$\phi(2170)$

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

See the review on "Spectroscopy of Light Meson Resonances."

$\phi(2170)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2162 ± 7 OUR AVERAGE		Error includes scale factor of 1.1.			
2176 ±24 ± 3		[1] ABLIKIM	21A	BES3	$e^+e^- \to \omega\eta$
2163.5± 6.2± 3.0		[2] ABLIKIM	21T	BES3	$e^+e^- \to \phi\eta$
2177.5± 4.8±19.5		[3] ABLIKIM	20M	BES3	$e^+e^- \to \eta'\phi$
2126.5±16.8±12.4		[4] ABLIKIM	20S	BES3	$e^+e^- \to K^+K^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2273.7± 5.7±19.3		[5] ABLIKIM	21AP	BES3	$e^+e^- \to K^0_S K^0_L$
2135 ± 8 ± 9	95	ABLIKIM	19I	BES3	$e^+e^- \to \eta\phi f_0(980)$
2239.2± 7.1±11.3		[6] ABLIKIM	19L	BES3	$e^+e^- \to K^+K^-$
2200 ± 6 ± 5	471	ABLIKIM	15H	BES3	$J/\psi \to \eta\phi\pi^+\pi^-$
2180 ± 8 ± 8		[7,8] LEES	12F	BABR	$10.6\ e^+e^- \to \phi\pi^+\pi^-\gamma$
2079 ±13 $^{+79}_{-28}$	4.8k	[9] SHEN	09	BELL	$10.6\ e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
2186 ±10 ± 6	52	ABLIKIM	08F	BES	$J/\psi \to \eta\phi f_0(980)$
2125 ±22 ±10	483	AUBERT	08S	BABR	$10.6\ e^+e^- \to \phi\eta\gamma$
2192 ±14	116	[10] AUBERT	07AK	BABR	$10.6\ e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
2169 ±20	149	[10] AUBERT	07AK	BABR	$10.6\ e^+e^- \to K^+K^-\pi^0\pi^0\gamma$
2175 ±10 ±15	201	[8,11] AUBERT,BE	06D	BABR	$10.6\ e^+e^- \to K^+K^-\pi\pi\gamma$

[1] From a fit to the cross section between 2.00 and 3.08 GeV with a coherent sum of Breit-Wigner amplitudes, including contributions from $\omega(1420)$ and $\omega(1650)/\phi(1680)$.

[2] From a fit to the cross section below 3.5 GeV measured by BaBar and BESIII with a coherent sum of two modified Breit-Wigner amplitudes ($\phi(1680)$ and $\phi(2170)$) and a nonresonant term.

[3] From a fit using a coherent sum of a phase-space modified Breit-Wigner function and a phase-space term.

[4] By a simultaneous fit of the intermediate channels in a partial-wave analysis, assuming the same structure, modelled with a coherent sum of a nonresonant component and a resonant component by a Breit-Wigner function.

[5] From a fit to the cross section between 2.00 and 3.08 GeV with a sum of Breit-Wigner amplitude and a nonresonant contribution. The observed structure can be also due to $\rho(2150)$.

[6] The observed structure can be due to both the $\phi(2170)$ and $\rho(2150)$.

[7] Fit includes interference with the $\phi(1680)$.

[8] From the $\phi f_0(980)$ component.

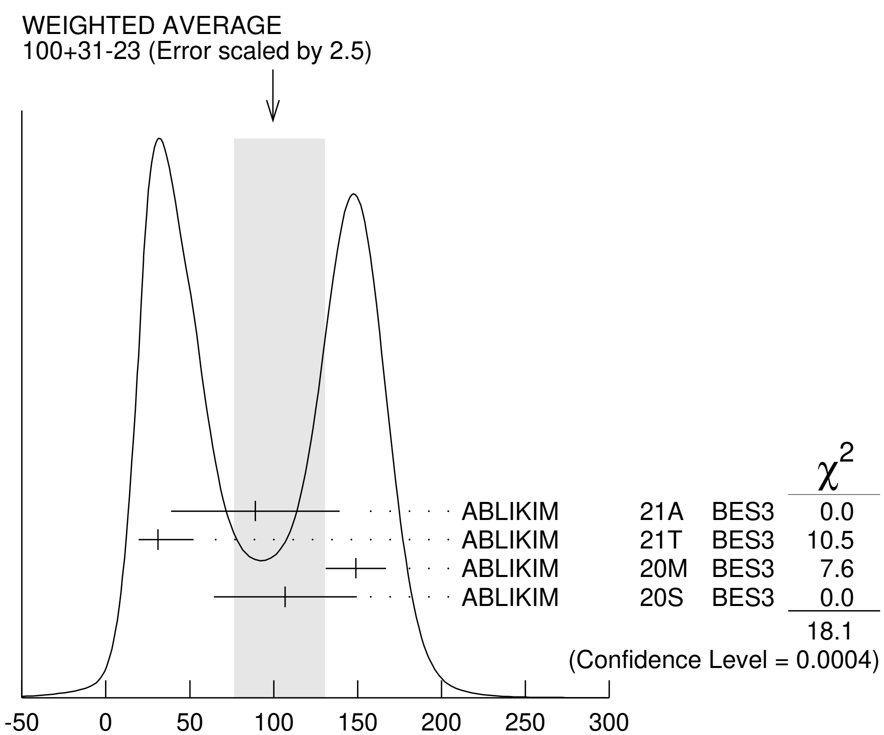
[9] From a fit with two incoherent Breit-Wigners.

