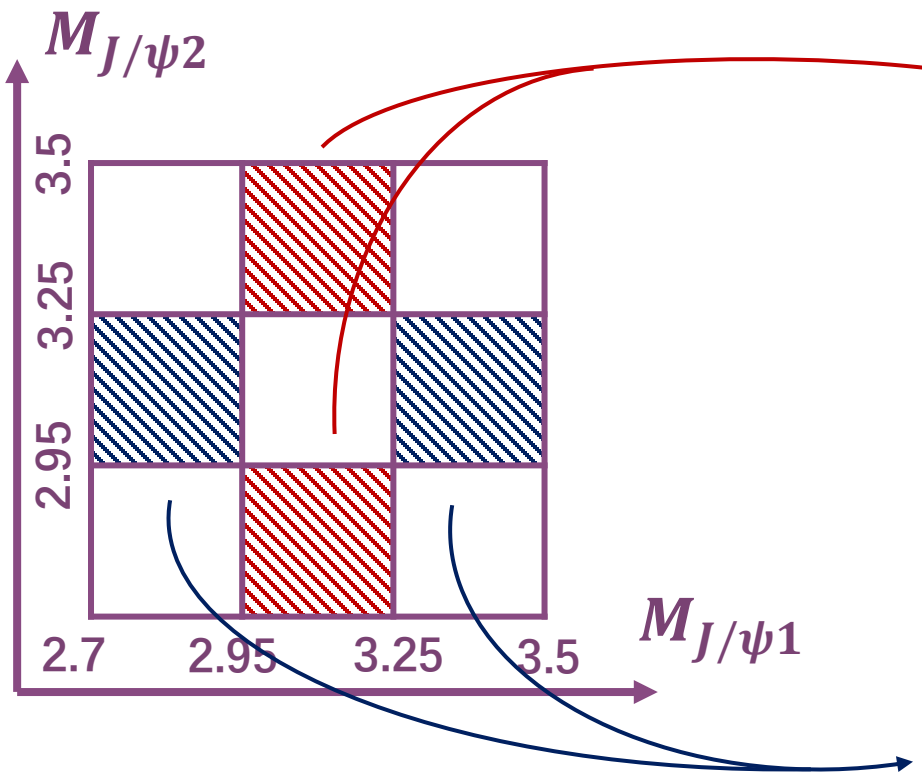
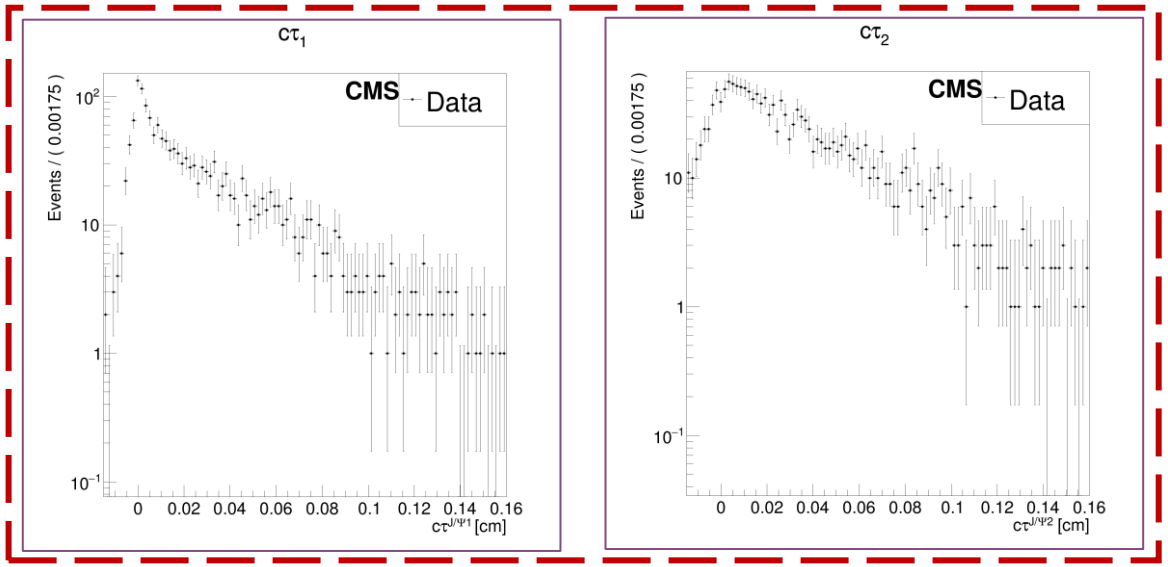
# Time information of the combinatorial background

