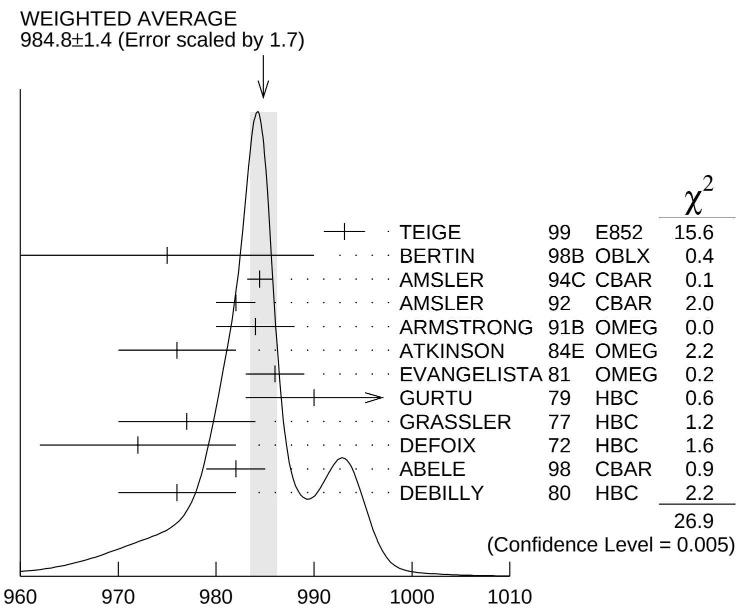
$a_0(980)$

$I^G(J^{PC}) = 1^-(0^{++})$

See our minireview on scalar mesons under $f_0(1370)$. (See the index for the page number.)

$a_0(980)$ MASS

VALUE (MeV)	DOCUMENT ID
984.8±1.4 OUR AVERAGE	Includes data from the 2 datablocks that follow this one. Error includes scale factor of 1.7. See the ideogram below.



$a_0(980)$ MASS

$\eta\pi$ FINAL STATE ONLY

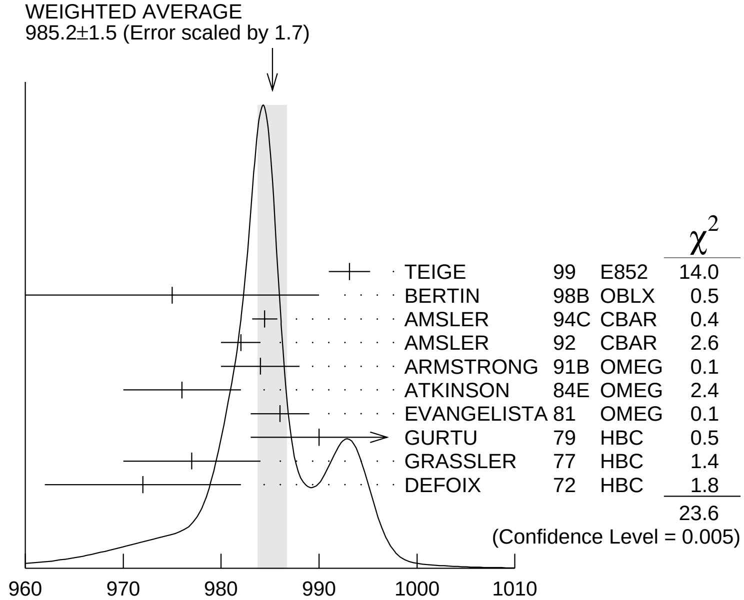
VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
The data in this block is included in the average printed for a previous datablock.						
985.2 ± 1.5 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.				
993.1 ± 2.1		[1] TEIGE	99	E852		18.3 $\pi^- p \to \eta\pi^+\pi^- n$

975	±15			BERTIN	98B	OBLX		$0.0\ \overline{p}p \to K^{\pm}K_S\pi^{\mp}$
984.45	± 1.23±0.34			AMSLER	94C	CBAR		$0.0\ \overline{p}p \to \omega\eta\pi^0$
982	± 2		[2]	AMSLER	92	CBAR		$0.0\ \overline{p}p \to \eta\eta\pi^0$
984	± 4	1040	[2]	ARMSTRONG	91B	OMEG	±	$300\ pp \to pp\eta\pi^+\pi^-$
976	± 6			ATKINSON	84E	OMEG	±	25–55 $\gamma p \to \eta\pi n$
986	± 3	500	[3]	EVANGELISTA	81	OMEG	±	$12\ \pi^- p \to \eta\pi^+\pi^-\pi^- p$
990	± 7	145	[3]	GURTU	79	HBC	±	$4.2\ K^- p \to \Lambda\eta 2\pi$
977	± 7			GRASSLER	77	HBC	−	$16\ \pi^{\mp} p \to p\eta 3\pi$
972	±10	150		DEFOIX	72	HBC	±	$0.7\ \overline{p}p \to 7\pi$

