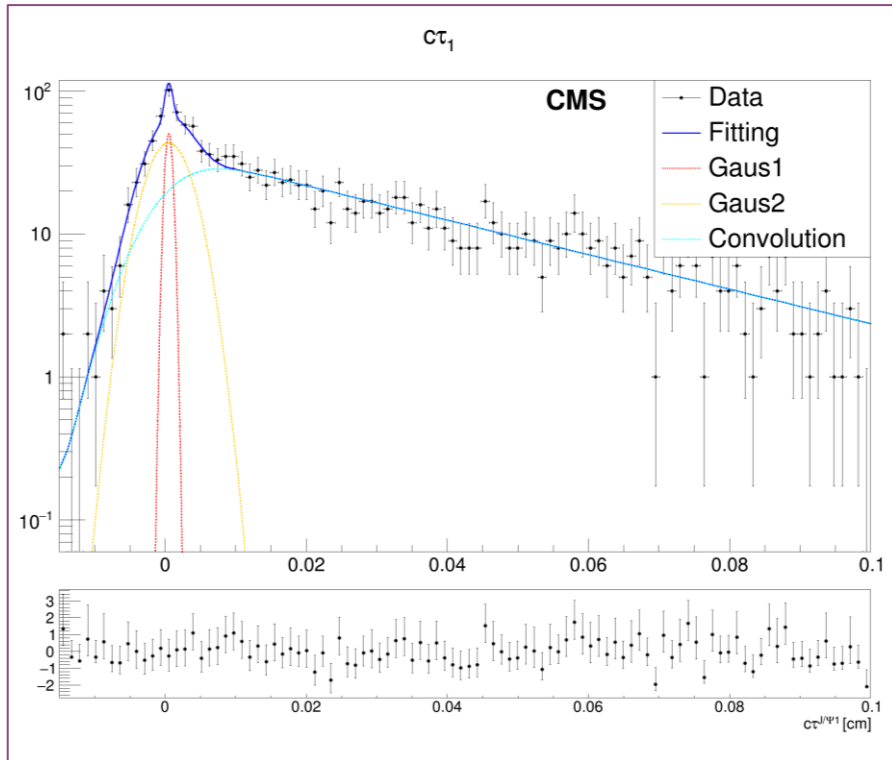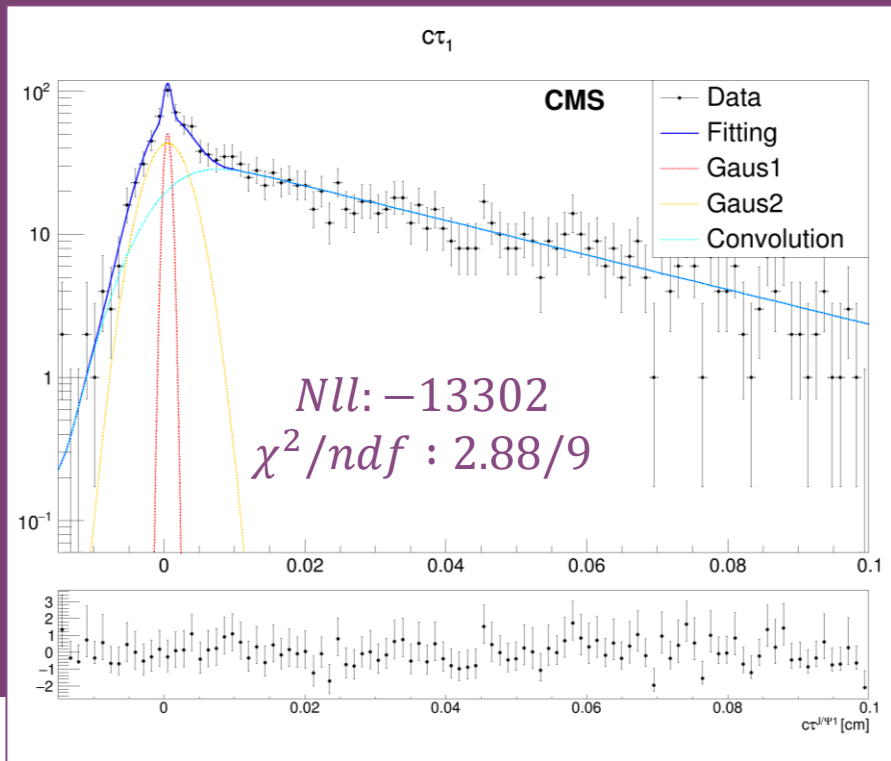# Last week