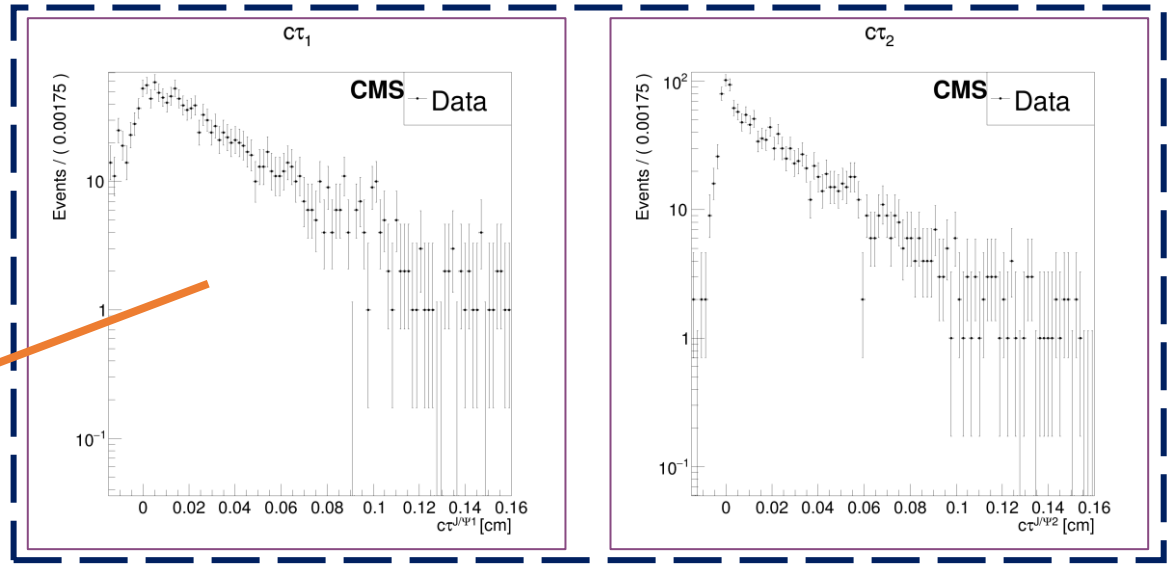



| | | |
|---|---|---|
| ① | ② | ③ |
| ④ | ⑤ | ⑥ |
| ⑦ | ⑧ | ⑨ |

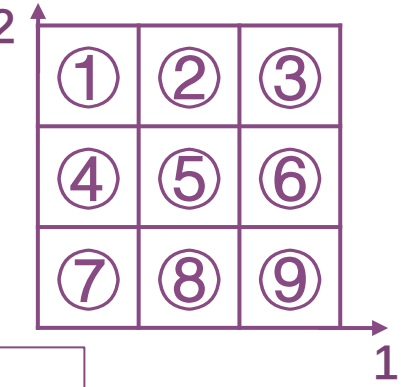
Time information of the $\mu^+\mu^-$

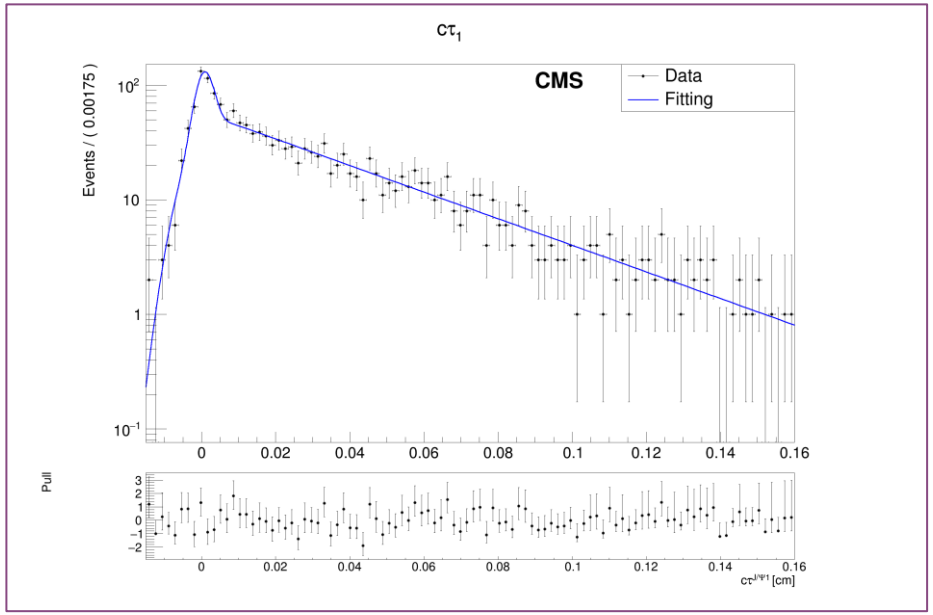
