PWA analysis on E852 '97 $K^+K^-\pi^0$ data

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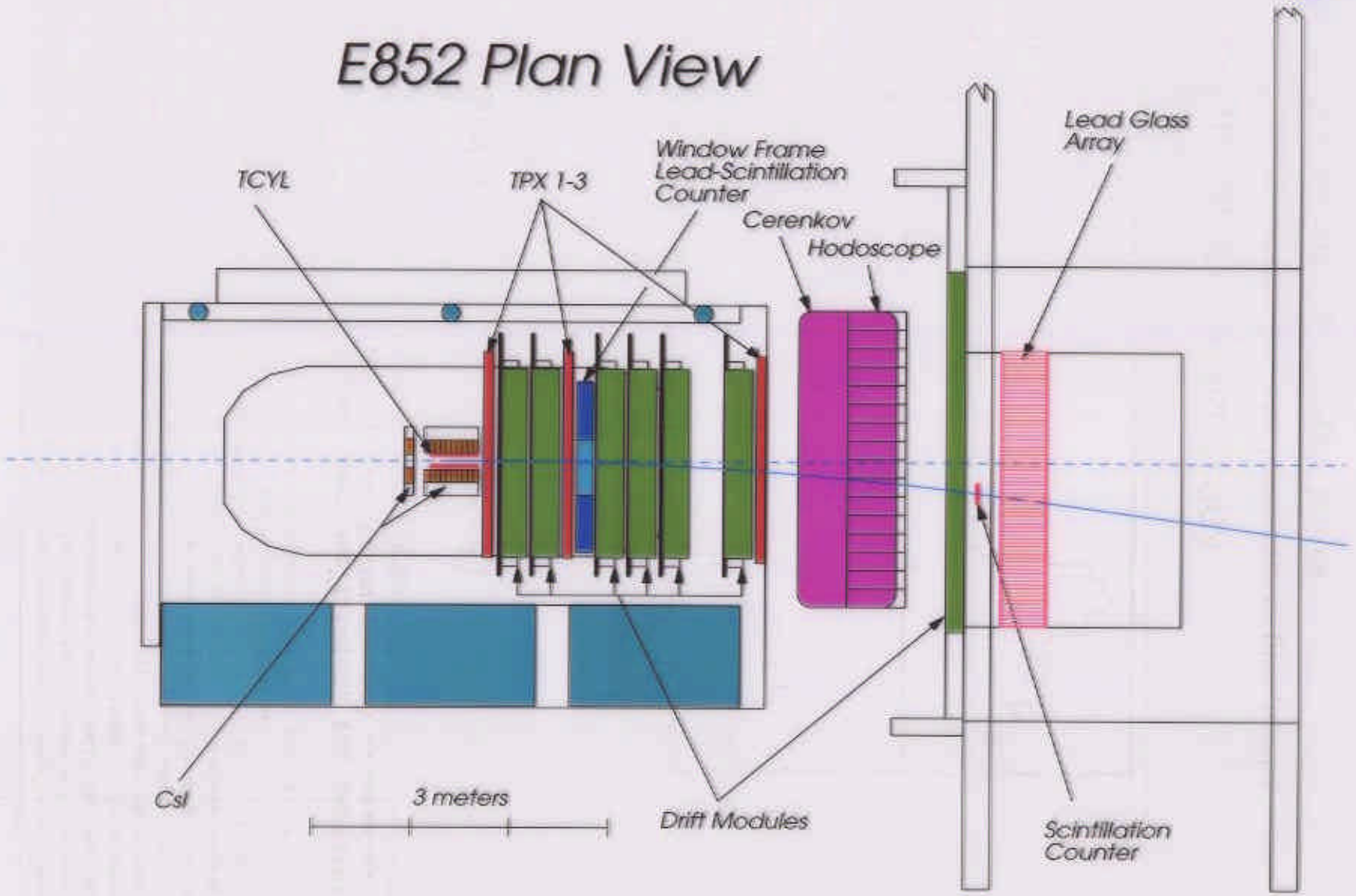
July 28, 2000

