

$f_0(980)$

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

See also the minireview on scalar mesons under $f_0(500)$. (See the index for the page number.)

$f_0(980)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
990 ± 20 OUR ESTIMATE				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
989.4 ± 1.3	424	ABLIKIM	15P BES3	$J/\psi \rightarrow K^+ K^- 3\pi$
989.9 ± 0.4	706	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma 3\pi$
1003 $\begin{smallmatrix} + 5 \\ - 27 \end{smallmatrix}$		1,2 GARCIA-MAR..11	RVUE	Compilation
996 ± 7		1,3 GARCIA-MAR..11	RVUE	Compilation
996 $\begin{smallmatrix} + 4 \\ - 14 \end{smallmatrix}$		4 MOUSSALLAM11	RVUE	Compilation
981 ± 43		5 MENNESSIER 10	RVUE	Compilation
1030 $\begin{smallmatrix} + 30 \\ - 10 \end{smallmatrix}$		6 ANISOVICH 09	RVUE	0.0 $\bar{p}p, \pi N$
977 $\begin{smallmatrix} + 11 \\ - 9 \end{smallmatrix} \pm 1$	44	7 ECKLUND 09	CLEO	4.17 $e^+ e^- \rightarrow D_s^- D_s^{*+} + c.c.$
982.2 ± 1.0 $\begin{smallmatrix} + 8.1 \\ - 8.0 \end{smallmatrix}$		8 UEHARA 08A	BELL	10.6 $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
976.8 ± 0.3 $\begin{smallmatrix} + 10.1 \\ - 0.6 \end{smallmatrix}$	64k	9 AMBROSINO 07	KLOE	1.02 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
984.7 ± 0.4 $\begin{smallmatrix} + 2.4 \\ - 3.7 \end{smallmatrix}$	64k	10 AMBROSINO 07	KLOE	1.02 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
973 ± 3	262 ± 30	11 AUBERT 07AK	BABR	10.6 $e^+ e^- \rightarrow \phi \pi^+ \pi^- \gamma$
970 ± 7	54 ± 9	11 AUBERT 07AK	BABR	10.6 $e^+ e^- \rightarrow \phi \pi^0 \pi^0 \gamma$
953 ± 20	2.6k	12 BONVICINI 07	CLEO	$D^+ \rightarrow \pi^- \pi^+ \pi^+$
985.6 $\begin{smallmatrix} + 1.2 + 1.1 \\ - 1.5 - 1.6 \end{smallmatrix}$		13 MORI 07	BELL	10.6 $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$
983.0 ± 0.6 $\begin{smallmatrix} + 4.0 \\ - 3.0 \end{smallmatrix}$		14 AMBROSINO 06B	KLOE	1.02 $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
977.3 ± 0.9 $\begin{smallmatrix} + 3.7 \\ - 4.3 \end{smallmatrix}$		15 AMBROSINO 06B	KLOE	1.02 $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
950 ± 9	4286	16 GARMASH 06	BELL	$B^+ \rightarrow K^+ \pi^+ \pi^-$
965 ± 10		17 ABLIKIM 05	BES2	$J/\psi \rightarrow \phi \pi^+ \pi^-, \phi K^+ K^-$
1031 ± 8		18 ANISOVICH 03	RVUE	
1037 ± 31		TIKHOMIROV 03	SPEC	40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
973 ± 1	2438	19 ALOISIO 02D	KLOE	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
977 ± 3 ± 2	848	20 AITALA 01A	E791	$D_s^+ \rightarrow \pi^- \pi^+ \pi^+$
969.8 ± 4.5	419	21 ACHASOV 00H	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
985 $\begin{smallmatrix} + 16 \\ - 12 \end{smallmatrix}$	419	22,23 ACHASOV 00H	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
976 ± 5 ± 6		24 AKHMETSHIN 99B	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$

