PURDUE UNIVERSITY Department of Physics

Last updates on the lifetime saga

•12/15 presented lifetime measurements of B^+/B^0. Bkg fixed from sideband (3 exps + gaussian). Non biasing cuts applied. Central values badly off.

•01/05 oxford presented a lifetime measurement of B^+ with their method. Bkg modeled with 3 exps and 1 gaussian all treated as signal. Wider mass window. Central value ok, but large error and some doubts.

•01/19 Saverio Da Ronco proposed a new measurement. Non biasing but strong cuts applied. Bkg modeled with 1 exp treated as signal and 1 gaussian. Central values ok, but fit not very convincing

Considerations

•Reducing bkg helps. Biasing but more effective cuts like L_{xy} have to be introduced sooner or later, better to start now

•A wider mass window helps to fix better the bkg fraction, but this means more bkg and difficulties in treating the reflections and the B-type bkg

•In my opinion it's not correct to treat bkg and signal in the same way, specially in the case of combinatorial bkg

•Somehow the $B^+ \rightarrow D^0\pi$ has been chosen to be the "calibration" channel, but it's not a simple one

Fitting function

Background:

$$L_{BG}^{comb}(ct, s_t) = Templ(ct)$$

Misreconst. & Combinatorial

$$L_{BG}^{partial}(ct, s_t) = \left(\int \frac{1}{lp} \cdot e^{-\frac{t}{lp}} \frac{1}{\sqrt{2p} \cdot s \cdot s_t} \cdot e^{-\frac{(ct-t)^2}{2(s \cdot s_t)}} \cdot dt \right) \cdot e_{SVT}(ct)$$

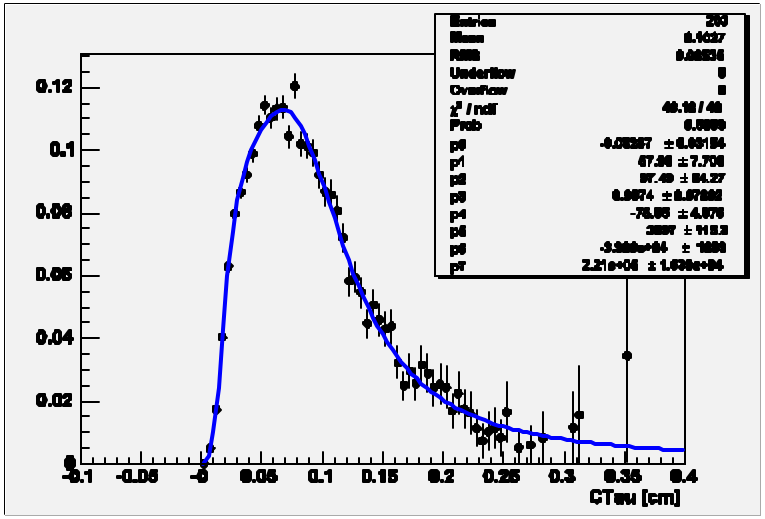
Signal:

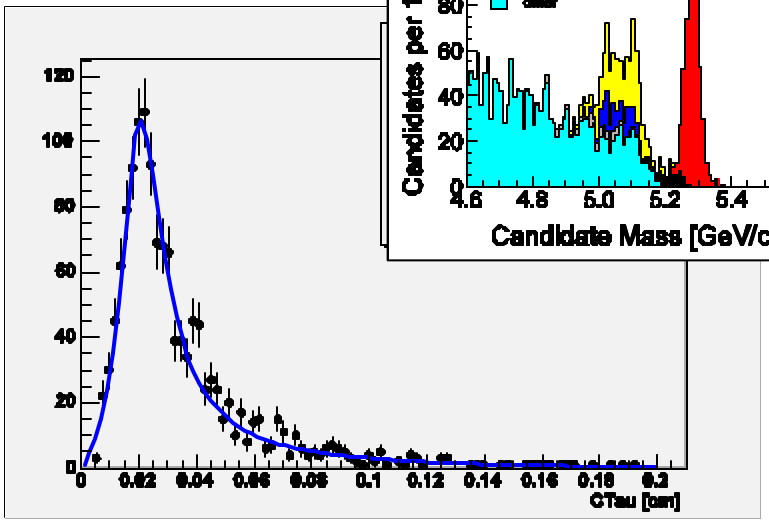
Partial reconstructed B

$$L_{SIG}(ct, s_t) = \left(\int \frac{1}{life} \cdot e^{-\frac{t}{life}} \frac{1}{\sqrt{2p} \cdot s \cdot s_t} \cdot e^{-\frac{(ct-t)^2}{2(s \cdot s_t)}} \cdot dt \right) \cdot e_{SVT}(ct)$$