Outline

- Motivation
- PWA Fit
- Conclusion

$\pi^- p \rightarrow K^+ K^- \pi^0 n$ @ 18 GeV/c

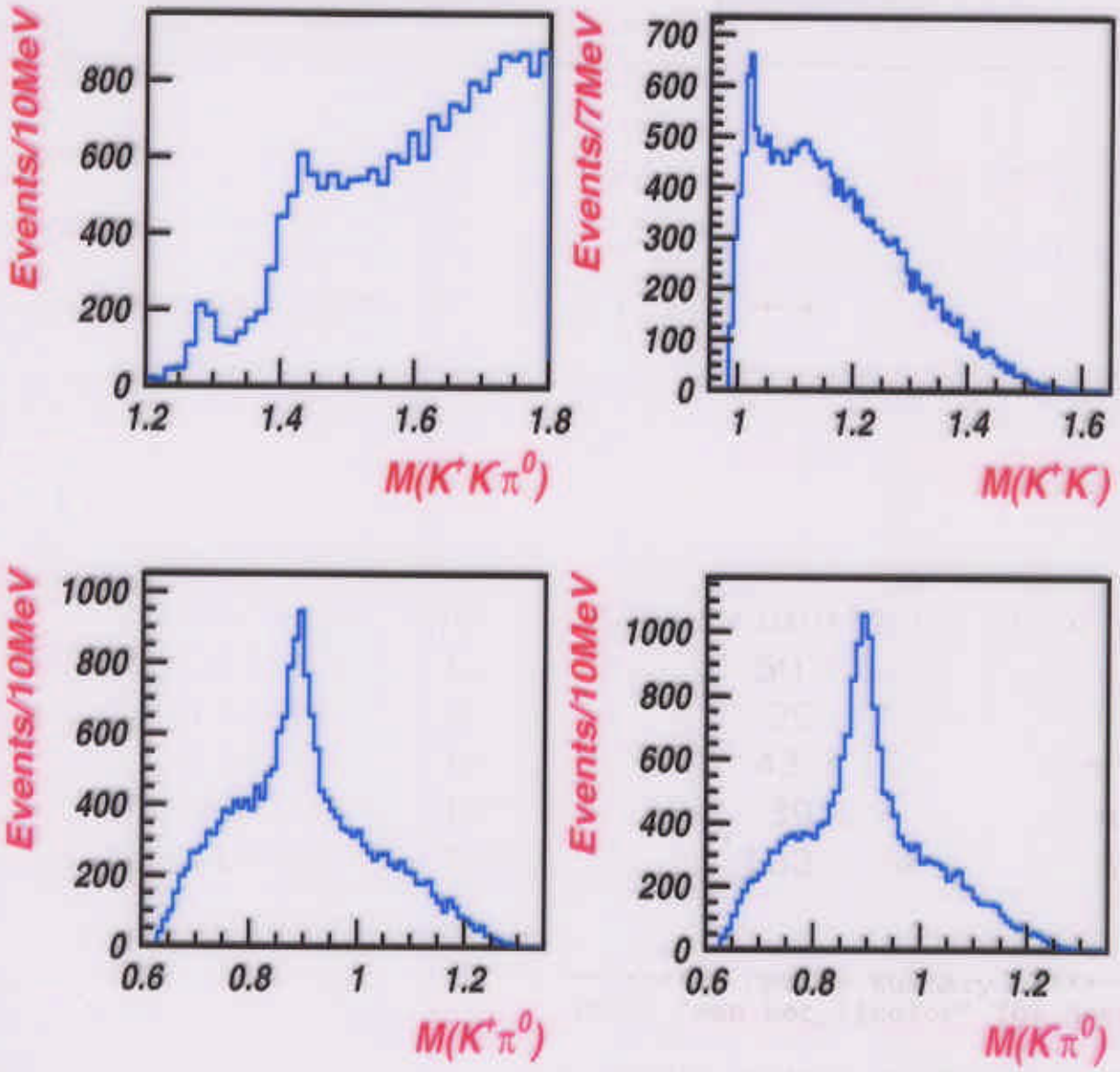
E852 Plan View



I. Motivation

- Provide more experimental information for light meson spectroscopy
- A long standing puzzle on D and E/ι mesons
- Study of $C(1480)$

Mass distributions



Finally, 19,576 events survive the data selection and will be used in the partial wave analysis.