977 ± 3 ± 6	268	24 AKHMETSHIN	99C CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
975 ± 4 ± 6		25 AKHMETSHIN	99C CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
975 ± 4 ± 6		26 AKHMETSHIN	99C CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma,$ $\pi^0 \pi^0 \gamma$
985 ± 10		BARBERIS	99 OMEG	450 $pp \rightarrow$ $p_s p_f K^+ K^-$
982 ± 3		BARBERIS	99B OMEG	450 $pp \rightarrow p_s p_f \pi^+ \pi^-$
982 ± 3		BARBERIS	99C OMEG	450 $pp \rightarrow p_s p_f \pi^0 \pi^0$
987 ± 6 ± 6		27 BARBERIS	99D OMEG	450 $pp \rightarrow K^+ K^-,$ $\pi^+ \pi^-$
989 ± 15		BELLAZZINI	99 GAM4	450 $pp \rightarrow pp \pi^0 \pi^0$
991 ± 3		28 KAMINSKI	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
~ 980		28 OLLER	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 993.5		OLLER	99B RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 987		28 OLLER	99C RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
957 ± 6		29 ACKERSTAFF	98Q OPAL	$Z \rightarrow f_0 X$
960 ± 10		ALDE	98 GAM4	
1015 ± 15		28 ANISOVICH	98B RVUE	Compilation
1008		30 LOCHER	98 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
955 ± 10		29 ALDE	97 GAM2	450 $pp \rightarrow pp \pi^0 \pi^0$
994 ± 9		31 BERTIN	97C OBLX	0.0 $\bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
993.2 ± 6.5 ± 6.9		32 ISHIDA	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
1006		TORNQVIST	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi,$ $\eta\pi$
997 ± 5	3k	33 ALDE	95B GAM2	38 $\pi^- p \rightarrow \pi^0 \pi^0 n$
960 ± 10	10k	34 ALDE	95B GAM2	38 $\pi^- p \rightarrow \pi^0 \pi^0 n$
994 ± 5		AMSLER	95B CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0$
~ 996		35 AMSLER	95D CBAR	0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0,$ $\pi^0 \eta\eta, \pi^0 \pi^0 \eta$
987 ± 6		36 ANISOVICH	95 RVUE	
1015		JANSSSEN	95 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
983		37 BUGG	94 RVUE	$\bar{p}p \rightarrow \eta 2\pi^0$
973 ± 2		38 KAMINSKI	94 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
988		39 ZOU	94B RVUE	
988 ± 10		40 MORGAN	93 RVUE	$\pi\pi(K\bar{K}) \rightarrow \pi\pi(K\bar{K}),$ $J/\psi \rightarrow \phi\pi\pi(K\bar{K}),$ $D_s \rightarrow \pi(\pi\pi)$
971.1 ± 4.0		29 AGUILAR-...	91 EHS	400 pp
979 ± 4		41 ARMSTRONG	91 OMEG	300 $pp \rightarrow pp\pi\pi,$ $ppK\bar{K}$
956 ± 12		BREAKSTONE	90 SFM	$pp \rightarrow pp\pi^+\pi^-$
959.4 ± 6.5		29 AUGUSTIN	89 DM2	$J/\psi \rightarrow \omega\pi^+\pi^-$
978 ± 9		29 ABACHI	86B HRS	$e^+ e^- \rightarrow \pi^+ \pi^- X$
985.0 ^{+9.0} _{-39.0}		ETKIN	82B MPS	23 $\pi^- p \rightarrow n 2K_S^0$
974 ± 4		41 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+ \pi^- X$
975		42 ACHASOV	80 RVUE	
986 ± 10		41 AGUILAR-...	78 HBC	0.7 $\bar{p}p \rightarrow K_S^0 K_S^0$
969 ± 5		41 LEEPER	77 ASPK	2-2.4 $\pi^- p \rightarrow$ $\pi^+ \pi^- n, K^+ K^- n$
987 ± 7		41 BINNIE	73 CNTR	$\pi^- p \rightarrow nMM$

1012 ± 6	43 GRAYER	73 ASPK	17 $\pi^- p \rightarrow \pi^+ \pi^- n$
1007 ± 20	43 HYAMS	73 ASPK	17 $\pi^- p \rightarrow \pi^+ \pi^- n$
997 ± 6	43 PROTOPOP...	73 HBC	7 $\pi^+ p \rightarrow \pi^+ p \pi^+ \pi^-$