$c\tau_1$ $c\tau_2$

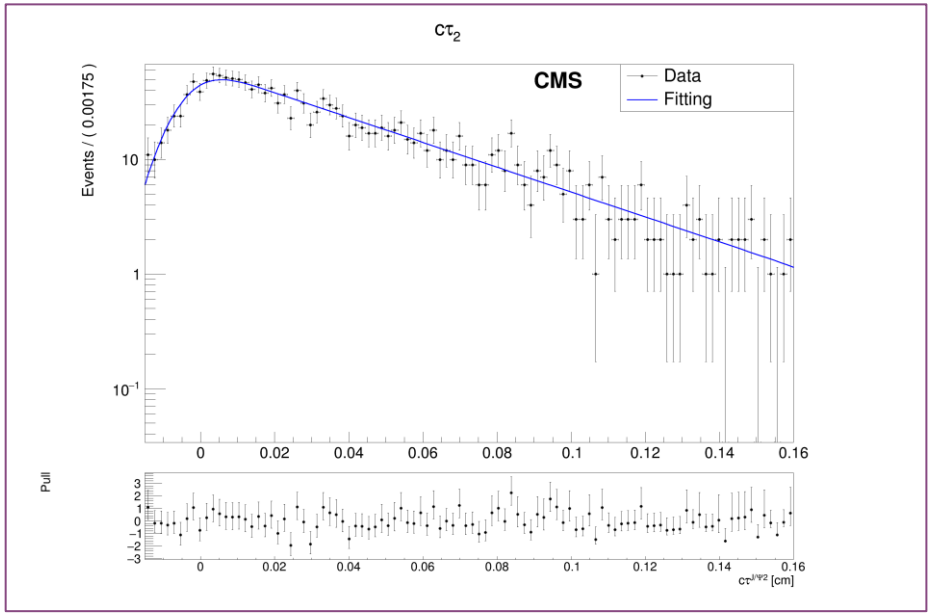


# Time information of the combinatorial background




Shape5, the $J/\psi_1\mu^+\mu^-$ on the $c\tau_1$ dimension, gaussian + convolution

