

$f_0(980)$

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

See the related review(s):
[Scalar Mesons below 1 GeV](#)

 $f_0(980)$ T-MATRIX POLE \sqrt{s}

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(980–1010) – i (20–35) OUR ESTIMATE (see Fig. 64.4 in the review)			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$(1014 \pm 8) - i(35 \pm 5)$	SARANTSEV 21	RVUE	$J/\psi(1S) \rightarrow \gamma (\pi\pi, K\bar{K}, \eta\eta, \omega\phi)$
$(992.8 \pm 1.3) - i(30.7 \pm 2.3)$	¹ ALBRECHT 20	RVUE	$0.9 \bar{p}p \rightarrow \pi^0\pi^0\eta, \pi^0\eta\eta, \pi^0K^+K^-$
$(1003_{-27}^{+5}) - i(21_{-8}^{+10})$	² GARCIA-MAR..11	RVUE	Compilation
$(996 \pm 7) - i(25_{-6}^{+10})$	³ GARCIA-MAR..11	RVUE	Compilation
$(996_{-14}^{+4}) - i(24_{-3}^{+11})$	⁴ MOUSSALLAM11	RVUE	Compilation
$(981 \pm 43) - i(18 \pm 11)$	⁵ MENNESSIER 10	RVUE	Compilation
$(1030_{-10}^{+30}) - i(35_{-16}^{+10})$	⁶ ANISOVICH 09	RVUE	$0.0 \bar{p}p, \pi N$
$(973_{-127}^{+39}) - i(11_{-11}^{+189})$	⁷ PELAEZ 04A	RVUE	$\pi\pi \rightarrow \pi\pi$

¹ 5 poles, 5 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\bar{K}$), BINON 83 ($\eta\eta$), and BINON 84C ($\eta\eta'$). Based on 18.5k events. Second solution 977.8 ± 1.7 MeV.

² Reanalysis of the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73 using Roy equations.

³ Reanalysis of the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73 using GKPY equations.

⁴ Uses 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 $(850 - i 100)$ MeV.

⁷ Reanalysis of data from PROTOPOPESCU 73, ESTABROOKS 74, GRAYER 74, and COHEN 80 in the unitarized ChPT model.

 $f_0(980)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
990 \pm 20 OUR ESTIMATE				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$992.0_{-7.5}^{+8.5} \pm 8.6$		¹ AAIJ 19H	LHCB	$pp \rightarrow D^\pm X$
989.4 ± 1.3	424	ABLIKIM 15P	BES3	$J/\psi \rightarrow K^+ K^- 3\pi$
989.9 ± 0.4	706	ABLIKIM 12E	BES3	$J/\psi \rightarrow \gamma 3\pi$
$977_{-9}^{+11} \pm 1$	44	² ECKLUND 09	CLEO	$4.17 e^+e^- \rightarrow D_s^- D_s^{*+} + \text{c.c.}$
$982.2 \pm 1.0_{-8.0}^{+8.1}$		³ UEHARA 08A	BELL	$10.6 e^+e^- \rightarrow e^+e^- \pi^0 \pi^0$

