

# $f_0(980)$

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

See also the minireview on scalar mesons under  $f_0(600)$ . (See the index for the page number.)

## $f_0(980)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>980 ± 10 OUR ESTIMATE</b>				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
976.8 ± 0.3 <sup>+10.1</sup> <sub>-0.6</sub>	64k	1 AMBROSINO 07	KLOE	1.02 e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
984.7 ± 0.4 <sup>+2.4</sup> <sub>-3.7</sub>	64k	2 AMBROSINO 07	KLOE	1.02 e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
985.6 <sup>+1.2</sup> <sub>-1.5</sub> <sup>+1.1</sup> <sub>-1.6</sub>		3 MORI 07	BELL	10.6 e <sup>+</sup> e <sup>-</sup> → e <sup>+</sup> e <sup>-</sup> π <sup>+</sup> π <sup>-</sup>
983.0 ± 0.6 <sup>+4.0</sup> <sub>-3.0</sub>		4 AMBROSINO 06B	KLOE	1.02 e <sup>+</sup> e <sup>-</sup> → π <sup>+</sup> π <sup>-</sup> γ
977.3 ± 0.9 <sup>+3.7</sup> <sub>-4.3</sub>		5 AMBROSINO 06B	KLOE	1.02 e <sup>+</sup> e <sup>-</sup> → π <sup>+</sup> π <sup>-</sup> γ
950 ± 9	4286	6 GARMASH 06	BELL	B <sup>+</sup> → K <sup>+</sup> π <sup>+</sup> π <sup>-</sup>
965 ± 10		ABLIKIM 05	BES2	J/ψ → φπ <sup>+</sup> π <sup>-</sup> , φK <sup>+</sup> K <sup>-</sup>
1031 ± 8		7 ANISOVICH 03	RVUE	
1037 ± 31		TIKHOMIROV 03	SPEC	40.0 π <sup>-</sup> C → K <sub>S</sub> <sup>0</sup> K <sub>S</sub> <sup>0</sup> K <sub>L</sub> <sup>0</sup> X
973 ± 1	2438	8 ALOISIO 02D	KLOE	e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
977 ± 3 ± 2	848	9 AITALA 01A	E791	D <sub>S</sub> <sup>+</sup> → π <sup>-</sup> π <sup>+</sup> π <sup>+</sup>
969.8 ± 4.5	419	10 ACHASOV 00H	SND	e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
985 <sup>+16</sup> <sub>-12</sub>	419	11,12 ACHASOV 00H	SND	e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
976 ± 5 ± 6		13 AKHMETSHIN 99B	CMD2	e <sup>+</sup> e <sup>-</sup> → π <sup>+</sup> π <sup>-</sup> γ
977 ± 3 ± 6	268	13 AKHMETSHIN 99C	CMD2	e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
975 ± 4 ± 6		14 AKHMETSHIN 99C	CMD2	e <sup>+</sup> e <sup>-</sup> → π <sup>0</sup> π <sup>0</sup> γ
975 ± 4 ± 6		15 AKHMETSHIN 99C	CMD2	e <sup>+</sup> e <sup>-</sup> → π <sup>+</sup> π <sup>-</sup> γ, π <sup>0</sup> π <sup>0</sup> γ
985 ± 10		BARBERIS 99	OMEG	450 pp → p <sub>S</sub> p <sub>f</sub> K <sup>+</sup> K <sup>-</sup>
982 ± 3		BARBERIS 99B	OMEG	450 pp → p <sub>S</sub> p <sub>f</sub> π <sup>+</sup> π <sup>-</sup>
982 ± 3		BARBERIS 99C	OMEG	450 pp → p <sub>S</sub> p <sub>f</sub> π <sup>0</sup> π <sup>0</sup>
987 ± 6 ± 6		16 BARBERIS 99D	OMEG	450 pp → K <sup>+</sup> K <sup>-</sup> , π <sup>+</sup> π <sup>-</sup>
989 ± 15		BELLAZZINI 99	GAM4	450 pp → ppπ <sup>0</sup> π <sup>0</sup>
991 ± 3		17 KAMINSKI 99	RVUE	ππ → ππ, K <sup>-</sup> K <sup>-</sup> , σσ
~ 980		17 OLLER 99	RVUE	ππ → ππ, K <sup>-</sup> K <sup>-</sup>
~ 993.5		OLLER 99B	RVUE	ππ → ππ, K <sup>-</sup> K <sup>-</sup>
~ 987		17 OLLER 99C	RVUE	ππ → ππ, K <sup>-</sup> K <sup>-</sup> , ηη
957 ± 6		18 ACKERSTAFF 98Q	OPAL	Z → f <sub>0</sub> X
960 ± 10		ALDE 98	GAM4	
1015 ± 15		17 ANISOVICH 98B	RVUE	Compilation

