

$f_0(980)$

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

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

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

Note that $\Gamma = -2 \operatorname{Im}(\sqrt{s})$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(980–1010) – i (20–35) OUR ESTIMATE (see Fig. 64.4 in the review)			
$(1002 \pm 9) - i(23 \pm 8)$	¹ HOFERICH... 24	RVUE	Compilation
$(993 \pm 2^{+2}_{-1}) - i(21 \pm 3^{+2}_{-4})$	² DANILKIN 21	RVUE	Compilation
$(1014 \pm 8) - i(35 \pm 5)$	SARANTSEV 21	RVUE	$J/\psi(1S) \rightarrow \gamma (\pi\pi, K\bar{K}, \eta\eta, \omega\phi)$
$(992.8 \pm 1.3) - i(30.7 \pm 2.3)$	³ ALBRECHT 20	RVUE	$0.9 \bar{p}p \rightarrow \pi^0 \pi^0 \eta, \pi^0 \eta\eta, \pi^0 K^+ K^-$
$(1003^{+5}_{-27}) - i(21^{+10}_{-8})$	⁴ GARCIA-MAR..11	RVUE	Compilation
$(996 \pm 7) - i(25^{+10}_{-6})$	⁵ GARCIA-MAR..11	RVUE	Compilation
$(996^{+4}_{-14}) - i(24^{+11}_{-3})$	⁶ MOUSSALLAM11	RVUE	Compilation
$(981 \pm 43) - i(18 \pm 11)$	⁷ MENNESSIER 10	RVUE	Compilation
$(1030^{+30}_{-10}) - i(35^{+10}_{-16})$	⁸ ANISOVICH 09	RVUE	$0.0 \bar{p}p, \pi N$
$(973^{+39}_{-127}) - i(11^{+189}_{-11})$	⁹ PELAEZ 04A	RVUE	$\pi\pi \rightarrow \pi\pi$

- ¹ Using the GPKY equations as GARCIA-MARTIN 11, but with different treatment of kaon thresholds and input for $\pi\pi/K\bar{K}$ T-matrix from HOFERICHTER 16.
- ² Data driven analysis using partial-wave dispersion relations.
- ³ 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.
- ⁴ 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.
- ⁵ 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 GPKY equations.
- ⁶ Uses Roy equations.
- ⁷ 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.
- ⁸ On sheet II in a 2-pole solution. The other pole is found on sheet III at $(850 - i 100)$ MeV.
- ⁹ 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 ±20 OUR ESTIMATE				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$992.0^{+8.5}_{-7.5} \pm 8.6$		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 $^{+11}_{-9} \pm 1$	44	² ECKLUND	09	CLEO	$4.17 e^+ e^- \rightarrow D_s^- D_s^{*+} + \text{c.c.}$
982.2 ± 1.0 $^{+8.1}_{-8.0}$		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	07AK	BABR	$10.6 e^+ e^- \rightarrow \phi \pi^+ \pi^- \gamma$
970 ± 7	54 ± 9	⁶ AUBERT	07AK	BABR	$10.6 e^+ e^- \rightarrow \phi \pi^0 \pi^0 \gamma$
953 ± 20	2.6k	⁷ BONVICINI	07	CLEO	$D^+ \rightarrow \pi^- \pi^+ \pi^+$
985.6 $^{+1.2}_{-1.5} \pm 1.1$		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	$D_s^+ \rightarrow \pi^- \pi^+ \pi^+$
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 $\pm 6.5 \pm 6.9$		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 $\pi^-p \rightarrow \pi^0\pi^0n$
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	$e^+e^- \rightarrow \pi^+\pi^-\chi$
985.0 $^{+9.0}_{-39.0}$		ETKIN	82B MPS	23 $\pi^-p \rightarrow n 2K_S^0$
974 ± 4		36 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+\pi^-\chi$
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 AOUBE 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 $g_\pi=0.09\pm0.01\pm0.01$, $g_K=0.02\pm0.04\pm0.03$.
- 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 $\begin{smallmatrix} + \\ - \end{smallmatrix}$ $\begin{smallmatrix} 30 \\ 22 \end{smallmatrix}$ ± 3	44	¹ ECKLUND	09 CLEO	$4.17 e^+ e^- \rightarrow D_s^- D_s^{*+} + \text{c.c.}$

