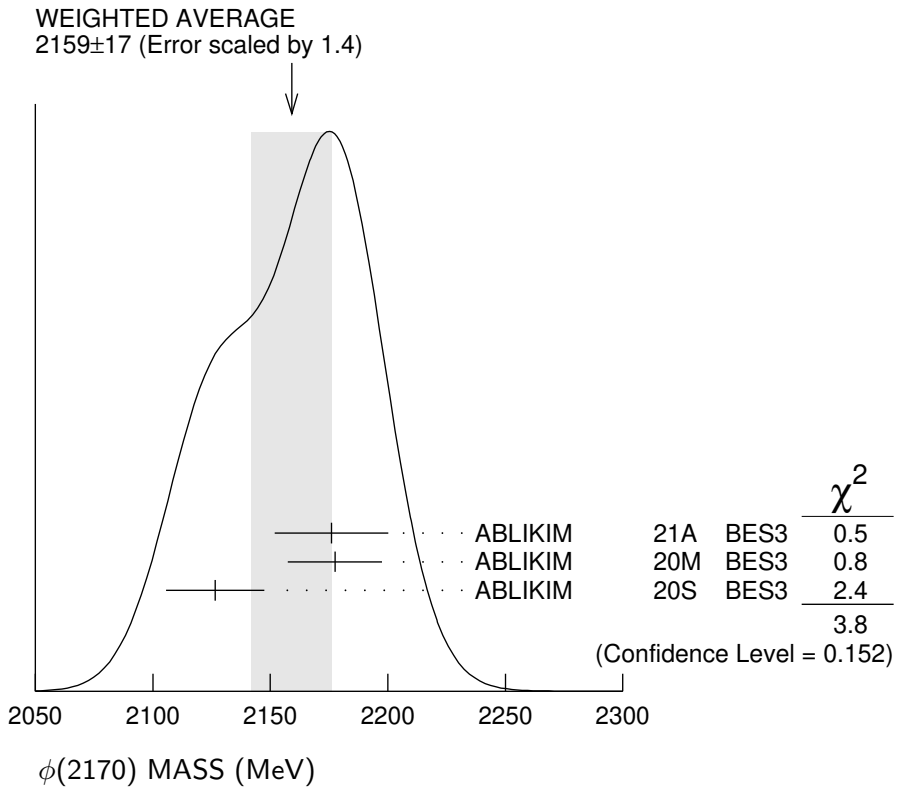
$\phi(2170)$

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

$\phi(2170)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2159 ±17 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.			
2176 ±24 ± 3		[1] ABLIKIM	21A	BES3	$e^+e^- \to \omega\eta$
2177.5± 4.8±19.5		[2] ABLIKIM	20M	BES3	$e^+e^- \to \eta'\phi$
2126.5±16.8±12.4		[3] ABLIKIM	20S	BES3	$e^+e^- \to K^+K^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2135 ± 8 ± 9	95	ABLIKIM	19I	BES3	$e^+e^- \to \eta\phi f_0(980)$
2239.2± 7.1±11.3		[4] 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		[5,6] LEES	12F	BABR	10.6 $e^+e^- \to \phi\pi^+\pi^-\gamma$
2079 ±13 $^{+79}_{-28}$	4.8k	[7] 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	[8] AUBERT	07AK	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
2169 ±20	149	[8] AUBERT	07AK	BABR	10.6 $e^+e^- \to K^+K^-\pi^0\pi^0\gamma$
2175 ±10 ±15	201	[6,9] 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 using a coherent sum of a phase-space modified Breit-Wigner function and a phase-space term.
[3] 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.
[4] The observed structure can be due to both the $\phi(2170)$ and $\rho(2150)$.
[5] Fit includes interference with the $\phi(1680)$.
[6] From the $\phi f_0(980)$ component.
[7] From a fit with two incoherent Breit-Wigners.
[8] From the $K^+K^-f_0(980)$ component.
[9] Superseded by LEES 12F.

