$f_0(980)$

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

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
980 ±10 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$983.0 \pm 0.6^{+4.0}_{-3.0}$		[1] AMBROSINO	06B	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\gamma$
$977.3 \pm 0.9^{+3.7}_{-4.3}$		[2] AMBROSINO	06B	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\gamma$
965 ± 10		ABLIKIM	05	BES2	$J/\psi \to \phi\pi^+\pi^-$, ϕK^+K^-
$976 \pm 4\ ^{+2}_{-3}$	2584	[3] GARMASH	05	BELL	$B^+ \to K^+\pi^+\pi^-$
1031 ± 8		[4] ANISOVICH	03	RVUE	
1037 ± 31		TIKHOMIROV	03	SPEC	40.0 $\pi^- C \to K^0_S K^0_S K^0_L X$
973 ± 1	2438	[5] ALOISIO	02D	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$
$977 \pm 3 \pm 2$	848	[6] AITALA	01A	E791	$D^+_s \to \pi^-\pi^+\pi^+$
969.8 ± 4.5	419	[7] ACHASOV	00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$
$985\ ^{+16}_{-12}$	419	[8,9] ACHASOV	00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$
$976 \pm 5 \pm 6$		[10] AKHMETSHIN	99B	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
$977 \pm 3 \pm 6$	268	[10] AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
$975 \pm 4 \pm 6$		[11] AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
$975 \pm 4 \pm 6$		[12] AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$
985 ± 10		BARBERIS	99	OMEG	450 $pp \to p_s p_f K^+K^-$
982 ± 3		BARBERIS	99B	OMEG	450 $pp \to p_s p_f \pi^+\pi^-$
982 ± 3		BARBERIS	99C	OMEG	450 $pp \to p_s p_f \pi^0\pi^0$
$987 \pm 6 \pm 6$		[13] BARBERIS	99D	OMEG	450 $pp \to K^+K^-$, $\pi^+\pi^-$
989 ± 15		BELLAZZINI	99	GAM4	450 $pp \to pp\pi^0\pi^0$
991 ± 3		[14] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\sigma\sigma$
~ 980		[14] OLLER	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
~ 993.5		OLLER	99B	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
~ 987		[14] OLLER	99C	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\eta\eta$
957 ± 6		[15] ACKERSTAFF	98Q	OPAL	$Z \to f_0 X$
960 ± 10		ALDE	98	GAM4	
1015 ± 15		[14] ANISOVICH	98B	RVUE	Compilation
1008		[16] LOCHER	98	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
955 ± 10		[15] ALDE	97	GAM2	450 $pp \to pp\pi^0\pi^0$

994 ± 9		[17] BERTIN	97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
$993.2 \pm 6.5 \pm 6.9$		[18] ISHIDA	96	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
1006		TORNQVIST	96	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
997 ± 5	3k	[19] ALDE	95B	GAM2	38 $\pi^-p \to \pi^0\pi^0 n$
960 ± 10	10k	[20] ALDE	95B	GAM2	38 $\pi^-p \to \pi^0\pi^0 n$
994 ± 5		AMSLER	95B	CBAR	0.0 $\overline{p}p \to 3\pi^0$
~ 996		[21] AMSLER	95D	CBAR	0.0 $\overline{p}p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$
987 ± 6		[22] ANISOVICH	95	RVUE	
1015		JANSSEN	95	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
983		[23] BUGG	94	RVUE	$\overline{p}p \to \eta 2\pi^0$
973 ± 2		[24] KAMINSKI	94	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
988		[25] ZOU	94B	RVUE	
988 ± 10		[26] MORGAN	93	RVUE	$\pi\pi(K\overline{K}) \to \pi\pi(K\overline{K})$, $J/\psi \to \phi\pi\pi(K\overline{K})$, $D_s \to \pi(\pi\pi)$
971.1 ± 4.0		[15] AGUILAR-...	91	EHS	400 pp
979 ± 4		[27] ARMSTRONG	91	OMEG	300 $pp \to pp\pi\pi$, $ppK\overline{K}$
956 ± 12		BREAKSTONE	90	SFM	$pp \to pp\pi^+\pi^-$
959.4 ± 6.5		[15] AUGUSTIN	89	DM2	$J/\psi \to \omega\pi^+\pi^-$
978 ± 9		[15] ABACHI	86B	HRS	$e^+e^- \to \pi^+\pi^- X$
$985.0^{+9.0}_{-39.0}$		ETKIN	82B	MPS	23 $\pi^-p \to n2K^0_S$
974 ± 4		[27] GIDAL	81	MRK2	$J/\psi \to \pi^+\pi^- X$
975		[28] ACHASOV	80	RVUE	
986 ± 10		[27] AGUILAR-...	78	HBC	0.7 $\overline{p}p \to K^0_S K^0_S$
969 ± 5		[27] LEEPER	77	ASPK	2–2.4 $\pi^-p \to \pi^+\pi^- n$, $K^+K^- n$
987 ± 7		[27] BINNIE	73	CNTR	$\pi^-p \to n MM$
1012 ± 6		[29] GRAYER	73	ASPK	17 $\pi^-p \to \pi^+\pi^- n$
1007 ± 20		[29] HYAMS	73	ASPK	17 $\pi^-p \to \pi^+\pi^- n$
997 ± 6		[29] PROTOPOP...	73	HBC	7 $\pi^+p \to \pi^+p\pi^+\pi^-$