1008		19 LOCHER	98 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
955 $\pm 10$		18 ALDE	97 GAM2	450 $pp \rightarrow pp\pi^0\pi^0$
994 $\pm 9$		20 BERTIN	97C OBLX	0.0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
993.2 $\pm 6.5 \pm 6.9$		21 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 $\pm 5$	3k	22 ALDE	95B GAM2	38 $\pi^-p \rightarrow \pi^0\pi^0n$
960 $\pm 10$	10k	23 ALDE	95B GAM2	38 $\pi^-p \rightarrow \pi^0\pi^0n$
994 $\pm 5$		AMSLER	95B CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0$
~ 996		24 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 $\pm 6$		25 ANISOVICH	95 RVUE	
1015		JANSEN	95 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
983		26 BUGG	94 RVUE	$\bar{p}p \rightarrow \eta 2\pi^0$
973 $\pm 2$		27 KAMINSKI	94 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
988		28 ZOU	94B RVUE	
988 $\pm 10$		29 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 $\pm 4.0$		18 AGUILAR-...	91 EHS	400 $pp$
979 $\pm 4$		30 ARMSTRONG	91 OMEG	300 $pp \rightarrow pp\pi\pi,$ $ppK\bar{K}$
956 $\pm 12$		BREAKSTONE	90 SFM	$pp \rightarrow pp\pi^+\pi^-$
959.4 $\pm 6.5$		18 AUGUSTIN	89 DM2	$J/\psi \rightarrow \omega\pi^+\pi^-$
978 $\pm 9$		18 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 $\pm 4$		30 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+\pi^-X$
975		31 ACHASOV	80 RVUE	
986 $\pm 10$		30 AGUILAR-...	78 HBC	0.7 $\bar{p}p \rightarrow K_S^0 K_S^0$
969 $\pm 5$		30 LEEPER	77 ASPK	2-2.4 $\pi^-p \rightarrow$ $\pi^+\pi^-n, K^+K^-n$
987 $\pm 7$		30 BINNIE	73 CNTR	$\pi^-p \rightarrow nMM$
1012 $\pm 6$		32 GRAYER	73 ASPK	17 $\pi^-p \rightarrow \pi^+\pi^-n$
1007 $\pm 20$		32 HYAMS	73 ASPK	17 $\pi^-p \rightarrow \pi^+\pi^-n$
997 $\pm 6$		32 PROTOPOP...	73 HBC	7 $\pi^+p \rightarrow \pi^+p\pi^+\pi^-$

<sup>1</sup> In the kaon-loop fit.

<sup>2</sup> In the no-structure fit.

<sup>3</sup> Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio  $g_{f_0}^2 K K / g_{f_0}^2 \pi\pi$  from ABLIKIM 05.

<sup>4</sup> In the kaon-loop fit following formalism of ACHASOV 89.

<sup>5</sup> In the no-structure fit assuming a direct coupling of  $\phi$  to  $f_0\gamma$ .

<sup>6</sup> FLATTE 76 parameterization. Supersedes GARMASH 05.

