Low-mass $K^+K^-\pi^0$ study

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- We should be able to distinguish the J=1 nature through PWA
- Will start by assuming t-channel prior to searching for s-channel contributions (code is currently setup for t-channel).

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ASU

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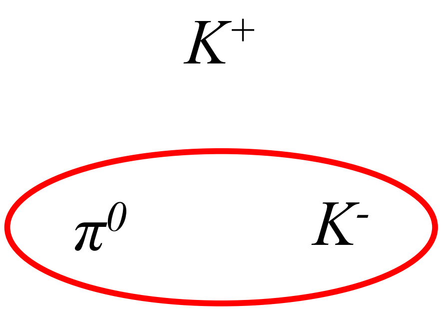

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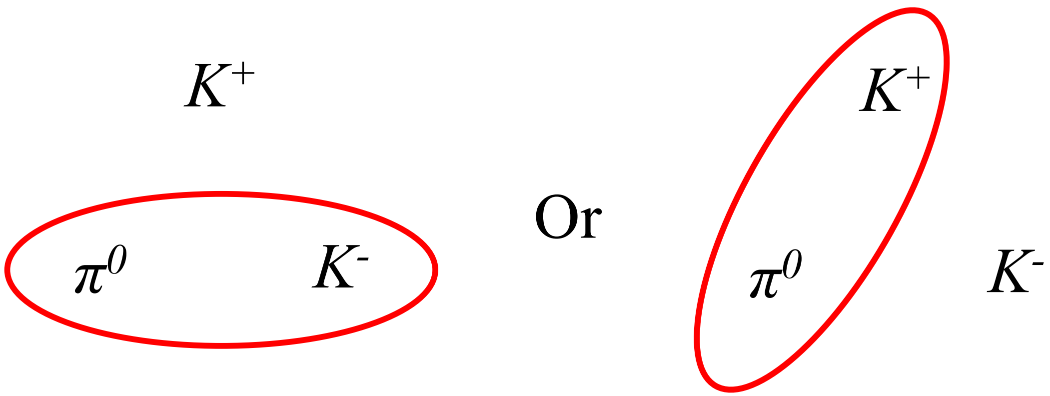

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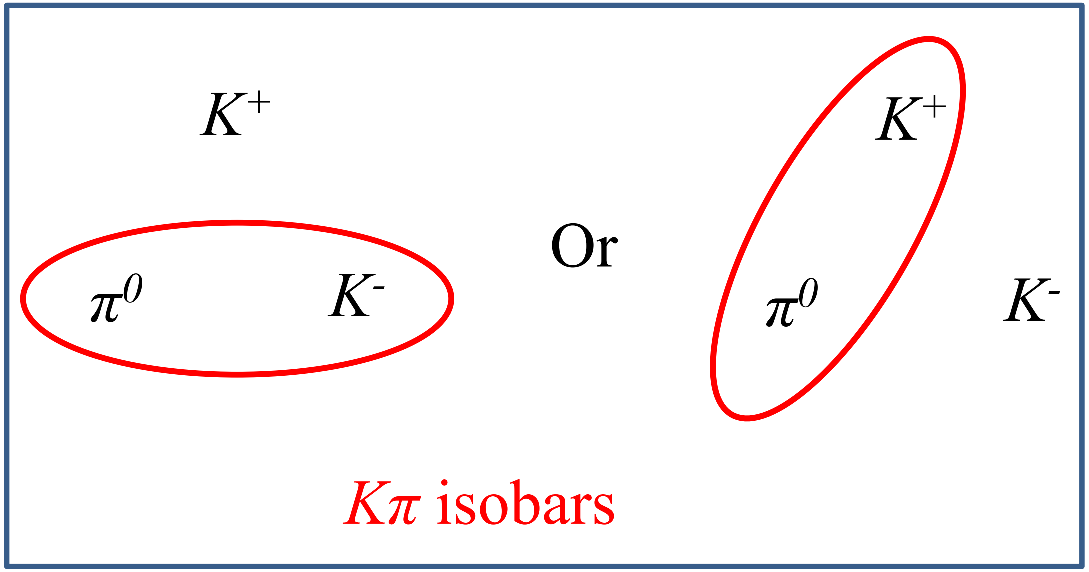

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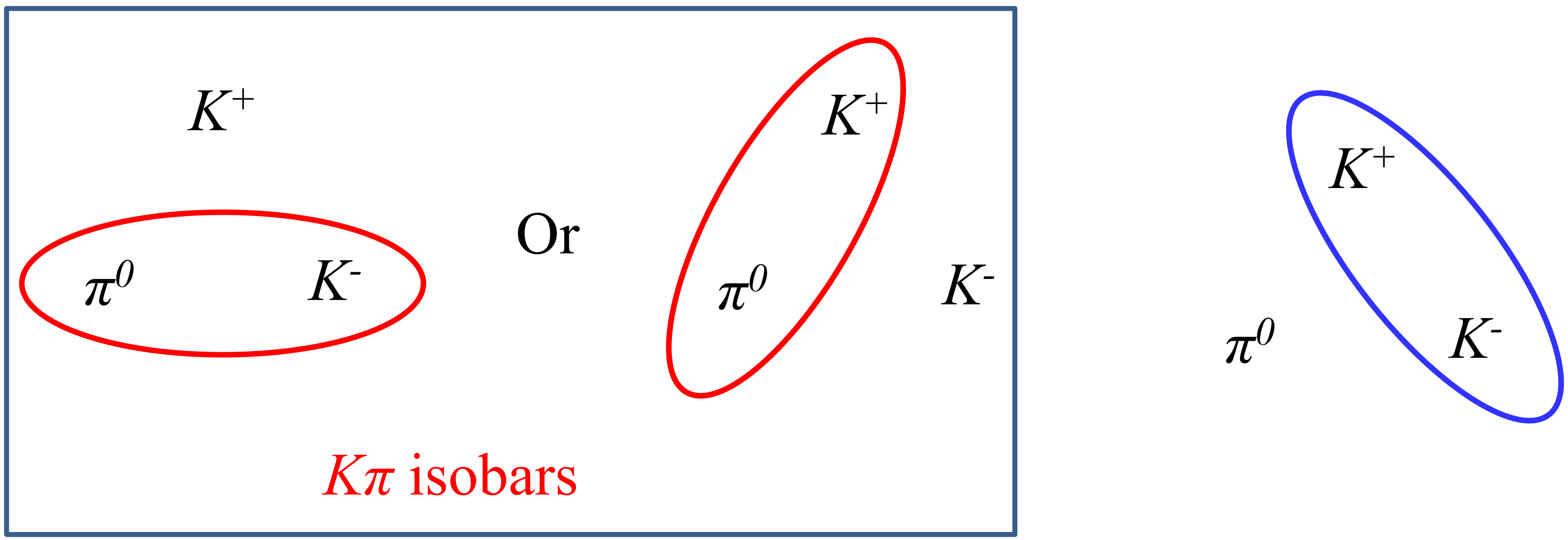

