

$K_3^*(1780)$

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

$K_3^*(1780)$ T-MATRIX POLE \sqrt{s}

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$(1754 \pm 13) - i(119 \pm 14)$	¹ PELAEZ	17	RVUE $\pi K \rightarrow \pi K$
¹ 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
1779 ± 8 OUR AVERAGE		Error includes scale factor of 1.2.			
$1813 \pm 15^{+65}_{-16}$	18k	¹ ABLIKIM	20F	BES3	$\psi(2S) \rightarrow K^+ K^- \eta$
$1781 \pm 8 \pm 4$		² ASTON	88	LASS	0 11 $K^- p \rightarrow K^- \pi^+ n$
$1740 \pm 14 \pm 15$		² ASTON	87	LASS	0 11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1779 ± 11		³ BALDI	76	SPEC	+ 10 $K^+ p \rightarrow K^0 \pi^+ p$
1776 ± 26		⁴ 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. • • •					
$1720 \pm 10 \pm 15$	6111	⁵ 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		⁶ 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 $K^- p \rightarrow K^- \pi^+ n$

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

² From energy-independent partial-wave analysis.

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

⁴ Confirmed by phase shift analysis of ESTABROOKS 78, yields $J^P = 3^-$.

⁵ From a partial wave amplitude analysis.

⁶ From a fit to the Y_6^0 moment.

$K_3^*(1780)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
161 ± 17 OUR AVERAGE		Error includes scale factor of 1.1.			
$191^{+43}_{-37} + 3_{-81}$	1.8k	¹ ABLIKIM	20F	BES3	$\psi(2S) \rightarrow K^+ K^- \eta$
$203 \pm 30 \pm 8$		² ASTON	88	LASS	0 11 $K^- p \rightarrow K^- \pi^+ n$

171±42±20		² ASTON	87	LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
135±22		³ 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	⁴ BIRD	89	LASS	-	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
193 ⁺⁵¹ ₋₃₇		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		⁵ 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		⁶ 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		⁷ BRANDENB...	76D	ASPK	0	13 $K^\pm p \rightarrow K^\pm \pi^\mp N$

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

² From energy-independent partial-wave analysis.

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

⁴ From a partial wave amplitude analysis.

⁵ From a fit to Y_6^0 moment.

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

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

$K_3^*(1780)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $K \rho$	(31 ± 9) %	
Γ_2 $K^*(892) \pi$	(20 ± 5) %	
Γ_3 $K \pi$	(18.8 ± 1.0) %	
Γ_4 $K \eta$	(30 ± 13) %	
Γ_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

$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$ Γ_1/Γ_2

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

$\Gamma(K^*(892)\pi)/\Gamma(K\pi)$ Γ_2/Γ_3

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

$\Gamma(K\pi)/\Gamma_{\text{total}}$ Γ_3/Γ

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

$\Gamma(K\eta)/\Gamma(K\pi)$ Γ_4/Γ_3

VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
1.6 ± 0.7 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.41 ± 0.050	¹ BIRD	89	LASS	-	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
0.50 ± 0.18	ASTON	88B	LASS	-	11 $K^- p \rightarrow K^- \eta p$

¹This result supersedes ASTON 88B.

$\Gamma(K_2^*(1430)\pi)/\Gamma(K^*(892)\pi)$ Γ_5/Γ_2

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT	
< 0.78	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
