

$\phi(1680)$

$$I^G(J^{PC}) = 0^-(1^{--})$$

$\phi(1680)$ MASS

e^+e^- PRODUCTION

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1680 ± 20 OUR ESTIMATE				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1623 ± 20	948	¹ AKHMETSHIN 03	CMD2	1.05–1.38 $e^+e^- \rightarrow K_L^0 K_S^0$
~ 1500		² ACHASOV	98H RVUE	$e^+e^- \rightarrow \pi^+\pi^-\pi^0, \omega\pi^+\pi^-, K^+K^-$
~ 1900		³ ACHASOV	98H RVUE	$e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$
1700 ± 20		⁴ CLEGG	94 RVUE	$e^+e^- \rightarrow K^+K^-, K_S^0 K\pi$
1657 ± 27	367	BISELLO	91C DM2	$e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$
1655 ± 17		⁵ BISELLO	88B DM2	$e^+e^- \rightarrow K^+K^-$
1680 ± 10		⁶ BUON	82 DM1	$e^+e^- \rightarrow \text{hadrons}$
1677 ± 12		⁷ MANE	82 DM1	$e^+e^- \rightarrow K_S^0 K\pi$

PHOTOPRODUCTION

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1753 ± 3	⁸ LINK	02K FOCS	20–160 $\gamma p \rightarrow K^+K^-p$
1726 ± 22	⁸ BUSENITZ	89 TPS	$\gamma p \rightarrow K^+K^-X$
1760 ± 20	⁸ ATKINSON	85C OMEG	20–70 $\gamma p \rightarrow K\bar{K}X$
1690 ± 10	⁸ ASTON	81F OMEG	25–70 $\gamma p \rightarrow K^+K^-X$

¹ From the combined fit of AKHMETSHIN 03 and MANE 81 also including ρ , ω , and ϕ . Neither isospin nor flavor structure known.

² Using data from IVANOV 81, BARKOV 87, BISELLO 88B, DOLINSKY 91, and ANTONELLI 92.

³ Using the data from BISELLO 91C.

⁴ Using BISELLO 88B and MANE 82 data.

⁵ From global fit including ρ , ω , ϕ and $\rho(1700)$ assume mass 1570 MeV and width 510 MeV for ρ radial excitation.

⁶ From global fit of ρ , ω , ϕ and their radial excitations to channels $\omega\pi^+\pi^-$, K^+K^- , $K_S^0 K_L^0$, $K_S^0 K^\pm \pi^\mp$. Assume mass 1570 MeV and width 510 MeV for ρ radial excitations, mass 1570 and width 500 MeV for ω radial excitation.

⁷ Fit to one channel only, neglecting interference with ω , $\rho(1700)$.

⁸ We list here a state decaying into K^+K^- possibly different from $\phi(1680)$.

$\phi(1680)$ WIDTH

e^+e^- PRODUCTION

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
150±50 OUR ESTIMATE				This is only an educated guess; the error given is larger than the error on the average of the published values.
••• We do not use the following data for averages, fits, limits, etc. •••				
139±60	948	⁹ AKHMETSHIN 03	CMD2	1.05–1.38 $e^+e^- \rightarrow K_L^0 K_S^0$
300±60		¹⁰ CLEGG	94 RVUE	$e^+e^- \rightarrow K^+ K^-, K_S^0 K\pi$
146±55	367	BISELLO	91C DM2	$e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$
207±45		¹¹ BISELLO	88B DM2	$e^+e^- \rightarrow K^+ K^-$
185±22		¹² BUON	82 DM1	$e^+e^- \rightarrow \text{hadrons}$
102±36		¹³ MANE	82 DM1	$e^+e^- \rightarrow K_S^0 K\pi$

PHOTOPRODUCTION

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
••• We do not use the following data for averages, fits, limits, etc. •••			
122±63	¹⁴ LINK	02K FOCS	20–160 $\gamma p \rightarrow K^+ K^- p$
121±47	¹⁴ BUSENITZ	89 TPS	$\gamma p \rightarrow K^+ K^- X$
80±40	¹⁴ ATKINSON	85C OMEG	20–70 $\gamma p \rightarrow K \bar{K} X$
100±40	¹⁴ ASTON	81F OMEG	25–70 $\gamma p \rightarrow K^+ K^- X$

⁹ From the combined fit of AKHMETSHIN 03 and MANE 81 also including ρ , ω , and ϕ . Neither isospin nor flavor structure known.

¹⁰ Using BISELLO 88B and MANE 82 data.

¹¹ From global fit including ρ , ω , ϕ and $\rho(1700)$

¹² From global fit of ρ , ω , ϕ and their radial excitations to channels $\omega\pi^+\pi^-$, K^+K^- , $K_S^0 K_L^0$, $K_S^0 K^\pm \pi^\mp$. Assume mass 1570 MeV and width 510 MeV for ρ radial excitations, mass 1570 and width 500 MeV for ω radial excitation.

