



Deutsches Elektronen-Synchrotron DESY  
Ein Forschungszentrum der Helmholtz-Gemeinschaft



# Double Jpsi

Taozhe YU

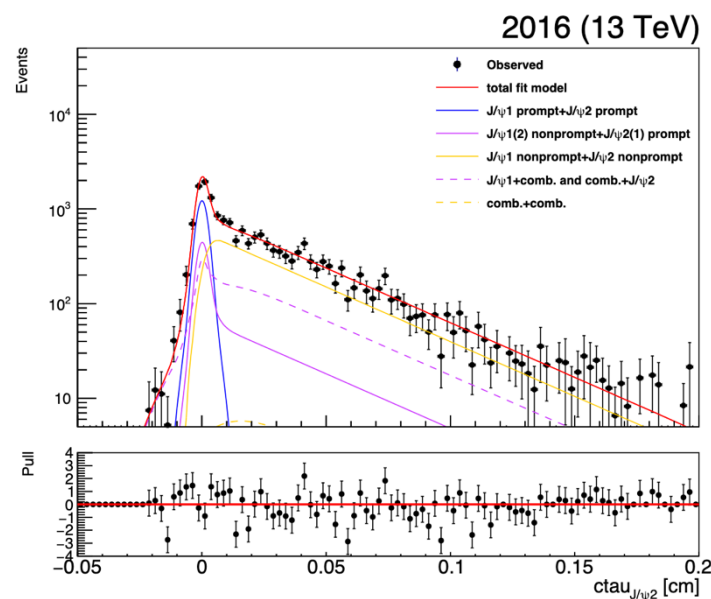
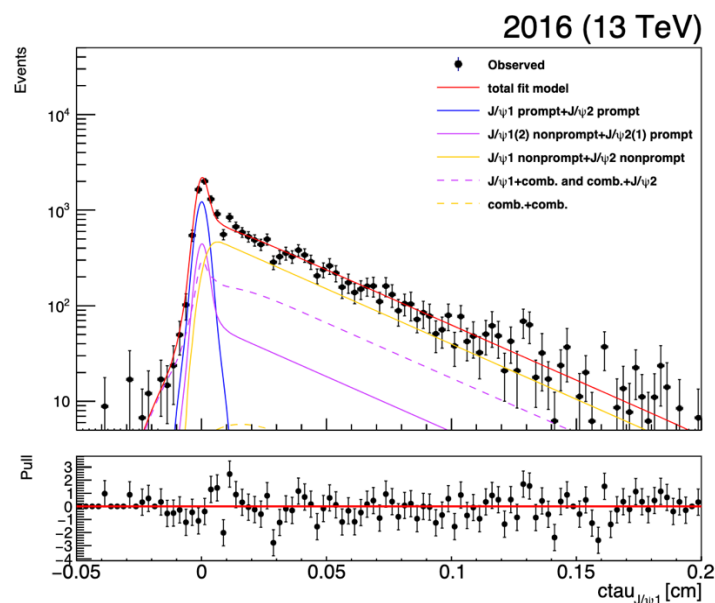
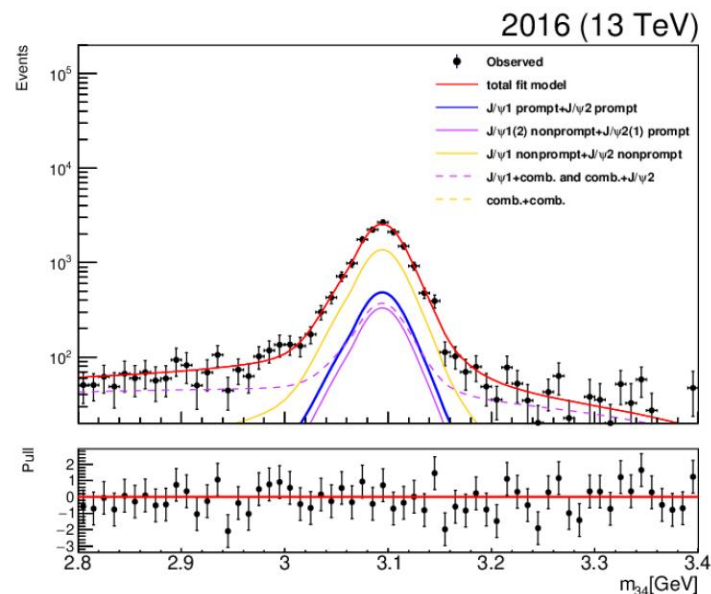
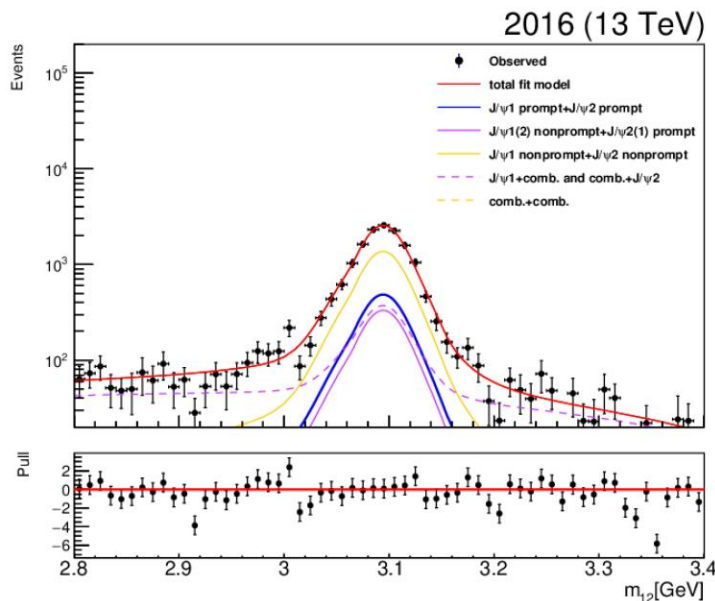
Table 18:  $J/\psi$  cross sections

