PWA of the reaction
$\gamma p \longrightarrow p K^- K^+ \pi^0$
in new mass region

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April 24th, 2024

Background

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  - No cuts on photon energy

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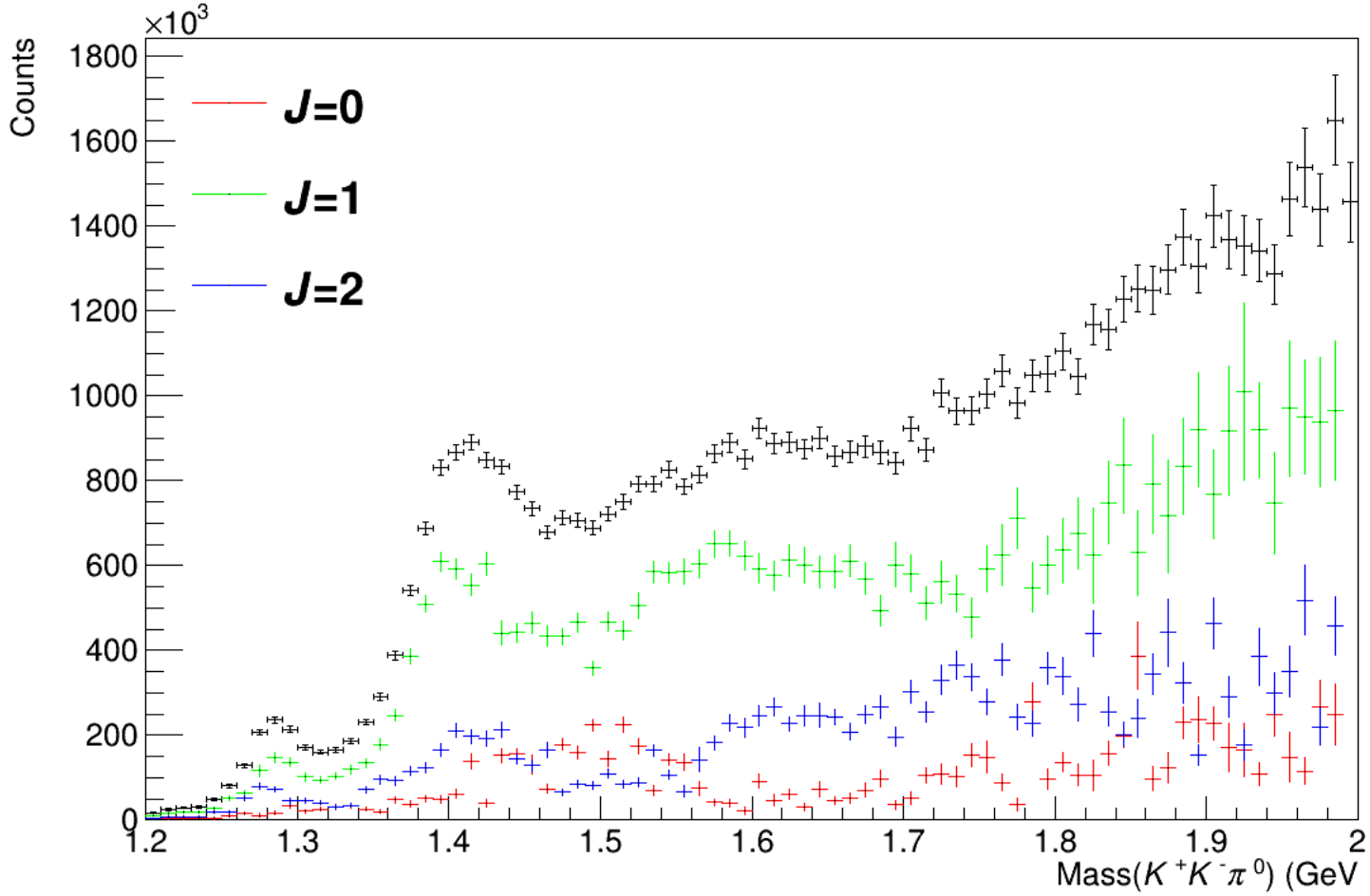
- Other changes
  - Mass range expanded to 1.2 GeV – 2.0 GeV
    - Currently concentrating on 1.2 GeV – 1.75 GeV
  - Early exploration of wave set selection using likelihood ratio tests