66.9 ± 2.2 ^{+17.6} _{-12.5}		² UEHARA	08A	BELL	10.6 e ⁺ e ⁻ → e ⁺ e ⁻ π ⁰ π ⁰
65 ± 13	262 ± 30	³ AUBERT	07AK	BABR	10.6 e ⁺ e ⁻ → φπ ⁺ π ⁻ γ
81 ± 21	54 ± 9	³ AUBERT	07AK	BABR	10.6 e ⁺ e ⁻ → φπ ⁰ π ⁰ γ
51.3 ⁺ ₋ 20.8 ⁺ ₋ 13.2 ⁺ ₋ 3.8		⁴ MORI	07	BELL	10.6 e ⁺ e ⁻ → e ⁺ e ⁻ π ⁺ π ⁻
61 ± 9	⁺¹⁴ ₋₈	2584 ⁵ GARMASH	05	BELL	B ⁺ → K ⁺ π ⁺ π ⁻
64 ± 16		⁶ ANISOVICH	03	RVUE	
121 ± 23		TIKHOMIROV	03	SPEC	40.0 π ⁻ C → K ⁰ _S K ⁰ _S K ⁰ _L X
~ 70		⁷ BRAMON	02	RVUE	1.02 e ⁺ e ⁻ → π ⁰ π ⁰ γ
44 ± 2 ± 2	848	⁸ AITALA	01A	E791	D ⁺ _S → π ⁻ π ⁺ π ⁺
201 ± 28	419	⁹ ACHASOV	00H	SND	e ⁺ e ⁻ → π ⁰ π ⁰ γ
122 ± 13	419	^{10,11} ACHASOV	00H	SND	e ⁺ e ⁻ → π ⁰ π ⁰ γ
56 ± 20		¹² AKHMETSHIN	99C	CMD2	e ⁺ e ⁻ → π ⁰ π ⁰ γ
65 ± 20		BARBERIS	99	OMEG	450 pp → p _S p _f K ⁺ K ⁻
80 ± 10		BARBERIS	99B	OMEG	450 pp → p _S p _f π ⁺ π ⁻
80 ± 10		BARBERIS	99C	OMEG	450 pp → p _S p _f π ⁰ π ⁰
48 ± 12 ± 8		¹³ BARBERIS	99D	OMEG	450 pp → K ⁺ K ⁻ , π ⁺ π ⁻
65 ± 25		BELLAZZINI	99	GAM4	450 pp → ppπ ⁰ π ⁰
71 ± 14		¹⁴ KAMINSKI	99	RVUE	ππ → ππ, K ⁻ K ⁻ , σσ
~ 28		¹⁴ OLLER	99	RVUE	ππ → ππ, K ⁻ K ⁻
~ 25		OLLER	99B	RVUE	ππ → ππ, K ⁻ K ⁻
~ 14		¹⁴ OLLER	99C	RVUE	ππ → ππ, K ⁻ K ⁻ , ηη
70 ± 20		ALDE	98	GAM4	
86 ± 16		¹⁴ ANISOVICH	98B	RVUE	Compilation
54		¹⁵ LOCHER	98	RVUE	ππ → ππ, K ⁻ K ⁻
69 ± 15		¹⁶ ALDE	97	GAM2	450 pp → ppπ ⁰ π ⁰
38 ± 20		¹⁷ BERTIN	97C	OBLX	0.0 p̄p → π ⁺ π ⁻ π ⁰
~ 100		¹⁸ ISHIDA	96	RVUE	ππ → ππ, K ⁻ K ⁻
34		TORNQVIST	96	RVUE	ππ → ππ, K ⁻ K ⁻ , Kπ, ηπ
48 ± 10	3k	¹⁹ ALDE	95B	GAM2	38 π ⁻ p → π ⁰ π ⁰ n
95 ± 20	10k	²⁰ ALDE	95B	GAM2	38 π ⁻ p → π ⁰ π ⁰ n
26 ± 10		AMSLER	95B	CBAR	0.0 p̄p → 3π ⁰
~ 112		²¹ AMSLER	95D	CBAR	0.0 p̄p → π ⁰ π ⁰ π ⁰ , π ⁰ ηη, π ⁰ π ⁰ η
80 ± 12		²² ANISOVICH	95	RVUE	
30		JANSSEN	95	RVUE	ππ → ππ, K ⁻ K ⁻
74		²³ BUGG	94	RVUE	p̄p → η2π ⁰
29 ± 2		²⁴ KAMINSKI	94	RVUE	ππ → ππ, K ⁻ 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	$e^+e^- \rightarrow \pi^+\pi^-\chi$
120 ± 281 ± 20	ETKIN	82B MPS	23 $\pi^-p \rightarrow n2K_S^0$
28 ± 10	27 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+\pi^-\chi$
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 $\pi^-p \rightarrow \pi^0\pi^0n$, $\pi^-p \rightarrow K\bar{K}n$, $\pi^+\pi^- \rightarrow \pi^+\pi^-$, $\bar{p}p \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$, $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, $K_S^0K_S^0\pi^0$, $K^+K_S^0\pi^-$ at rest, $\bar{p}n \rightarrow \pi^-\pi^-\pi^+$, $K_S^0K^-\pi^0$, $K_S^0K_S^0\pi^-$ 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)
$\Gamma_1 \quad \pi\pi$	seen
$\Gamma_2 \quad K\bar{K}$	seen
$\Gamma_3 \quad \gamma\gamma$	seen
$\Gamma_4 \quad e^+e^-$	

