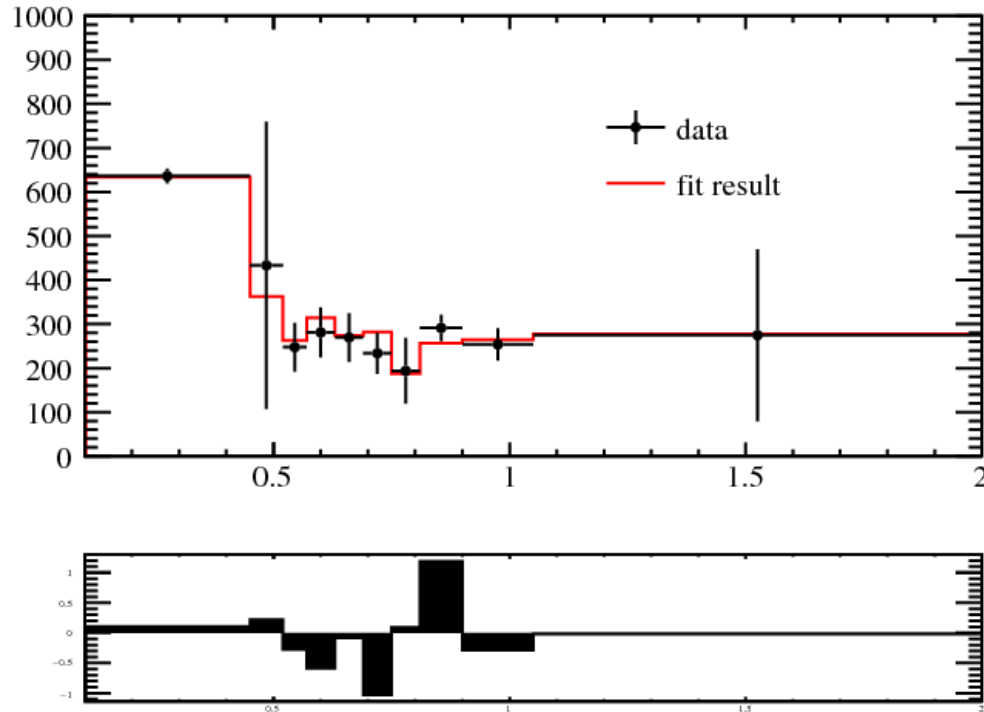


Ω_c^0 lifetime measurement

Dong Ao

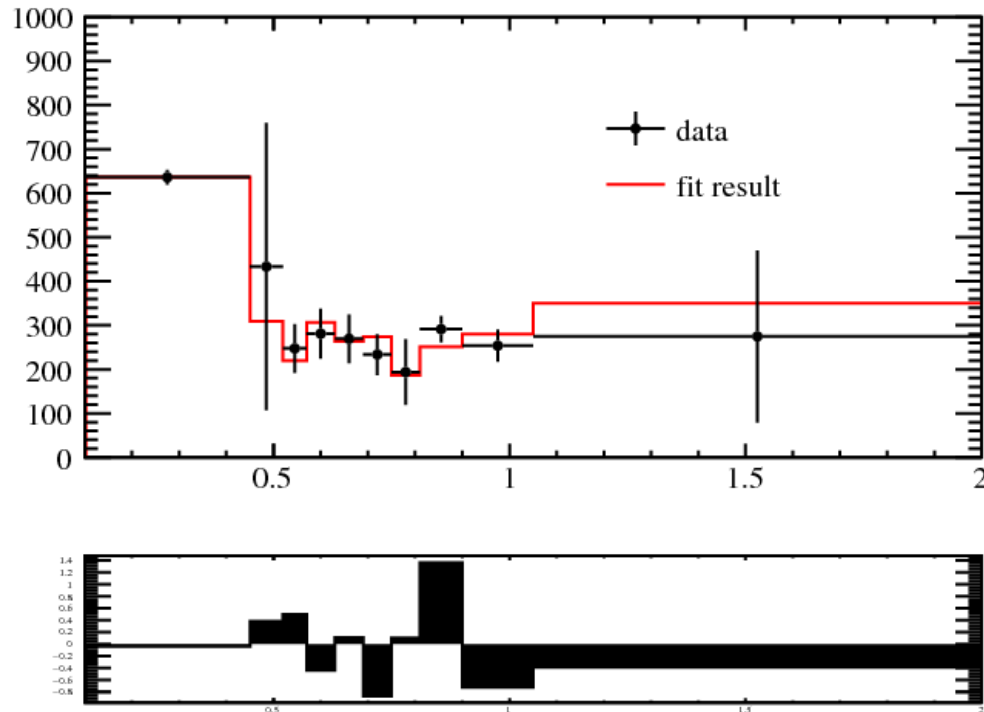
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC



- Input :
 - D^0 MC: $\tau=410$ fs
 - Ω_c^0 MC: $\tau=250$ fs
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 261.7 \pm 8.9$ fs
- $\chi^2/ndf = 2.79/8$

Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC

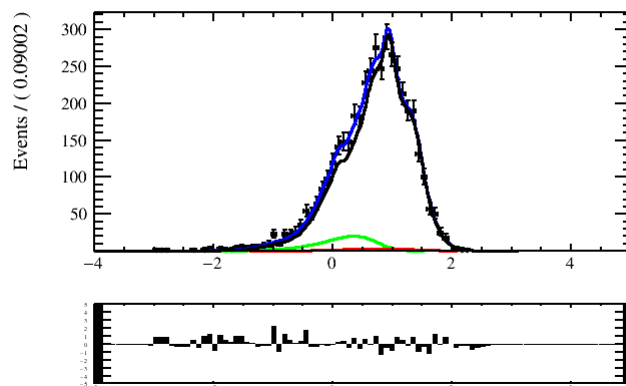
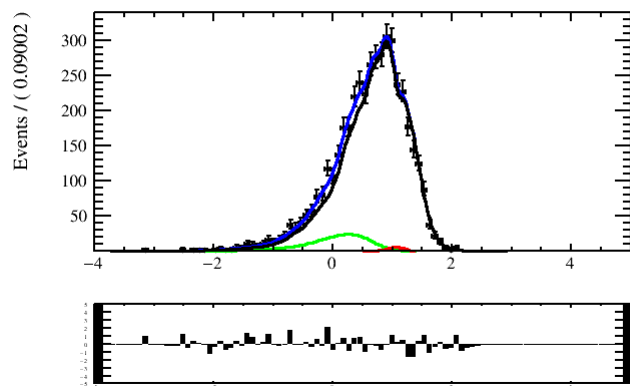
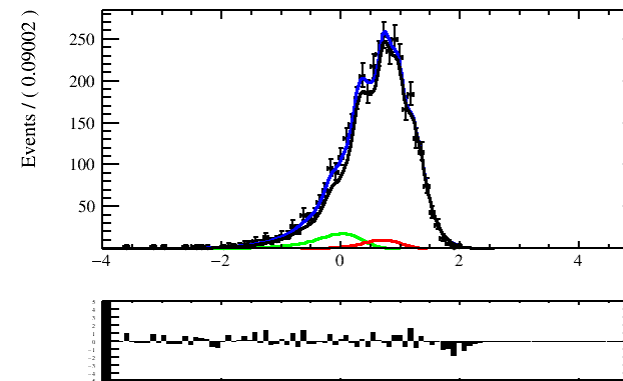
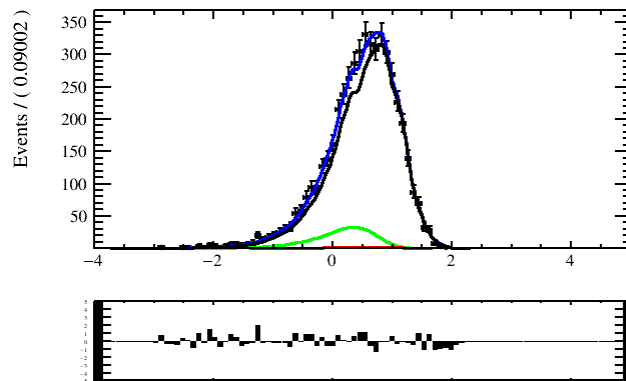
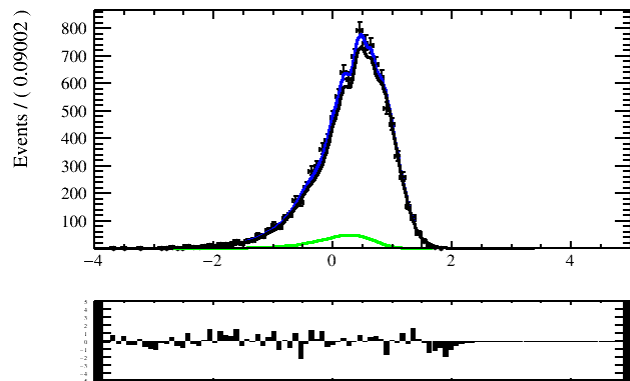


- $\tau = 300 \pm 11 \text{ fs}$
- $\chi^2/ndf = 3.7/8$

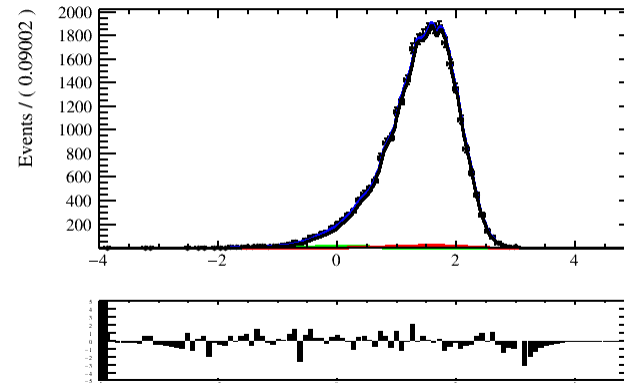
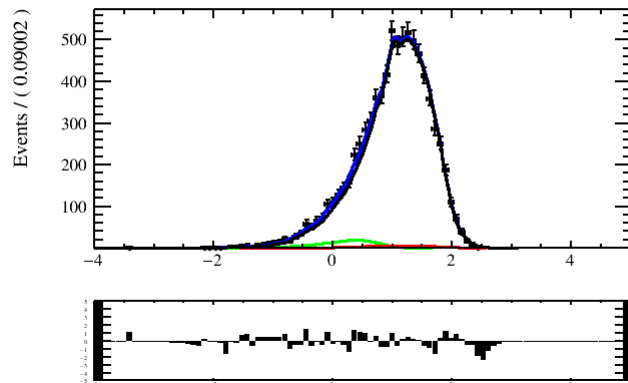
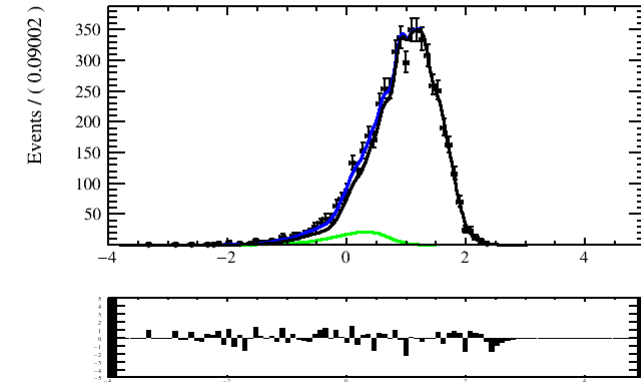
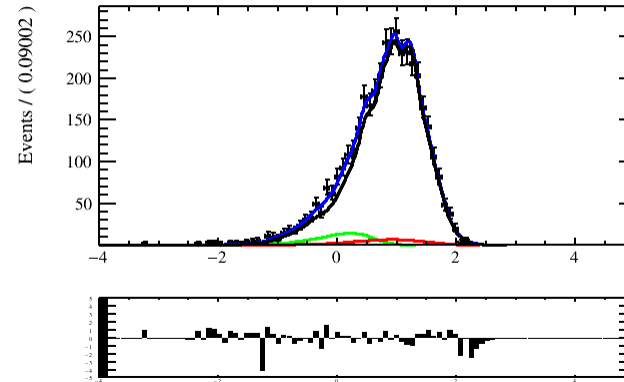
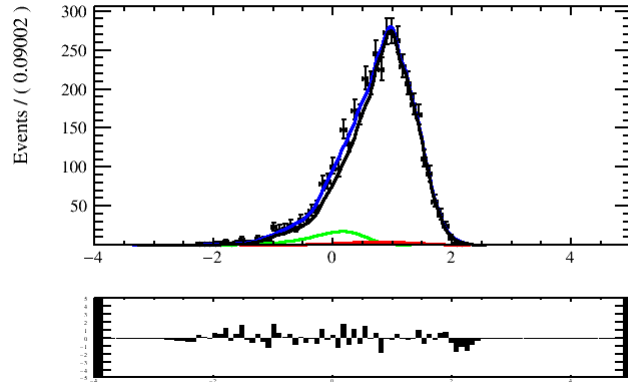
- Input :
 - D^0 MC: $\tau=410 \text{ fs}$
 - Ω_c^0 MC: $\tau=500 \text{ fs}$
- MC correction:
 - PIDCalib
 - Dalitz reweight