- **Detail about the fitting:**
  - **Using double gaussian to describe prompt $c\tau$ shape**
  - **Free parameters of combinatorial mass shape**
  - **Using double gaussian + convolution to describe combinatorial $c\tau$ shape (J/ψ side)**
    - **Suspicion of overfitting**
    - **Would fix the two gaussian by prompt MC sample**
- **Fitting validation:**
  - **Two methods were tried, results of both are fine**
  - **Except non-prompt + non-prompt component, because mass/time windows in the fitting, which would be fixed.**
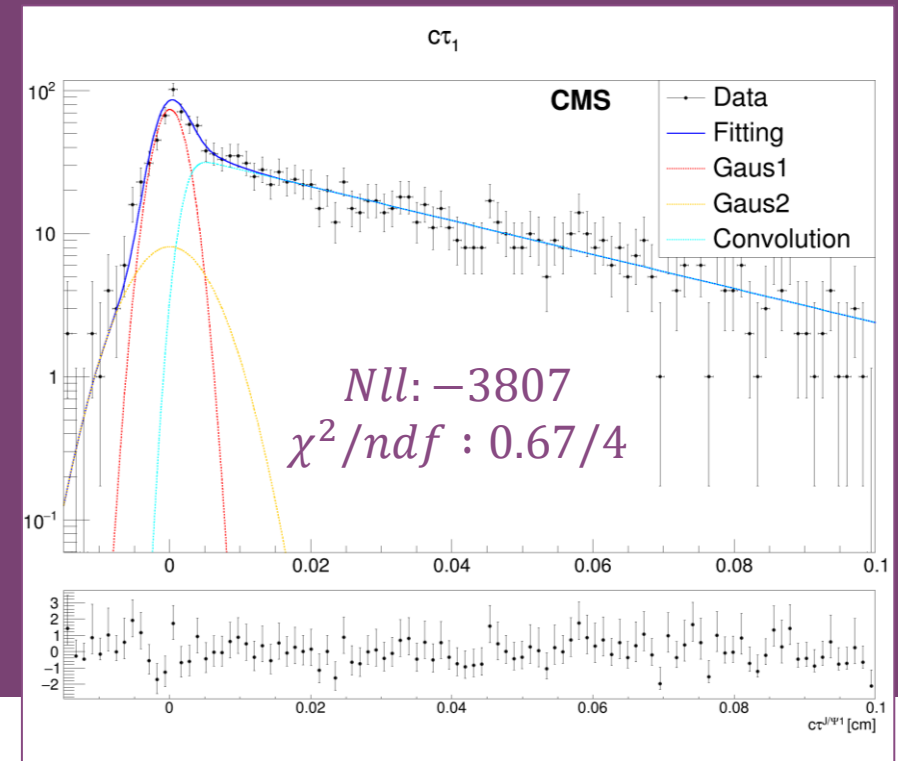
1

Fitting details

- $c\tau$ p.d.f. for combinatorial background (J/ψ side)
  - Double gaussian used to describe the peak is fixed to the prompt MC

Fixed double gaussian

$Nll: -13302$
$\chi^2/ndf : 2.88/9$

$Nll: -3807$
$\chi^2/ndf : 0.67/4$

Fitting validation

- 1. Data + Pure MC + generated samples

		0	1	2	3	4	5
J/ψ_1 J/ψ_2	SPS	-	1000	-	1000	-	-
	DPS	-	-	500	500	-	-
	P+NP	-	-	-	-	500	-
	B decay	-	-	-	-	-	2000
$J/\psi\mu^+\mu^-$		-	-	-	-	-	-
$\mu^+\mu^-\mu^+\mu^-$		-	-	-	-	-	-

		0	1	2	3	4	5
J/ψ_1 J/ψ_2	P+P	2650 ± 60	3670 ± 70	3090 ± 60	4110 ± 70	2630 ± 60	2650 ± 60
	NP+P	780 ± 30	770 ± 30	800 ± 30	790 ± 30	1290 ± 40	780 ± 40
	NP+NP	4420 ± 100	4410 ± 100	4390 ± 100	4390 ± 100	4290 ± 100	6430 ± 110
$J/\psi\mu^+\mu^-$		1510 ± 50	1510 ± 50	1520 ± 50	1520 ± 50	1510 ± 50	1500 ± 50
$\mu^+\mu^-\mu^+\mu^-$		80 ± 20	80 ± 20	80 ± 20	80 ± 30	80 ± 20	90 ± 20

3

Fitting validation

- 1. Data + Pure MC + generated samples

		0	6	7	8	9	10
J/ψ_1 J/ψ_2	SPS	-	-	-	1000	1000	1000
	DPS	-	-	-	500	500	500
	P+NP	-	-	-	500	-	500
	B decay	-	-	-	2000	-	2000
$J/\psi\mu^+\mu^-$		-	1000	-	-	1000	1000
$\mu^+\mu^-\mu^+\mu^-$		-	-	100	-	100	100

		0	6	7	8	9	10
J/ψ_1 J/ψ_2	P+P	2650 ± 60	2630 ± 60	2640 ± 60	4090 ± 70	4080 ± 70	4070 ± 70
	NP+P	780 ± 30	780 ± 40	770 ± 30	1300 ± 40	790 ± 40	1300 ± 40
	NP+NP	4420 ± 100	4360 ± 110	4390 ± 100	6390 ± 110	4340 ± 100	6330 ± 120
$J/\psi\mu^+\mu^-$		1500 ± 50	2540 ± 60	1530 ± 50	1520 ± 50	2560 ± 60	2560 ± 60
$\mu^+\mu^-\mu^+\mu^-$		80 ± 20	70 ± 30	180 ± 30	100 ± 20	180 ± 30	190 ± 30