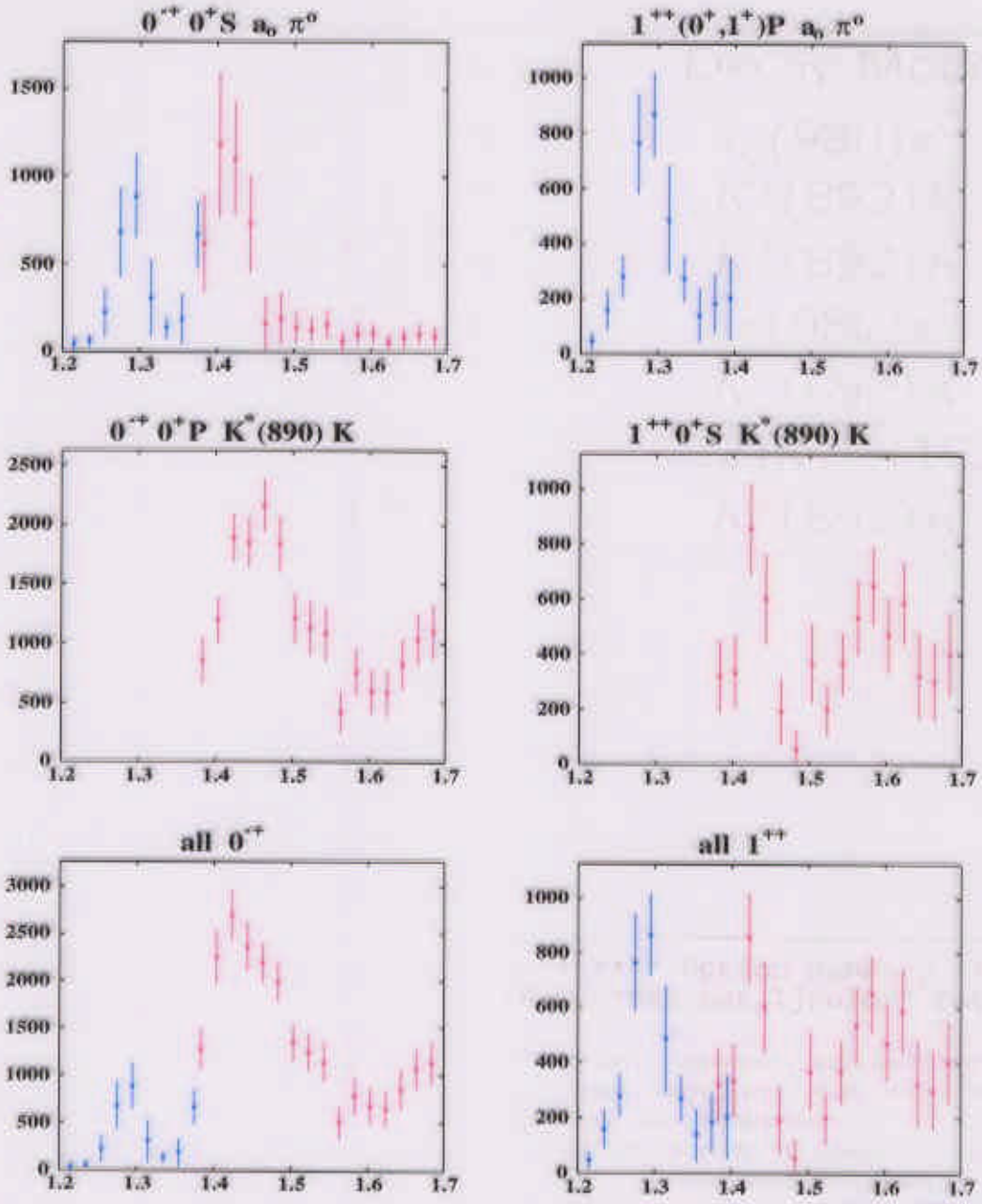
II. PWA Fit

J^{PC}	m^{ϵ}	L	Decay Mode
0^{-+}	0^{+}	S	$a_0(980)\pi^0$
		P	$K^*(892)\overline{K}$
1^{++}	0^{+}	S	$K^*(892)\overline{K}$
	$0^{+}, 1^{\pm}$	P	$a_0(980)\pi^0$
1^{+-}	0^{+}	S	$K^*(892)\overline{K}$
1^{--}	0^{-}	P	$K^*(892)\overline{K}$, $\phi(1020)\pi^0$