- Effect of MC lifetime?

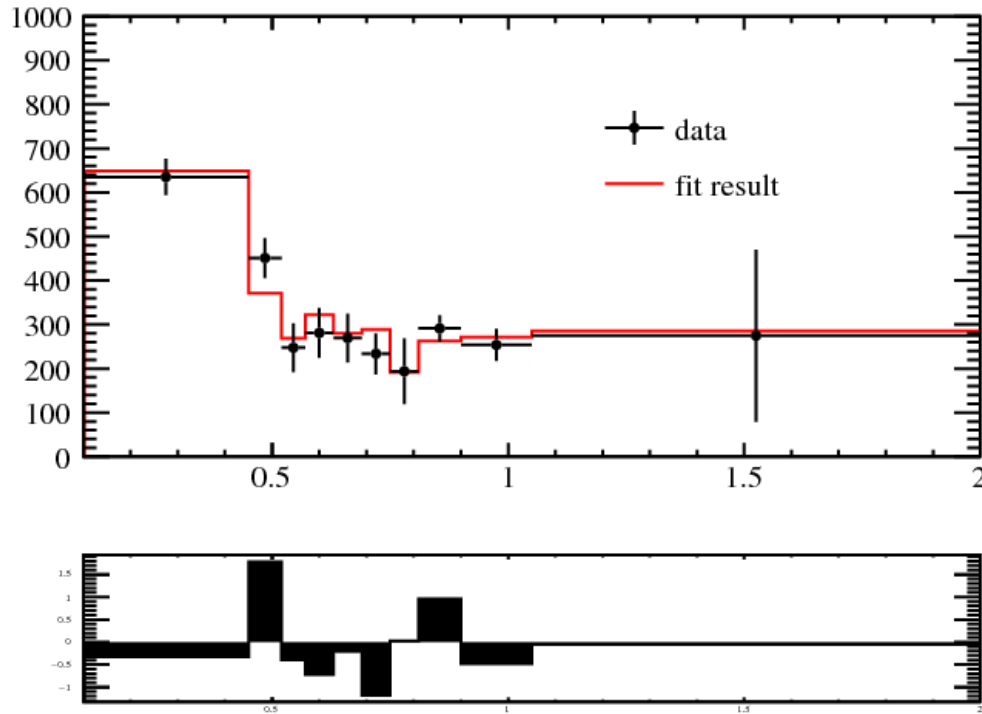
Omegac0 bin0~bin4



Omegac0 bin5~bin9



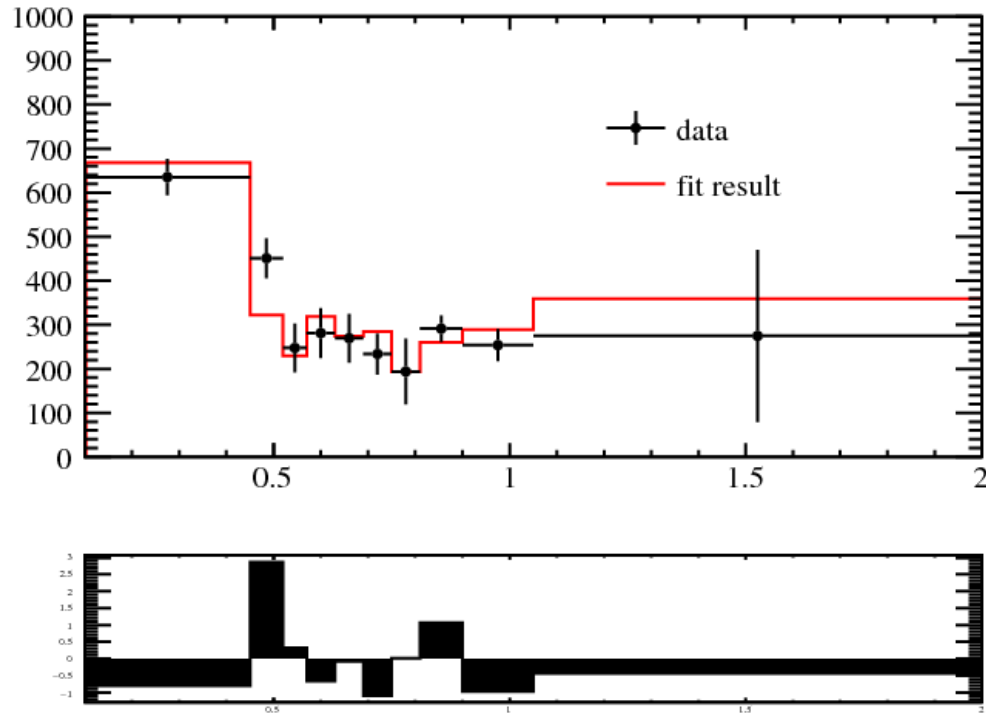
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC



- Input :
 - D^0 MC: $\tau=410$ fs
 - Ω_c^0 MC: $\tau=250$ fs
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 262.0 \pm 10.8$ fs
- $\chi^2/ndf = 6.1/8$

Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC

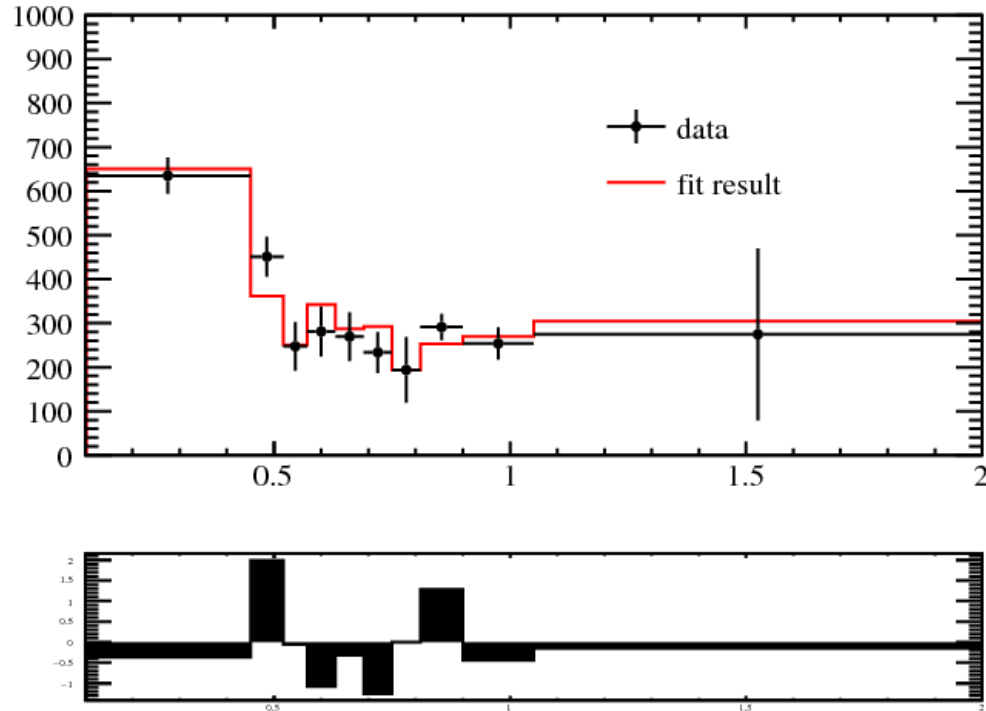


- $\tau = 297.9 \pm 13 \text{ fs}$
- $\chi^2/ndf = 12/8$

- Input :
 - D^0 MC: $\tau=410 \text{ fs}$
 - Ω_c^0 MC: $\tau=500 \text{ fs}$
- MC correction:
 - PIDCalib
 - Dalitz reweight

- Effect of MC lifetime?

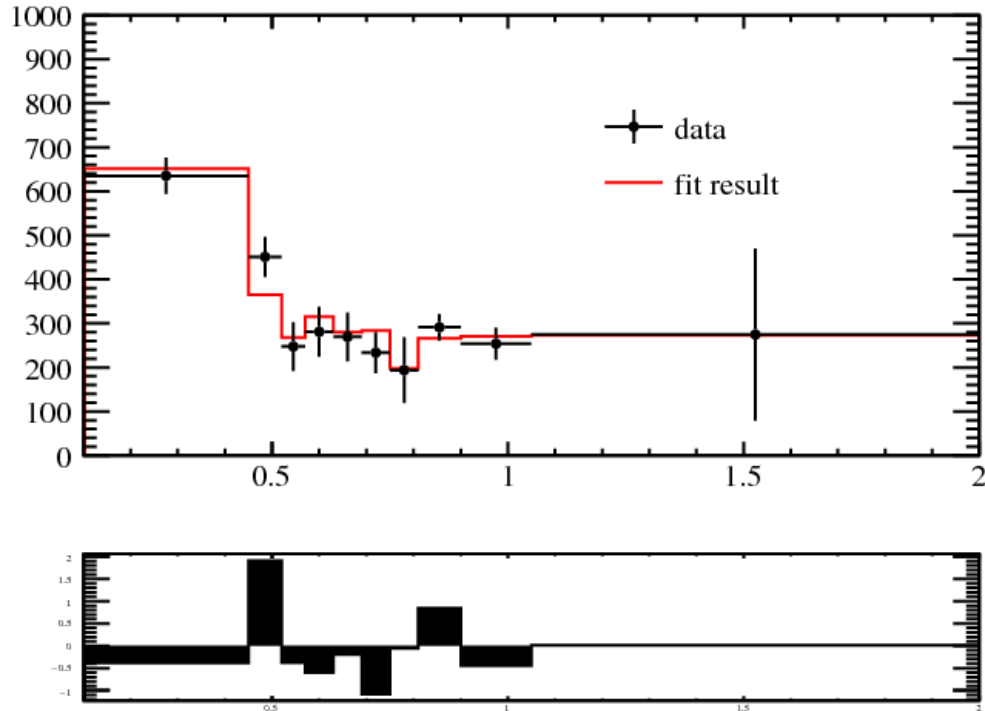
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC



- Input :
 - D^0 MC: $\tau=410$ fs
 - Ω_c^0 MC: $\tau=500$ fs (weight to 250 fs)
- MC correction:
 - PIDCalib
 - Dalitz reweight
 - TREUTAU weight

