

Measurement of Ω_c^0 lifetime with the prompt production

Ao Xu

Tsinghua University

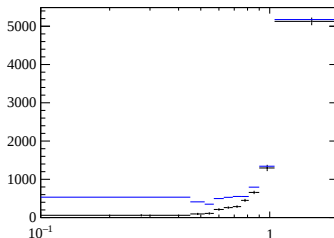
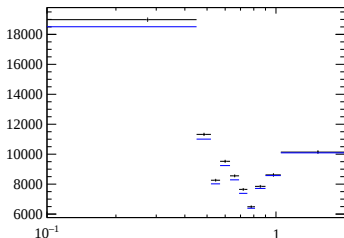
Ω_c^0 lifetime measurement meeting

December 25, 2018



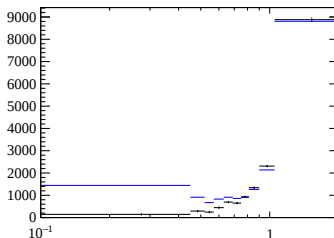
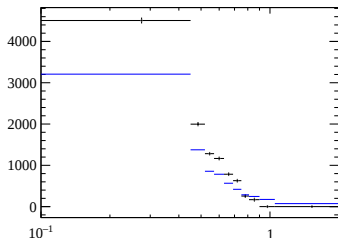
Sanity check: fit the combined (prompt+secondary) MC

- Ω_c^0 : (left) prompt and (right) secondary input (in blue) and fitted (in black) yield
 - Fit with μ free and other parameters fixed
 - Seems **not** to re-produce the correct b -fraction



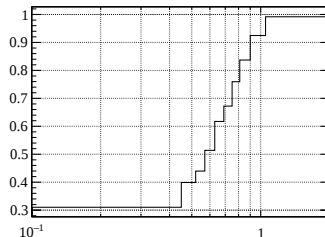
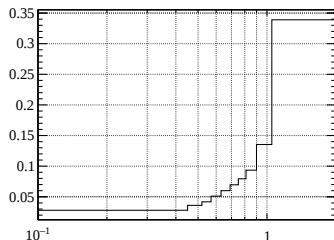
Sanity check: fit the combined (prompt+secondary) MC

- Ξ_c^0 : (left) prompt and (right) secondary input (in blue) and fitted (in black) yield
 - Fit with μ free and other parameters fixed
 - Seems **not** to re-produce the correct b -fraction, either



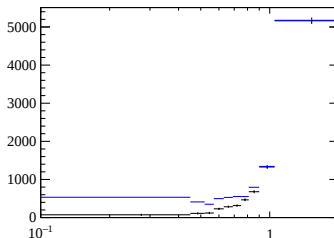
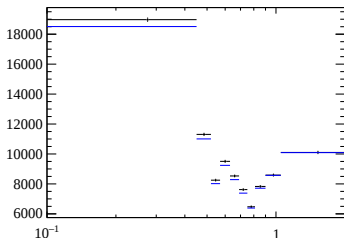
Input b -fraction in MC

- (left) Ω_c^0 and (right) Ξ_c^0



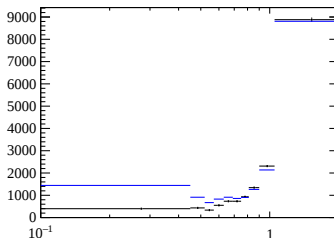
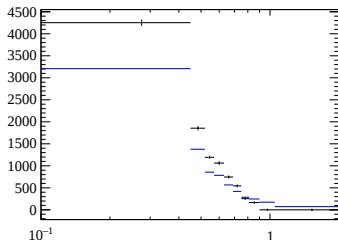
Sanity check: fit the combined (prompt+secondary) MC

- Ω_c^0 : (left) prompt and (right) secondary input (in blue) and fitted (in black) yield
 - Fit with all parameters fixed
 - Seems **not** to re-produce the correct b -fraction



Sanity check: fit the combined (prompt+secondary) MC

- Ξ_c^0 : (left) prompt and (right) secondary input (in blue) and fitted (in black) yield
 - Fit with all parameters fixed
 - Seems **not** to re-produce the correct b -fraction, either