[1] In the kaon-loop fit following formalism of ACHASOV 89.
[2] In the no-structure fit assuming a direct coupling of ϕ to $f_0\gamma$.
[3] Breit-Wigner, solution 1, PWA ambiguous.
[4] K-matrix pole from combined analysis of $\pi^-p \to \pi^0\pi^0 n$, $\pi^-p \to K\overline{K}n$, $\pi^+\pi^- \to \pi^+\pi^-$, $\overline{p}p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$, $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, $K^0_S K^0_S\pi^0$, $K^+K^0_S\pi^-$ at rest, $\overline{p}n \to \pi^-\pi^-\pi^+$, $K^0_S K^-\pi^0$, $K^0_S K^0_S\pi^-$ at rest.
[5] 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.
[6] Coupled-channel Breit-Wigner, couplings $g_\pi = 0.09 \pm 0.01 \pm 0.01$, $g_K = 0.02 \pm 0.04 \pm 0.03$.
[7] Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
[8] Supersedes ACHASOV 98I.
[9] In the "narrow resonance" approximation.
[10] Assuming $\Gamma(f_0) = 40$ MeV.

[11] From a narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
[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] From invariant mass fit.
[16] On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039−93i) MeV.
[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, AMSLER 94D.
[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] 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
40 to 100 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
61 ± 9 $^{+14}_{-8}$	2584	[30] GARMASH 05	BELL	$B^+ \rightarrow K^+ \pi^+ \pi^-$
64 ± 16		[31] ANISOVICH 03	RVUE	
121 ± 23		TIKHOMIROV 03	SPEC	40.0 $\pi^- C \rightarrow K^0_S K^0_S K^0_L X$
∼ 70		[32] BRAMON 02	RVUE	1.02 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
44 ± 2 ± 2	848	[33] AITALA 01A	E791	$D^+_s \rightarrow \pi^- \pi^+ \pi^+$
201 ± 28	419	[34] ACHASOV 00H	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
122 ± 13	419	[35,36] ACHASOV 00H	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
56 ± 20		[37] AKHMETSHIN 99C	CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
65 ± 20		BARBERIS 99	OMEG	450 $p p \rightarrow p_s p_f K^+ K^-$
80 ± 10		BARBERIS 99B	OMEG	450 $p p \rightarrow p_s p_f \pi^+ \pi^-$
80 ± 10		BARBERIS 99C	OMEG	450 $p p \rightarrow p_s p_f \pi^0 \pi^0$
48 ± 12 ± 8		[38] BARBERIS 99D	OMEG	450 $p p \rightarrow K^+ K^-$, $\pi^+ \pi^-$
65 ± 25		BELLAZZINI 99	GAM4	450 $p p \rightarrow p p \pi^0 \pi^0$