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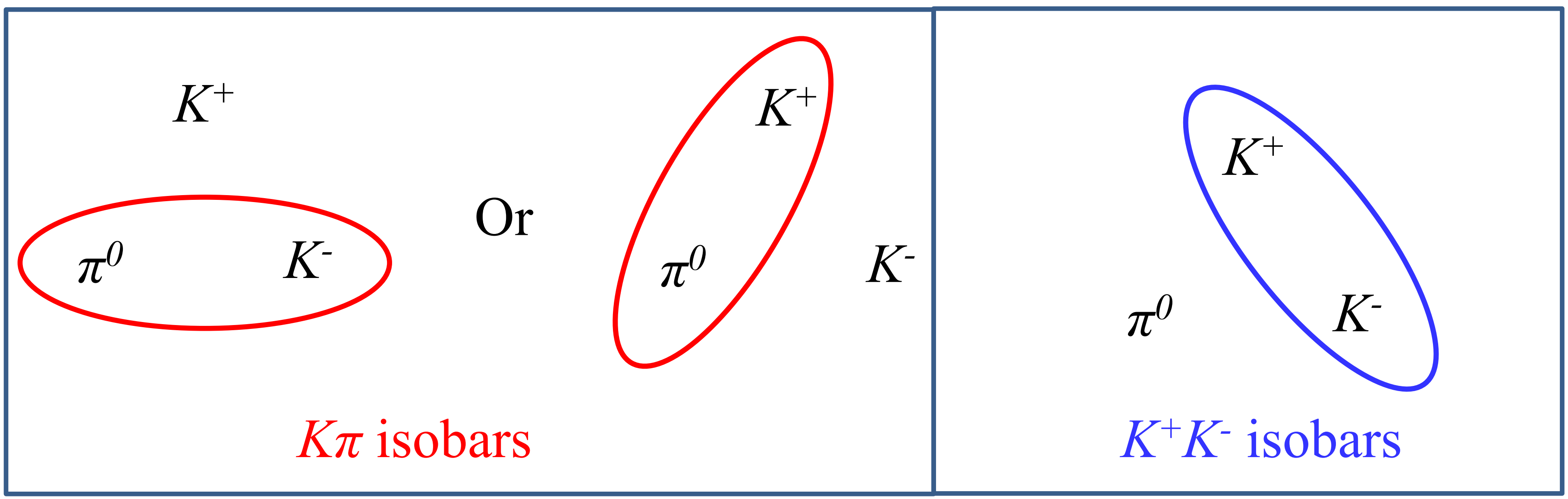

$K\pi$ isobar candidates

$K_0^*(700)$ $I(J^P) = \frac{1}{2}(0^+)$

also known as κ; was $K_0^*(800)$

See the review on "Scalar Mesons below 1 GeV."

Mass (T-Matrix Pole $\sqrt{s}$) = (630–730) − i (260–340) MeV
Mass (Breit-Wigner) = 845 ± 17 MeV
Full width (Breit-Wigner) = 468 ± 30 MeV

$K_0^*(700)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
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$K^0\gamma$	$(2.46 \pm 0.21) \times 10^{-3}$		307
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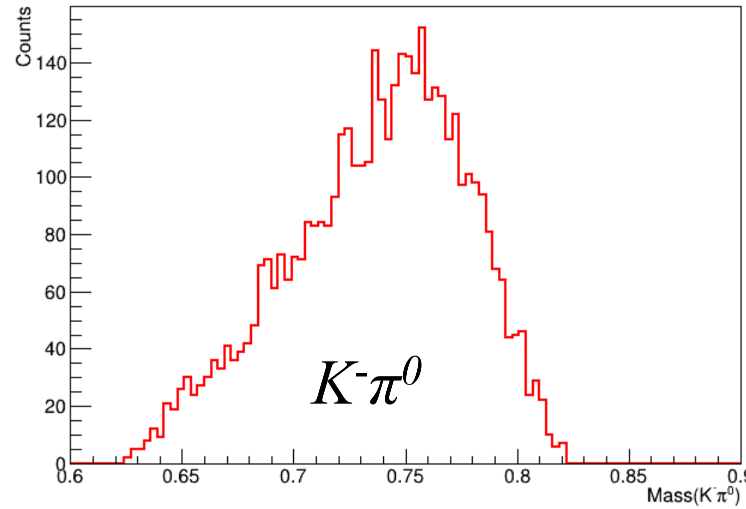

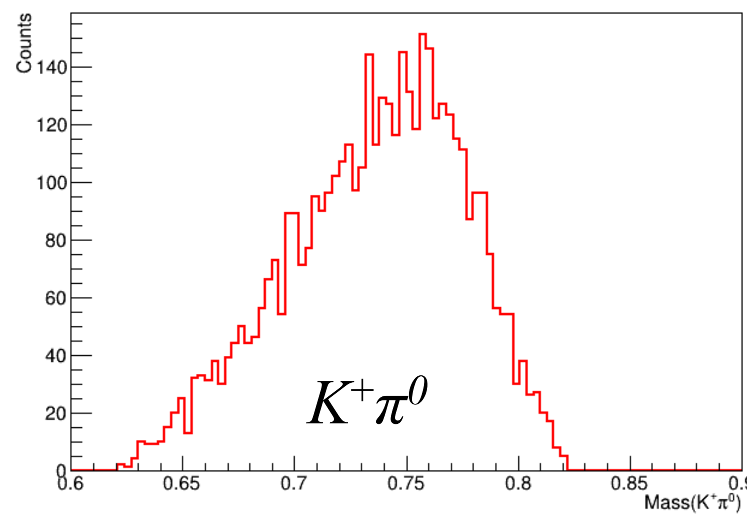

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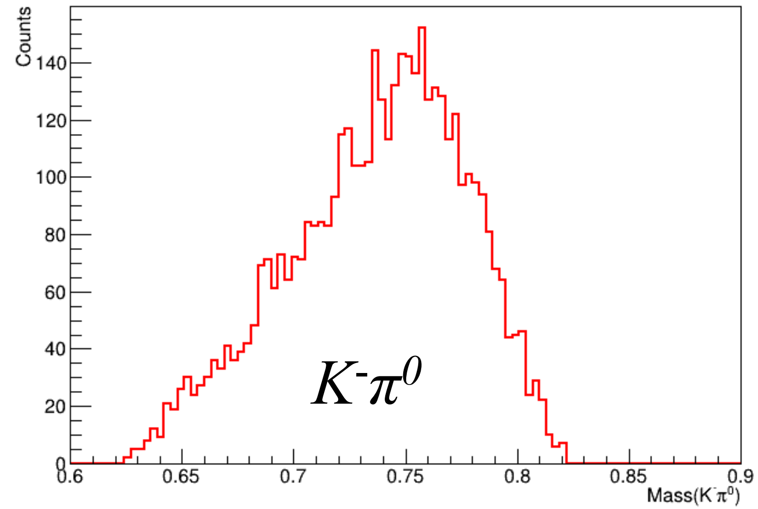

