$a_0(980)$

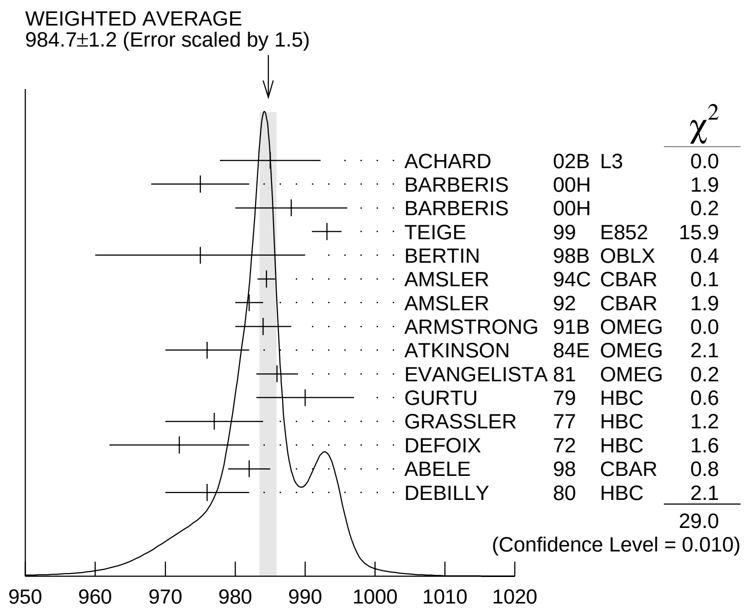
$I^G(J^{PC}) = 1^-(0^{++})$

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.



$a_0(980)$ 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.

985.1 ± 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	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. • • •

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 $a_0^{\pm}$.

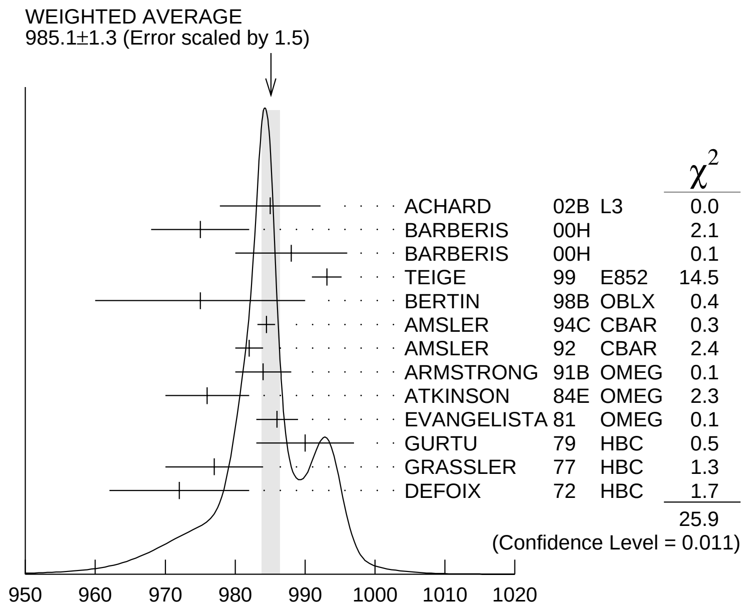
[2] From a single Breit-Wigner fit.

[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

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. • • •

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
50 ±13 ±4	318	ACHARD 02B	L3		183–209 $e^+e^- \to e^+e^-\eta\pi^+\pi^-$
72 ±16		BARBERIS 00H			450 $pp \to p_f\eta\pi^0 p_s$
61 ±19		BARBERIS 00H			450 $pp \to \Delta_f^{++}\eta\pi^- p_s$
∼ 42		[11] OLLER 99	RVUE		$\eta\pi$, $K\overline{K}$
∼ 112		[11] 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		[11] 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		[12] AMSLER 92	CBAR		0.0 $\overline{p}p \to \eta\eta\pi^0$
95 ±14	1040	[12] ARMSTRONG 91B	OMEG	±	300 $pp \to pp\eta\pi^+\pi^-$
62 ±15	500	[13] EVANGELISTA 81	OMEG	±	12 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$
60 ±20	145	[13] 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		[14] 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 $K^- p \to \Lambda\eta 2\pi$

[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 $\overline{p}p \rightarrow K^0_L K^\pm \pi^\mp$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
∼ 24		[16] OLLER	99C	RVUE		$\pi\pi \rightarrow \pi\pi$, $K\overline{K}$
∼ 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) → $\eta\pi$) =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	$e^+e^- \rightarrow e^+e^-\pi^0\eta$
$0.19\pm0.07^{+0.10}_{-0.07}$		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
0.183±0.024 OUR NEW AVERAGE Error includes scale factor of 1.2. [0.177 ± 0.024 OUR 2002 AVERAGE Scale factor = 1.2]					
0.57 ±0.16	[20] BARGIOTTI	03	OBLX		$\overline{p}p$
0.23 ±0.05	[21] ABELE	98	CBAR		0.0 $\overline{p}p \rightarrow K^0_L K^\pm \pi^\mp$
0.166±0.01 ±0.02	[22] 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	[23] BUGG	94	RVUE		$\overline{p}p \rightarrow \eta\eta\pi^0$
0.7 ±0.3	[22] CORDEN	78	OMEG		12–15 $\pi^- p \rightarrow n\eta 2\pi$
0.25 ±0.08	[22] DEFOIX	72	HBC	±	0.7 $\overline{p} \rightarrow 7\pi$

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

[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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JAFFE	77	PR D15 267,281	R. Jaffe	(MIT)
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GAY	76B	PL 63B 220	J.B. Gay *et al.*	(CERN, AMST, NIJM) JP
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