976.8 ± 0.3 ^{+10.1} _{-0.6}	64k	4	AMBROSINO	07	KLOE	1.02	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
984.7 ± 0.4 ^{+2.4} _{-3.7}	64k	5	AMBROSINO	07	KLOE	1.02	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
973 ± 3	262 ± 30	6	AUBERT	07AKBABR		10.6	$e^+e^- \rightarrow \phi\pi^+\pi^-\gamma$
970 ± 7	54 ± 9	6	AUBERT	07AKBABR		10.6	$e^+e^- \rightarrow \phi\pi^0\pi^0\gamma$
953 ± 20	2.6k	7	BONVICINI	07	CLEO		$D^+ \rightarrow \pi^-\pi^+\pi^+$
985.6 ^{+1.2} _{-1.5} ^{+1.1} _{-1.6}		8	MORI	07	BELL	10.6	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
983.0 ± 0.6 ^{+4.0} _{-3.0}		9	AMBROSINO	06B	KLOE	1.02	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
977.3 ± 0.9 ^{+3.7} _{-4.3}		10	AMBROSINO	06B	KLOE	1.02	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
950 ± 9	4286	11	GARMASH	06	BELL		$B^+ \rightarrow K^+\pi^+\pi^-$
965 ± 10		12	ABLIKIM	05	BES2		$J/\psi \rightarrow \phi\pi^+\pi^-, \phi K^+K^-$
1031 ± 8		13	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	14	ALOISIO	02D	KLOE		$e^+e^- \rightarrow \pi^0\pi^0\gamma$
977 ± 3 ± 2	848	15	AITALA	01A	E791		$D^+ \rightarrow \pi^-\pi^+\pi^+$
969.8 ± 4.5	419	16	ACHASOV	00H	SND		$e^+e^- \rightarrow \pi^0\pi^0\gamma$
985 ⁺¹⁶ ₋₁₂	419	17,18	ACHASOV	00H	SND		$e^+e^- \rightarrow \pi^0\pi^0\gamma$
976 ± 5 ± 6		19	AKHMETSHIN	99B	CMD2		$e^+e^- \rightarrow \pi^+\pi^-\gamma$
977 ± 3 ± 6	268	19	AKHMETSHIN	99C	CMD2		$e^+e^- \rightarrow \pi^0\pi^0\gamma$
975 ± 4 ± 6		20	AKHMETSHIN	99C	CMD2		$e^+e^- \rightarrow \pi^0\pi^0\gamma$
975 ± 4 ± 6		21	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		22	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		23	KAMINSKI	99	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
~ 980		23	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		23	OLLER	99C	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
957 ± 6		24	ACKERSTAFF	98Q	OPAL		$Z \rightarrow f_0 X$
960 ± 10			ALDE	98	GAM4		
1015 ± 15		23	ANISOVICH	98B	RVUE		Compilation
1008		25	LOCHER	98	RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}$
955 ± 10		24	ALDE	97	GAM2	450	$pp \rightarrow pp\pi^0\pi^0$
994 ± 9		26	BERTIN	97C	OBLX	0.0	$\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
993.2 ± 6.5 ± 6.9		27	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	28	ALDE	95B	GAM2	38	$\pi^-p \rightarrow \pi^0\pi^0n$

960 ± 10	10k	29 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		30 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		31 ANISOVICH	95 RVUE	
1015		JANSSEN	95 RVUE	$\pi \pi \rightarrow \pi \pi, K \bar{K}$
983		32 BUGG	94 RVUE	$\bar{p} p \rightarrow \eta 2\pi^0$
973 ± 2		33 KAMINSKI	94 RVUE	$\pi \pi \rightarrow \pi \pi, K \bar{K}$
988		34 ZOU	94B RVUE	
988 ± 10		35 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		24 AGUILAR-...	91 EHS	400 pp
979 ± 4		36 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		24 AUGUSTIN	89 DM2	$J/\psi \rightarrow \omega \pi^+\pi^-$
978 ± 9		24 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		36 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+\pi^- X$
975		37 ACHASOV	80 RVUE	
986 ± 10		36 AGUILAR-...	78 HBC	0.7 $\bar{p} p \rightarrow K_S^0 K_S^0$
969 ± 5		36 LEEPER	77 ASPK	2-2.4 $\pi^- p \rightarrow$ $\pi^+\pi^- n, K^+ K^- n$
987 ± 7		36 BINNIE	73 CNTR	$\pi^- p \rightarrow nMM$
1012 ± 6		38 GRAYER	73 ASPK	17 $\pi^- p \rightarrow \pi^+\pi^- n$
1007 ± 20		38 HYAMS	73 ASPK	17 $\pi^- p \rightarrow \pi^+\pi^- n$
997 ± 6		38 PROTOPOP...	73 HBC	7 $\pi^+ p \rightarrow \pi^+ p \pi^+ \pi^-$

¹ From the $D^\pm \rightarrow K^\pm K^+ K^-$ Dalitz plot fit with the Triple-M amplitude in the multi-meson model of AOUDE 18.

² Using a relativistic Breit-Wigner function and taking into account the finite D_S mass.

³ Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0} K K / g_{f_0} \pi \pi = 0$.

⁴ In the kaon-loop fit.

⁵ In the no-structure fit.

⁶ Systematic errors not estimated.

⁷ FLATTE 76 parameterization. $g_{f_0} \pi \pi = 329 \pm 96 \text{ MeV}/c^2$ assuming $g_{f_0} K \bar{K} / g_{f_0} \pi \pi = 2$.

⁸ Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0} K K / g_{f_0} \pi \pi = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.

⁹ In the kaon-loop fit following formalism of ACHASOV 89.

