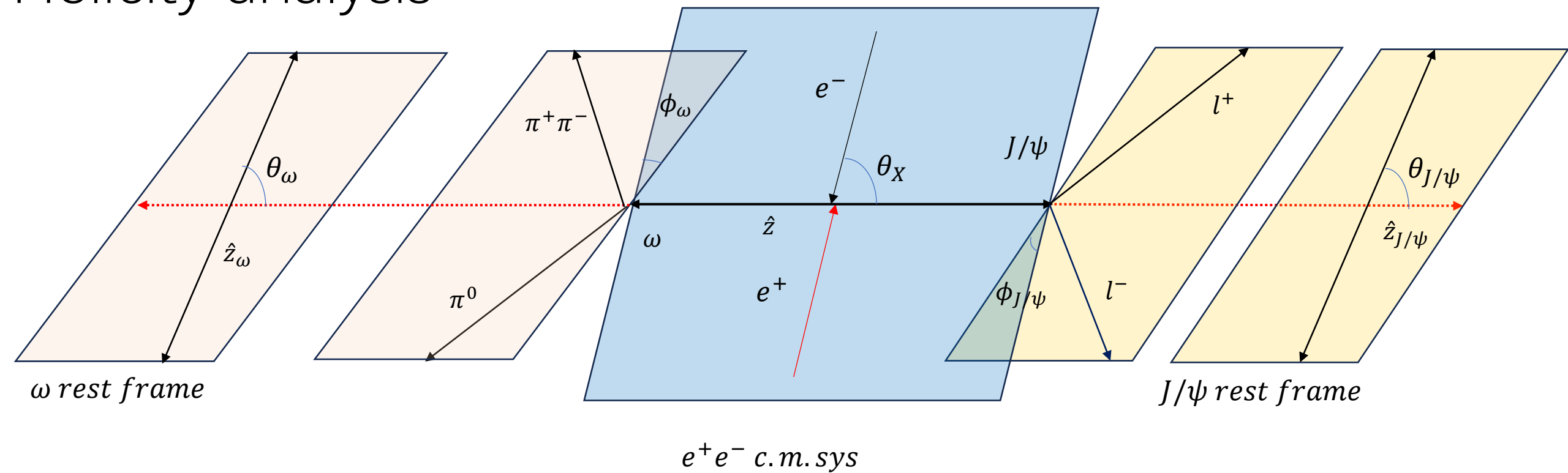


Group meeting

2025/12/19

Helicity analysis



θ_X : e^+e^- 质心系下 J/ψ 与 z 轴的极角。
 $\phi_{J/\psi}(\phi_\omega)$: $J/\psi(\omega)$ 产生平面与衰变平面的夹角。
 $\theta_{J/\psi}$: J/ψ 质心系下 l 与 z 轴的极角。
 θ_ω : ω 质心系下衰变平面的法向量与 z 轴的夹角。

0⁺假设下角分布:

$(*H1=0.04; H2=\sqrt{1/\pi^4 - 3/2 * H1^2} *)$

expr = 1 / 8 (

$$3 H_1^2 + 2 H_2^2$$
$$- 2 (H2^2 - H1^2 \cos [\phi Jpsi + \phi Omega] ^2) \cos [2 \theta Jpsi]$$

余弦

余弦

$$- (3 H_1^2 - 2 H_2^2 + (H_1^2 + 2 H_2^2) \cos[2 \theta_{\text{psi}}]) \cos[2 \theta_{\text{Omega}}]$$

余弦

余弦

$$+ H1^2 \cos[2(\phi_j \psi_i + \phi_o \Omega)] (-1 + 2 \cos[2\theta_o \Omega] \sin[\theta_j \psi_i]^2) + 4 H1 H2 \cos[\phi_j \psi_i + \phi_o \Omega] \sin[2\theta_j \psi_i] \sin[2\theta_o \Omega];$$

| 余弦

余弦

| 正弦

| 余弦

| 正弦

| 正弦

$2^+(0)$ 下角分布:

[illegible]

(*并行积分*)

```
integrals = ParallelMap[Function[term, Integrate[term, {phiJpsi, 0, 2 Pi}, {thetaJpsi, 0, Pi}, {thetaOmega, 0, Pi}, {thetaX, 0, Pi}, {phiX, 0, 2 Pi}]], termsList];
```

(*最终积分*)

```
totalIntegral = Total[integrals]
```

```
coeffH1 = Coefficient[totalIntegral, H1^2]
```

```
coeffH2 = Coefficient[totalIntegral, H2^2]
```

```
coeffH3 = Coefficient[totalIntegral, H3^2]
```

```
coeffH4 = Coefficient[totalIntegral, H4^2]
```

```
coeffH5 = Coefficient[totalIntegral, H5^2]
```