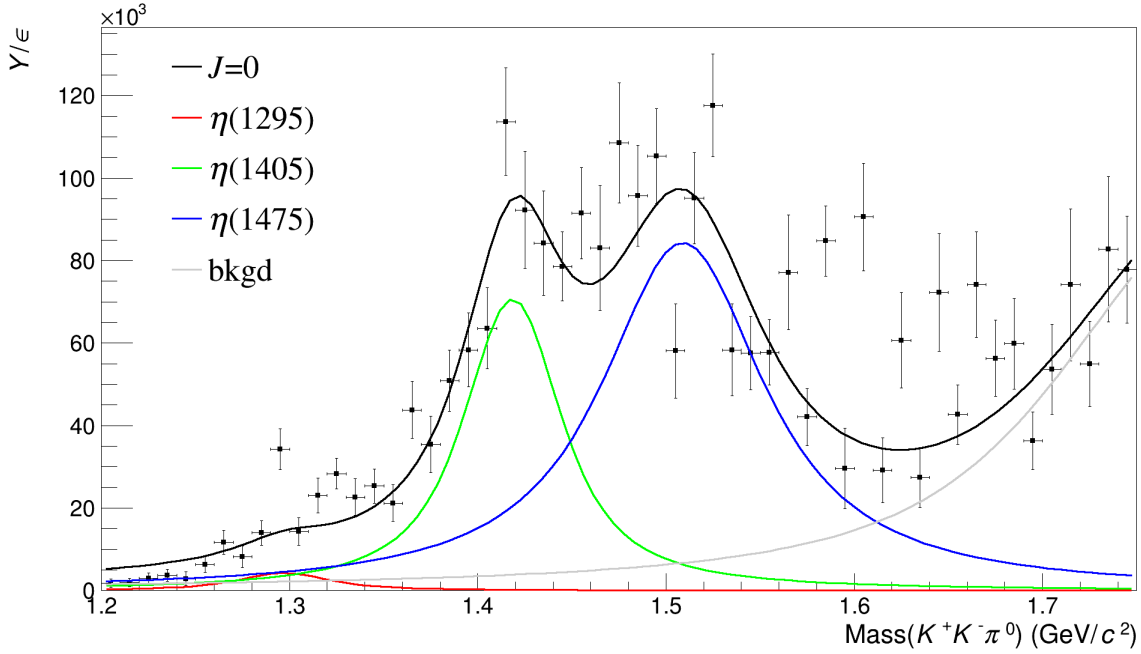
Full wave set (config 14)

- $J=0, l=0, s=0, a_0(980)$ η
- $J=0, l=1, s=1, I=0, K^*$ η
- $J=1, l=1, s=0\ , a_0(980)$ f_1
- $J=1, l=0, s=1, I=0, K^*$ $f_1\ , h_1$
- $J=1, l=2, s=1, I=0, K^*$ $f_1\ , h_1$
- $J=1, l=1, s=1, I=0, K^*$ ϕ
- $J=1, l=1, s=1, I=1, K^*$ ρ
- $J=2, l=2, s=0, a_0(980)$ η_2
- $J=2, l=1, s=1, I=0, K^*$ η_2
- $J=2, l=2, s=1, I=0, K^*$ f_2'
- $J=2, l=1, s=1, I=1, K^*$ π_2

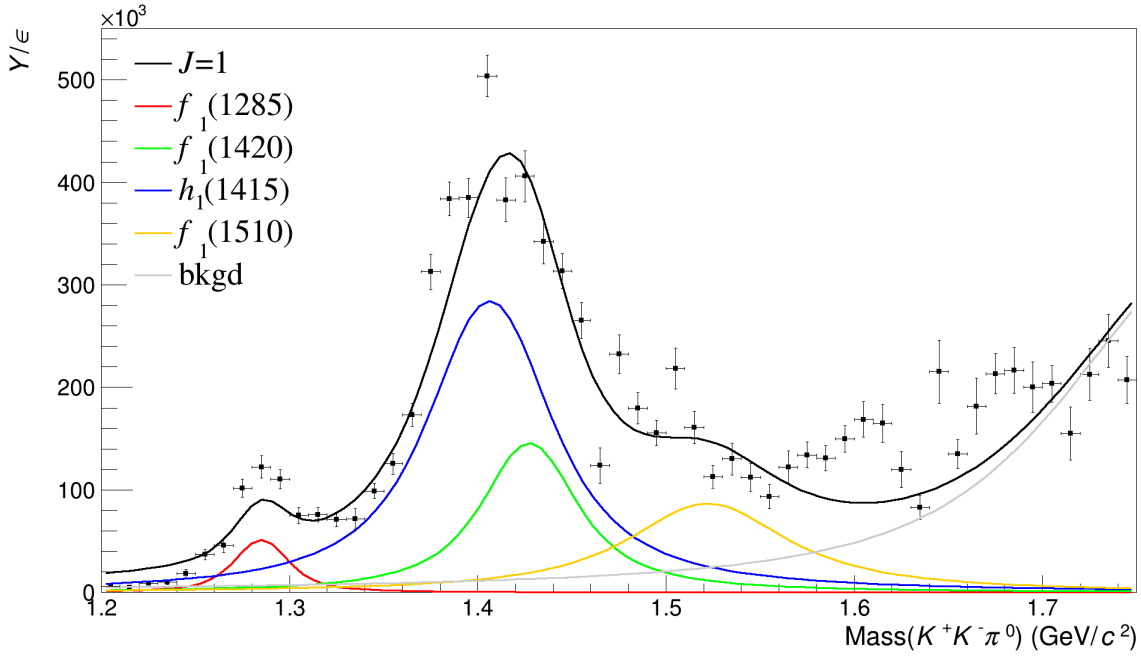
Expanded mass range



Config 14



$J = 0$



$J = 1$

First comparison

Config 12

- $J=0, l=0, s=0, a_0(980)$ η
- $J=0, l=1, s=1, I=0, K^*$ η
- $J=1, l=1, s=0, a_0(980)$ f_1
- $J=1, l=0, s=1, I=0, K^*$ f_1, h_1
- $J=1, l=2, s=1, I=0, K^*$ f_1, h_1
- $J=1, l=1, s=1, I=0, K^*$ ϕ
- $J=1, l=1, s=1, I=1, K^*$ ρ
- $J=2, l=2, s=0, a_0(980)$ η_2
- $J=2, l=1, s=1, I=0, K^*$ η_2
- **$J=2, l=2, s=1, I=0, K^*$** **f_2'**