- ¹ Quoted number refers to real part of pole position.
- ² Analytic continuation using Roy equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi \pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.
- ³ Analytic continuation using GPKY equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi \pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.
- ⁴ Pole position. Used Roy equations.
- ⁵ Average of the analyses of three data sets in the K-matrix model. Uses the data of BATLEY 08A, HYAMS 73, and GRAYER 74, partially of COHEN 80 or ETKIN 82B.
- ⁶ On sheet II in a 2-pole solution. The other pole is found on sheet III at (850–100i) MeV
- ⁷ Using a relativistic Breit-Wigner function and taking into account the finite D_S mass.
- ⁸ Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0 K K} / g_{f_0 \pi \pi} = 0$.
- ⁹ In the kaon-loop fit.
- ¹⁰ In the no-structure fit.
- ¹¹ Systematic errors not estimated.
- ¹² FLATTE 76 parameterization. $g_{f_0 \pi \pi} = 329 \pm 96 \text{ MeV}/c^2$ assuming $g_{f_0 K \bar{K}} / g_{f_0 \pi \pi} = 2$.
- ¹³ Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0 K K} / g_{f_0 \pi \pi} = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.
- ¹⁴ In the kaon-loop fit following formalism of ACHASOV 89.
- ¹⁵ In the no-structure fit assuming a direct coupling of ϕ to $f_0 \gamma$.
- ¹⁶ FLATTE 76 parameterization. Supersedes GARMASH 05.
- ¹⁷ FLATTE 76 parameterization, $g_{f_0 K \bar{K}} / g_{f_0 \pi \pi} = 4.21 \pm 0.25 \pm 0.21$.
- ¹⁸ K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K \bar{K} n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p} p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p} n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.
- ¹⁹ From the negative interference with the $f_0(500)$ meson of AITALA 01B using the ACHASOV 89 parameterization for the $f_0(980)$, a Breit-Wigner for the $f_0(500)$, and ACHASOV 01F for the $\rho \pi$ contribution.
- ²⁰ Coupled-channel Breit-Wigner, couplings $g_\pi = 0.09 \pm 0.01 \pm 0.01$, $g_K = 0.02 \pm 0.04 \pm 0.03$.
- ²¹ Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- ²² Supersedes ACHASOV 98I.
- ²³ In the “narrow resonance” approximation.
- ²⁴ Assuming $\Gamma(f_0) = 40 \text{ MeV}$.
- ²⁵ From a narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
- ²⁶ From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.
- ²⁷ Supersedes BARBERIS 99 and BARBERIS 99B
- ²⁸ T-matrix pole.
- ²⁹ From invariant mass fit.
- ³⁰ On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039–93i) MeV.
- ³¹ On sheet II in a 2 pole solution. The other pole is found on sheet III at (963–29i) MeV.
- ³² Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- ³³ At high $|t|$.
- ³⁴ At low $|t|$.

- 35 On sheet II in a 4-pole solution, the other poles are found on sheet III at (953–55*i*) MeV and on sheet IV at (938–35*i*) MeV.
 36 Combined fit of ALDE 95B, ANISOVICH 94, AMSLER 94D.
 37 On sheet II in a 2 pole solution. The other pole is found on sheet III at (996–103*i*) MeV.
 38 From sheet II pole position.
 39 On sheet II in a 2 pole solution. The other pole is found on sheet III at (797–185*i*) MeV and can be interpreted as a shadow pole.
 40 On sheet II in a 2 pole solution. The other pole is found on sheet III at (978–28*i*) MeV.
 41 From coupled channel analysis.
 42 Coupled channel analysis with finite width corrections.
 43 Included in AGUILAR-BENITEZ 78 fit.

$f_0(980)$ WIDTH

Width determination very model dependent. Peak width in $\pi\pi$ is about 50 MeV, but decay width can be much larger.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
10 to 100 OUR ESTIMATE				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
15.3 ± 4.7	424	ABLIKIM	15P BES3	$J/\psi \rightarrow K^+ K^- 3\pi$
9.5 ± 1.1	706	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma 3\pi$
42 +20 -16		1,2 GARCIA-MAR..11	RVUE	Compilation
50 +20 -12		2,3 GARCIA-MAR..11	RVUE	Compilation
48 +22 -6		4 MOUSSALLAM11	RVUE	Compilation
36 ± 22		5 MENNESSIER 10	RVUE	Compilation
70 +20 -32		6 ANISOVICH 09	RVUE	0.0 $\bar{p}p, \pi N$
91 +30 ± 3 -22	44	7 ECKLUND 09	CLEO	4.17 $e^+e^- \rightarrow D_s^- D_s^{*+} + \text{c.c.}$
66.9 ± 2.2 +17.6 -12.5		8 UEHARA 08A	BELL	10.6 $e^+e^- \rightarrow e^+e^- \pi^0 \pi^0$
65 ± 13	262 ± 30	9 AUBERT 07AK	BABR	10.6 $e^+e^- \rightarrow \phi \pi^+ \pi^- \gamma$
81 ± 21	54 ± 9	9 AUBERT 07AK	BABR	10.6 $e^+e^- \rightarrow \phi \pi^0 \pi^0 \gamma$
51.3 +20.8 +13.2 -17.7 -3.8		10 MORI 07	BELL	10.6 $e^+e^- \rightarrow e^+e^- \pi^+ \pi^-$
61 ± 9 +14 -8	2584	11 GARMASH 05	BELL	$B^+ \rightarrow K^+ \pi^+ \pi^-$
64 ± 16		12 ANISOVICH 03	RVUE	
121 ± 23		TIKHOMIROV 03	SPEC	40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
~ 70		13 BRAMON 02	RVUE	1.02 $e^+e^- \rightarrow \pi^0 \pi^0 \gamma$
44 ± 2 ± 2	848	14 AITALA 01A	E791	$D_s^+ \rightarrow \pi^- \pi^+ \pi^+$
201 ± 28	419	15 ACHASOV 00H	SND	$e^+e^- \rightarrow \pi^0 \pi^0 \gamma$
122 ± 13	419	16,17 ACHASOV 00H	SND	$e^+e^- \rightarrow \pi^0 \pi^0 \gamma$
56 ± 20		18 AKHMETSHIN 99C	CMD2	$e^+e^- \rightarrow \pi^0 \pi^0 \gamma$

