$a_0(980)$

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

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*
983.4±0.9 OUR AVERAGE	Includes data from the 2 datablocks that follow this one.

$\eta\pi$ 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.						
983.7 ± 0.9 OUR AVERAGE						
984.45± 1.23±0.34		AMSLER	94C	CBAR		0.0 $\overline{p}p \to \omega\eta\pi^0$
982 ± 2		[1] AMSLER	92	CBAR		0.0 $\overline{p}p \to \eta\eta\pi^0$
984 ± 4	1040	[1] 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	[2] EVANGELISTA	81	OMEG	±	12 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$
990 ± 7	145	[2] 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. • • •						
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] From a single Breit-Wigner fit.
[2] From $f_1(1285)$ decay.

$K\overline{K}$ 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		[3] 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. • • •						
1016 ±10	100	[4] ASTIER	67	HBC	±	0.0 $\overline{p}p$
1003.3± 7.0	143	[5] ROSENFELD	65	RVUE	±	

[3] T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.
[4] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[5] 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. • • •						
~ 100		TORNQVIST	96	RVUE		$\pi\pi \to \pi\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
202		JANSSEN	95	RVUE		$\eta\pi \to \eta\pi$, $K\overline{K}$, $K\pi$, $\eta\pi$
$54.12 \pm 0.34 \pm 0.12$		AMSLER	94C	CBAR		$0.0\ \overline{p}p \to \omega\eta\pi^0$
54 ± 10		[6] AMSLER	92	CBAR		$0.0\ \overline{p}p \to \eta\eta\pi^0$
95 ± 14	1040	[6] ARMSTRONG	91B	OMEG	$\pm$	$300\ pp \to pp\eta\pi^+\pi^-$
62 ± 15	500	[7] EVANGELISTA	81	OMEG	$\pm$	$12\ \pi^- p \to \eta\pi^+\pi^-\pi^- p$
60 ± 20	145	[7] GURTU	79	HBC	$\pm$	$4.2\ K^- p \to \Lambda\eta 2\pi$
60 $^{+50}_{-30}$	47	CONFORTO	78	OSPK	$-$	$4.5\ \pi^- p \to pX^-$
86.0 $^{+60.0}_{-50.0}$	50	CORDEN	78	OMEG	$\pm$	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		[8] 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 $\pm$ 5	150	DEFOIX	72	HBC	$\pm$	$0.7\ \overline{p}p \to 7\pi$
40 ± 15		CAMPBELL	69	DBC	$\pm$	$2.7\ \pi^+ d$
60 ± 30	15	MILLER	69B	HBC	$-$	$4.5\ K^- N \to \eta\pi\Lambda$
80 ± 30	30	AMMAR	68	HBC	$\pm$	$5.5\ K^- p \to \Lambda\eta 2\pi$

[6] From a single Breit-Wigner fit.
[7] From $f_1(1285)$ decay.
[8] Using a two-channel resonance parametrization of GAY 76B data.

$K\overline{K}$ ONLY

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
92 $\pm$ 8		[9] 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. • • •						
~ 25	100	[10] ASTIER	67	HBC	$\pm$	
57 ± 13	143	[11] ROSENFELD	65	RVUE	$\pm$	

[9] T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.
[10] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[11] 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^-	

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

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

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	$e^+e^- \to e^+e^-\pi^0\eta$

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

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*
0.23±0.05	[12] 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. • • •					
1.16 ± 0.18	[13] BUGG	94	RVUE		$\overline{p}p \to \eta\eta\pi^0$
$0.7\ \pm0.3$	[14] CORDEN	78	OMEG		12–15 $\pi^- p \to n\eta 2\pi$
0.25 ± 0.08	[14] DEFOIX	72	HBC	$\pm$	0.7 $\overline{p} \to 7\pi$

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

$\Gamma(\rho\pi)/\Gamma(\eta\pi)$ 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	$\pm$	4.1,5.5 $K^- p \to \Lambda\eta 2\pi$