Total function: $L = L_{SIG} + fracb \cdot L_{BG}^{comb} + fracp \cdot L_{BG}^{partial}$

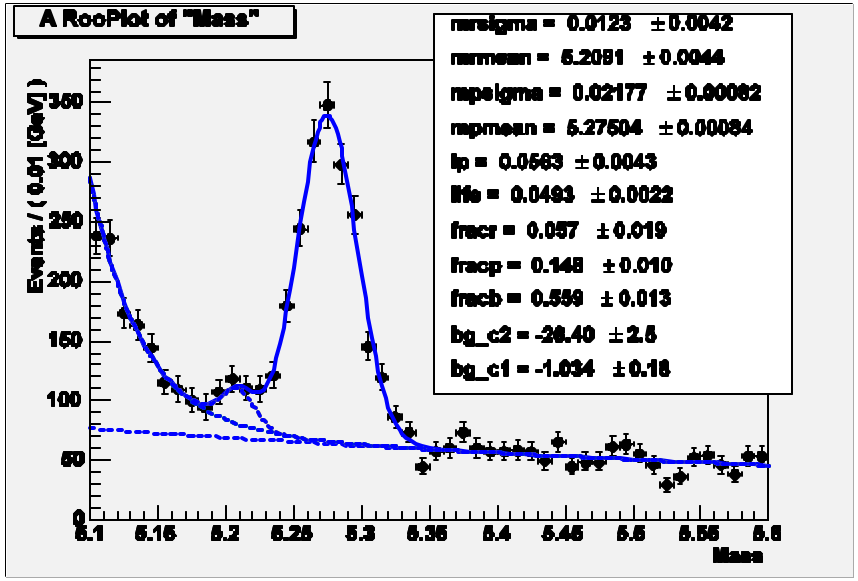
B+ lifetime-mass fit

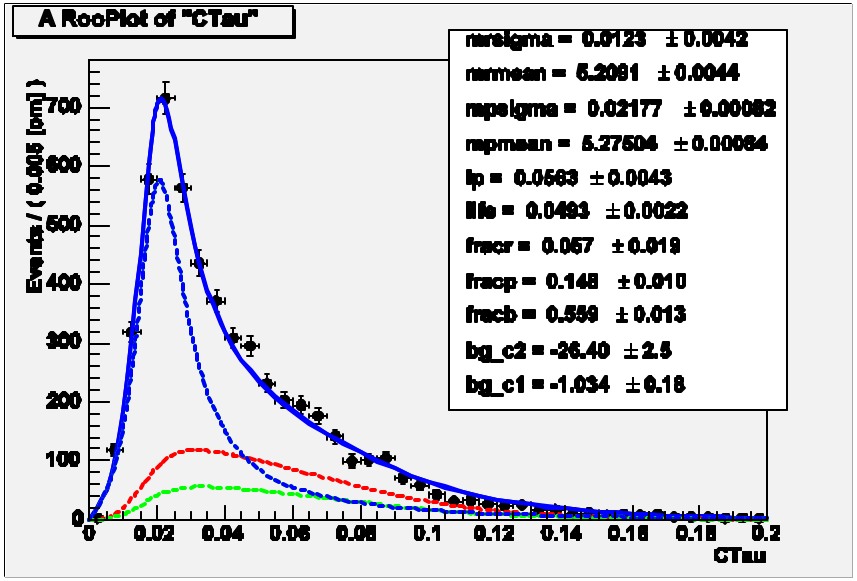




- ε_{svt} calculated from offline quantities (systematic from bin by bin migration), including L_{xy} and I.P.
- Upper side band used to build a template for combinatorial bkg lifetime distribution