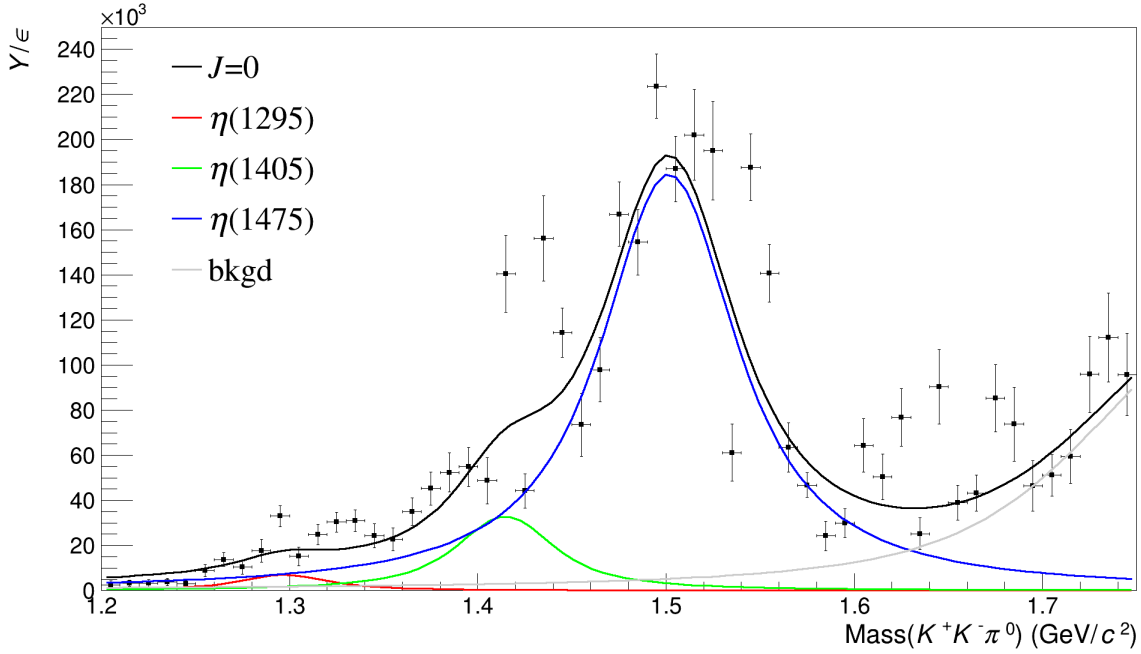
Config 15

- $J=0, l=0, s=0, a_0(980)$
- $J=0, l=1, s=1, I=0, K^*$
- $J=1, l=1, s=0, a_0(980)$
- $J=1, l=0, s=1, I=0, K^*$
- $J=1, l=2, s=1, I=0, K^*$
- $J=1, l=1, s=1, I=0, K^*$
- $J=1, l=1, s=1, I=1, K^*$
- $J=2, l=2, s=0, a_0(980)$
- $J=2, l=1, s=1, I=0, K^*$
- **$J=2, l=1, s=1, I=1, K^*$** **π_2**

