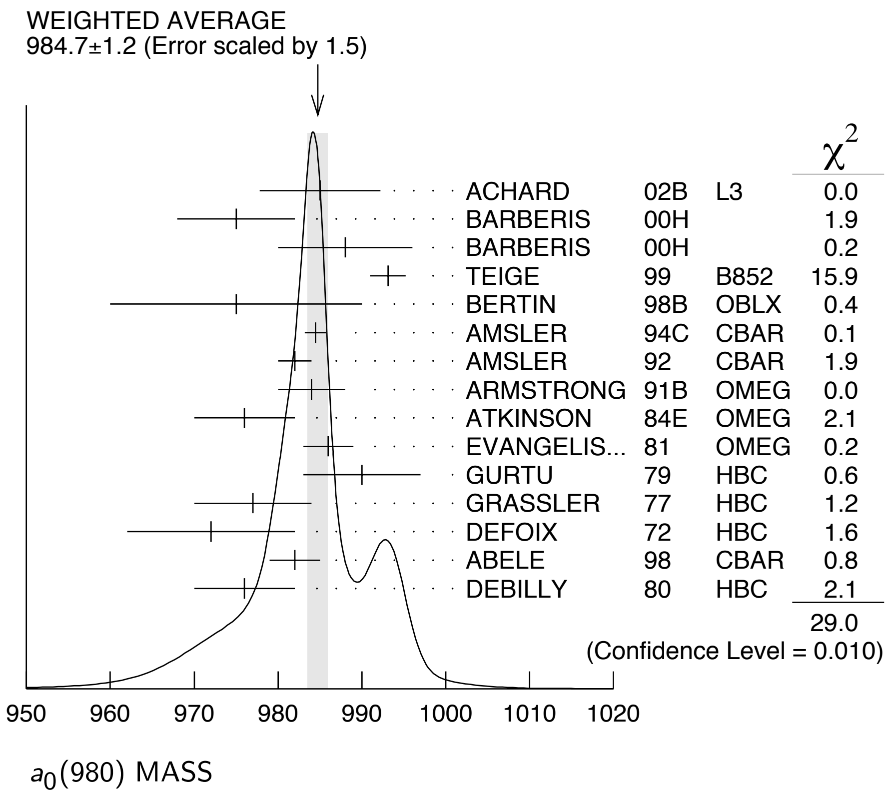
$a_0(980)$

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

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

$a_0(980)$ MASS

VALUE (MeV)	*DOCUMENT ID*
984.7±1.2 OUR AVERAGE	Includes data from the 2 datablocks that follow this one. Error includes scale factor of 1.5. See the ideogram below.