Studies of $D^{*+} \rightarrow \pi^+ D^0 (\rightarrow K^- K^+ \pi^- \pi^+)$ control mode

■ Selection

- Apply the same DIRA and IPCHI2 cuts as those of signal mode
- Require $|M(D^{*+}) - M(D^0) - 146| < 6 \text{ MeV}/c^2$

■ Mass fit

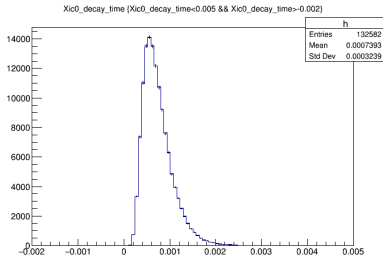
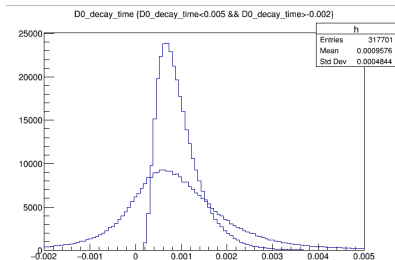
- In $1865 \pm 45 \text{ MeV}/c^2$ mass region
- Gaussian + 2nd-order Chebychev

■ IPCHI2 fit

- In $1865 \pm 2.5 \times 5.65 \text{ MeV}/c^2$ mass region
- Prompt and secondary signal components: μ free and other parameters fixed to MC
- Background: kernel estimation with mass-sideband data
- The total number of backgrounds fixed to values from mass fit
- Binning scheme (the same as the signal mode): [0.1, 0.45, 0.52, 0.57, 0.63, 0.69, 0.75, 0.81, 0.9, 1.05, 2.0] ps

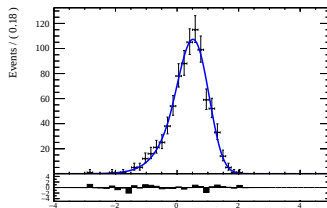
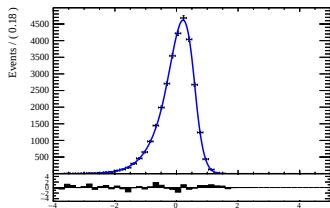
Defination of decay time

- Inconsistency between D0_TAU and decay time $t \equiv \frac{\vec{p} \cdot \vec{r}}{p^2} \times m$
(left) Prompt D^0 MC and (right) prompt Ω_c^0 MC
- Resolution effect between D^{*+} vertex and PV?
- Use decay time t in the following studies



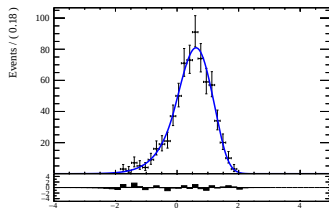
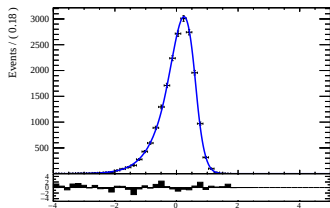
Fit D^0 MC with all parameters free: bin 0

- (left) Prompt and (right) secondary



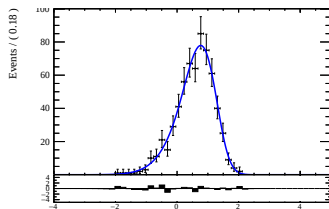
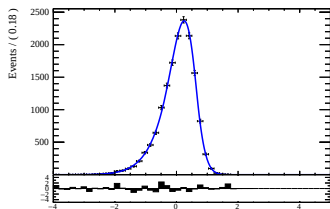
Fit D^0 MC with all parameters free: bin 1

- (left) Prompt and (right) secondary



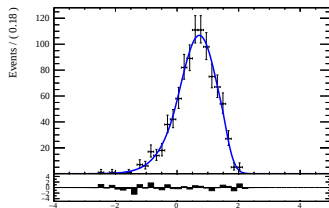
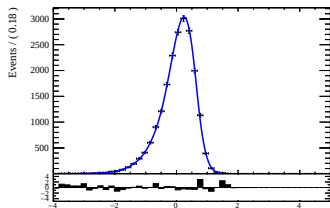
Fit D^0 MC with all parameters free: bin 2

