$a_0(980)$

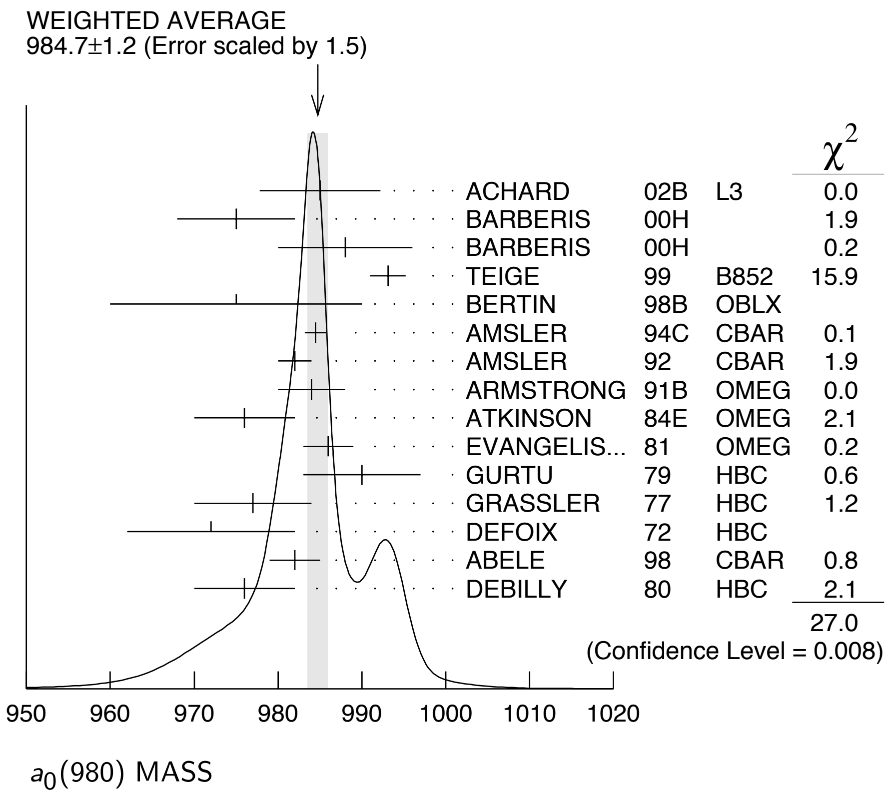
$I^G(J^{PC}) = 1^-(0^{++})$

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

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.

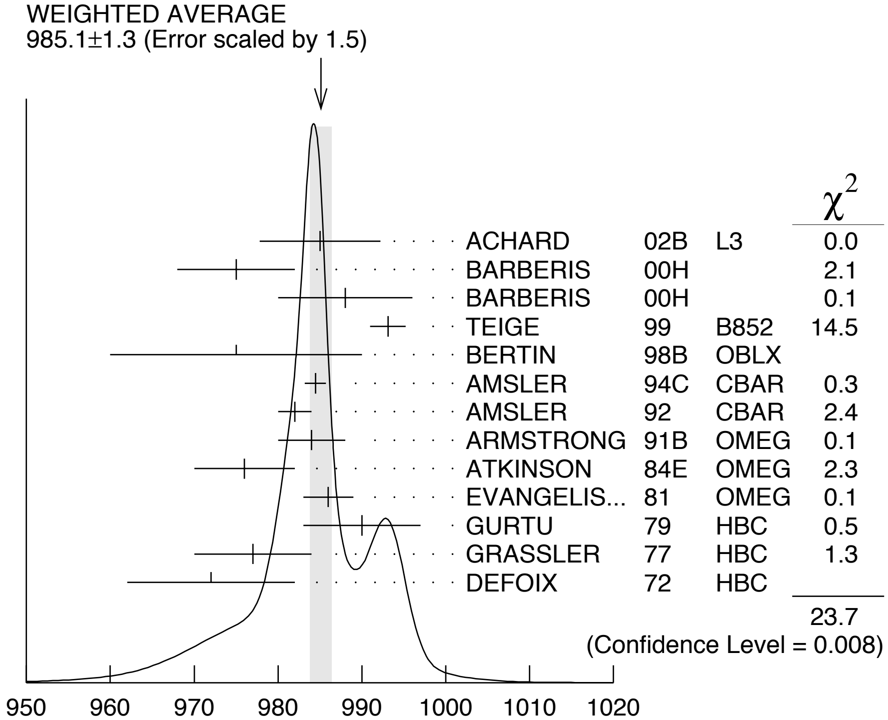
VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
985 ± 4 ±6	318	ACHARD	02B	L3		183–209 $e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$
975 ± 7		BARBERIS	00H			450 $pp \rightarrow p_f\eta\pi^0 p_s$
988 ± 8		BARBERIS	00H			450 $pp \rightarrow \Delta_f^{++}\eta\pi^- p_s$
993.1 ± 2.1		[1] TEIGE	99	B852		18.3 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

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	$\pm$	
57 ± 13	143	[18] ROSENFELD	65	RVUE	$\pm$	

[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 $\pm$ 0.08 keV.

$a_0(980)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

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

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
$0.24^{+0.08}_{-0.07}$ OUR AVERAGE					
$0.28\pm0.04\pm0.10$	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 $\overline{p}p \rightarrow K^0_L K^{\pm}\pi^{\mp}$
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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