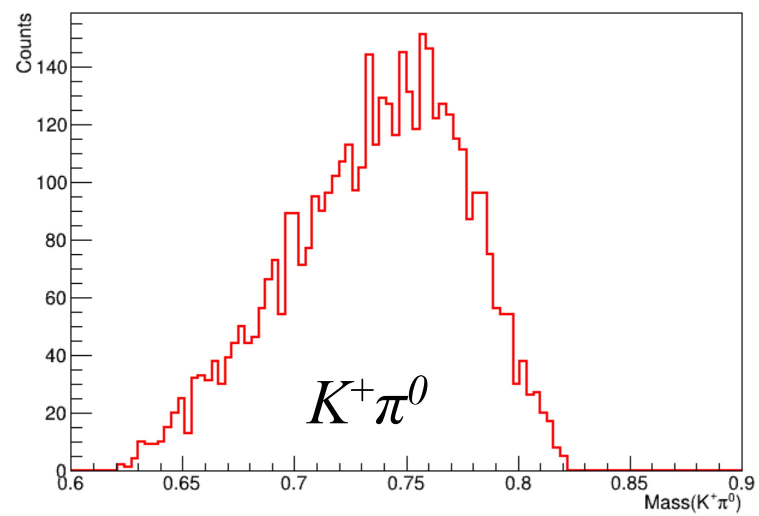

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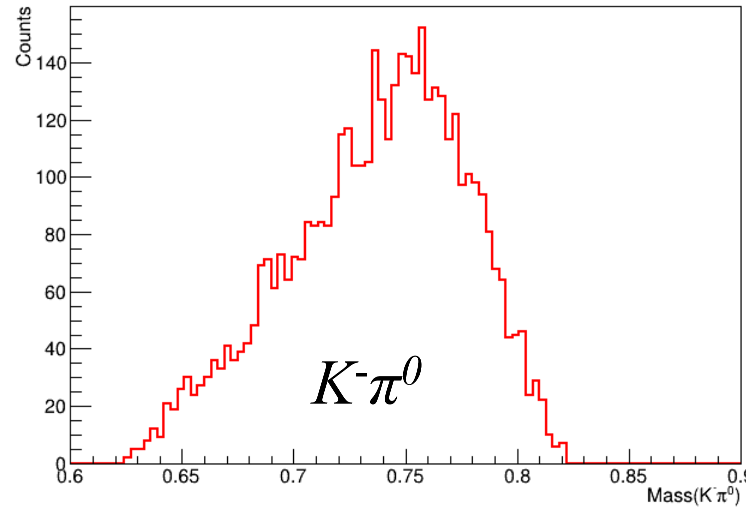

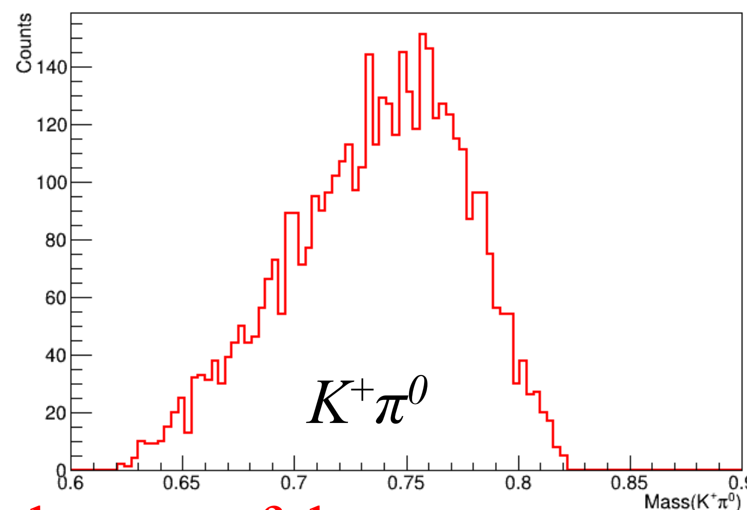

Mass too large and narrow to be part of these events

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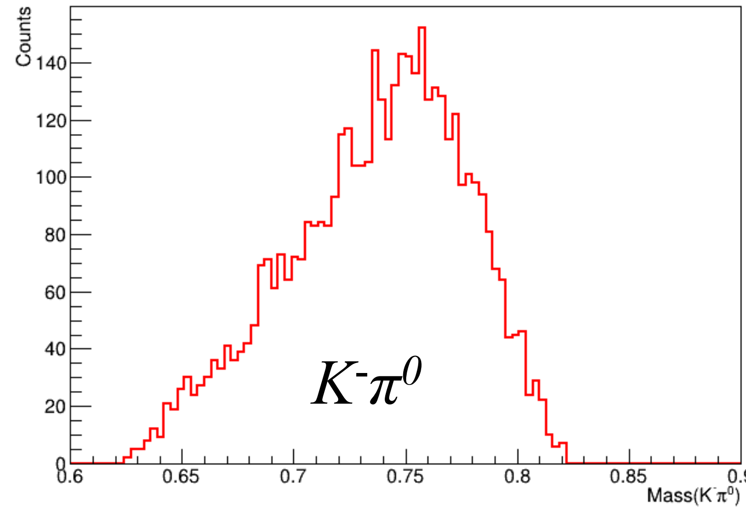

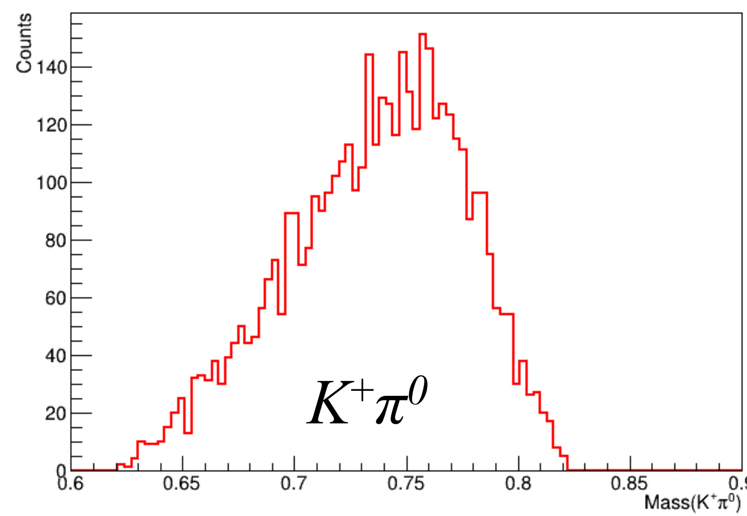

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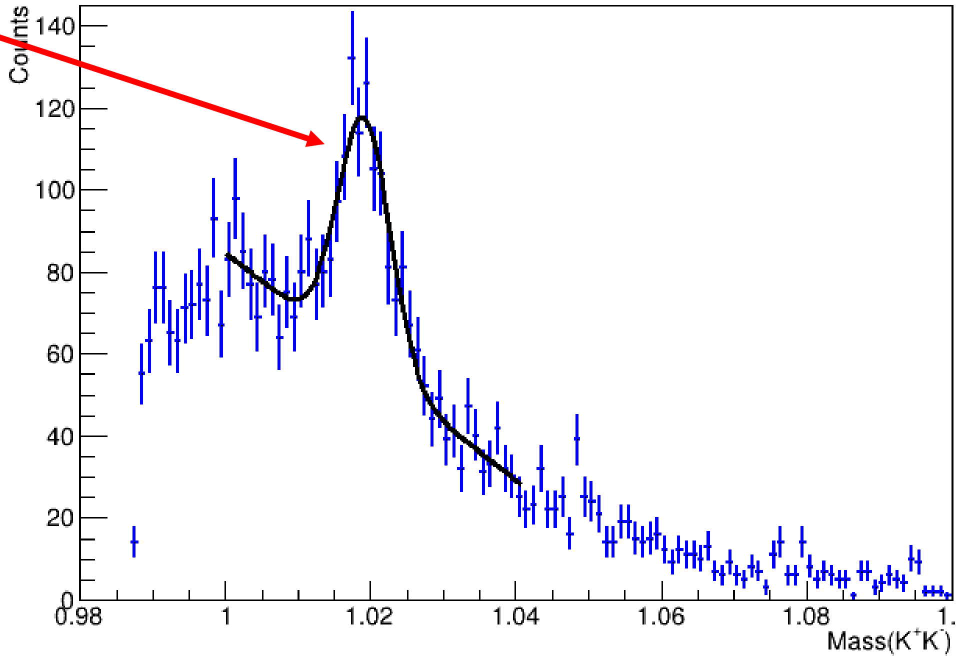