- $\tau = 268 \pm 13$ fs
- $\chi^2/ndf = 6.2/8$

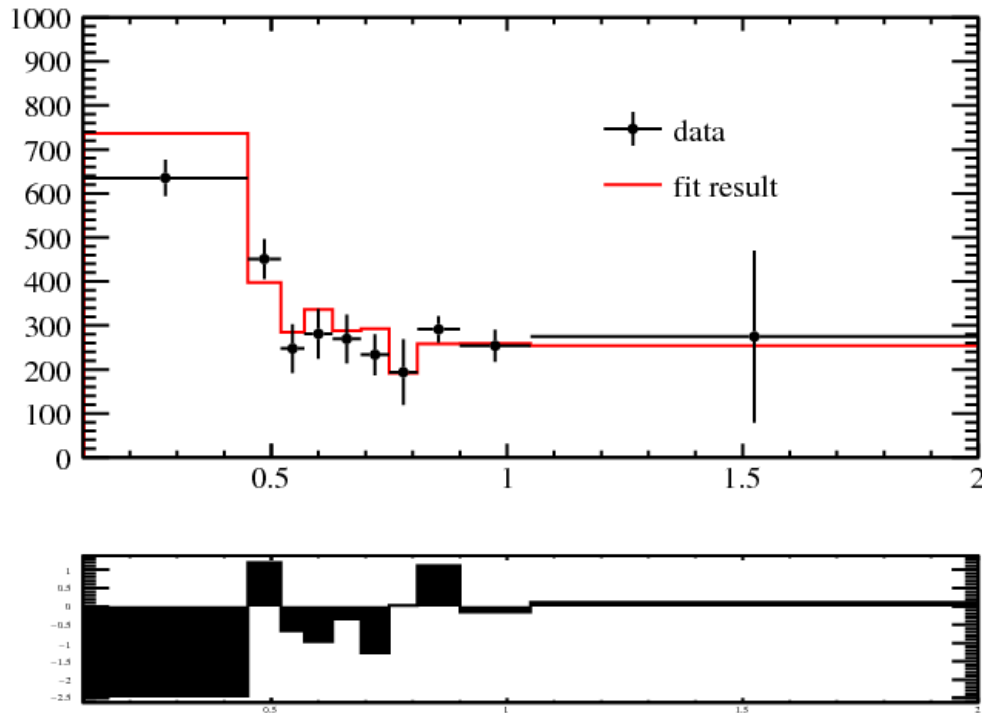
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC



- $\tau = 249 \pm 10 \text{ fs}$
- $\chi^2/ndf = 5.2/8$

- Input :
 - D^0 MC: $\tau = 410 \text{ fs}$
 - Ω_c^0 MC: $\tau = 250 \text{ fs}$
- MC correction:
 - PIDCalib
 - L0HadronTOS efficiency correction
 - Dalitz reweight

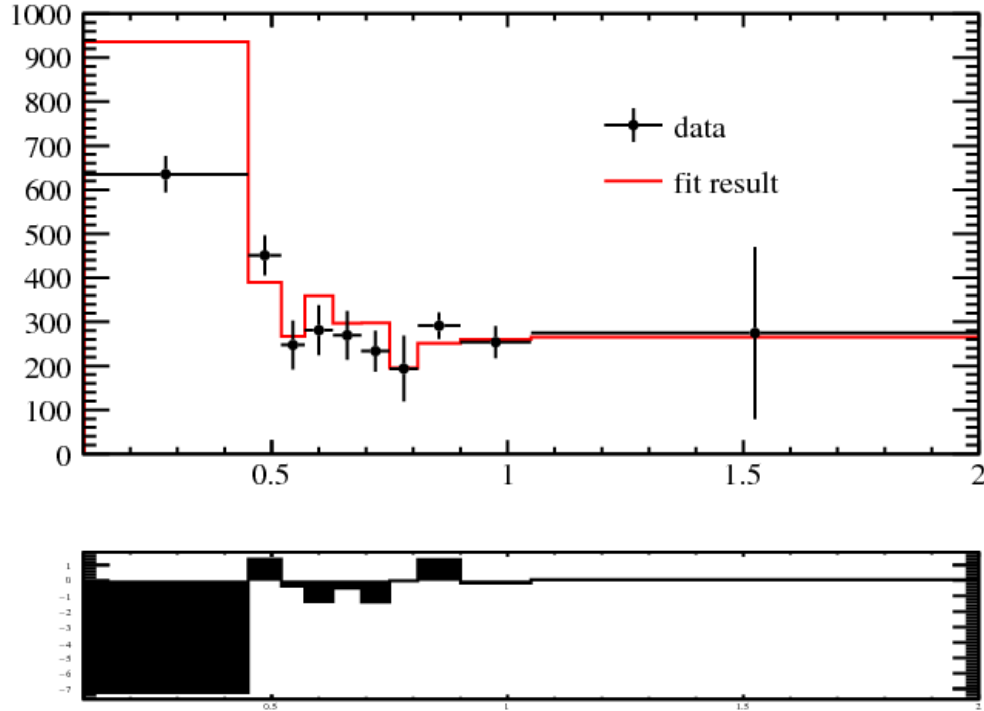
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC(without bin0)



- Input :
 - D^0 MC: $\tau=410$ fs
 - Ω_c^0 MC: $\tau=250$ fs
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 247 \pm 20$ fs
- $\chi^2/ndf = 5.4/7$