- (left) Prompt and (right) secondary



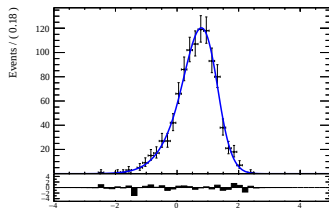
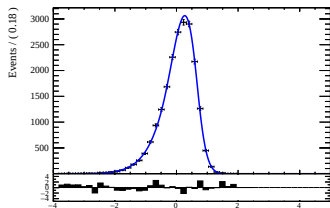
Fit D^0 MC with all parameters free: bin 3

- (left) Prompt and (right) secondary



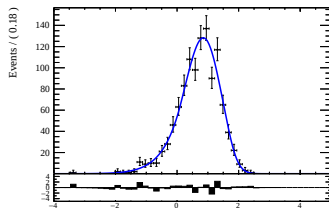
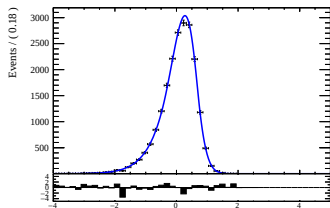
Fit D^0 MC with all parameters free: bin 4

- (left) Prompt and (right) secondary



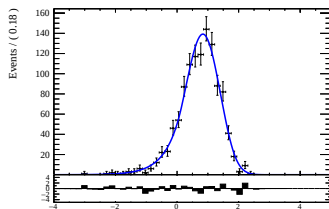
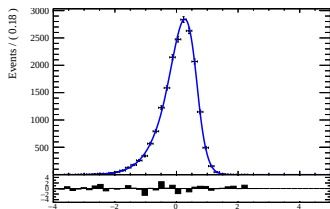
Fit D^0 MC with all parameters free: bin 5

- (left) Prompt and (right) secondary



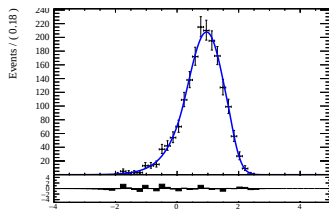
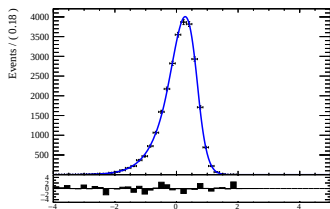
Fit D^0 MC with all parameters free: bin 6

- (left) Prompt and (right) secondary



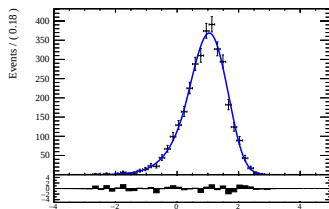
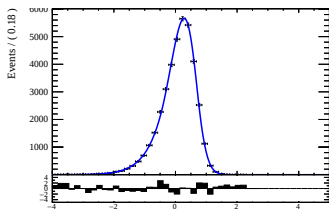
Fit D^0 MC with all parameters free: bin 7

- (left) Prompt and (right) secondary



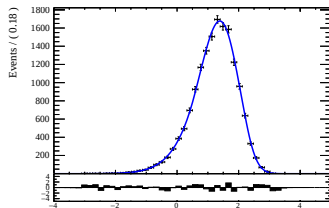
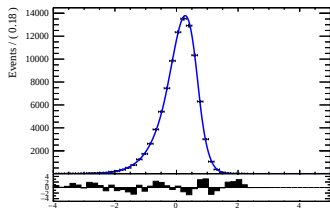
Fit D^0 MC with all parameters free: bin 8

