Ω_c^0 lifetime measurement

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About tau fit

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Final version

Measurement of the decay-width difference between the B_s^0 and B^0 mesons and the D_s and D mesons

A binned least-squares fit is used to extract $\Delta(D)$, by minimizing

$$\chi^2 = \sum_i^{\text{bins}} \frac{(n_i - R_i d_i)^2}{\sigma_{n_i}^2 + R_i^2 \sigma_{d_i}^2}, \tag{8}$$

where n_i (d_i) is the yield of the numerator (denominator) in time bin i, σ_{n_i} (σ_{d_i}) its uncertainty, and R_i is the expected ratio defined as

$$R_i = N\, A_i \frac{\int_{T_i} \text{pdf}_n(t_D)\, dt_D}{\int_{T_i} \text{pdf}_d(t_D)\, dt_D}. \tag{9}$$

For the bin i, T_i is the corresponding t_D interval, A_i is the ratio between the decay-time acceptances of the numerator over the denominator, $\text{pdf}_{n(d)}$ is the pdf of the numerator (denominator), and N a normalisation factor. The integral over t is done numerically with 100 steps per decay-time bin. Each pdf is written as

$$\text{pdf}_j(t) = e^{-\Gamma_j t_D} \otimes \mathcal{G}_j^{\text{res}} \qquad (j = n, d), \tag{10}$$

Model

$$\chi^2 = \sum_i^{bins} \frac{(n_i - R_i d_i)^2}{\sigma_{n_i}^2 + R_i^2 \sigma_{d_i}^2}$$

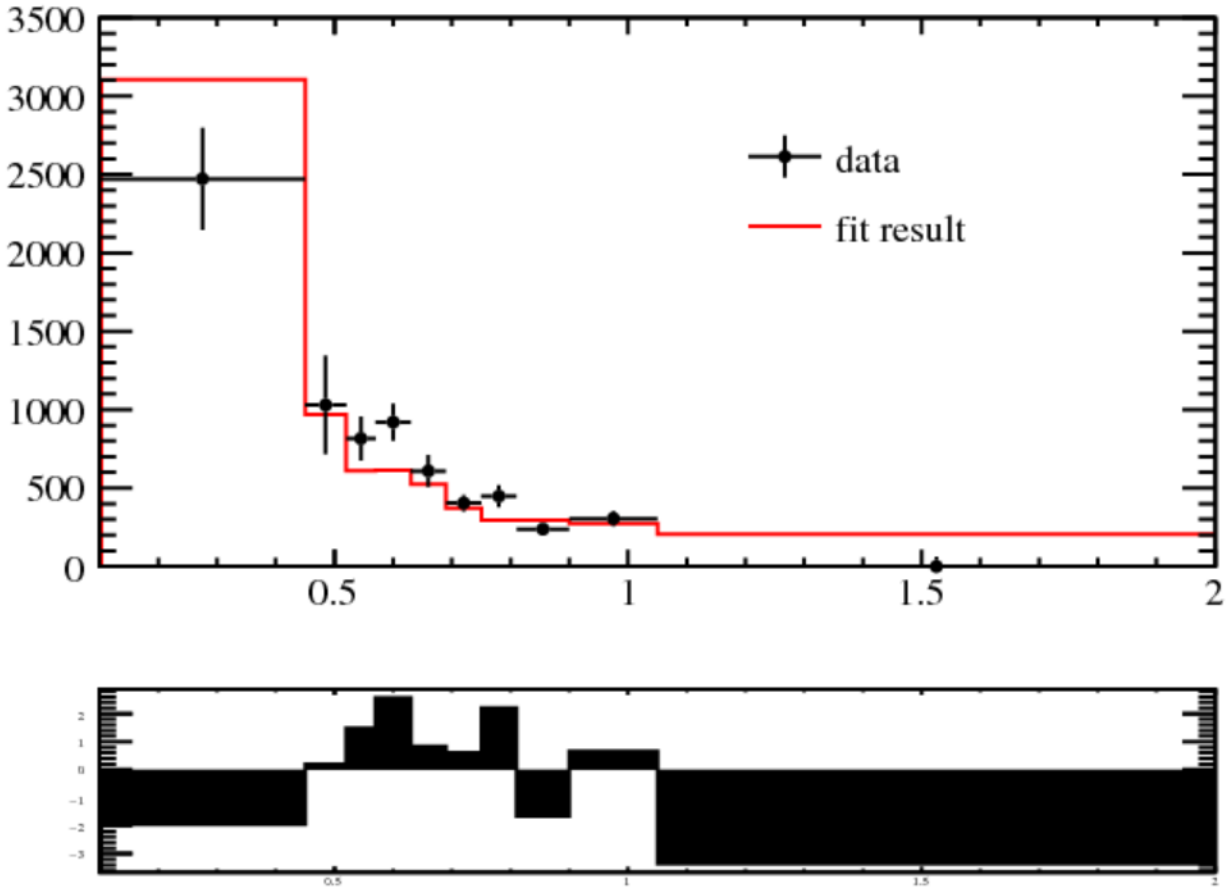
- n_i (d_i) is the yield of the numerator (denominator) in time bin i, $\sigma_{n_i}^2(\sigma_{d_i}^2)$ is its uncertainty , R_i is the expected ratio