$\Sigma LL(12) < \Sigma LL(15)$

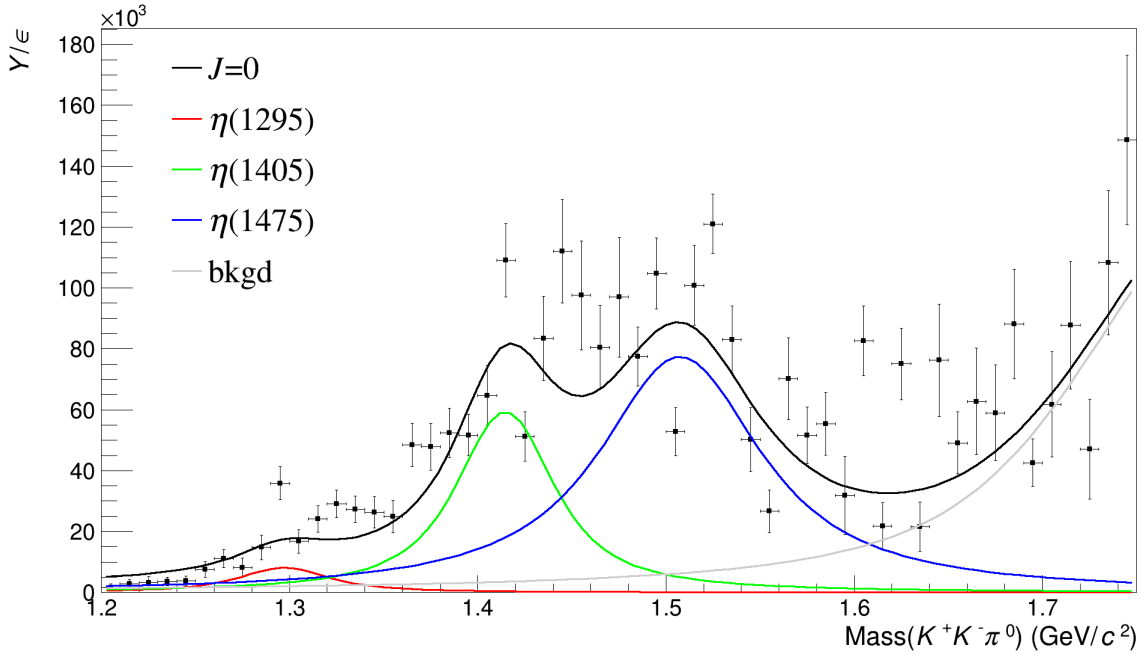
$J = 0$

Config 12



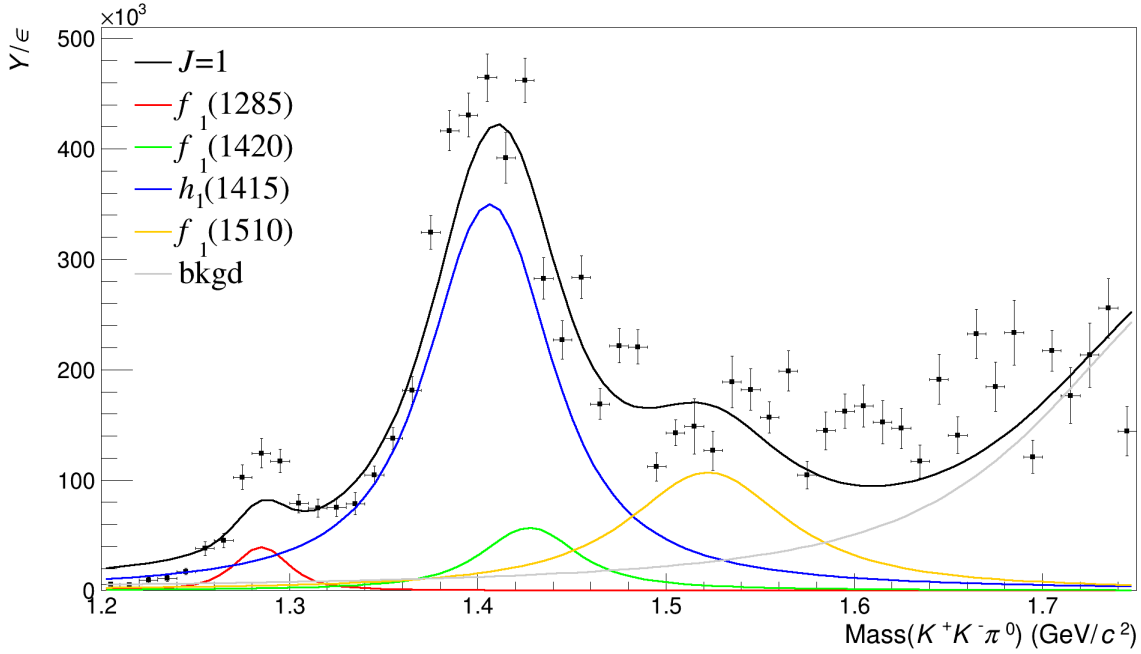
Config 15

✓



$J = 1$

Config 12



Config 15

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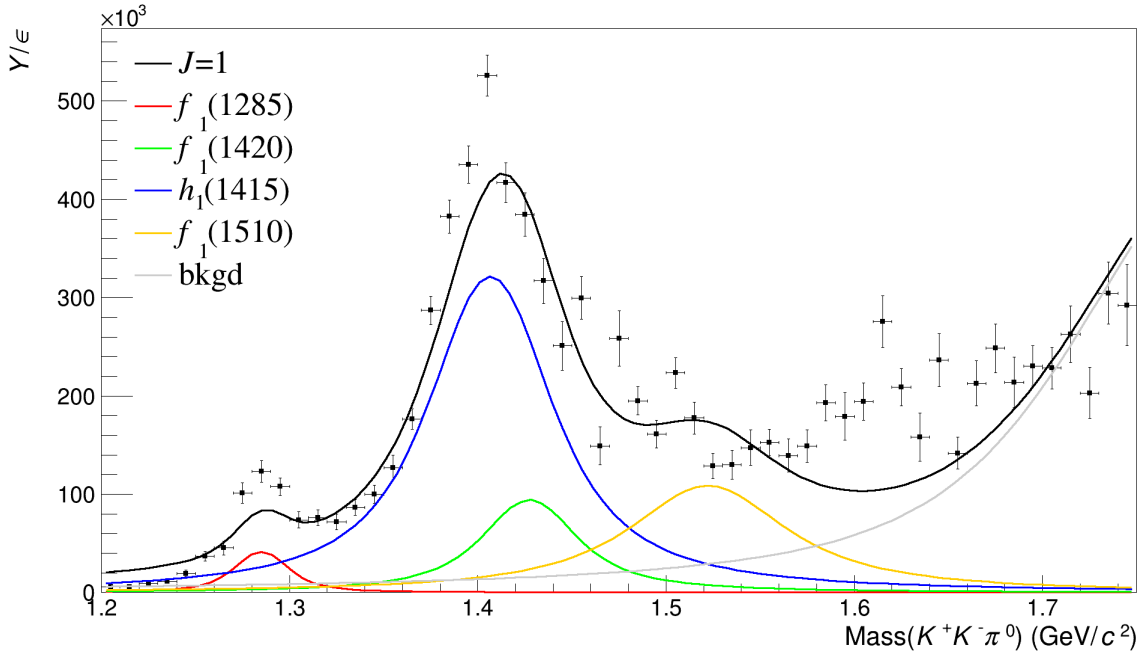


ASU

Second comparison

Config 4

- $J=0, l=0, s=0, a_0(980)$ η
- $J=0, l=1, s=1, I=0, K^*$ η
- $J=1, l=1, s=0, a_0(980)$ f_1
- $J=1, l=0, s=1, I=0, K^*$ f_1, h_1
- $J=1, l=2, s=1, I=0, K^*$ f_1, h_1
- $J=1, l=1, s=1, I=0, K^*$ ϕ
- $J=1, l=1, s=1, I=1, K^*$ ρ
- **$J=2, l=2, s=0, a_0(980)$** **η_2**