- (left) Prompt and (right) secondary



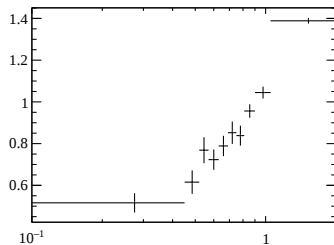
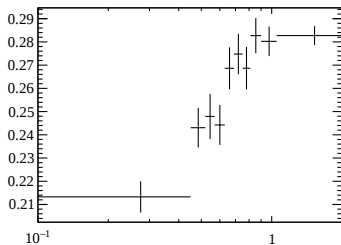
Fit D^0 MC with all parameters free: bin 9

- (left) Prompt and (right) secondary



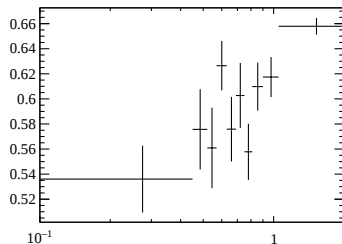
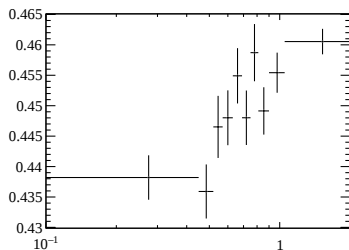
Fit results in decay-time bins μ

- (left) Prompt and (right) secondary



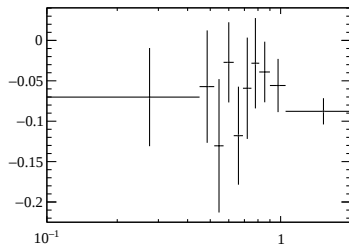
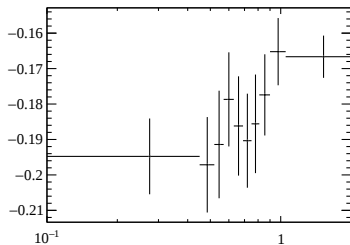
Fit results in decay-time bins σ

- (left) Prompt and (right) secondary



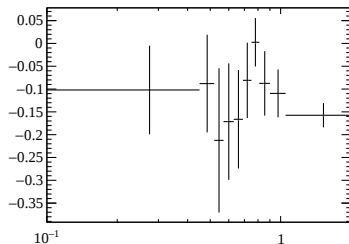
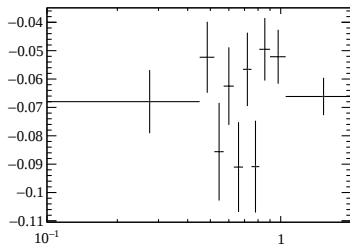
Fit results in decay-time bins ξ

- (left) Prompt and (right) secondary



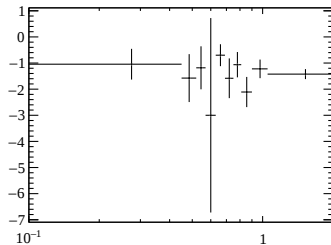
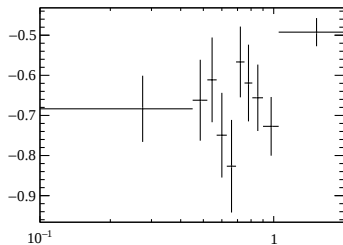
Fit results in decay-time bins ρ_1

- (left) Prompt and (right) secondary



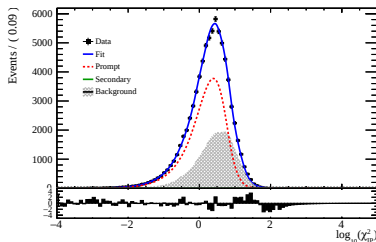
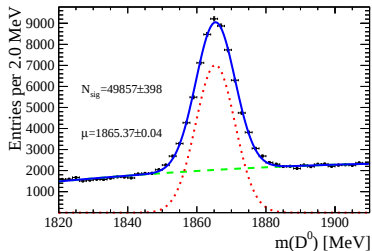
Fit results in decay-time bins ρ_2

