$\eta(1405)$
was $\eta(1440)$

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

THE $\eta(1405)$, $\eta(1475)$, $f_1(1420)$, AND $f_1(1510)$

Revised December 2003 by M. Aguilar-Benitez (CIEMAT), C. Amsler (Zürich), and A. Masoni (INFN Cagliari).

A pseudoscalar meson decaying into $K\overline{K}\pi$ was first observed in the 1400–1500 mass region in $p\overline{p}$ annihilation at rest into $(K\overline{K}\pi)\pi^+\pi^-$ (BAILLON 67). This state was reported to decay through $a_0(980)\pi$ and $K^*(892)\overline{K}$ with roughly equal contributions. It was then observed in radiative $J/\psi(1S)$ decay into $K\overline{K}\pi$ (SCHARRE 80, EDWARDS 82E, AUGUSTIN 90). This meson was previously called $\eta(1440)$. However, there is now evidence for the existence of two pseudoscalars in this mass region, and accordingly, we have split the $\eta(1440)$ into $\eta(1405)$ and $\eta(1475)$. The former decays mainly through $a_0(980)\pi$ (or direct $K\overline{K}\pi$), and the latter mainly to $K^*(892)\overline{K}$.

The simultaneous observation of two pseudoscalars is reported in three production mechanisms: π^-p (RATH 89, ADAMS 01); radiative $J/\psi(1S)$ decay (BAI 90C, AUGUSTIN 92); and $\overline{p}p$ annihilation at rest (BERTIN 95,97, CICALO 99, NICHITIU 02). All of them give values for the masses, widths, and decay modes in reasonable agreement. However, AUGUSTIN 92 finds the state decaying into $K^*(892)\overline{K}$ at a lower mass than the state decaying into $a_0(980)\pi$.

In $J/\psi(1S)$ radiative decay, the $\eta(1405)$ decays into $K\overline{K}\pi$ through $a_0(980)\pi$, and hence, a signal is also expected in the $\eta\pi\pi$ mass spectrum. This was indeed observed by MARK III in $\eta\pi^+\pi^-$ (BOLTON 92B). This state is also observed in $\overline{p}p$ annihilation at rest into $\eta\pi^+\pi^-\pi^0\pi^0$, where it decays into $\eta\pi\pi$ (AMSLER 95F). The intermediate $a_0(980)\pi$ accounts for roughly half of the $\eta\pi\pi$ signal, in agreement with MARK III (BOLTON 92B) and DM2 (AUGUSTIN 90).

The $\eta(1475)$ could be the first radial excitation of the η', with the $\eta(1295)$ being the first radial excitation of the η. Ideal mixing, suggested by the $\eta(1295)$ and $\pi(1300)$ mass degeneracy, would then imply that the second isoscalar in the nonet is mainly $s\overline{s}$, and hence, couples to $K^*\overline{K}$, in agreement with observation. Its width also matches the expected width for the radially excited $s\overline{s}$ state (CLOSE 97, BARNES 97).

An investigation of the $K\overline{K}\pi$ and $\eta\pi\pi$ channels in $\gamma\gamma$ collisions was performed (ACCIARRI 01G). They observed the $\eta(1475)$ in $K\overline{K}\pi$, but not the $\eta(1405)$ in $\eta\pi\pi$. Since gluonium production is presumably suppressed in $\gamma\gamma$ collisions, the ACCIARRI 01G results suggest that this latter state has a large gluonic content (CLOSE 97B, LI 03C). The gluonium interpretation, however, is not favored by lattice gauge theories, which predict the 0^{-+} state above 2 GeV (BALI 93).

Let us now deal with 1^{++} isoscalars. The $f_1(1420)$, decaying to $K^*\overline{K}$, was first reported in π^-p reactions at 4 GeV/c (DIONISI 80). However, later analyses found that the 1400–1500 MeV region was far more complex (CHUNG 85, REEVES 86, BIRMAN 88, ADAMS 01). A reanalysis of the MARK III data in radiative $J/\psi(1S)$ decay to $K\overline{K}\pi$ (BAI 90C) shows the $f_1(1420)$ decaying into $K^*\overline{K}$. Also, a $C = +1$ state is observed in tagged $\gamma\gamma$ collisions (*e.g.*, BEHREND 89).

