If the $a_0(980)$ is not the $^3P_0$ state, then this state should be observed near 1300 MeV, with partial decay widths close to the flavor symmetry predictions for an ideal nonet (TORNQVIST 90). The candidate $a_0(1320)$ reported by GAMS-4000 has the right mass, but the signal is weak under the dominant $a_2(1320)$, and its width is much smaller than expected.

See also the "Note on the $f_0(1300)$".

$a_0(980)$ MASS

VALUE (MeV)	DOCUMENT ID
982.4±1.4 OUR AVERAGE	Includes data from the 2 datablocks that follow this one.

$\eta\pi$ FINAL STATE ONLY

The data in this block is included in the average printed for a previous datablock.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
982.7± 1.4 OUR AVERAGE						
982 ± 2		[1] AMSLER	92	CBAR		0.0 $\bar{p}p \rightarrow \eta\eta\pi^0$
984 ± 4	1040	[1] ARMSTRONG	91B	OMEG	±	300 $pp \rightarrow pp\eta\pi^+\pi^-$
976 ± 6		ATKINSON	84E	OMEG	±	25–55 $\gamma p \rightarrow \eta\pi n$
986 ± 3	500	[2] EVANGELISTA	81	OMEG	±	12 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
990.0± 7.0	145	[2] GURTU	79	HBC	±	4.2 $K^- p \rightarrow \Lambda\eta 2\pi$
977.0± 7.0		GRASSLER	77	HBC	−	16 $\pi^\mp p \rightarrow p\eta 3\pi$
972 ±10	150	DEFOIX	72	HBC	±	0.7 $\bar{p}p \rightarrow 7\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
980 ±11	47	CONFORTO	78	OSPK	−	4.5 $\pi^- p \rightarrow pX^-$
978.0±16.0	50	CORDEN	78	OMEG	±	12–15 $\pi^- p \rightarrow n\eta 2\pi$
989.0± 4.0	70	WELLS	75	HBC	−	3.1–6 $K^- p \rightarrow \Lambda\eta 2\pi$
970.0±15.0	20	BARNES	69C	HBC	−	4–5 $K^- p \rightarrow \Lambda\eta 2\pi$
980 ±10		CAMPBELL	69	DBC	±	2.7 $\pi^+ d$
980.0±10.0	15	MILLER	69B	HBC	−	4.5 $K^- N \rightarrow \eta\pi\Lambda$
980.0±10.0	30	AMMAR	68	HBC	±	5.5 $K^- p \rightarrow \Lambda\eta 2\pi$

[1] From a single Breit-Wigner fit.
[2] From $f_1(1285)$ decay.

$K\overline{K}$ ONLY

The data in this block is included in the average printed for a previous datablock.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
976 ± 6	316	DEBILLY	80	HBC	±	1.2–2 $\bar{p}p \rightarrow f_1(1285)\omega$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1016 ±10	100	[3] ASTIER	67	HBC	±	0.0 $\bar{p}p$
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

$\eta\pi$ FINAL STATE ONLY

Width determination very model dependent. Peak width is about 60 MeV, but decay width can be much larger.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
50 to 300 OUR ESTIMATE						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
54 ±10		[5] AMSLER	92	CBAR		0.0 $\bar{p}p \rightarrow \eta\eta\pi^0$
95 ±14	1040	[5] ARMSTRONG	91B	OMEG	±	300 $pp \rightarrow pp\eta\pi^+\pi^-$
62 ±15	500	[6] EVANGELISTA	81	OMEG	±	12 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
60.0±20.0	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 $\pi^- p \rightarrow n\eta 2\pi$
44.0±22.0		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 $\bar{p}p \rightarrow 7\pi$
40 ±15		CAMPBELL	69	DBC	±	2.7 $\pi^+ d$
60.0±30.0	15	MILLER	69B	HBC	−	4.5 $K^- N \rightarrow \eta\pi\Lambda$
80.0±30.0	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	±
57.0±13.0	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 ± 7	OEST	90	JADE	$e^+e^- \rightarrow e^+e^-\pi^0\eta$
$0.19\pm0.07\,^{+0.10}_{-0.07}$		ANTREASYAN	86	CBAL	$e^+e^- \rightarrow e^+e^-\pi^0\eta$

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

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. • • •					
0.7 ±0.3	[10] CORDEN	78	OMEG		12–15 $\pi^- p \rightarrow n\eta 2\pi$
0.25±0.08	[10] DEFOIX	72	HBC	±	0.7 $\bar{p} \rightarrow 7\pi$

[10] 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

AMSLER 92 PL B291 347 +Augustin, Baker+ (Crystal Barrel Collab.)
ARMSTRONG 91B ZPHY C52 389 +Barnes+ (ATHU, BARI, BIRM, CERN, CDEF)
OEST 90 ZHPY 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 (NOVO)
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)