Status of $B^0 - \bar{B}^0$ Mixing with Inclusive $D^* l \nu$

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Recent improvements:

- First evaluation of systematic uncertainties from:

  B^+ treatment and fraction;

  Offset determination.

- New Approach for the Combinatorial Background description.

Systematics Evaluation

B^+ description:

- Pure lifetime component with the same Resolution function as the signal;
- B^+ dilutions tuned on DATA:

  Efficiency and mistag rate corrected for the ratio between Data and MC in fully reconstructed B^+ decays (BAD 119);
- Error on this correction $\oplus \pm 50\%$ variation of the B^+ fraction:

$$\Longrightarrow \delta(\Delta m)_{B^+} = \pm 0.010\ ps^{-1}$$

Offsets:

- Varying the offsets by their error from the $dN/d\theta_{tag\ track-\pi^*}$ fit:

$$\Longrightarrow \delta(\Delta m)_{offset} = \pm 0.001\ ps^{-1}$$

$D^* l\nu$

Combinatorial Background Description-1

- Old Approach:

  Combinatorial Background was described by three components:

  Zero Lifetime, Non-zero Lifetime, Mixing, parametrized from the control samples:

  Side Band ($l^+\pi^-$), Side+Mass Band ($l^+\pi^+$)

  Problem: the choice of the control sample to obtain a reliable background description was tag-dependent.

- New Approach:

  $(\Delta t, \sigma(\Delta t))$ distribution for Combinatorial (mixed, unmixed) computed using the recipe:

  $(Mass - Band)_{l^+\pi^-} = (Mass - Band)_{l^+\pi^+} \times \frac{(Side-Band)_{l^+\pi^-}}{(Side-Band)_{l^+\pi^+}}$

- In the fit: Combinatorial Shape fixed, normalization free

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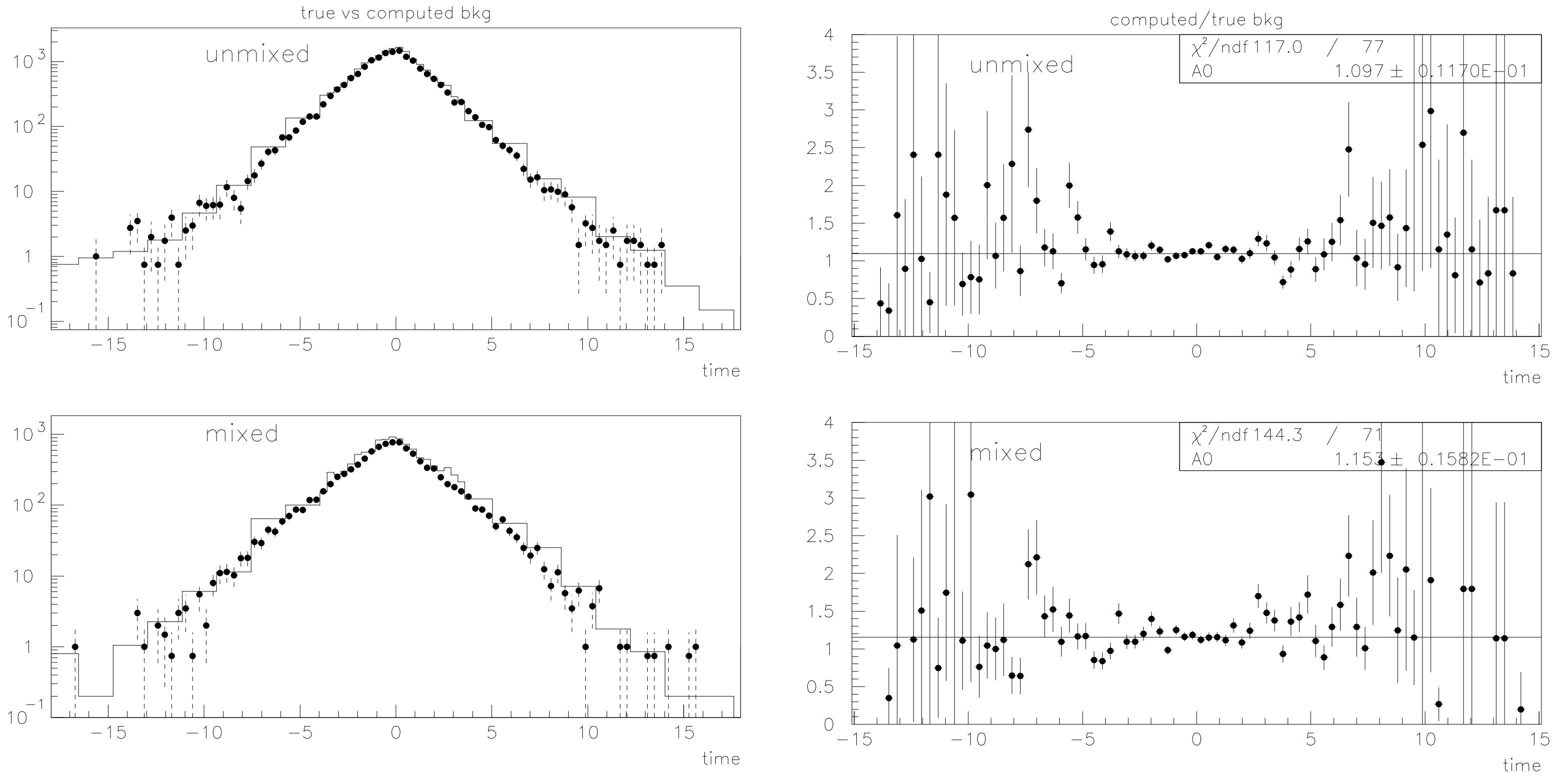
Combinatorial Background Description-2

