Group meeting
February 9th, 2024

Instruction responsibilities

- Classes:
  - PHY 252:
    - One lecture
    - One exam + creation + grading
    - One homework grading
  - PHY 331:
    - Two lectures
    - Produced example problems for exam 2
- Undergraduate independent study and research:
  - Luis:
    - Talked about Chapter 7 of Griffiths particle book
    - Talked about axion papers and calculations of probabilities for axion and pseudoscalar creation using photons in a static magnetic field.
  - Preston:

Committee responsibilities

- Committee:
  - ASU Faculty Activity Report (FAR) Committee:
    - Scored 2 faculty members
    - Attended meeting that was to help committee members align methods of scoring
    - Created example Excel spreadsheet for computing weighted average to share with a committee member that was having difficulty
  - GlueX Compton Analysis Review Committee:
    - Got on mailing list
    - Printed analysis note in preparation of creating review notes

Group responsibilities

- Designated Barry as no longer being shift eligible
- Met with Katelyn Tuesday and Thursday

Presentation given at Vector-Pseudoscalar meeting on January 31st

$K^+K^-\pi^0$ update

Isobar fits
and
comparison of real to fake data

Included waves

- Uniform background

- $J = 0$:
  - $a_0\pi^0$
  - $K^{*+}K^-$
  - $K^{*-}K^+$

Included waves

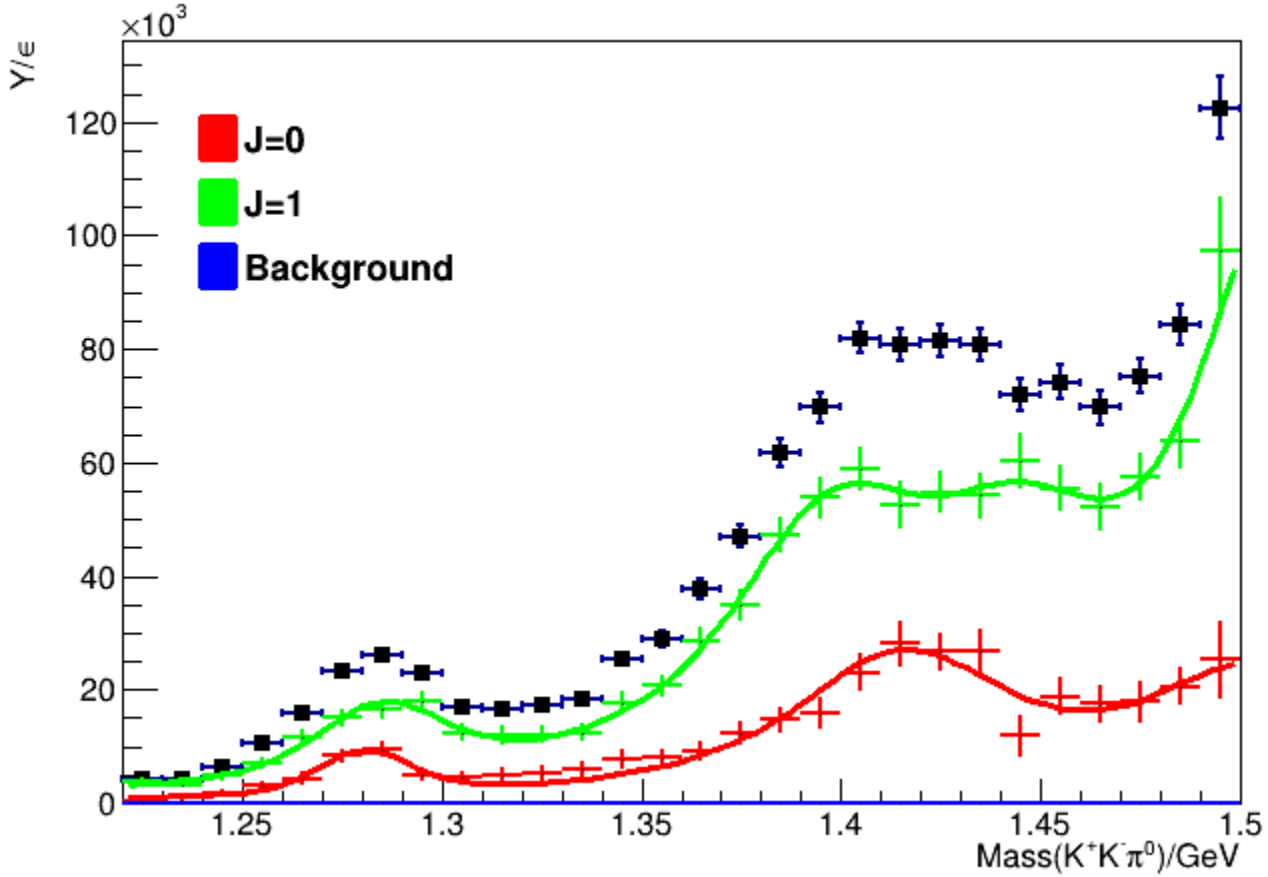
- Uniform background

- $J = 0$:
  - $a_0\pi^0$
  - $K^{*+}K^-$
  - $K^{*-}K^+$

- $J = 1$:
  - $a_0\pi^0$
  - $K^{*+}K^-$ (L=0, and L=1)
  - $K^{*-}K^+$ (L=0, and L=1)

PWA Results for $J = 0,1$ and background

Isobar fit results



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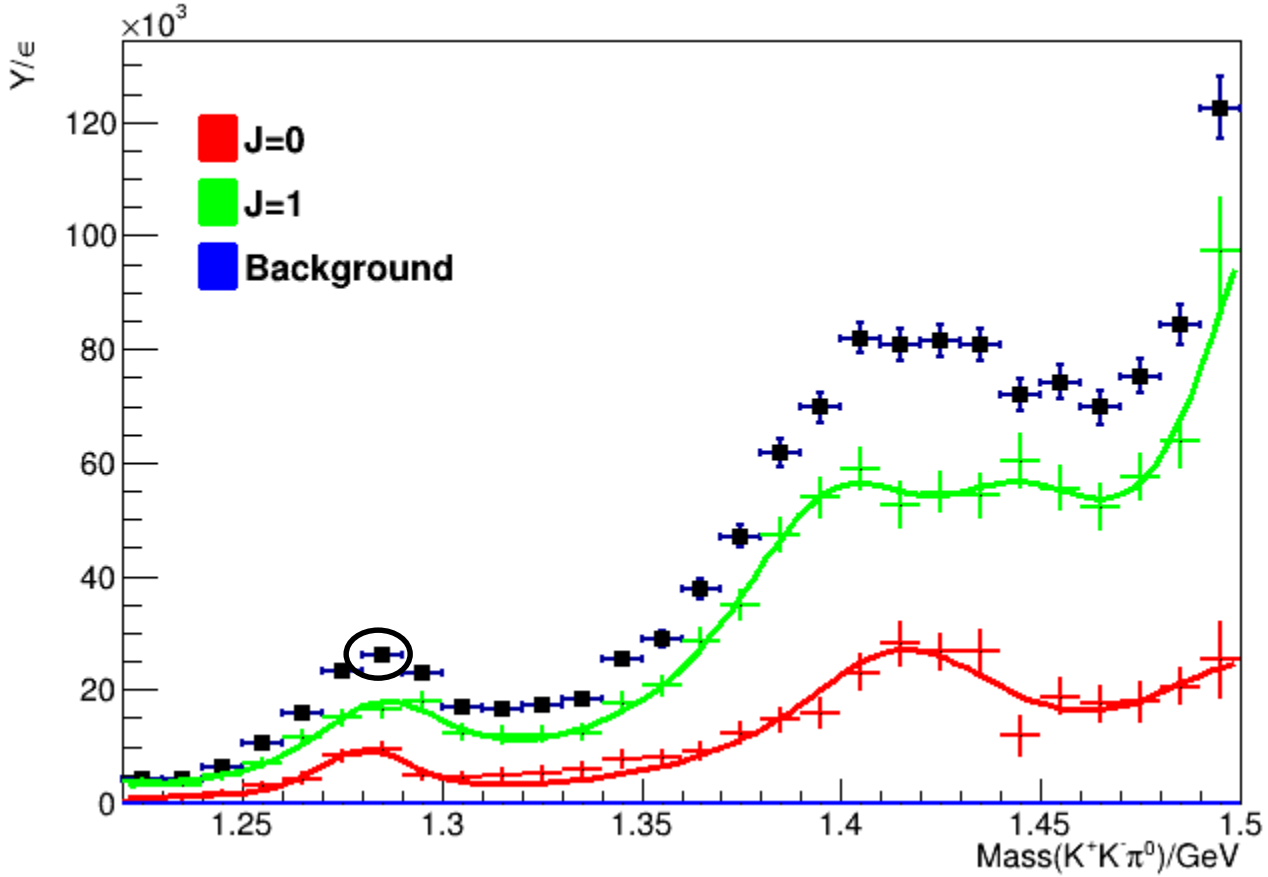

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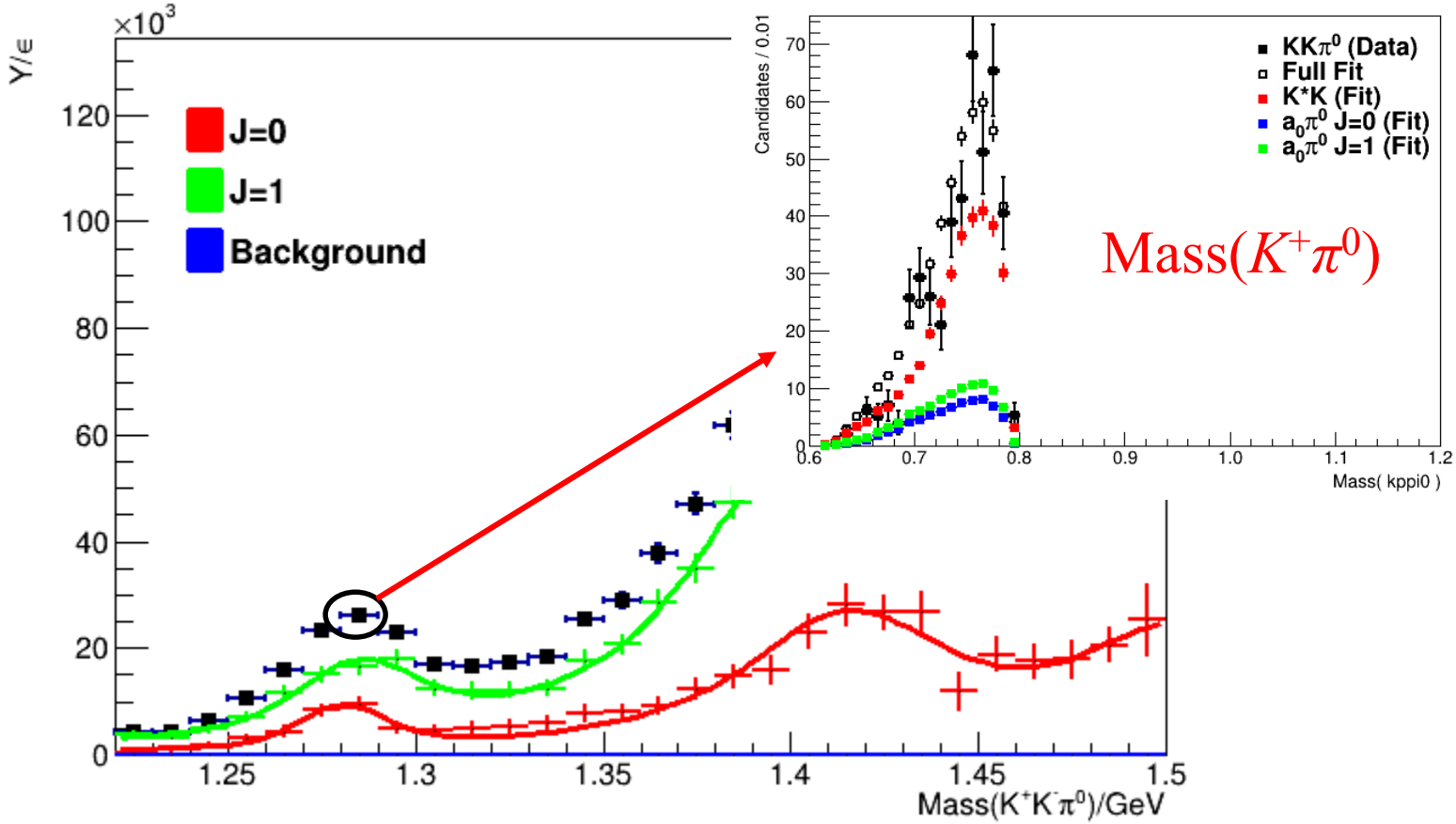