In $\pi^-p \rightarrow \eta\pi\pi n$ charge-exchange reactions at 8–9 GeV/c, the $\eta\pi\pi$ mass spectrum is dominated by the $\eta(1405/1475)$, and $\eta(1295)$ (ANDO 86, FUKUI 91C), and at 100 GeV/c ALDE 97B report $\eta(1295)$ and $\eta(1405/1475)$ decaying to $\eta\pi^0\pi^0$, with a weak $f_1(1285)$ signal and no evidence for the $f_1(1420)$.

Axial (1^{++}) mesons are not observed in $\overline{p}p$ annihilation at rest in liquid hydrogen, which proceeds dominantly through

S-wave annihilation. However, in gaseous hydrogen, P-wave annihilation is enhanced, and indeed, BERTIN 97 report the $f_1(1420)$ decaying into $K^*\overline{K}$.

The $f_1(1420)$, decaying into $K\overline{K}\pi$, is also seen in pp central production, together with the $f_1(1285)$. The latter decays via $a_0(980)\pi$, and the former only via $K^*\overline{K}$, while no pseudoscalar is observed (ARMSTRONG 89, BARBERIS 97C). The $K_S K_S \pi^0$ decay mode of the $f_1(1420)$ establishes unambiguously C=+1. On the other hand, there is no evidence for any state decaying into $\eta\pi\pi$ around 1400 MeV, and hence, the $\eta\pi\pi$ mode of the $f_1(1420)$ must be suppressed (ARMSTRONG 91B).

We now turn to the experimental evidence for the $f_1(1510)$. Two states, the $f_1(1420)$ and $f_1(1510)$, decaying to $K^*\overline{K}$, compete for the $s\overline{s}$ assignment in the 1^{++} nonet. The $f_1(1510)$ was seen in $K^-p \rightarrow \Lambda K\overline{K}\pi$ at 4 GeV/c (GAVILLET 82) and at 11 GeV/c (ASTON 88C). Evidence is also reported in π^-p at 8 GeV/c, based on the phase motion of the 1^{++} $K^*\overline{K}$ wave (BIRMAN 88). The absence of the $f_1(1420)$ in K^-p (ASTON 88C) argues against being the $s\overline{s}$ member of the 1^{++} nonet. However, the $f_1(1420)$ was indeed reported in K^-p, but not in π^-p (BITYUKOV 84).

Two experiments do not observe the $f_1(1510)$ in K^-p (BITYUKOV 84, KING 91). It is also not seen in radiative $J/\psi(1S)$ decay (BAI 90C, AUGUSTIN 92), central collisions (BARBERIS 97C), or in $\gamma\gamma$ collisions (AIHARA 88C), although, surprisingly for an $s\overline{s}$ state, a signal is reported in 4π decays (BAUER 93B). These facts leads to the conclusion that the $f_1(1510)$ is not well established (CLOSE 97D).

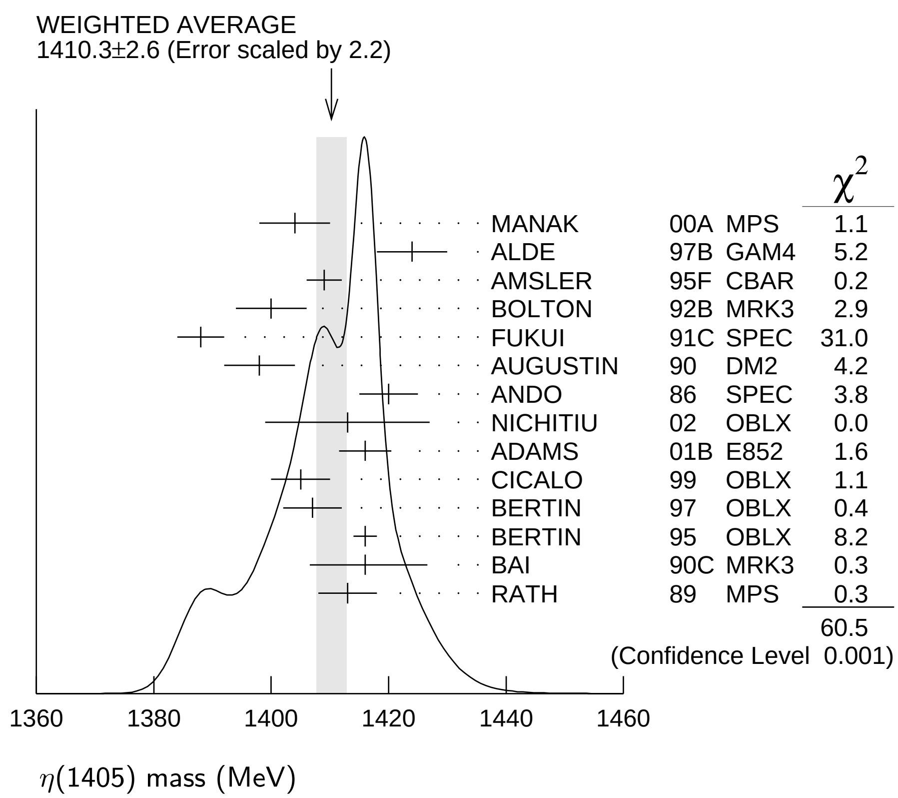
Assigning the $f_1(1420)$ to the 1^{++} nonet, one finds a nonet mixing angle of $\sim 50°$ (CLOSE 97D). However, arguments favoring the $f_1(1420)$ being a hybrid $q\overline{q}g$ meson or a four-quark state were put forward by ISHIDA 89 and by CALDWELL 90, respectively, while LONGACRE 90 argued for a molecular state formed by the π orbiting in a P-wave around an S-wave $K\overline{K}$ state.