<sup>7</sup> K-matrix pole from combined analysis of  $\pi^-p \rightarrow \pi^0\pi^0n, \pi^-p \rightarrow K\bar{K}n,$   
 $\pi^+\pi^- \rightarrow \pi^+\pi^-, \bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta, \pi^+\pi^-\pi^0, K^+K^-\pi^0, K_S^0 K_S^0\pi^0,$   
 $K^+K_S^0\pi^-$  at rest,  $\bar{p}n \rightarrow \pi^-\pi^-\pi^+, K_S^0 K^-\pi^0, K_S^0 K_S^0\pi^-$  at rest.

<sup>8</sup> From the negative interference with the  $f_0(600)$  meson of AITALA 01B using the ACHASOV 89 parameterization for the  $f_0(980)$ , a Breit-Wigner for the  $f_0(600)$ , and ACHASOV 01F for the  $\rho\pi$  contribution.

<sup>9</sup> Coupled-channel Breit-Wigner, couplings  $g_\pi=0.09\pm 0.01\pm 0.01, g_K=0.02\pm 0.04\pm 0.03$ .

- 10 Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- 11 Supersedes ACHASOV 98I.
- 12 In the “narrow resonance” approximation.
- 13 Assuming  $\Gamma(f_0) = 40$  MeV.
- 14 From a narrow pole fit taking into account  $f_0(980)$  and  $f_0(1200)$  intermediate mechanisms.
- 15 From the combined fit of the photon spectra in the reactions  $e^+e^- \rightarrow \pi^+\pi^-\gamma$ ,  $\pi^0\pi^0\gamma$ .
- 16 Supersedes BARBERIS 99 and BARBERIS 99B
- 17 T-matrix pole.
- 18 From invariant mass fit.
- 19 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(1039-93i)$  MeV.
- 20 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(963-29i)$  MeV.
- 21 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- 22 At high  $|t|$ .
- 23 At low  $|t|$ .
- 24 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.
- 25 Combined fit of ALDE 95B, ANISOVICH 94, AMSLER 94D.
- 26 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(996-103i)$  MeV.
- 27 From sheet II pole position.
- 28 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.
- 29 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(978-28i)$  MeV.
- 30 From coupled channel analysis.
- 31 Coupled channel analysis with finite width corrections.
- 32 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
<b>40 to 100 OUR ESTIMATE</b>				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$51.3^{+20.8+13.2}_{-17.7-3.8}$		33 MORI	07 BELL	$10.6 e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
$61 \pm 9 \quad ^{+14}_{-8}$	2584	34 GARMASH	05 BELL	$B^+ \rightarrow K^+\pi^+\pi^-$
$64 \pm 16$		35 ANISOVICH	03 RVUE	
$121 \pm 23$		TIKHOMIROV	03 SPEC	$40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
$\sim 70$		36 BRAMON	02 RVUE	$1.02 e^+e^- \rightarrow \pi^0\pi^0\gamma$
$44 \pm 2 \pm 2$	848	37 AITALA	01A E791	$D_s^+ \rightarrow \pi^-\pi^+\pi^+$
$201 \pm 28$	419	38 ACHASOV	00H SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
$122 \pm 13$	419	39,40 ACHASOV	00H SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
$56 \pm 20$		41 AKHMETSHIN	99C CMD2	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
$65 \pm 20$		BARBERIS	99 OMEG 450	$pp \rightarrow p_s p_f K^+ K^-$
$80 \pm 10$		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		42 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		43 KAMINSKI	99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
~ 28		43 OLLER	99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 25		OLLER	99B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 14		43 OLLER	99C	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
70 ± 20		ALDE	98	GAM4	
86 ± 16		43 ANISOVICH	98B	RVUE	Compilation
54		44 LOCHER	98	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
69 ± 15		45 ALDE	97	GAM2	450 $pp \rightarrow pp \pi^0 \pi^0$
38 ± 20		46 BERTIN	97C	OBLX	0.0 $\bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
~ 100		47 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	48 ALDE	95B	GAM2	38 $\pi^- p \rightarrow \pi^0 \pi^0 n$
95 ± 20	10k	49 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		50 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		51 ANISOVICH	95	RVUE	
30		JANSEN	95	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
74		52 BUGG	94	RVUE	$\bar{p}p \rightarrow \eta 2\pi^0$
29 ± 2		53 KAMINSKI	94	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
46		54 ZOU	94B	RVUE	
48 ± 12		55 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		45 AGUILAR-...	91	EHS	400 $pp$
72 ± 8		56 ARMSTRONG	91	OMEG	300 $pp \rightarrow pp\pi\pi, ppK\bar{K}$
110 ± 30		BREAKSTONE	90	SFM	$pp \rightarrow pp\pi^+\pi^-$
29 ± 13		45 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		56 GIDAL	81	MRK2	$J/\psi \rightarrow \pi^+\pi^- X$
70 to 300		57 ACHASOV	80	RVUE	
100 ± 80		58 AGUILAR-...	78	HBC	0.7 $\bar{p}p \rightarrow K_S^0 K_S^0$
30 ± 8		56 LEEPER	77	ASPK	2-2.4 $\pi^- p \rightarrow \pi^+\pi^- n, K^+ K^- n$
48 ± 14		56 BINNIE	73	CNTR	$\pi^- p \rightarrow nMM$
32 ± 10		59 GRAYER	73	ASPK	17 $\pi^- p \rightarrow \pi^+\pi^- n$
30 ± 10		59 HYAMS	73	ASPK	17 $\pi^- p \rightarrow \pi^+\pi^- n$
54 ± 16		59 PROTOPOP...	73	HBC	7 $\pi^+ p \rightarrow \pi^+ p \pi^+ \pi^-$