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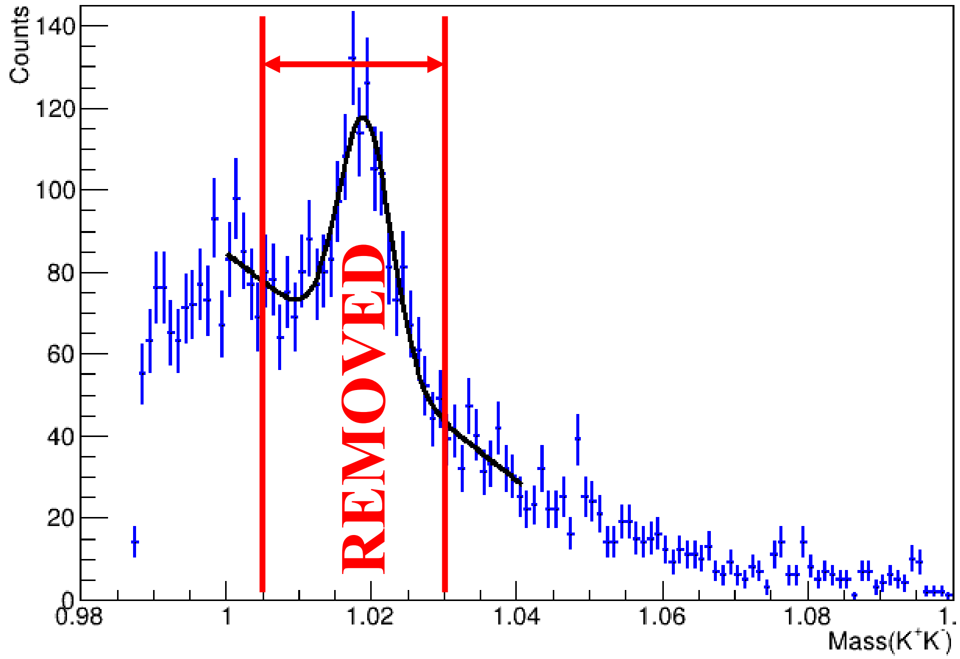

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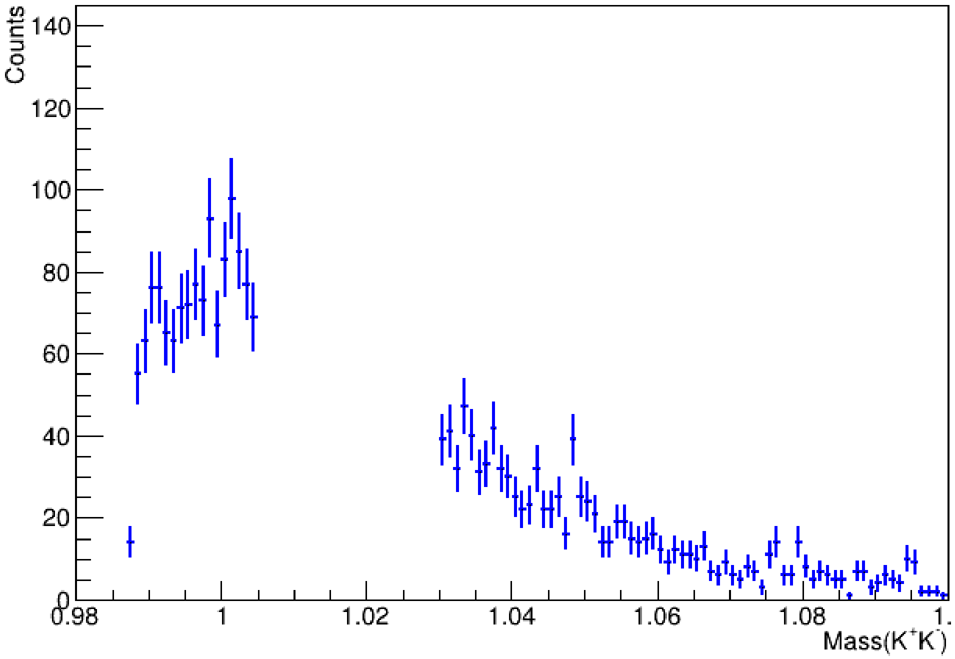
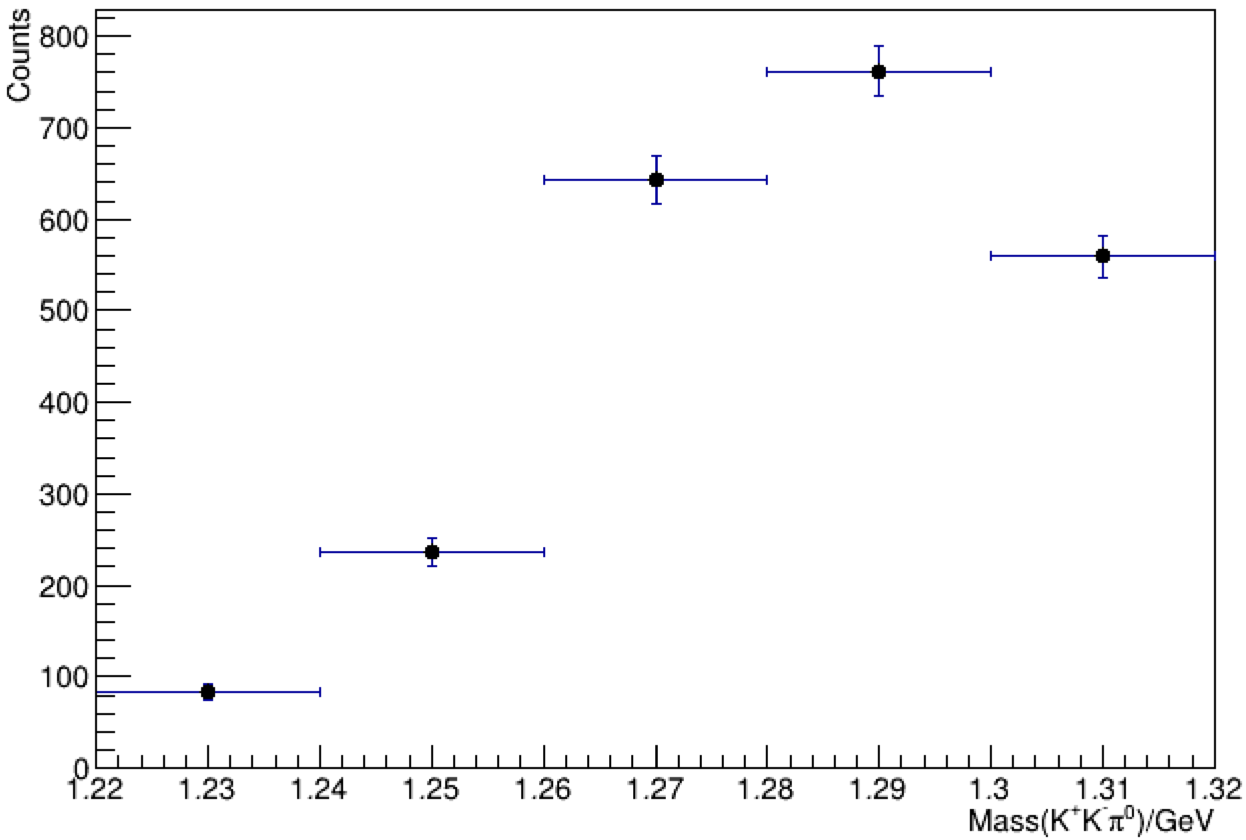


Mass binned PWA for low-mass $K^+K^-\pi^0$

- Performed a PWA on each mass bin shown on plot below



PWA

- Used expressions:

$a_{Jlsm} \sum_{\lambda} D^{J*}_{m\lambda}(\varphi_{GJ}, \theta_{GJ}) D^{s*}_{\lambda 0}(\varphi_h, \theta_h) \langle l0s\lambda | J\lambda \rangle$, where the form under summation is from Salgado-Weygand and a_{Jlsm} are the coefficients of the fit