Summarizing, there is convincing evidence for the $f_1(1420)$ decaying into $K^*\overline{K}$, and for two pseudoscalars in the 1400-1500 MeV region, the $\eta(1405)$ and $\eta(1475)$, decaying to $a_0(980)\pi$ and $K^*\overline{K}$, respectively. The $f_1(1510)$ is not well established.

References may be found at the end of the $\eta(1405)$, $\eta(1475)$ $f_1(1420)$, and $f_1(1510)$ Listings.

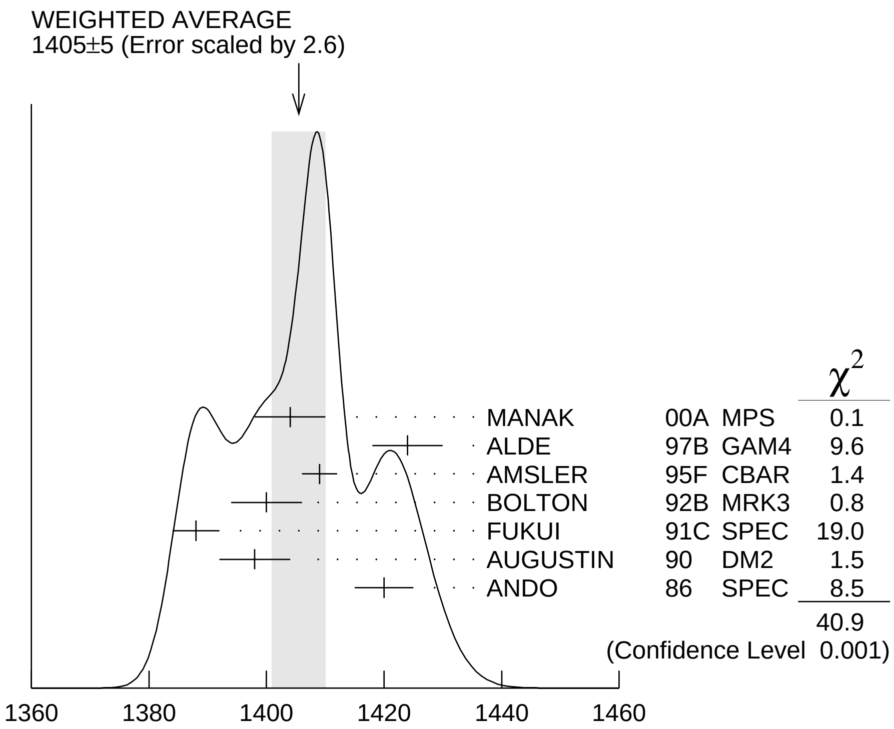
$\eta(1405)$ MASS

VALUE (MeV)	*DOCUMENT ID*
1410.3±2.6 OUR AVERAGE Includes data from the 2 datablocks that follow this one. Error includes scale factor of 2.2. See the ideogram below.	