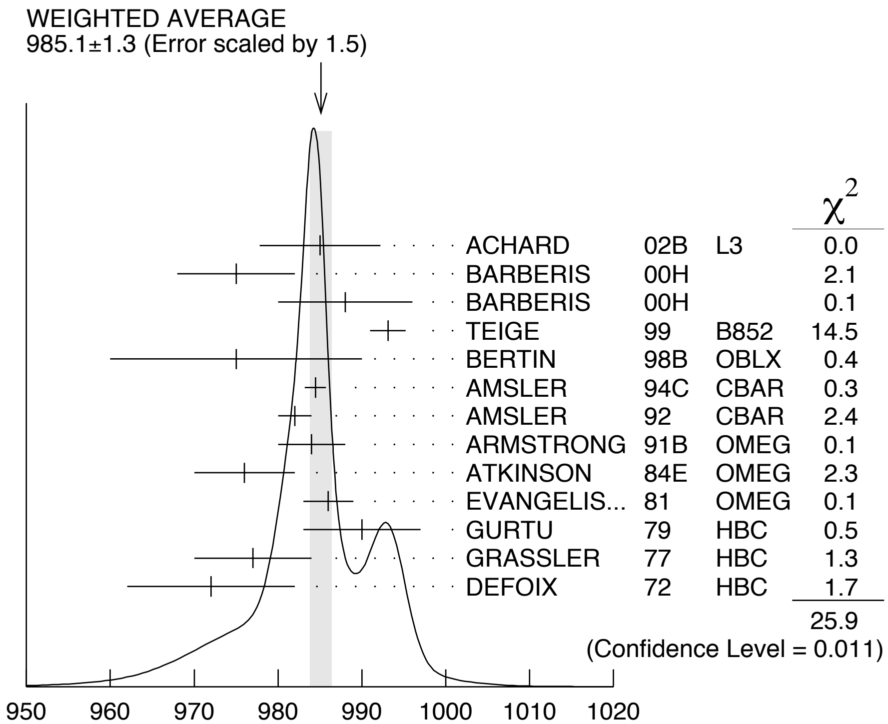


$\eta\pi$ FINAL STATE ONLY

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
985.1 ± 1.3 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.					
985 ± 4 ±6	318	ACHARD 02B	L3		183–209 $e^+e^- \to e^+e^-\eta\pi^+\pi^-$
975 ± 7		BARBERIS 00H			450 $pp \to p_f\eta\pi^0 p_s$
988 ± 8		BARBERIS 00H			450 $pp \to \Delta_f^{++}\eta\pi^- p_s$
993.1 ± 2.1		[1] TEIGE 99	B852		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] EVANGELIS...	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. • • •						
995 $^{+52}_{-10}$	36	[4] ACHASOV	00F	SND		$e^+e^- \to \eta\pi^0\gamma$
994 $^{+33}_{-8}$	36	[5] ACHASOV	00F	SND		$e^+e^- \to \eta\pi^0\gamma$
∼ 1055		[6] OLLER	99	RVUE		$\eta\pi$, $K\overline{K}$
∼ 1009.2		[6] OLLER	99B	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$
988 ± 6		[6] 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] Supersedes ACHASOV 98B. Using the model of ACHASOV 89.
[5] Supersedes ACHASOV 98B. Using the model of JAFFE 77.
[6] T-matrix pole.



$\eta\pi$ 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		[7] 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		[8] OLLER	99C	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$
1016 ±10	100	[9] ASTIER	67	HBC	±	0.0 $\overline{p}p$
1003.3± 7.0	143	[10] ROSENFELD	65	RVUE	±	

[7] T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.
[8] T-matrix pole.
[9] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[10] 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. • • •

50 ±13 ±4	318		ACHARD	02B	L3		183–209 $e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$
72 ±16			BARBERIS	00H			450 $pp \rightarrow p_f\eta\pi^0 p_s$
61 ±19			BARBERIS	00H			450 $pp \rightarrow \Delta_f^{++}\eta\pi^- p_s$
∼ 42		[11]	OLLER	99	RVUE		$\eta\pi$, $K\overline{K}$
∼ 112		[11]	OLLER	99B	RVUE		$\pi\pi \rightarrow \eta\pi$, $K\overline{K}$
71 ± 7			TEIGE	99	B852		18.3 $\pi^- p \rightarrow \eta\pi^+\pi^- n$
92 ±20		[11]	ANISOVICH	98B	RVUE		Compilation
65 ±10			BERTIN	98B	OBLX		0.0 $\overline{p}p \rightarrow K^\pm K_s\pi^\mp$
∼ 100			TORNQVIST	96	RVUE		$\pi\pi \rightarrow \pi\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
202			JANSSEN	95	RVUE		$\eta\pi \rightarrow \eta\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
54.12± 0.34±0.12			AMSLER	94C	CBAR		0.0 $\overline{p}p \rightarrow \omega\eta\pi^0$
54 ±10		[12]	AMSLER	92	CBAR		0.0 $\overline{p}p \rightarrow \eta\eta\pi^0$
95 ±14	1040	[12]	ARMSTRONG	91B	OMEG	±	300 $pp \rightarrow pp\eta\pi^+\pi^-$
62 ±15	500	[13]	EVANGELIS...	81	OMEG	±	12 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
60 ±20	145	[13]	GURTU	79	HBC	±	4.2 $K^- p \rightarrow \Lambda\eta 2\pi$
60 $^{+50}_{-30}$	47		CONFORTO	78	OSPK	−	4.5 $\pi^- p \rightarrow pX^-$
86.0 $^{+60.0}_{-50.0}$	50		CORDEN	78	OMEG	±	12–15 $\pi^- p \rightarrow n\eta 2\pi$
44 ±22			GRASSLER	77	HBC	−	16 $\pi^\mp p \rightarrow p\eta 3\pi$
80 to 300		[14]	FLATTE	76	RVUE	−	4.2 $K^- p \rightarrow \Lambda\eta 2\pi$
16.0 $^{+25.0}_{-16.0}$	70		WELLS	75	HBC	−	3.1–6 $K^- p \rightarrow \Lambda\eta 2\pi$
30 ± 5	150		DEFOIX	72	HBC	±	0.7 $\overline{p}p \rightarrow 7\pi$
40 ±15			CAMPBELL	69	DBC	±	2.7 $\pi^+ d$
60 ±30	15		MILLER	69B	HBC	−	4.5 $K^- N \rightarrow \eta\pi\Lambda$
80 ±30	30		AMMAR	68	HBC	±	5.5 $K^- p \rightarrow \Lambda\eta 2\pi$