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

∼ 1055			[4]	OLLER	99	RVUE		$\eta\pi$, $K\overline{K}$
∼ 1009.2			[4]	OLLER	99B	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$
986	$^{+23}_{-10}$	20	[5]	ACHASOV	98B	SND		$e^+e^- \to 5\gamma$
988	± 6		[4]	ANISOVICH	98B	RVUE		Compilation
987				TORNQVIST	96	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
991				JANSSEN	95	RVUE		$\eta\pi \to \eta\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
980	±11	47		CONFORTO	78	OSPK	−	$4.5\ \pi^- p \to pX^-$
978	±16	50		CORDEN	78	OMEG	±	12–15 $\pi^- p \to n\eta 2\pi$
989	± 4	70		WELLS	75	HBC	−	3.1–6 $K^- p \to \Lambda\eta 2\pi$
970	±15	20		BARNES	69C	HBC	−	4–5 $K^- p \to \Lambda\eta 2\pi$
980	±10			CAMPBELL	69	DBC	±	$2.7\ \pi^+ d$
980	±10	15		MILLER	69B	HBC	−	$4.5\ K^- N \to \eta\pi\Lambda$
980	±10	30		AMMAR	68	HBC	±	$5.5\ K^- p \to \Lambda\eta 2\pi$

[1] Breit-Wigner fit, average between $a_0^{\pm}$ and a_0^0. The fit favors a slightly heavier $a_0^{\pm}$.
[2] From a single Breit-Wigner fit.
[3] From $f_1(1285)$ decay.
[4] T-matrix pole.
[5] Assuming $g_{a\eta\pi} = 0.85\ g_{aK^+K^-}$. Systematic uncertainties not estimated.



$\eta\pi$ FINAL STATE ONLY

$K\overline{K}$ ONLY

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
980.8± 2.7 OUR AVERAGE					
982 ± 3		[6] ABELE	98	CBAR		0.0 $\overline{p}p \to K^0_L K^\pm \pi^\mp$
976 ± 6	316	DEBILLY	80	HBC	±	1.2–2 $\overline{p}p \to f_1(1285)\omega$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
∼ 1053		[7] OLLER	99C	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$
1016 ±10	100	[8] ASTIER	67	HBC	±	0.0 $\overline{p}p$
1003.3± 7.0	143	[9] ROSENFELD	65	RVUE	±	

[6] T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.
[7] T-matrix pole.
[8] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[9] Plus systematic errors.

$a_0(980)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
50 to 100 OUR ESTIMATE	Width determination very model dependent. Peak width in $\eta\pi$ is about 60 MeV, but decay width can be much larger.				
• • • We do not use the following data for averages, fits, limits, etc. • • •					
∼ 42		[10] OLLER	99	RVUE	$\eta\pi$, $K\overline{K}$
∼ 112		[10] OLLER	99B	RVUE	$\pi\pi \to \eta\pi$, $K\overline{K}$
71 ± 7		TEIGE	99	E852	18.3 $\pi^- p \to \eta\pi^+\pi^- n$
92 ±20		[10] ANISOVICH	98B	RVUE	Compilation

65 ±10			BERTIN	98B	OBLX		0.0 $\overline{p}p \to K^{\pm} K_S \pi^{\mp}$
~ 100			TORNQVIST	96	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
202			JANSSEN	95	RVUE		$\eta\pi \to \eta\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
54.12± 0.34±0.12			AMSLER	94C	CBAR		0.0 $\overline{p}p \to \omega\eta\pi^0$
54 ±10		[11]	AMSLER	92	CBAR		0.0 $\overline{p}p \to \eta\eta\pi^0$
95 ±14	1040	[11]	ARMSTRONG	91B	OMEG	±	300 $pp \to pp\eta\pi^+\pi^-$
62 ±15	500	[12]	EVANGELISTA	81	OMEG	±	12 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$
60 ±20	145	[12]	GURTU	79	HBC	±	4.2 $K^- p \to \Lambda\eta 2\pi$
60 $^{+50}_{-30}$	47		CONFORTO	78	OSPK	−	4.5 $\pi^- p \to pX^-$
86.0 $^{+60.0}_{-50.0}$	50		CORDEN	78	OMEG	±	12–15 $\pi^- p \to n\eta 2\pi$
44 ±22			GRASSLER	77	HBC	−	16 $\pi^{\mp} p \to p\eta 3\pi$
80 to 300		[13]	FLATTE	76	RVUE	−	4.2 $K^- p \to \Lambda\eta 2\pi$
16.0 $^{+25.0}_{-16.0}$	70		WELLS	75	HBC	−	3.1–6 $K^- p \to \Lambda\eta 2\pi$
30 ± 5	150		DEFOIX	72	HBC	±	0.7 $\overline{p}p \to 7\pi$
40 ±15			CAMPBELL	69	DBC	±	2.7 $\pi^+ d$
60 ±30	15		MILLER	69B	HBC	−	4.5 $K^- N \to \eta\pi\Lambda$
80 ±30	30		AMMAR	68	HBC	±	5.5 $K^- p \to \Lambda\eta 2\pi$