- (left) Prompt and (right) secondary



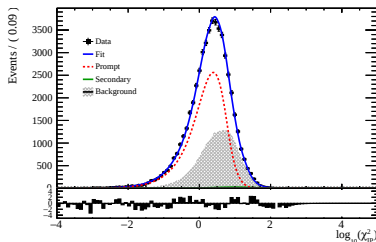
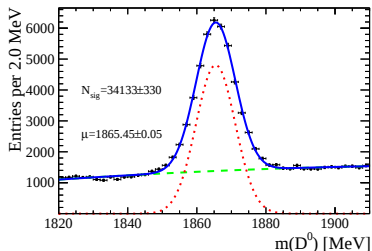
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 0

- (left) $M(D^0)$ and (right) logIPCHI2



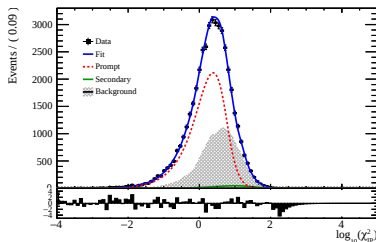
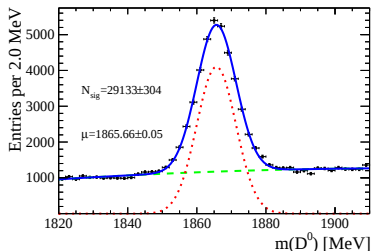
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 1

- (left) $M(D^0)$ and (right) logIPCHI2



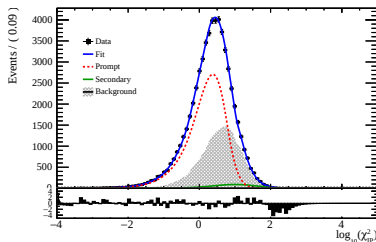
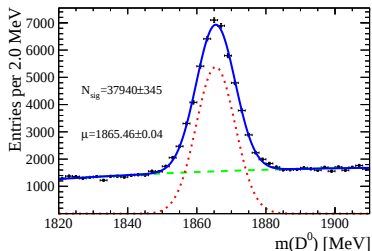
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 2

- (left) $M(D^0)$ and (right) logIPCHI2



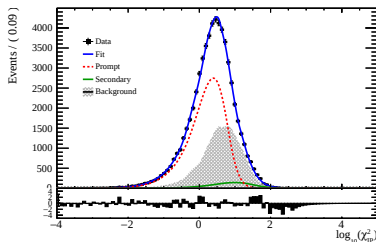
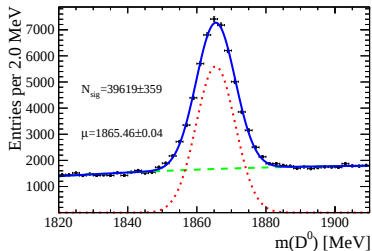
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 3

- (left) $M(D^0)$ and (right) logIPCHI2



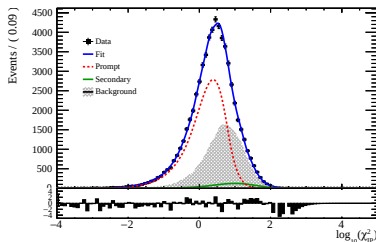
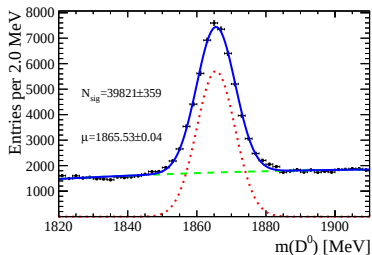
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 4

- (left) $M(D^0)$ and (right) logIPCHI2



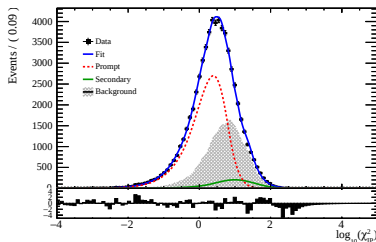
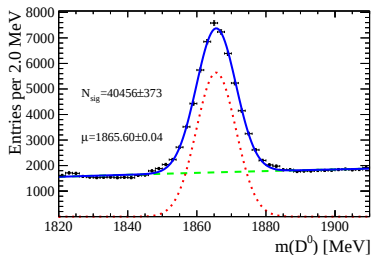
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 5

