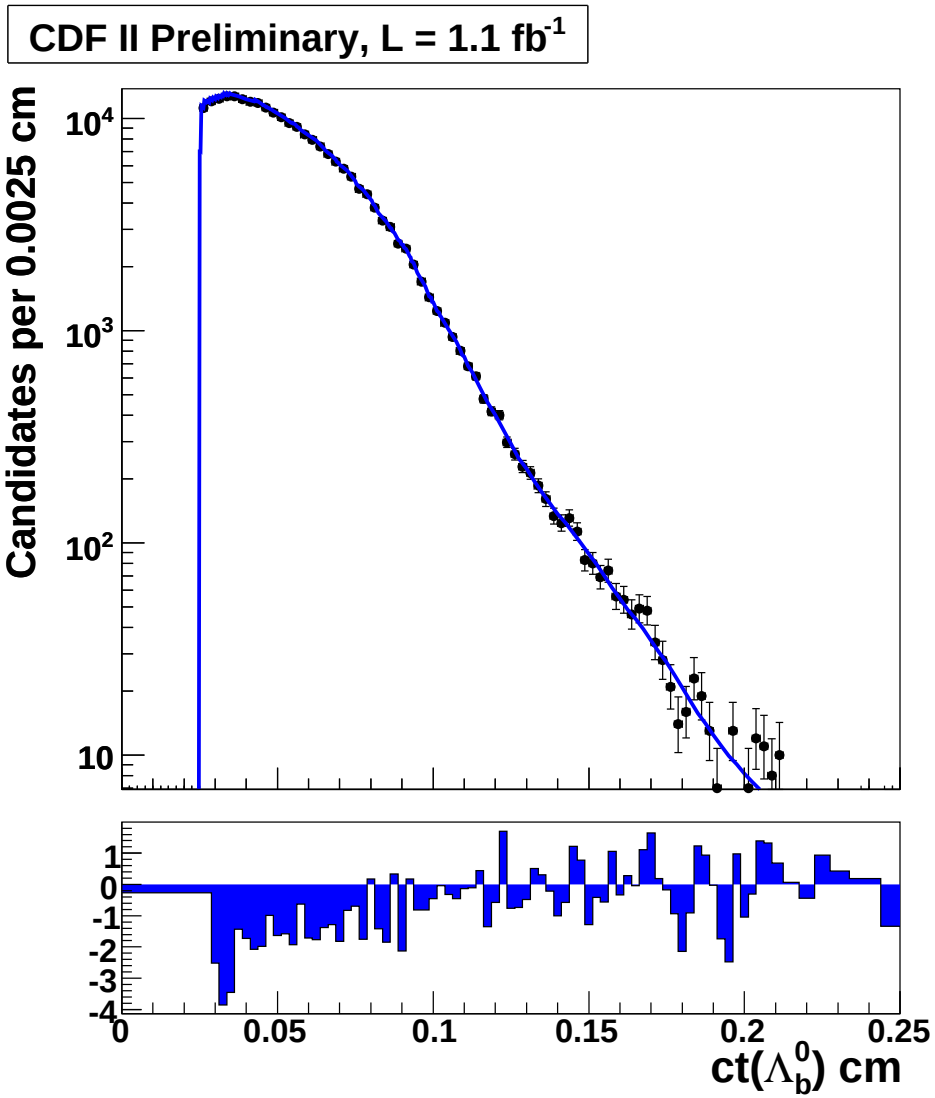


Old Efficiency



New Efficiency

Updated Λ_b^0 Monte Carlo Fit Result

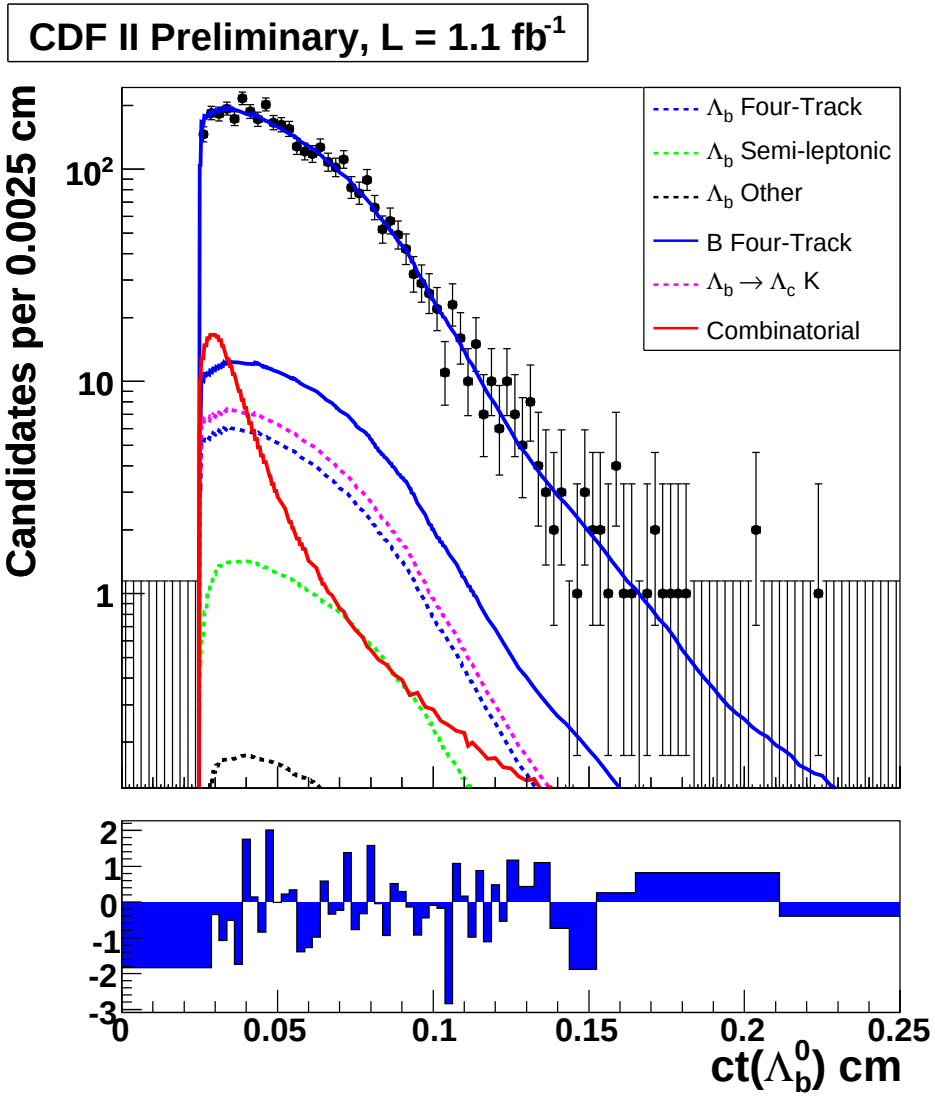


$$c\tau(\Lambda_b^0) = 367.5 \pm 1.2\mu\mathrm{m}$$

compare to

generated value of $368.0\mu\mathrm{m}$

