$\phi(1680)$

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

$\phi(1680)$ 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 $e^+ e^- \to K^0_L K^0_S$
~ 1500		[2] ACHASOV	98H	RVUE	$e^+ e^- \to \pi^+ \pi^- \pi^0$, $\omega \pi^+ \pi^-$, $K^+ K^-$
~ 1900		[3] ACHASOV	98H	RVUE	$e^+ e^- \to K^0_S K^\pm \pi^\mp$
1700±20		[4] CLEGG	94	RVUE	$e^+ e^- \to K^+ K^-$, $K^0_S K \pi$
1657±27	367	BISELLO	91C	DM2	$e^+ e^- \to K^0_S K^\pm \pi^\mp$
1655±17		[5] BISELLO	88B	DM2	$e^+ e^- \to K^+ K^-$
1680±10		[6] BUON	82	DM1	$e^+ e^- \to$ hadrons
1677±12		[7] MANE	82	DM1	$e^+ e^- \to K^0_S K \pi$

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 $\gamma p \to K^+ K^- p$
1726±22	[8] BUSENITZ	89	TPS	$\gamma p \to K^+ K^- X$
1760±20	[8] ATKINSON	85C	OMEG	20–70 $\gamma p \to K \overline{K} X$
1690±10	[8] ASTON	81F	OMEG	25–70 $\gamma p \to K^+ K^- X$

[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 $\omega \pi^+ \pi^-$, $K^+ K^-$, $K^0_S K^0_L$, $K^0_S K^\pm \pi^\mp$. 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 $e^+ e^- \to K^0_L K^0_S$
300±60		[10] CLEGG	94	RVUE	$e^+ e^- \to K^+ K^-$, $K^0_S K \pi$
146±55	367	BISELLO	91C	DM2	$e^+ e^- \to K^0_S K^\pm \pi^\mp$
207±45		[11] BISELLO	88B	DM2	$e^+ e^- \to K^+ K^-$
185±22		[12] BUON	82	DM1	$e^+ e^- \to$ hadrons
102±36		[13] MANE	82	DM1	$e^+ e^- \to K^0_S K \pi$

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 $\gamma p \to K^+ K^- p$
121±47	[14] BUSENITZ	89	TPS	$\gamma p \to K^+ K^- X$
80±40	[14] ATKINSON	85C	OMEG	20–70 $\gamma p \to K \overline{K} X$
100±40	[14] ASTON	81F	OMEG	25–70 $\gamma p \to K^+ K^- X$

[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^-, $K^0_S K^0_L$, $K^0_S K^\pm \pi^\mp$. 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	$K\overline{K}^*(892)+$ c.c.	dominant
Γ_2	$K^0_S K \pi$	seen
Γ_3	$K\overline{K}$	seen
Γ_4	$K^0_L K^0_S$	
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^-.

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

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 $e^+e^- \to K_L^0 K_S^0$

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

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 $e^+e^- \to K_S^0 K^\pm \pi^\mp$

[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 $B(K\overline{K}^*(892) + \text{c.c.}) \times \Gamma(e^+e^-)$.

$\phi(1680)$ BRANCHING RATIOS

$\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma(K_S^0 K\pi)$ $\quad \Gamma_1/\Gamma_2$

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

$\Gamma(K\overline{K})/\Gamma(K\overline{K}^*(892)+\text{c.c.})$ $\quad \Gamma_3/\Gamma_1$

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^-

$\Gamma(\omega\pi\pi)/\Gamma(K\overline{K}^*(892)+\text{c.c.})$ $\quad \Gamma_6/\Gamma_1$

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

$\phi(1680)$ REFERENCES

AKHMETSHIN	03	PL B551 27	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
Also	02	PAN 65 1222 Translated from YAF 65 1255.	E.V. Anashkin, V.M. Aulchenko, R.R. Akhmetshin	
LINK	02K	PL B545 50	J.M. Link *et al.*	(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 *et al.*	(DM2 Collab.)
BISELLO	91C	ZPHY C52 227	D. Bisello *et al.*	(DM2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky *et al.*	(NOVO)
BUSENITZ	89	PR D40 1	J.K. Busenitz *et al.*	(ILL, FNAL)
BISELLO	88B	ZPHY C39 13	D. Bisello *et al.*	(PADO, CLER, FRAS+)
BARKOV	87	JETPL 46 164 Translated from ZETFP 46 132.	L.M. Barkov *et al.*	(NOVO)

ATKINSON	85C	ZPHY C27 233	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
BUON	82	PL 118B 221	J. Buon *et al.*	(LALO, MONP)
MANE	82	PL 112B 178	F. Mane *et al.*	(LALO)
ASTON	81F	PL 104B 231	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)
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ABELE	99D	PL B468 178	A. Abele *et al.*	(Crystal Barrel Collab.)
ACHASOV	97F	PAN 60 2029 Translated from YAF 60 2212.	N.N. Achasov, A.A. Kozhevnikov	(NOVM)
ATKINSON	86C	ZPHY C30 541	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
ATKINSON	84	NP B231 15	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
ATKINSON	84B	NP B231 1	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
ATKINSON	83C	NP B229 269	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
CORDIER	81	PL 106B 155	A. Cordier *et al.*	(ORSAY)
MANE	81	PL 99B 261	F. Mane *et al.*	(ORSAY)
ASTON	80F	NP B174 269	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)