

**$K_3^*(1780)$** 

$$I(J^P) = \frac{1}{2}(3^-)$$

 **$K_3^*(1780)$  T-MATRIX POLE  $\sqrt{s}$** Note that  $\Gamma = -2 \operatorname{Im}(\sqrt{s})$ .

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>(1754 ± 13) – i (119 ± 14) OUR EVALUATION</b>			
(1754 ± 13) – i (119 ± 14)	<sup>1</sup> PELAEZ	17	RVUE $\pi K \rightarrow \pi K$
<sup>1</sup> Reanalysis of ESTABROOKS 78 and ASTON 88 satisfying Forward Dispersion Relations and using sequences of Pade approximants.			

 **$K_3^*(1780)$  MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>1779 ± 8 OUR AVERAGE</b>		Error includes scale factor of 1.2.			
1813 ± 15 <sup>+65</sup> <sub>-16</sub>	18k	<sup>1</sup> ABLIKIM	20F	BES3	$\psi(2S) \rightarrow K^+ K^- \eta$
1781 ± 8 ± 4		<sup>2</sup> ASTON	88	LASS 0	11 $K^- p \rightarrow K^- \pi^+ n$
1740 ± 14 ± 15		<sup>2</sup> ASTON	87	LASS 0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1779 ± 11		<sup>3</sup> BALDI	76	SPEC +	10 $K^+ p \rightarrow K^0 \pi^+ p$
1776 ± 26		<sup>4</sup> BRANDENB...	76D	ASPK 0	13 $K^\pm p \rightarrow K^\pm \pi^\mp N$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1720 ± 10 ± 15	6111	<sup>5</sup> BIRD	89	LASS –	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
1749 ± 10		ASTON	88B	LASS –	11 $K^- p \rightarrow K^- \eta p$
1780 ± 9	300	BAUBILLIER	84B	HBC –	8.25 $K^- p \rightarrow \bar{K}^0 \pi^- p$
1790 ± 15		BAUBILLIER	82B	HBC 0	8.25 $K^- p \rightarrow K_S^0 2\pi N$
1784 ± 9	2060	CLELAND	82	SPEC ±	50 $K^+ p \rightarrow K_S^0 \pi^\pm p$
1786 ± 15		<sup>6</sup> ASTON	81D	LASS 0	11 $K^- p \rightarrow K^- \pi^+ n$
1762 ± 9	190	TOAFF	81	HBC –	6.5 $K^- p \rightarrow \bar{K}^0 \pi^- p$
1850 ± 50		ETKIN	80	MPS 0	6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^-$
1812 ± 28		BEUSCH	78	OMEG	10 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1786 ± 8		CHUNG	78	MPS 0	6 $K^- p \rightarrow K^- \pi^+ n$

<sup>1</sup> Seen in  $\psi(2S)$  decay with branching ratio  $\psi(2S) \rightarrow K^\pm X \rightarrow K^+ K^- \eta = (2.0 \pm 0.4^{+1.9}_{-0.4}) \times 10^{-6}$ .<sup>2</sup> From energy-independent partial-wave analysis.<sup>3</sup> From a fit to  $Y_6^2$  moment.  $J^P = 3^-$  found.<sup>4</sup> Confirmed by phase shift analysis of ESTABROOKS 78, yields  $J^P = 3^-$ .<sup>5</sup> From a partial wave amplitude analysis.<sup>6</sup> From a fit to the  $Y_6^0$  moment.

**$K_3^*(1780)$  WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>161 ± 17 OUR AVERAGE</b>		Error includes scale factor of 1.1.			
191 <sup>+43+3</sup> <sub>-37-81</sub>	1.8k	<sup>1</sup> ABLIKIM	20F	BES3	$\psi(2S) \rightarrow K^+ K^- \eta$
203 ± 30 ± 8		<sup>2</sup> ASTON	88	LASS	0 11 $K^- p \rightarrow K^- \pi^+ n$
171 ± 42 ± 20		<sup>2</sup> ASTON	87	LASS	0 11 $K^- p \rightarrow$ $\bar{K}^0 \pi^+ \pi^- n$
135 ± 22		<sup>3</sup> BALDI	76	SPEC	+ 10 $K^+ p \rightarrow K^0 \pi^+ p$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
187 ± 31 ± 20	6111	<sup>4</sup> BIRD	89	LASS	- 11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
193 <sup>+51</sup> <sub>-37</sub>		ASTON	88B	LASS	- 11 $K^- p \rightarrow K^- \eta p$
99 ± 30	300	BAUBILLIER	84B	HBC	- 8.25 $K^- p \rightarrow \bar{K}^0 \pi^- p$
~ 130		BAUBILLIER	82B	HBC	0 8.25 $K^- p \rightarrow K_S^0 2\pi N$
191 ± 24	2060	CLELAND	82	SPEC	± 50 $K^+ p \rightarrow K_S^0 \pi^\pm p$
225 ± 60		<sup>5</sup> ASTON	81D	LASS	0 11 $K^- p \rightarrow K^- \pi^+ n$
~ 80	190	TOAFF	81	HBC	- 6.5 $K^- p \rightarrow \bar{K}^0 \pi^- p$
240 ± 50		ETKIN	80	MPS	0 6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^-$
181 ± 44		<sup>6</sup> BEUSCH	78	OMEG	10 $K^- p \rightarrow$ $\bar{K}^0 \pi^+ \pi^- n$
96 ± 31		CHUNG	78	MPS	0 6 $K^- p \rightarrow K^- \pi^+ n$
270 ± 70		<sup>7</sup> BRANDENB...	76D	ASPK	0 13 $K^\pm p \rightarrow K^\pm \pi^\mp N$

<sup>1</sup> Seen in  $\psi(2S)$  decay with branching ratio  $\psi(2S) \rightarrow K^\pm X \rightarrow K^+ K^- \eta = (2.0 \pm 0.4^{+1.9}_{-0.4}) \times 10^{-6}$ .