$\eta\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.					
1405±5 OUR AVERAGE					Error includes scale factor of 2.6. See the ideogram below.
1404±6	9082	MANAK	00A	MPS	18 $\pi^- p \to \eta\pi^+\pi^- n$
1424±6	2200	ALDE	97B	GAM4	100 $\pi^- p \to \eta\pi^0\pi^0 n$
1409±3		AMSLER	95F	CBAR	0 $\overline{p}p \to \pi^+\pi^-\pi^0\pi^0\eta$
1400±6		[1] BOLTON	92B	MRK3	$J/\psi \to \gamma\eta\pi^+\pi^-$
1388±4		FUKUI	91C	SPEC	8.95 $\pi^- p \to \eta\pi^+\pi^- n$
1398±6	261	[2] AUGUSTIN	90	DM2	$J/\psi \to \gamma\eta\pi^+\pi^-$
1420±5		ANDO	86	SPEC	8 $\pi^- p \to \eta\pi^+\pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1385±7		BAI	99	BES	$J/\psi \to \gamma\pi^+\pi^-$



$\eta(1405)$ mass, $\eta\pi\pi$ mode (MeV)

$K\overline{K}\pi$ MODE ($a_0(980)\pi$ or direct $K\overline{K}\pi$)

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.					
1413.9± 1.7 OUR AVERAGE					Error includes scale factor of 1.1.
1413 ±14	3651	[3] NICHITIU	02	OBLX	
1416 ± 4 ±2	20k	ADAMS	01B	E852	18 GeV $\pi^- p \to K^+ K^- \pi^0 n$
1405 ± 5		[4] CICALO	99	OBLX	0 $\overline{p}p \to K^\pm K^0_S \pi^\mp \pi^+ \pi^-$
1407 ± 5		[4] BERTIN	97	OBLX	0 $\overline{p}p \to K^\pm (K^0) \pi^\mp \pi^+ \pi^-$

1416 ± 2		[4] BERTIN 95	OBLX	$0\ \overline{p}p \rightarrow K\overline{K}\pi\pi\pi$
$1416 \pm 8\ ^{+7}_{-5}$	700	[5] BAI 90C	MRK3	$J/\psi \rightarrow \gamma K^0_S K^{\pm}\pi^{\mp}$
1413 ± 5		[5] RATH 89	MPS	$21.4\ \pi^- p \rightarrow n K^0_S K^0_S \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1459 ± 5		[6] AUGUSTIN 92	DM2	$J/\psi \rightarrow \gamma K\overline{K}\pi$

$\pi\pi\gamma$ MODE

VALUE (MeV)	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1401 ± 18	[7,8] AUGUSTIN 90	DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
1432 ± 8	[8] COFFMAN 90	MRK3	$J/\psi \rightarrow \pi^+\pi^- 2\gamma$

4π MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1420 ± 20		BUGG 95	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$
1489 ± 12	3270	[9] BISELLO 89B	DM2	$J/\psi \rightarrow 4\pi\gamma$

$K\overline{K}\pi$ MODE (unresolved)