- 33 Breit-Wigner  $\pi\pi$  width. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio  $g_{f_0}^2 K K / g_{f_0}^2 \pi\pi$  from ABLIKIM 05.
- 34 Breit-Wigner, solution 1, PWA ambiguous.
- 35 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.
- 36 Using the data of AKHMETSHIN 99C, ACHASOV 00H, and ALOISIO 02D.
- 37 Breit-Wigner width.
- 38 Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- 39 Supersedes ACHASOV 98I.
- 40 In the “narrow resonance” approximation.
- 41 From the combined fit of the photon spectra in the reactions  $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$ ,  $\pi^0 \pi^0 \gamma$ .
- 42 Supersedes BARBERIS 99 and BARBERIS 99B
- 43 T-matrix pole.
- 44 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(1039-93i)$  MeV.
- 45 From invariant mass fit.
- 46 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(963-29i)$  MeV.
- 47 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- 48 At high  $|t|$ .
- 49 At low  $|t|$ .
- 50 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.
- 51 Combined fit of ALDE 95B, ANISOVICH 94,
- 52 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(996-103i)$  MeV.
- 53 From sheet II pole position.
- 54 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.
- 55 On sheet II in a 2 pole solution. The other pole is found on sheet III at  $(978-28i)$  MeV.
- 56 From coupled channel analysis.
- 57 Coupled channel analysis with finite width corrections.
- 58 From coupled channel fit to the HYAMS 73 and PROTOPODESCU 73 data. With a simultaneous fit to the  $\pi\pi$  phase-shifts, inelasticity and to the  $K_S^0 K_S^0$  invariant mass.
- 59 Included in AGUILAR-BENITEZ 78 fit.

### $f_0(980)$ DECAY MODES

	Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$	$\pi\pi$	dominant
$\Gamma_2$	$K\bar{K}$	seen
$\Gamma_3$	$\gamma\gamma$	seen
$\Gamma_4$	$e^+ e^-$	

## $f_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$

$\Gamma_3$

VALUE (keV)                      DOCUMENT ID      TECN      COMMENT

**0.29  $^{+0.07}_{-0.09}$  OUR AVERAGE**

0.205  $^{+0.095+0.147}_{-0.083-0.117}$       60 MORI      07 BELL      10.6  $e^+e^- \rightarrow e^+e^-\pi^+\pi^-$

0.28  $^{+0.09}_{-0.13}$       61 BOGLIONE      99 RVUE       $\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$

0.42  $\pm 0.06 \pm 0.18$       62 OEST      90 JADE       $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.29  $\pm 0.07 \pm 0.12$       63,64 BOYER      90 MRK2       $e^+e^- \rightarrow e^+e^-\pi^+\pi^-$

0.31  $\pm 0.14 \pm 0.09$       63,64 MARSISKE      90 CBAL       $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$

0.63  $\pm 0.14$       65 MORGAN      90 RVUE       $\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$

<sup>60</sup> Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio  $g_{f_0}^2 K K / g_{f_0}^2 \pi \pi$  from ABLIKIM 05.