$\phi(2170)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
137 ±16 OUR AVERAGE					
89 ±50 ± 5		[1] ABLIKIM	21A	BES3	$e^+e^- \to \omega\eta$
149.0±15.6± 8.9		[2] ABLIKIM	20M	BES3	$e^+e^- \to \eta'\phi$
106.9±32.1±28.1		[3] ABLIKIM	20S	BES3	$e^+e^- \to K^+K^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
104 ±24 ±12	95	ABLIKIM	19I	BES3	$e^+e^- \to \eta\phi f_0(980)$
139.8±12.3±20.6		[4] 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		[5,6] LEES	12F	BABR	10.6 $e^+e^- \to \phi\pi^+\pi^-\gamma$
192 ±23 $^{+25}_{-61}$	4.8k	[7] 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	[8] AUBERT	07AK	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$
102 ±27	149	[8] AUBERT	07AK	BABR	10.6 $e^+e^- \to K^+K^-\pi^0\pi^0\gamma$
58 ±16 ±20	201	[6,9] 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 using a coherent sum of a phase-space modified Breit-Wigner function and a phase-space term.
[3] 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.
[4] The observed structure can be due to both the $\phi(2170)$ and $\rho(2150)$.
[5] Fit includes interference with the $\phi(1680)$.
[6] From the $\phi f_0(980)$ component.
[7] From a fit with two incoherent Breit-Wigners.
[8] From the $K^+K^-f_0(980)$ component.
[9] Superseded by LEES 12F.

$\phi(2170)$ 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	$K^+K^-\pi^+\pi^-$	
Γ_8	$K^+K^- f_0(980) \rightarrow K^+K^-\pi^+\pi^-$	seen
Γ_9	$K^+K^-\pi^0\pi^0$	
Γ_{10}	$K^+K^- f_0(980) \rightarrow K^+K^-\pi^0\pi^0$	seen
Γ_{11}	$K^{*0}K^\pm\pi^\mp$	not seen
Γ_{12}	$K^*(892)^0\overline{K}^*(892)^0$	not seen
Γ_{13}	$K^*(892)^+K^*(892)^-$	
Γ_{14}	$K(1460)^+K^-$ + c.c.	
Γ_{15}	$K_1(1270)^+K^-$ + c.c.	
Γ_{16}	$K_1(1400)^+K^-$ + c.c.	

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

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

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.7\pm0.7\pm1.3$	483	AUBERT	08S	BABR	10.6 $e^+e^- \rightarrow \phi\eta\gamma$

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

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
$0.43\pm0.15\pm0.04$	[1] ABLIKIM	21A	BES3	$e^+e^- \rightarrow \omega\eta$

[1] For constructive interference with $\omega(1420)$ and $\omega(1650)/\phi(1680)$. For destructive interference: 1.25 ± 0.48 ± 0.18 eV.

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

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
$7.1\pm0.7\pm0.7$	[1] ABLIKIM	20M	BES3	$e^+e^- \rightarrow \eta'\phi$

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

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

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
$2.3\pm0.3\pm0.3$		[1,2] LEES	12F	BABR	10.6 $e^+e^- \rightarrow \phi\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2.5\pm0.8\pm0.4$	201	[2,3] AUBERT,BE	06D	BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi\pi\gamma$

[1] From a fit with constructive interference with the $\phi(1680)$. In a fit with destructive interference, the value is larger by a factor of 12.
[2] From the $\phi f_0(980)$ component.
[3] Superseded by LEES 12F.

$\Gamma(K^*(892)^+ K^*(892)^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{13}\Gamma_1/\Gamma$

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.

$\Gamma(K(1460)^+ K^- + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{14}\Gamma_1/\Gamma$

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.

$\Gamma(K_1(1270)^+ K^- + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{15}\Gamma_1/\Gamma$

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.

$\Gamma(K_1(1400)^+ K^- + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{16}\Gamma_1/\Gamma$

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.

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

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

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_8/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_{10}/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_{11}/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_{12}/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	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.)