¹³ Fit to one channel only, neglecting interference with ω , $\rho(1700)$.

¹⁴ We list here a state decaying into $K^+ K^-$ possibly different from $\phi(1680)$.

$\phi(1680)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K \bar{K}^*(892) + \text{c.c.}$	dominant
Γ_2 $K_S^0 K\pi$	seen
Γ_3 $K \bar{K}$	seen
Γ_4 $K_L^0 K_S^0$	
Γ_5 e^+e^-	seen
Γ_6 $\omega\pi\pi$	not seen
Γ_7 $K^+ K^- \pi^0$	

$\phi(1680) \Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

This combination of a branching ratio into channel (*i*) and branching ratio into e^+e^- is directly measured and obtained from the cross section at the peak. We list only data that have not been used to determine the branching ratio into (*i*) or e^+e^- .

$\Gamma(K_L^0 K_S^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}^2$ $\Gamma_4\Gamma_5/\Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.131 ± 0.059	948	¹⁵ AKHMETSHIN 03	CMD2	$1.05-1.38 e^+e^- \rightarrow K_L^0 K_S^0$

$\Gamma(K\bar{K}^*(892)+\text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}^2$ $\Gamma_1\Gamma_5/\Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
3.29 ± 1.57	367	¹⁶ BISELLO	91c DM2	$1.35-2.40 e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$

¹⁵ From the combined fit of AKHMETSHIN 03 and MANE 81 also including ρ , ω , and ϕ . Neither isospin nor flavor structure known. Recalculated by us.

¹⁶ Recalculated by us with the published value of $B(K\bar{K}^*(892) + \text{c.c.}) \times \Gamma(e^+e^-)$.

$\phi(1680)$ BRANCHING RATIOS

$\Gamma(K\bar{K}^*(892)+\text{c.c.})/\Gamma(K_S^0 K \pi)$ Γ_1/Γ_2

VALUE	DOCUMENT ID	TECN	COMMENT
dominant	MANE	82 DM1	$e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$

$\Gamma(K\bar{K})/\Gamma(K\bar{K}^*(892)+\text{c.c.})$ Γ_3/Γ_1

VALUE	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
0.07 ± 0.01	BUON	82 DM1	e^+e^-

$\Gamma(\omega\pi\pi)/\Gamma(K\bar{K}^*(892)+\text{c.c.})$ Γ_6/Γ_1

VALUE	DOCUMENT ID	TECN	COMMENT
<0.10	BUON	82 DM1	e^+e^-

$\phi(1680)$ REFERENCES

AKHMETSHIN 03	PL B551 27	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
Also	02 PAN 65 1222	E.V. Anashkin, V.M. Aulchenko, R.R. Akhmetshin	
	Translated from YAF 65	1255.	
LINK	02K PL B545 50	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
ACHASOV	98H PR D57 4334	N.N. Achasov, A.A. Kozhevnikov	
CLEGG	94 ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)
ANTONELLI	92 ZPHY C56 15	A. Antonelli <i>et al.</i>	(DM2 Collab.)
BISELLO	91C ZPHY C52 227	D. Bisello <i>et al.</i>	(DM2 Collab.)
DOLINSKY	91 PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)
BUSENITZ	89 PR D40 1	J.K. Busenitz <i>et al.</i>	(ILL, FNAL)
BISELLO	88B ZPHY C39 13	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)
BARKOV	87 JETPL 46 164	L.M. Barkov <i>et al.</i>	(NOVO)
	Translated from ZETFP 46	132.	

ATKINSON	85C	ZPHY C27 233	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
BUON	82	PL 118B 221	J. Buon <i>et al.</i>	(LALO, MONP)
MANE	82	PL 112B 178	F. Mane <i>et al.</i>	(LALO)
ASTON	81F	PL 104B 231	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)
IVANOV	81	PL 107B 297	P.M. Ivanov <i>et al.</i>	(NOVO)
MANE	81	PL 99B 261	F. Mane <i>et al.</i>	(ORSAY)

OTHER RELATED PAPERS

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LINK	02K	PL B545 50	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
ABELE	99D	PL B468 178	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ACHASOV	97F	PAN 60 2029	N.N. Achasov, A.A. Kozhevnikov	(NOVM)
		Translated from YAF 60 2212.		
ATKINSON	86C	ZPHY C30 541	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
ATKINSON	84	NP B231 15	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
ATKINSON	84B	NP B231 1	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
ATKINSON	83C	NP B229 269	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
CORDIER	81	PL 106B 155	A. Cordier <i>et al.</i>	(ORSAY)
MANE	81	PL 99B 261	F. Mane <i>et al.</i>	(ORSAY)
ASTON	80F	NP B174 269	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)