2&8

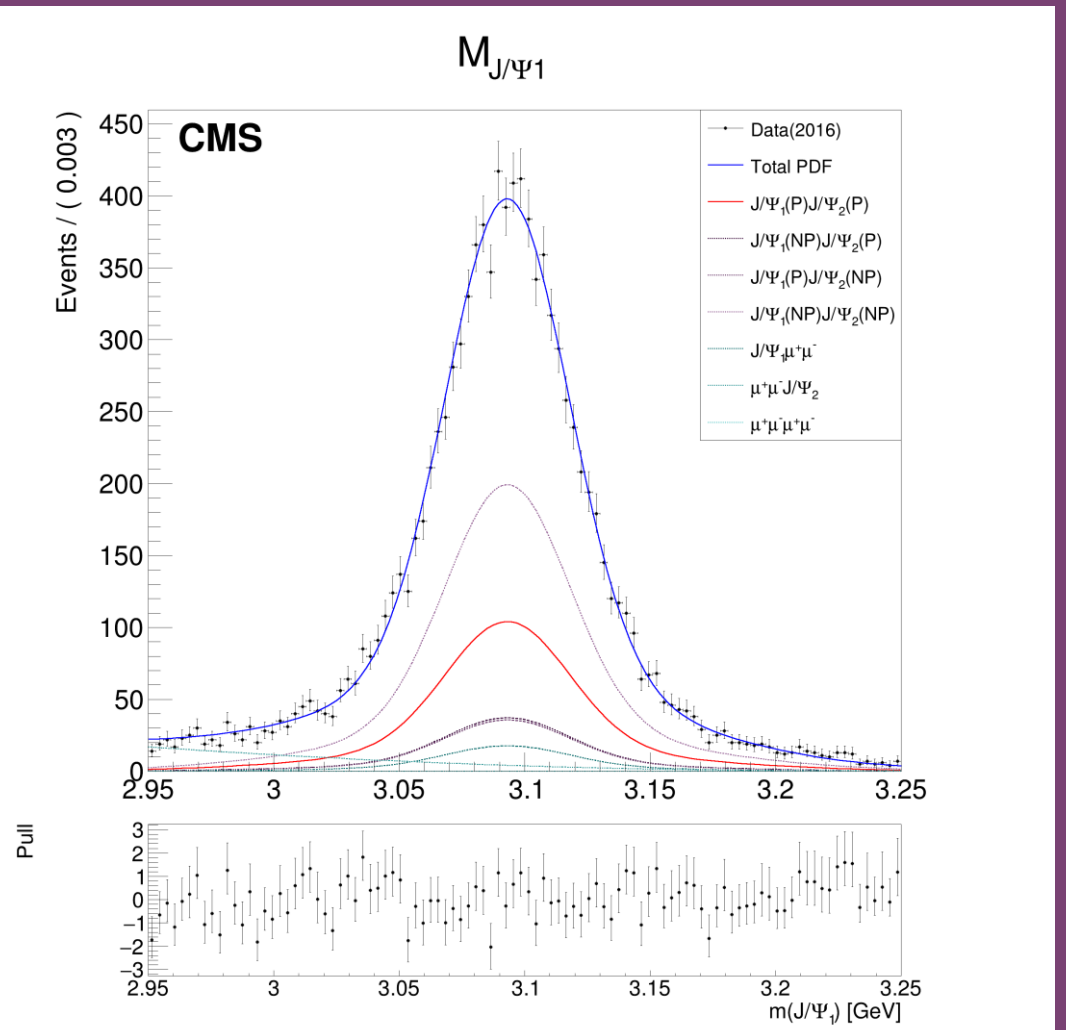
**Shape6**, the $J/\psi_1\mu^+\mu^-$ on the $c\tau_2$ dimension, convolution