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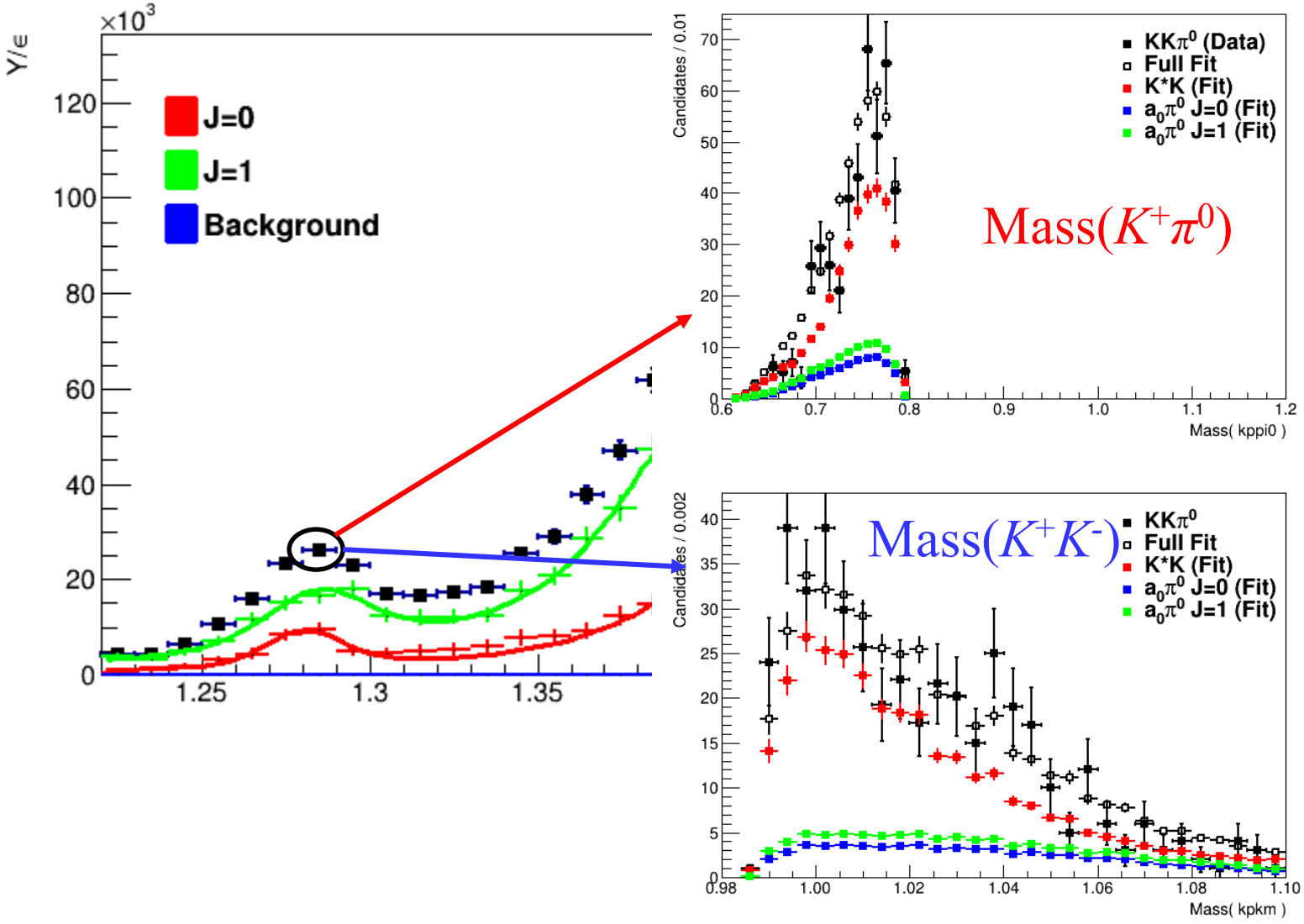

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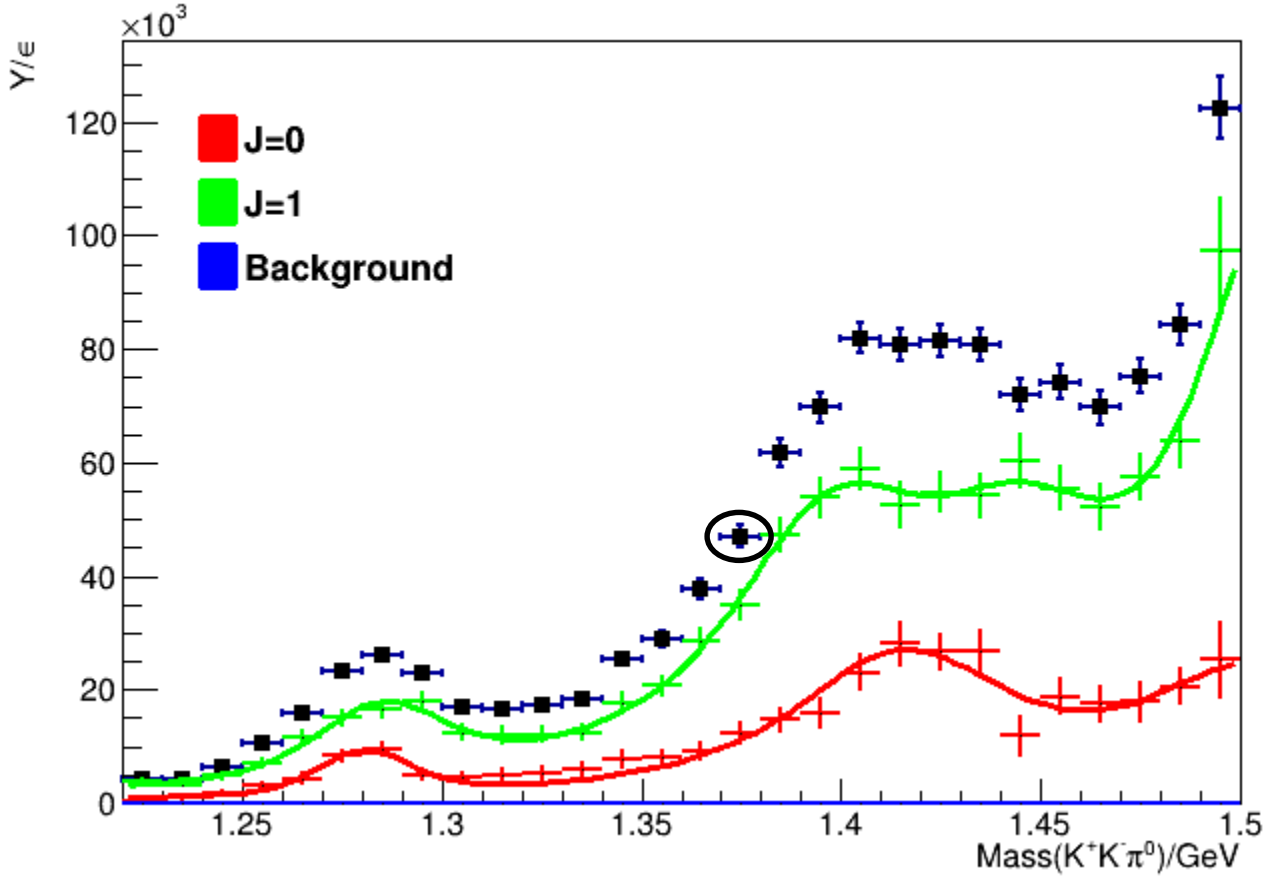

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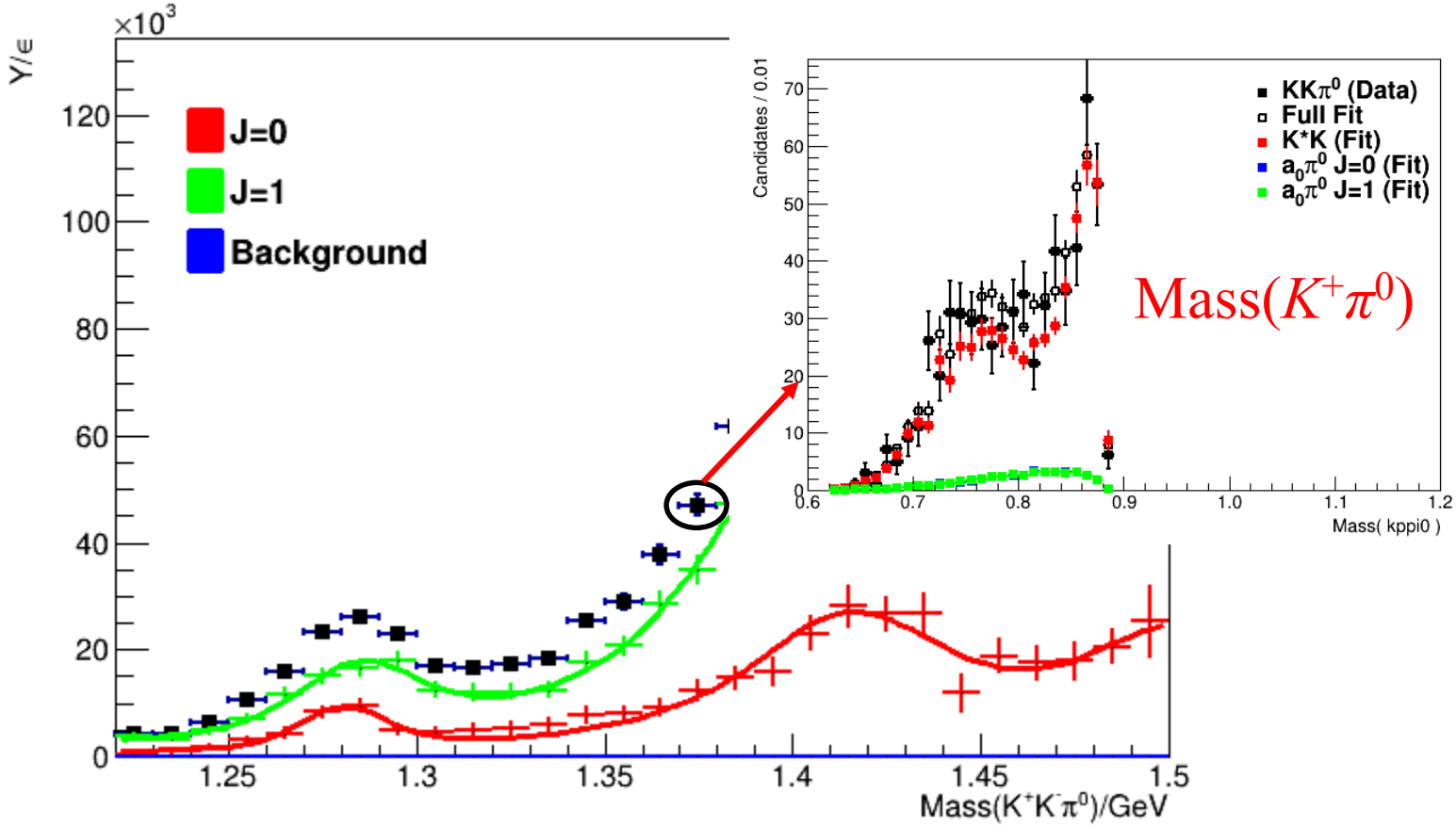

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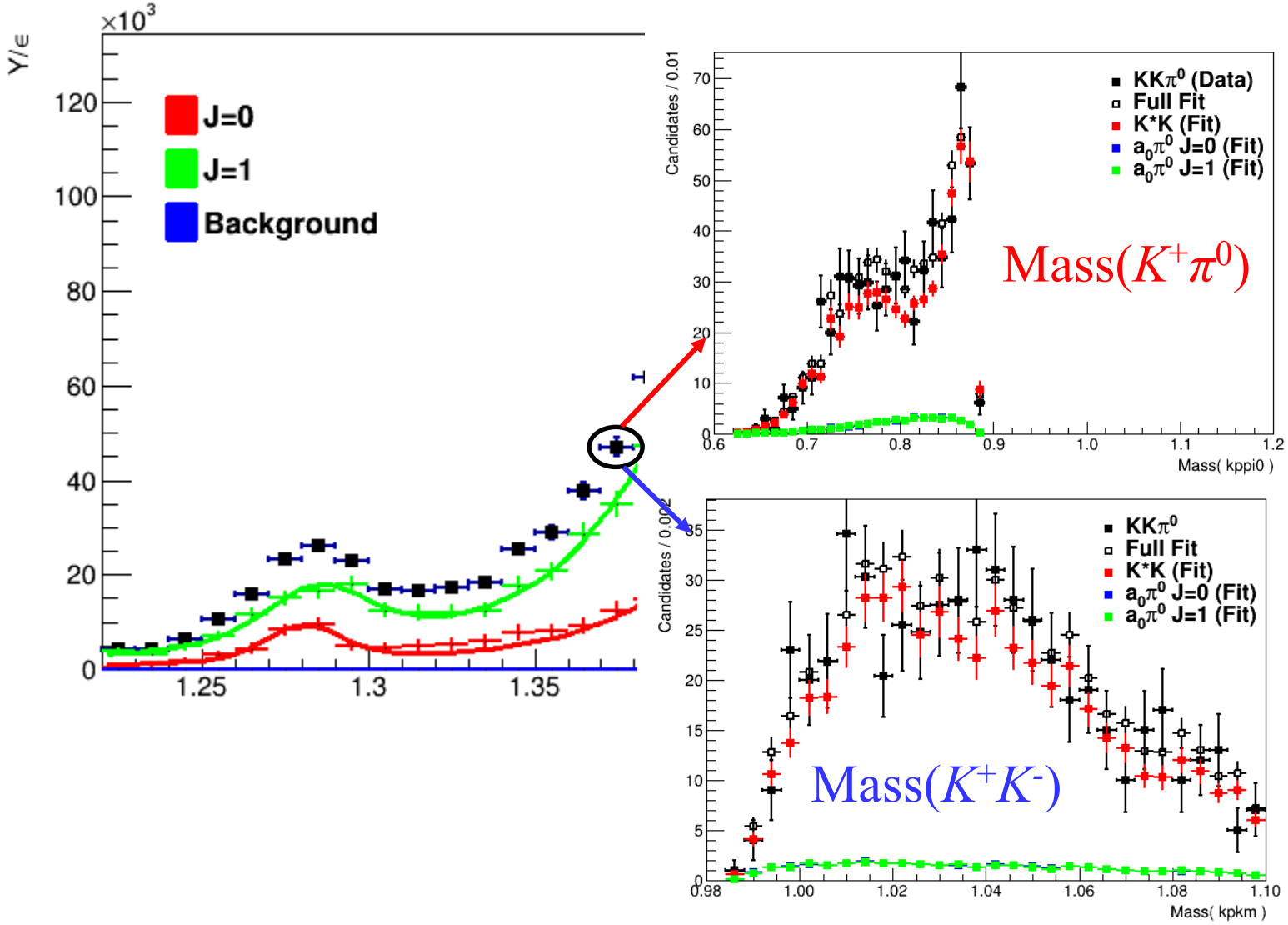