2^{++}	$0^{-}, 1^{+}$	D	$K^*(892)\overline{K}$

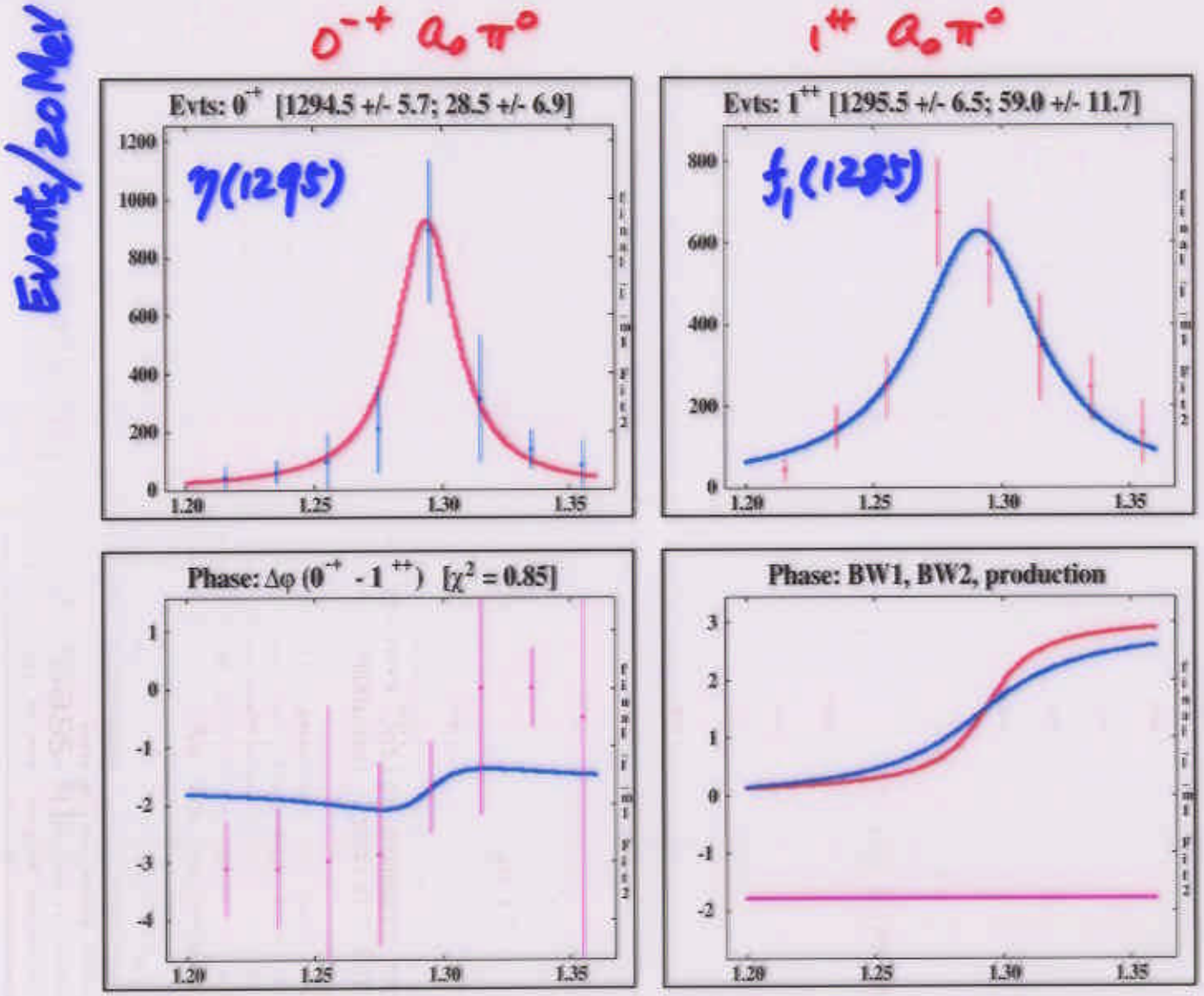
- Two wave sets used to do fit over $1.2 < M(K^+K^-\pi^0) < 1.7$GeV. $K^*\overline{K}$ waves are not included in low masses fit(1.2—1.4GeV) because of its threshold.