[10] From the $K^+K^- f_0(980)$ component.

[11] Superseded by LEES 12F.

$\phi(2170)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
100 $^{+31}_{-23}$ OUR AVERAGE				Error includes scale factor of 2.5. See the ideogram below.
89 ±50 ± 5		[1] ABLIKIM 21A	BES3	$e^+e^- \to \omega\eta$
$31.1^{+21.1}_{-11.6}\pm$ 1.1		[2] ABLIKIM 21T	BES3	$e^+e^- \to \phi\eta$
149.0±15.6± 8.9		[3] ABLIKIM 20M	BES3	$e^+e^- \to \eta'\phi$
106.9±32.1±28.1		[4] ABLIKIM 20S	BES3	$e^+e^- \to K^+K^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
86 ±44 ±51		[5] ABLIKIM 21AP	BES3	$e^+e^- \to K^0_S K^0_L$
104 ±24 ±12	95	ABLIKIM 19I	BES3	$e^+e^- \to \eta\phi f_0(980)$
139.8±12.3±20.6		[6] ABLIKIM 19L	BES3	$e^+e^- \to K^+K^-$
104 ±15 ±15	471	ABLIKIM 15H	BES3	$J/\psi \to \eta\phi\pi^+\pi^-$
77 ±15 ±10		[7,8] LEES 12F	BABR	10.6 $e^+e^- \to \phi\pi^+\pi^-\gamma$
192 ±23 $^{+25}_{-61}$	4.8k	[9] SHEN 09	BELL	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
65 ±23 ±17	52	ABLIKIM 08F	BES	$J/\psi \to \eta\phi f_0(980)$
61 ±50 ±13	483	AUBERT 08S	BABR	10.6 $e^+e^- \to \phi\eta\gamma$
71 ±21	116	[10] AUBERT 07AK	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
102 ±27	149	[10] AUBERT 07AK	BABR	10.6 $e^+e^- \to K^+K^-\pi^0\pi^0\gamma$
58 ±16 ±20	201	[8,11] AUBERT,BE 06D	BABR	10.6 $e^+e^- \to K^+K^-\pi\pi\gamma$



[1] From a fit to the cross section between 2.00 and 3.08 GeV with a coherent sum of Breit-Wigner amplitudes, including contributions from $\omega(1420)$ and $\omega(1650)/\phi(1680)$.

[2] From a fit to the cross section below 3.5 GeV measured by BaBar and BESIII with a coherent sum of two modified Breit-Wigner amplitudes (ϕ(1680) and ϕ(2170)) and a nonresonant term.
[3] From a fit using a coherent sum of a phase-space modified Breit-Wigner function and a phase-space term.
[4] By a simultaneous fit of the intermediate channels in a partial-wave analysis, assuming the same structure, modelled with a coherent sum of a nonresonant component and a resonant component by a Breit-Wigner function.
[5] From a fit to the cross section between 2.00 and 3.08 GeV with a sum of Breit-Wigner amplitude and a nonresonant contribution. The observed structure can be also due to ρ(2150).
[6] The observed structure can be due to both the ϕ(2170) and ρ(2150).
[7] Fit includes interference with the ϕ(1680).
[8] From the $\phi f_0(980)$ component.
[9] From a fit with two incoherent Breit-Wigners.
[10] From the $K^+ K^- f_0(980)$ component.
[11] Superseded by LEES 12F.