- Used AmpTools for PWA
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  - Incoherently added:
    - *j*=0, *l*=0, *s*=0
    - *j*=0, *l*=1, *s*=1
    - *j*=1, *l*=1, *s*=0
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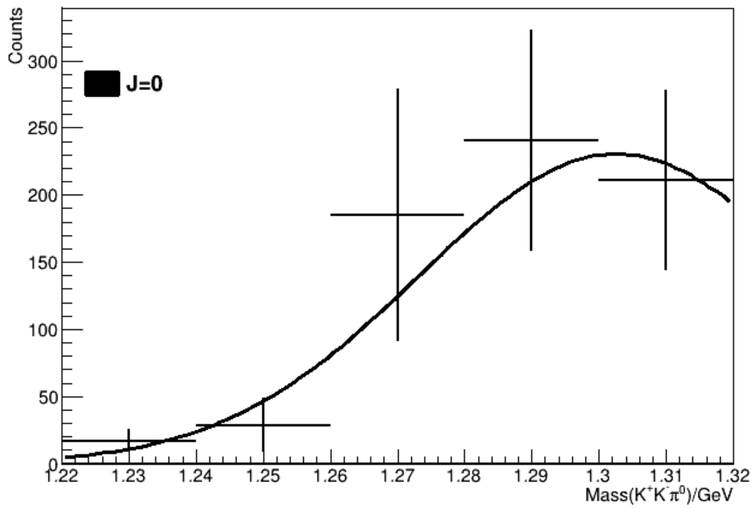
j=0



- Fit gaussian to PWA results
- Center: 1302 +/- 20 MeV
- FWHM: 69 +/- 26 MeV

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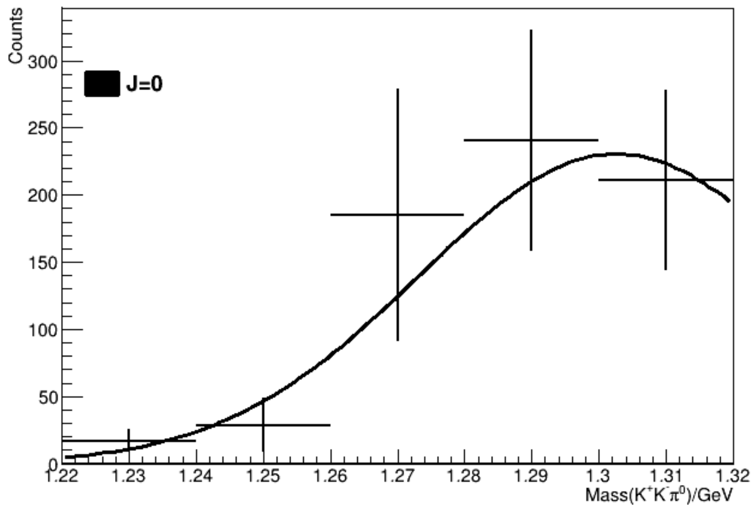

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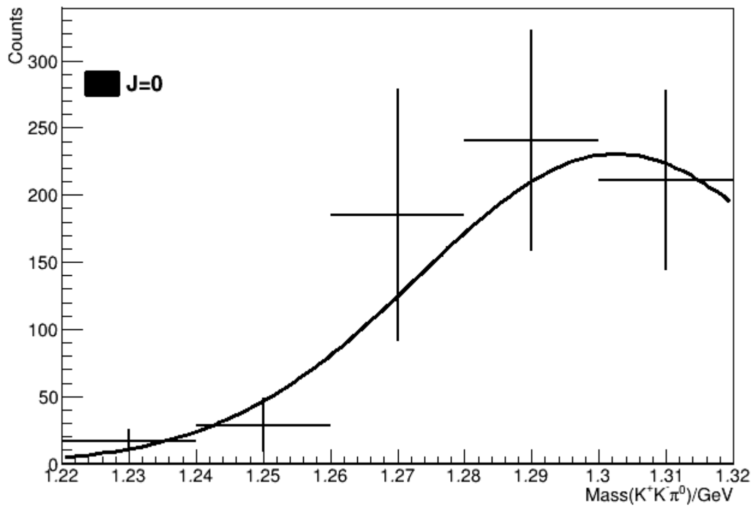
$\eta(1295)$ $I^G(J^{PC}) = 0^+(0^{-+})$

See the review on "Spectroscopy of Light Meson Resonances."

$\eta(1295)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
1294±4 OUR AVERAGE	Error includes scale factor of 1.6. See the ideogram below.			

j=0



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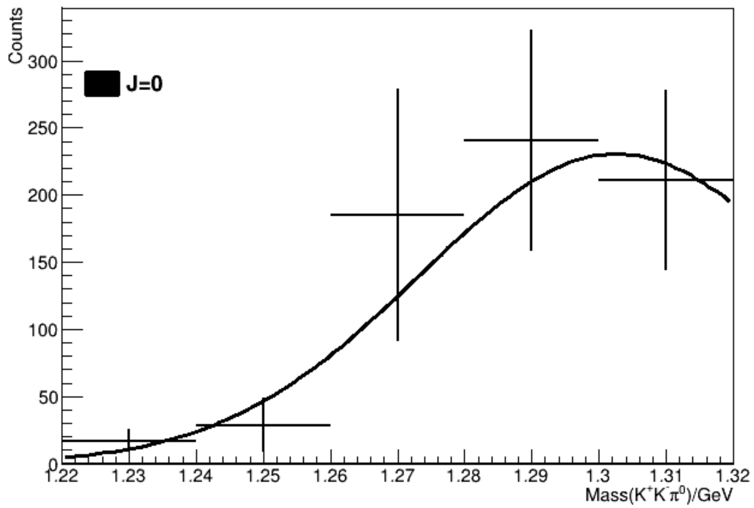
$\eta(1295)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
55± 5 OUR AVERAGE				

$j=0$



- Fit gaussian to PWA results
- Center: 1302 +/- 20 MeV
- FWHM: 69 +/- 26 MeV

- Agrees with PDG state $\eta(1295)$

$\eta(1295)$

$I^G(J^{PC}) = 0^+(0^{-+})$

See the review on "Spectroscopy of Light Meson Resonances."

η(1295) MASS

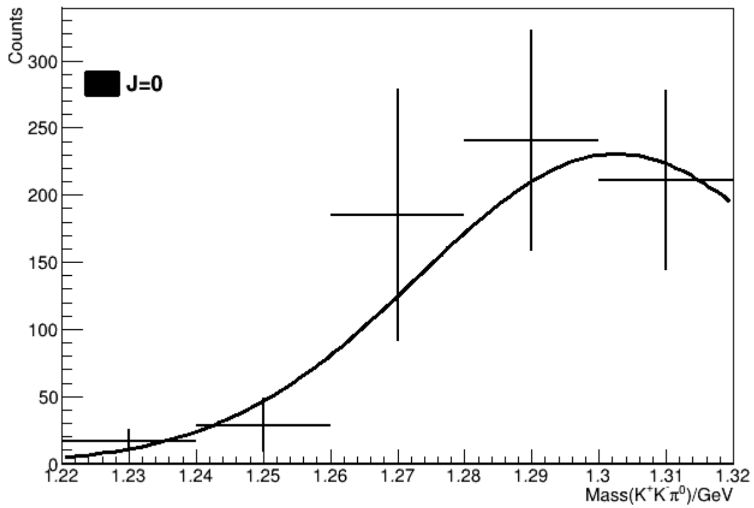
VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
1294±4 OUR AVERAGE	Error includes scale factor of 1.6. See the ideogram below.			