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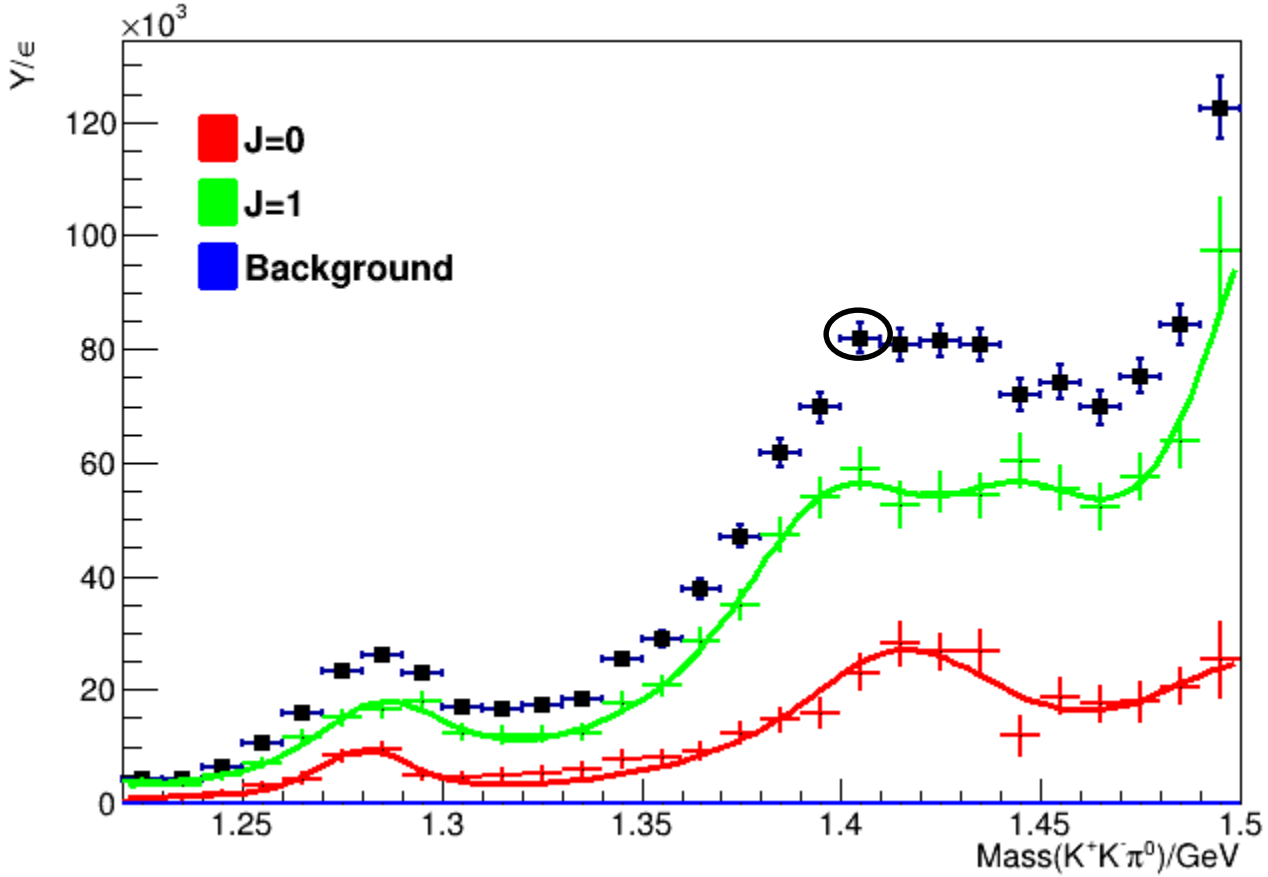

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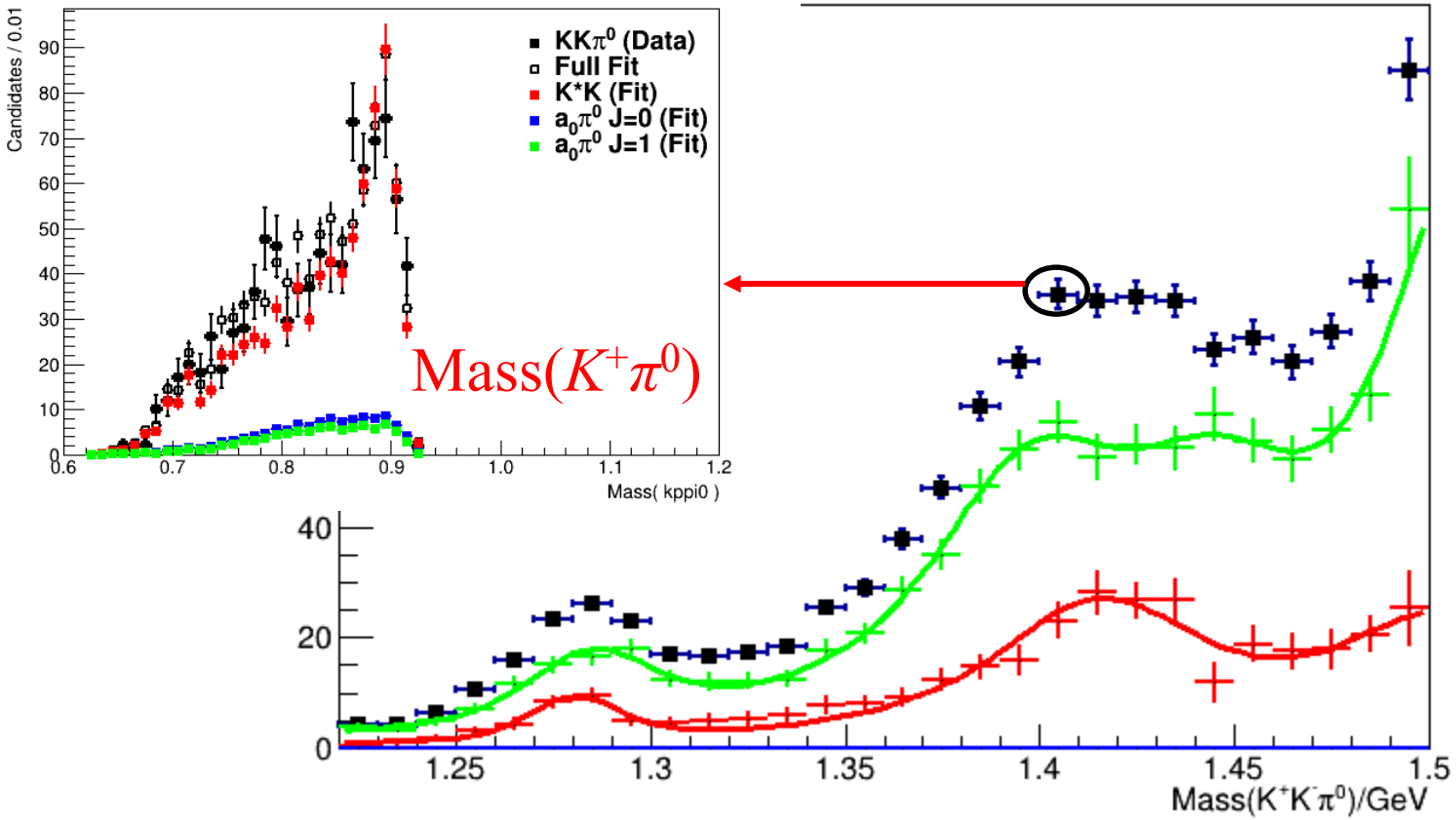

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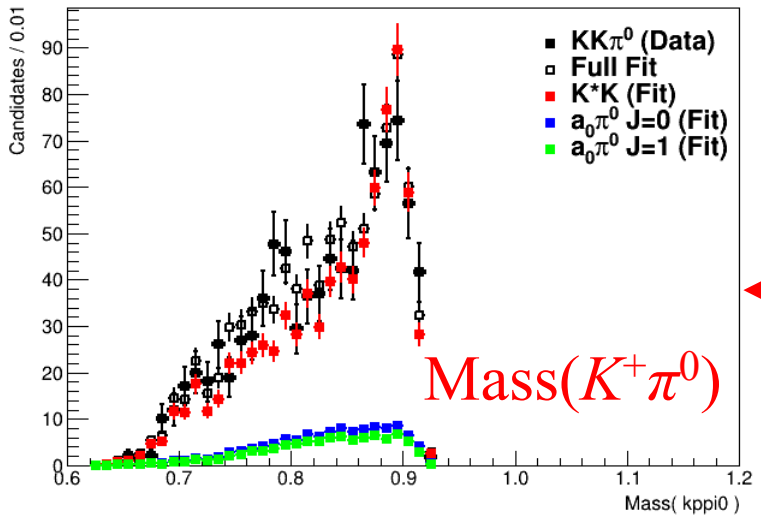
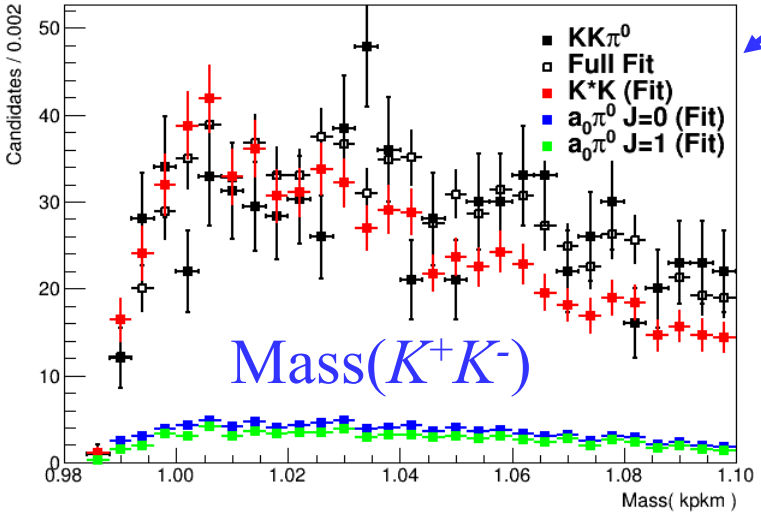
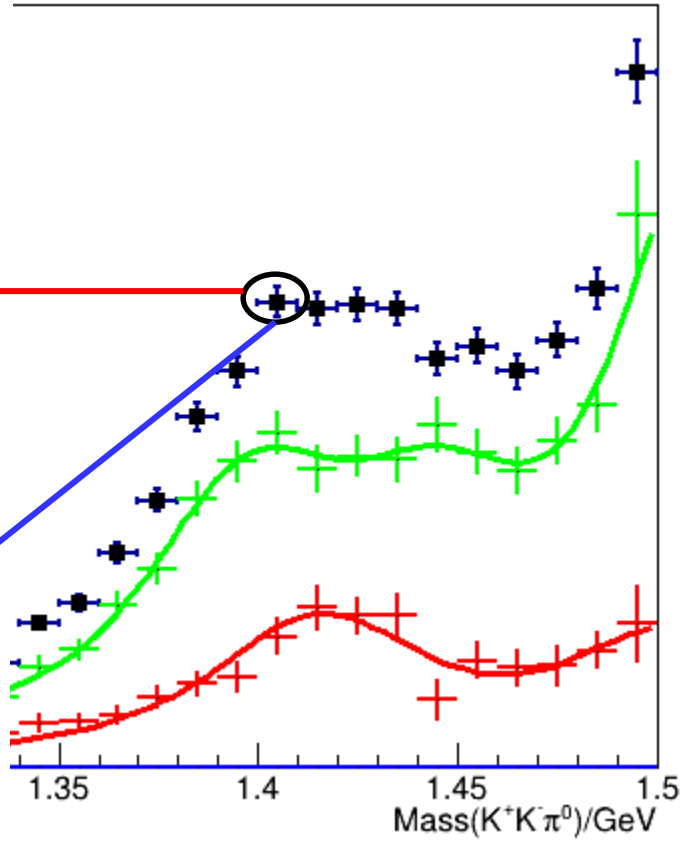
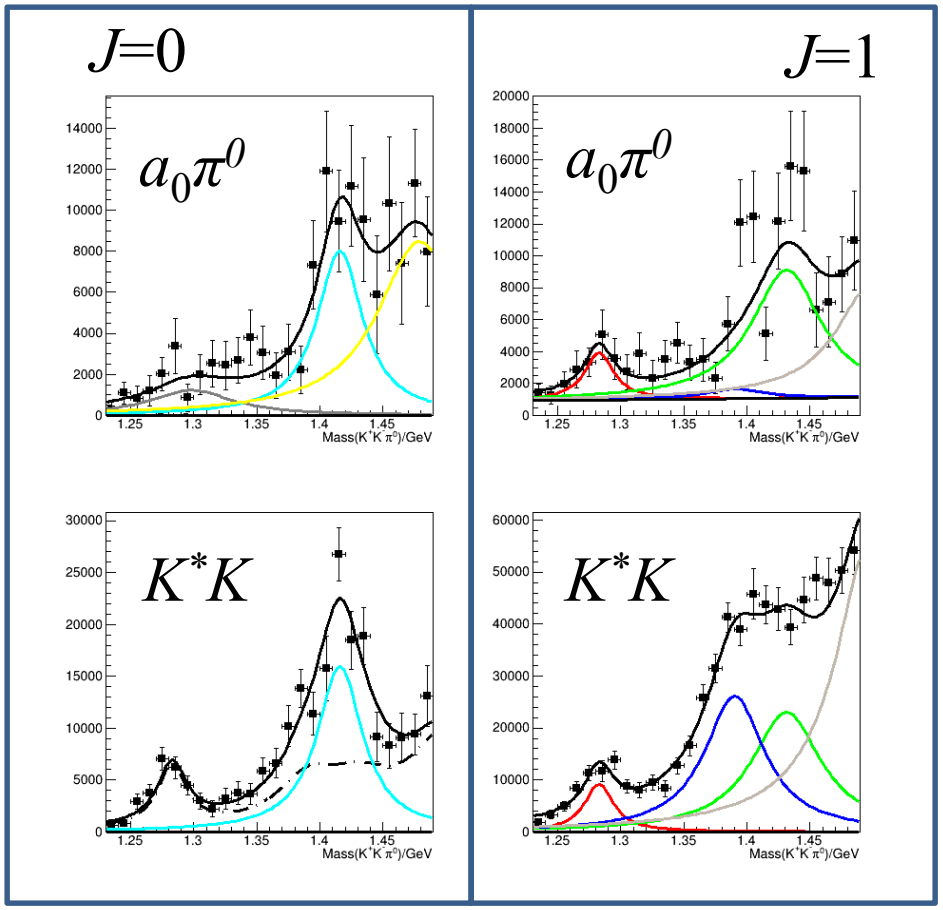