¹⁰ In the no-structure fit assuming a direct coupling of ϕ to $f_0 \gamma$.

¹¹ FLATTE 76 parameterization. Supersedes GARMASH 05.

¹² FLATTE 76 parameterization, $g_{f_0} K \bar{K} / g_{f_0} \pi \pi = 4.21 \pm 0.25 \pm 0.21$.

¹³ 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.

¹⁴ 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.

- 15 Coupled-channel Breit-Wigner, couplings $g_\pi=0.09\pm 0.01\pm 0.01$, $g_K=0.02\pm 0.04\pm 0.03$.
 16 Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
 17 Supersedes ACHASOV 98I.
 18 In the “narrow resonance” approximation.
 19 Assuming $\Gamma(f_0)=40$ MeV.
 20 From a narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
 21 From the combined fit of the photon spectra in the reactions $e^+e^- \rightarrow \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
 22 Supersedes BARBERIS 99 and BARBERIS 99B
 23 T-matrix pole.
 24 From invariant mass fit.
 25 On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039–93*i*) MeV.
 26 On sheet II in a 2 pole solution. The other pole is found on sheet III at (963–29*i*) MeV.
 27 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
 28 At high $|t|$.
 29 At low $|t|$.
 30 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.
 31 Combined fit of ALDE 95B, ANISOVICH 94, AMSLER 94D.
 32 On sheet II in a 2 pole solution. The other pole is found on sheet III at (996–103*i*) MeV.
 33 From sheet II pole position.
 34 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.
 35 On sheet II in a 2 pole solution. The other pole is found on sheet III at (978–28*i*) MeV.
 36 From coupled channel analysis.
 37 Coupled channel analysis with finite width corrections.
 38 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	$J/\psi \rightarrow \gamma 3\pi$
91 $\begin{smallmatrix} +30 \\ -22 \end{smallmatrix} \pm 3$	44	¹ ECKLUND	09 CLEO	$4.17 e^+e^- \rightarrow D_s^- D_s^{*+} + \text{c.c.}$
66.9± $\begin{smallmatrix} 2.2+17.6 \\ -12.5 \end{smallmatrix}$		² UEHARA	08A BELL	$10.6 e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
65 ± 13	262 ± 30	³ AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \phi\pi^+\pi^-\gamma$
81 ± 21	54 ± 9	³ AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \phi\pi^0\pi^0\gamma$
51.3 $\begin{smallmatrix} +20.8+13.2 \\ -17.7-3.8 \end{smallmatrix}$		⁴ MORI	07 BELL	$10.6 e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
61 ± 9 $\begin{smallmatrix} +14 \\ -8 \end{smallmatrix}$	2584	⁵ GARMASH	05 BELL	$B^+ \rightarrow K^+\pi^+\pi^-$
64 ± 16		⁶ ANISOVICH	03 RVUE	

121 ± 23		TIKHOMIROV	03	SPEC	40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
~ 70		7 BRAMON	02	RVUE	1.02 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
44 ± 2 ± 2	848	8 AITALA	01A	E791	$D_S^+ \rightarrow \pi^- \pi^+ \pi^+$
201 ± 28	419	9 ACHASOV	00H	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
122 ± 13	419	10,11 ACHASOV	00H	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
56 ± 20		12 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		13 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		14 KAMINSKI	99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
~ 28		14 OLLER	99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 25		OLLER	99B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 14		14 OLLER	99C	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
70 ± 20		ALDE	98	GAM4	
86 ± 16		14 ANISOVICH	98B	RVUE	Compilation
54		15 LOCHER	98	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
69 ± 15		16 ALDE	97	GAM2	450 $pp \rightarrow pp \pi^0 \pi^0$
38 ± 20		17 BERTIN	97C	OBLX	0.0 $\bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
~ 100		18 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	19 ALDE	95B	GAM2	38 $\pi^- p \rightarrow \pi^0 \pi^0 n$
95 ± 20	10k	20 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		21 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		22 ANISOVICH	95	RVUE	
30		JANSSEN	95	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
74		23 BUGG	94	RVUE	$\bar{p}p \rightarrow \eta 2\pi^0$
29 ± 2		24 KAMINSKI	94	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
46		25 ZOU	94B	RVUE	
48 ± 12		26 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		16 AGUILAR-...	91	EHS	400 pp
72 ± 8		27 ARMSTRONG	91	OMEG	300 $pp \rightarrow pp\pi\pi, ppK\bar{K}$
110 ± 30		BREAKSTONE	90	SFM	$pp \rightarrow pp\pi^+\pi^-$
29 ± 13		16 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		27 GIDAL	81	MRK2	$J/\psi \rightarrow \pi^+\pi^- X$
70 to 300		28 ACHASOV	80	RVUE	