η(1295) WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
55± 5 OUR AVERAGE				

ASU

j=0



- Fit gaussian to PWA results
- Center: 1302 +/- 20 MeV
- FWHM: 69 +/- 26 MeV

- Agrees with PDG state η(1295) ☺

$\eta(1295)$ $I^G(J^{PC}) = 0^+(0^{-+})$

See the review on "Spectroscopy of Light Meson Resonances."

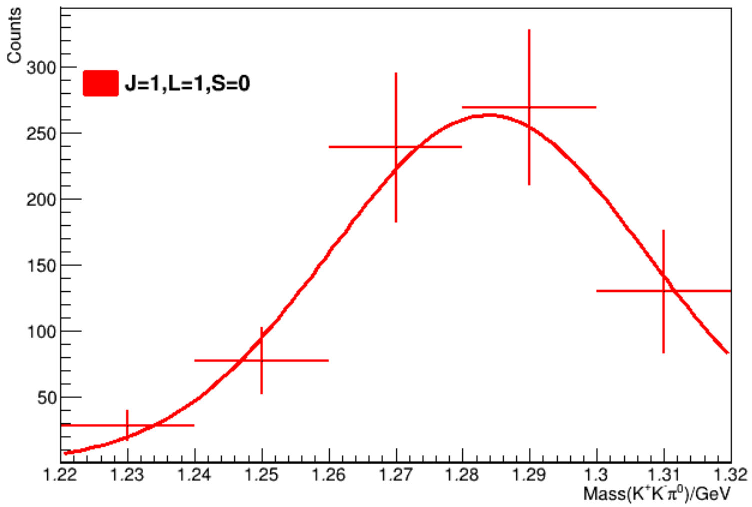
η(1295) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1294±4 OUR AVERAGE	Error includes scale factor of 1.6. See the ideogram below.			

η(1295) WIDTH

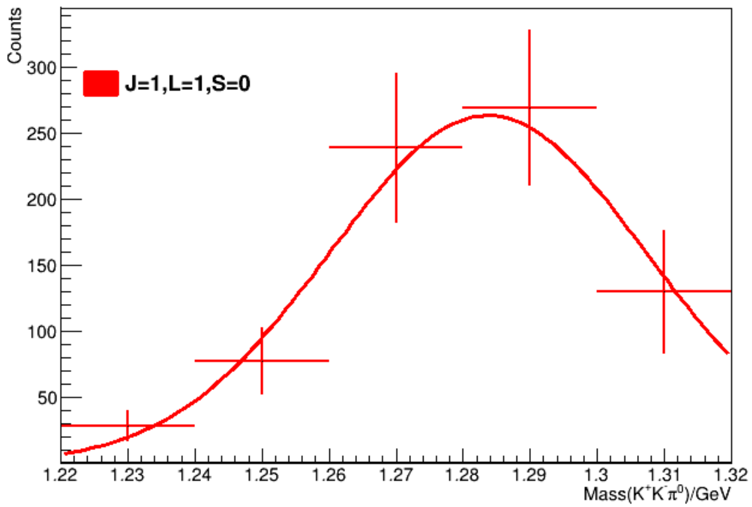
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
55± 5 OUR AVERAGE				

j=1, l=1, s=0



- Fit gaussian to PWA results
- Center: 1284 +/- 4 MeV
- FWHM: 55 +/- 8 MeV

j=1, l=1, s=0



- Fit gaussian to PWA results
- Center: 1284 +/- 4 MeV
- FWHM: 55 +/- 8 MeV

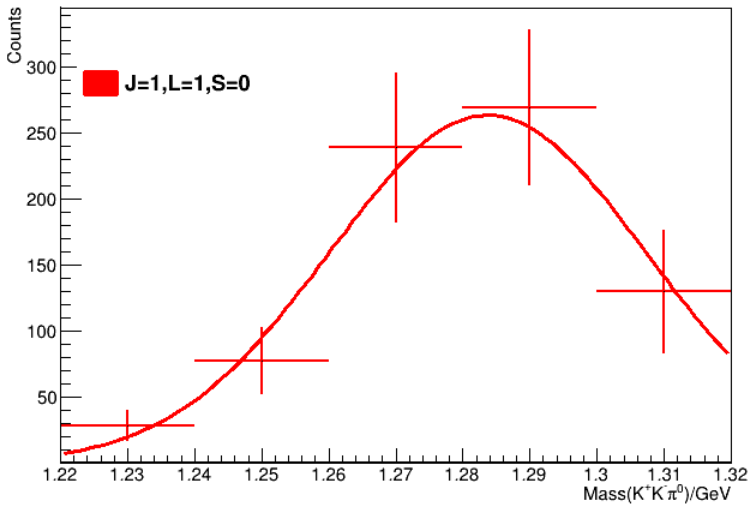
$f_1(1285)$ $I^G(J^{PC}) = 0^+(1^{++})$

$f_1(1285)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
1281.9 ± 0.5	**OUR AVERAGE**	Error includes scale factor of 1.8. See the ideogram		

ASU

$j=1, l=1, s=0$



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$f_1(1285)$

$I^G(J^{PC}) = 0^+(1^{++})$

$f_1(1285)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
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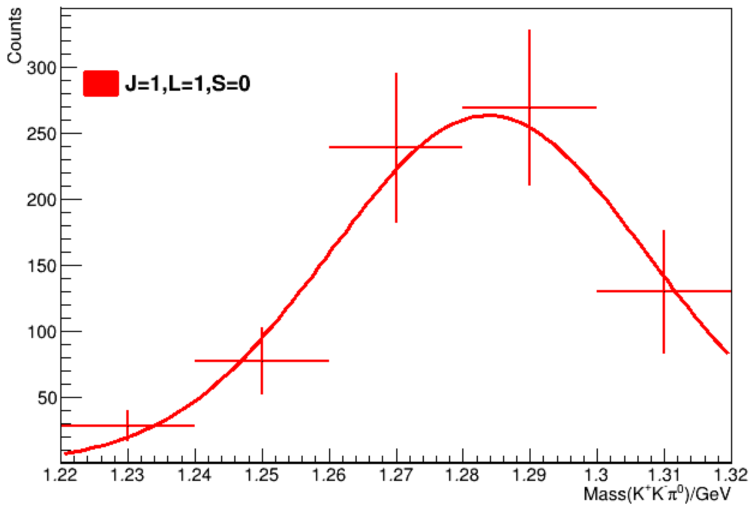
$f_1(1285)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
22.7± 1.1 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.		

ASU

$j=1, l=1, s=0$



- Fit gaussian to PWA results
- Center: 1284 +/- 4 MeV
- FWHM: 55 +/- 8 MeV
- Wide compared to PDG state $f_1(1285)$

$f_1(1285)$

$I^G(J^{PC}) = 0^+(1^{++})$

$f_1(1285)$ MASS

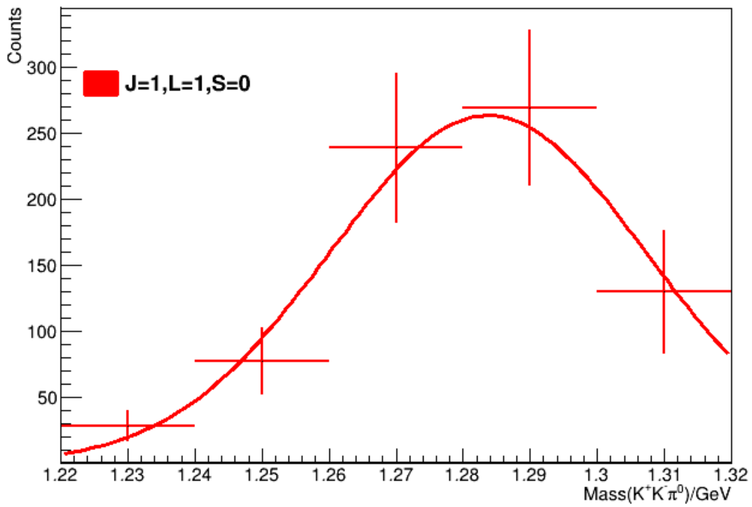
VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
1281.9 ± 0.5	**OUR AVERAGE**	Error includes scale factor of 1.8. See the ideogram		

$f_1(1285)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
22.7 ± 1.1	**OUR AVERAGE**	Error includes scale factor of 1.5. See the ideogram below.		

