$f_0(980)$

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

See also the minireview on scalar mesons under $f_0(1370)$. (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. • • •					
976 ± 5 ±6		[1] AKHMETSHIN	99B	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
977 ± 3 ±6	268	[1] AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
975 ± 4 ±6		[2] AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
975 ± 4 ±6		[3] 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 ± 6 ±6		[4] 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		[5] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\sigma\sigma$
~ 980		[5] 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		[5] OLLER	99C	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\eta\eta$
984 ±12	164	[6] ACHASOV	98I	SND	$e^+e^- \to 5\gamma$
971 ± 6	164	[7] ACHASOV	98I	SND	$e^+e^- \to 5\gamma$
957 ± 6		[8] ACKERSTAFF	98Q	OPAL	$Z \to f_0$ X
960 ±10		ALDE	98	GAM4	
1015 ±15		[5] ANISOVICH	98B	RVUE	Compilation
1008		[9] LOCHER	98	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
955 ±10		[8] ALDE	97	GAM2	450 $pp \to pp\pi^0\pi^0$
994 ± 9		[10] BERTIN	97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
993.2± 6.5±6.9		[11] 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	[12] ALDE	95B	GAM2	38 $\pi^- p \to \pi^0\pi^0 n$
960 ±10	10k	[13] 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		[14] 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	[15] ANISOVICH	95	RVUE		
1015	JANSSEN	95	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
983	[16] BUGG	94	RVUE	$\overline{p}p \to \eta 2\pi^0$
973 ± 2	[17] KAMINSKI	94	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
988	[18] ZOU	94B	RVUE	
988 ±10	[19] 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	[8] AGUILAR-...	91	EHS	400 pp
979 ± 4	[20] 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	[8] AUGUSTIN	89	DM2	$J/\psi \to \omega\pi^+\pi^-$
978 ± 9	[8] ABACHI	86B	HRS	$e^+e^- \to \pi^+\pi^- X$
$985.0^{+9.0}_{-39.0}$	ETKIN	82B	MPS	23 $\pi^- p \to n 2K^0_S$
974 ± 4	[20] GIDAL	81	MRK2	$J/\psi \to \pi^+\pi^- X$
975	[21] ACHASOV	80	RVUE	
986 ±10	[20] AGUILAR-...	78	HBC	0.7 $\overline{p}p \to K^0_S K^0_S$
969 ± 5	[20] LEEPER	77	ASPK	2–2.4 $\pi^- p \to \pi^+\pi^- n$, $K^+K^- n$
987 ± 7	[20] BINNIE	73	CNTR	$\pi^- p \to n$MM
1012 ± 6	[22] GRAYER	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$
1007 ±20	[22] HYAMS	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$
997 ± 6	[22] PROTOPOP...	73	HBC	7 $\pi^+ p \to \pi^+ p\pi^+\pi^-$