Updated Blinded Data Fit Result



$$c\tau(\Lambda_b^0) = 424.7 \pm 12.3 \mu\mathrm{m}$$

compare to

previous value of

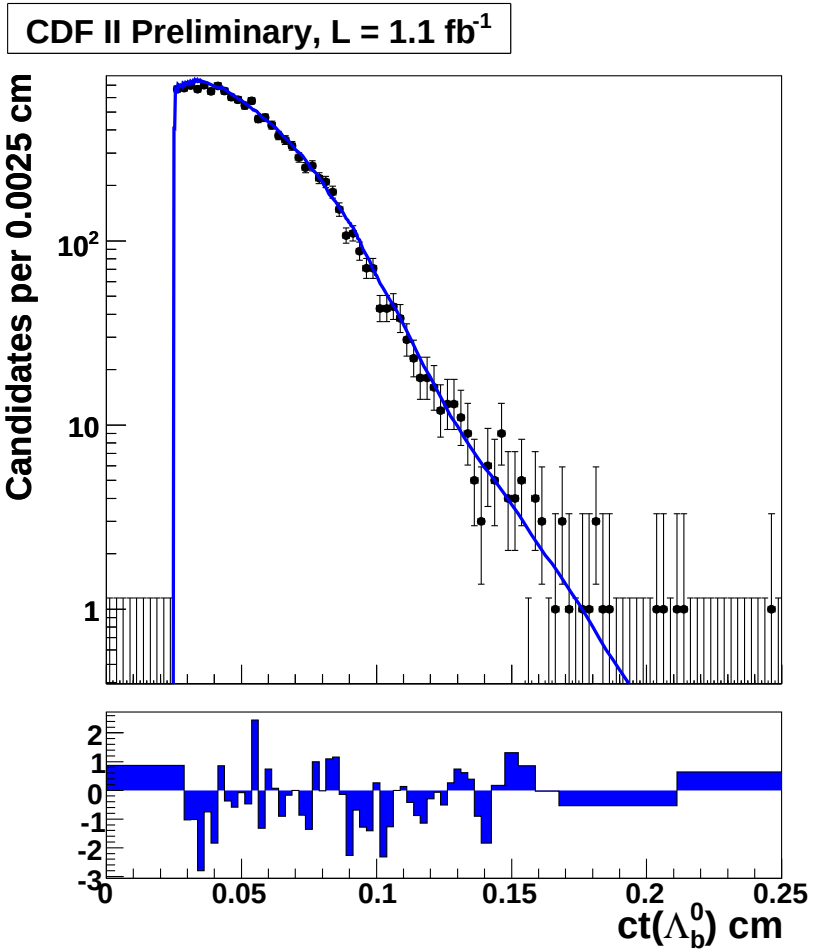
$$407.1 \pm 10.7 \mu\mathrm{m}$$

Fits to Monte Carlo w/ different $c\tau(\Lambda_b^0)$