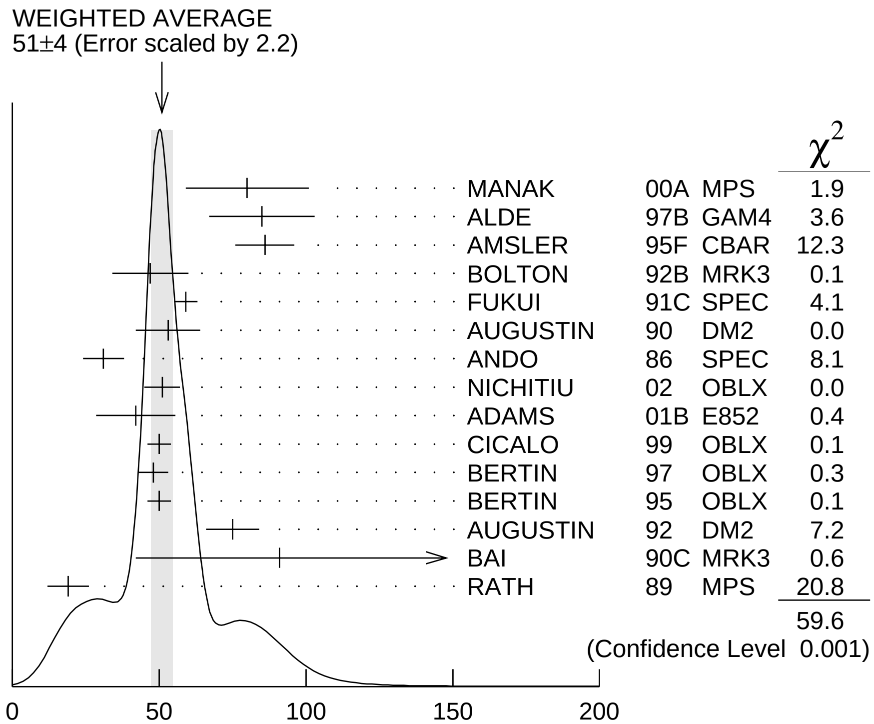
VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1442 ± 10	410	[10] BAI 98C	BES	$J/\psi \rightarrow \gamma K^+K^-\pi^0$
1445 ± 8	693	[10] AUGUSTIN 90	DM2	$J/\psi \rightarrow \gamma K^0_S K^{\pm}\pi^{\mp}$
1433 ± 8	296	[10] AUGUSTIN 90	DM2	$J/\psi \rightarrow \gamma K^+K^-\pi^0$
1413 ± 8	500	[10] DUCH 89	ASTE	$\overline{p}p \rightarrow \pi^+\pi^- K^{\pm}\pi^{\mp}K^0$
1453 ± 7	170	[10] RATH 89	MPS	$21.4\ \pi^- p \rightarrow K^0_S K^0_S \pi^0 n$
1419 ± 1	8800	[10] BIRMAN 88	MPS	$8\ \pi^- p \rightarrow K^+\overline{K}^0\pi^- n$
1424 ± 3	620	[10] REEVES 86	SPEC	$6.6\ p\overline{p} \rightarrow K\overline{K}\pi X$
1421 ± 2		[10] CHUNG 85	SPEC	$8\ \pi^- p \rightarrow K\overline{K}\pi n$
1440^{+20}_{-15}	174	[10] EDWARDS 82E	CBAL	$J/\psi \rightarrow \gamma K^+K^-\pi^0$
1440^{+10}_{-15}		[10] SCHARRE 80	MRK2	$J/\psi \rightarrow \gamma K^0_S K^{\pm}\pi^{\mp}$
1425 ± 7	800	[10,11] BAILLON 67	HBC	$0\ \overline{p}p \rightarrow K\overline{K}\pi\pi\pi$

[1] From fit to the $a_0(980)\pi\ 0^{-+}$ partial wave.
[2] Best fit with a single Breit Wigner.
[3] Decaying dominantly directly to $K^+K^-\pi^0$.
[4] Decaying into $(K\overline{K})_S\pi$, $(K\pi)_S\overline{K}$, and $a_0(980)\pi$.
[5] From fit to the $a_0(980)\pi\ 0^{-+}$ partial wave. Cannot rule out a $a_0(980)\pi\ 1^{++}$ partial wave.
[6] Excluded from averaging because averaging would be meaningless.
[7] Best fit with a single Breit Wigner.
[8] This peak in the $\gamma\rho$ channel may not be related to the $\eta(1405)$.
[9] Estimated by us from various fits.
[10] These experiments identify only one pseudoscalar in the 1400–1500 range. Data could also refer to $\eta(1475)$.
[11] From best fit of 0^{-+} partial wave , 50% $K^*(892)K$, 50% $a_0(980)\pi$.