Simultaneous fit



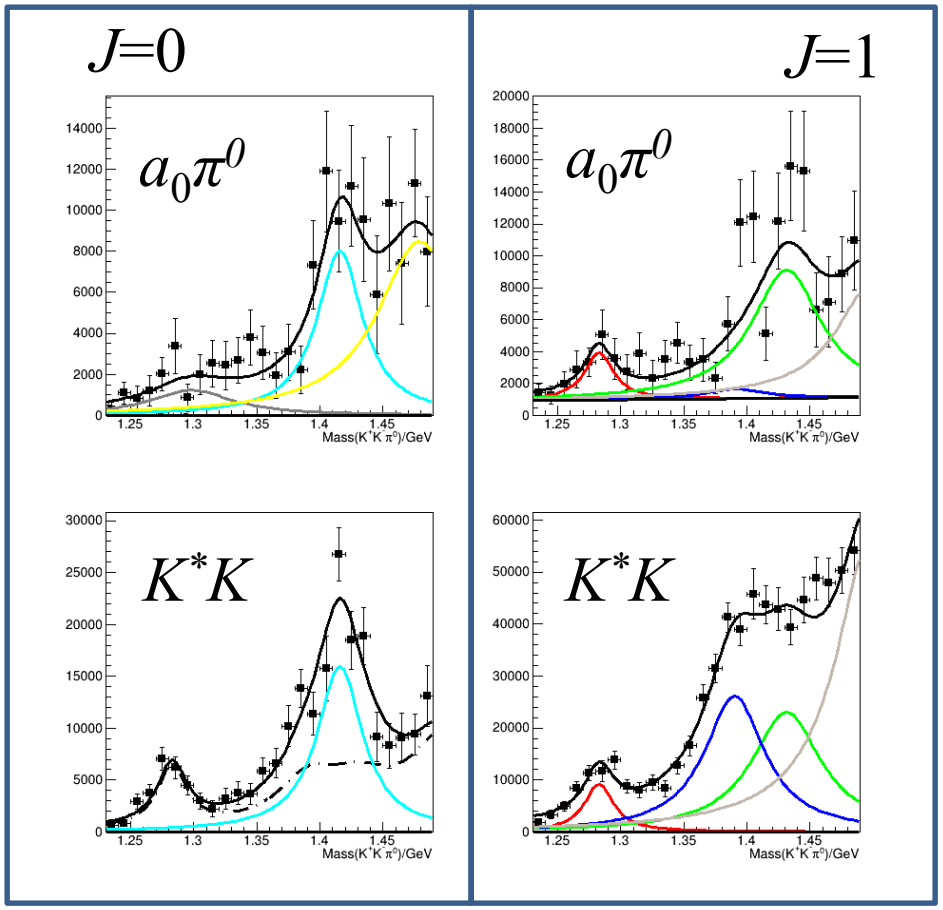
Simultaneous fit

J=0

Gray: $\eta(1295)$

Cyan: $\eta(1405)$

Yellow: $\eta(1475)$



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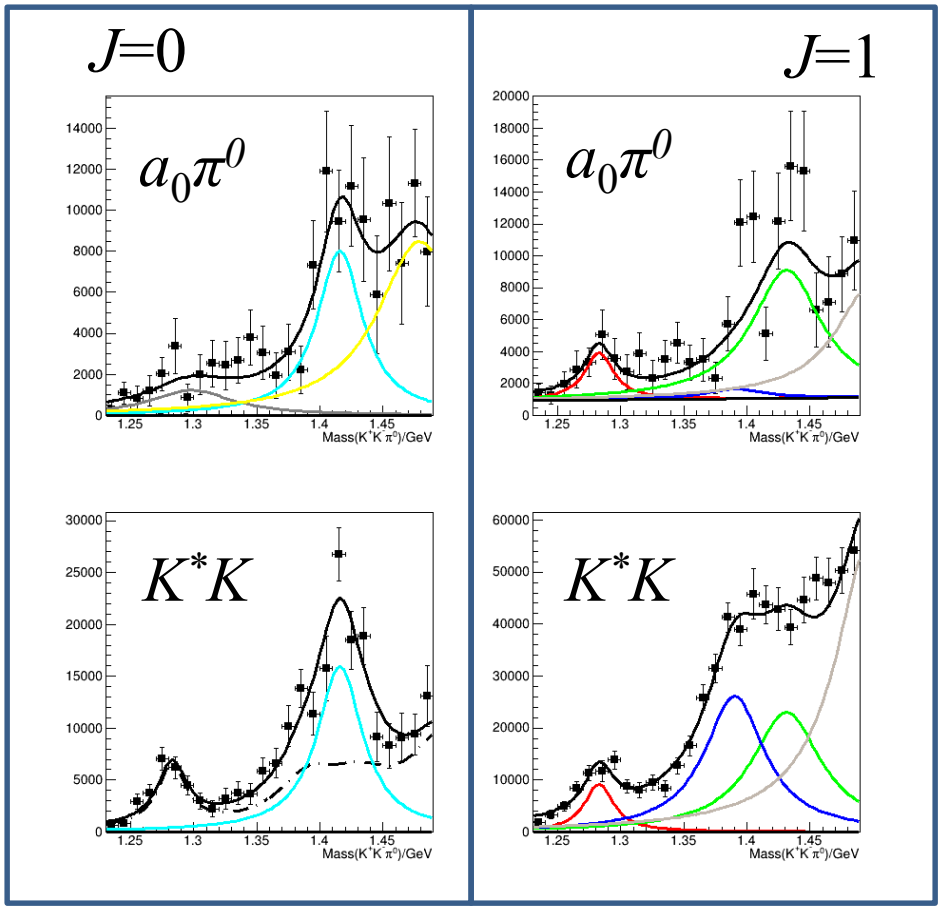

J=1

Red: $f_1(1285)$

Blue: $h_1(1415)$

Green: $f_1(1420)$

Brown: $f_1(1510)$

Simultaneous fit

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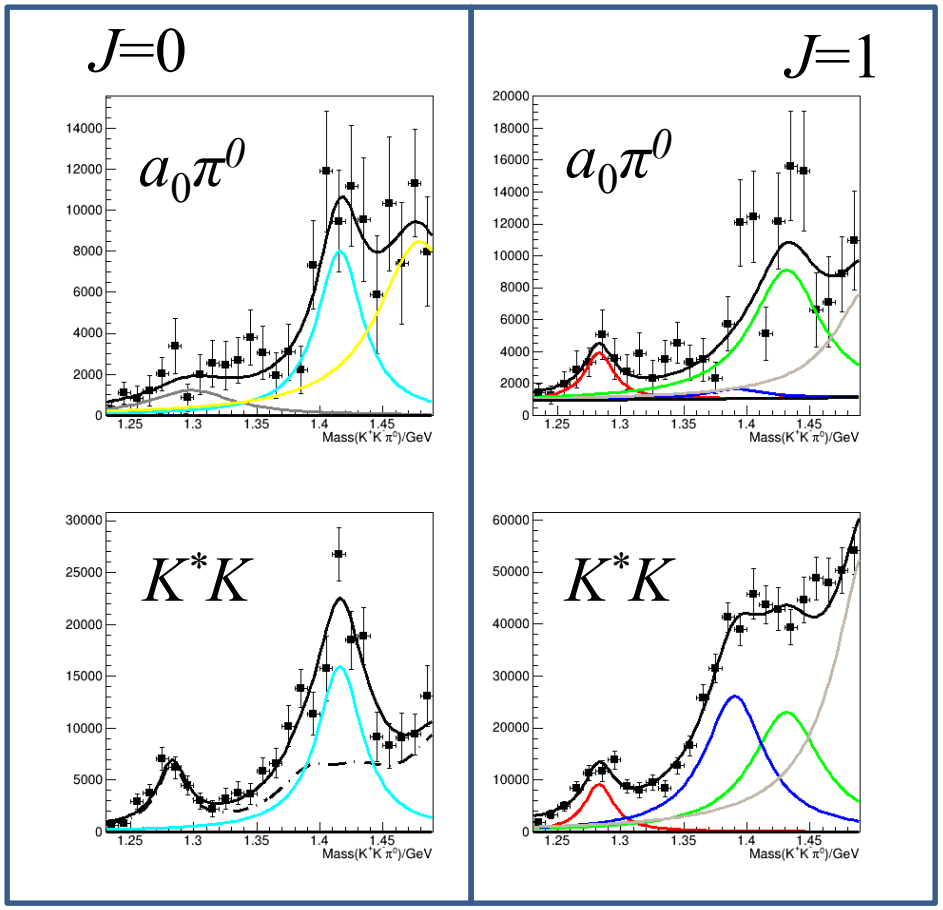

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Red: $f_1(1285)$

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- Dashed-dotted line is estimated leakage of J=1 into J=0

Simultaneous fit

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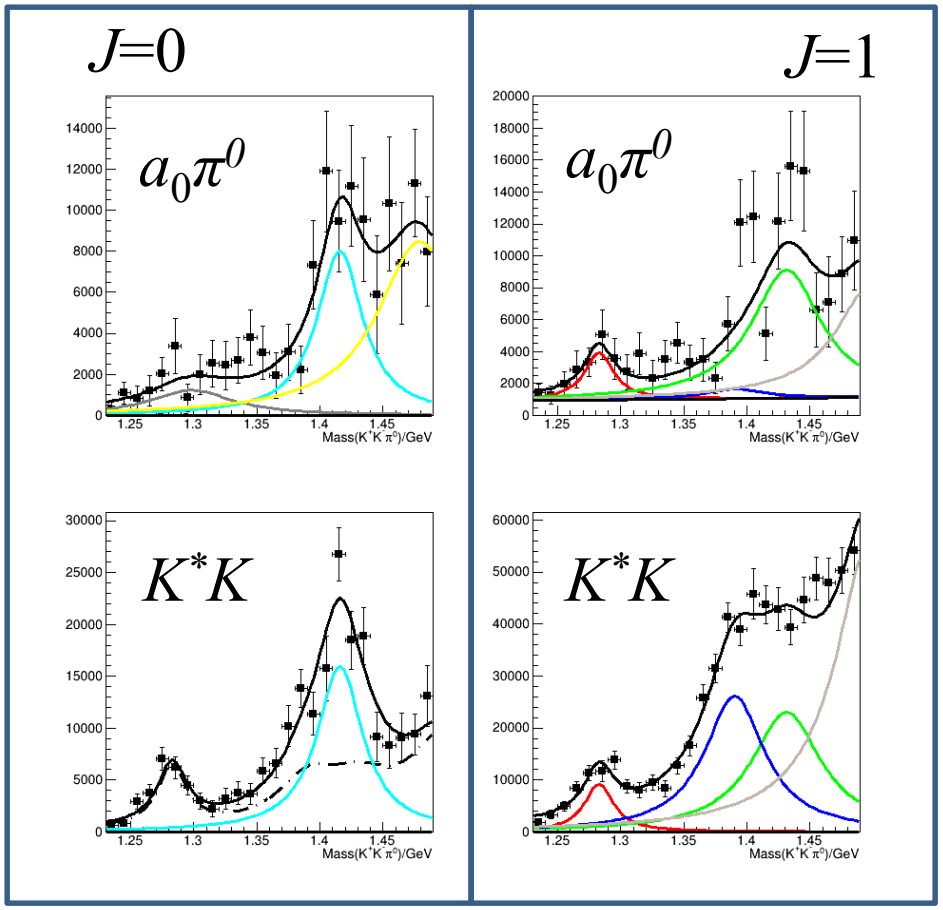

J=1

Red: $f_1(1285)$

Blue: $h_1(1415)$

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- Dashed-dotted line is estimated leakage of J=1 into J=0
- Used parameters (centers and widths) of Breit-Wigners from the above fit to lock down those parameters for mass-dependent fit

Included waves for mass dependent fit

- $J = 0$:

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  - $h_1(1415) \rightarrow K^*K$ (Note: $h_1 \rightarrow a_0\pi^0$ not allowed)