$p_T$	$\langle p_T \rangle$	$\langle \mathcal{A} \rangle$	$\langle \epsilon \rangle$	$\langle \frac{1}{\mathcal{A}\epsilon} \rangle$	$\sigma \times BR [pb]$
$ y  < 1.2$					
10-11	10.50	0.23	0.46	$10.395 \pm 0.019$	$2421.93 \pm 26.97$
11-12	11.49	0.29	0.56	$6.308 \pm 0.007$	$1293.31 \pm 14.88$
12-13	12.48	0.35	0.60	$4.887 \pm 0.005$	$822.42 \pm 10.14$
13-14	13.48	0.39	0.61	$4.238 \pm 0.004$	$562.05 \pm 7.67$
14-15	14.48	0.43	0.66	$3.502 \pm 0.003$	$384.42 \pm 5.71$
15-16	15.48	0.47	0.67	$3.185 \pm 0.003$	$246.73 \pm 4.22$
16-18	17.09	0.25	0.57	$7.872 \pm 0.010$	$168.58 \pm 1.71$
18-20	18.99	0.42	0.67	$3.628 \pm 0.002$	$87.22 \pm 0.81$
20-22	20.96	0.56	0.71	$2.502 \pm 0.001$	$48.87 \pm 0.49$
22-26	23.77	0.66	0.73	$2.095 \pm 0.001$	$24.01 \pm 0.21$
26-30	27.79	0.71	0.73	$1.933 \pm 0.001$	$10.51 \pm 0.13$
30-38	33.26	0.76	0.73	$1.816 \pm 0.001$	$4.11 \pm 0.06$
38-54	43.78	0.81	0.72	$1.725 \pm 0.003$	$0.86 \pm 0.02$
$1.2 <  y  < 1.8$					
16-18	17.02	0.29	0.53	$6.803 \pm 0.010$	$151.68 \pm 2.14$
18-20	18.97	0.47	0.62	$3.482 \pm 0.003$	$77.83 \pm 1.07$
20-22	20.95	0.61	0.64	$2.586 \pm 0.002$	$41.32 \pm 0.65$
22-26	23.72	0.70	0.65	$2.247 \pm 0.002$	$20.77 \pm 0.30$
26-30	27.78	0.74	0.65	$2.108 \pm 0.002$	$8.68 \pm 0.19$
30-38	33.11	0.79	0.63	$2.057 \pm 0.003$	$3.07 \pm 0.07$
38-54	43.39	0.83	0.60	$2.089 \pm 0.008$	$0.59 \pm 0.02$