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

$K\overline{K}$ ONLY

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
92± 8		[15] ABELE	98	CBAR		0.0 $\overline{p}p \rightarrow K_L^0 K^\pm\pi^\mp$

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

∼ 24		[16] OLLER	99C	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$
∼ 25	100	[17] ASTIER	67	HBC	±	
57±13	143	[18] ROSENFELD	65	RVUE	±	

[15] T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.
[16] T-matrix pole.
[17] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[18] 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	[19] AMSLER	98	RVUE

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

a_0(980) Γ(i)Γ($\gamma\gamma$)/Γ(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	$e^+e^- \to e^+e^-\pi^0\eta$
$0.19\pm0.07^{+0.10}_{-0.07}$		ANTREASYAN	86	CBAL	$e^+e^- \to e^+e^-\pi^0\eta$

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

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

$a_0(980)$ BRANCHING RATIOS

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

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
0.183±0.024 OUR AVERAGE	Error includes scale factor of 1.2.				
0.57 ±0.16	[20] BARGIOTTI	03	OBLX		$\overline{p}p$
0.23 ±0.05	[21] ABELE	98	CBAR		0.0 $\overline{p}p \to K^0_L K^\pm \pi^\mp$
0.166±0.01 ±0.02	[22] BARBERIS	98C	OMEG		450 $pp \to p_f f_1(1285) p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
∼ 0.60	OLLER	99B	RVUE		$\pi\pi \to \eta\pi$, $K\overline{K}$
1.16 ±0.18	[23] BUGG	94	RVUE		$\overline{p}p \to \eta\eta\pi^0$
0.7 ±0.3	[22] CORDEN	78	OMEG		12–15 $\pi^- p \to n\eta 2\pi$
0.25 ±0.08	[22] DEFOIX	72	HBC	±	0.7 $\overline{p} \to 7\pi$

$\Gamma(\rho\pi)/\Gamma(\eta\pi)$ — 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 $K^- p \to \Lambda\eta 2\pi$

[20] Coupled channel analysis of $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, and $K^\pm K^0_S\pi^\mp$.
[21] Using $\pi^0\pi^0\eta$ from AMSLER 94D.
[22] From the decay of $f_1(1285)$.
[23] BUGG 94 uses AMSLER 94C data. This is a ratio of couplings.

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ACHASOV	00F	PL B479 53	M.N. Achasov et al.	(Novosibirsk SND Collab.)
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BARBERIS	98C	PL B440 225	D. Barberis et al.	(WA 102 Collab.)
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EVANGELIS...	81	NP B178 197	C. Evangelista *et al.*	(BARI, BONN, CERN+)
DEBILLY	80	NP B176 1	L. de Billy *et al.*	(CURIN, LAUS, NEUC+)
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