65 ± 20		BARBERIS	99	OMEG	450	$pp \rightarrow p_s p_f K^+ K^-$
80 ± 10		BARBERIS	99B	OMEG	450	$pp \rightarrow p_s p_f \pi^+ \pi^-$
80 ± 10		BARBERIS	99C	OMEG	450	$pp \rightarrow p_s p_f \pi^0 \pi^0$
48 ± 12 ± 8		¹⁹ BARBERIS	99D	OMEG	450	$pp \rightarrow K^+ K^-, \pi^+ \pi^-$
65 ± 25		BELLAZZINI	99	GAM4	450	$pp \rightarrow pp \pi^0 \pi^0$
71 ± 14		²⁰ KAMINSKI	99	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
~ 28		²⁰ OLLER	99	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 25		OLLER	99B	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 14		²⁰ OLLER	99C	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
70 ± 20		ALDE	98	GAM4		
86 ± 16		²⁰ ANISOVICH	98B	RVUE		Compilation
54		²¹ LOCHER	98	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
69 ± 15		²² ALDE	97	GAM2	450	$pp \rightarrow pp \pi^0 \pi^0$
38 ± 20		²³ BERTIN	97C	OBLX	0.0	$\bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
~ 100		²⁴ ISHIDA	96	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
34		TORNQVIST	96	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
48 ± 10	3k	²⁵ ALDE	95B	GAM2	38	$\pi^- p \rightarrow \pi^0 \pi^0 n$
95 ± 20	10k	²⁶ ALDE	95B	GAM2	38	$\pi^- p \rightarrow \pi^0 \pi^0 n$
26 ± 10		AMSLER	95B	CBAR	0.0	$\bar{p}p \rightarrow 3\pi^0$
~ 112		²⁷ AMSLER	95D	CBAR	0.0	$\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta \eta, \pi^0 \pi^0 \eta$
80 ± 12		²⁸ ANISOVICH	95	RVUE		
30		JANSSSEN	95	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
74		²⁹ BUGG	94	RVUE		$\bar{p}p \rightarrow \eta 2\pi^0$
29 ± 2		³⁰ KAMINSKI	94	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
46		³¹ ZOU	94B	RVUE		
48 ± 12		³² MORGAN	93	RVUE		$\pi\pi(K\bar{K}) \rightarrow \pi\pi(K\bar{K}), J/\psi \rightarrow \phi\pi\pi(K\bar{K}), D_s \rightarrow \pi(\pi\pi)$
37.4 ± 10.6		²² AGUILAR-...	91	EHS	400	pp
72 ± 8		³³ ARMSTRONG	91	OMEG	300	$pp \rightarrow pp\pi\pi, ppK\bar{K}$
110 ± 30		BREAKSTONE	90	SFM		$pp \rightarrow pp\pi^+\pi^-$
29 ± 13		²² ABACHI	86B	HRS		$e^+e^- \rightarrow \pi^+\pi^- X$
120 ± 281 ± 20		ETKIN	82B	MPS	23	$\pi^- p \rightarrow n 2K_S^0$
28 ± 10		³³ GIDAL	81	MRK2		$J/\psi \rightarrow \pi^+\pi^- X$
70 to 300		³⁴ ACHASOV	80	RVUE		
100 ± 80		³⁵ AGUILAR-...	78	HBC	0.7	$\bar{p}p \rightarrow K_S^0 K_S^0$
30 ± 8		³³ LEEPER	77	ASPK	2-2.4	$\pi^- p \rightarrow \pi^+\pi^- n, K^+ K^- n$
48 ± 14		³³ BINNIE	73	CNTR		$\pi^- p \rightarrow nMM$
32 ± 10		³⁶ GRAYER	73	ASPK	17	$\pi^- p \rightarrow \pi^+\pi^- n$
30 ± 10		³⁶ HYAMS	73	ASPK	17	$\pi^- p \rightarrow \pi^+\pi^- n$
54 ± 16		³⁶ PROTOPOP...	73	HBC	7	$\pi^+ p \rightarrow \pi^+ p \pi^+ \pi^-$