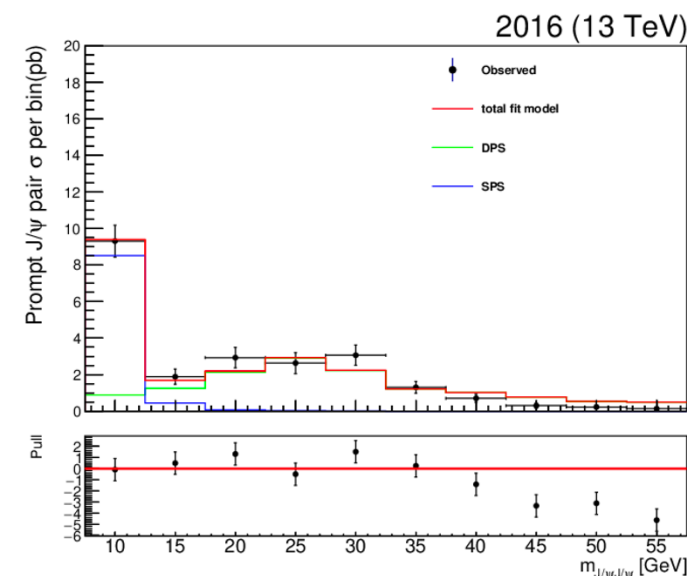
$$2421.9 + 1293.3 + 822.4 + 562.0 + 384.4 + 246.7 + 168.6 \cdot 2 + 87.22 \cdot 2 + 48.9 \cdot 2 + 24.0 \cdot 4 + 10.5 \cdot 4 + 4.11 \cdot 8 + 0.86 \cdot 16 = 6524.7800 \text{ pb}$$

$$6524.8 \text{ pb} / 0.0593 = 110030.02 \text{ pb}$$

$$\bullet \sigma_{eff} = \frac{\sigma_{J/\psi}^2}{2\sigma_{DPS \rightarrow J\psi J\psi}} = \frac{(110030.02 \text{ pb})^2}{2 \cdot (23.11 \cdot 0.59) \text{ pb}} = 0.44 \text{ mb}$$



Phase space: Jpsi:  $p_t > 10 \text{ GeV}$ ,  $|y| < 1.2$   
 Muon:  $p_t > 4 \text{ GeV}$ ,  $|y| < 1.4$