ASU

$j=1$, $l=1$, $s=0$



- Fit gaussian to PWA results
- Center: 1284 +/- 4 MeV
- FWHM: 55 +/- 8 MeV

- Wide compared to PDG state $f_1(1285)$ ☹

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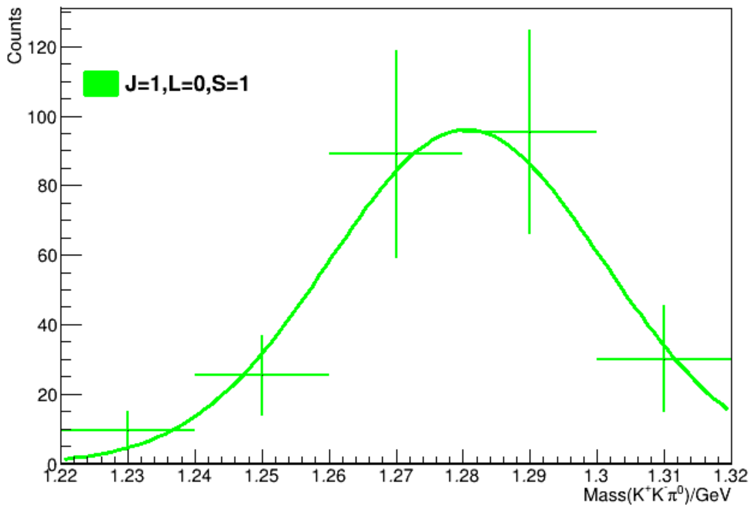
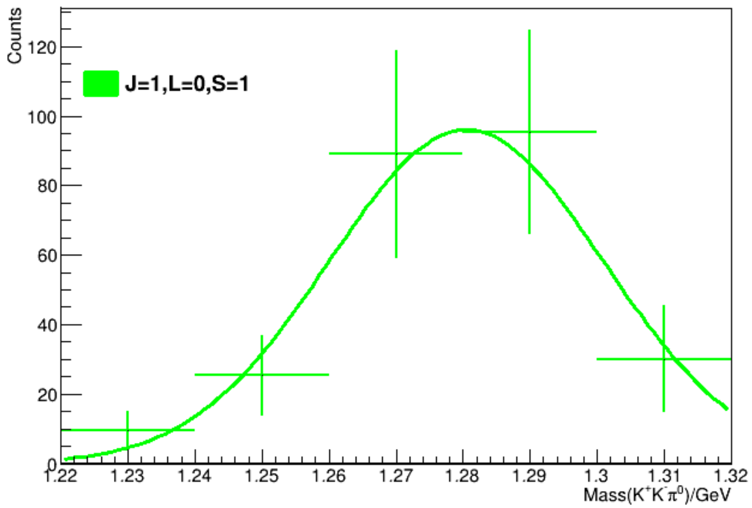
$j=1$, $l=0$, $s=1$



- Fit gaussian to PWA results
- Center: 1280 +/- 4 MeV
- FWHM: 48 +/- 10 MeV

$j=1, l=0, s=1$



- Fit gaussian to PWA results
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$f_1(1285)$

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VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
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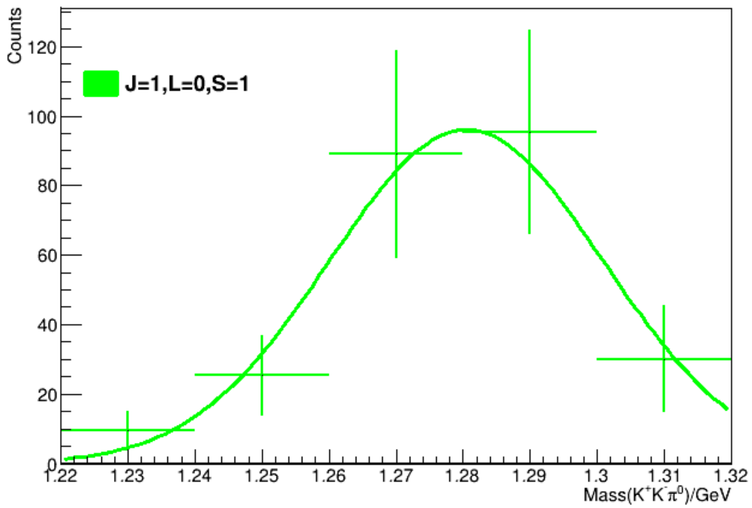

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$f_1(1285)$

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VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
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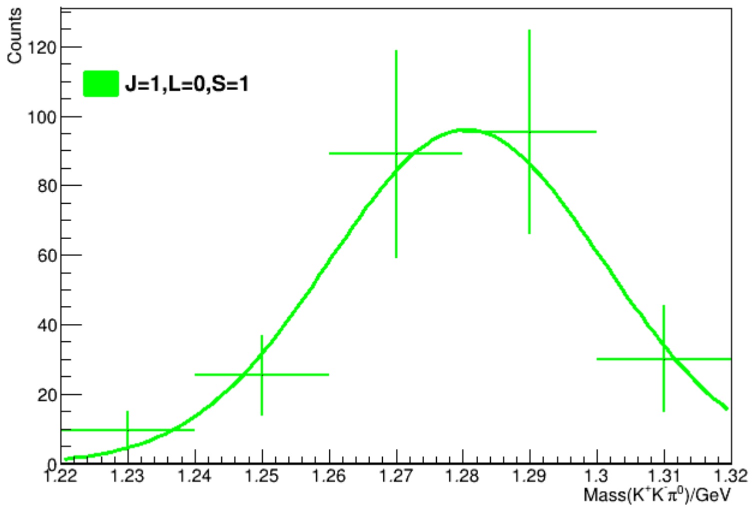
$f_1(1285)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
22.7 ± 1.1	**OUR AVERAGE**	Error includes scale factor of 1.5. See the ideogram below.		

$j=1, l=0, s=1$



- Fit gaussian to PWA results
- Center: 1280 +/- 4 MeV
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- Wide compared to PDG state $f_1(1285)$

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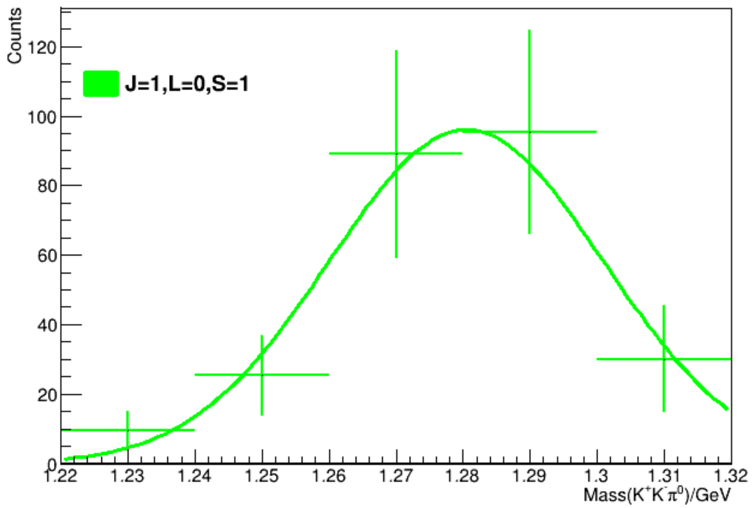
$f_1(1285)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
22.7 ± 1.1	**OUR AVERAGE**	Error includes scale factor of 1.5. See the ideogram below.		

