

$K_3^*(1780)$

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

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

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$(1754 \pm 13) - i$	(119 ± 14)	¹ PELAEZ	17 RVUE $\pi K \rightarrow \pi K$
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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
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1779 ± 8 OUR AVERAGE Error includes scale factor of 1.2.

1813 ± 15	⁺⁶⁵ ₋₁₆	18k	¹ ABLIKIM	20F	BES3	$\psi(2S) \rightarrow K^+ K^- \eta$
1781 ± 8	± 4		² ASTON	88	LASS 0	11 $K^- p \rightarrow K^- \pi^+ n$
1740 ± 14	± 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 $K^\pm p \rightarrow K^\pm \pi^\mp N$

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1720 ± 10	± 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⁺³ ₋₃₇₋₈₁	1.8k	¹ ABLIKIM	20F	BES3	$\psi(2S) \rightarrow K^+ K^- \eta$
203 ± 30 ± 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±0.21±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±0.008±0.008	ASTON	88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
0.19 ±0.02	ESTABROOKS	78	ASPK	0	13 $K^\pm p \rightarrow K\pi N$

$\Gamma(K\eta)/\Gamma(K\pi)$ Γ_4/Γ_3

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
1.6 ±0.7 OUR FIT				

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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 $K^- p \rightarrow K^- \eta p$

¹ This 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