# Final fitting

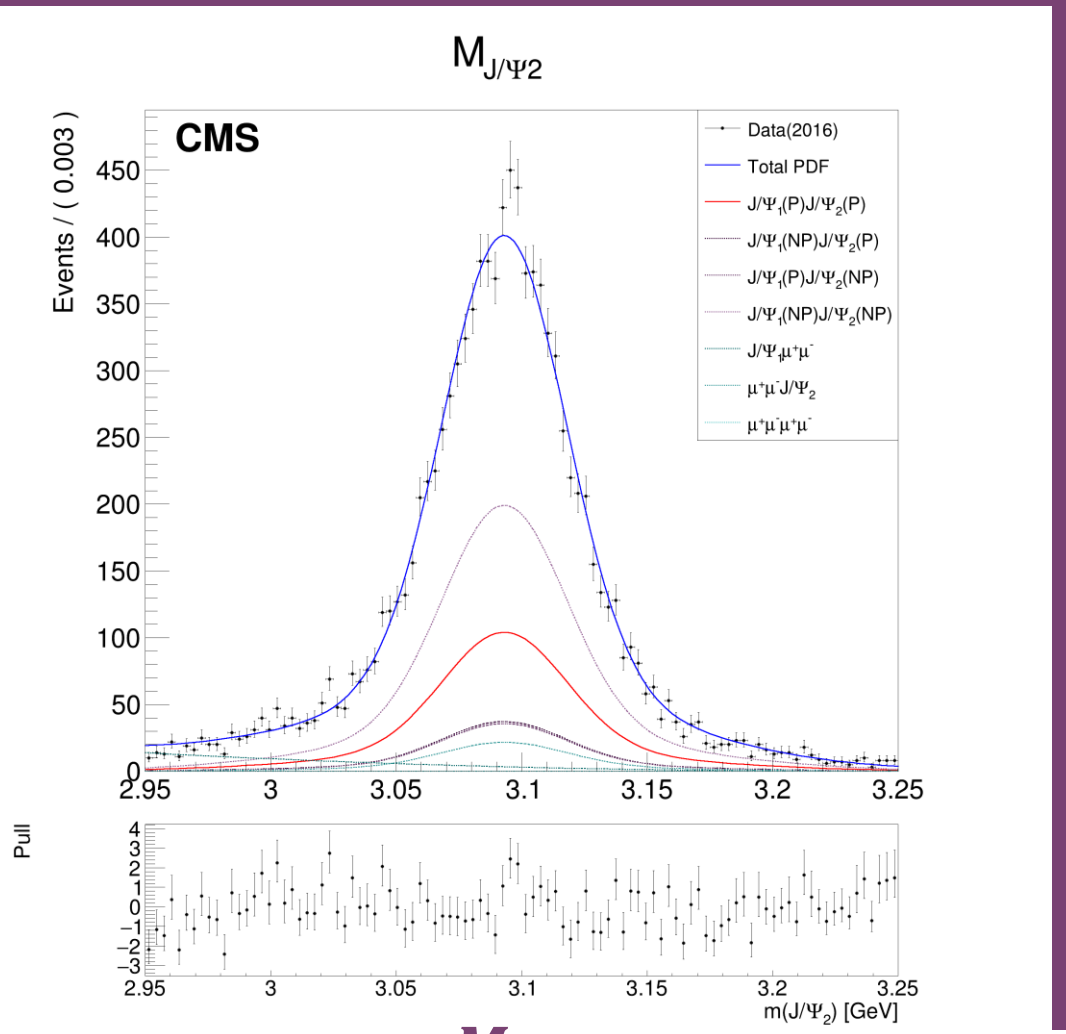
| Components | | $M_{J/\psi 1}$ | $M_{J/\psi 2}$ | $c\tau_1$ | $c\tau_2$ |
|---|---|---|---|---|---|
| $J/\psi_1 J/\psi_2$ | P+P | Double CB | Double CB | Shape1 | Shape1 |
| | NP+P | | | Shape2 | Shape1 |
| | P+NP | | | Shape1 | Shape2 |
| | NP+NP | | | Shape2 | Shape2 |
| $J/\psi_1 \mu^+\mu^-$ | | Double CB | Shape4 | Shape5 | Shape6 |
| $\mu^+\mu^- J/\psi_2$ | | Shape4 | Double CB | Shape6 | Shape5 |
| $\mu^+\mu^-\mu^+\mu^-$ | | Shape4 | Shape4 | Shape6 | Shape6 |

- The functions that share the same name listed in the table also share the same set of parameters (because of the smearing between two $J/\psi$s)
- The parameters for the shape1/2/4/5/6 are fixed from the previous fitting
- The parameters for the double CB are float
- Shape6 is now required from the $c\tau_2$ of the $J/\psi_1 \mu^+\mu^-$ sample

