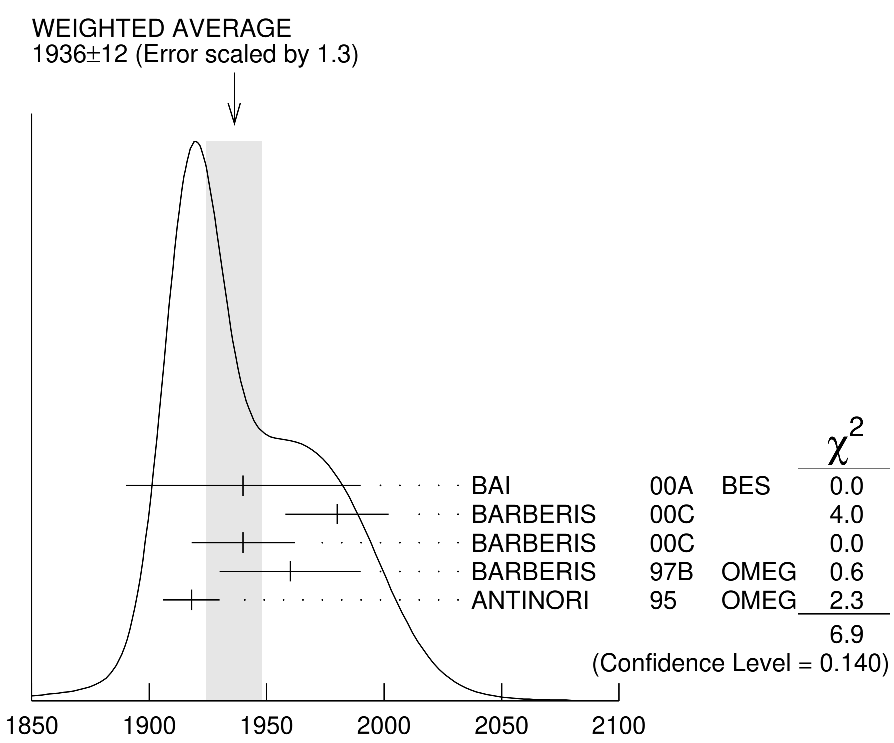
$f_2(1950)$

$I^G(J^{PC}) = 0^+(2^{++})$

$f_2(1950)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1936 ±12 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
1940 ±50	BAI	00A	BES	$J/\psi \to \gamma(\pi^+\pi^-\pi^+\pi^-)$
1980 ±22	[1] BARBERIS	00C		450 $pp \to pp4\pi$
1940 ±22	[2] BARBERIS	00C		450 $pp \to pp2\pi2\pi^0$
1960 ±30	BARBERIS	97B	OMEG	450 $pp \to pp2(\pi^+\pi^-)$
1918 ±12	ANTINORI	95	OMEG	300,450 $pp \to pp2(\pi^+\pi^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1955 ±75	[3] RODAS	22	RVUE	$J/\psi(1S) \to \gamma\ (\pi\pi,\ K\overline{K})$
$1978.2 \pm 1.8^{+28.4}_{-16.9}$	[4] ALBRECHT	20	RVUE	0.9 $\overline{p}p \to \pi^0\pi^0\eta,\ \pi^0\eta\eta,\ \pi^0K^+K^-$
$2038\ ^{+13}_{-11}\ ^{+12}_{-73}$	[5] UEHARA	09	BELL	10.6 $e^+e^- \to e^+e^-\pi^0\pi^0$
1930 ±25	[6] BINON	05	GAMS	33 $\pi^-p \to \eta\eta n$
1980 ± 2 ±14	ABE	04	BELL	10.6 $e^+e^- \to e^+e^-K^+K^-$
1867 ±46	[7] AMSLER	02	CBAR	0.9 $\overline{p}p \to \pi^0\eta\eta,\ \pi^0\pi^0\pi^0$
2010 ±25	ANISOVICH	00J	SPEC	
1980 ±50	ANISOVICH	99B	SPEC	1.35–1.94 $p\overline{p} \to \eta\eta\pi^0$
~ 1990	[8] OAKDEN	94	RVUE	0.36–1.55 $\overline{p}p \to \pi\pi$
1950 ±15	[9] ASTON	91	LASS	11 $K^-p \to \Lambda K\overline{K}\pi\pi$



[1] Decaying into $\pi^+\pi^-2\pi^0$.