- $C-$parity eigenstates constructed to generate amplitudes.

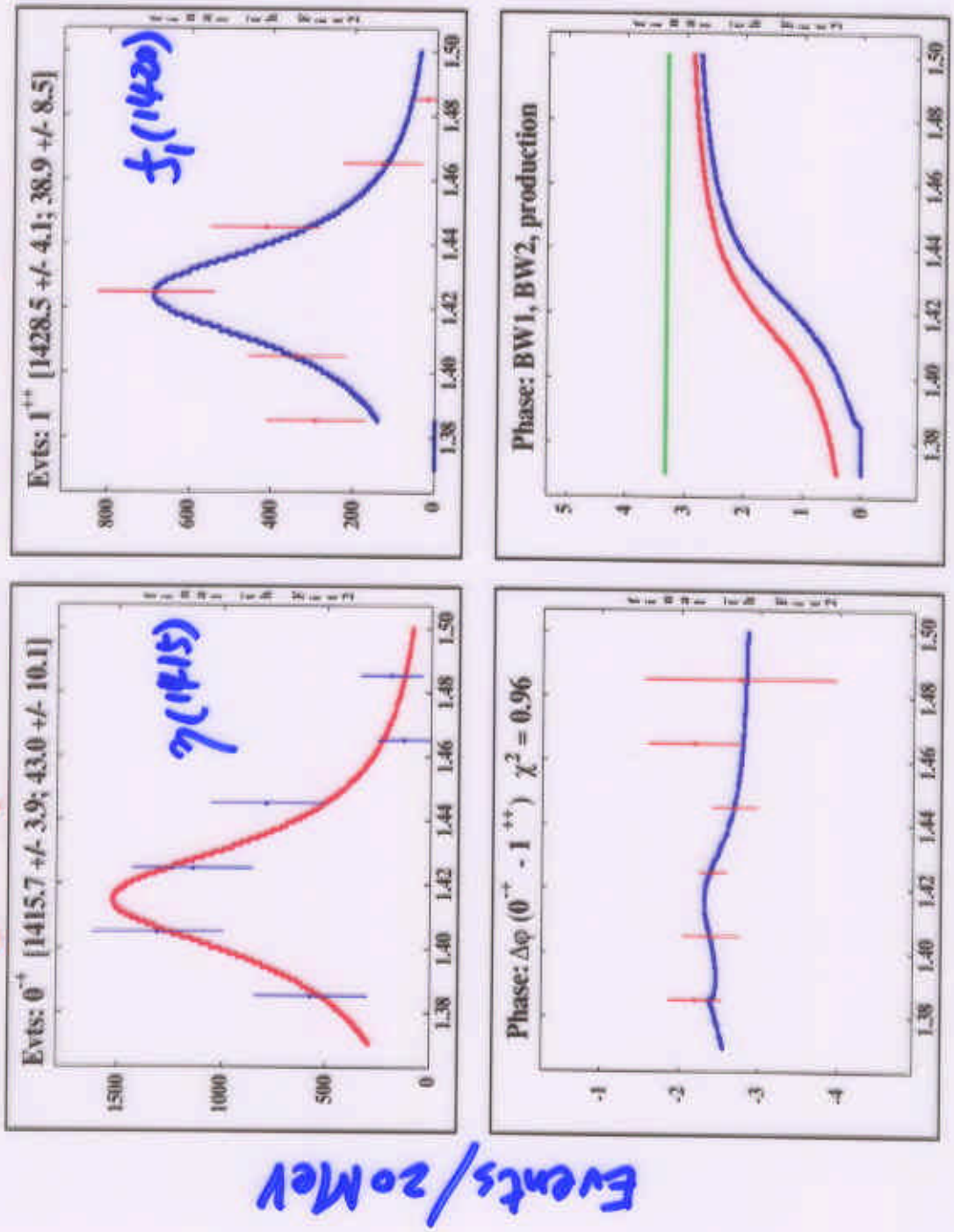
Fit results



• low mass fit; • high mass fit

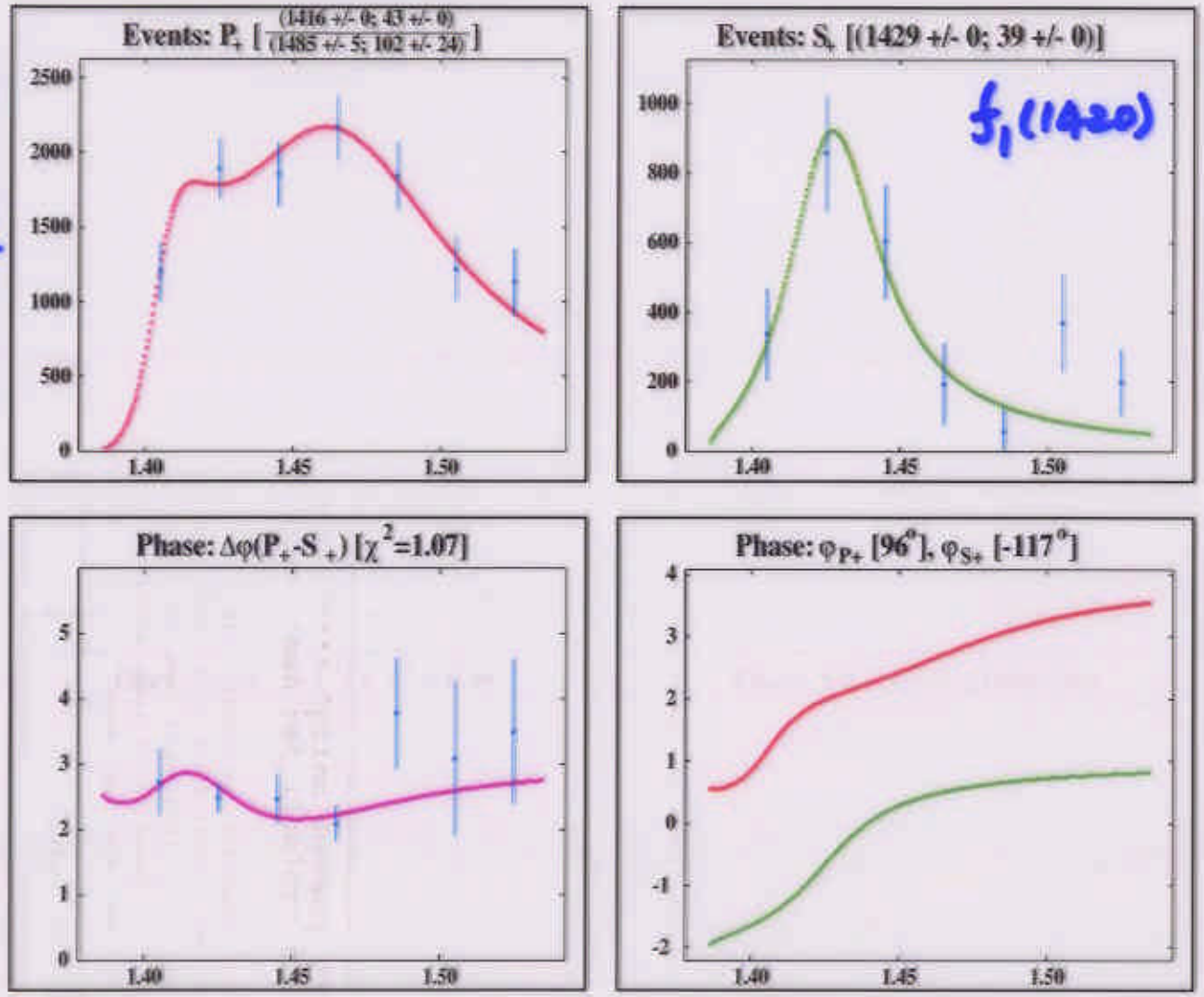

Events/20 MeV
0^{-+} $a_0\pi^0$
1^{++} $a_0\pi^0$
Evts: 0^{-+} [1294.5 +/- 5.7; 28.5 +/- 6.9]
$\eta(1295)$
Evts: 1^{++} [1295.5 +/- 6.5; 59.0 +/- 11.7]
$f_1(1285)$
Phase: $\Delta\varphi$ (0^{-+} - 1^{++}) [χ^2 = 0.85]
Phase: BW1, BW2, production
$M(K^+K^-\pi^0)$ GeV

