$K_3^*(1780)$

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

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

VALUE (MeV)	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$(1754 \pm 13) - i\,(119 \pm 14)$	[1] PELAEZ 17	RVUE	$\pi K \to \pi K$

[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		$\psi(2S) \to K^+ K^- \eta$
$1781 \pm 8 \pm 4$		[2] ASTON 88	LASS	0	$11\ K^- p \to K^- \pi^+ n$
$1740 \pm 14 \pm 15$		[2] ASTON 87	LASS	0	$11\ K^- p \to \overline{K}{}^0 \pi^+ \pi^- n$
1779 ± 11		[3] BALDI 76	SPEC	+	$10\ K^+ p \to K^0 \pi^+ p$
1776 ± 26		[4] BRANDENB... 76D	ASPK	0	$13\ K^\pm p \to K^\pm \pi^\mp N$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1720 \pm 10 \pm 15$	6111	[5] BIRD 89	LASS	−	$11\ K^- p \to \overline{K}{}^0 \pi^- p$
1749 ± 10		ASTON 88B	LASS	−	$11\ K^- p \to K^- \eta p$
1780 ± 9	300	BAUBILLIER 84B	HBC	−	$8.25\ K^- p \to \overline{K}{}^0 \pi^- p$
1790 ± 15		BAUBILLIER 82B	HBC	0	$8.25\ K^- p \to K^0_S 2\pi N$
1784 ± 9	2060	CLELAND 82	SPEC	±	$50\ K^+ p \to K^0_S \pi^\pm p$
1786 ± 15		[6] ASTON 81D	LASS	0	$11\ K^- p \to K^- \pi^+ n$
1762 ± 9	190	TOAFF 81	HBC	−	$6.5\ K^- p \to \overline{K}{}^0 \pi^- p$
1850 ± 50		ETKIN 80	MPS	0	$6\ K^- p \to \overline{K}{}^0 \pi^+ \pi^-$
1812 ± 28		BEUSCH 78	OMEG		$10\ K^- p \to \overline{K}{}^0 \pi^+ \pi^- n$
1786 ± 8		CHUNG 78	MPS	0	$6\ K^- p \to K^- \pi^+ n$

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

[2] From energy-independent partial-wave analysis.

[3] From a fit to Y^2_6 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^0_6 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		$\psi(2S) \to K^+ K^- \eta$
$203 \pm 30 \pm 8$		[2] ASTON 88	LASS	0	$11\ K^- p \to K^- \pi^+ n$

$171 \pm 42 \pm 20$		[2] ASTON	87	LASS	0	11 $K^- p \rightarrow \overline{K}^0 \pi^+ \pi^- n$
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. • • •

$187 \pm 31 \pm 20$	6111	[4] BIRD	89	LASS	−	11 $K^- p \rightarrow \overline{K}^0 \pi^- p$
193^{+51}_{-37}		ASTON	88B	LASS	−	11 $K^- p \rightarrow K^- \eta p$
99 ± 30	300	BAUBILLIER	84B	HBC	−	8.25 $K^- p \rightarrow \overline{K}^0 \pi^- p$
~ 130		BAUBILLIER	82B	HBC	0	8.25 $K^- p \rightarrow K^0_S 2\pi N$
191 ± 24	2060	CLELAND	82	SPEC	±	50 $K^+ p \rightarrow K^0_S \pi^\pm p$
225 ± 60		[5] ASTON	81D	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
~ 80	190	TOAFF	81	HBC	−	6.5 $K^- p \rightarrow \overline{K}^0 \pi^- p$
240 ± 50		ETKIN	80	MPS	0	6 $K^- p \rightarrow \overline{K}^0 \pi^+ \pi^-$
181 ± 44		[6] BEUSCH	78	OMEG		10 $K^- p \rightarrow \overline{K}^0 \pi^+ \pi^- n$
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^2_6 moment. $J^P = 3^-$ found.

[4] From a partial wave amplitude analysis.

[5] From a fit to Y^0_6 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 $\left\langle \delta x_i \delta x_j \right\rangle / (\delta x_i \cdot \delta x_j)$, 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.

$$\begin{array}{c|ccc} x_2 & 85 & & \\ x_3 & 18 & 21 & \\ x_4 & -98 & -94 & -27 \\ \hline & x_1 & x_2 & x_3 \end{array}$$

$K_3^*(1780)$ BRANCHING RATIOS

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

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

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

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

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

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 $K^- p \to K^- \pi^+ n$
0.19 ±0.02	ESTABROOKS	78	ASPK	0	13 $K^\pm p \to K \pi N$

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

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 $K^- p \to \overline{K}^0 \pi^- p$
0.50±0.18	ASTON	88B	LASS	−	11 $K^- p \to K^- \eta p$

[1] This result supersedes ASTON 88B.

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

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
<0.78	95	ASTON	87	LASS	0	11 $K^- p \to \overline{K}^0 \pi^+ \pi^- n$

$K_3^*(1780)$ REFERENCES

ABLIKIM	20F	PR D101 032008	M. Ablikim *et al.*	(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 *et al.*	(SLAC, NAGO, CINC, INUS)
ASTON	88B	PL B201 169	D. Aston *et al.*	(SLAC, NAGO, CINC, INUS) JP
ASTON	87	NP B292 693	D. Aston *et al.*	(SLAC, NAGO, CINC, INUS)
ASTON	84B	NP B247 261	D. Aston *et al.*	(SLAC, CARL, OTTA)
BAUBILLIER	84B	ZPHY C26 37	M. Baubillier *et al.*	(BIRM, CERN, GLAS+)
BAUBILLIER	82B	NP B202 21	M. Baubillier *et al.*	(BIRM, CERN, GLAS+)

CLELAND	82	NP B208 189	W.E. Cleland *et al.*	(DURH, GEVA, LAUS+)
ASTON	81D	PL 99B 502	D. Aston *et al.*	(SLAC, CARL, OTTA) JP
TOAFF	81	PR D23 1500	S. Toaff *et al.*	(ANL, KANS)
ETKIN	80	PR D22 42	A. Etkin *et al.*	(BNL, CUNY) JP
BEUSCH	78	PL 74B 282	W. Beusch *et al.*	(CERN, AACH3, ETH) JP
CHUNG	78	PRL 40 355	S.U. Chung *et al.*	(BNL, BRAN, CUNY+) JP
ESTABROOKS	78	NP B133 490	P.G. Estabrooks *et al.*	(MCGI, CARL, DURH+) JP
Also		PR D17 658	P.G. Estabrooks *et al.*	(MCGI, CARL, DURH+)
BALDI	76	PL 63B 344	R. Baldi *et al.*	(GEVA) JP
BRANDENB...	76D	PL 60B 478	G.W. Brandenburg *et al.*	(SLAC) JP