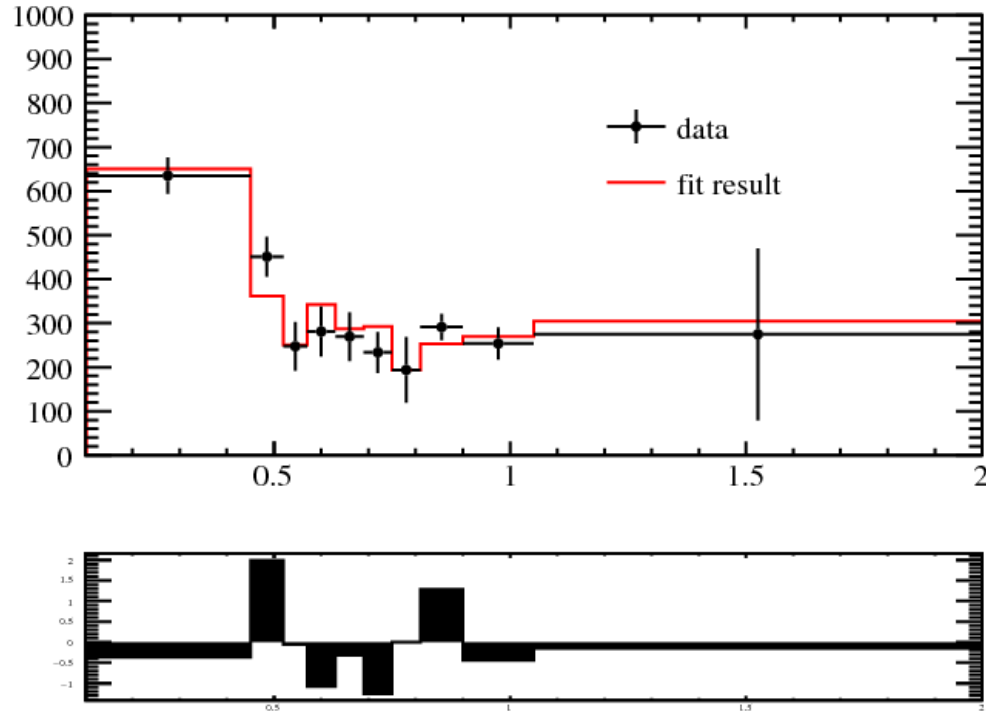
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC (without bin0)



- Input :
 - D^0 MC: $\tau=410$ fs
 - Ω_c^0 MC: $\tau=500$ fs
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 252 \pm 20$ fs
- $\chi^2/ndf = 7.6/7$

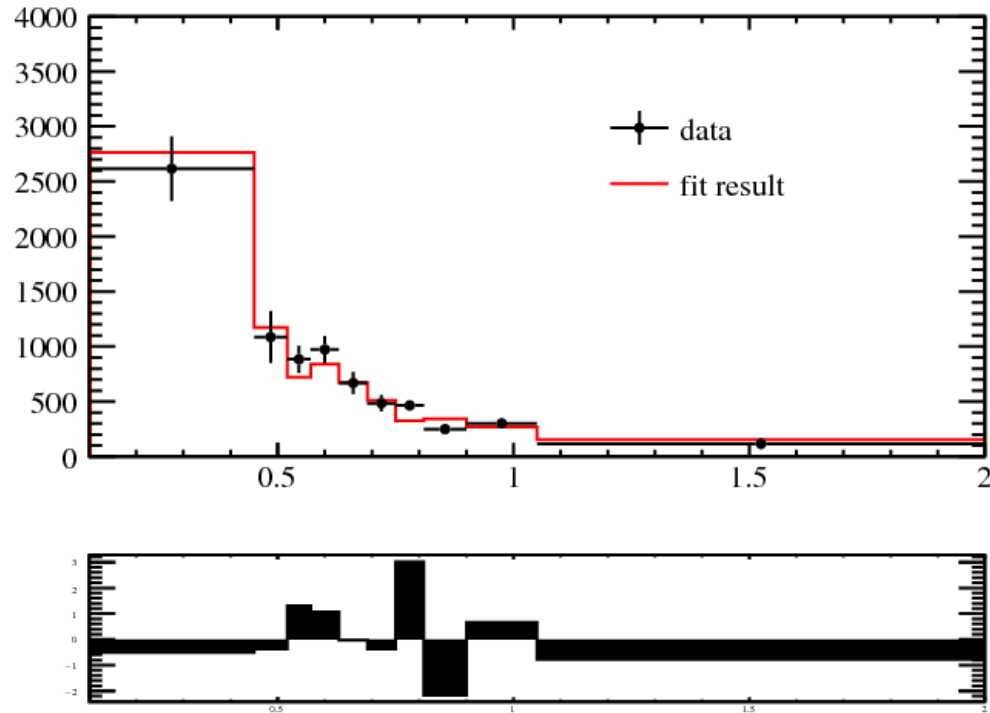
Fit $\tau_{\Omega_c^0}$ use Ω_c^0 and D^0 data and MC (without bin0)



- Input :
 - D^0 MC: $\tau=410$ fs
 - Ω_c^0 MC: $\tau=500$ fs (weight to 250 fs)
- MC correction:
 - PIDCalib
 - Dalitz reweight
 - TREUTAU weight

- $\tau = 251 \pm 23$ fs
- $\chi^2/ndf = 5.6/7$

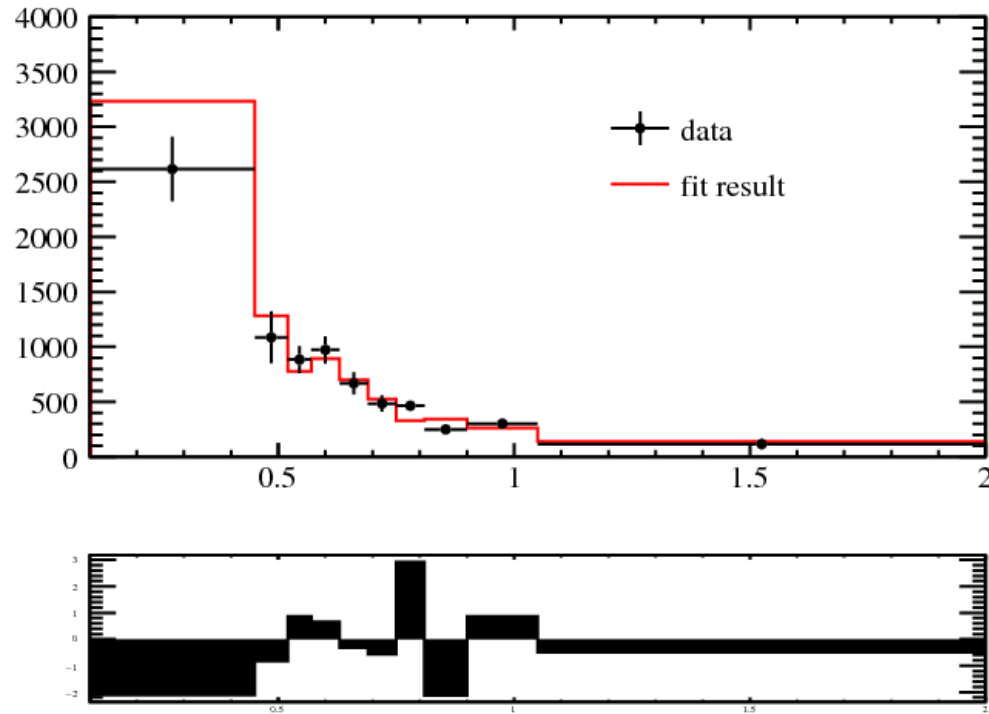
Fit $\tau_{\Xi_c^0}$ use Ξ_c^0 and D^0 data and MC