- Good agreement between expected/computed background for all the tags (Line/Dots: computed/expected Background)



- The recipe reproduces well the shape with $\sim 10 - 15\%$ difference in normalization

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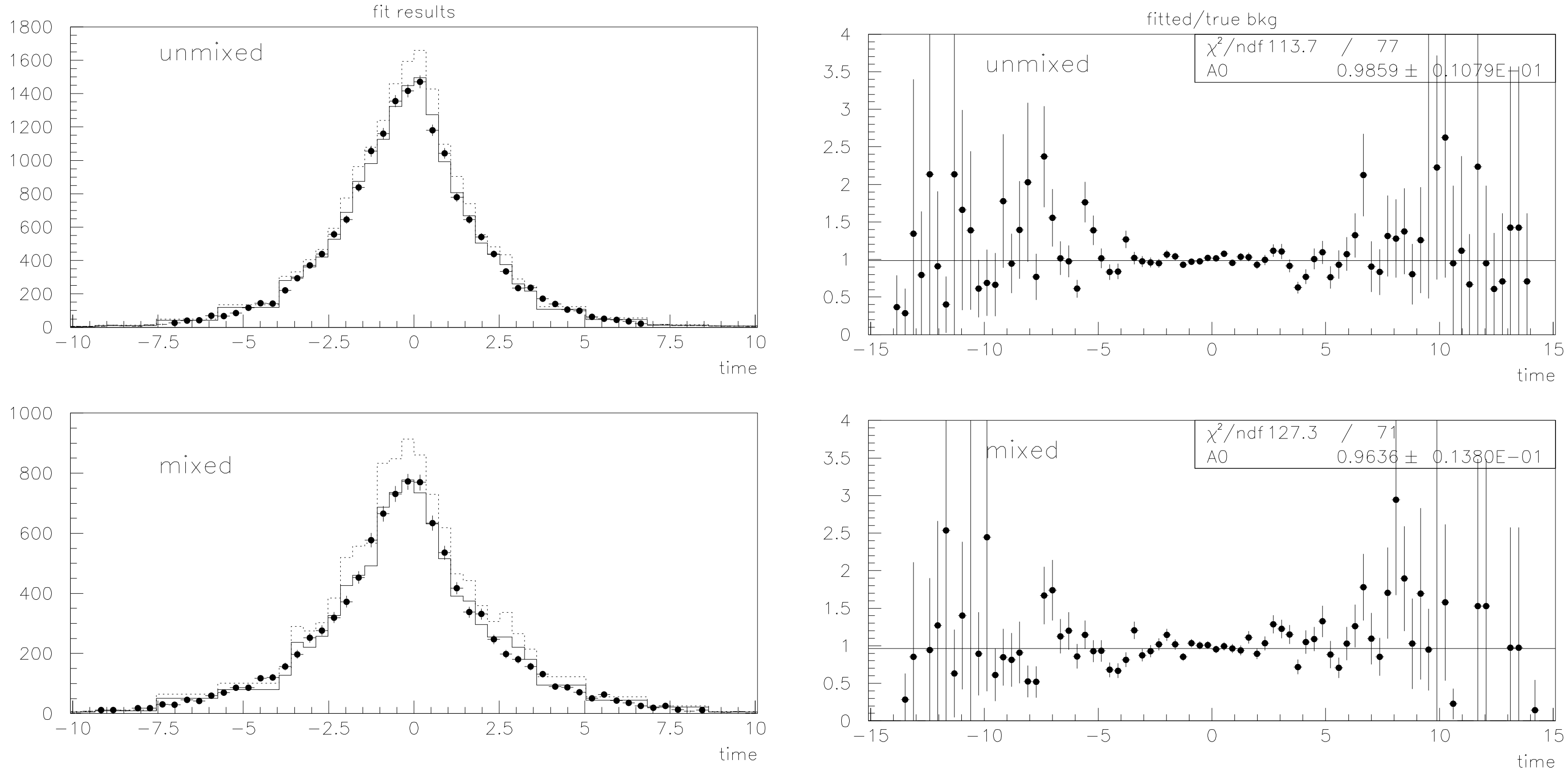
Combinatorial Background Description-3