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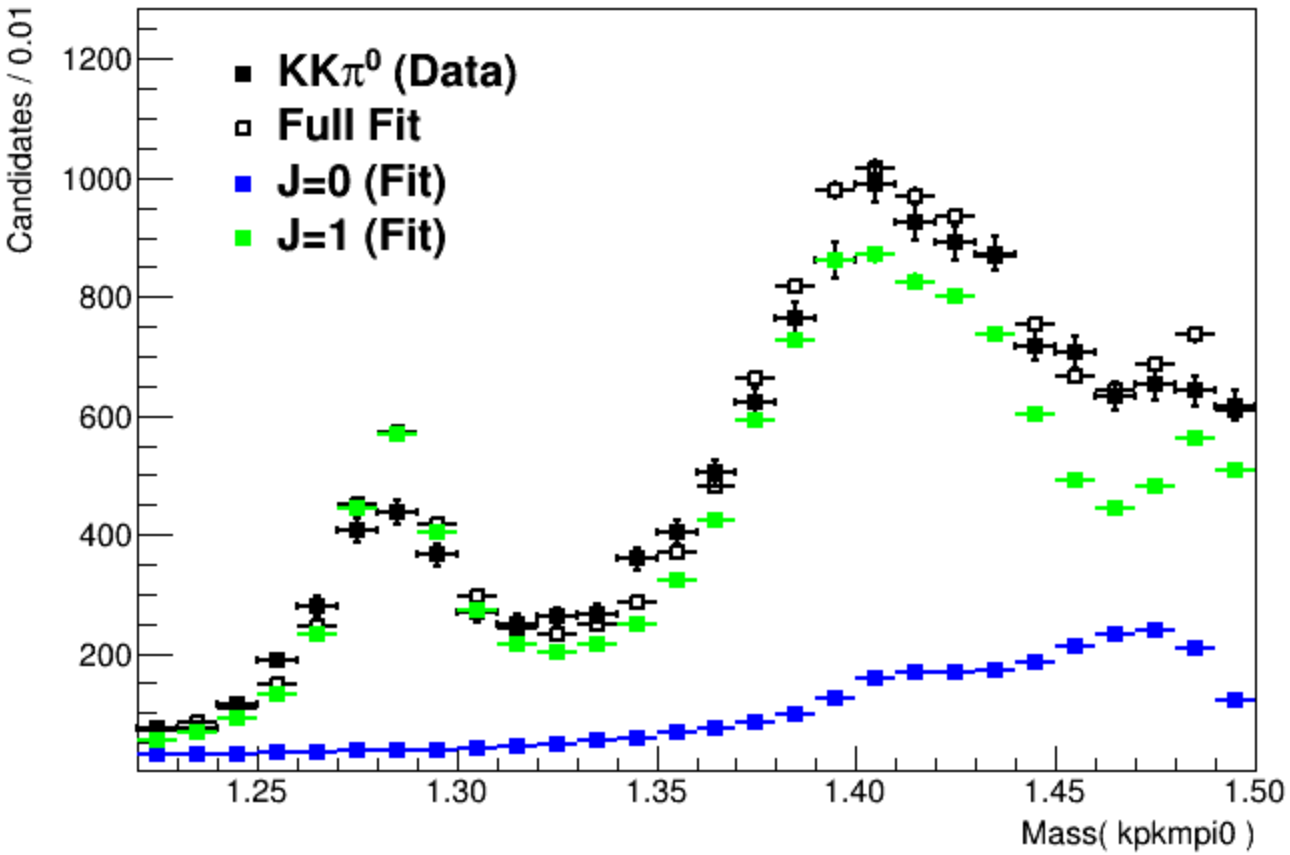
PWA mass-dependent fit



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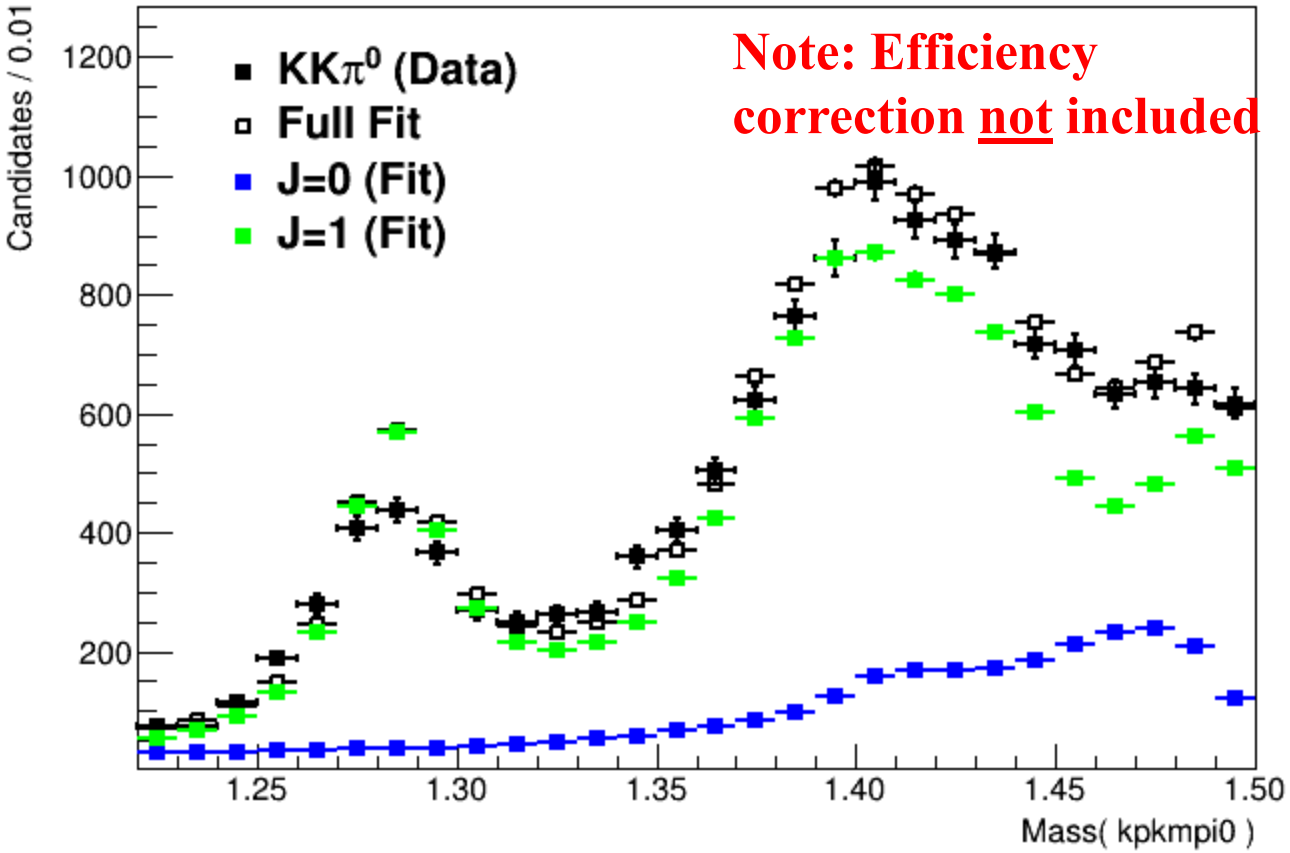

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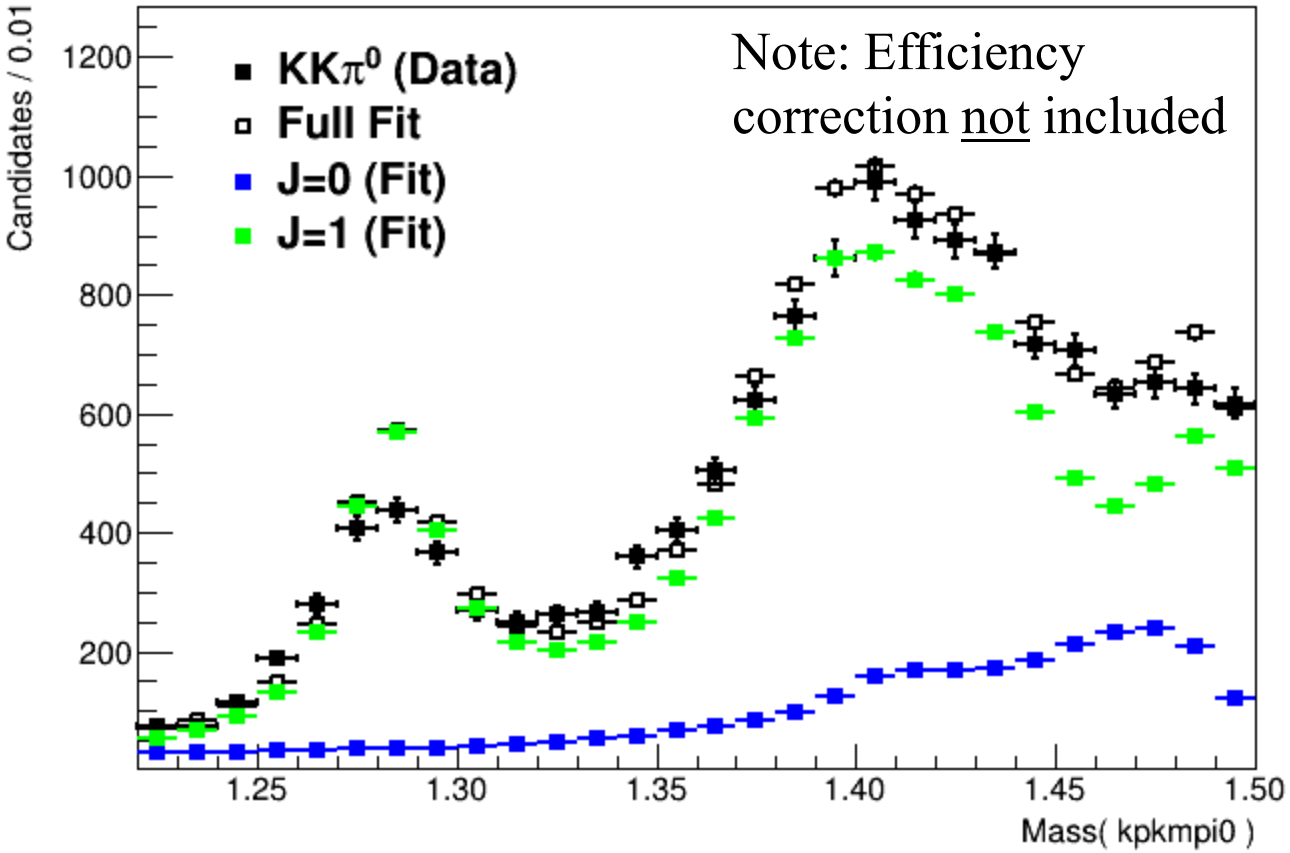

- Used fit parameters from above fit to simulate signal using gen_amp

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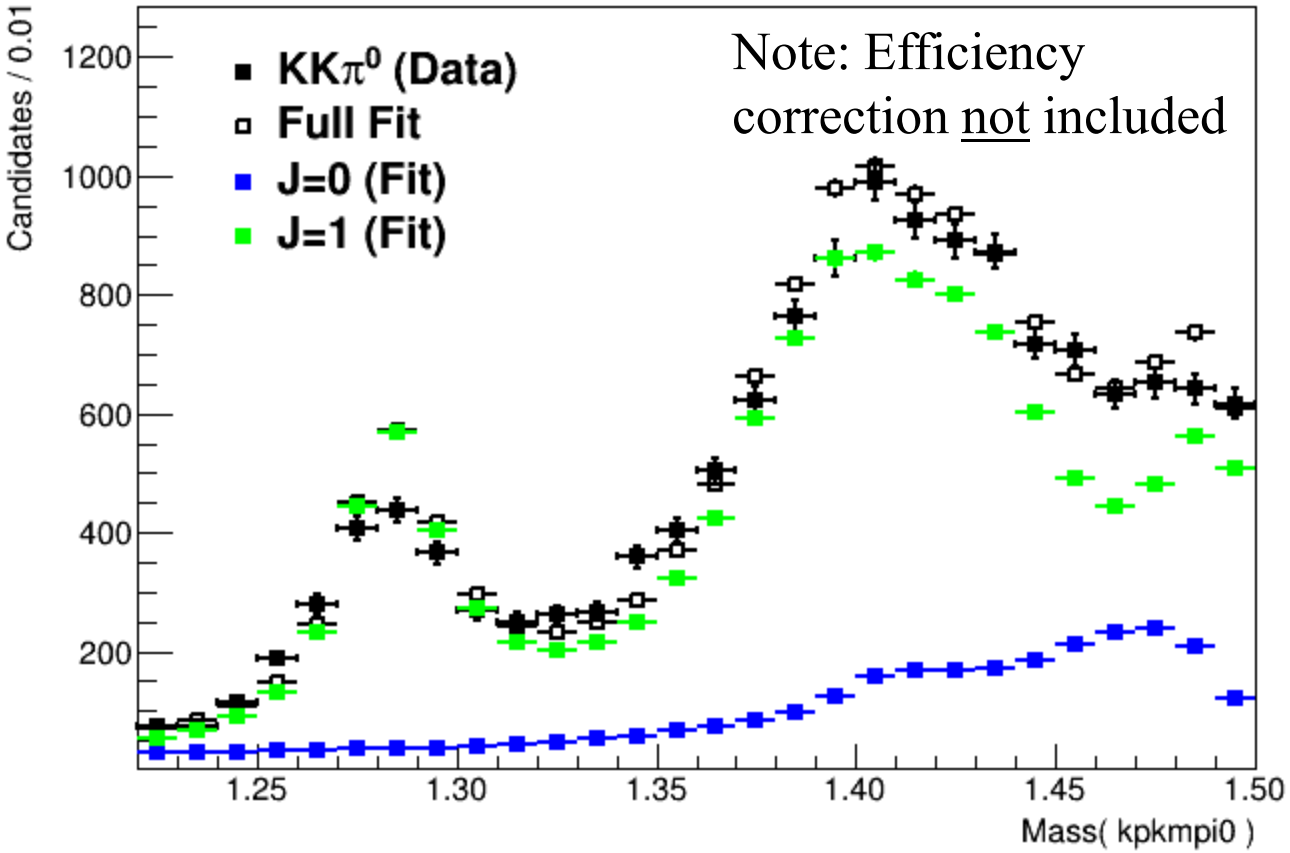

- Used fit parameters from above fit to simulate signal using gen_amp
- Did mass-independent fit using the gen_amp simulation to help verify leakage assumption