$\eta(1415)$ and $f_1(1420)$



0^{-+} $K^*\bar{K}$ $\quad$ 1^{++} $K^*\bar{K}$

$\eta(1415)$ $\quad$ $\eta(1485)$



Events/20 MeV

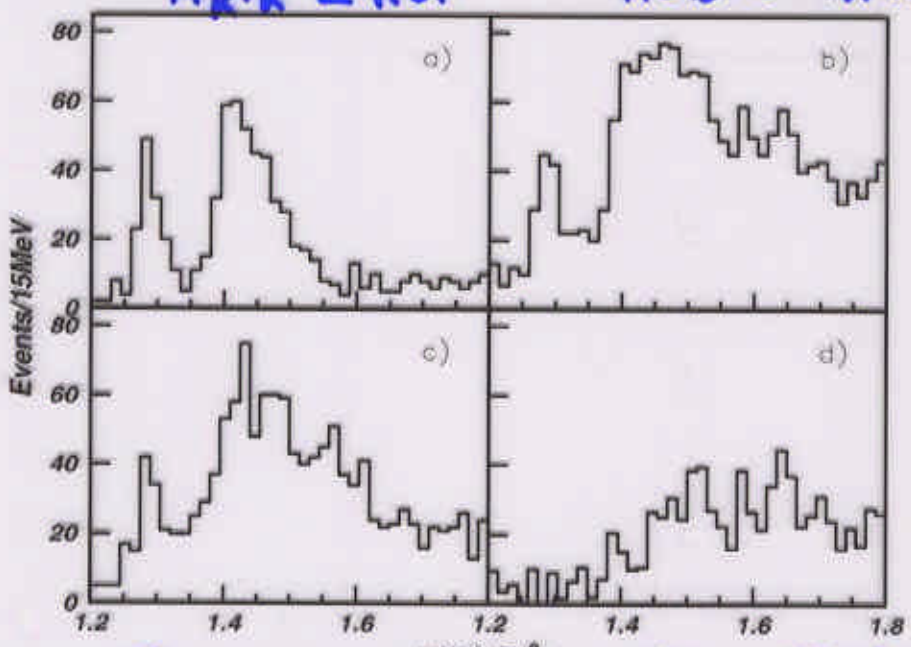
$M(K^+K^-\pi^0)$ GeV

$\eta(1415)$ and $\eta(1485)$

$C(1480)$

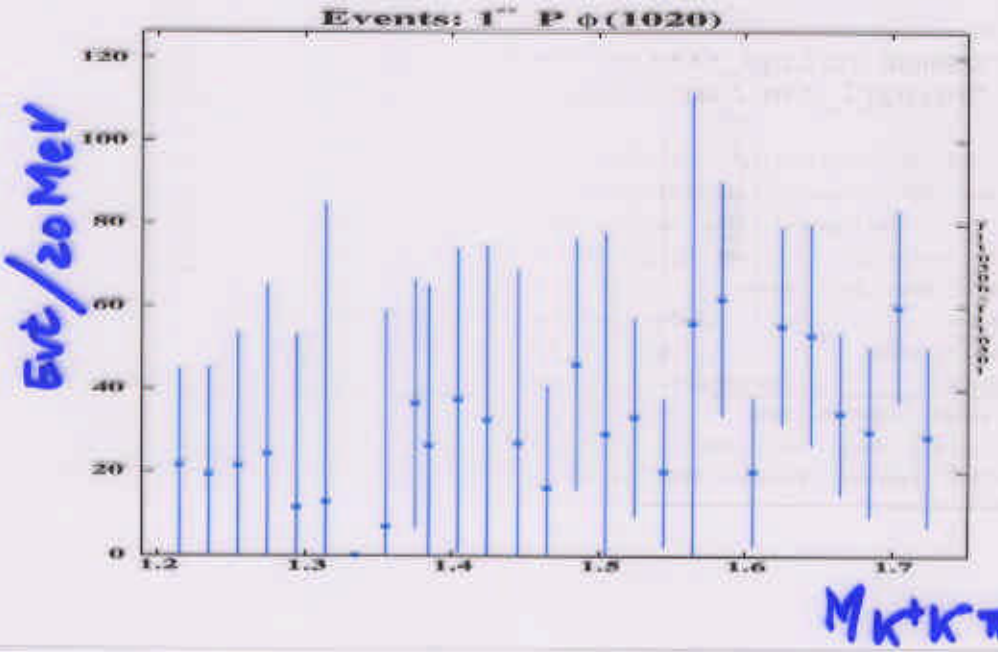
- $\phi(1020)$ sideband study

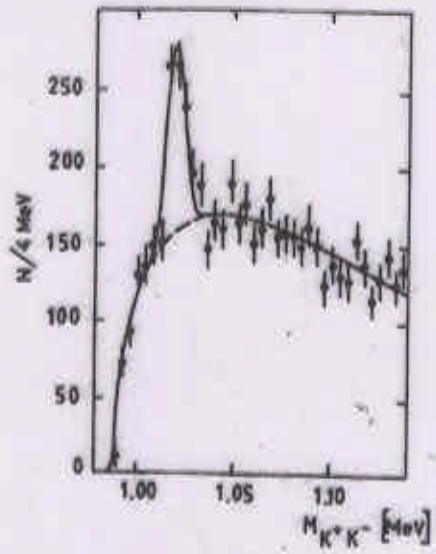
$M_{K^+K^-} < 1.01$ $\quad$ $1.013 < M_{K^+K^-} < 1.025$