$f_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$				Γ_3
VALUE (keV)	DOCUMENT ID	TECN	COMMENT	
0.29 $^{+0.11}_{-0.06}$ OUR AVERAGE				
$0.286 \pm 0.017^{+0.211}_{-0.070}$	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	$10.6 e^+e^- \rightarrow e^+e^- \pi^+ \pi^-$	
$0.42 \pm 0.06 \pm 0.18$	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		
$0.29 \pm 0.21^{+0.02}_{-0.07}$	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	$\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	
$0.29 \pm 0.07 \pm 0.12$	^{11,12} BOYER	90 MRK2	$e^+e^- \rightarrow e^+e^- \pi^+ \pi^-$	
$0.31 \pm 0.14 \pm 0.09$	^{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	060	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 060 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.					

$f_0(980)$ REFERENCES

HOFERICHT... 24	PL B853 138698	M. Hoferichter <i>et al.</i>	(BERN, MADU, BONN+)
DANILKIN 21	PR D103 114023	I. Danilkin, O. Deineka, M. Vanderhaeghen	(MAINZ)
SARANTSEV 21	PL B816 136227	A.V. Sarantsev <i>et al.</i>	(BONN, PNPI)
ALBRECHT 20	EPJ C80 453	M. Albrecht <i>et al.</i>	(Crystal Barrel Collab.)
AAIJ 19H	JHEP 1904 063	R. Aaij <i>et al.</i>	(LHCb Collab.)
AOUDE 18	PR D98 056021	R.T. Aoude <i>et al.</i>	
HOFERICHT... 16	PRPL 625 1	M. Hoferichter <i>et al.</i>	(WASH, BONN)
ABLIKIM 15P	PR D92 012007	M. Ablikim <i>et al.</i>	(BESIII Collab.)
DAI 14A	PR D90 036004	L.-Y. Dai, M.R. Pennington	(CEBAF)
ABLIKIM 12E	PRL 108 182001	M. Ablikim <i>et al.</i>	(BESIII Collab.)
GARCIA-MAR... 11	PRL 107 072001	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
GARCIA-MAR... 11A	PR D83 074004	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
MENNESSIER 11	PL B696 40	G. Mennessier, S. Narison, X.-G. Wang	