Comparison of Mass[$K^+K^-\pi^0$] between efficiency corrected real data and generated (gen_amp)

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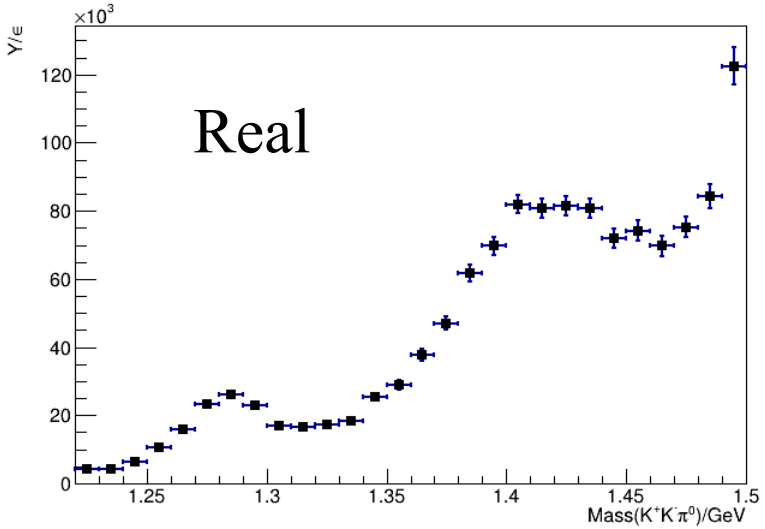

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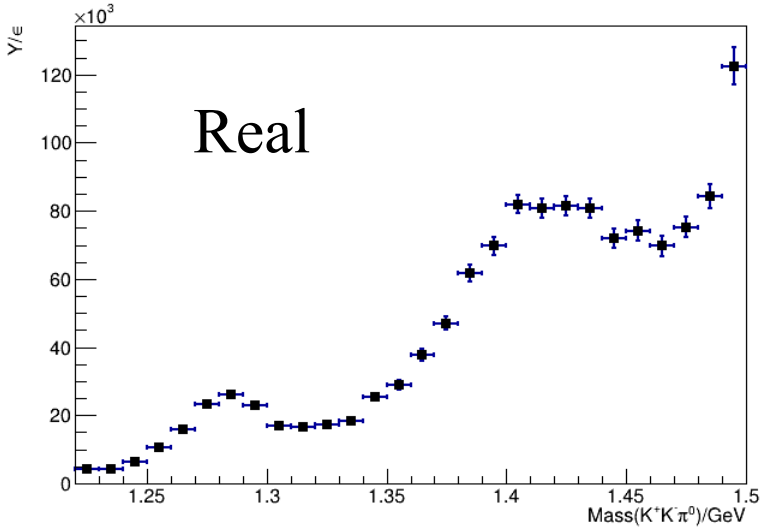

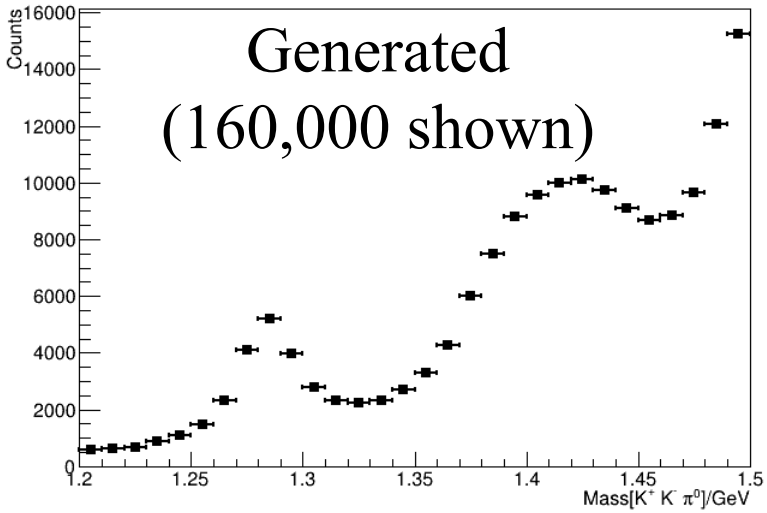

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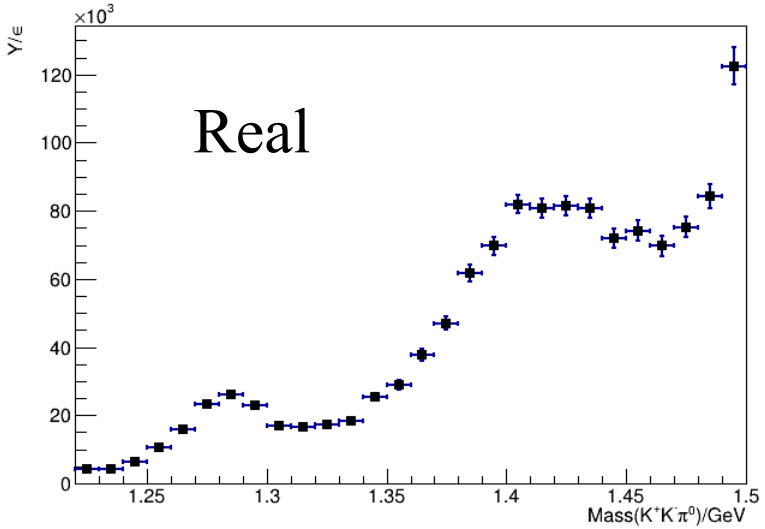
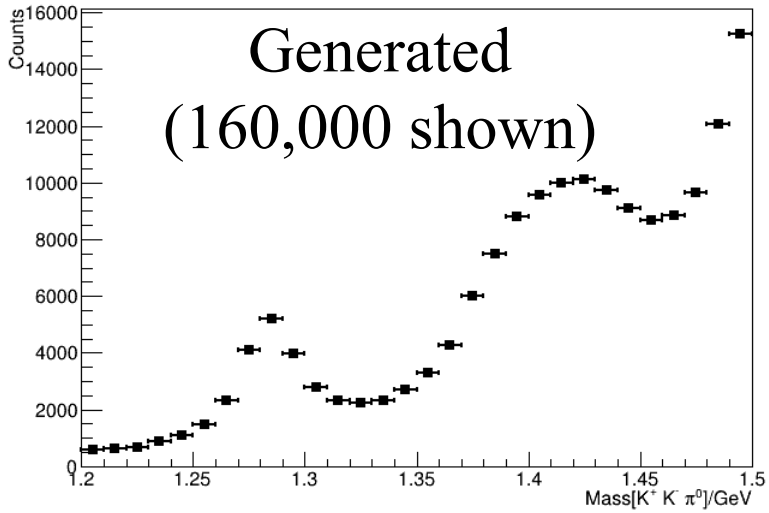
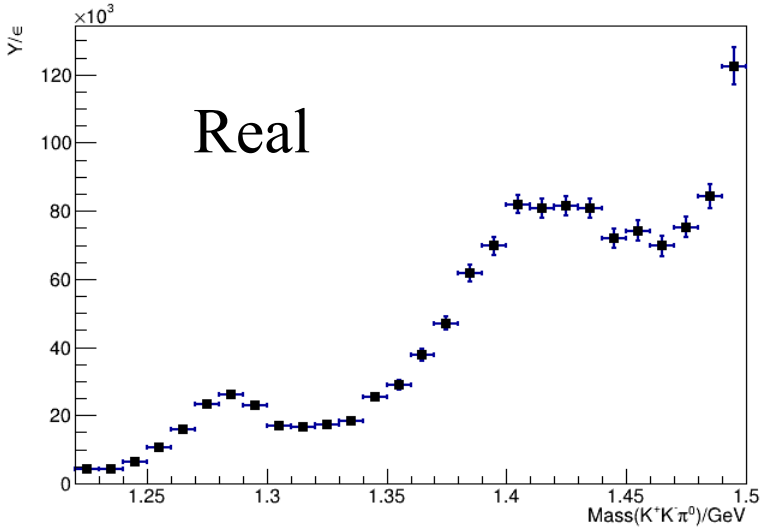
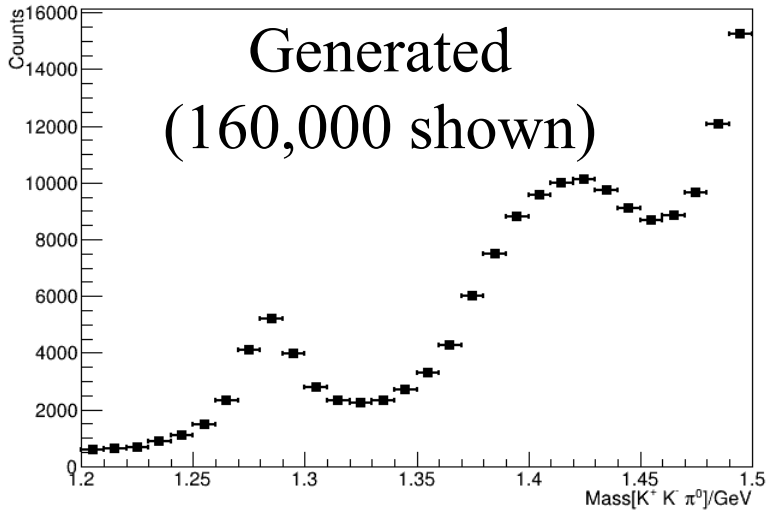




- Integral of efficiency corrected real data = 1.3 million

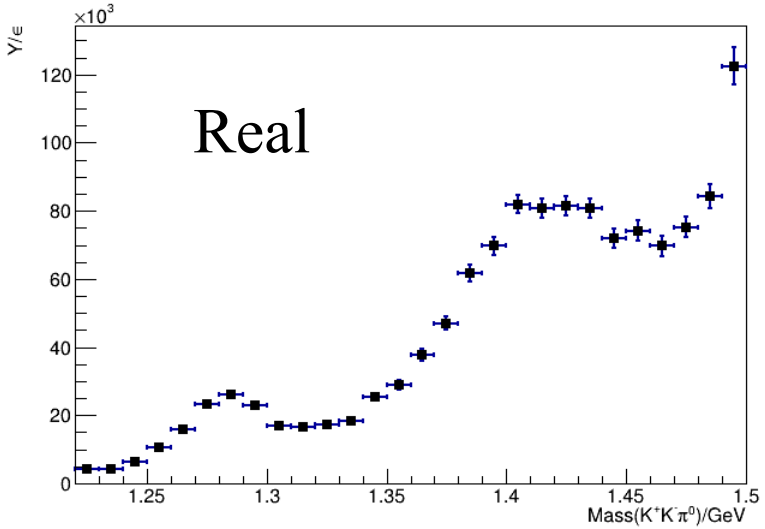
Comparison of Mass[$K^+K^-\pi^0$] between efficiency corrected real data and generated (gen_amp)

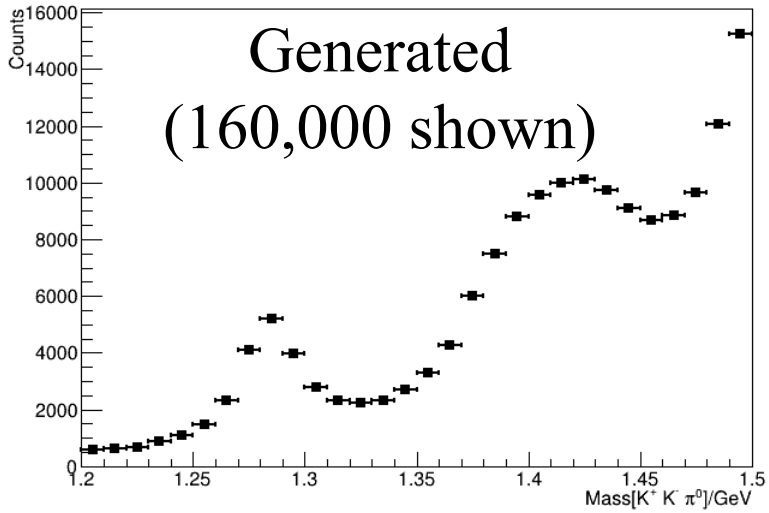




- Integral of efficiency corrected real data = 1.3 million
- More than enough generated data pushed through glueX simulation

Comparison of Mass[$K^+K^-\pi^0$] between efficiency corrected real data and generated (gen_amp)

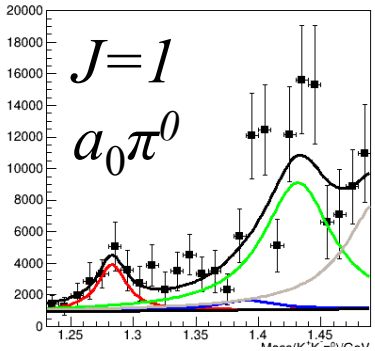




- Integral of efficiency corrected real data = 1.3 million
- More than enough generated data pushed through glueX simulation
- Next step was : PWA of the gen_amp data as though it was real

Comparison of Real to Fake: Mass[$K^+K^-\pi^0$]

REAL



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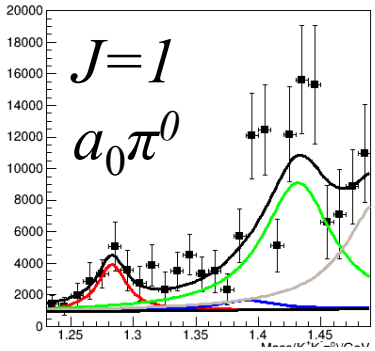

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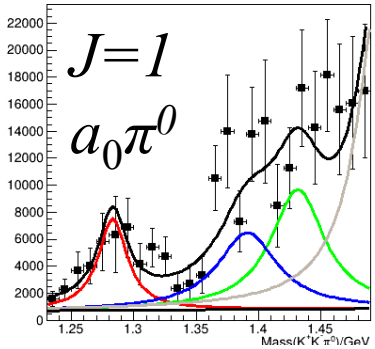