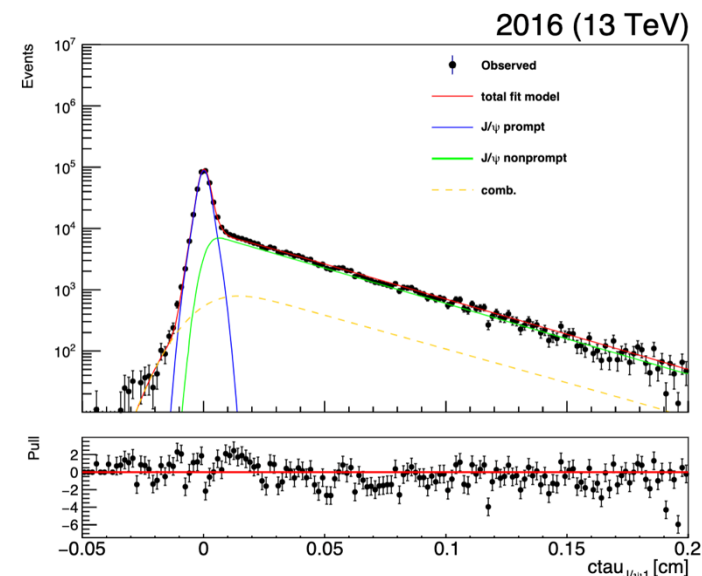
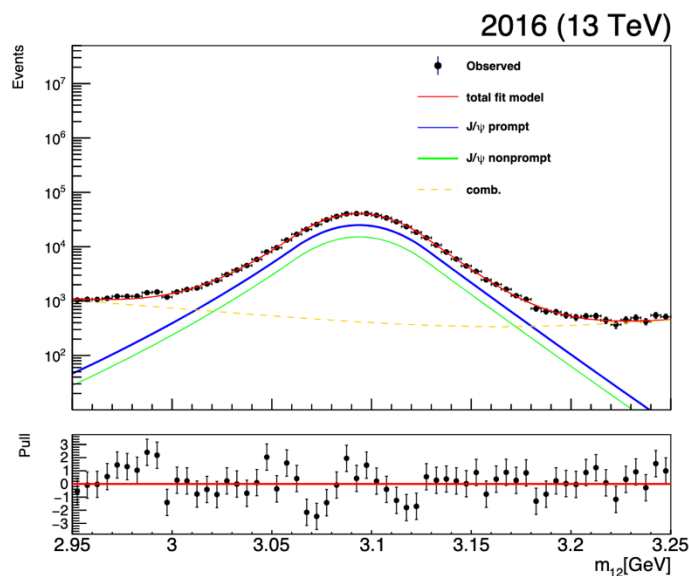
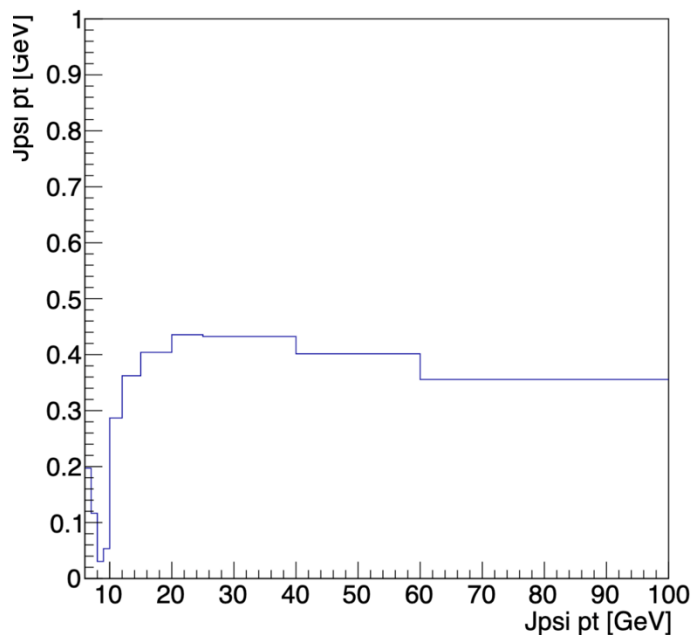


Double Jpsi cross section :  $23.11 \text{ pb}$   
 DPS fraction:  $0.59$

- Phase space: Jpsi:  $pt > 10\text{GeV}$ ,  $|y| < 1.2$
- Muon:  $pt > 3.5\text{GeV}$ ,  $|\eta| < 1.4$

HLT\_Dimuon10\_Jpsi\_Barrel\_v

pass HLT probability



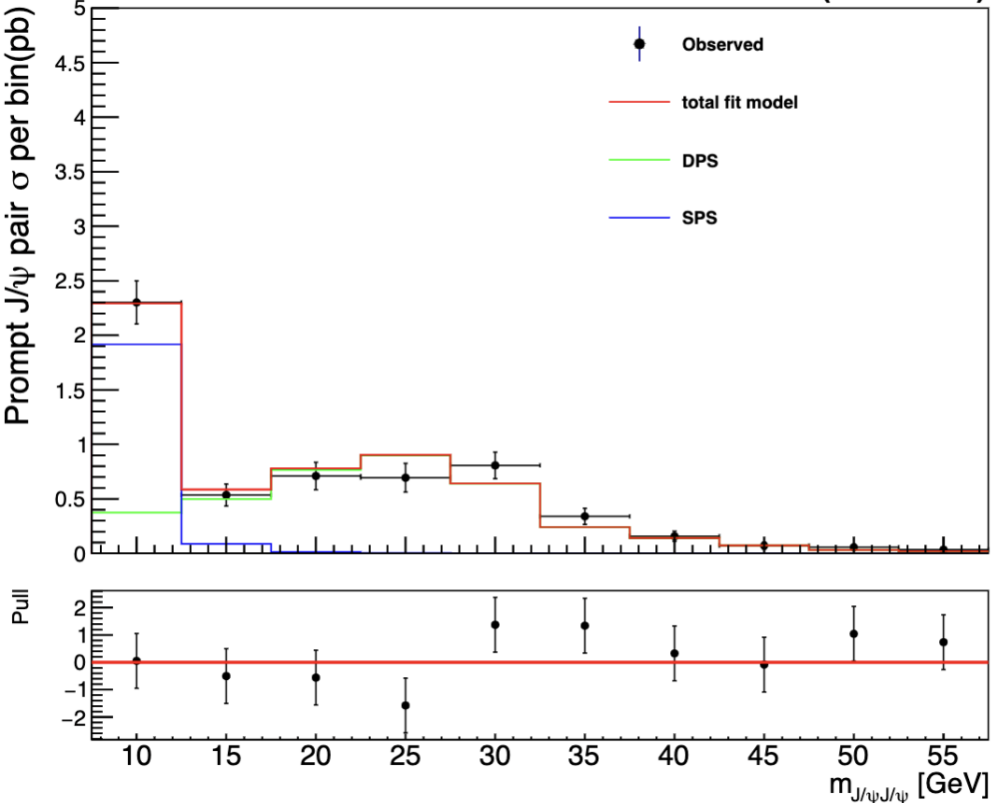
$$\frac{(308772/528646) * 6.78e+07}{5.819/fb * 0.0593} = 114849\text{pb}$$