Config 13

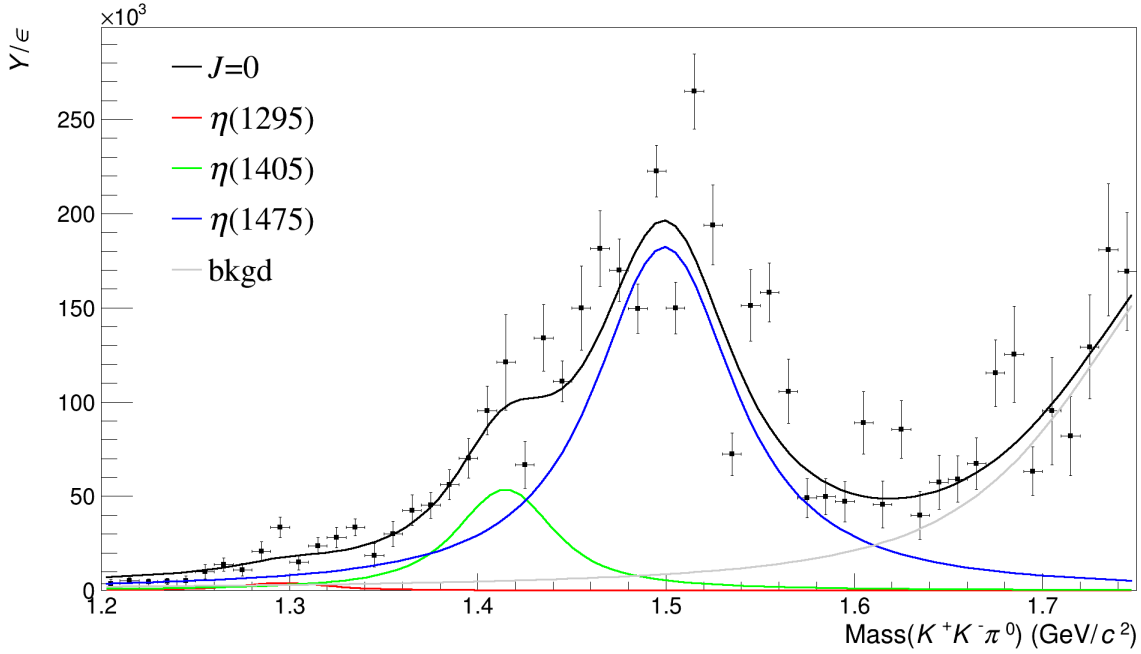
- $J=0, l=0, s=0, a_0(980)$
- $J=0, l=1, s=1, I=0, K^*$
- $J=1, l=1, s=0, a_0(980)$
- $J=1, l=0, s=1, I=0, K^*$
- $J=1, l=2, s=1, I=0, K^*$
- $J=1, l=1, s=1, I=0, K^*$
- $J=1, l=1, s=1, I=1, K^*$
- **$J=2, l=1, s=1, I=0, K^*$** **η_2**