<sup>61</sup> Supersedes MORGAN 90.

<sup>62</sup> OEST 90 quote systematic errors  $^{+0.08}_{-0.18}$ . We use  $\pm 0.18$ . Observed 60 events.

<sup>63</sup> From analysis allowing arbitrary background unconstrained by unitarity.

<sup>64</sup> Data included in MORGAN 90, BOGLIONE 99 analyses.

<sup>65</sup> From amplitude analysis of BOYER 90 and MARSISKE 90, data corresponds to resonance parameters  $m = 989$  MeV,  $\Gamma = 61$  MeV.

$\Gamma(e^+e^-)$

$\Gamma_4$

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  $\pm 0.12$       9.9k      66 AUBERT      06O BABR       $B^\pm \rightarrow K^\pm \pi^\pm \pi^\mp$

0.75  $^{+0.11}_{-0.13}$       67 ABLIKIM      05Q BES2       $\chi_{c0} \rightarrow 2\pi^+ 2\pi^-, \pi^+\pi^- K^+ K^-$

0.84  $\pm 0.02$       68 ANISOVICH      02D SPEC      Combined fit

$\sim 0.68$       OLLER      99B RVUE       $\pi\pi \rightarrow \pi\pi, K\bar{K}$

0.67  $\pm 0.09$       69 LOVERRE      80 HBC       $4 \pi^- p \rightarrow n 2K_S^0$

0.81  $^{+0.09}_{-0.04}$       69 CASON      78 STRC       $7 \pi^- p \rightarrow n 2K_S^0$

0.78  $\pm 0.03$       69 WETZEL      76 OSPK       $8.9 \pi^- p \rightarrow n 2K_S^0$

<sup>66</sup> Recalculated by us using  $\Gamma(K^+ K^-) / \Gamma(\pi^+ \pi^-) = 0.69 \pm 0.32$  from AUBERT 060 and isospin relations.

<sup>67</sup> Using data from ABLIKIM 04G.

<sup>68</sup> From a combined K-matrix analysis of Crystal Barrel ( $0. p\bar{p} \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$ ), 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.

<sup>69</sup> Measure  $\pi\pi$  elasticity assuming two resonances coupled to the  $\pi\pi$  and  $K\bar{K}$  channels only.

## $f_0(980)$ REFERENCES

- |            |     |                              |                                       |                             |
|------------|-----|------------------------------|---------------------------------------|-----------------------------|
| AMBROSINO  | 07  | EPJ C49 473                  | F. Ambrosino <i>et al.</i>            | (KLOE Collab.)              |
| MORI       | 07  | PR D75 051101R               | 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.)               |
| 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 <i>et al.</i>            | (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 (erratum)      | J.A. Oller <i>et al.</i>              |                             |
| OLLER      | 99B | NP A652 407 (erratum)        | 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. Akerstaff <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               | (HEL5)                      |
| 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)                 |
| 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)                      |
|            |     | Translated from YAF 48 436.  |                                       |                             |

