$a_0(980)$

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

See our minireview on scalar mesons under $f_0(1370)$ and on the non-$q\overline{q}$ candidates.

$a_0(980)$ MASS

VALUE (MeV)	DOCUMENT ID
983.5±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.						
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	[3] ASTIER	67	HBC	±	0.0 $\overline{p}p$
1003.3± 7.0	143	[4] ROSENFELD	65	RVUE	±	

[3] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[4] 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 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±	0.34±0.12		AMSLER	94C	CBAR		0.0 $\overline{p}p \rightarrow \omega\eta\pi^0$	
54	±10		[5] AMSLER	92	CBAR		0.0 $\overline{p}p \rightarrow \eta\eta\pi^0$	
95	±14	1040	[5] ARMSTRONG	91B	OMEG	±	300 $pp \rightarrow pp\eta\pi^+\pi^-$	
62	±15	500	[6] EVANGELISTA	81	OMEG	±	12 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$	
60	±20	145	[6] 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		[7] 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 $K^- p \rightarrow \Lambda\eta 2\pi$	

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

$K\overline{K}$ ONLY

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 25	100	[8] ASTIER	67	HBC	±
57±13	143	[9] ROSENFELD	65	RVUE	±

[8] ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.
[9] 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	$\pi\eta'(958)$	
Γ_5	$\gamma\gamma$	seen
Γ_6	e^+e^-	

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

$\Gamma(\eta\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_1\Gamma_5/\Gamma$

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±0.07$^{+0.10}_{-0.07}$		ANTREASYAN	86	CBAL	$e^+e^- \rightarrow e^+e^-\pi^0\eta$

$\Gamma(\eta\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_1\Gamma_6/\Gamma$

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
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.16±0.18	[10] BUGG	94	RVUE		$\overline{p}p \rightarrow \eta\eta\pi^0$
0.7 ±0.3	[11] CORDEN	78	OMEG		12–15 $\pi^- p \rightarrow n\eta 2\pi$
0.25±0.08	[11] DEFOIX	72	HBC	±	0.7 $\overline{p} \rightarrow 7\pi$

[10] BUGG 94 uses AMSLER 94C data. This is a ratio of couplings.
[11] From the decay of $f_1(1285)$.

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

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

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.)
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

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)