$\Sigma LL(4) > \Sigma LL(13)$

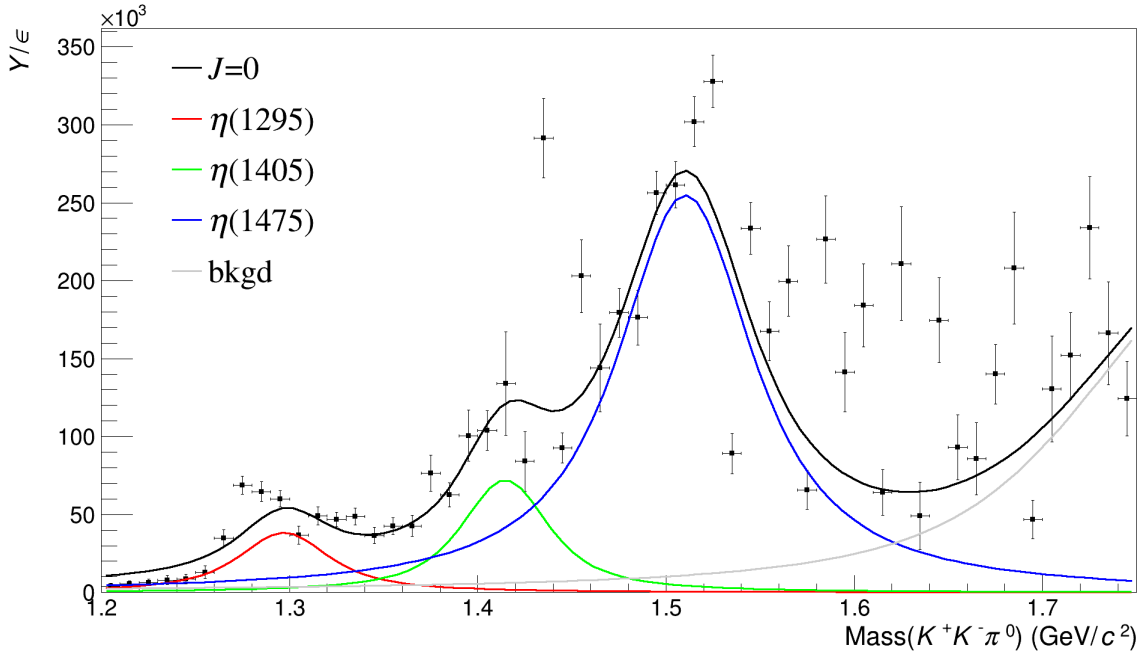
$J = 0$

Config 4

✓



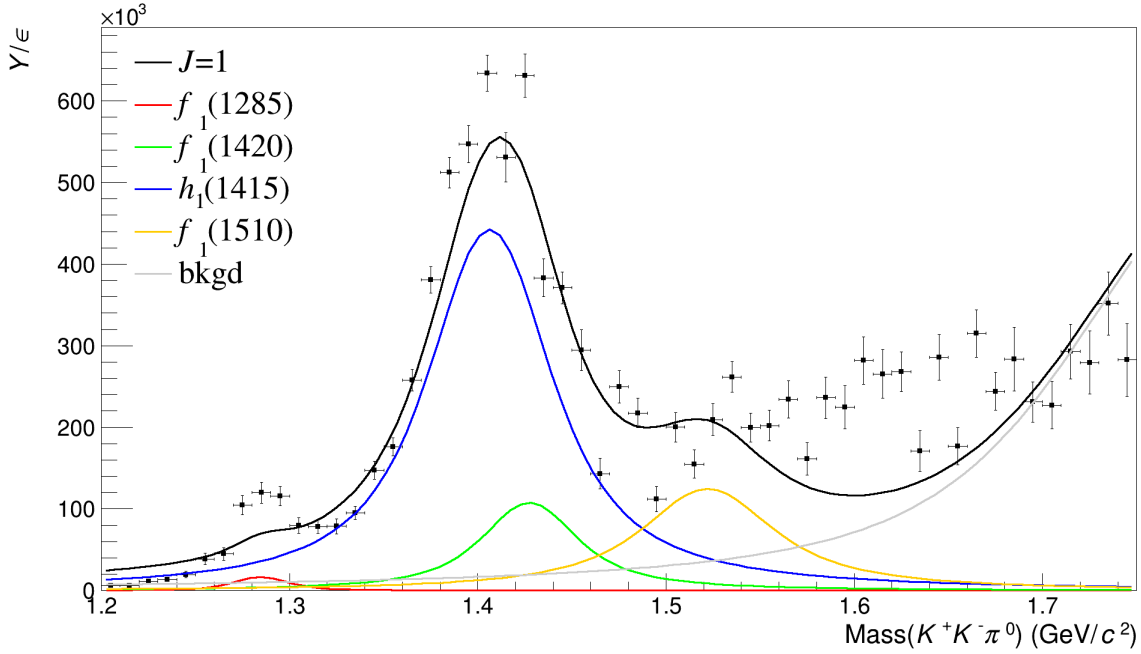
Config 13



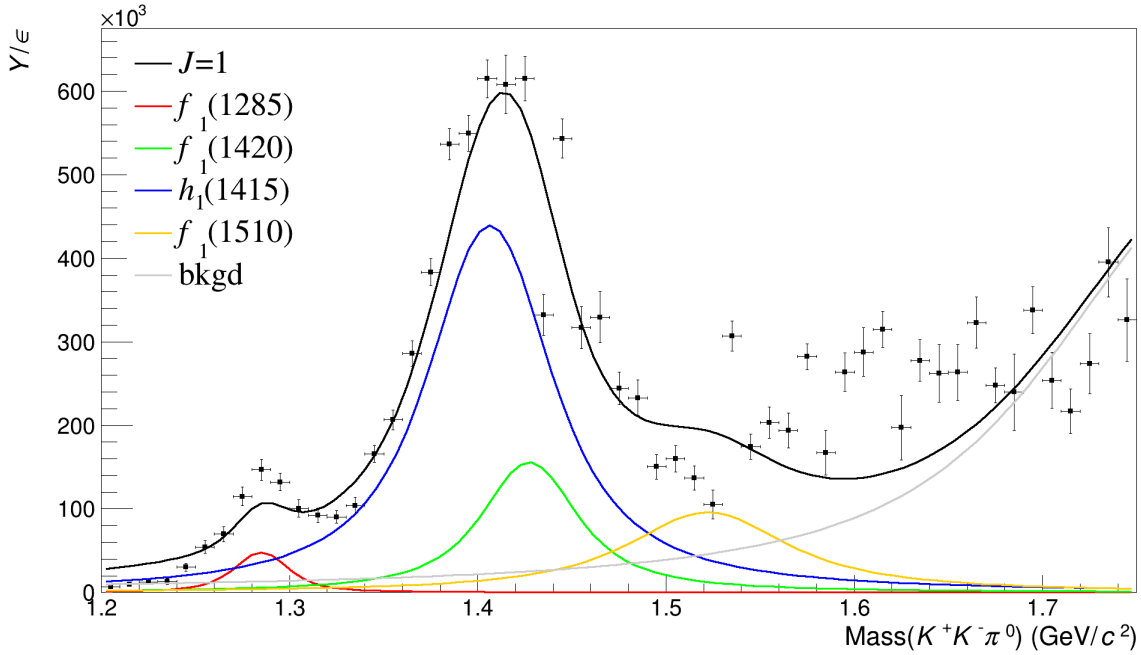
$J = 1$

Config 4

✓



Config 13



ASU

Third comparison

Config 6

- $J=0, l=0, s=0, a_0(980)$ η
- $J=0, l=1, s=1, I=0, K^*$ η
- $J=1, l=1, s=0, a_0(980)$ f_1
- $J=1, l=0, s=1, I=0, K^*$ f_1, h_1
- $J=1, l=2, s=1, I=0, K^*$ f_1, h_1
- **$J=1, l=1, s=1, I=0, K^*$** **ϕ**
- $J=2, l=2, s=0, a_0(980)$ η_2