ABACHI	86B	PRL 57 1990	S. Abachi <i>et al.</i>	(PURD, ANL, IND, MICH+)
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)
GIDAL	81	PL 107B 153	G. Gidal <i>et al.</i>	(SLAC, LBL)
ACHASOV	80	SJNP 32 566	N.N. Achasov, S.A. Devyanin, G.N. Shestakov	(NOVM)
LOVERRE	80	ZPHY C6 187	P.F. Loverre <i>et al.</i>	(CERN, CDEF, MADR+) IJP
AGUILAR-...	78	NP B140 73	M. Aguilar-Benitez <i>et al.</i>	(MADR, BOMB+)
CASON	78	PRL 41 271	N.M. Cason <i>et al.</i>	(NDAM, ANL)
LEEPER	77	PR D16 2054	R.J. Leeper <i>et al.</i>	(ISU)
ROSSELET	77	PR D15 574	L. Rosselet <i>et al.</i>	(GEVA, SACL)
FLATTE	76	PL 63B 224	S.M. Flatte	(CERN)
WETZEL	76	NP B115 208	W. Wetzel <i>et al.</i>	(ETH, CERN, LOIC)
SRINIVASAN	75	PR D12 681	V. Srinivasan <i>et al.</i>	(NDAM, ANL)
GRAYER	74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM)
BINNIE	73	PRL 31 1534	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)
GRAYER	73	Tallahassee	G. Grayer <i>et al.</i>	(CERN, MPIM)
HYAMS	73	NP B64 134	B.D. Hyams <i>et al.</i>	(CERN, MPIM)
PROTOPOP...	73	PR D7 1279	S.D. Protopopescu <i>et al.</i>	(LBL)

## OTHER RELATED PAPERS

GARMASH	07	PR D75 012006	A. Garmash <i>et al.</i>	(BELLE Collab.)
ACHASOV	06B	PR D73 054029	N.N. Achasov, A. V. Kiselev	
BUGG	06A	EPJ C47 45	D.V. Bugg	
CHENG	06	PR D73 014017	H.-Y. Cheng, C.-K. Chua, K.-C. Yang	
FARIBORZ	06	PR D74 054030	A.H. Fariborz	
KALASHNIK...	06	PR C73 045203	Yu. Kalashnikova <i>et al.</i>	
ROSNER	06C	PR D74 076006	J.L. Rosner	
WANG	06B	PR D74 114010	W. Wang <i>et al.</i>	
ANISOVICH	05B	PAN 68 1554	A.V. Anisovich, V.V. Anisovich, V.N. Markov	
AUBERT,B	05G	PR D72 052002	B. Aubert <i>et al.</i>	(BABAR Collab.)
BARU	05	EPJ A23 523	V.V. Baru, J. Haidenbauer, C. Hanhart	
BRITO	05	PL B608 69	T.V. Brito <i>et al.</i>	
KALASHNIK...	05	EPJ A24 437	Yu.S. Kalashnikova, A.E. Kudryavtsev, A.V. Nefediev	
LI	05B	EPJ A25 263	D.-M. Li, K.-W. Wei, H. Yu	
RODRIGUEZ	05	PR D71 074008	S. Rodriguez, M. Napsuciale	
TESHIMA	05	NP A759 131	T. Teshima, I. Kitamura, N. Morisita	
VIJANDE	05	PR D72 034025	J. Vijande, A. Valarce, F. Fernandez	
WANG	05C	EPJ C42 89	Z.-G. Wang, W.-M. Yang	
ABLIKIM	04A	PL B598 149	M. Ablikim <i>et al.</i>	(BES Collab.)
AUBERT,B	04P	PR D70 092001	B. Aubert <i>et al.</i>	(BABAR Collab.)
BARU	04	PL B586 53	V. Baru <i>et al.</i>	
BEDIAGA	04	PL B579 59	I. Bediaga <i>et al.</i>	
BUGG	04B	PL B598 8	D.V. Bugg	
LINK	04	PL B585 200	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
PELAEZ	04	PRL 92 102001	J.R. Pelaez	
PELAEZ	04A	MPL A19 2879	J.R. Pelaez	
WANG	04B	EPJ C37 223	Z.-G. Wang <i>et al.</i>	
ACHASOV	03E	NP A728 425	N.N. Achasov	
ANISOVICH	03B	PAN 66 741	V.V. Anisovich, V.A. Nikonov, A.V. Sarantsev	
ANISOVICH	03D	PAN 66 928	V.V. Anisovich, A.V. Sarantsev	
BEDAIGA	03	PR D68 036001	I. Bedaiga, M. Nielsen	
BOGLIONE	03	EPJ C30 503	M. Boglione, M.R. Pennington	
CHEN	03	PR D67 094011	C.-H. Chen	
COLANGELO	03	PL B559 49	P. Colangelo, F. De Fazio	
PALOMAR	03	NP A729 743	J.E. Palomar <i>et al.</i>	
ACHASOV	02G	PL B534 83	N.N. Achasov, A.V. Kiselev	
ANISOVICH	02C	PAN 65 497	A.V. Anisovich <i>et al.</i>	
BLACK	02	PRL 88 181603	D. Black, M. Harada, J. Schechter	
CLOSE	02B	JPG 28 R249	F.E. Close, N. Tornqvist	
KAMINSKI	02	EPJ Direct C4 1	R. Kaminski, L. Lesniak, K. Rybicki	
KLEEFELD	02	PR D66 034007	F. Kleefeld <i>et al.</i>	
RUPP	02	PR D65 078501	G. Rupp, E. vanBeveren, M.D. Scadron	
SHAKIN	02	PR D65 078502	C.M. Shakin, H. Wang	
TESHIMA	02	JPG 28 1391	T. Teshima, I. Kitamura, N. Morisita	
VOLKOV	02	PAN 65 1657	M.K. Volkov, V.L. Yudichev	
		Translated from YAF 65 1701.		