- ¹ Analytic continuation using Roy equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.
- ² Quoted number refers to twice imaginary part of pole position.
- ³ Analytic continuation using GKPY equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.
- ⁴ Pole position. Used Roy equations.
- ⁵ Average of the analyses of three data sets in the K-matrix model. Uses the data of BATLEY 08A, HYAMS 73, and GRAYER 74, partially of COHEN 80 or ETKIN 82B.
- ⁶ On sheet II in a 2-pole solution. The other pole is found on sheet III at $(850-100i)$ MeV
- ⁷ Using a relativistic Breit-Wigner function and taking into account the finite D_S mass.
- ⁸ Breit-Wigner $\pi\pi$ width. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0}^{KK}/g_{f_0}^{\pi\pi} = 0$.
- ⁹ Systematic errors not estimated.
- ¹⁰ Breit-Wigner $\pi\pi$ width. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0}^{KK}/g_{f_0}^{\pi\pi} = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.
- ¹¹ Breit-Wigner, solution 1, PWA ambiguous.
- ¹² K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K \bar{K} n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p} p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p} n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.
- ¹³ Using the data of AKHMETSHIN 99C, ACHASOV 00H, and ALOISIO 02D.
- ¹⁴ Breit-Wigner width.
- ¹⁵ Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- ¹⁶ Supersedes ACHASOV 98I.
- ¹⁷ In the “narrow resonance” approximation.
- ¹⁸ From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.
- ¹⁹ Supersedes BARBERIS 99 and BARBERIS 99B
- ²⁰ T-matrix pole.
- ²¹ On sheet II in a 2 pole solution. The other pole is found on sheet III at $(1039-93i)$ MeV.
- ²² From invariant mass fit.
- ²³ On sheet II in a 2 pole solution. The other pole is found on sheet III at $(963-29i)$ MeV.
- ²⁴ Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- ²⁵ At high $|t|$.
- ²⁶ At low $|t|$.
- ²⁷ On sheet II in a 4-pole solution, the other poles are found on sheet III at $(953-55i)$ MeV and on sheet IV at $(938-35i)$ MeV.
- ²⁸ Combined fit of ALDE 95B, ANISOVICH 94,
- ²⁹ On sheet II in a 2 pole solution. The other pole is found on sheet III at $(996-103i)$ MeV.
- ³⁰ From sheet II pole position.
- ³¹ On sheet II in a 2 pole solution. The other pole is found on sheet III at $(797-185i)$ MeV and can be interpreted as a shadow pole.
- ³² On sheet II in a 2 pole solution. The other pole is found on sheet III at $(978-28i)$ MeV.
- ³³ From coupled channel analysis.
- ³⁴ Coupled channel analysis with finite width corrections.
- ³⁵ From coupled channel fit to the HYAMS 73 and PROTOPOPESCU 73 data. With a simultaneous fit to the $\pi\pi$ phase-shifts, inelasticity and to the $K_S^0 K_S^0$ invariant mass.
- ³⁶ Included in AGUILAR-BENITEZ 78 fit.

$f_0(980)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $\pi\pi$	dominant
Γ_2 $K\bar{K}$	seen
Γ_3 $\gamma\gamma$	seen
Γ_4 e^+e^-	