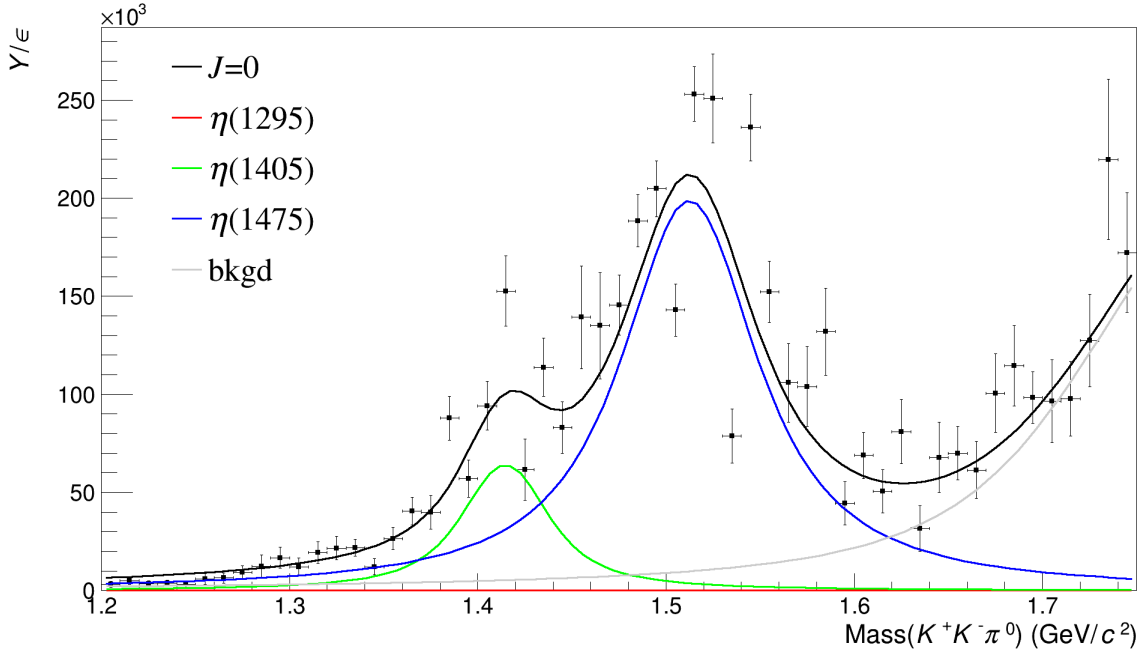
Config 7

- $J=0, l=0, s=0, a_0(980)$
- $J=0, l=1, s=1, I=0, K^*$
- $J=1, l=1, s=0, a_0(980)$
- $J=1, l=0, s=1, I=0, K^*$
- $J=1, l=2, s=1, I=0, K^*$
- **$J=1, l=1, s=1, I=1, K^*$** **ρ**
- $J=2, l=2, s=0, a_0(980)$