- Input :
 - D0 MC: $\tau=410\text{fs}$
 - Xic0 MC: $\tau=250\text{fs}$ (weight to 150 fs)
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 139.7 \pm 6.6 \text{ fs}$
- $\chi^2/ndf = 3.8/8$

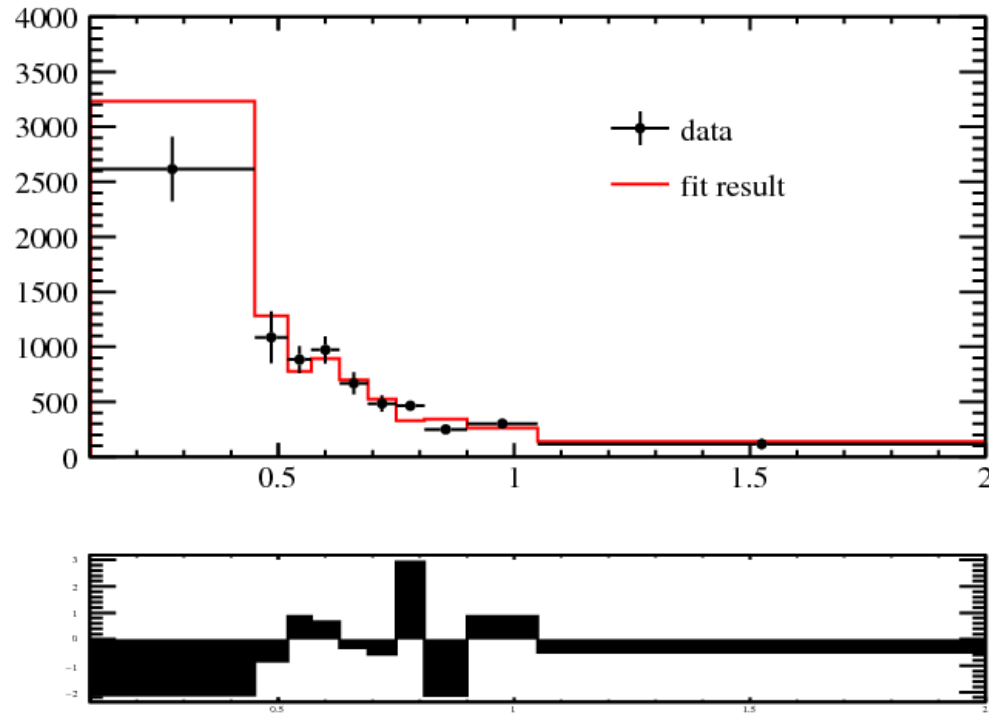
Fit $\tau_{\Xi_c^0}$ use Ξ_c^0 and D^0 data and MC (without bin0)



- Input :
 - D0 MC: $\tau=410\text{fs}$
 - Xic0 MC: $\tau=250\text{fs}$
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 134.6 \pm 6.3 \text{ fs}$
- $\chi^2/ndf = 14.5/7$

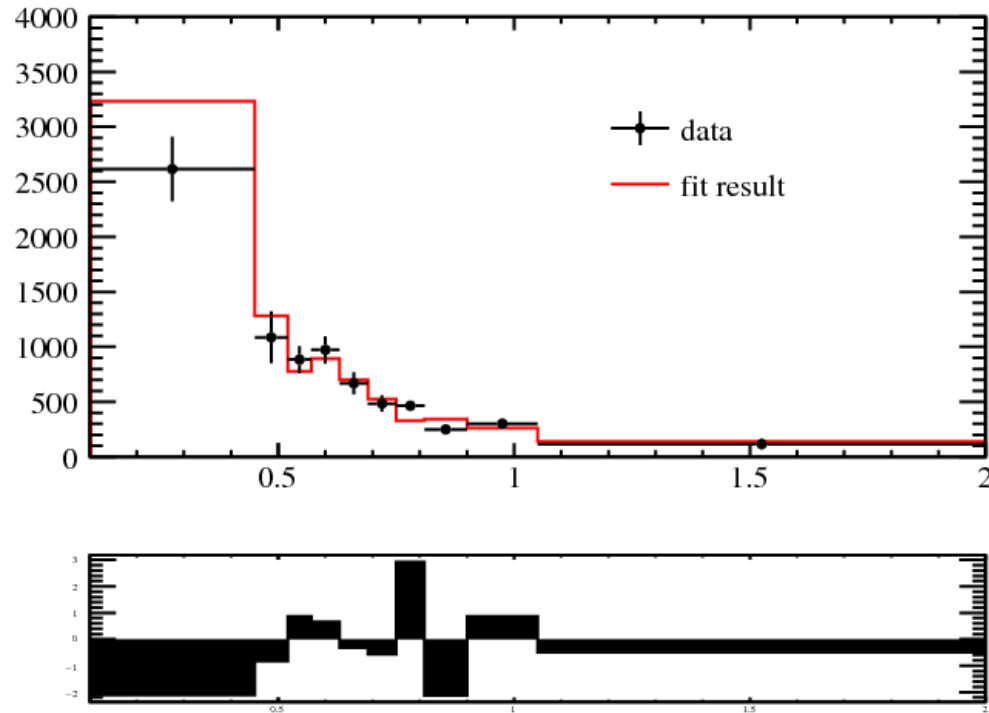
Fit $\tau_{\Xi_c^0}$ use Ξ_c^0 and D^0 data and MC (without bin0)