$\eta(1405)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*

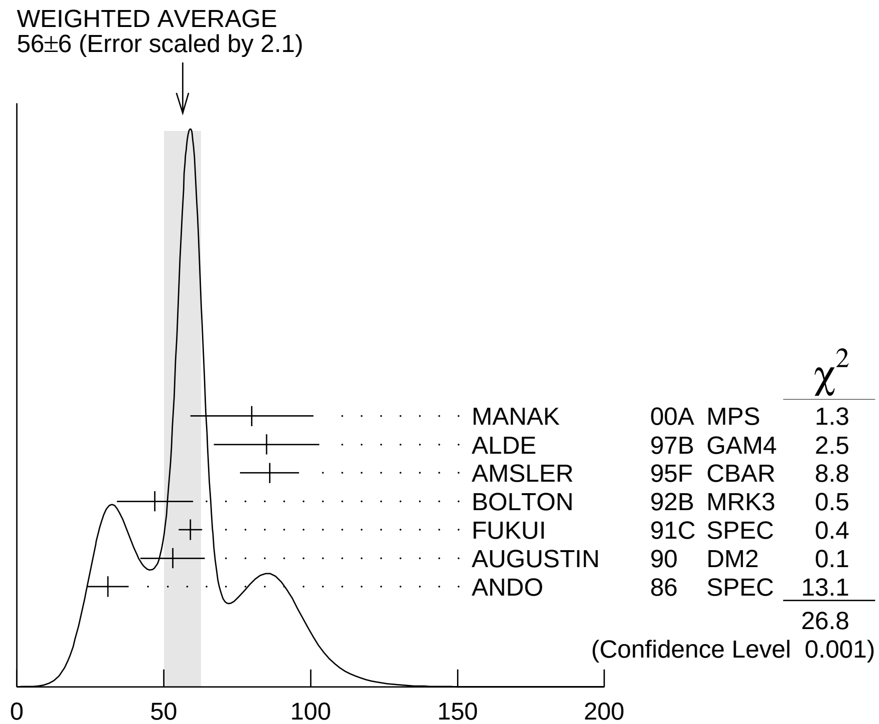
51±4 OUR AVERAGE Includes data from the 2 datablocks that follow this one. Error includes scale factor of 2.2. See the ideogram below.



$\eta(1405)$ width (MeV)

$\eta\pi\pi$ MODE

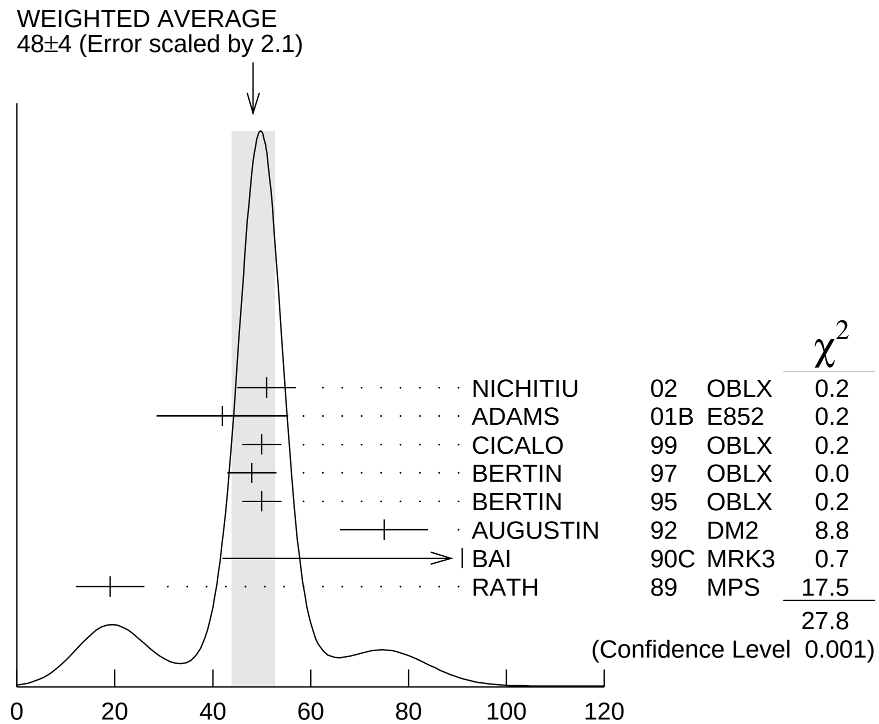
VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
56± 6 OUR AVERAGE	Error includes scale factor of 2.1. See the ideogram below.			
80±21	9082	MANAK 00A	MPS	18 $\pi^- p \to \eta\pi^+\pi^- n$
85±18	2200	ALDE 97B	GAM4	100 $\pi^- p \to \eta\pi^0\pi^0 n$
86±10		AMSLER 95F	CBAR	0 $\overline{p}p \to \pi^+\pi^-\pi^0\pi^0\eta$
47±13		[12] BOLTON 92B	MRK3	$J/\psi \to \gamma\eta\pi^+\pi^-$
59± 4		FUKUI 91C	SPEC	8.95 $\pi^- p \to \eta\pi^+\pi^- n$
53±11		[13] AUGUSTIN 90	DM2	$J/\psi \to \gamma\eta\pi^+\pi^-$
31± 7		ANDO 86	SPEC	8 $\pi^- p \to \eta\pi^+\pi^- n$