- (left) $M(D^0)$ and (right) logIPCHI2



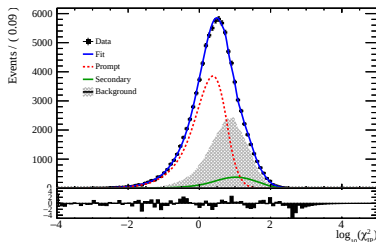
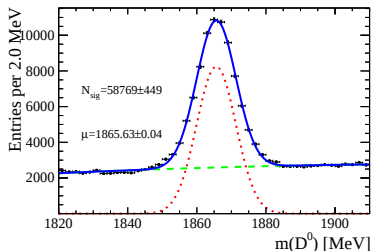
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 6

- (left) $M(D^0)$ and (right) logIPCHI2



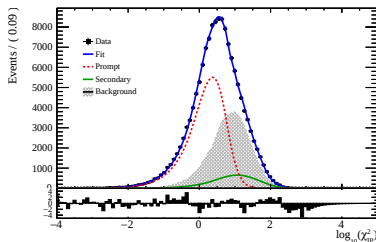
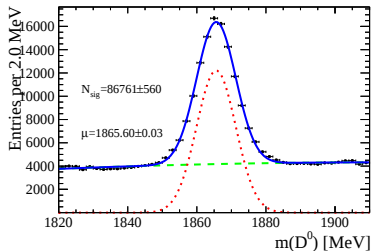
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 7

- (left) $M(D^0)$ and (right) logIPCHI2



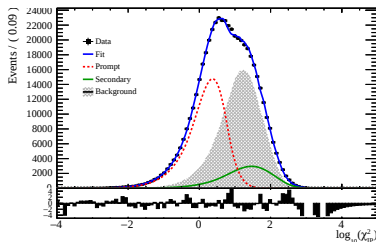
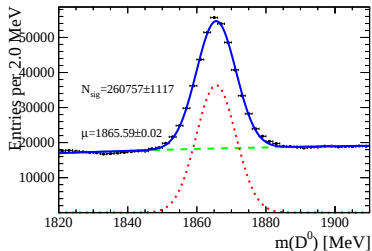
Fit D^0 data $M(D^0)$ and logIPCHI2: bin 8

- (left) $M(D^0)$ and (right) logIPCHI2



Fit D^0 data $M(D^0)$ and logIPCHI2: bin 9

- (left) $M(D^0)$ and (right) logIPCHI2



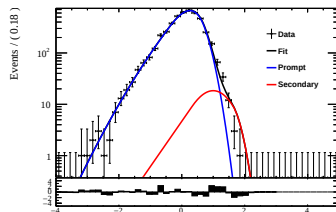
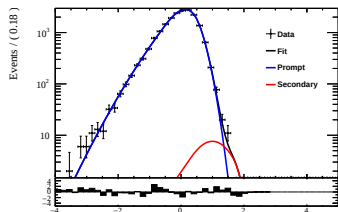
- Fit the efficiency-corrected decay time distribution

BACKUP

- Fit the combined (prompt+secondary) MC with free μ while fixing other parameters
- Seems **not** to reproduce the correct b -fraction

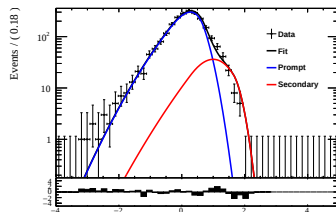
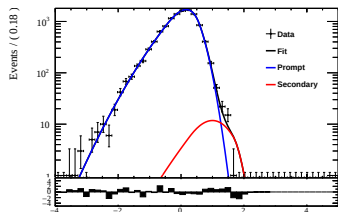
Fit the combined MC: bin 0

- (left) Ω_c^0 and (right) Ξ_c^0



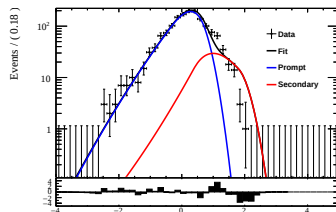
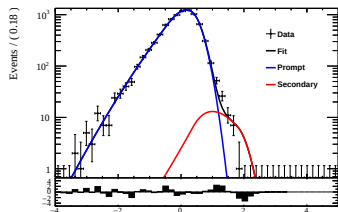
Fit the combined MC: bin 1