Fitting validation

- 2. Pure MC + generated samples

		1	2	3	4	5
J/ψ_1 J/ψ_2	SPS	1000	2000	1000	2000	1000
	DPS	500	500	1000	1000	500
	P+NP	500	500	500	500	1000
	B decay	2000	2000	2000	2000	2000
$J/\psi\mu^+\mu^-$		1000	1000	1000	1000	1000
$\mu^+\mu^-\mu^+\mu^-$		100	100	100	100	100

		1	2	3	4	5
J/ψ_1 J/ψ_2	P+P	1430 ± 40	2430 ± 50	1880 ± 50	2880 ± 60	1480 ± 50
	NP+P	530 ± 30	520 ± 30	540 ± 30	540 ± 30	1020 ± 30
	NP+NP	1960 ± 60	1960 ± 60	1960 ± 60	1960 ± 60	1980 ± 70
$J/\psi\mu^+\mu^-$		1030 ± 40	1040 ± 30	1030 ± 40	1040 ± 30	1000 ± 40
$\mu^+\mu^-\mu^+\mu^-$		100 ± 20	100 ± 20	100 ± 20	100 ± 20	100 ± 20

Fitting validation

- 2. Pure MC + generated samples

		6	7	8	9	10
J/ψ_1 J/ψ_2	SPS	1000	1000	1000	2000	2000
	DPS	500	500	500	1000	1000
	P+NP	500	500	500	1000	500
	B decay	4000	2000	2000	4000	2000
$J/\psi\mu^+\mu^-$		1000	2000	1000	1000	2000
$\mu^+\mu^-\mu^+\mu^-$		100	100	200	200	200

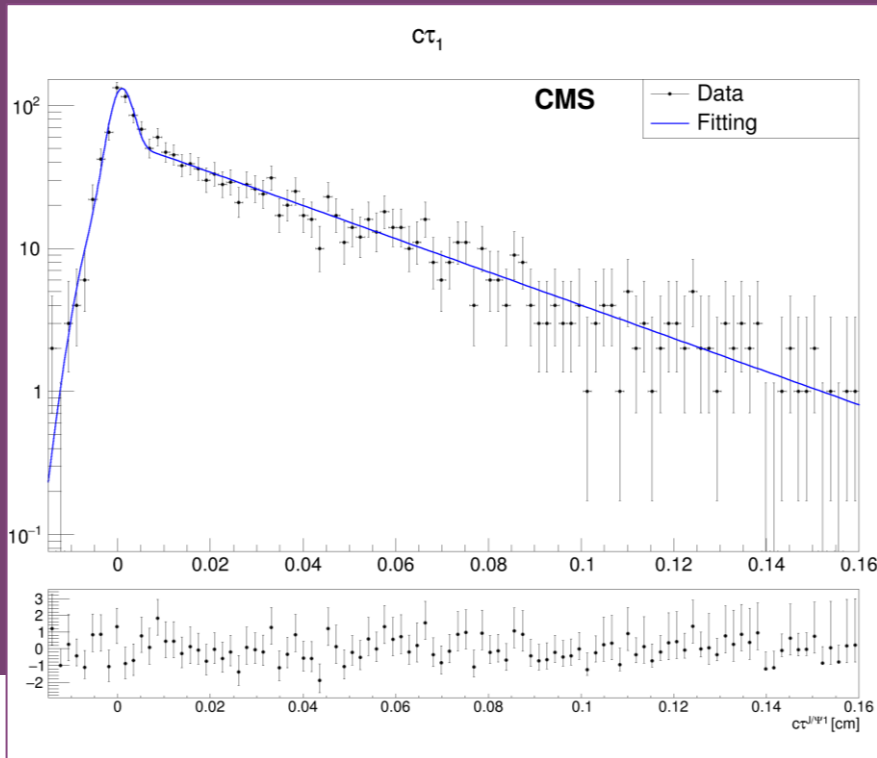|		6	7	8	9	10
J/ψ_1 J/ψ_2	P+P	1430 ± 40	1440 ± 40	1430 ± 40	2940 ± 60	2890 ± 60
	NP+P	520 ± 30	530 ± 30	530 ± 30	1020 ± 30	530 ± 30
	NP+NP	3890 ± 90	2060 ± 70	1960 ± 60	3910 ± 90	2050 ± 70
$J/\psi\mu^+\mu^-$		1070 ± 40	1960 ± 40	1030 ± 30	1050 ± 40	1980 ± 40
$\mu^+\mu^-\mu^+\mu^-$		100 ± 20	130 ± 30	190 ± 20	110 ± 20	230 ± 30

Back Up

Fitting details

- 1. $c\tau$ p.d.f. for prompt $J/\psi J/\psi$ component

    - $c\tau$ p.d.f. for combinatorial background (J/ψ side)

Another gaussian embedded