$$R_i = N \frac{\int_{T_i} pdf_n(t)dt}{\int_{T_i} pdf_d(t)dt}$$

- Here use simple pdf:

$$pdf(t) = e^{-\frac{t}{\tau}}$$

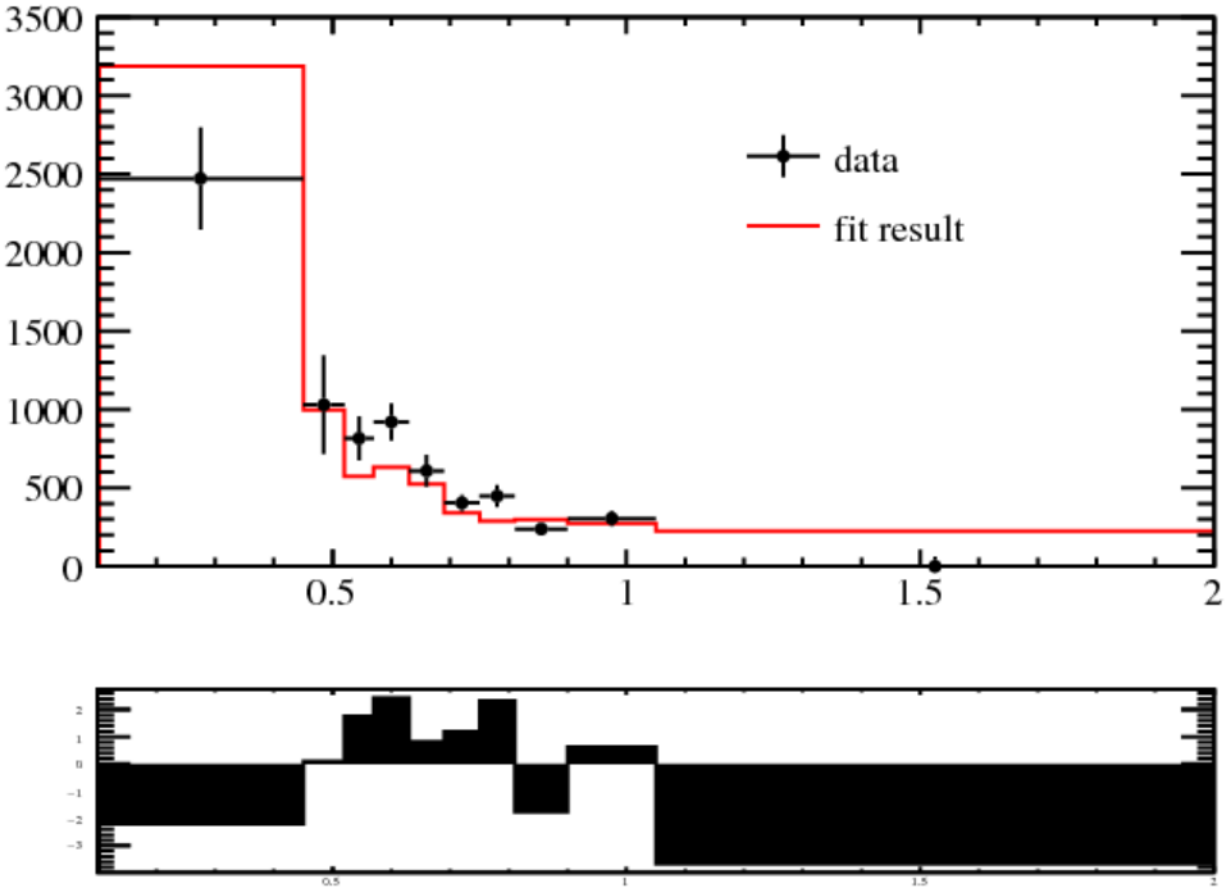
Fit use Xic0 data and Xic0(tau=250 fs) MC



- Without L0 correction

- $\tau = 163.4 \pm 4.7\ fs$
- $\chi^2/ndf = 31.9/8$

Fit use Xic0 data and Xic0(tau=250 fs) MC



- With L0 correction

- $\tau = 173.9 \pm 5.4\ fs$
- $\chi^2/ndf = 35.3/8$

Effect of resolution

- $pdf(t) = e^{-\frac{t}{\tau}} \rightarrow pdf(t) = e^{-\frac{t}{\tau}} \otimes G(t; \mu = 0, \sigma)$
- Fit with free σ ,converge at $\sigma = 287 fs$?
- Fix σ at different value

	Without resolution	$\sigma = 20\ fs$	$\sigma = 50\ fs$	$\sigma = 70\ fs$	$\sigma = 100\ fs$
Result τ/fs	163.4 ±4.7	163.4 ±4.7	163.3 ±4.7	162.7 ±4.7	160.9 ±4.8