 $f_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$					Γ_3
VALUE (keV)	DOCUMENT ID	TECN	COMMENT		
0.31 $\begin{smallmatrix} +0.05 \\ -0.04 \end{smallmatrix}$	OUR AVERAGE				
0.32 ± 0.05	¹ DAI	14A	RVUE	Compilation	
0.286 ± 0.017 $\begin{smallmatrix} +0.211 \\ -0.070 \end{smallmatrix}$	² UEHARA	08A	BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
0.205 $\begin{smallmatrix} +0.095 & +0.147 \\ -0.083 & -0.117 \end{smallmatrix}$	³ MORI	07	BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^+\pi^-$	
0.42 ± 0.06 ± 0.18	⁴ OEST	90	JADE	$e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
• • •	We do not use the following data for averages, fits, limits, etc. • • •				
0.16 ± 0.01	⁵ MENNESSIER	11	RVUE		
0.29 ± 0.21 $\begin{smallmatrix} +0.02 \\ -0.07 \end{smallmatrix}$	⁶ MOUSSALLAM	11	RVUE	Compilation	
0.42	^{7,8} PENNINGTON	08	RVUE	Compilation	
0.10	^{8,9} PENNINGTON	08	RVUE	Compilation	
0.28 $\begin{smallmatrix} +0.09 \\ -0.13 \end{smallmatrix}$	¹⁰ BOGLIONE	99	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$	
0.29 ± 0.07 ± 0.12	^{11,12} BOYER	90	MRK2	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$	
0.31 ± 0.14 ± 0.09	^{11,12} MARSISKE	90	CBAL	$e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
0.63 ± 0.14	¹³ MORGAN	90	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$	

¹ Using dispersive analysis with phases from GARCIA-MARTIN 11A and BUETTAKER 04 as input.

² Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0 KK}/g_{f_0 \pi\pi} = 0$.

³ Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0 KK}/g_{f_0 \pi\pi} = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.

⁴ OEST 90 quote systematic errors $\begin{smallmatrix} +0.08 \\ -0.18 \end{smallmatrix}$. We use ± 0.18 . Observed 60 events.

⁵ Uses an analytic K-matrix model. Compilation.

⁶ Using dispersion integral with phase input from Roy equations and data from MARSISKE 90, BOYER 90, BEHREND 92, UEHARA 08A, and MORI 07.

⁷ Solution A (preferred solution based on χ^2 -analysis).

⁸ Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.

⁹ Solution B (worse than solution A; still acceptable when systematic uncertainties are included).

¹⁰ Supersedes MORGAN 90.

¹¹ From analysis allowing arbitrary background unconstrained by unitarity.

¹² Data included in MORGAN 90, BOGLIONE 99 analyses.

¹³ From amplitude analysis of BOYER 90 and MARSISKE 90, data corresponds to resonance parameters $m = 989$ MeV, $\Gamma = 61$ MeV.

$\Gamma(e^+e^-)$ Γ_4

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<8.4	90	VOROBYEV 88	ND	$e^+e^- \rightarrow \pi^0\pi^0$

 $f_0(980)$ BRANCHING RATIOS $\Gamma(\pi\pi)/[\Gamma(\pi\pi) + \Gamma(K\bar{K})]$ $\Gamma_1/(\Gamma_1+\Gamma_2)$

VALUE	EVT%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.52 ± 0.12	9.9k	¹ AUBERT	06O	BABR $B^\pm \rightarrow K^\pm \pi^\pm \pi^\mp$
$0.75^{+0.11}_{-0.13}$		² ABLIKIM	05Q	BES2 $\chi_{c0} \rightarrow 2\pi^+ 2\pi^-$, $\pi^+ \pi^- K^+ K^-$
0.84 ± 0.02		³ ANISOVICH	02D	SPEC Combined fit
~ 0.68		OLLER	99B	RVUE $\pi\pi \rightarrow \pi\pi, K\bar{K}$
0.67 ± 0.09		⁴ LOVERRE	80	HBC $4 \pi^- p \rightarrow n 2K_S^0$
$0.81^{+0.09}_{-0.04}$		⁴ CASON	78	STRC $7 \pi^- p \rightarrow n 2K_S^0$
0.78 ± 0.03		⁴ WETZEL	76	OSPK $8.9 \pi^- p \rightarrow n 2K_S^0$

¹ Recalculated by us using $\Gamma(K^+K^-) / \Gamma(\pi^+\pi^-) = 0.69 \pm 0.32$ from AUBERT 06O and isospin relations.

² Using data from ABLIKIM 04G.

³ From a combined K-matrix analysis of Crystal Barrel ($0. \rho\bar{p} \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$), GAMS ($\pi p \rightarrow \pi^0\pi^0 n, \eta\eta n, \eta\eta' n$), and BNL ($\pi p \rightarrow K\bar{K}n$) data.

⁴ Measure $\pi\pi$ elasticity assuming two resonances coupled to the $\pi\pi$ and $K\bar{K}$ channels only.

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