[10] T-matrix pole.
[11] From a single Breit-Wigner fit.
[12] From $f_1(1285)$ decay.
[13] Using a two-channel resonance parametrization of GAY 76B data.

$K\overline{K}$ ONLY

VALUE (MeV)	EVTS		DOCUMENT ID		TECN	CHG	COMMENT
92± 8		[14]	ABELE	98	CBAR		0.0 $\overline{p}p \to K^0_L K^{\pm}\pi^{\mp}$
• • • We do not use the following data for averages, fits, limits, etc. • • •							
~ 24		[15]	OLLER	99C	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$
~ 25	100	[16]	ASTIER	67	HBC	±	
57±13	143	[17]	ROSENFELD	65	RVUE	±	

[14] T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.
[15] T-matrix pole.
[16] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[17] Plus systematic errors.

$a_0(980)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\eta\pi$	dominant
Γ_2	$K\overline{K}$	seen
Γ_3	$\rho\pi$	
Γ_4	$\gamma\gamma$	seen
Γ_5	$e^+ e^-$	

$a_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$ — Γ_4

VALUE (keV)	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.30±0.10	[18] AMSLER	98	RVUE

[18] Using $\Gamma_{\gamma\gamma}$B($a0(980) \rightarrow \eta\pi$) =0.24 ± 0.08 keV.

$a_0(980)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(total)$

$\Gamma(\eta\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_1\Gamma_4/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
$0.24^{+0.08}_{-0.07}$ OUR AVERAGE					
0.28±0.04±0.10	44	OEST	90	JADE	$e^+e^- \rightarrow e^+e^-\pi^0\eta$
$0.19\pm0.07^{+0.10}_{-0.07}$		ANTREASYAN	86	CBAL	$e^+e^- \rightarrow e^+e^-\pi^0\eta$

$\Gamma(\eta\pi) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_1\Gamma_5/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<1.5	90	VOROBYEV	88	ND	$e^+e^- \rightarrow \pi^0\eta$

$a_0(980)$ BRANCHING RATIOS

$\Gamma(K\overline{K})/\Gamma(\eta\pi)$ — Γ_2/Γ_1

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.177±0.024 OUR AVERAGE	Error includes scale factor of 1.2.				
0.23 ±0.05	[19] ABELE	98	CBAR		0.0 $\overline{p}p \rightarrow K^0_L K^\pm \pi^\mp$
0.166±0.01 ±0.02	[20] BARBERIS	98C	OMEG		450 $pp \rightarrow p_f f_1(1285) p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
∼ 0.60	OLLER	99B	RVUE		$\pi\pi \rightarrow \eta\pi$, $K\overline{K}$
1.16 ±0.18	[21] BUGG	94	RVUE		$\overline{p}p \rightarrow \eta\eta\pi^0$
0.7 ±0.3	[20] CORDEN	78	OMEG		12–15 $\pi^- p \rightarrow n\eta 2\pi$
0.25 ±0.08	[20] DEFOIX	72	HBC	±	0.7 $\overline{p} \rightarrow 7\pi$

[19] Using $\pi^0\pi^0\eta$ from AMSLER 94D.
[20] From the decay of $f_1(1285)$.
[21] BUGG 94 uses AMSLER 94C data. This is a ratio of couplings.

$\Gamma(\rho\pi)/\Gamma(\eta\pi)$ — Γ_3/Γ_1

$\rho\pi$ forbidden.