Note:

- $h_1 \rightarrow a_0\pi^0$ (**Blue**) was not generated

Comparison of Real to Fake: Mass[$K^+K^-\pi^0$]

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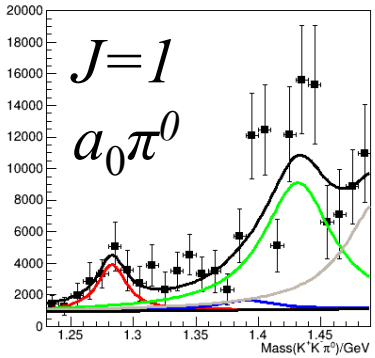

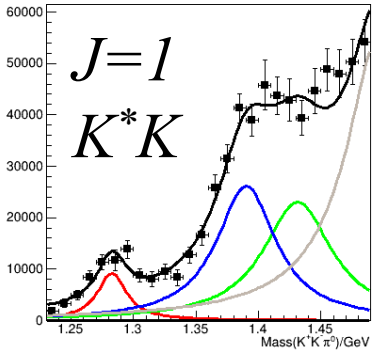

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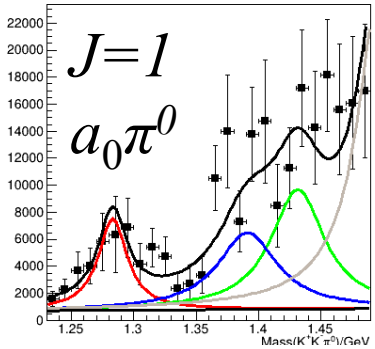

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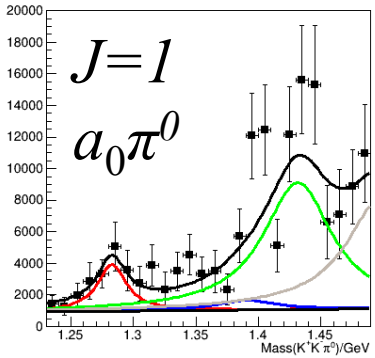

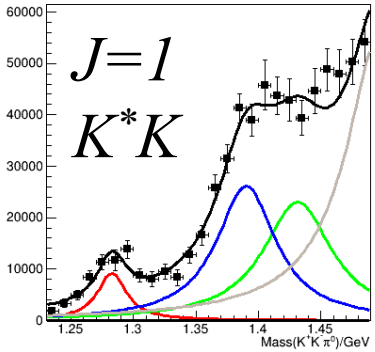

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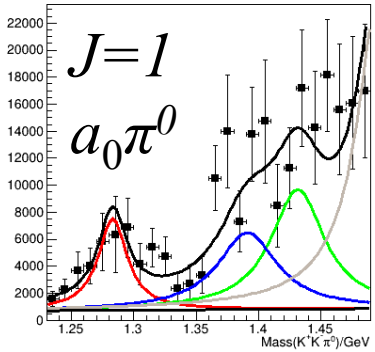

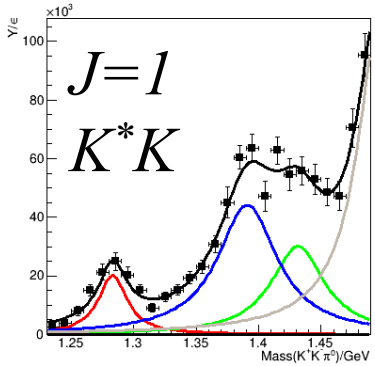

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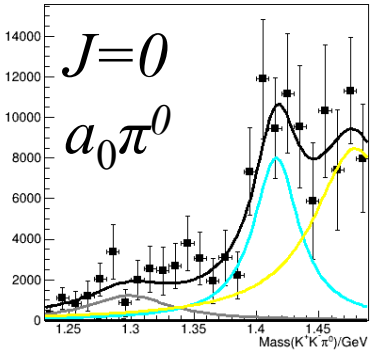
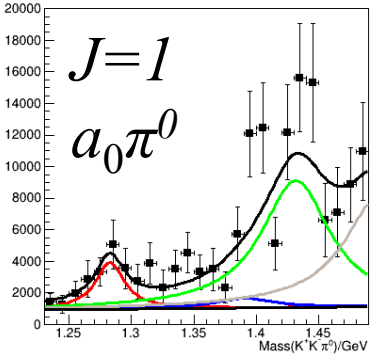
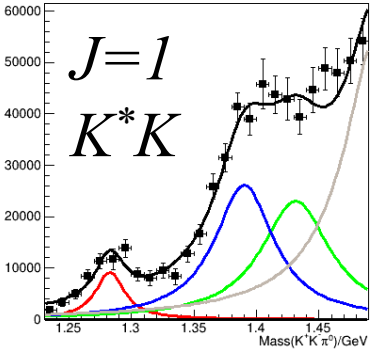
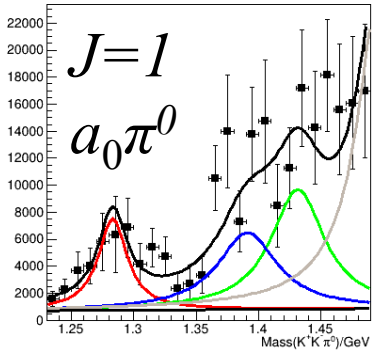
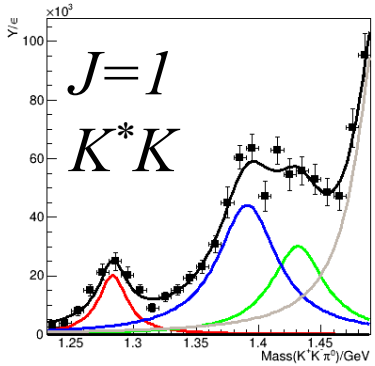






FAKE



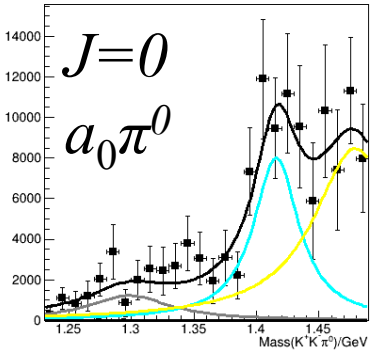


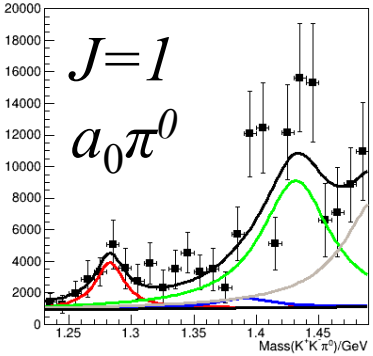
Note:

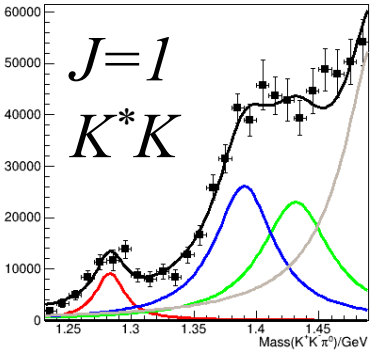
- $h_1 \rightarrow a_0\pi^0$ (**Blue**) was not generated

Comparison of Real to Fake: Mass[$K^+K^-\pi^0$]

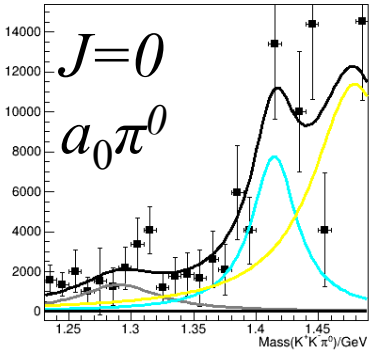
REAL

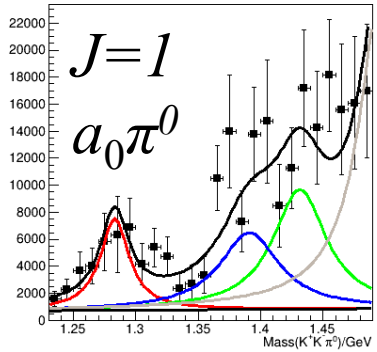


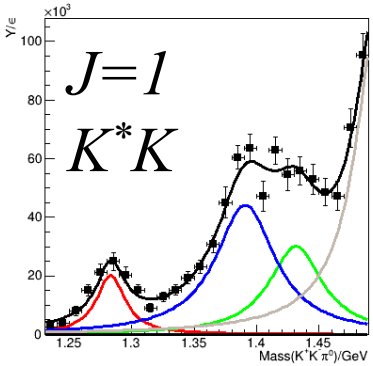




FAKE





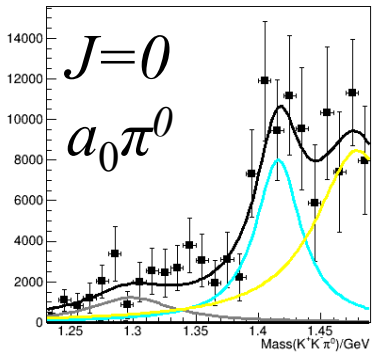


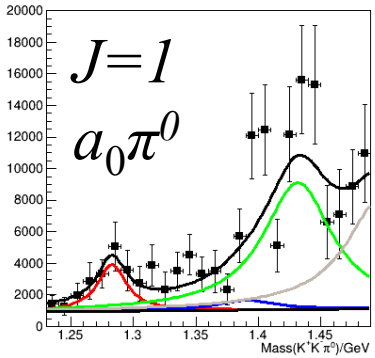
Note:

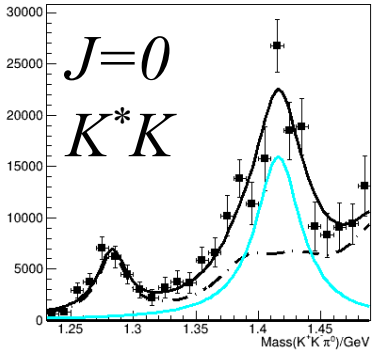
- $h_1 \rightarrow a_0\pi^0$ **[Blue]** was not generated
- $\eta(1295)$ [Gray] was not generated

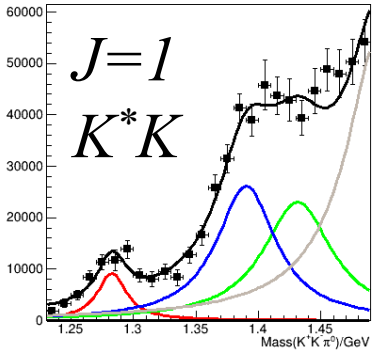
Comparison of Real to Fake: Mass[$K^+K^-\pi^0$]

REAL

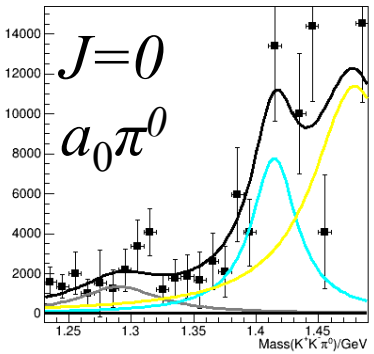


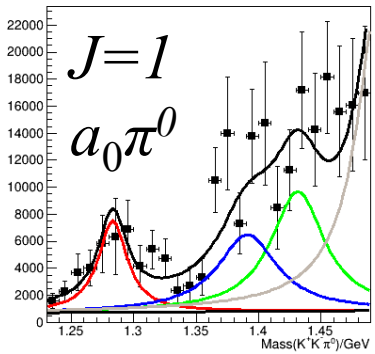


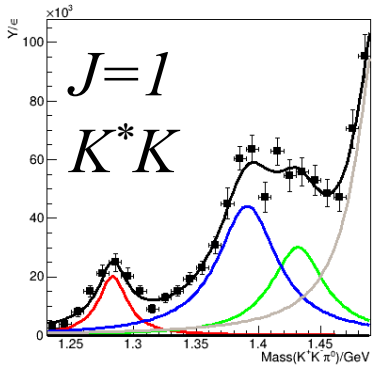




FAKE





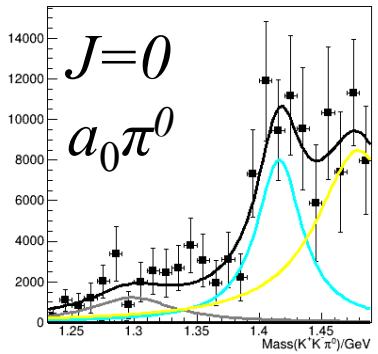


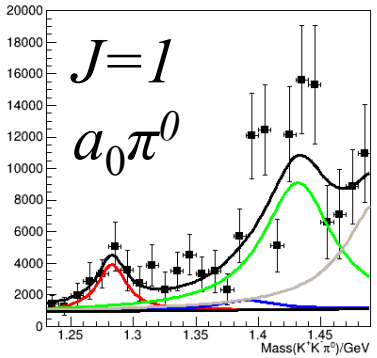
Note:

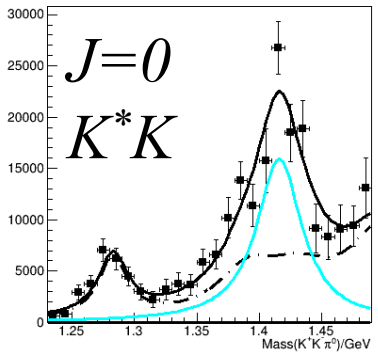
- $h_1 \rightarrow a_0\pi^0$ **[Blue]** was not generated
- $\eta(1295)$ [Gray] was not generated