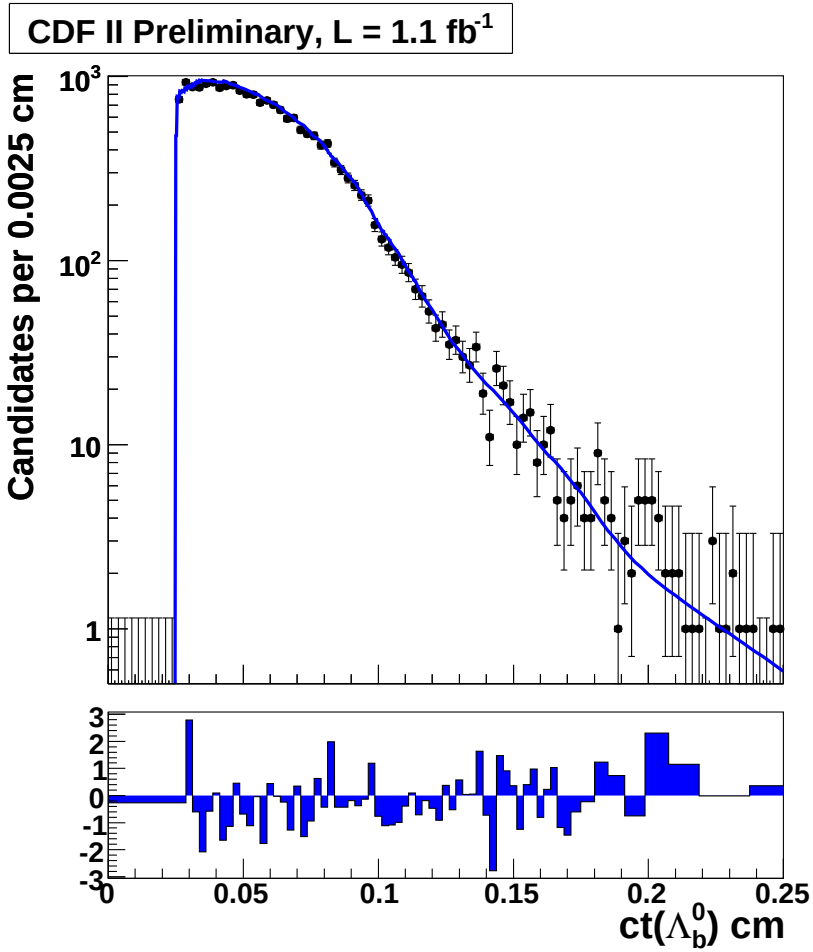
Two small ($\sim 40k$) MC samples were generated w/ $c\tau(\Lambda_b^0) = 325$ and 500μm.
Samples are re-weighted the same as the original Signal MC.
After re-weighting each sample consists of $\sim 20,000$ events.