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.25	70	AMMAR	70	HBC	±	4.1,5.5 $K^- p \rightarrow \Lambda\eta 2\pi$

$a_0(980)$ REFERENCES

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	
TEIGE	99	PR D59 012001	S. Teige *et al.*	(BNL-852 Collab.)
ABELE	98	PR D57 3860	A. Abele *et al.*	(Crystal Barrel Collab.)
ACHASOV	98B	PL B438 441	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
AMSLER	98	RMP 70 1293	C. Amsler	
ANISOVICH	98B	UFN 41 419	V.V. Anisovich *et al.*	
BARBERIS	98C	PL B440 225	D. Barberis *et al.*	(WA102 Collab.)
BERTIN	98B	PL B434 180	A. Bertin *et al.*	(OBELIX Collab.)
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)
JANSSEN	95	PR D52 2690	G. Janssen *et al.*	(STON, ADLD, JULI)
AMSLER	94C	PL B327 425	C. Amsler *et al.*	(Crystal Barrel Collab.)
AMSLER	94D	PL B333 277	C. Amsler *et al.*	(Crystal Barrel Collab.)
BUGG	94	PR D50 4412	D.V. Bugg *et al.*	(LOQM)
AMSLER	92	PL B291 347	C. Amsler *et al.*	(Crystal Barrel Collab.)
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong *et al.*	(ATHU, BARI, BIRM+)
OEST	90	ZPHY C47 343	T. Oest *et al.*	(JADE Collab.)
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev *et al.*	(NOVO)
		Translated from YAF 48 436.		
ANTREASYAN	86	PR D33 1847	D. Antreasyan *et al.*	(Crystal Ball Collab.)
ATKINSON	84E	PL 138B 459	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
EVANGELISTA	81	NP B178 197	C. Evangelista *et al.*	(BARI, BONN, CERN+)
DEBILLY	80	NP B176 1	L. de Billy *et al.*	(CURIN, LAUS, NEUC+)
GURTU	79	NP B151 181	A. Gurtu *et al.*	(CERN, ZEEM, NIJM, OXF)
CONFORTO	78	LNC 23 419	B. Conforto *et al.*	(RHEL, TNTO, CHIC+)
CORDEN	78	NP B144 253	M.J. Corden *et al.*	(BIRM, RHEL, TELA+)
GRASSLER	77	NP B121 189	H. Grassler *et al.*	(AACH3, BERL, BONN+)
FLATTE	76	PL 63B 224	S.M. Flatte	(CERN)
GAY	76B	PL 63B 220	J.B. Gay *et al.*	(CERN, AMST, NIJM) JP
WELLS	75	NP B101 333	J. Wells *et al.*	(OXF)
DEFOIX	72	NP B44 125	C. Defoix *et al.*	(CDEF, CERN)
AMMAR	70	PR D2 430	R. Ammar *et al.*	(KANS, NWES, ANL, WISC)
BARNES	69C	PRL 23 610	V.E. Barnes *et al.*	(BNL, SYRA)
CAMPBELL	69	PRL 22 1204	J.H. Campbell *et al.*	(PURD)
MILLER	69B	PL 29B 255	D.H. Miller *et al.*	(PURD)
Also	69	PR 188 2011	W.L. Yen *et al.*	(PURD)
AMMAR	68	PRL 21 1832	R. Ammar *et al.*	(NWES, ANL)
ASTIER	67	PL 25B 294	A. Astier *et al.*	(CDEF, CERN, IRAD)
Includes data of BARLOW 67, CONFORTO 67, and ARMENTEROS 65.				
BARLOW	67	NC 50A 701	J. Barlow *et al.*	(CERN, CDEF, IRAD, LIVP)
CONFORTO	67	NP B3 469	G. Conforto *et al.*	(CERN, CDEF, IPNP+)
ARMENTEROS	65	PL 17 344	R. Armenteros *et al.*	(CERN, CDEF)
ROSENFELD	65	Oxford Conf. 58	A.H. Rosenfeld	(LRL)

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ANISOVICH	99D	PL B452 180	A.V. Anisovich *et al.*	
Also	99F	NP A651 253	A.V. Anisovich *et al.*	
MARCO	99	PL B470 20	E. Marco *et al.*	
ACHASOV	98J	SPU 41 1149	N.N. Achasov	
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.*	
AMSLER	94D	PL B333 277	C. Amsler *et al.*	(Crystal Barrel Collab.)
TORNQVIST	90	NPBPS 21 196	N.A. Tornqvist	(HELS)
WEINSTEIN	89	UTPT 89 03	J. Weinstein, N. Isgur	(TNTO)
ACHASOV	88B	ZPHY C41 309	N.N. Achasov, G.N. Shestakov	(NOVM)
BEVEREN	86	ZPHY C30 615	E. van Beveren *et al.*	(NIJM, BIEL)
WEINSTEIN	83B	PR D27 588	J. Weinstein, N. Isgur	(TNTO)
TORNQVIST	82	PRL 49 624	N.A. Tornqvist	(HELS)
BRAMON	80	PL 93B 65	A. Bramon, E. Masso	(BARC)
TURKOT	63	Siena Conf. 1 661	F. Turkot *et al.*	(BNL, PITT)