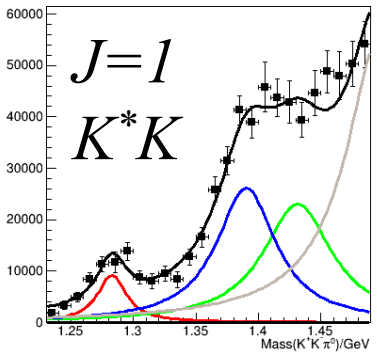
Comparison of Real to Fake: Mass[$K^+K^-\pi^0$]

REAL

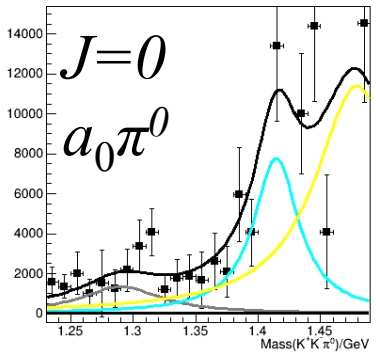


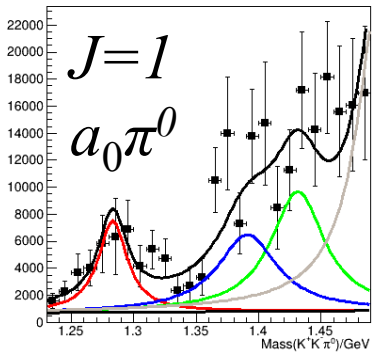


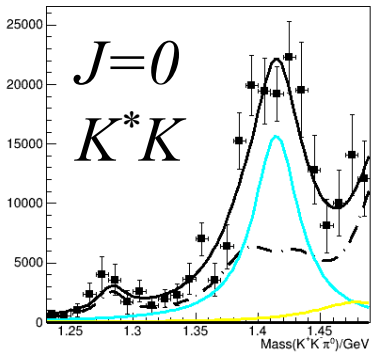


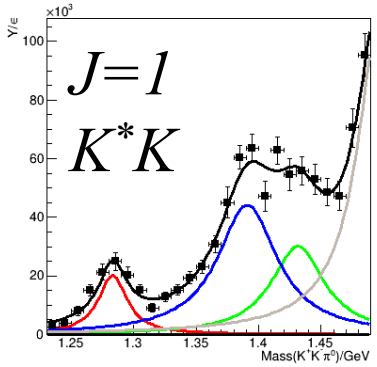


FAKE









Note:

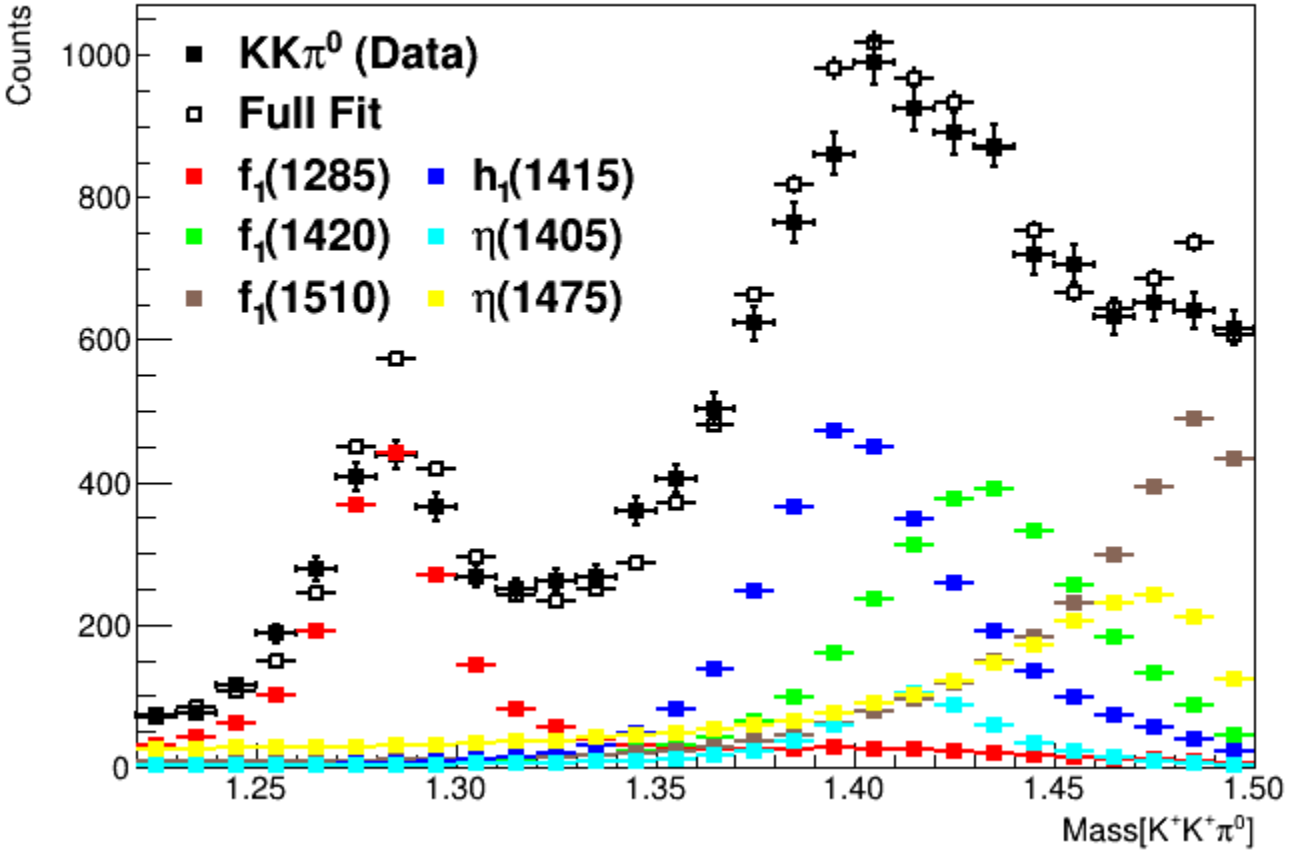
- $h_1 \rightarrow a_0\pi^0$ **[Blue]** was not generated
- $\eta(1295)$ [Gray] was not generated
- Assumed leakage (dashed-dotted lines) looks similar ☺

New this week

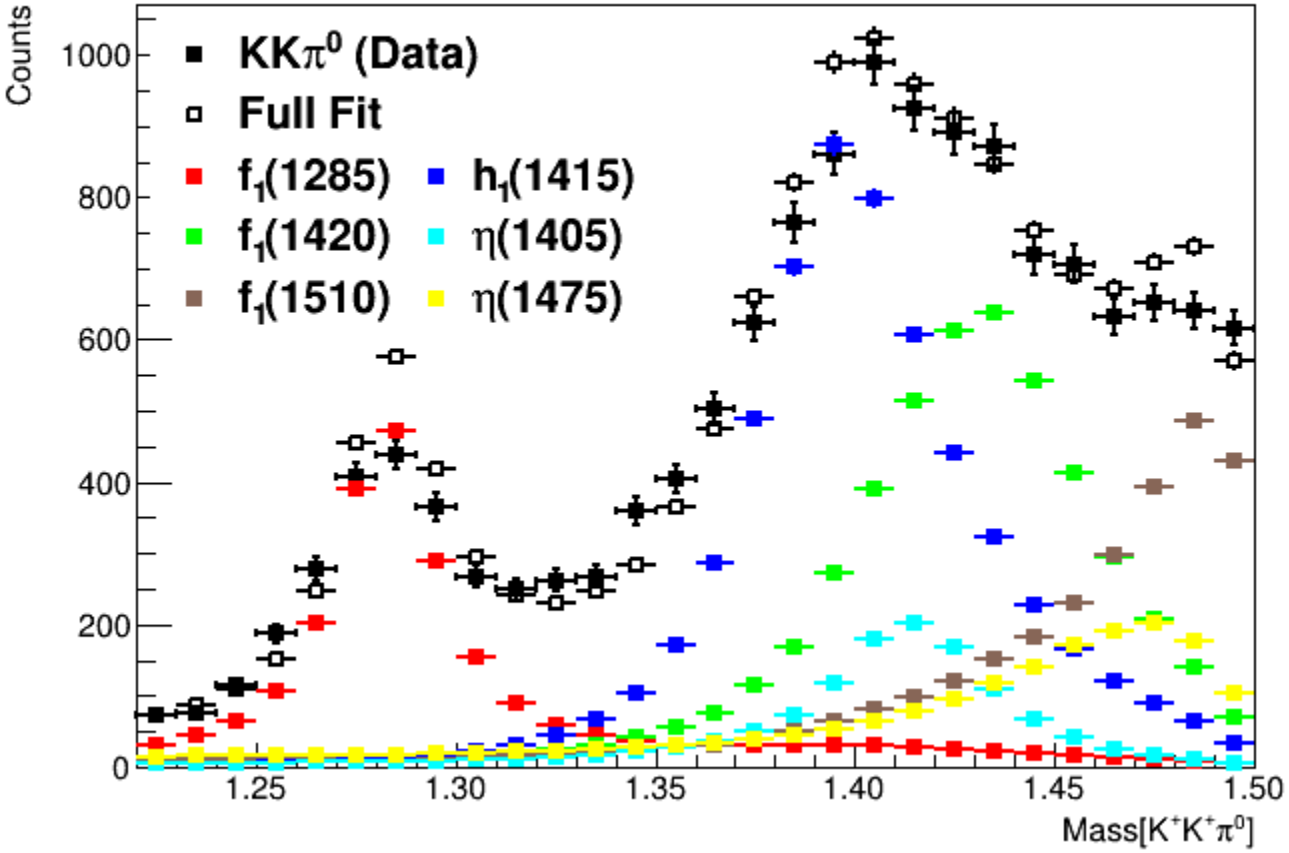
Update 2-9-2024 of $KK\pi$

- Included parsing code within plotResults.cc of AmpTools to collect amplitudes for individual resonance states:
  - $\eta(1295)$
  - $\eta(1405)$
  - $\eta(1475)$
  - $f_1(1285)$
  - $f_1(1420)$
  - $f_1(1510)$
  - $h_1(1415)$
- Added parsing for decays of above states to:
  - K^*K
  - $a_0\pi$
  - $KK\pi$ (only included for η state decays)

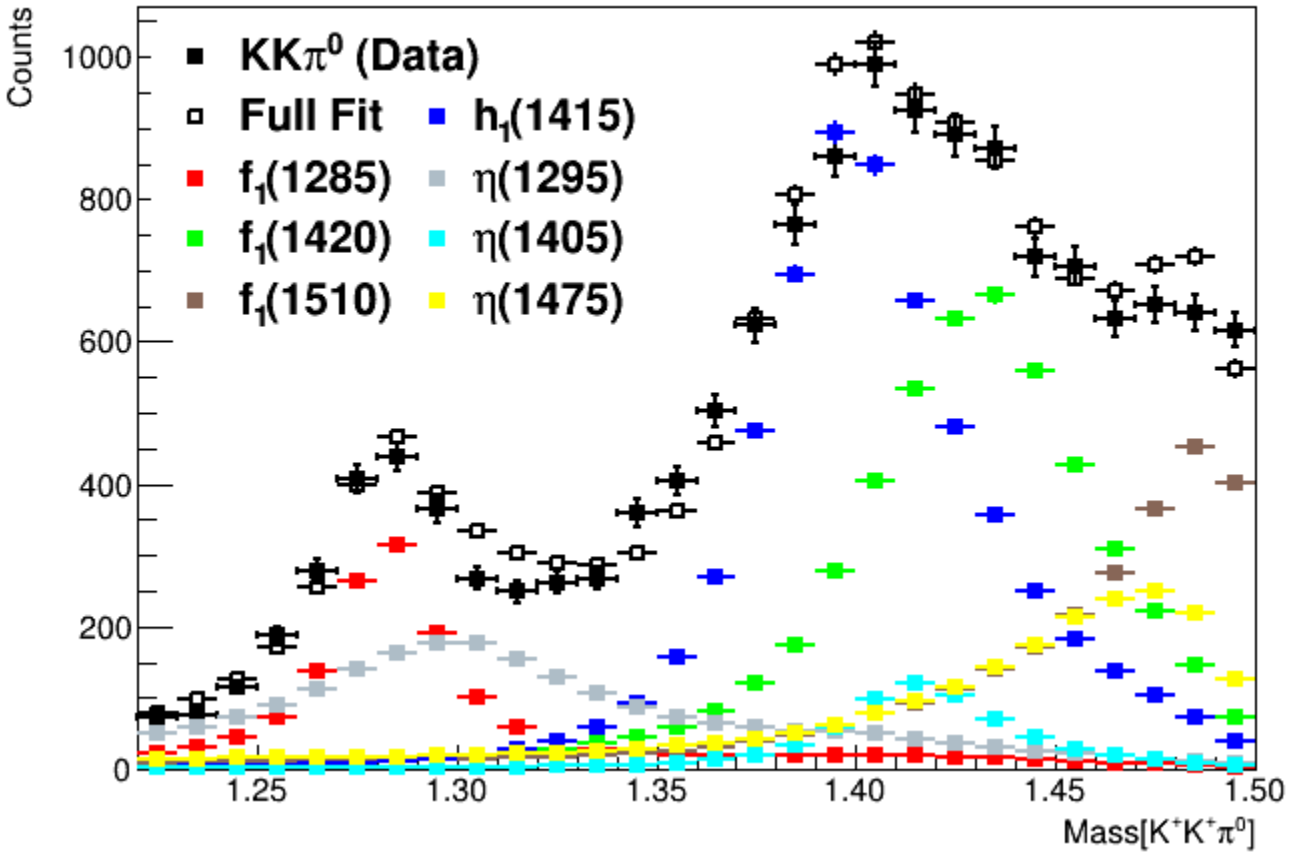
Full fit as previous



Full fit with $\eta(1475) \rightarrow K^*K$ included



Full fit as previous + $\eta(1295)$ included



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