ASU

$j=1,\ l=0,\ s=1$



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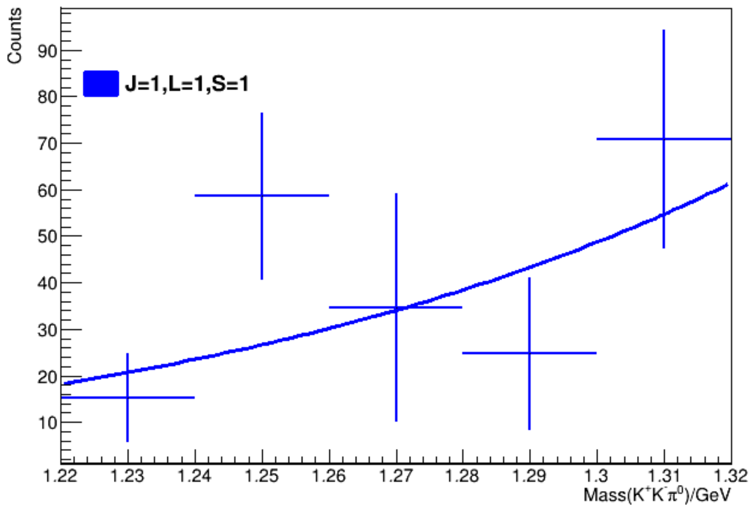
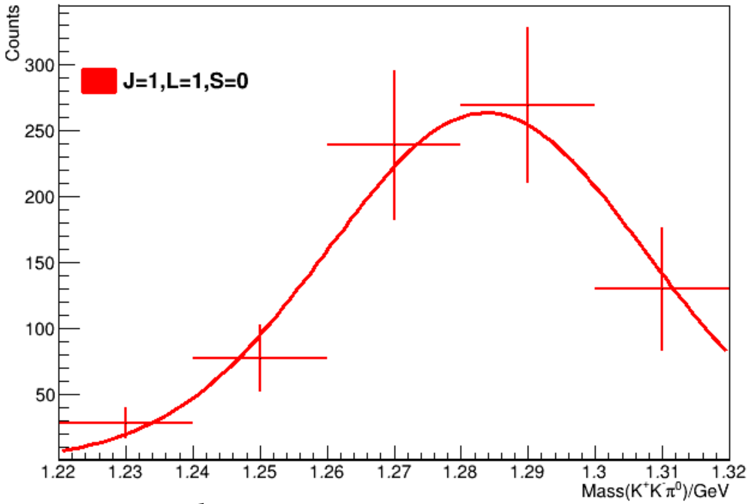
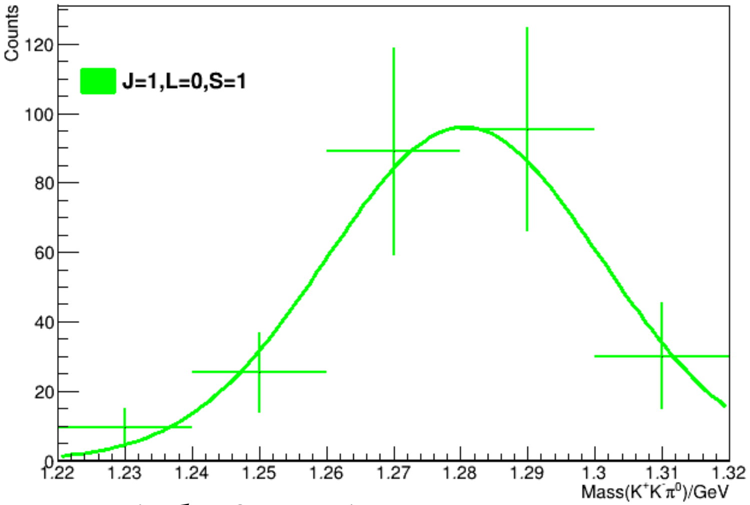
j=1, l=1, s=1



- Shape is not very suggestive

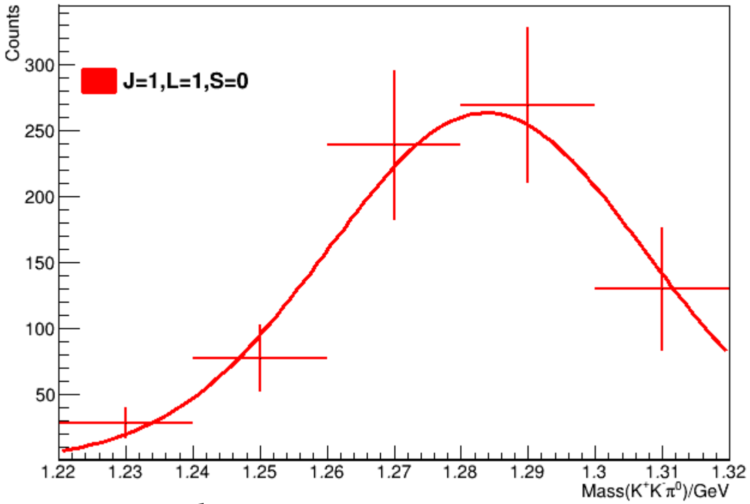
The two similar *j*=1 states

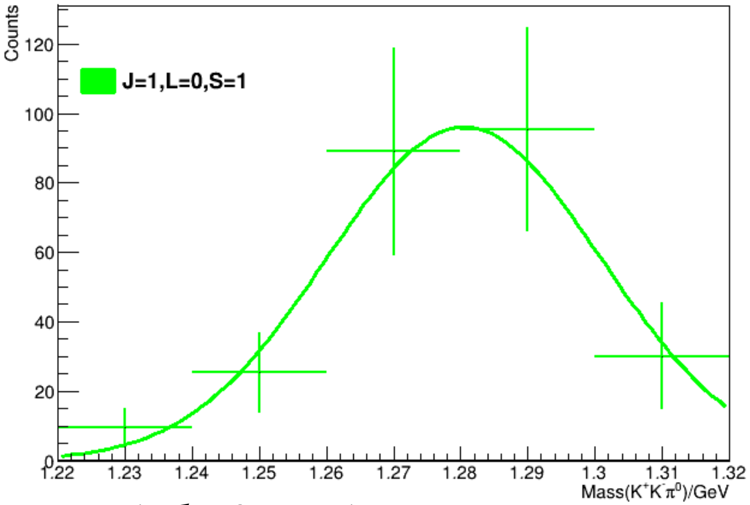




- *j*=1,*l*=1,*s*=0
  - Center: 1284 +/- 4 MeV
  - FWHM: 55 +/- 8 MeV
- *j*=1,*l*=0,*s*=1
  - Center: 1280 +/- 4 MeV
  - FWHM: 48 +/- 10 MeV

The two similar *j*=1 states





- *j*=1,*l*=1,*s*=0
  - Center: 1284 +/- 4 MeV
  - FWHM: 55 +/- 8 MeV
- *j*=1,*l*=0,*s*=1
  - Center: 1280 +/- 4 MeV
  - FWHM: 48 +/- 10 MeV

- Mass distribution so similar that these must be the same state

Title