ϕ(2170) WIDTH (MeV)

ϕ(2170) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$e^+ e^-$	seen
Γ_2	$\phi\eta$	
Γ_3	$\omega\eta$	
Γ_4	$\phi\eta'$	
Γ_5	$\phi\pi\pi$	
Γ_6	$\phi f_0(980)$	seen
Γ_7	$K^0_S K^0_L$	
Γ_8	$K^+ K^- \pi^+ \pi^-$	
Γ_9	$K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^+ \pi^-$	seen
Γ_{10}	$K^+ K^- \pi^0 \pi^0$	
Γ_{11}	$K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^0 \pi^0$	seen
Γ_{12}	$K^{*0} K^\pm \pi^\mp$	not seen
Γ_{13}	$K^*(892)^0 \overline{K}^*(892)^0$	not seen
Γ_{14}	$K^*(892)^+ K^*(892)^-$	
Γ_{15}	$K(1460)^+ K^- +$ c.c.	
Γ_{16}	$K_1(1270)^+ K^- +$ c.c.	
Γ_{17}	$K_1(1400)^+ K^- +$ c.c.	

ϕ(2170) $\Gamma(i)\Gamma(e^+ e^-)/\Gamma(\text{total})$

$\Gamma(\phi\eta) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$ — $\Gamma_2\Gamma_1/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.24^{+0.12}_{-0.07}$		[1] ABLIKIM	21T	BES3	$e^+ e^- \rightarrow \phi\eta$

1.7 ±0.7 ±1.3	483	AUBERT	08S	BABR	10.6 $e^+ e^- \to \phi\eta\gamma$

[1] From a solution of the fit to the cross section below 3.5 GeV measured by BaBar and BESIII with a coherent sum of two modified Breit-Wigner amplitudes (ϕ(1680) and ϕ(2170)) and a nonresonant term. The other solution gives $10.11^{+3.87}_{-3.13}$ eV.

$\Gamma(\omega\eta) \times \Gamma(e^+ e^-)/\Gamma_{total}$ — $\Gamma_3\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
0.43±0.15±0.04	[1] ABLIKIM	21A	BES3	$e^+ e^- \to \omega\eta$

[1] For constructive interference with ω(1420) and ω(1650)/ϕ(1680). For destructive interference: 1.25 ± 0.48 ± 0.18 eV.

$\Gamma(\phi\eta') \times \Gamma(e^+ e^-)/\Gamma_{total}$ — $\Gamma_4\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
7.1±0.7±0.7	[1] ABLIKIM	20M	BES3	$e^+ e^- \to \eta'\phi$

[1] From a fit using a coherent sum of a phase-space modified Breit-Wigner function and a phase-space term.

$\Gamma(\phi f_0(980)) \times \Gamma(e^+ e^-)/\Gamma_{total}$ — $\Gamma_6\Gamma_1/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
2.3±0.3±0.3		[1,2] LEES	12F	BABR	10.6 $e^+ e^- \to \phi\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.5±0.8±0.4	201	[2,3] AUBERT,BE	06D	BABR	10.6 $e^+ e^- \to K^+ K^- \pi\pi\gamma$

[1] From a fit with constructive interference with the ϕ(1680). In a fit with destructive interference, the value is larger by a factor of 12.
[2] From the ϕf_0(980) component.
[3] Superseded by LEES 12F.

$\Gamma(K^0_S K^0_L) \times \Gamma(e^+ e^-)/\Gamma_{total}$ — $\Gamma_7\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.9±0.6±0.7	[1] ABLIKIM	21AP	BES3	$e^+ e^- \to K^0_S K^0_L$

[1] From a fit to the cross section between 2.00 and 3.08 GeV with a sum of Breit-Wigner amplitude and a nonresonant contribution. The observed structure can be also due to ρ(2150).

$\Gamma(K^*(892)^+ K^*(892)^-) \times \Gamma(e^+ e^-)/\Gamma_{total}$ — $\Gamma_{14}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<1.9	90	[1] ABLIKIM	20S	BES3	$e^+ e^- \to K^+ K^- \pi^0 \pi^0$

[1] By a simultaneous fit of the intermediate channels in a partial-wave analysis, assuming the same structure, modelled with a coherent sum of a nonresonant component and a resonant component by a Breit-Wigner function.