(★构建归一化条件★)

$$\text{NormalizeEq} = \text{coeffH1} * H1^2 + \text{coeffH2} * H2^2 + \text{coeffH3} * H3^2 + \text{coeffH4} * H4^2 + \text{coeffH5} * H5^2 == 1$$

$$\frac{33 \text{ H1}^2 \pi^6}{32} + \frac{3 \text{ H2}^2 \pi^6}{16} + \frac{27 \text{ H3}^2 \pi^6}{64} + \frac{9 \text{ H4}^2 \pi^6}{16} + \frac{11 \text{ H5}^2 \pi^6}{64}$$

MC generation

舍选法抽样，需要最大值

0^+ 下角分布：

`MaxValue[{expr, 0 ≤ thetaJpsi ≤ Pi, 0 ≤ thetaOmega ≤ Pi, -Pi ≤ phiJpsi ≤ Pi, -Pi ≤ phiOmega ≤ Pi}, {thetaJpsi, thetaOmega, phiJpsi, phiOmega}]`
最大函数值 圆周率 ... 圆周率 ... 圆周率 圆周率

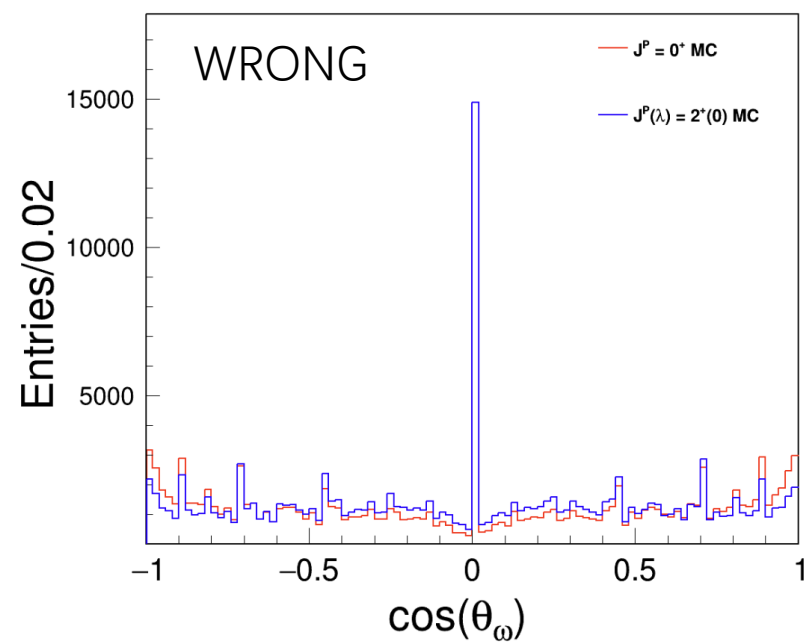
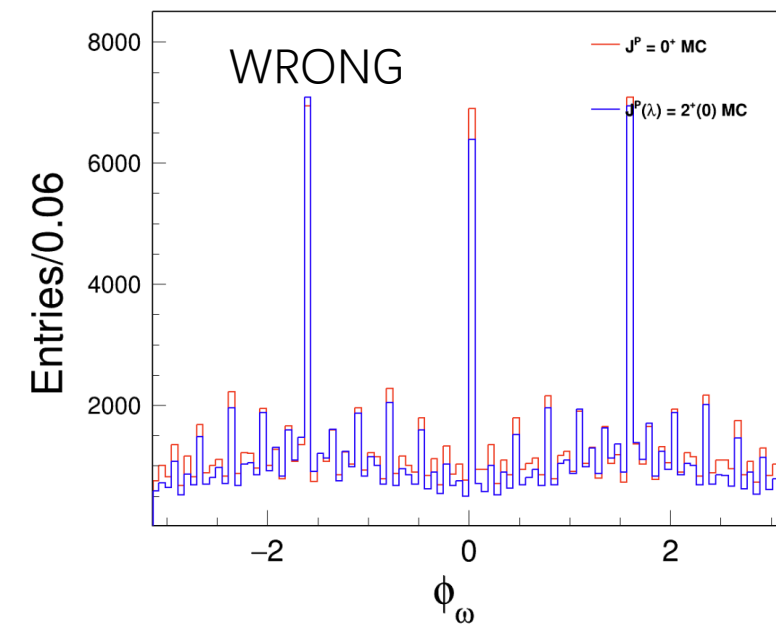
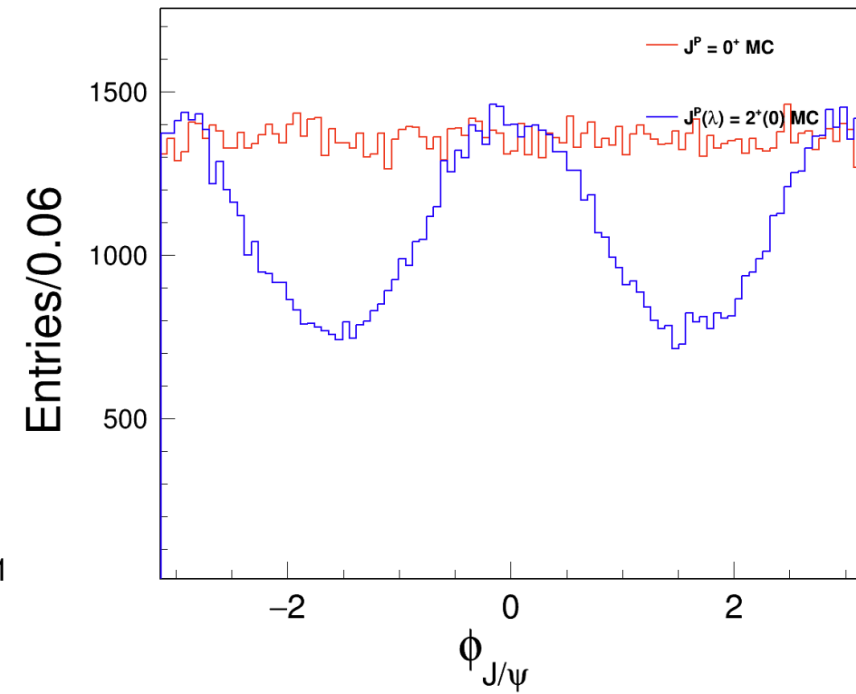
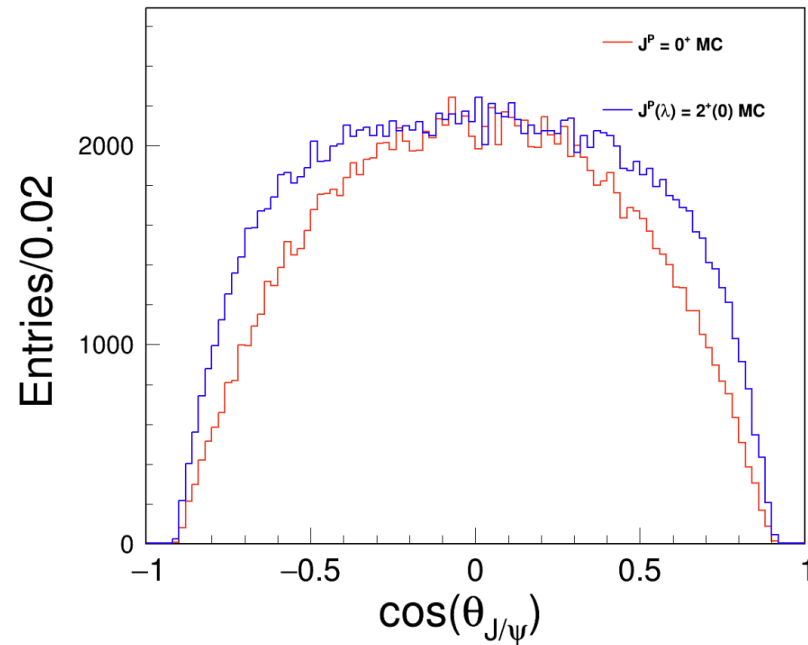
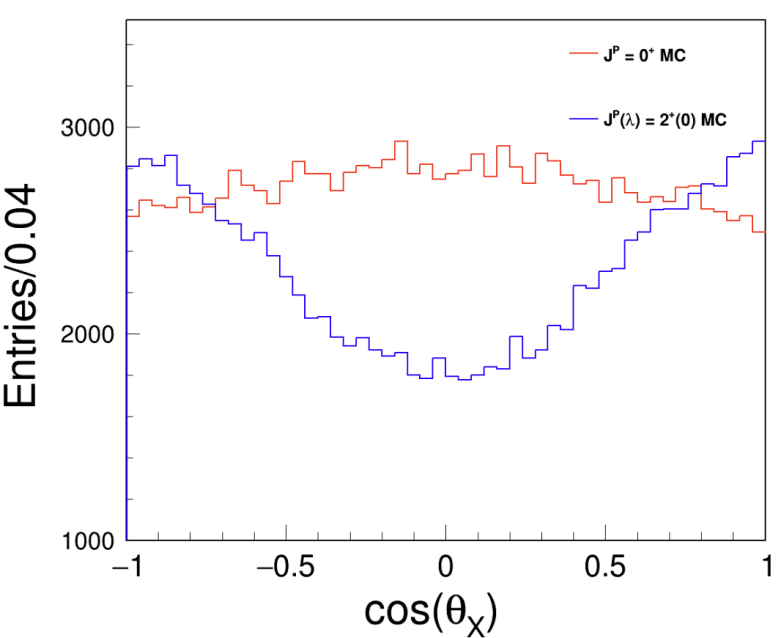
```
h1 = 0.04;  
h2 = sqrt(1.0 / pow(acos(-1.0), 4) - 3.0 / 2.0 * h1 * h1);
```