[1] Assuming $\Gamma(f_0)$= 40 MeV.
[2] From a narrow pole fit taking into account f_0(980) and f_0(1200) intermediate mechanisms.
[3] From the combined fit of the photon spectra in the reactions $e^+e^- \to \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
[4] Supersedes BARBERIS 99 and BARBERIS 99B
[5] T-matrix pole.
[6] In the "narrow resonance" approximation.
[7] Using the "broad resonance" formulae of ACHASOV 97C.
[8] From invariant mass fit.
[9] On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039−93*i*) MeV.
[10] On sheet II in a 2 pole solution. The other pole is found on sheet III at (963-29i) MeV.
[11] Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
[12] At high $|t|$.
[13] At low $|t|$.
[14] 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.
[15] Combined fit of ALDE 95B, ANISOVICH 94, AMSLER 94D.
[16] On sheet II in a 2 pole solution. The other pole is found on sheet III at (996−103*i*) MeV.
[17] From sheet II pole position.
[18] 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.
[19] On sheet II in a 2 pole solution. The other pole is found on sheet III at (978−28*i*) MeV.
[20] From coupled channel analysis.
[21] Coupled channel analysis with finite width corrections.
[22] 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. • • •					
56 ± 20		[23] AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
65 ± 20		BARBERIS	99	OMEG	450 $pp \to p_s p_f K^+ K^-$
80 ± 10		BARBERIS	99B	OMEG	450 $pp \to p_s p_f \pi^+\pi^-$
80 ± 10		BARBERIS	99C	OMEG	450 $pp \to p_s p_f \pi^0\pi^0$
48 ± 12 ± 8		[24] BARBERIS	99D	OMEG	450 $pp \to K^+K^-$, $\pi^+\pi^-$
65 ± 25		BELLAZZINI	99	GAM4	450 $pp \to pp\pi^0\pi^0$
71 ± 14		[25] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\sigma\sigma$
∼ 28		[25] OLLER	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
∼ 25		OLLER	99B	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
∼ 14		[25] OLLER	99C	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\eta\eta$
74 ± 12	164	[26] ACHASOV	98I	SND	$e^+e^- \to 5\gamma$
188^{+48}_{-33}	164	[27] ACHASOV	98I	SND	$e^+e^- \to 5\gamma$
70 ± 20		ALDE	98	GAM4	
86 ± 16		[25] ANISOVICH	98B	RVUE	Compilation
54		[28] LOCHER	98	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
69 ± 15		[29] ALDE	97	GAM2	450 $pp \to pp\pi^0\pi^0$
38 ± 20		[30] BERTIN	97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
∼ 100		[31] 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	[32] ALDE	95B	GAM2	38 $\pi^- p \to \pi^0\pi^0 n$
95 ± 20	10k	[33] 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		[34] 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		[35] ANISOVICH	95	RVUE	
30		JANSSEN	95	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
74		[36] BUGG	94	RVUE	$\overline{p}p \to \eta 2\pi^0$
29 ± 2		[37] KAMINSKI	94	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$
46		[38] ZOU	94B	RVUE	
48 ± 12		[39] 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	[29] AGUILAR-...	91	EHS	400 pp
72 ± 8	[40] ARMSTRONG	91	OMEG	300 $pp \to pp\pi\pi$, $ppK\overline{K}$
110 ± 30	BREAKSTONE	90	SFM	$pp \to pp\pi^+\pi^-$
29 ± 13	[29] ABACHI	86B	HRS	$e^+e^- \to \pi^+\pi^- X$
120 ±281 ±20	ETKIN	82B	MPS	23 $\pi^- p \to n2K^0_S$
28 ± 10	[40] GIDAL	81	MRK2	$J/\psi \to \pi^+\pi^- X$
70 to 300	[41] ACHASOV	80	RVUE	
100 ± 80	[42] AGUILAR-...	78	HBC	0.7 $\overline{p}p \to K^0_S K^0_S$
30 ± 8	[40] LEEPER	77	ASPK	2–2.4 $\pi^- p \to \pi^+\pi^- n$, $K^+K^- n$
48 ± 14	[40] BINNIE	73	CNTR	$\pi^- p \to n$MM
32 ± 10	[43] GRAYER	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$
30 ± 10	[43] HYAMS	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$
54 ± 16	[43] PROTOPOP...	73	HBC	7 $\pi^+ p \to \pi^+ p\pi^+\pi^-$

[23] From the combined fit of the photon spectra in the reactions $e^+e^- \to \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
[24] Supersedes BARBERIS 99 and BARBERIS 99B
[25] T-matrix pole.
[26] In the "narrow resonance" approximation.
[27] Using the "broad resonance" formulae of ACHASOV 97C.
[28] On sheet II in a 2 pole solution. The other pole is found on sheet III at (1039−93i) MeV.
[29] From invariant mass fit.
[30] On sheet II in a 2 pole solution. The other pole is found on sheet III at (963-29i) MeV.
[31] Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
[32] At high $|t|$.
[33] At low $|t|$.
[34] 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.
[35] Combined fit of ALDE 95B, ANISOVICH 94,
[36] On sheet II in a 2 pole solution. The other pole is found on sheet III at (996−103i) MeV.
[37] From sheet II pole position.
[38] 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.
[39] On sheet II in a 2 pole solution. The other pole is found on sheet III at (978−28i) MeV.
[40] From coupled channel analysis.
[41] Coupled channel analysis with finite width corrections.
[42] 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.
[43] 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	$\gamma\gamma$	
Γ_4	e^+e^-	