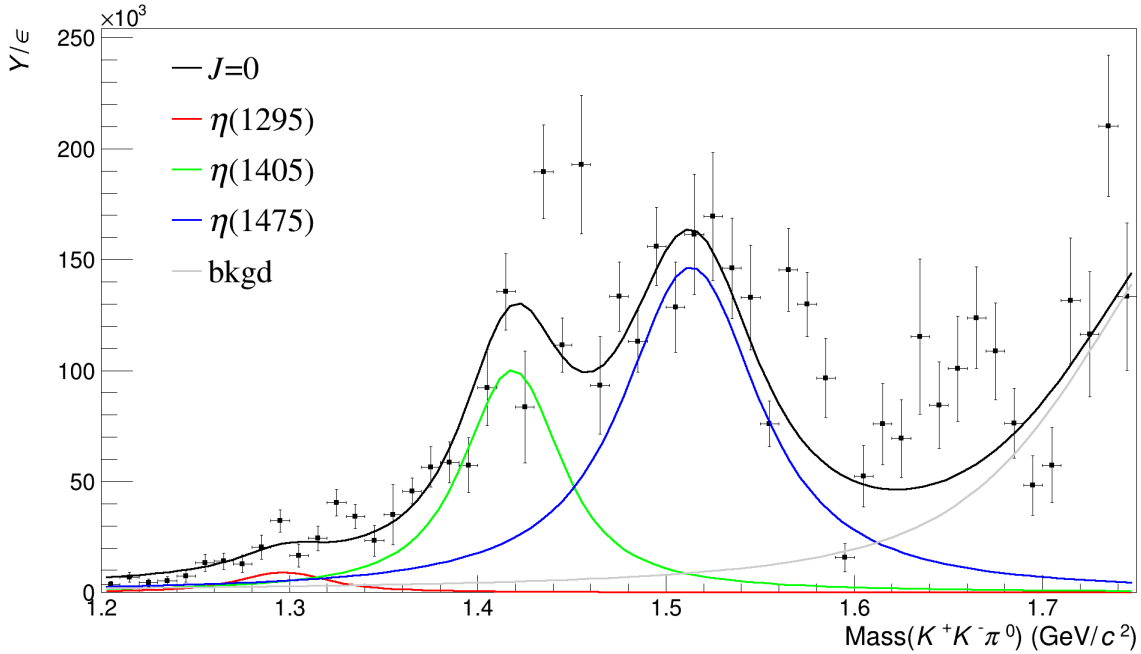
$\Sigma LL(6) > \Sigma LL(7)$

$J = 0$

Config 6



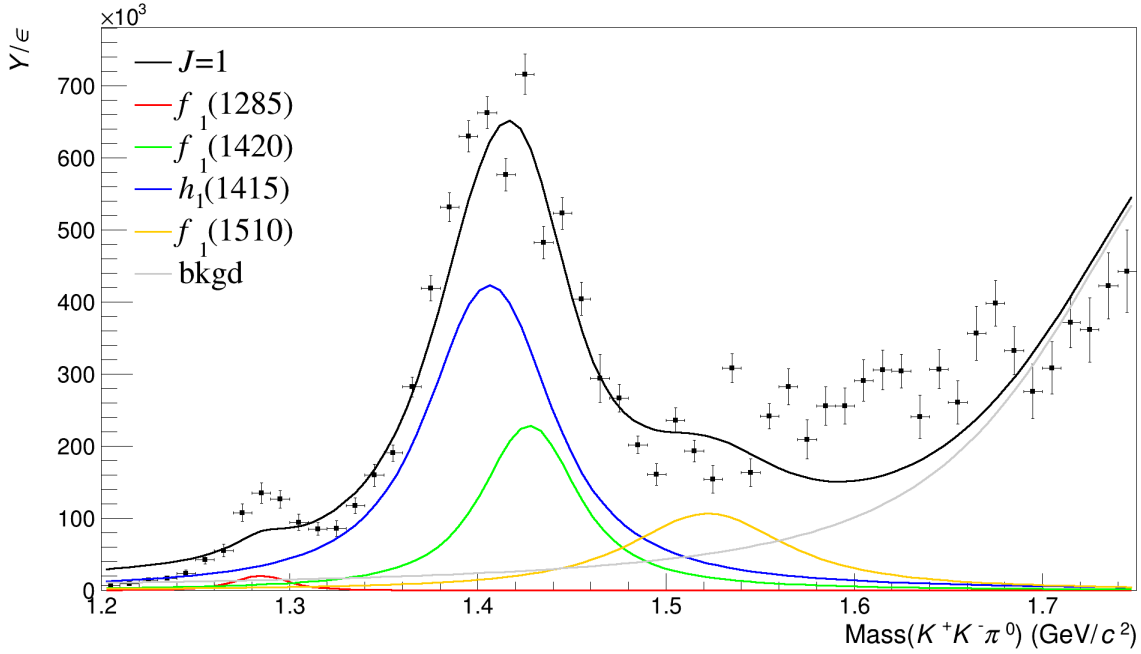
Config 7



$J = 1$

Config 6

✓



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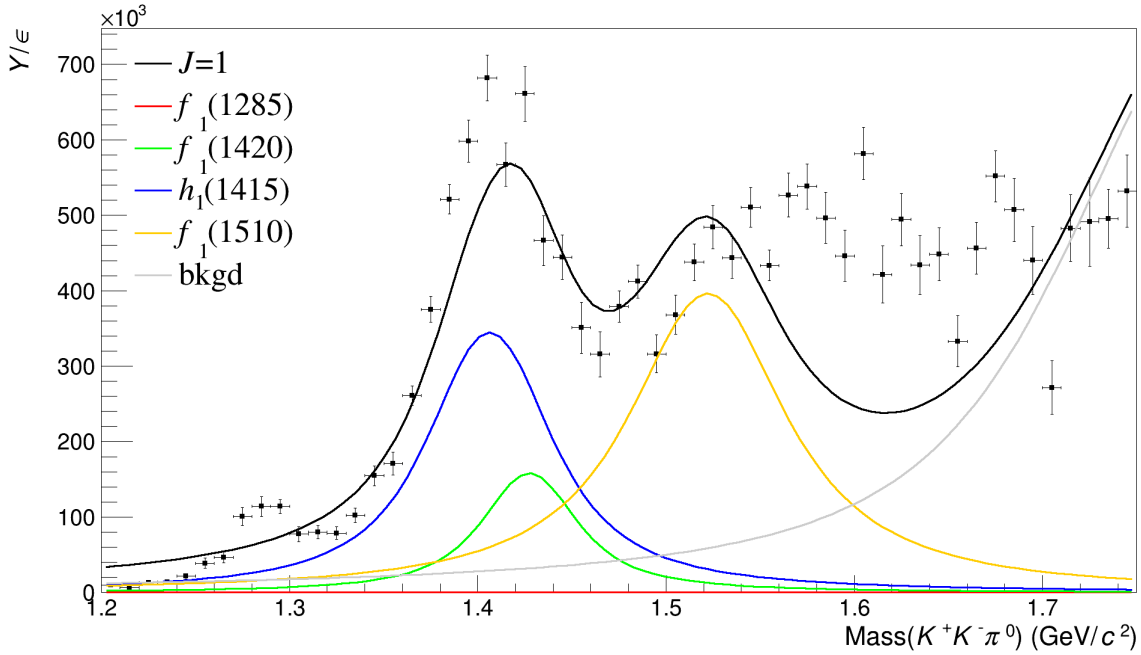

Next steps

- Compare likelihoods on a bin-by-bin basis, instead of comparing likelihood sum across all bins
- Consider statistical significance of likelihood ratio test (LRT)