# Final fitting

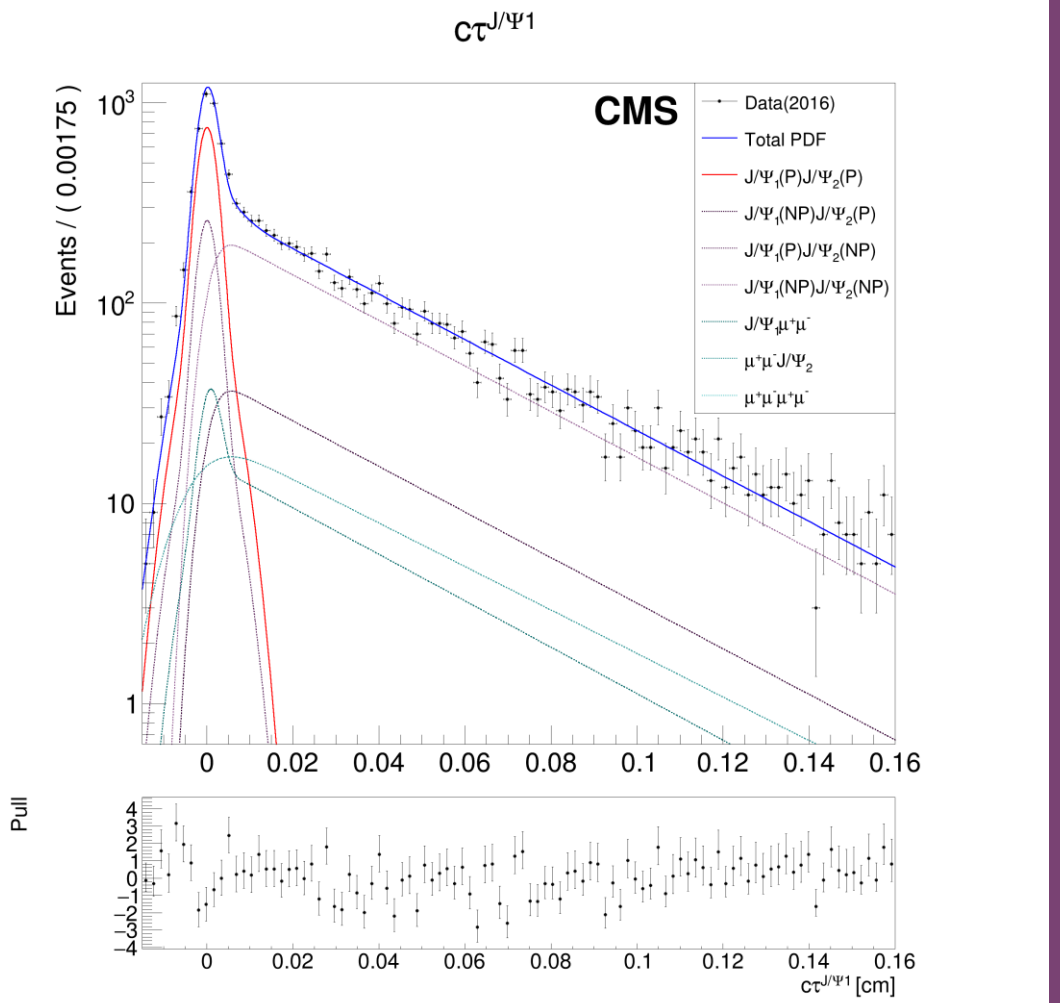



$M_{J/\psi 1}$

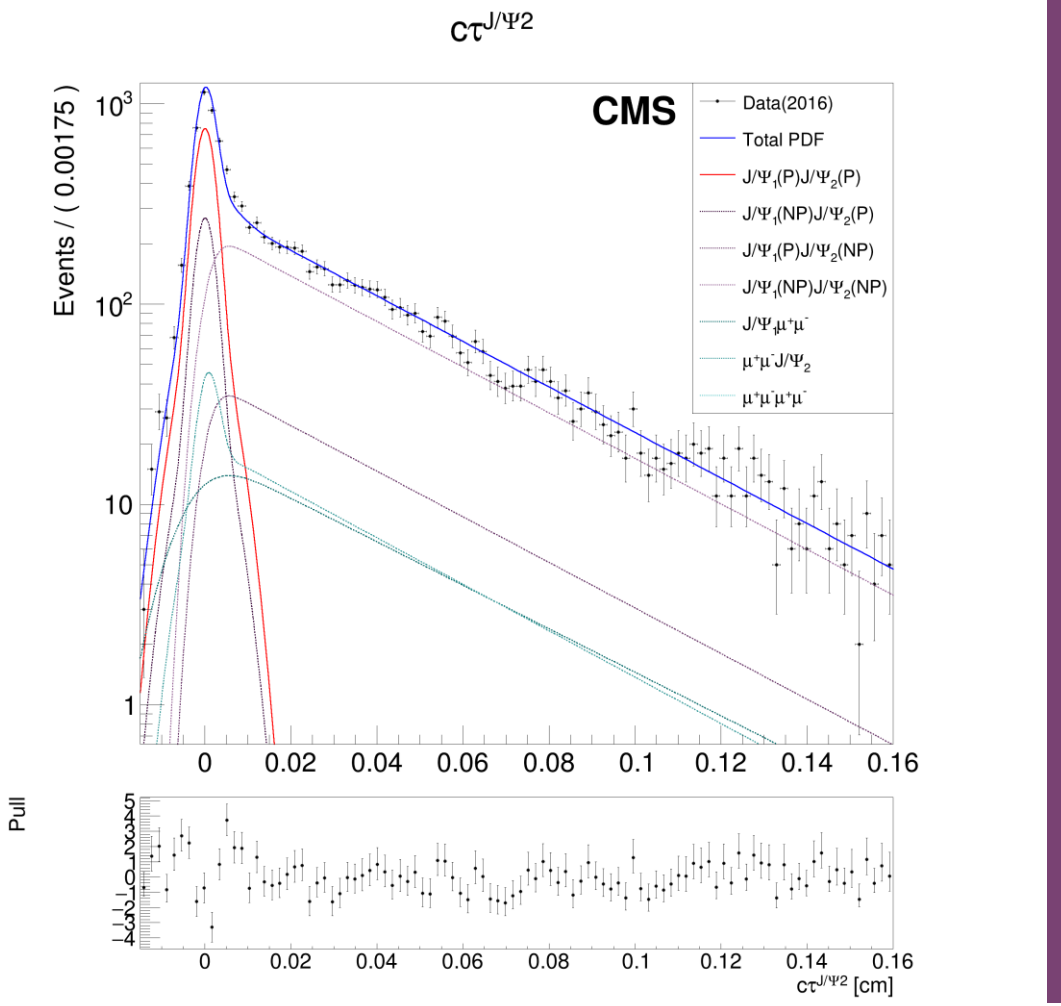



$M_{J/\psi 2}$

# Final fitting

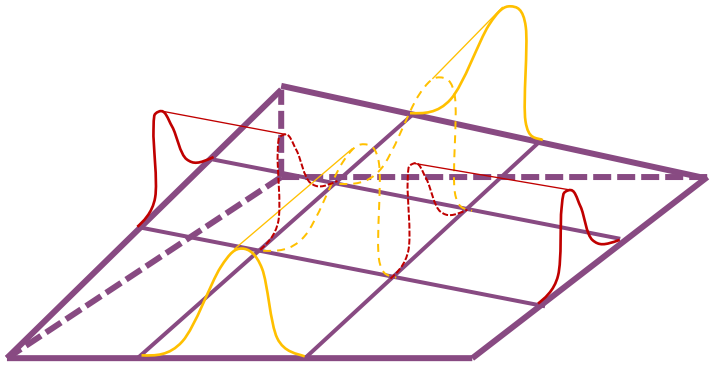


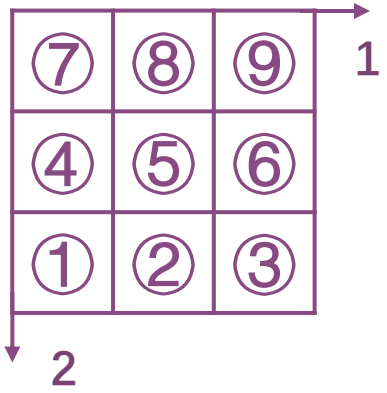

$c\tau_1$



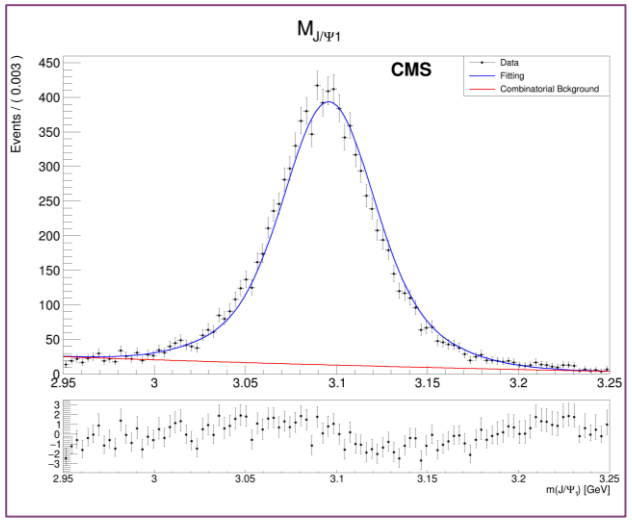

$c\tau_2$

# New proposal of the combinatorial background processing






- Apply 4D fit to three side band samples and record their heights



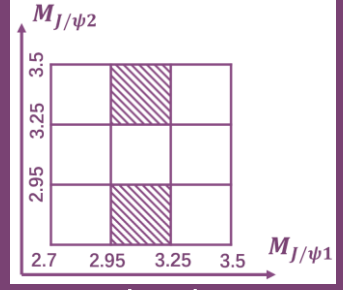

| Components | $M_{J/\psi 1}$ | $M_{J/\psi 2}$ | $c\tau_1$ | $c\tau_2$ |
|---|---|---|---|---|
| $J/\psi_1\mu^+\mu^-$ (2&8) | Double CB | Shape4 | Shape5 | Shape6 |
| $\mu^+\mu^- J/\psi_2$ (4&6) | Shape4 | Double CB | Shape6 | Shape5 |
| $\mu^+\mu^-\mu^+\mu^-$ (1&3&7&9) | Shape4 | Shape4 | Shape6 | Shape6 |

⇨

| $N$ |
|---|
| $N_{28}$ |
| $N_{46}$ |
| $N_{1379}$ |