B+ lifetime-mass fit





- Mass shapes of the reflection and the B-type background have to be modeled by a template (Donatella should provide me her).
- A simple gaussian and exponential are used in the fit

Lifetime conclusion

•We are getting convinced that problems in lifetime measurements come from our poor understanding of the bkg

•Though different methods model well signal, there is no clear way how to treat bkg in the correct way

•02/16 Hadronic meeting will be devoted to evaluate pros and cons of different approaches focusing more on systematics rather than central values

•In the case of D's we have high purity and pointing out the source of bias can be an important step to trust lifetime ratios

D^0/D^+ Status and Plan

- Executables ready in 4.11.2 and 5.3.0

- Data samples
  - D^* stripped
  - D^+ ready to strip, last checks

  Space problem forseen

- MC samples
  - $B \rightarrow D^* \pi$ 4.9.1
  - $D^* \rightarrow D^0 \pi$ and $D \rightarrow K\pi\pi$ 4.11.2

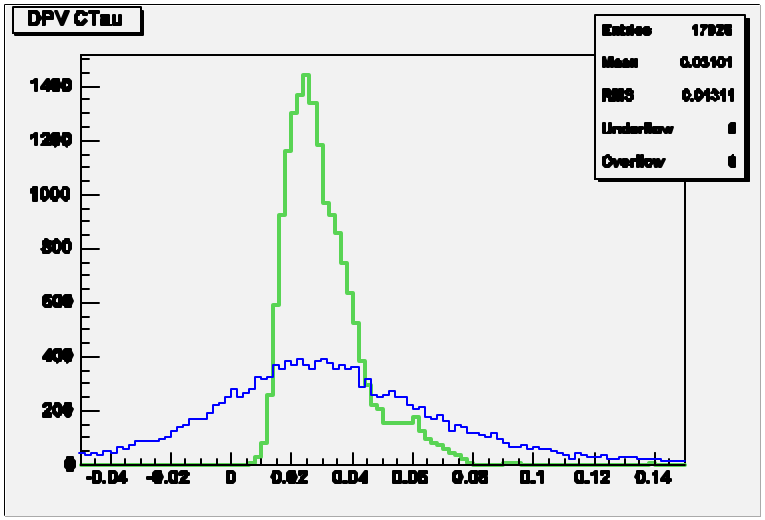
  It will take time to have all the samples in 5.3.0

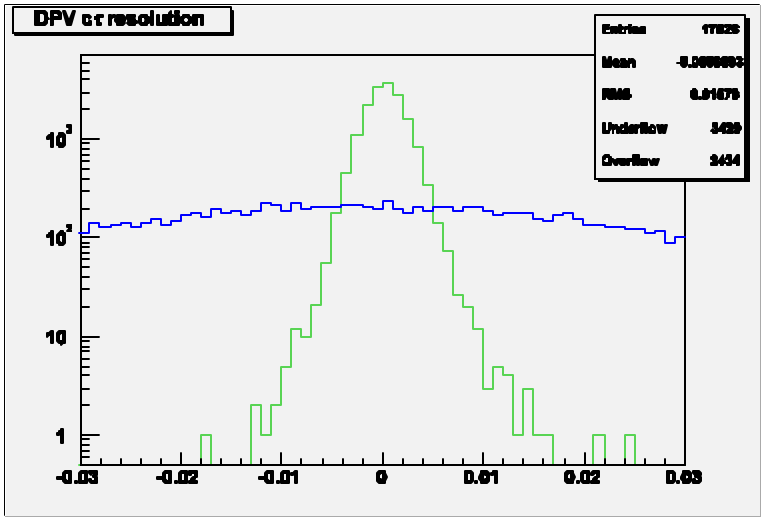
  Problem between BGen and EvtGen

- Studies to handle no prompt fraction (starting from CDF6177)

Primary vertex vs D^* vertex

Idea: if we are able to measure L_{xy} with respect to the D^* vertex we don't have to treat the no prompt D^0 differently





- CT resolution is very bad (300µm vs 20µm) even requiring hits in the innermost layers and loosing efficiency
- L00 can help but probably not much