71 ± 14		[39] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\sigma\sigma$
∼ 28		[39] OLLER	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
∼ 25		OLLER	99B	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
∼ 14		[39] OLLER	99C	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\eta\eta$
70 ± 20		ALDE	98	GAM4	
86 ± 16		[39] ANISOVICH	98B	RVUE	Compilation
54		[40] LOCHER	98	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
69 ± 15		[41] ALDE	97	GAM2	450 $p p \to p p \pi^0 \pi^0$
38 ± 20		[42] BERTIN	97C	OBLX	0.0 $\overline{p} p \to \pi^+ \pi^- \pi^0$
∼ 100		[43] ISHIDA	96	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
34		TORNQVIST	96	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
48 ± 10	3k	[44] ALDE	95B	GAM2	38 $\pi^- p \to \pi^0 \pi^0 n$
95 ± 20	10k	[45] ALDE	95B	GAM2	38 $\pi^- p \to \pi^0 \pi^0 n$
26 ± 10		AMSLER	95B	CBAR	0.0 $\overline{p} p \to 3\pi^0$
∼ 112		[46] AMSLER	95D	CBAR	0.0 $\overline{p} p \to \pi^0 \pi^0 \pi^0$, $\pi^0 \eta\eta$, $\pi^0 \pi^0 \eta$
80 ± 12		[47] ANISOVICH	95	RVUE	
30		JANSSEN	95	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
74		[48] BUGG	94	RVUE	$\overline{p} p \to \eta 2\pi^0$
29 ± 2		[49] KAMINSKI	94	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
46		[50] ZOU	94B	RVUE	
48 ± 12		[51] MORGAN	93	RVUE	$\pi\pi(K\overline{K}) \to \pi\pi(K\overline{K})$, $J/\psi \to \phi\pi\pi(K\overline{K})$, $D_s \to \pi(\pi\pi)$
37.4 ± 10.6		[41] AGUILAR-...	91	EHS	400 $p p$
72 ± 8		[52] ARMSTRONG	91	OMEG	300 $p p \to p p \pi\pi$, $p p K\overline{K}$
110 ± 30		BREAKSTONE	90	SFM	$p p \to p p \pi^+ \pi^-$
29 ± 13		[41] ABACHI	86B	HRS	$e^+ e^- \to \pi^+ \pi^- X$
120 ± 281 ± 20		ETKIN	82B	MPS	23 $\pi^- p \to n 2K^0_S$
28 ± 10		[52] GIDAL	81	MRK2	$J/\psi \to \pi^+ \pi^- X$
70 to 300		[53] ACHASOV	80	RVUE	
100 ± 80		[54] AGUILAR-...	78	HBC	0.7 $\overline{p} p \to K^0_S K^0_S$
30 ± 8		[52] LEEPER	77	ASPK	2–2.4 $\pi^- p \to \pi^+ \pi^- n$, $K^+ K^- n$
48 ± 14		[52] BINNIE	73	CNTR	$\pi^- p \to n$ MM
32 ± 10		[55] GRAYER	73	ASPK	17 $\pi^- p \to \pi^+ \pi^- n$
30 ± 10		[55] HYAMS	73	ASPK	17 $\pi^- p \to \pi^+ \pi^- n$
54 ± 16		[55] PROTOPOP...	73	HBC	7 $\pi^+ p \to \pi^+ p \pi^+ \pi^-$

[30] Breit-Wigner, solution 1, PWA ambiguous.

[31] K-matrix pole from combined analysis of $\pi^- p \to \pi^0 \pi^0 n$, $\pi^- p \to K\overline{K} n$, $\pi^+ \pi^- \to \pi^+ \pi^-$, $\overline{p} p \to \pi^0 \pi^0 \pi^0$, $\pi^0 \eta\eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K^0_S K^0_S \pi^0$, $K^+ K^0_S \pi^-$ at rest, $\overline{p} n \to \pi^- \pi^- \pi^+$, $K^0_S K^- \pi^0$, $K^0_S K^0_S \pi^-$ at rest.

[32] Using the data of AKHMETSHIN 99C, ACHASOV 00H, and ALOISIO 02D.

[33] Breit-Wigner width.

[34] Supersedes ACHASOV 98I. Using the model of ACHASOV 89.

[35] Supersedes ACHASOV 98I.