# Double Jpsi DPS



2016 (13 TeV)



$$\text{effective CS} = \frac{(114849\text{pb})^2}{2*18.56\text{pb}} = 0.355\text{mb}$$

$$\text{DPS} = 29\text{pb} * 0.64 = 18.56\text{pb}$$



Deutsches Elektronen-Synchrotron DESY  
Ein Forschungszentrum der Helmholtz-Gemeinschaft



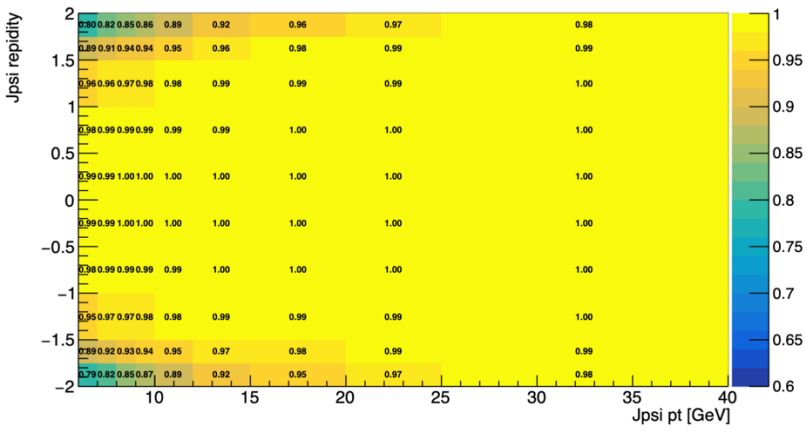
11.12



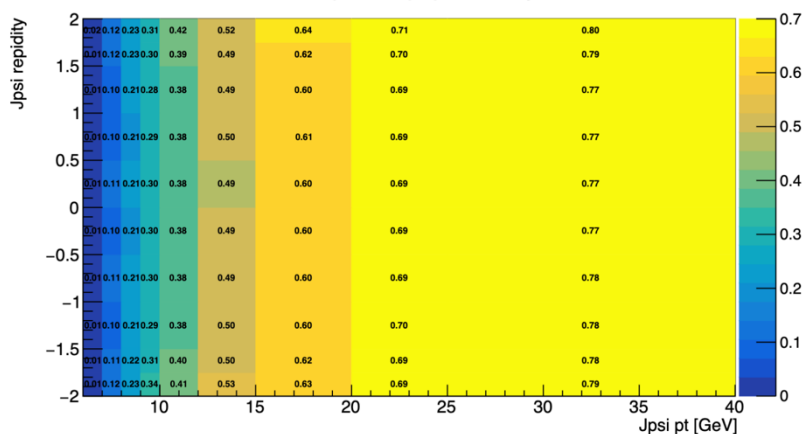
# Single Acc and eff (old)