# Back Up

# Fitting procedure




- Mix SPS and DPS samples into the prompt sample (8K:4K)
- 1D fit to the prompt sample on the $c\tau_1$ dimension to acquire the **shape1** (double gaussian)
- 1D fit to the non-prompt sample on the $c\tau_1$ dimension to acquire the **shape2** (convolution of an exponent and a gaussian)
- 1D fit to the prompt sample on the $M_{J/\psi 1}$ dimension to acquire the **shape3** (double CB)
- 1D fit to the data sample on the $M_{J/\psi 1}$ dimension to acquire the **shape4** (second order Cheb, the fitting is applied with a merging of the float Cheb and the **shape3**)
- Side band cut to the data sample to acquire the combinatorial background ($J/\psi_1\mu^+\mu^-$)
- 1D fit to the $J/\psi_1\mu^+\mu^-$ on the $c\tau_1$ dimension to acquire the **shape5** (merging of a gaussian and a convolution)
- 1D fit to the $J/\psi_1\mu^+\mu^-$ on the $c\tau_2$ dimension to acquire the **shape6** (convolution of an exponent and a gaussian)
- **Final fitting**

# Final fitting

| Components | | $M_{J/\psi 1}$ | $M_{J/\psi 2}$ | $c\tau_1$ | $c\tau_2$ |
|---|---|---|---|---|---|
| $J/\psi_1 J/\psi_2$ | P+P | Double CB | Double CB | Shape1 | Shape1 |
| | NP+P | | | Shape2 | Shape1 |
| | P+NP | | | Shape1 | Shape2 |
| | NP+NP | | | Shape2 | Shape2 |
| $J/\psi_1 \mu^+\mu^-$ | | Double CB | Shape4 | Shape5 | Shape6 |
| $\mu^+\mu^- J/\psi_2$ | | Shape4 | Double CB | Shape6 | Shape5 |
| $\mu^+\mu^-\mu^+\mu^-$ | | Shape4 | Shape4 | Shape6 | Shape6 |

- The functions that share the same name listed in the table also share the same set of parameters (because of the smearing between two $J/\psi$s)
- The parameters for the shape1/2/4/5/6 are fixed from the previous fitting
- The parameters for the double CB are float
- Shape6 is now required from the $c\tau_2$ of the $J/\psi_1 \mu^+\mu^-$ sample