$f_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$ Γ_3

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
$0.39^{+0.10}_{-0.13}$ OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.				
$0.28^{+0.09}_{-0.13}$		[44] BOGLIONE	99	RVUE	$\gamma\gamma \to \pi^+\pi^-$, $\pi^0\pi^0$
0.63 ± 0.14		[45] MORGAN	90	RVUE	$\gamma\gamma \to \pi^+\pi^-$, $\pi^0\pi^0$
$0.42\pm0.06\pm0.18$	60	[46] OEST	90	JADE	$e^+e^- \to e^+e^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.29\pm0.07\pm0.12$		[47,48] BOYER	90	MRK2	$e^+e^- \to e^+e^-\pi^+\pi^-$
$0.31\pm0.14\pm0.09$		[47,48] MARSISKE	90	CBAL	$e^+e^- \to e^+e^-\pi^0\pi^0$

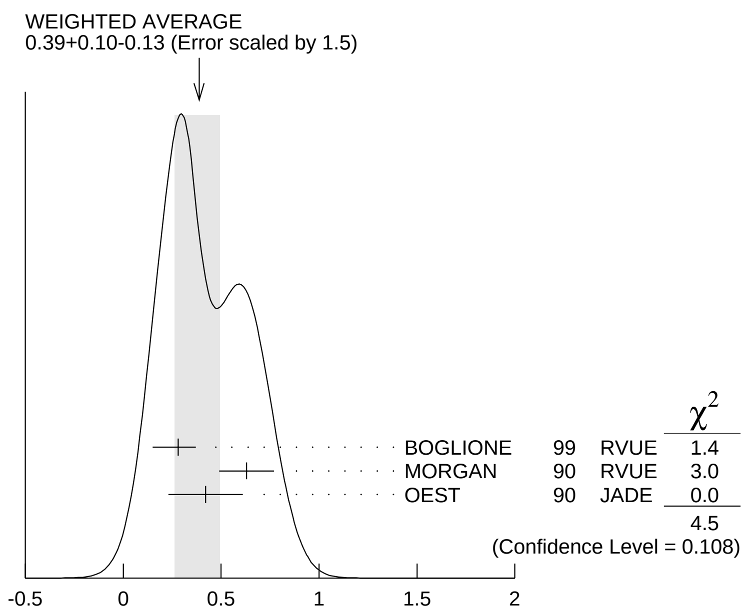
[44] Supersedes MORGAN 90.

[45] From amplitude analysis of BOYER 90 and MARSISKE 90, data corresponds to resonance parameters m = 989 MeV, Γ = 61 MeV.

[46] OEST 90 quote systematic errors $^{+0.08}_{-0.18}$. We use ±0.18.

[47] From analysis allowing arbitrary background unconstrained by unitarity.

[48] Data included in MORGAN 90, BOGLIONE 99 analyses.



$\Gamma(\gamma\gamma)$ Γ_3

$\Gamma(e^+e^-)$ Γ_4

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

$f_0(980)$ 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. • • •				
~ 0.68	OLLER	99B	RVUE	$\pi\pi \rightarrow \pi\pi$, $K\overline{K}$
0.67 ± 0.09	[49] LOVERRE	80	HBC	$4\ \pi^- p \rightarrow n 2K^0_S$
$0.81^{+0.09}_{-0.04}$	[49] CASON	78	STRC	$7\ \pi^- p \rightarrow n 2K^0_S$
0.78 ± 0.03	[49] WETZEL	76	OSPK	$8.9\ \pi^- p \rightarrow n 2K^0_S$

[49] Measure $\pi\pi$ elasticity assuming two resonances coupled to the $\pi\pi$ and $K\overline{K}$ channels only.