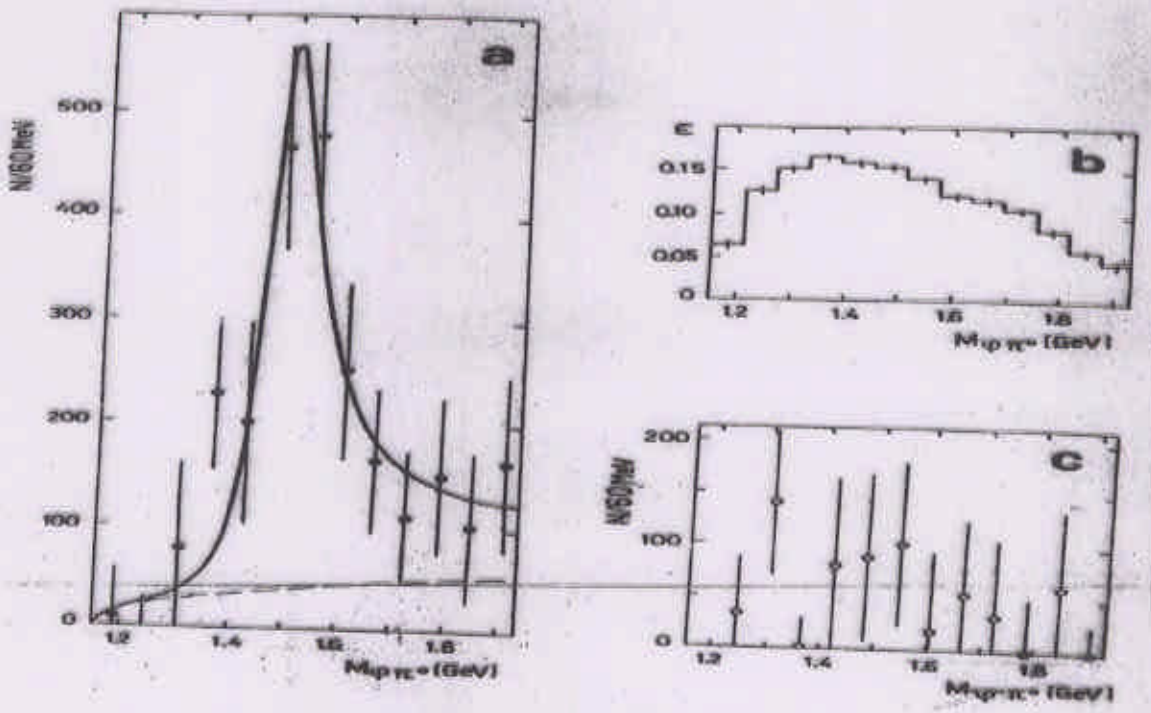


$1.025 < M_{K^+K^-} < 1.05$ $\quad$ after sideband subtraction

- PWA fit ($1^{--}\ \phi\pi^0$ waves)