$2^+(0)$ 下角分布：

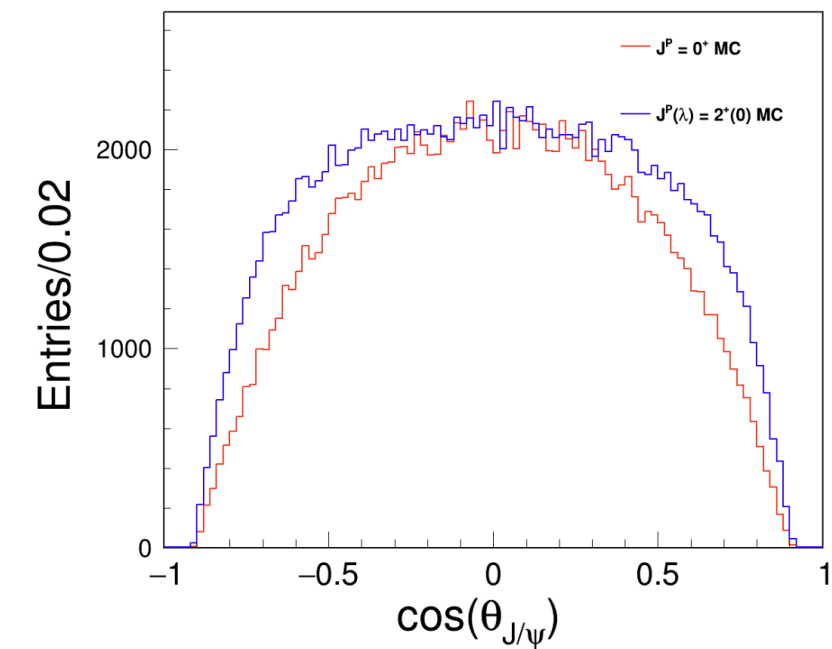
2×10^8 次蒙卡模拟，取最大值

```
double pi = acos(-1.0);  
H1 = sqrt(1.0 / pow(pi, 6) * 32. / 33. / 5.);  
H2 = sqrt(1.0 / pow(pi, 6) * 16. / 3. / 5.);  
H3 = sqrt(1.0 / pow(pi, 6) * 64. / 27. / 5.);  
H4 = sqrt(1.0 / pow(pi, 6) * 16. / 9. / 5.);  
H5 = sqrt(1.0 / pow(pi, 6) * 64. / 11. / 5.);
```

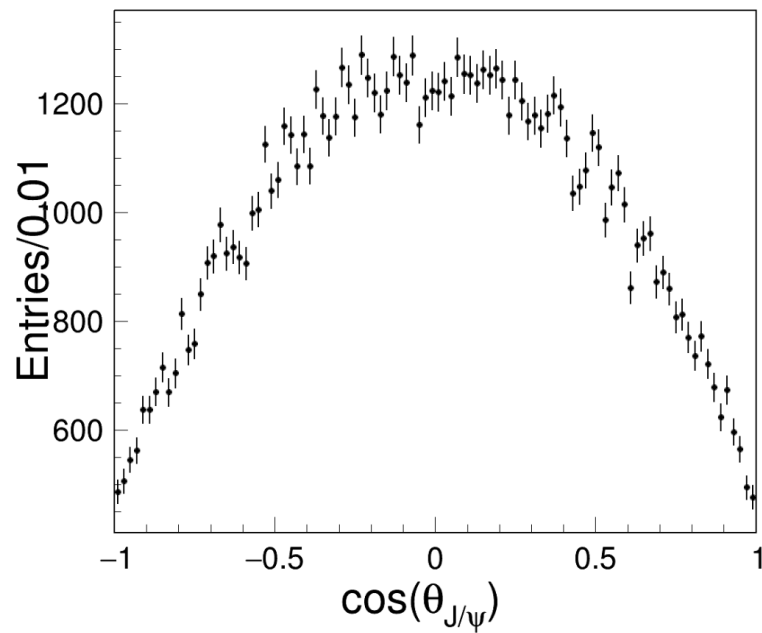
Distribution check:



Distribution check:



0^+ MC after detector



0^+ MC before detector and selection

Next to do :

1. Check the wrong or inconsistent distribution.
2. Hypothesis check in MC.
3. Note update.