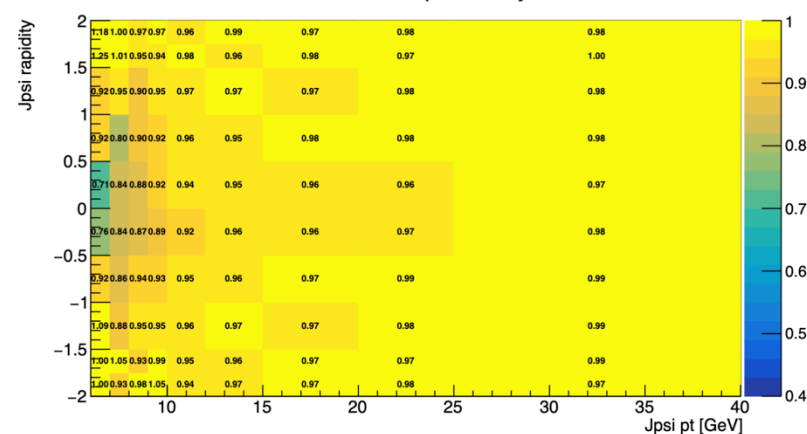
acceptance eta probability



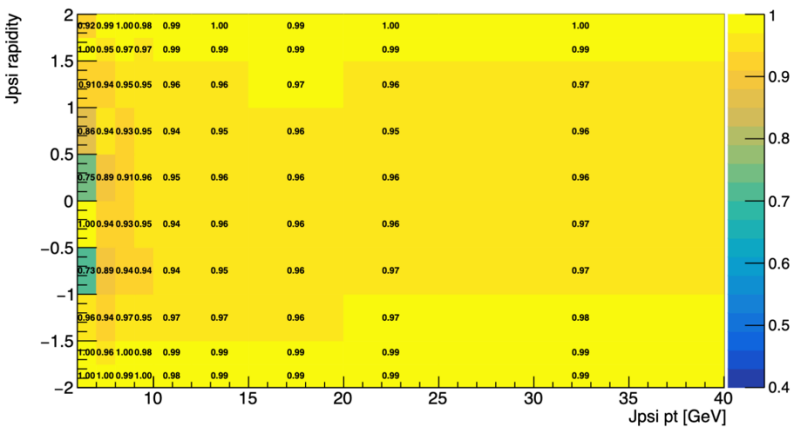
acceptance pt probability



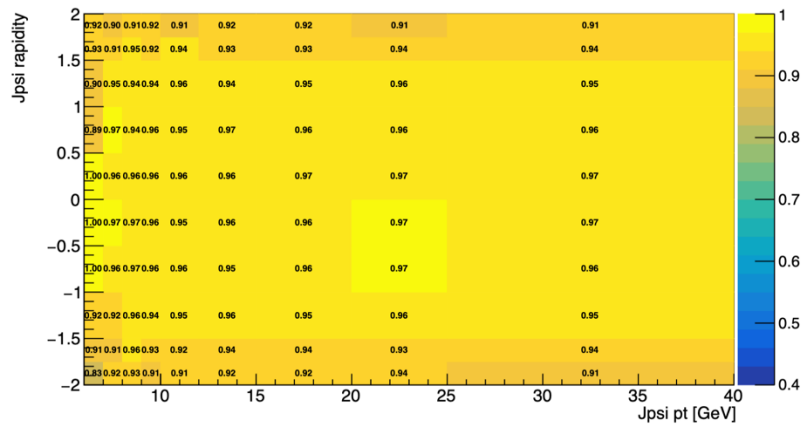
reconstruct probability