- (left) Ω_c^0 and (right) Ξ_c^0



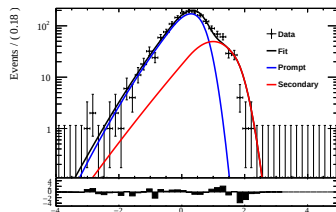
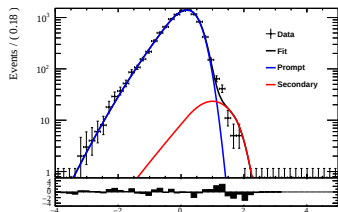
Fit the combined MC: bin 2

- (left) Ω_c^0 and (right) Ξ_c^0



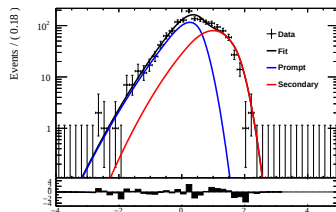
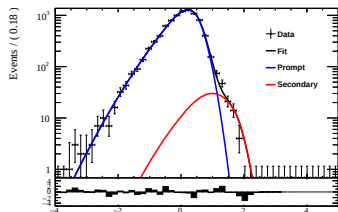
Fit the combined MC: bin 3

- (left) Ω_c^0 and (right) Ξ_c^0



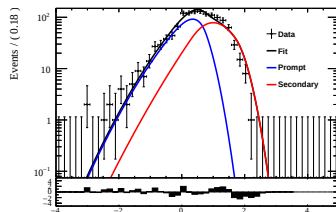
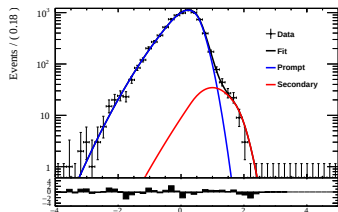
Fit the combined MC: bin 4

- (left) Ω_c^0 and (right) Ξ_c^0



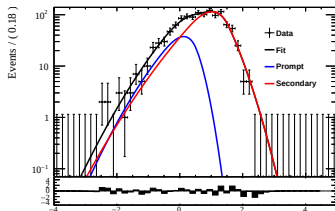
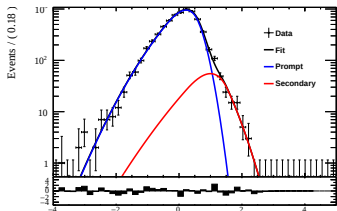
Fit the combined MC: bin 5

- (left) Ω_c^0 and (right) Ξ_c^0



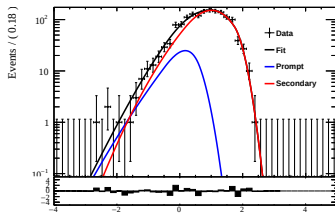
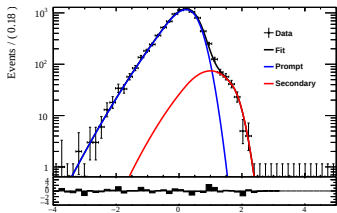
Fit the combined MC: bin 6

- (left) Ω_c^0 and (right) Ξ_c^0



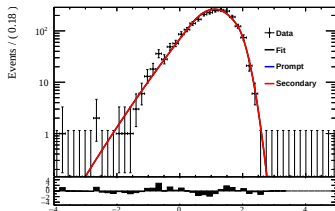
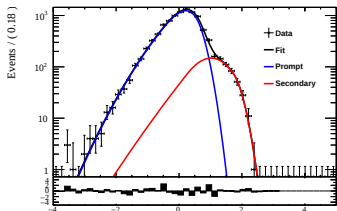
Fit the combined MC: bin 7

- (left) Ω_c^0 and (right) Ξ_c^0



Fit the combined MC: bin 8

- (left) Ω_c^0 and (right) Ξ_c^0



Fit the combined MC: bin 9

- (left) Ω_c^0 and (right) Ξ_c^0