Generated $c\tau(\Lambda_b^0)$	325μm	368μm	500μm
Fit $c\tau(\Lambda_b^0)$	$334.6 \pm 4.6\mu$m	$367.5 \pm 1.2\mu$m	$500.7 \pm 6.9\mu$m

Monte Carlo Fit Projections



325μm

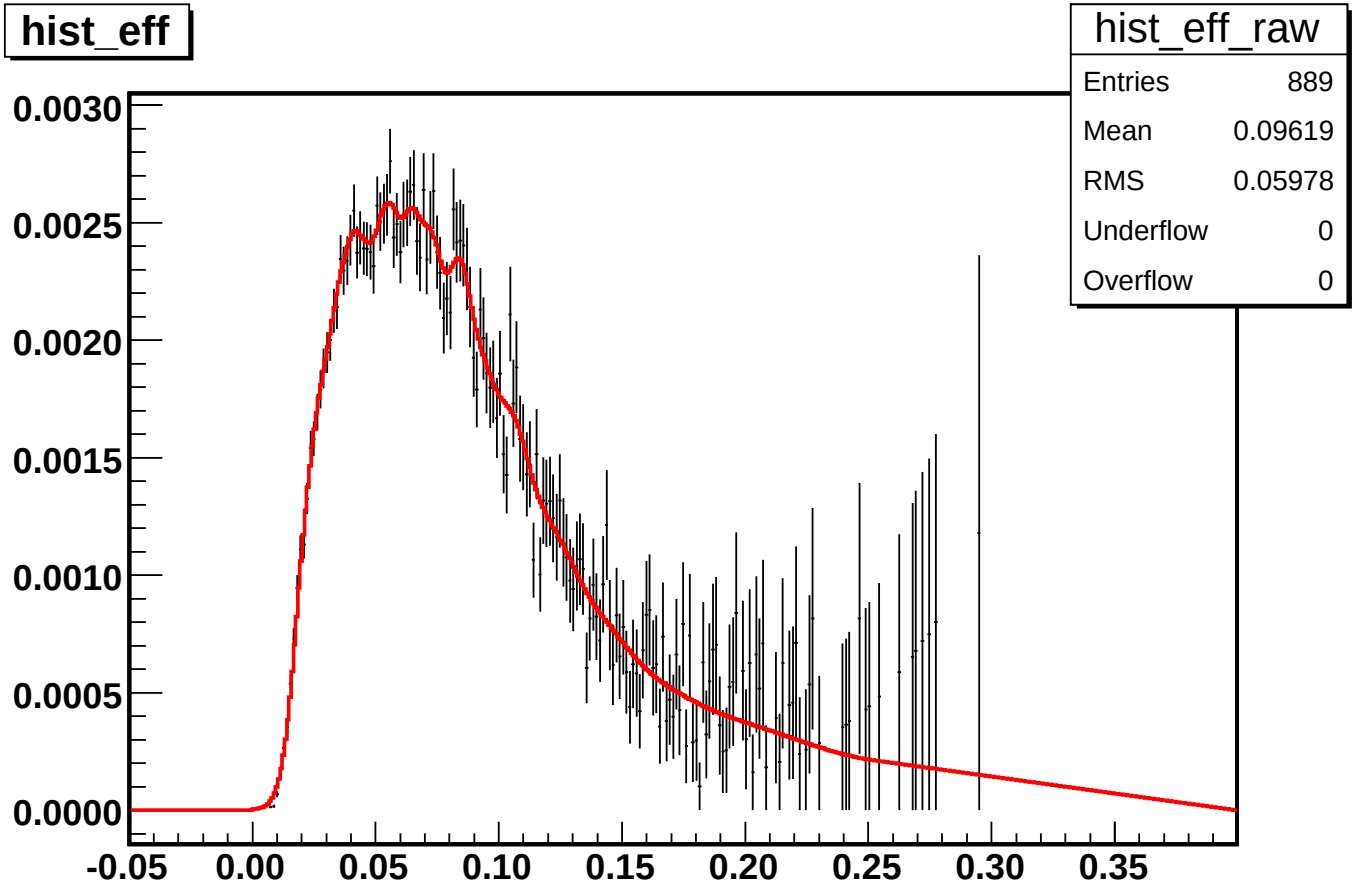


500μm

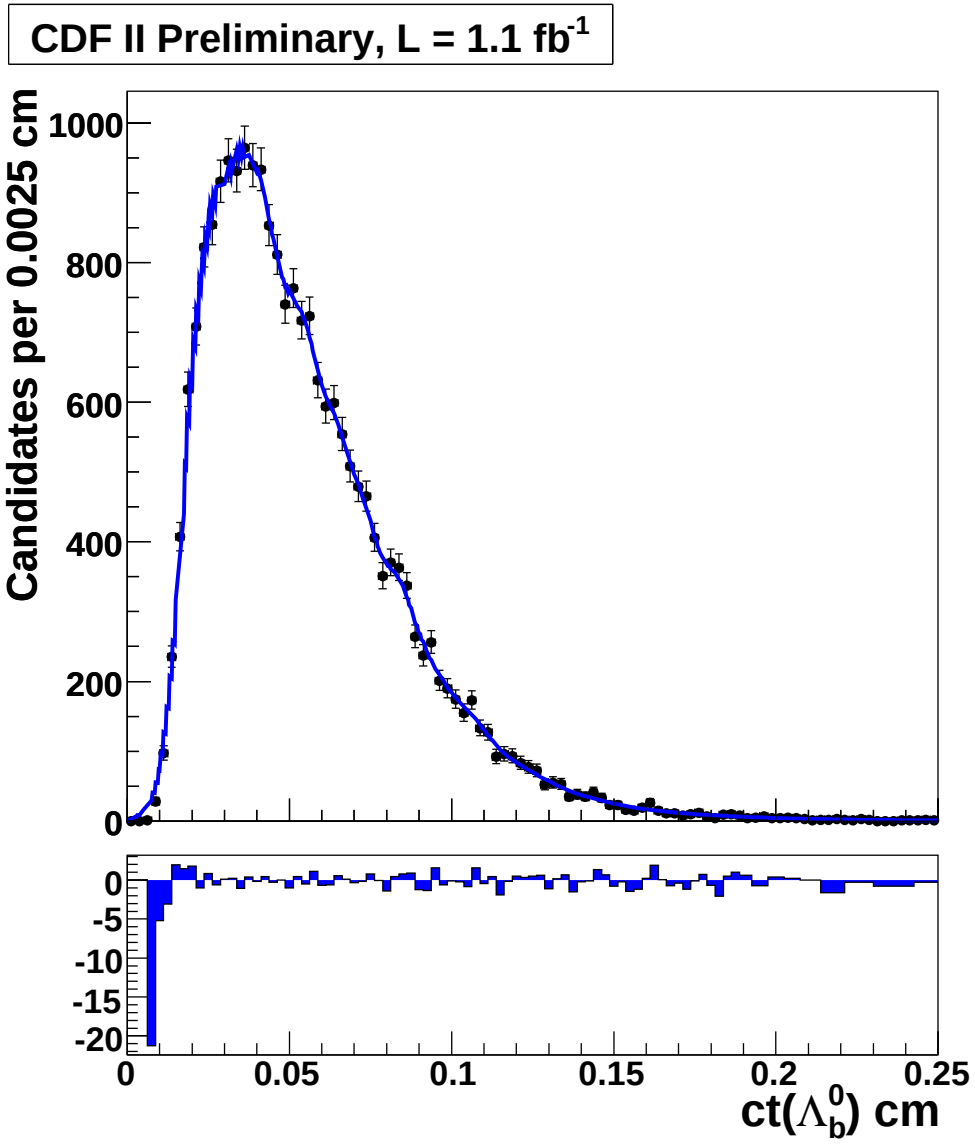
B^0 Signal Monte Carlo Cross-check

- Amanda supplied her re-weighted Signal Monte Carlo sample
- require $conf > 0$,$m(D) > 1.8446$, and $m(D) < 1.8846$.
- signal and side-band windows are the same as Amanda uses.
- Efficiency is generated using 22,831 events.
- Gaussian resolution function is used.
- Scale factor is obtained from Amanda's previous MC studies: 1.012.
- $c\tau'(B^0) = 464\mu\mathrm{m}$

B^0 SVT Efficiency



B^0 Monte Carlo Lifetime Fit Result



$c\tau(B^0) = 460.8 \pm 4.6 \mu\mathrm{m}$

compare to generated value of 464

More detailed comparison to Amanda's fit is in progress.

Conclusion and To-Do

- More detailed comparison to Amanda's B^0 fit.
- Study S_{ct} dependence on ct.
- Update SVT-dependent systematics.
- Looking into possibilities for Dalitz systematic; EvtGen, re-weight 3-body phase-space.
- Add Λ_c^+ and D^+ lifetime systematics.
- Update `cdfnote 8578` this week.
- Address other specific questions from Blind Pre-blessing.
- Planning to Bless Blind in January.