<sup>2</sup> From energy-independent partial-wave analysis.

<sup>3</sup> From a fit to  $Y_6^2$  moment.  $J^P = 3^-$  found.

<sup>4</sup> From a partial wave amplitude analysis.

<sup>5</sup> From a fit to  $Y_6^0$  moment.

<sup>6</sup> Errors enlarged by us to  $4\Gamma/\sqrt{N}$ ; see the note with the  $K^*(892)$  mass.

<sup>7</sup> ESTABROOKS 78 find that BRANDENBURG 76D data are consistent with 175 MeV width. Not averaged.

 **$K_3^*(1780)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
$\Gamma_1$ $K\rho$	(31 ± 9) %	
$\Gamma_2$ $K^*(892)\pi$	(20 ± 5) %	
$\Gamma_3$ $K\pi$	(18.8 ± 1.0) %	
$\Gamma_4$ $K\eta$	(30 ± 13) %	
$\Gamma_5$ $K_2^*(1430)\pi$	< 16 %	95%

**CONSTRAINED FIT INFORMATION**

An overall fit to 3 branching ratios uses 4 measurements and one constraint to determine 4 parameters. The overall fit has a  $\chi^2 = 0.0$  for 1 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients  $\langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j)$ , in percent, from the fit to the branching fractions,  $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$ . The fit constrains the  $x_i$  whose labels appear in this array to sum to one.

$x_2$	85		
$x_3$	18	21	
$x_4$	-98	-94	-27
	$x_1$	$x_2$	$x_3$

 **$K_3^*(1780)$  BRANCHING RATIOS**

**$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$   $\Gamma_1/\Gamma_2$**

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
<b>1.52±0.23 OUR FIT</b>				
<b>1.52±0.21±0.10</b>	ASTON	87	LASS	0
				11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

**$\Gamma(K^*(892)\pi)/\Gamma(K\pi)$   $\Gamma_2/\Gamma_3$**

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
<b>1.09±0.26 OUR FIT</b>				
<b>1.09±0.26</b>	ASTON	84B	LASS	0
				11 $K^- p \rightarrow \bar{K}^0 2\pi n$

**$\Gamma(K\pi)/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$**

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
<b>0.188±0.010 OUR FIT</b>				
<b>0.188±0.010 OUR AVERAGE</b>				
0.187±0.008±0.008	ASTON	88	LASS	0
				11 $K^- p \rightarrow K^- \pi^+ n$
0.19 ±0.02	ESTABROOKS	78	ASPK	0
				13 $K^\pm p \rightarrow K\pi N$

**$\Gamma(K\eta)/\Gamma(K\pi)$   $\Gamma_4/\Gamma_3$**

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
<b>1.6 ±0.7 OUR FIT</b>				

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.41±0.050	<sup>1</sup> BIRD	89	LASS	-	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
0.50±0.18	ASTON	88B	LASS	-	11 $K^- p \rightarrow K^- \eta p$

<sup>1</sup> This result supersedes ASTON 88B.

**$\Gamma(K_2^*(1430)\pi)/\Gamma(K^*(892)\pi)$   $\Gamma_5/\Gamma_2$**

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<b>&lt;0.78</b>	95	ASTON	87	LASS	0
					11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

**$K_3^*(1780)$  REFERENCES**

ABLIKIM	20F	PR D101 032008	M. Ablikim <i>et al.</i>	(BESIII Collab.)
PELAEZ	17	EPJ C77 91	J.R. Pelaez, A.Rodas, J.R. de Elvira	
BIRD	89	SLAC-332	P.F. Bird	(SLAC)
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON	88B	PL B201 169	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS) JP
ASTON	87	NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON	84B	NP B247 261	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA)
BAUBILLIER	84B	ZPHY C26 37	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
BAUBILLIER	82B	NP B202 21	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
CLELAND	82	NP B208 189	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)
ASTON	81D	PL 99B 502	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP
TOAFF	81	PR D23 1500	S. Toaff <i>et al.</i>	(ANL, KANS)
ETKIN	80	PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP
BEUSCH	78	PL 74B 282	W. Beusch <i>et al.</i>	(CERN, AACH3, ETH) JP
CHUNG	78	PRL 40 355	S.U. Chung <i>et al.</i>	(BNL, BRAN, CUNY+) JP
ESTABROOKS	78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+) JP
Also		PR D17 658	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)
BALDI	76	PL 63B 344	R. Baldi <i>et al.</i>	(GEVA) JP
BRANDENB...	76D	PL 60B 478	G.W. Brandenburg <i>et al.</i>	(SLAC) JP