[2] Decaying into $2(\pi^+\pi^-)$.
[3] T-matrix pole from coupled channel K-matrix fit to data on $J/\psi \rightarrow \gamma\pi^0\pi^0$ (ABLIKIM 15AE) and $J/\psi \rightarrow \gamma K^0_S K^0_S$ (ABLIKIM 18AA).
[4] T-matrix pole, 4 poles, 4 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\overline{K}$), BINON 83 ($\eta\eta$).
[5] Taking into account $f_4(2050)$.
[6] First solution, PWA is ambiguous.
[7] T-matrix pole.
[8] From solution B of amplitude analysis of data on $\overline{p}p \rightarrow \pi\pi$. See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J=3$ to be important but not significantly resonant.
[9] Cannot determine spin to be 2.

$f_2(1950)$ mass (MeV)

$f_2(1950)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
464 ± 24 OUR AVERAGE				
380^{+120}_{-90}	BAI	00A	BES	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^+\pi^-)$
520 ± 50	[1] BARBERIS	00C		$450\ pp \rightarrow pp4\pi$
485 ± 55	[2] BARBERIS	00C		$450\ pp \rightarrow pp4\pi$
460 ± 40	BARBERIS	97B	OMEG	$450\ pp \rightarrow pp2(\pi^+\pi^-)$
390 ± 60	ANTINORI	95	OMEG	$300{,}450\ pp \rightarrow pp2(\pi^+\pi^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
350 ± 113	[3] RODAS	22	RVUE	$J/\psi(1S) \rightarrow \gamma\ (\pi\pi,\ K\overline{K})$
$237.6 \pm 1.6^{+41.6}_{-15.5}$	[4] ALBRECHT	20	RVUE	$0.9\ \overline{p}p \rightarrow \pi^0\pi^0\eta,\ \pi^0\eta\eta,\ \pi^0K^+K^-$
$441^{+27}_{-25}{}^{+28}_{-192}$	[5] UEHARA	09	BELL	$10.6\ e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
450 ± 50	[6] BINON	05	GAMS	$33\ \pi^-p \rightarrow \eta\eta n$
$297 \pm 12 \pm 6$	ABE	04	BELL	$10.6\ e^+e^- \rightarrow e^+e^-K^+K^-$
385 ± 58	[7] AMSLER	02	CBAR	$0.9\ \overline{p}p \rightarrow \pi^0\eta\eta,\ \pi^0\pi^0\pi^0$
495 ± 35	ANISOVICH	00J	SPEC	
500 ± 100	ANISOVICH	99B	SPEC	$1.35–1.94\ p\overline{p} \rightarrow \eta\eta\pi^0$
~ 100	[8] OAKDEN	94	RVUE	$0.36–1.55\ \overline{p}p \rightarrow \pi\pi$
250 ± 50	[9] ASTON	91	LASS	$11\ K^-p \rightarrow \Lambda K\overline{K}\pi\pi$

[1] Decaying into $\pi^+\pi^-2\pi^0$.
[2] Decaying into $2(\pi^+\pi^-)$.
[3] T-matrix pole from coupled channel K-matrix fit to data on $J/\psi \rightarrow \gamma\pi^0\pi^0$ (ABLIKIM 15AE) and $J/\psi \rightarrow \gamma K^0_S K^0_S$ (ABLIKIM 18AA).
[4] T-matrix pole, 4 poles, 4 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\overline{K}$), BINON 83 ($\eta\eta$).
[5] Taking into account $f_4(2050)$.
[6] First solution, PWA is ambiguous.
[7] T-matrix pole.
[8] From solution B of amplitude analysis of data on $\overline{p}p \rightarrow \pi\pi$. See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J=3$ to be important but not significantly resonant.
[9] Cannot determine spin to be 2.