MOUSSALLAM	11	EPJ C71 1814	B. Moussallam	
BATLEY	10C	EPJ C70 635	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
MENNESSIER	10	PL B688 59	G. Mennessier, S. Narison, X.-G. Wang	
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	(PNPI)
ECKLUND	09	PR D80 052009	K.M. Ecklund <i>et al.</i>	(CLEO Collab.)
BATLEY	08A	EPJ C54 411	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
PENNINGTON	08	EPJ C56 1	M.R. Pennington <i>et al.</i>	
UEHARA	08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)
AMBROSINO	07	EPJ C49 473	F. Ambrosino <i>et al.</i>	(KLOE Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
BONVICINI	07	PR D76 012001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
MORI	07	PR D75 051101	T. Mori <i>et al.</i>	(BELLE Collab.)
AMBROSINO	06B	PL B634 148	F. Ambrosino <i>et al.</i>	(KLOE Collab.)
AUBERT	06O	PR D74 032003	B. Aubert <i>et al.</i>	(BABAR Collab.)
GARMASH	06	PRL 96 251803	A. Garmash <i>et al.</i>	(BELLE Collab.)
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
ACHASOV	05	PR D72 013006	N.N. Achasov, G.N. Shestakov	
GARMASH	05	PR D71 092003	A. Garmash <i>et al.</i>	(BELLE Collab.)
ABLIKIM	04G	PR D70 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
BUETTIKER	04	EPJ C33 409	P. Buettiker, S. Descotes-Genon, B. Moussallam	
PELAEZ	04A	MPL A19 2879	J.R. Pelaez	(MADU)
ANISOVICH	03	EPJ A16 229	V.V. Anisovich <i>et al.</i>	
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>	
		Translated from YAF 66 860.		
ALOISIO	02D	PL B537 21	A. Aloisio <i>et al.</i>	(KLOE Collab.)
ANISOVICH	02D	PAN 65 1545	V.V. Anisovich <i>et al.</i>	
		Translated from YAF 65 1583.		
BRAMON	02	EPJ C26 253	A. Bramon <i>et al.</i>	
ACHASOV	01F	PR D63 094007	N.N. Achasov, V.V. Gubin	(Novosibirsk SND Collab.)
AITALA	01A	PRL 86 765	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
AITALA	01B	PRL 86 770	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
ACHASOV	00H	PL B485 349	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
BARBERIS	99	PL B453 305	D. Barberis <i>et al.</i>	(Omega Expt.)
BARBERIS	99B	PL B453 316	D. Barberis <i>et al.</i>	(Omega Expt.)
BARBERIS	99C	PL B453 325	D. Barberis <i>et al.</i>	(Omega Expt.)
BARBERIS	99D	PL B462 462	D. Barberis <i>et al.</i>	(Omega Expt.)
BELLAZZINI	99	PL B467 296	R. Bellazzini <i>et al.</i>	
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington	
KAMINSKI	99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN)
OLLER	99	PR D60 099906 (errat.)	J.A. Oller <i>et al.</i>	
OLLER	99B	NP A652 407 (errat.)	J.A. Oller, E. Oset	
OLLER	99C	PR D60 074023	J.A. Oller, E. Oset	
ACHASOV	98I	PL B440 442	M.N. Achasov <i>et al.</i>	
ACKERSTAFF	98Q	EPJ C4 19	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)
Also		PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)
		Translated from YAF 62 446.		
ANISOVICH	98B	SPU 41 419	V.V. Anisovich <i>et al.</i>	
		Translated from UFN 168 481.		
LOCHER	98	EPJ C4 317	M.P. Locher <i>et al.</i>	(PSI)
ALDE	97	PL B397 350	D.M. Alde <i>et al.</i>	(GAMS Collab.)
BERTIN	97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)
ISHIDA	96	PTP 95 745	S. Ishida <i>et al.</i>	(TOKY, MIYA, KEK)
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)
ALDE	95B	ZPHY C66 375	D.M. Alde <i>et al.</i>	(GAMS Collab.)
AMSLER	95B	PL B342 433	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
AMSLER	95D	PL B355 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
ANISOVICH	95	PL B355 363	V.V. Anisovich <i>et al.</i>	(PNPI, SERP)
JANSEN	95	PR D52 2690	G. Janssen <i>et al.</i>	(STON, ADLD, JULI)
AMSLER	94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
ANISOVICH	94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.)
BUGG	94	PR D50 4412	D.V. Bugg <i>et al.</i>	(LOQM)
KAMINSKI	94	PR D50 3145	R. Kaminski, L. Lesniak, J.P. Maillet	(CRAC+)
ZOU	94B	PR D50 591	B.S. Zou, D.V. Bugg	(LOQM)
MORGAN	93	PR D48 1185	D. Morgan, M.R. Pennington	(RAL, DURH)
BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.)
AGUILAR-...	91	ZPHY C50 405	M. Aguilar-Benitez <i>et al.</i>	(LEBC-EHS Collab.)
ARMSTRONG	91	ZPHY C51 351	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)
BOYER	90	PR D42 1350	J. Boyer <i>et al.</i>	(Mark II Collab.)

BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone <i>et al.</i>	(ISU, BGNA, CERN+)
MARSISKE	90	PR D41 3324	H. Marsiske <i>et al.</i>	(Crystal Ball Collab.)
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)
OEST	90	ZPHY C47 343	T. Oest <i>et al.</i>	(JADE Collab.)
ACHASOV	89	NP B315 465	N.N. Achasov, V.N. Ivanchenko	
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)
ABACHI	86B	Translated from YAF 48 436.	S. Abachi <i>et al.</i>	(PURD, ANL, IND, MICH+)
LONGACRE	86	PRL 57 1990	R.S. Longacre <i>et al.</i>	(BNL, BRAN, CUNY+)
BINON	84C	PL B177 223	F.G. Binon <i>et al.</i>	(BNL, BRAN, CUNY+)
BINON	83	NC 80A 363	F.G. Binon <i>et al.</i>	(BELG, LAPP, SERP+)
ETKIN	82B	NC 78A 313	F.G. Binon <i>et al.</i>	(BELG, LAPP, SERP+)
GIDAL	81	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)
ACHASOV	80	PL 107B 153	G. Gidal <i>et al.</i>	(SLAC, LBL)
		SJNP 32 566	N.N. Achasov, S.A. Devyanin, G.N. Shestakov	(NOVM)
COHEN	80	Translated from YAF 32 1098.	D. Cohen <i>et al.</i>	(ANL) IJP
LOVERRE	80	PR D22 2595	P.F. Loverre <i>et al.</i>	(CERN, CDEF, MADR+) IJP
AGUILAR-...	78	ZPHY C6 187	M. Aguilar-Benitez <i>et al.</i>	(MADR, BOMB+)
CASON	78	NP B140 73	N.M. Cason <i>et al.</i>	(NDAM, ANL)
LEEPER	77	PRL 41 271	R.J. Leeper <i>et al.</i>	(ISU)
ROSSELET	77	PR D16 2054	L. Rosselet <i>et al.</i>	(GEVA, SACL)
FLATTE	76	PR D15 574	S.M. Flatte	(CERN)
WETZEL	76	PL 63B 224	W. Wetzel <i>et al.</i>	(ETH, CERN, LOIC)
HYAMS	75	NP B115 208	B.D. Hyams <i>et al.</i>	(CERN, MPIM)
SRINIVASAN	75	NP B100 205	V. Srinivasan <i>et al.</i>	(NDAM, ANL)
ESTABROOKS	74	PR D12 681	P.G. Estabrooks, A.D. Martin	(DURH)
GRAYER	74	NP B79 301	G. Grayer <i>et al.</i>	(CERN, MPIM)
BINNIE	73	NP B75 189	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)
GRAYER	73	PRL 31 1534	G. Grayer <i>et al.</i>	(CERN, MPIM)
HYAMS	73	Tallahassee	B.D. Hyams <i>et al.</i>	(CERN, MPIM)
PROTOPOP...	73	NP B64 134	S.D. Protopopescu <i>et al.</i>	(LBL)
		PR D7 1279		