[36] In the "narrow resonance" approximation.
[37] From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.
[38] Supersedes BARBERIS 99 and BARBERIS 99B
[39] T-matrix pole.
[40] On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039−93i) MeV.
[41] From invariant mass fit.
[42] On sheet II in a 2 pole solution. The other pole is found on sheet III at (963-29i) MeV.
[43] Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
[44] At high $|t|$.
[45] At low $|t|$.
[46] 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.
[47] Combined fit of ALDE 95B, ANISOVICH 94,
[48] On sheet II in a 2 pole solution. The other pole is found on sheet III at (996− 103i) MeV.
[49] From sheet II pole position.
[50] 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.
[51] On sheet II in a 2 pole solution. The other pole is found on sheet III at (978− 28i) MeV.
[52] From coupled channel analysis.
[53] Coupled channel analysis with finite width corrections.
[54] 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 $K^0_S K^0_S$ invariant mass.
[55] Included in AGUILAR-BENITEZ 78 fit.

$f_0(980)$ DECAY MODES

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

$f_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$ Γ_3

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
$0.31^{+0.08}_{-0.11}$ OUR AVERAGE					
$0.28^{+0.09}_{-0.13}$		[56] BOGLIONE	99	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^-$, $\pi^0 \pi^0$
$0.42\pm0.06\pm0.18$	60	[57] OEST	90	JADE	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.29\pm0.07\pm0.12$		[58,59] BOYER	90	MRK2	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$
$0.31\pm0.14\pm0.09$		[58,59] MARSISKE	90	CBAL	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
0.63 ± 0.14		[60] MORGAN	90	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^-$, $\pi^0 \pi^0$

[56] Supersedes MORGAN 90.
[57] OEST 90 quote systematic errors $^{+0.08}_{-0.18}$. We use ±0.18.
[58] From analysis allowing arbitrary background unconstrained by unitarity.
[59] Data included in MORGAN 90, BOGLIONE 99 analyses.
[60] 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

$\Gamma(\pi\pi)/[\Gamma(\pi\pi)+\Gamma(K\overline{K})]$ $\Gamma_1/(\Gamma_1+\Gamma_2)$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.75^{+0.11}_{-0.13}$	[61] ABLIKIM	05Q	BES2	$\chi_{c0} \rightarrow 2\pi^+2\pi^-$, $\pi^+\pi^-K^+K^-$
0.84 ± 0.02	[62] ANISOVICH	02D	SPEC	Combined fit
~ 0.68	OLLER	99B	RVUE	$\pi\pi \rightarrow \pi\pi$, $K\overline{K}$
0.67 ± 0.09	[63] LOVERRE	80	HBC	$4\ \pi^- p \rightarrow n2K^0_S$
$0.81^{+0.09}_{-0.04}$	[63] CASON	78	STRC	$7\ \pi^- p \rightarrow n2K^0_S$
0.78 ± 0.03	[63] WETZEL	76	OSPK	$8.9\ \pi^- p \rightarrow n2K^0_S$

[61] Using data from ABLIKIM 04G.
[62] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \rightarrow \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \rightarrow K\overline{K}n$) data.
[63] Measure $\pi\pi$ elasticity assuming two resonances coupled to the $\pi\pi$ and $K\overline{K}$ channels only.