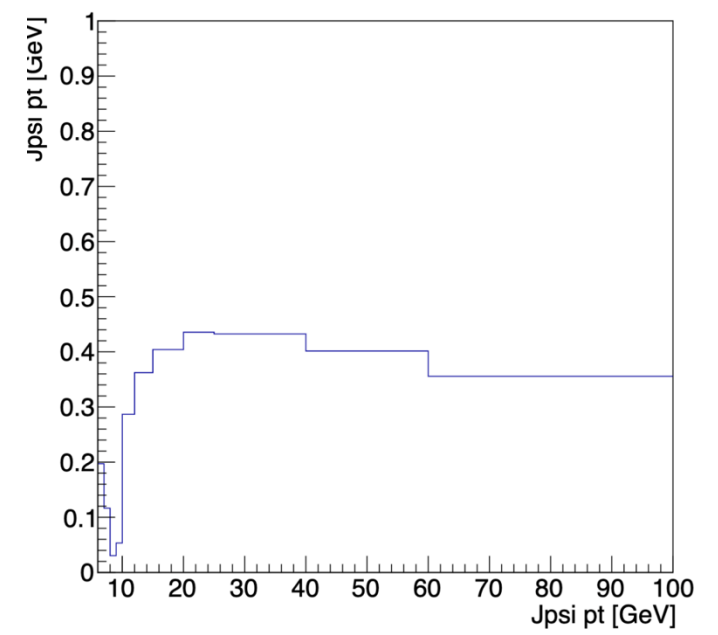
selection probability



vertex probability



pass HLT probability



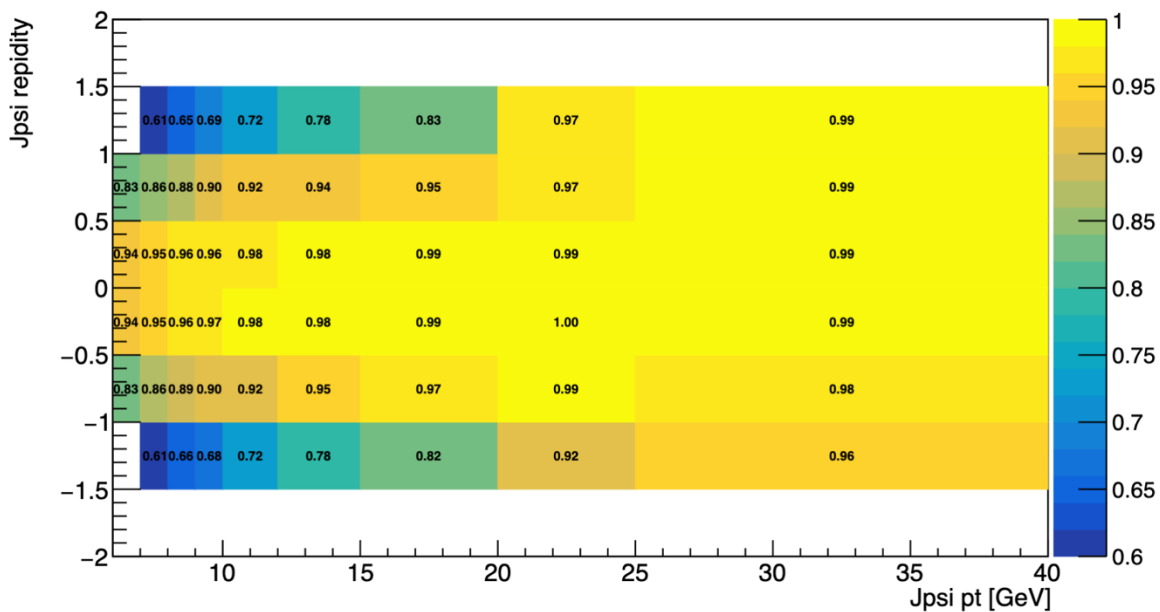




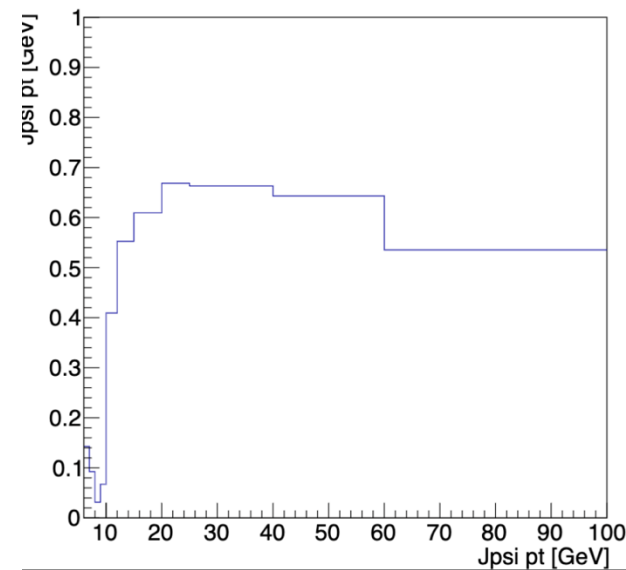
# Single Acc and eff (new)