ACHASOV	01F	PR D63 094007	N.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
CLOSE	01	PL B515 13	F.E. Close, A. Kirk	
GOKALP	01	PR D64 053017	A. Gokalp, O. Yilmaz	
SUROVTSEV	01	PR D63 054024	Y.S. Surovtsev, D. Krupa, M. Nagy	
MARKUSHIN	00	EPJ A8 389	V.E. Markushin	
WANG	00A	PR D62 017503	Z. Wang	
ABREU	99J	PL B449 364	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ANISOVICH	99D	PL B452 180	A.V. Anisovich <i>et al.</i>	
Also		NP A651 253	A.V. Anisovich <i>et al.</i>	
ANISOVICH	99H	PL B467 289	A.V. Anisovich, V.V. Anisovich	
BLACK	99	PR D59 074026	D. Black <i>et al.</i>	
DELBOURGO	99	PL B446 332	R. Delbourgo, D. Liu, M. Scadron	
MARCO	99	PL B470 20	E. Marco <i>et al.</i>	
MINKOWSKI	99	EPJ C9 283	P. Minkowski, W. Ochs	
ACHASOV	98G	JETPL 67 464	N.N. Achasov <i>et al.</i>	
ACHASOV	98J	SPU 41 1149	N.N. Achasov	
CHLIAPNIK...	98	PL B423 401	P.V. Chliapnikov, V.A. Uvarov	
PROKOSHKIN	97	SPD 42 117	Y.D. Prokoshkin <i>et al.</i>	(SERP)
		Translated from DANS 353 323.		
AU	87	PR D35 1633	K.L. Au, D. Morgan, M.R. Pennington	(DURH, RAL)
AKESSON	86	NP B264 154	T. Akesson <i>et al.</i>	(Axial Field Spec. Collab.)
VANBEVEREN	86	ZPHY C30 615	E. van Beveren <i>et al.</i>	(NIJM, BIEL)
MENNESSIER	83	ZPHY C16 241	G. Mennessier	(MONP)
BARBER	82	ZPHY C12 1	D.P. Barber <i>et al.</i>	(DARE, LANC, SHEF)
ETKIN	82C	PR D25 2446	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)
SRINIVASAN	75	PR D12 681	V. Srinivasan <i>et al.</i>	(NDAM, ANL)
BIGI	62	CERN Conf. 247	A. Bigi <i>et al.</i>	(CERN)
BINGHAM	62	CERN Conf. 240	H.H. Bingham <i>et al.</i>	(EPOL, CERN)
ERWIN	62	PRL 9 34	A.R. Erwin <i>et al.</i>	(WISC, BNL)
WANG	61	JETP 13 323	K.-C. Wang <i>et al.</i>	(JINR)
		Translated from ZETF 40 464.		