$f_0(980)$ REFERENCES

AMBROSINO	06B	PL B634 148	F. Ambrosino et al.	(KLOE Collab.)
ABLIKIM	05	PL B607 243	M. Ablikim et al.	(BES Collab.)
ABLIKIM	05Q	PR D72 092002	M. Ablikim et al.	(BES Collab.)
GARMASH	05	PR D71 092003	A. Garmash et al.	(BELLE Collab.)
ABLIKIM	04G	PR D70 092002	M. Ablikim et al.	(BES Collab.)
ANISOVICH	03	EPJ A16 229	V.V. Anisovich et al.	
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov et al.	
		Translated from YAF 66 860.		
ALOISIO	02D	PL B537 21	A. Aloisio et al.	(KLOE Collab.)
ANISOVICH	02D	PAN 65 1545	V.V. Anisovich et al.	
		Translated from YAF 65 1583.		
BRAMON	02	EPJ C26 253	A. Bramon et al.	
ACHASOV	01F	PR D63 094007	N.N. Achasov et al.	(Novosibirsk SND Collab.)
AITALA	01A	PRL 86 765	E.M. Aitala et al.	(FNAL E791 Collab.)
AITALA	01B	PRL 86 770	E.M. Aitala et al.	(FNAL E791 Collab.)
ACHASOV	00H	PL B485 349	M.N. Achasov et al.	(Novosibirsk SND Collab.)
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin et al.	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin et al.	(Novosibirsk CMD-2 Collab.)
BARBERIS	99	PL B453 305	D. Barberis et al.	(Omega Expt.)
BARBERIS	99B	PL B453 316	D. Barberis et al.	(Omega Expt.)
BARBERIS	99C	PL B453 325	D. Barberis et al.	(Omega Expt.)
BARBERIS	99D	PL B462 462	D. Barberis et al.	(Omega Expt.)
BELLAZZINI	99	PL B467 296	R. Bellazzini et al.	
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 *et al.*	
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 *et al.*	
ACKERSTAFF	98Q	EPJ C4 19	K. Ackerstaff *et al.*	(OPAL Collab.)
ALDE	98	EPJ A3 361	D. Alde *et al.*	(GAM4 Collab.)
Also		PAN 62 405	D. Alde *et al.*	(GAMS Collab.)
		Translated from YAF 62 446.		
ANISOVICH	98B	UFN 41 419	V.V. Anisovich *et al.*	
LOCHER	98	EPJ C4 317	M.P. Locher *et al.*	(PSI)
ALDE	97	PL B397 350	D.M. Alde *et al.*	(GAMS Collab.)
BERTIN	97C	PL B408 476	A. Bertin *et al.*	(OBELIX Collab.)
ISHIDA	96	PTP 95 745	S. Ishida *et al.*	(TOKY, MIYA, KEK)
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)
ALDE	95B	ZPHY C66 375	D.M. Alde *et al.*	(GAMS Collab.)
AMSLER	95B	PL B342 433	C. Amsler *et al.*	(Crystal Barrel Collab.)
AMSLER	95D	PL B355 425	C. Amsler *et al.*	(Crystal Barrel Collab.)
ANISOVICH	95	PL B355 363	V.V. Anisovich *et al.*	(PNPI, SERP)
JANSSEN	95	PR D52 2690	G. Janssen *et al.*	(STON, ADLD, JULI)
AMSLER	94D	PL B333 277	C. Amsler *et al.*	(Crystal Barrel Collab.)
ANISOVICH	94	PL B323 233	V.V. Anisovich *et al.*	(Crystal Barrel Collab.)
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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 *et al.*	(LEBC-EHS Collab.)
ARMSTRONG	91	ZPHY C51 351	T.A. Armstrong *et al.*	(ATHU, BARI, BIRM+)
BOYER	90	PR D42 1350	J. Boyer *et al.*	(Mark II Collab.)
BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone *et al.*	(ISU, BGNA, CERN+)
MARSISKE	90	PR D41 3324	H. Marsiske *et al.*	(Crystal Ball Collab.)
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)
OEST	90	ZPHY C47 343	T. Oest *et al.*	(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 *et al.*	(NOVO)
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ETKIN	82B	PR D25 1786	A. Etkin *et al.*	(BNL, CUNY, TUFTS, VAND)
GIDAL	81	PL 107B 153	G. Gidal *et al.*	(SLAC, LBL)
ACHASOV	80	SJNP 32 566	N.N. Achasov, S.A. Devyanin, G.N. Shestakov	(NOVM)
		Translated from YAF 32 1098.		
LOVERRE	80	ZPHY C6 187	P.F. Loverre *et al.*	(CERN, CDEF, MADR+) IJP
AGUILAR-...	78	NP B140 73	M. Aguilar-Benitez *et al.*	(MADR, BOMB+)
CASON	78	PRL 41 271	N.M. Cason *et al.*	(NDAM, ANL)
LEEPER	77	PR D16 2054	R.J. Leeper *et al.*	(ISU)
ROSSELET	77	PR D15 574	L. Rosselet *et al.*	(GEVA, SACL)
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