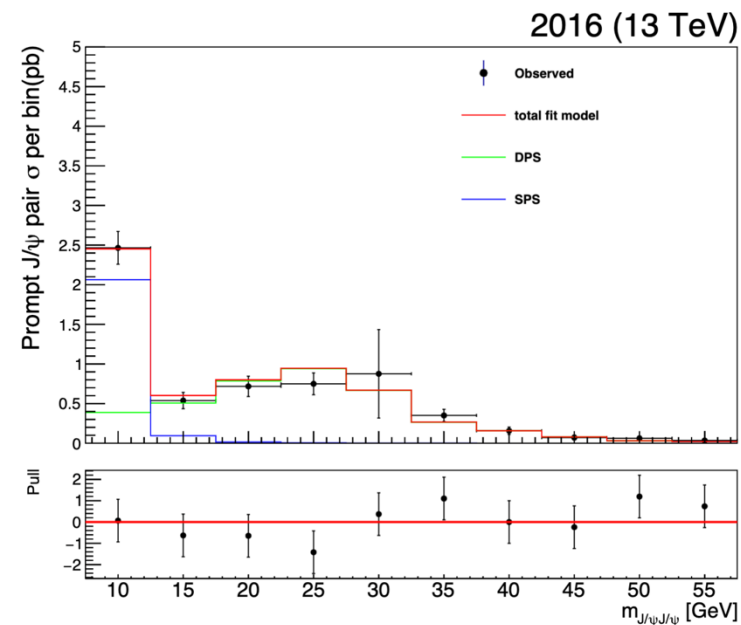
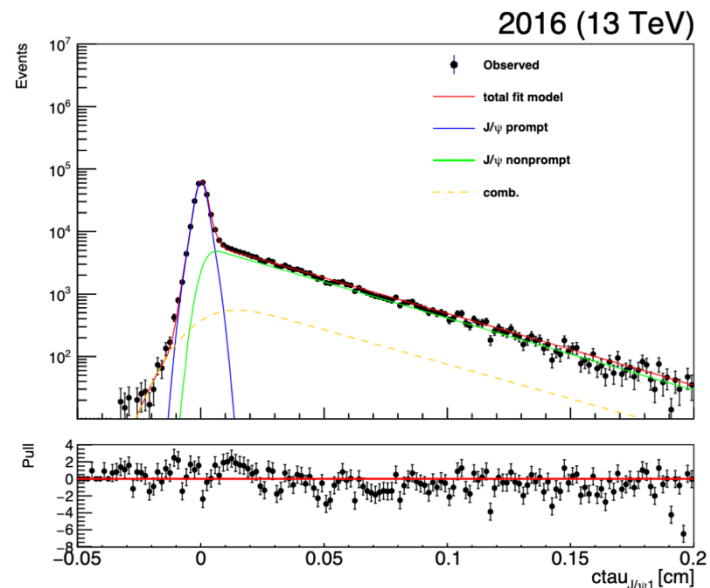
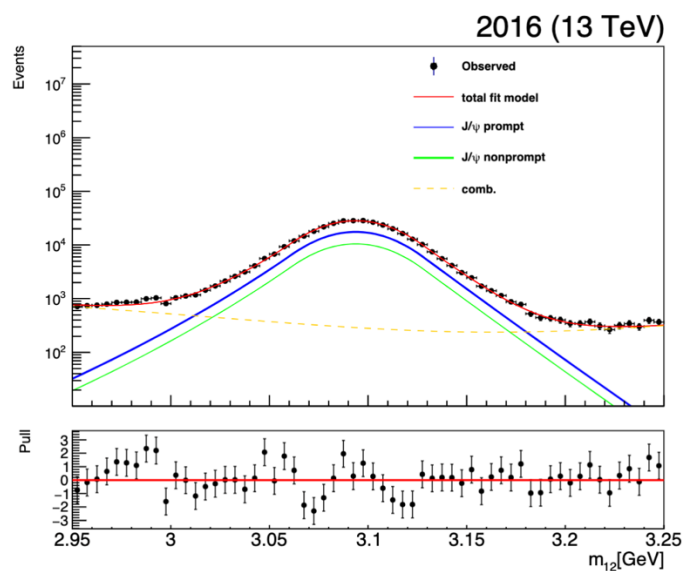
acceptance eta probability



pass HLT probability







$$\frac{(216733/379152) * 4.86e+07}{5.819/fb * 0.0593} = 80510 \text{ pb}$$

$$\text{DPS} = 30.8 \text{ pb} * 0.64 = 19.7 \text{ pb}$$

$$\text{effective CS} = \frac{(80510 \text{ pb})^2}{2 * 19.7 \text{ pb}} = 0.164 \text{ mb}$$