$\Gamma(K(1460)^+ K^- + c.c.) \times \Gamma(e^+ e^-)/\Gamma_{total}$ — $\Gamma_{15}\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.0±3.8	[1] ABLIKIM	20S	BES3	$e^+ e^- \to K^+ K^- \pi^0 \pi^0$

[1] By a simultaneous fit of the intermediate channels in a partial-wave analysis, assuming the same structure, modelled with a coherent sum of a nonresonant component and a resonant component by a Breit-Wigner function.

$\Gamma(K_1(1270)^+ K^- + c.c.) \times \Gamma(e^+ e^-)/\Gamma_{total}$ $\Gamma_{16}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<12.5	90	[1] ABLIKIM	20S	BES3	$e^+ e^- \to K^+ K^- \pi^0 \pi^0$

[1] By a simultaneous fit of the intermediate channels in a partial-wave analysis, assuming the same structure, modelled with a coherent sum of a nonresonant component and a resonant component by a Breit-Wigner function. A second solution of the fit with equal fit quality gives an upper limit value of 297.6 eV.

$\Gamma(K_1(1400)^+ K^- + c.c.) \times \Gamma(e^+ e^-)/\Gamma_{total}$ $\Gamma_{17}\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.7 ± 3.3	[1] ABLIKIM	20S	BES3	$e^+ e^- \to K^+ K^- \pi^0 \pi^0$

[1] By a simultaneous fit of the intermediate channels in a partial-wave analysis, assuming the same structure, modelled with a coherent sum of a nonresonant component and a resonant component by a Breit-Wigner function. A second solution of the fit with equal fit quality gives a value of 98.8 ± 7.8 eV.

$\phi(2170)$ $\Gamma(i)\Gamma(e^+ e^-)/\Gamma^2(\text{total})$

$\Gamma(\phi\pi\pi)/\Gamma_{total} \times \Gamma(e^+ e^-)/\Gamma_{total}$ $\Gamma_5/\Gamma \times \Gamma_1/\Gamma$

VALUE (units 10^{-7})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.65 \pm 0.15 \pm 0.18$	4.8k	[1] SHEN	09	BELL	$10.6\ e^+ e^- \to K^+ K^- \pi^+ \pi^- \gamma$

[1] Multiplied by 3/2 to take into account the $\phi\pi^0\pi^0$ mode. Using $B(\phi \to K^+ K^-) = (49.2 \pm 0.6)\%$.

$\phi(2170)$ BRANCHING RATIOS

$\Gamma(K^+ K^- f_0(980) \to K^+ K^- \pi^+ \pi^-)/\Gamma_{total}$ Γ_9/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AUBERT	07AK	BABR	$10.6\ e^+ e^- \to K^+ K^- \pi^+ \pi^- \gamma$

$\Gamma(K^+ K^- f_0(980) \to K^+ K^- \pi^0 \pi^0)/\Gamma_{total}$ Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AUBERT	07AK	BABR	$10.6\ e^+ e^- \to K^+ K^- \pi^0 \pi^0 \gamma$

$\Gamma(K^{*0} K^\pm \pi^\mp)/\Gamma_{total}$ Γ_{12}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	AUBERT	07AK	BABR	10.6 GeV $e^+ e^-$

$\Gamma(K^*(892)^0 \overline{K}^*(892)^0)/\Gamma_{total}$ Γ_{13}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	ABLIKIM	10C	BES2	$J/\psi \to \eta K^+ \pi^- K^- \pi^+$

$\phi(2170)$ REFERENCES

ABLIKIM	21A	PL B813 136059	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21AP	PR D104 092014	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21T	PR D104 032007	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20M	PR D102 012008	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20S	PRL 124 112001	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19I	PR D99 012014	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19L	PR D99 032001	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	15H	PR D91 052017	M. Ablikim *et al.*	(BESIII Collab.)
LEES	12F	PR D86 012008	J.P. Lees *et al.*	(BABAR Collab.)
ABLIKIM	10C	PL B685 27	M. Ablikim *et al.*	(BES II Collab.)
SHEN	09	PR D80 031101	C.P. Shen *et al.*	(BELLE Collab.)
ABLIKIM	08F	PRL 100 102003	M. Ablikim *et al.*	(BES Collab.)
AUBERT	08S	PR D77 092002	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert *et al.*	(BABAR Collab.)
AUBERT,BE	06D	PR D74 091103	B. Aubert *et al.*	(BABAR Collab.)