$\eta(1405)$ width $\eta\pi\pi$ mode (MeV)

$K\overline{K}\pi$ MODE ($a_0(980)\pi$ or direct $K\overline{K}\pi$)

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
48± 4 OUR AVERAGE	Error includes scale factor of 2.1. See the ideogram below.				
51± 6	3651	[14] NICHITIU	02	OBLX	
42±10± 9	20k	ADAMS	01B	E852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
50± 4		CICALO	99	OBLX	0 $\overline{p}p \rightarrow K^\pm K^0_S \pi^\mp \pi^+ \pi^-$
48± 5		[15] BERTIN	97	OBLX	0.0 $\overline{p}p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
50± 4		[15] BERTIN	95	OBLX	0 $\overline{p}p \rightarrow K\overline{K}\pi\pi\pi$
75± 9		AUGUSTIN	92	DM2	$J/\psi \rightarrow \gamma K\overline{K}\pi$
$91^{+67}_{-31}{}^{+15}_{-38}$		[16] BAI	90C	MRK3	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
19± 7		[16] RATH	89	MPS	21.4 $\pi^- p \rightarrow n K^0_S K^0_S \pi^0$



$\eta(1405)$ width $K\overline{K}\pi$ mode ($a_0(980)\,\pi$ dominant)

$\pi\pi\gamma$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
174±44	AUGUSTIN	90	DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
90±26	[17] COFFMAN	90	MRK3	$J/\psi \rightarrow \pi^+\pi^- 2\gamma$

4π MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
160±30		BUGG	95	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$
144±13	3270	[18] BISELLO	89B	DM2	$J/\psi \rightarrow 4\pi\gamma$

$K\overline{K}\pi$ MODE (unresolved)

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
93±14	296	[19] AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
105±10	693	[19] AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
62±16	500	[19] DUCH	89	ASTE	$\overline{p}p \rightarrow K\overline{K}\pi\pi\pi$
100±11	170	[19] RATH	89	MPS	$21.4\ \pi^- p \rightarrow K^0_S K^0_S \pi^0 n$
66± 2	8800	[19] BIRMAN	88	MPS	$8\ \pi^- p \rightarrow K^+ \overline{K}^0 \pi^- n$

60 ± 10	620	[19] REEVES	86	SPEC	$6.6\ p\overline{p} \to KK\pi X$
60 ± 10		[19] CHUNG	85	SPEC	$8\ \pi^- p \to K\overline{K}\pi n$
55^{+20}_{-30}	174	[19] EDWARDS	82E	CBAL	$J/\psi \to \gamma K^+ K^- \pi^0$
50^{+30}_{-20}		[19] SCHARRE	80	MRK2	$J/\psi \to \gamma K^0_S K^\pm \pi^\mp$
80 ± 10	800	[19,20] BAILLON	67	HBC	$0.0\ \overline{p}p \to K\overline{K}\pi\pi\pi$

[12] From fit to the $a_0(980)\pi$ 0^{-+} partial wave.

[13] From $\eta\pi^+\pi^-$ mass distribution - mainly $a_0(980)\pi$ - no spin–parity determination available.

[14] Decaying dominantly directly to $K^+K^-\pi^0$.

[15] Decaying into $(K\overline{K})_S\pi$, $(K\pi)_S\overline{K}$, and $a_0(980)\pi$.

[16] From fit to the $a_0(980)\pi$ 0^{-+} partial wave , but $a_0(980)\pi$ 1^{++} cannot be excluded.

[17] This peak in the $\gamma\rho$ channel may not be related to the $\eta(1405)$.

[18] Estimated by us from various fits.

[19] These experiments identify only one pseudoscalar in the 1400–1500 range. Data could also refer to $\eta(1475)$.

[20] From best fit to 0^{-+} partial wave , 50% $K^*(892)K$, 50% $a_0(980)\pi$.