100 ± 80	²⁹ AGUILAR-...	78	HBC	0.7	$\bar{p}p \rightarrow K_S^0 K_S^0$
30 ± 8	²⁷ LEEPER	77	ASPK	2-2.4	$\pi^- p \rightarrow \pi^+ \pi^- n, K^+ K^- n$
48 ± 14	²⁷ BINNIE	73	CNTR		$\pi^- p \rightarrow nMM$
32 ± 10	³⁰ GRAYER	73	ASPK	17	$\pi^- p \rightarrow \pi^+ \pi^- n$
30 ± 10	³⁰ HYAMS	73	ASPK	17	$\pi^- p \rightarrow \pi^+ \pi^- n$
54 ± 16	³⁰ PROTOPOP...	73	HBC	7	$\pi^+ p \rightarrow \pi^+ p \pi^+ \pi^-$

- ¹ Using a relativistic Breit-Wigner function and taking into account the finite D_S mass.
- ² Breit-Wigner $\pi\pi$ width. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0} K K / g_{f_0} \pi\pi = 0$.
- ³ Systematic errors not estimated.
- ⁴ Breit-Wigner $\pi\pi$ width. 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.
- ⁵ Breit-Wigner, solution 1, PWA ambiguous.
- ⁶ 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.
- ⁷ Using the data of AKHMETSHIN 99C, ACHASOV 00H, and ALOISIO 02D.
- ⁸ Breit-Wigner width.
- ⁹ Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- ¹⁰ Supersedes ACHASOV 98I.
- ¹¹ In the "narrow resonance" approximation.
- ¹² From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.
- ¹³ Supersedes BARBERIS 99 and BARBERIS 99B
- ¹⁴ T-matrix pole.
- ¹⁵ On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039–93i) MeV.
- ¹⁶ From invariant mass fit.
- ¹⁷ On sheet II in a 2 pole solution. The other pole is found on sheet III at (963–29i) MeV.
- ¹⁸ Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- ¹⁹ At high $|t|$.
- ²⁰ At low $|t|$.
- ²¹ 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.
- ²² Combined fit of ALDE 95B, ANISOVICH 94,
- ²³ On sheet II in a 2 pole solution. The other pole is found on sheet III at (996–103i) MeV.
- ²⁴ From sheet II pole position.
- ²⁵ 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.
- ²⁶ On sheet II in a 2 pole solution. The other pole is found on sheet III at (978–28i) MeV.
- ²⁷ From coupled channel analysis.
- ²⁸ Coupled channel analysis with finite width corrections.
- ²⁹ 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.
- ³⁰ Included in AGUILAR-BENITEZ 78 fit.

$f_0(980)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $\pi\pi$	seen
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		
0.29 $^{+0.11}_{-0.06}$	OUR AVERAGE				
0.286 ± 0.017 $^{+0.211}_{-0.070}$	1 UEHARA	08A	BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
0.205 $^{+0.095}_{-0.083}$ $^{+0.147}_{-0.117}$	2 MORI	07	BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^+\pi^-$	
0.42 ± 0.06 ± 0.18	3 OEST	90	JADE	$e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
• • •	We do not use the following data for averages, fits, limits, etc. • • •				
0.32 ± 0.05	4 DAI	14A	RVUE	Compilation	
0.16 ± 0.01	5 MENNESSIER	11	RVUE		
0.29 ± 0.21 $^{+0.02}_{-0.07}$	6 MOUSSALLAM	11	RVUE	Compilation	
0.42	7,8 PENNINGTON	08	RVUE	Compilation	
0.10	8,9 PENNINGTON	08	RVUE	Compilation	
0.28 $^{+0.09}_{-0.13}$	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 finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0 KK}/g_{f_0 \pi\pi} = 0$.

² 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.

³ OEST 90 quote systematic errors $^{+0.08}_{-0.18}$. We use ± 0.18 . Observed 60 events.

⁴ Using dispersive analysis with phases from GARCIA-MARTIN 11A and BUETTIKER 04 as input.

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	EVTs	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 ($p\bar{p} \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$), 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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