$a_0(980)$ REFERENCES

ABELE	98	PR D57 3860	A. Abele, Adomeit, Amsler+	(Crystal Barrel Collab.)
TORNQVIST	96	PRL 76 1575	+Roos	(HELS)
JANSSEN	95	PR D52 2690	+Pearce, Holinde, Speth	(STON, ADLD, JULI)
AMSLER	94C	PL B327 425	+Armstrong, Ravndal+	(Crystal Barrel Collab.)
AMSLER	94D	PL B333 277	+Anisovich, Spanier+	(Crystal Barrel Collab.)
BUGG	94	PR D50 4412	+Anisovich+	(LOQM)
AMSLER	92	PL B291 347	+Augustin, Baker+	(Crystal Barrel Collab.)
ARMSTRONG	91B	ZPHY C52 389	+Barnes+	(ATHU, BARI, BIRM, CERN, CDEF)
OEST	90	ZPHY C47 343	+Olsson+	(JADE Collab.)
VOROBYEV	88	SJNP 48 273	+Golubev, Dolinsky, Druzhinin+	(NOVO)
		Translated from YAF 48 436.		
ANTREASYAN	86	PR D33 1847	+Aschman, Besset, Bienlein+	(Crystal Ball Collab.)
ATKINSON	84E	PL 138B 459	+	(BONN, CERN, GLAS, LANC, MCHS, CURIN+)
EVANGELISTA	81	NP B178 197	+	(BARI, BONN, CERN, DARE, LIVP+)
DEBILLY	80	NP B176 1	+Briand, Duboc, Levy+	(CURIN, LAUS, NEUC, GLAS)
GURTU	79	NP B151 181	+Gavillet, Blokzijl+	(CERN, ZEEM, NIJM, OXF)
CONFORTO	78	LNC 23 419	+Conforto, Key+	(RHEL, TNTO, CHIC, FNAL+)
CORDEN	78	NP B144 253	+Corbett, Alexander+	(BIRM, RHEL, TELA, LOWC)
GRASSLER	77	NP B121 189	+	(AACH3, BERL, BONN, CERN, CRAC, HEIDH+)
FLATTE	76	PL 63B 224		(CERN)
GAY	76B	PL 63B 220	+Chaloupka, Blokzijl, Heinen+	(CERN, AMST, NIJM) JP
WELLS	75	NP B101 333	+Radojicic, Roscoe, Lyons	(OXF)
DEFOIX	72	NP B44 125	+Nascimento, Bizzarri+	(CDEF, CERN)
AMMAR	70	PR D2 430	+Kropac, Davis+	(KANS, NWES, ANL, WISC)
BARNES	69C	PRL 23 610	+Chung, Eisner, Bassano, Goldberg+	(BNL, SYRA)
CAMPBELL	69	PRL 22 1204	+Lichtman, Loeffler+	(PURD)
MILLER	69B	PL 29B 255	+Kramer, Carmony+	(PURD)
Also	69	PR 188 2011	Yen, Ammann, Carmony, Elsner+	(PURD)
AMMAR	68	PRL 21 1832	+Davis, Kropac, Derrick, Fields+	(NWES, ANL)
ASTIER	67	PL 25B 294	+Montanet, Baubillier, Duboc+	(CDEF, CERN, IRAD)
		Includes data of BARLOW 67, CONFORTO 67, and ARMENTEROS 65.		
BARLOW	67	NC 50A 701	+Lillestol, Montanet+	(CERN, CDEF, IRAD, LIVP)
CONFORTO	67	NP B3 469	+Marechal+	(CERN, CDEF, IPNP, LIVP)
ARMENTEROS	65	PL 17 344	+Edwards, Jacobsen+	(CERN, CDEF)
ROSENFELD	65	Oxford Conf. 58		(LRL)

OTHER RELATED PAPERS

ACHASOV	97C	PR D56 4084	N.N. Achasov+	
ACHASOV	97D	PR D56 203	N.N. Achasov+	
AMSLER	94D	PL B333 277	+Anisovich, Spanier+	(Crystal Barrel Collab.)
TORNQVIST	90	NPBPS 21 196		(HELS)
WEINSTEIN	89	UTPT 89 03	+Isgur	(TNTO)
ACHASOV	88B	ZPHY C41 309	+Shestakov	(NOVM)
WEINSTEIN	83B	PR D27 588	+Isgur	(TNTO)
TORNQVIST	82	PRL 49 624		(HELS)
BRAMON	80	PL 93B 65	+Masso	(BARC)
TURKOT	63	Siena Conf. 1 661	+Collins, Fujii, Kemp+	(BNL, PITT)