$\eta(1405)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$K\overline{K}\pi$	seen
Γ_2	$\eta\pi\pi$	seen
Γ_3	$a_0(980)\pi$	seen
Γ_4	$\eta(\pi\pi)_{S\text{-wave}}$	seen
Γ_5	$f_0(980)\eta$	seen
Γ_6	4π	seen
Γ_7	$\gamma\gamma$	
Γ_8	$\rho^0\gamma$	
Γ_9	$K^*(892)K$	seen

$\eta(1405)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_2\Gamma_7/\Gamma$

VALUE (keV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.095	95	ACCIARRI	01G	L3	183–202 $e^+e^- \to e^+e^-\eta\pi^+\pi^-$

$\Gamma(\rho^0\gamma) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_8\Gamma_7/\Gamma$

VALUE (keV)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.5	95	ALTHOFF	84E	TASS	$e^+e^- \to e^+e^-\pi^+\pi^-\gamma$

$\eta(1405)$ BRANCHING RATIOS

$\Gamma(\eta\pi\pi)/\Gamma(K\overline{K}\pi)$ — Γ_2/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.5	90	EDWARDS	83B	CBAL	$J/\psi \to \eta\pi\pi\gamma$
<1.1	90	SCHARRE	80	MRK2	$J/\psi \to \eta\pi\pi\gamma$
<1.5	95	FOSTER	68B	HBC	0.0 $\overline{p}p$

$\Gamma(a_0(980)\pi)/\Gamma(K\overline{K}\pi)$ — Γ_3/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.15		[21] BERTIN	95	OBLX	0 $\overline{p}p \to K\overline{K}\pi\pi\pi$
~ 0.8	500	[21] DUCH	89	ASTE	$\overline{p}p \to \pi^+\pi^- K^\pm\pi^\mp K^0$
~ 0.75		[21] REEVES	86	SPEC	6.6 $p\overline{p} \to KK\pi X$

$\Gamma(a_0(980)\pi)/\Gamma(\eta\pi\pi)$ — Γ_3/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.29±0.10		ABELE	98E	CBAR	0 $p\overline{p} \to \eta\pi^0\pi^0\pi^0$
0.19±0.04	2200	[22] ALDE	97B	GAM4	100 $\pi^- p \to \eta\pi^0\pi^0 n$
0.56±0.04±0.03		[22] AMSLER	95F	CBAR	0 $\overline{p}p \to \pi^+\pi^-\pi^0\pi^0\eta$

$\Gamma(a_0(980)\pi)/\Gamma(\eta(\pi\pi)_{S\text{-wave}})$ — Γ_3/Γ_4

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.91±0.12		ANISOVICH	01	SPEC	0.0 $\overline{p}p \to \eta\pi^+\pi^-\pi^+\pi^-$
0.15±0.04	9082	MANAK	00A	MPS	18 $\pi^- p \to \eta\pi^+\pi^- n$
0.70±0.12±0.20		[23] BAI	99	BES	$J/\psi \to \gamma\eta\pi^+\pi^-$

$\Gamma(\rho^0\gamma)/\Gamma(K\overline{K}\pi)$ — Γ_8/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.0152±0.0038	[24] COFFMAN	90	MRK3	$J/\psi \to \gamma\gamma\pi^+\pi^-$

$\Gamma(\eta(\pi\pi)_{S\text{-wave}})/\Gamma(\eta\pi\pi)$ — Γ_4/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.81±0.04	2200	ALDE	97B	GAM4	100 $\pi^- p \to \eta\pi^0\pi^0 n$

$\Gamma(a_0(980)\pi)/\Gamma(\eta(\pi\pi)_{S\text{-wave}})$ — Γ_3/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.32±0.07	[25] ANISOVICH	99I	SPEC	0.9–1.2 $\overline{p}p \to \eta 3\pi^0$

$\Gamma(K^*(892)K)/\Gamma(a_0(980)\pi)$ Γ_9/Γ_3

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.084±0.024	[26] ADAMS 01B	E852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$

[21] Assuming that the $a_0(980)$ decays only into $K\overline{K}$.
[22] Assuming that the $a_0(980)$ decays only into $\eta\pi$.
[23] Assuming that the $a_0(980)$ decays only into $\eta\pi$.
[24] Using B($J/\psi \rightarrow \gamma\eta(1405) \rightarrow \gamma K\overline{K}\pi$)=$4.2 \times 10^{-3}$ and B($J/\psi \rightarrow \gamma\eta(1405) \rightarrow \gamma\gamma\rho^0$)=$6.4 \times 10^{-5}$ and assuming that the $\gamma\rho^0$ signal does not come from the $f_1(1420)$.
[25] Using preliminary Crystal Barrel data.
[26] Statistical error only.

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