$f_2(1950)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$K^*(892)\overline{K}^*(892)$	seen
Γ_2	$\pi\pi$	
Γ_3	$\pi^+\pi^-$	seen
Γ_4	$\pi^0\pi^0$	seen
Γ_5	4π	seen
Γ_6	$\pi^+\pi^-\pi^+\pi^-$	
Γ_7	$a_2(1320)\pi$	
Γ_8	$f_2(1270)\pi\pi$	
Γ_9	$\eta\eta$	seen
Γ_{10}	$K\overline{K}$	seen
Γ_{11}	$\gamma\gamma$	seen
Γ_{12}	$p\overline{p}$	seen

$f_2(1950)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\overline{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_{10}\Gamma_{11}/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$122\pm4\pm26$	[1] ABE	04	BELL	10.6 $e^+e^- \rightarrow e^+e^-K^+K^-$

[1] Assuming spin 2.

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_2\Gamma_{11}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$162^{+69}_{-42}{}^{+1137}_{-\ 204}$	[1] UEHARA	09	BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$

[1] Taking into account $f_4(2050)$.

$f_2(1950)$ BRANCHING RATIOS

$\Gamma(K^*(892)\overline{K}^*(892))/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
seen	ASTON	91	LASS	0	11 $K^-p \rightarrow \Lambda K\overline{K}\pi\pi$

$\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$ — Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	BARBERIS	00B		450 $pp \rightarrow p_f\eta\pi^+\pi^-p_s$
not seen	BARBERIS	00C		450 $pp \rightarrow p_f 4\pi p_s$
possibly seen	BARBERIS	97B	OMEG	450 $pp \rightarrow pp2(\pi^+\pi^-)$

$\Gamma(\eta\eta)/\Gamma(4\pi)$ — Γ_9/Γ_5

VALUE	CL%	DOCUMENT ID		COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<5.0\times10^{-3}$	90	BARBERIS	00E	450 $pp \rightarrow p_f\eta\eta p_s$

$\Gamma(\eta\eta)/\Gamma(\pi^+\pi^-)$ — Γ_9/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
0.14±0.05	AMSLER	02	CBAR	0.9 $\overline{p}p \to \pi^0\eta\eta, \pi^0\pi^0\pi^0$

$\Gamma(p\overline{p})/\Gamma_{total}$ — Γ_{12}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	111	ALEXANDER	10	CLEO	$\psi(2S) \to \gamma p\overline{p}$

$f_2(1950)$ REFERENCES

RODAS	22	EPJ C82 80	A. Rodas et al.	(JPAC Collab.)
ALBRECHT	20	EPJ C80 453	M. Albrecht et al.	(Crystal Barrel Collab.)
ABLIKIM	18AA	PR D98 072003	M. Ablikim et al.	(BESIII Collab.)
ABLIKIM	15AE	PR D92 052003	M. Ablikim et al.	(BESIII Collab.)
ALEXANDER	10	PR D82 092002	J.P. Alexander et al.	(CLEO Collab.)
UEHARA	09	PR D79 052009	S. Uehara et al.	(BELLE Collab.)
BINON	05	PAN 68 960	F. Binon et al.	
		Translated from YAF 68 998.		
ABE	04	EPJ C32 323	K. Abe et al.	(BELLE Collab.)
AMSLER	02	EPJ C23 29	C. Amsler et al.	
ANISOVICH	00J	PL B491 47	A.V. Anisovich et al.	(RAL, LOQM, PNPI+)
BAI	00A	PL B472 207	J.Z. Bai et al.	(BES Collab.)
BARBERIS	00B	PL B471 435	D. Barberis et al.	(WA 102 Collab.)
BARBERIS	00C	PL B471 440	D. Barberis et al.	(WA 102 Collab.)
BARBERIS	00E	PL B479 59	D. Barberis et al.	(WA 102 Collab.)
ANISOVICH	99B	PL B449 154	A.V. Anisovich et al.	
BARBERIS	97B	PL B413 217	D. Barberis et al.	(WA 102 Collab.)
KLOET	96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)
ANTINORI	95	PL B353 589	F. Antinori et al.	(ATHU, BARI, BIRM+) JP
OAKDEN	94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)
ASTON	91	NPBPS B21 5	D. Aston et al.	(LASS Collab.)
LONGACRE	86	PL B177 223	R.S. Longacre et al.	(BNL, BRAN, CUNY+)
BINON	83	NC 78A 313	F.G. Binon et al.	(BELG, LAPP, SERP+)
HYAMS	75	NP B100 205	B.D. Hyams et al.	(CERN, MPIM)