$f_0(980)$ REFERENCES

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AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin *et al.*	(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	
OLLER	99	PR D60 099906	J.A. Oller *et al.*	
OLLER	99B	NP A652 407	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	99	PAN 62 405	D. Alde *et al.*	(GAMS Collab.)
ANISOVICH	98B	UFN 41 419	V.V. Anisovich *et al.*	
LOCHER	98	EPJ C4 317	M.P. Locher *et al.*	(PSI)
ACHASOV	97C	PR D56 4084	N.N. Achasov *et al.*	
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.*	
BUGG	94	PR D50 4412	D.V. Bugg *et al.*	(LOQM)
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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.)
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)
VOROBYEV	88	SJNP 48 273 Translated from YAF 48 436.	P.V. Vorobiev *et al.*	(NOVO)
ABACHI	86B	PRL 57 1990	S. Abachi *et al.*	(PURD, ANL, IND, MICH+)
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 Translated from YAF 32 1098.	N.N. Achasov, S.A. Devyanin, G.N. Shestakov	(NOVM)

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)
WETZEL	76	NP B115 208	W. Wetzel *et al.*	(ETH, CERN, LOIC)
SRINIVASAN	75	PR D12 681	V. Srinivasan *et al.*	(NDAM, ANL)
GRAYER	74	NP B75 189	G. Grayer *et al.*	(CERN, MPIM)
BINNIE	73	PRL 31 1534	D.M. Binnie *et al.*	(LOIC, SHMP)
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HYAMS	73	NP B64 134	B.D. Hyams *et al.*	(CERN, MPIM)
PROTOPOP...	73	PR D7 1279	S.D. Protopopescu *et al.*	(LBL)

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Also	99F	NP A651 253	A.V. Anisovich *et al.*	
ANISOVICH	99H	PL B467 289	A.V. Anisovich, V.V. Anisovich	
BLACK	99	PR D59 074026	D. Black *et al.*	
DELBOURGO	99	PL B446 332	R. Delbourgo, D. Liu, M. Scadron	
MARCO	99	PL B470 20	E. Marco *et al.*	
MINKOWSKI	99	EPJ C9 283	P. Minkowski, W. Ochs	
ACHASOV	98C	PR D57 1987	N.N. Achasov *et al.*	
ACHASOV	98G	JETP 67 464	N.N. Achasov *et al.*	
ACHASOV	98J	SPU 41 1149	N.N. Achasov	
CHLIAPNIK...	98	PL B423 401	P.V. Chliapnikov, V.A. Uvarov	
ACHASOV	97C	PR D56 4084	N.N. Achasov *et al.*	
ACHASOV	97D	PR D56 203	N.N. Achasov *et al.*	
ACHASOV	97E	IJMP A12 5019	N.N. Achasov *et al.*	
PROKOSHKIN	97	SPD 42 117	Y.D. Prokoshkin *et al.*	(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 *et al.*	(Axial Field Spec. Collab.)
BEVEREN	86	ZPHY C30 615	E. van Beveren *et al.*	(NIJM, BIEL)
MENNESSIER	83	ZPHY C16 241	G. Mennessier	(MONP)
BARBER	82	ZPHY C12 1	D.P. Barber *et al.*	(DARE, LANC, SHEF)
ETKIN	82C	PR D25 2446	A. Etkin *et al.*	(BNL, CUNY, TUFTS, VAND)
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BIGI	62	CERN Conf. 247	A. Bigi *et al.*	(CERN)
BINGHAM	62	CERN Conf. 240	H.H. Bingham *et al.*	(EPOL, CERN)
ERWIN	62	PRL 9 34	A.R. Erwin *et al.*	(WISC, BNL)
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		Translated from ZETF 40 464.		