- Input :
 - D0 MC: $\tau=410\text{fs}$
 - Xic0 MC: $\tau=250\text{fs}$ (weight to 150 fs)
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 135 \pm 10 \text{ fs}$
- $\chi^2/ndf = 3.5/7$

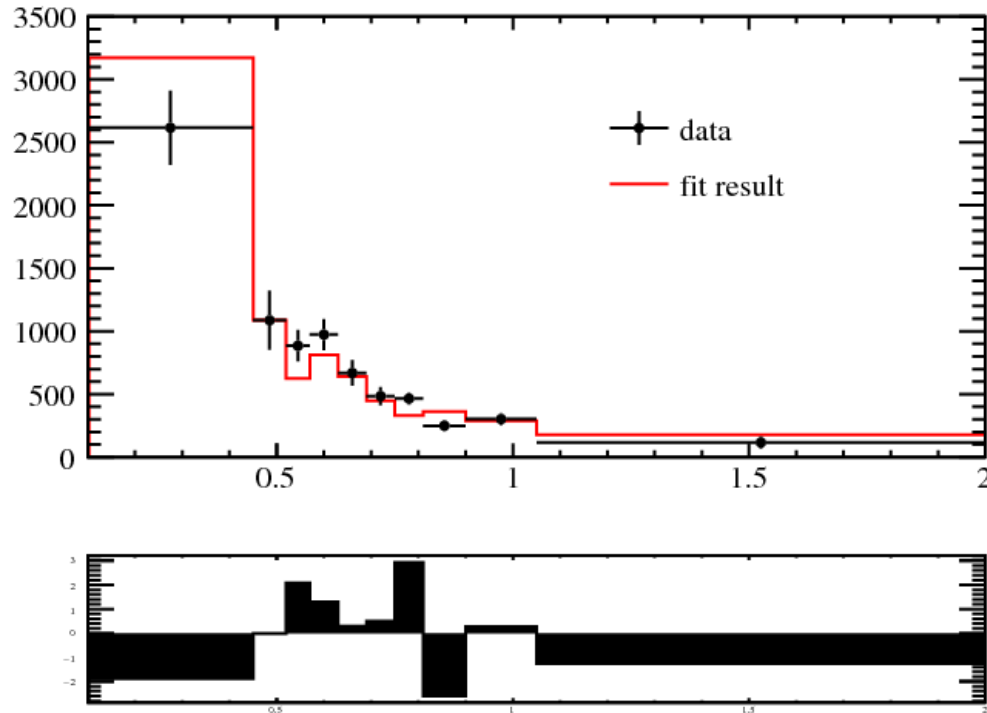
Fit $\tau_{\Xi_c^0}$ use Ξ_c^0 and D^0 data and MC (without bin0~1)



- Input :
 - D0 MC: $\tau=410\text{fs}$
 - Xic0 MC: $\tau=250\text{fs}$ (weight to 150 fs)
- MC correction:
 - PIDCalib
 - Dalitz reweight

- $\tau = 131 \pm 12 \text{ fs}$
- $\chi^2/ndf = 3.2/6$

Fit $\tau_{\Xi_c^0}$ use Ξ_c^0 and D^0 data and MC



- Input :
 - D0 MC: $\tau=410\text{fs}$
 - Xic0 MC: $\tau=250\text{fs}$ (weight to 150 fs)
- MC correction:
 - PIDCalib
 - L0HadronTOS efficiency correction
 - Dalitz reweight

- $\tau = 136 \pm 13 \text{ fs}$
- $\chi^2/ndf = 0.46/8$

To do list

- Try to add efficiency to fit model (if need bin0)
- Fit LOTIS data

Backup

- Lifetime reweight:

$$\bullet \frac{\tau_{250fs} * e^{-\frac{t}{\tau_{250fs}}}}{\tau_{500fs} * e^{-\frac{t}{\tau_{500fs}}}}$$

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

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

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

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

376 For the bin i , T_i is the corresponding t_D interval, A_i is the ratio between the decay-time
377 acceptances of the numerator over the denominator, $\text{pdf}_{n(d)}$ is the pdf of the numerator
378 (denominator), and N a normalisation factor. The integral over t is done numerically with
379 100 steps per decay-time bin. Each pdf is written as

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

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

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

- 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:

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

Double ratio fit

- Use double ratio $\frac{n_{d\Xi}/n_{m\Xi}}{n_{dD}/n_{mD}}$, n_d is yield of signal, n_m is yield of MC

- $\frac{n_{d\Xi}/n_{m\Xi}}{n_{dD}/n_{mD}} = \frac{R_{\Xi}}{R_D}$

$$\chi^2 = \sum_i^{bins} \frac{\left(n_{d\Xi i} - \frac{R_{\Xi i}}{R_{Di}} * n_{m\Xi i} * n_D / d_D \right)^2}{\sigma_{n_{d\Xi i}}^2 + \frac{R_{\Xi i}^2}{R_{Di}^2} \left(\frac{\sigma_{n_{m\Xi i}}^2 n_{dDi}^2}{n_{mDi}^2} + \frac{\sigma_{n_{dDi}}^2 n_{m\Xi i}^2}{n_{mDi}^2} + \frac{\sigma_{n_{mDi}}^2 n_{m\Xi i}^2 n_{dDi}^2}{n_{mDi}^4} \right)}$$

- Here $R_i = N \frac{\int_{T_i} pdf_d(t) dt}{\int_{T_i} pdf_m(t) dt}$ and $pdf(t) = e^{-\frac{t}{\tau}}$