- After the fit:

  Combinatorial Background underestimated at $\sim 2-3\%$ level

  (Dashed/full lines: before/after the fit; dots: expected Background)



$D^*l\nu$

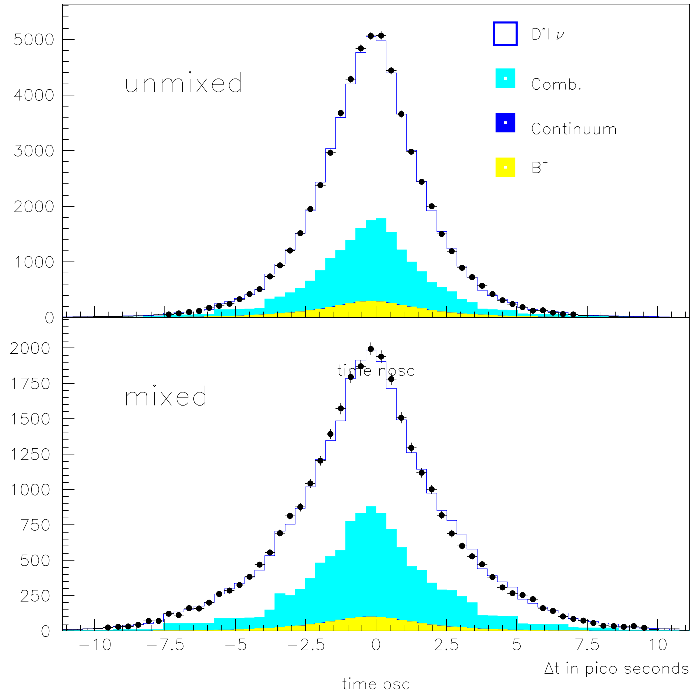
Combinatorial Background Description-4

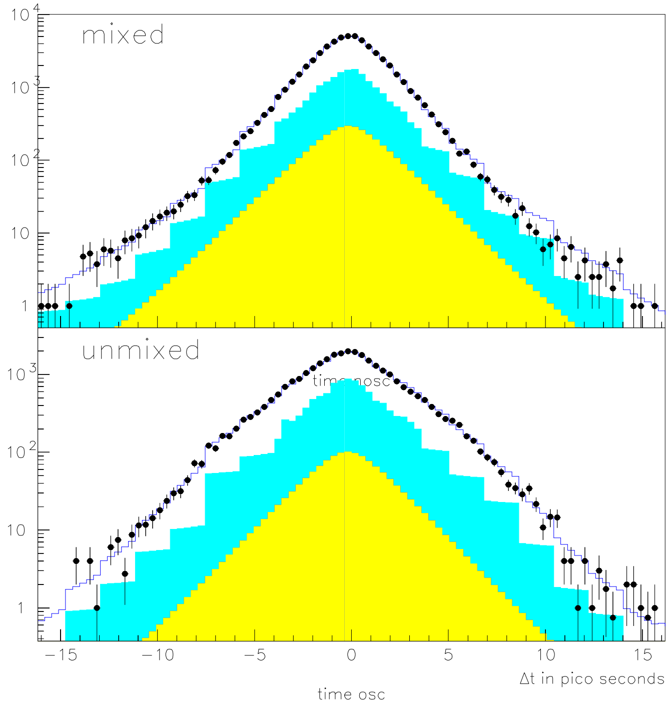
- Results on MC (no continuum):

$\tau_{B^0} = 1.522 \pm 0.020\ ps$; $\Delta m = .459 \pm 0.011\ ps^{-1}$

to be compared with the Pure Signal result:

$\tau_{B^0} = 1.508 \pm 0.015\ ps$; $\Delta m = .463 \pm 0.008\ ps^{-1}$





$D^*l\nu$