

$K^*(1680)$

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

$K^*(1680)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1718±18 OUR AVERAGE					
1722±20 ⁺³³ ₋₁₀₉	4289	¹ AAIJ	17c	LHCB	$B^+ \rightarrow J/\psi \phi K^+$
1677±10± 32		ASTON	88	LASS	0 11 $K^- p \rightarrow$ $K^- \pi^+ n$
1735±10± 20		ASTON	87	LASS	0 11 $K^- p \rightarrow$ $\bar{K}^0 \pi^+ \pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1678±64		BIRD	89	LASS	— 11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
1800±70		ETKIN	80	MPS	0 6 $K^- p \rightarrow$ $\bar{K}^0 \pi^+ \pi^- n$
~ 1650		ESTABROOKS	78	ASPK	0 13 $K^\pm p \rightarrow$ $K^\pm \pi^\pm n$

¹From an amplitude analysis of the decay $B^+ \rightarrow J/\psi \phi K^+$ with a significance of 8.5 σ .

$K^*(1680)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
320±110 OUR AVERAGE Error includes scale factor of 4.2.					
354± 75 ⁺¹⁴⁰ ₋₁₈₁	4289	² AAIJ	17c	LHCB	$B^+ \rightarrow J/\psi \phi K^+$
205± 16± 34		ASTON	88	LASS	0 11 $K^- p \rightarrow$ $K^- \pi^+ n$
423± 18± 30		ASTON	87	LASS	0 11 $K^- p \rightarrow$ $\bar{K}^0 \pi^+ \pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
454±270		BIRD	89	LASS	— 11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
170± 30		ETKIN	80	MPS	0 6 $K^- p \rightarrow$ $\bar{K}^0 \pi^+ \pi^- n$
250 to 300		ESTABROOKS	78	ASPK	0 13 $K^\pm p \rightarrow$ $K^\pm \pi^\pm n$

²From an amplitude analysis of the decay $B^+ \rightarrow J/\psi \phi K^+$ with a significance of 8.5 σ .

$K^*(1680)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K \pi$	(38.7±2.5) %
Γ_2 $K \rho$	(31.4 ^{+5.0} _{-2.1}) %
Γ_3 $K^*(892) \pi$	(29.9 ^{+2.2} _{-5.0}) %
Γ_4 $K \phi$	seen
Γ_5 $K \eta$	(1.4 ^{+1.0} _{-0.8}) %

CONSTRAINED FIT INFORMATION

An overall fit to 4 branching ratios uses 4 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 2.9$ for 2 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	−36	
x_3	−39	−72
	x_1	x_2

$K^*(1680)$ BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.387 ± 0.026 OUR FIT				
$0.388 \pm 0.014 \pm 0.022$	ASTON	88	LASS	0 11 $K^- p \rightarrow K^- \pi^+ n$

$\Gamma(K\pi)/\Gamma(K^*(892)\pi)$ Γ_1/Γ_3

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
$1.30^{+0.23}_{-0.14}$ OUR FIT				
2.8 ± 1.1	ASTON	84	LASS	0 11 $K^- p \rightarrow \bar{K}^0 2\pi n$

$\Gamma(K\rho)/\Gamma(K\pi)$ Γ_2/Γ_1

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
$0.81^{+0.14}_{-0.09}$ OUR FIT				
1.2 ± 0.4	ASTON	84	LASS	0 11 $K^- p \rightarrow \bar{K}^0 2\pi n$

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

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
$1.05^{+0.27}_{-0.11}$ OUR FIT				
$0.97 \pm 0.09^{+0.30}_{-0.10}$	ASTON	87	LASS	0 11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

$\Gamma(K\phi)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
seen	24k	³ AAIJ	21E	LHCB $B^+ \rightarrow J/\psi \phi K^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	4289	^{4,5} AAIJ	17C	LHCB $B^+ \rightarrow J/\psi \phi K^+$

³ From an amplitude analysis of the decay $B^+ \rightarrow J/\psi \phi K^+$ with a significance of 4.7 σ .

⁴ From an amplitude analysis of the decay $B^+ \rightarrow J/\psi \phi K^+$ with a significance of 8.5 σ .

⁵ Superseded by AAIJ 21E.

$\Gamma(K\eta)/\Gamma(K\pi)$					Γ_5/Γ_1
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$0.037 \pm 0.007^{+0.024}_{-0.018}$	116k	⁶ CHEN	20A BELL	$D^0 \rightarrow K^- \pi^+ \eta$	
⁶ CHEN 20A quotes the ratio $\Gamma(K^*(1680)^- \rightarrow K^- \eta)/\Gamma(K^*(1680)^- \rightarrow K^- \pi^0) = 0.11 \pm 0.02^{+0.06}_{-0.04} \pm 0.04(\text{BPDG})$ where the last uncertainty comes from $\text{B}(\eta \rightarrow \gamma\gamma) = (39.41 \pm 0.20)\%$. We divide it by 3 taking into account that $\Gamma(K^*(1680)^- \rightarrow K^- \pi^0)/\Gamma(K^*(1680)^- \rightarrow (K\pi)^-) = 1/3$.					

$\Gamma(K\eta)/\Gamma_{\text{total}}$					Γ_5/Γ
<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.44 \pm 0.21^{+0.96}_{-0.73}$	116k	⁷ CHEN	20A BELL	$D^0 \rightarrow K^- \pi^+ \eta$	
⁷ From an amplitude analysis of the decay $D^0 \rightarrow K^- \pi^+ \eta$ with a significance of 16σ . Not independent of the CHEN 20A measurement of $\Gamma(K^*(1680) \rightarrow K\eta)/\Gamma(K^*(1680) \rightarrow K\pi)$.					

$K^*(1680)$ REFERENCES

AAIJ	21E	PRL 127 082001	R. Aaij <i>et al.</i>	(LHCb Collab.)
CHEN	20A	PR D102 012002	Y.Q. Chen <i>et al.</i>	(BELLE Collab.)
AAIJ	17C	PRL 118 022003	R. Aaij <i>et al.</i>	(LHCb Collab.)
Also		PR D95 012002	R. Aaij <i>et al.</i>	(LHCb Collab.)
BIRD	89	SLAC-332	P.F. Bird	(SLAC)
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON	87	NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON	84	PL 149B 258	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP
ETKIN	80	PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP
ESTABROOKS	78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+) JP