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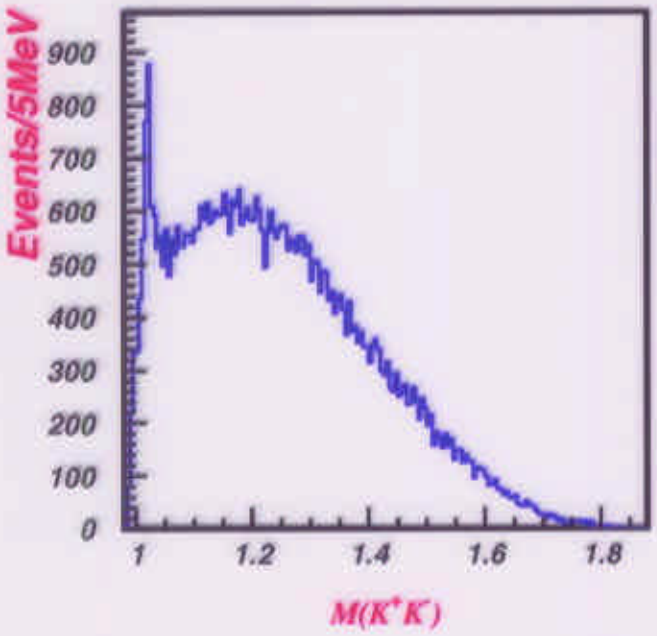
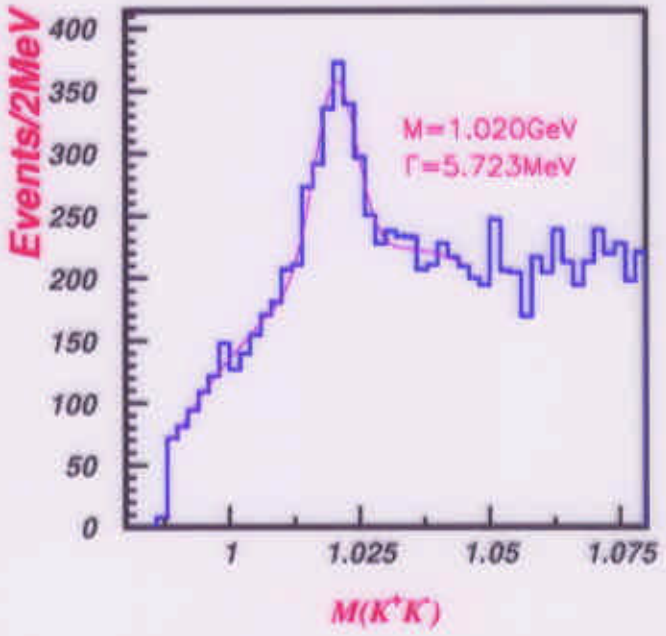
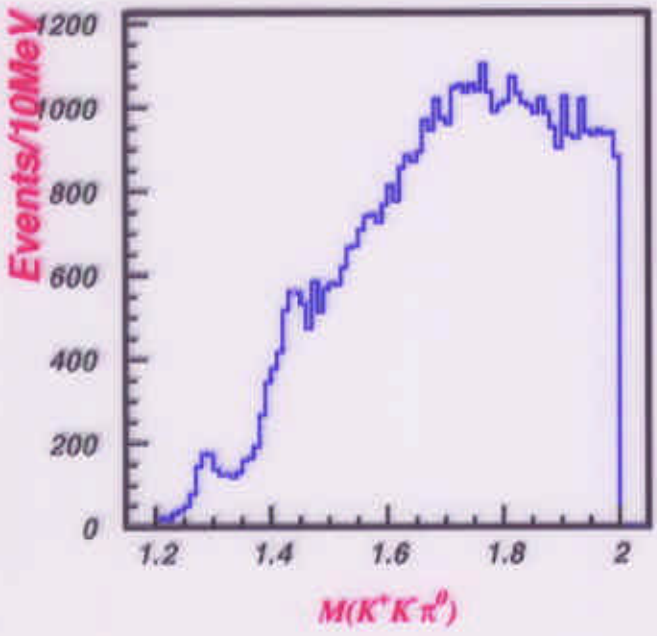
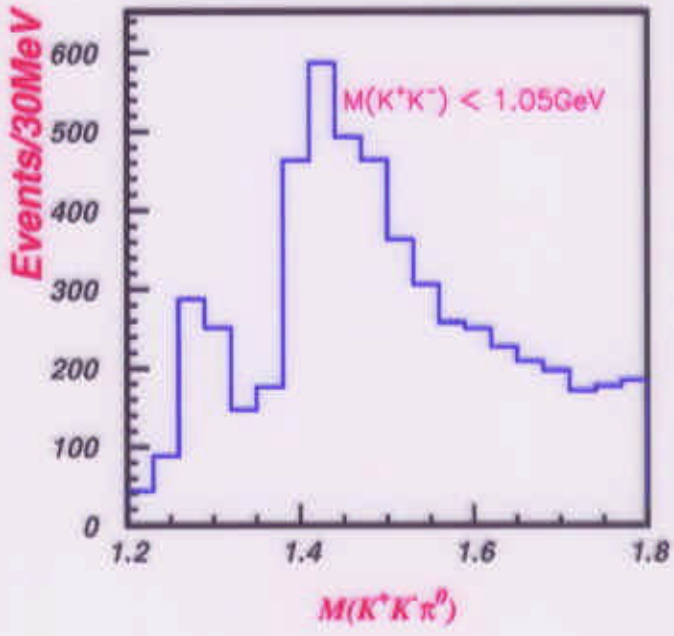

Events/5MeV
900
800
700
600
500
400
300
200
100
0
1
1.2
1.4
1.6
1.8
M(K⁺K⁻)


Events/2MeV
400
350
300
250
200
150
100
50
0
M=1.020GeV
Γ=5.723MeV
1
1.025
1.05
1.075
M(K⁺K⁻)


Events/10MeV
1200
1000
800
600
400
200
0
1.2
1.4
1.6
1.8
2
M(K⁺K⁻π⁰)


Events/30MeV
600
500
400
300
200
100
0
M(K⁺K⁻) < 1.05GeV
1.2
1.4
1.6
1.8
M(K⁺K⁻π⁰)

III. Conclusion

- PWA analysis is done for '97 BNL E852 $\pi^- p \to (K^+K^-\pi^0)n$ data. Results show three 0^{-+} and two 1^{++} states, identified as $\eta(1295)$, $\eta(1415)$, $\eta(1485)$, $f_1(1285)$ and $f_1(1420)$. Their masses and widths are measured.

Resonance	Mass(MeV)	Width(MeV)	Decay Mode
$f_1(1285)$	1296 ± 7	59 ± 12	$a_0\pi^0$
$\eta(1295)$	1295 ± 6	29 ± 7	$a_0\pi^0$
$\eta(1415)$	1415 ± 4	43 ± 10	$a_0\pi^0, K^*\overline{K}$
$f_1(1420)$	1428 ± 4	39 ± 9	$K^*\overline{K}$
$\eta(1485)$	1485 ± 5	102 ± 24	$K^*\overline{K}$

- $C(1480)$ is not observed from both side-band and PWA studies.

- $f_1(1510)$ not seen.