$\eta(1405)$

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

See also the $\eta(1475)$.

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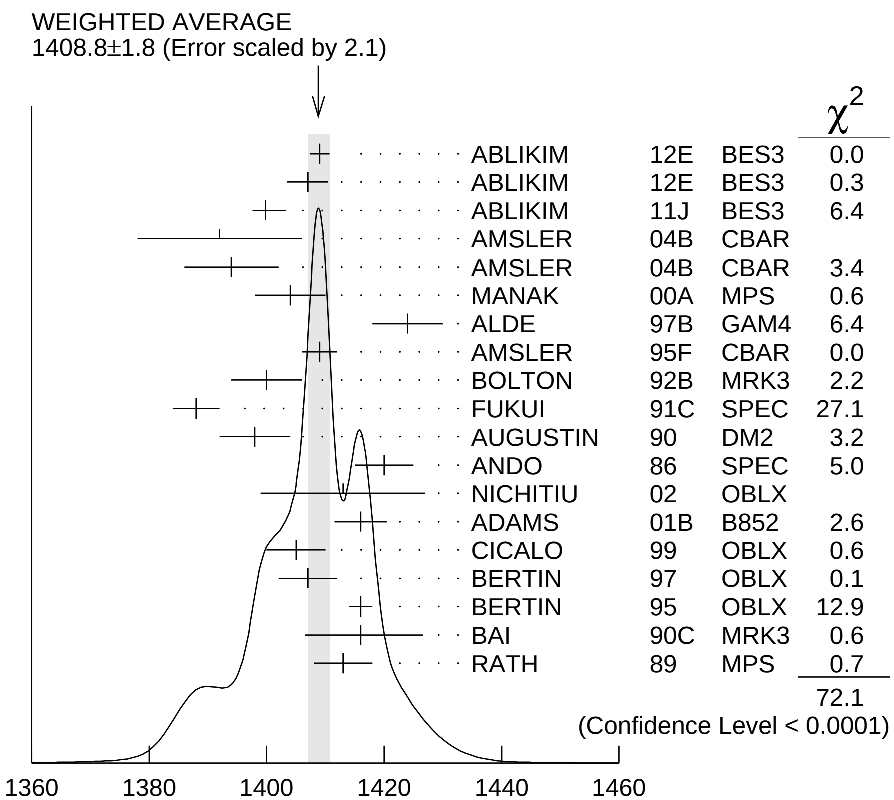
$\eta(1405)$ MASS

VALUE (MeV)	DOCUMENT ID
1408.8±1.8 OUR AVERAGE Includes data from the 2 datablocks that follow this one. Error includes scale factor of 2.1. See the ideogram below.	



$\eta(1405)$ mass (MeV)

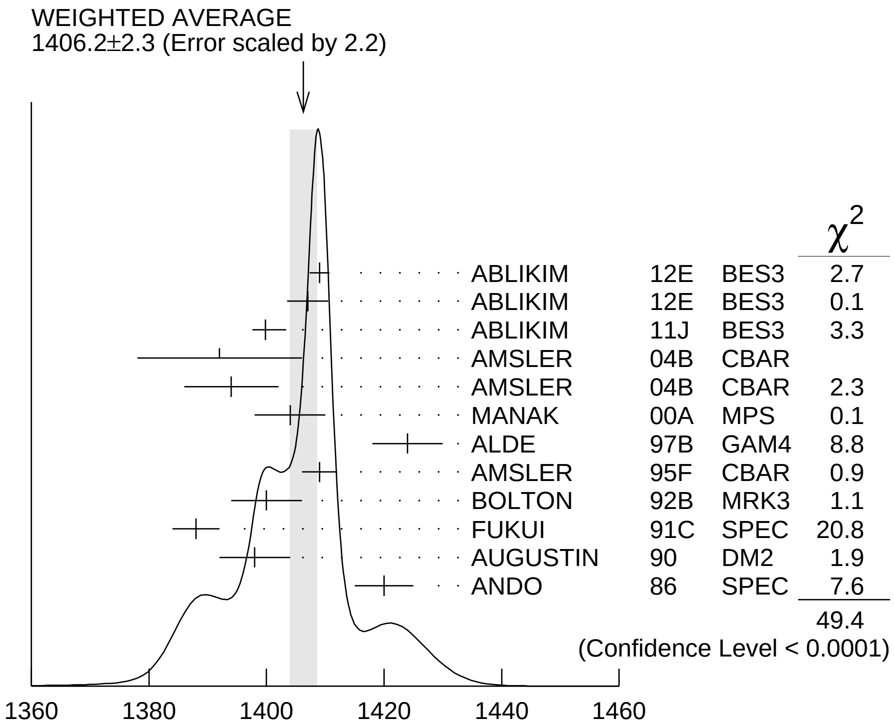
$\eta\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				
1406.2± 2.3 OUR AVERAGE Error includes scale factor of 2.2. See the ideogram below.				
1409.0± 1.7	743	ABLIKIM 12E	BES3	$J/\psi \to \gamma(\pi^+\pi^-\pi^0)$
1407.0± 3.5	198	ABLIKIM 12E	BES3	$J/\psi \to \gamma(\pi^0\pi^0\pi^0)$
1399.8± $2.2^{+2.8}_{-0.1}$		[1] ABLIKIM 11J	BES3	$J/\psi \to \omega(\eta\pi^+\pi^-)$
1392 ±14	900 ± 375	AMSLER 04B	CBAR	$0\ \overline{p}p \to \pi^+\pi^-\pi^+\pi^-\eta$
1394 ± 8	6.6 ± 2.0k	AMSLER 04B	CBAR	$0\ \overline{p}p \to \pi^+\pi^-\pi^0\pi^0\eta$
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		[2] 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	[3] 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	$J/\psi \to \gamma\eta\pi^+\pi^-$



$\eta(1405)$ 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.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1413 ±14	3651	[4] NICHITIU	02	OBLX	
1416 ± 4 ±2	20k	ADAMS	01B	B852	18 GeV $\pi^- p \to K^+ K^- \pi^0 n$
1405 ± 5		[5] CICALO	99	OBLX	0 $\overline{p} p \to K^\pm K^0_S \pi^\mp \pi^+ \pi^-$
1407 ± 5		[5] BERTIN	97	OBLX	0 $\overline{p} p \to K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
1416 ± 2		[5] BERTIN	95	OBLX	0 $\overline{p} p \to K\overline{K}\pi\pi\pi$
1416 ± 8 $^{+7}_{-5}$	700	[6] BAI	90C	MRK3	$J/\psi \to \gamma K^0_S K^\pm \pi^\mp$
1413 ± 5		[6] RATH	89	MPS	21.4 $\pi^- p \to n K^0_S K^0_S \pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1459 ± 5		[7] AUGUSTIN	92	DM2	$J/\psi \to \gamma K\overline{K}\pi$

$\pi\pi\gamma$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1390±12	235 ± 91	AMSLER	04B	CBAR	$0\ \overline{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1424±10±11	547	BAI	04J	BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
1401±18		[8,9] AUGUSTIN	90	DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
1432± 8		[9] 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	[10] BISELLO	89B	DM2	$J/\psi \rightarrow 4\pi\gamma$

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

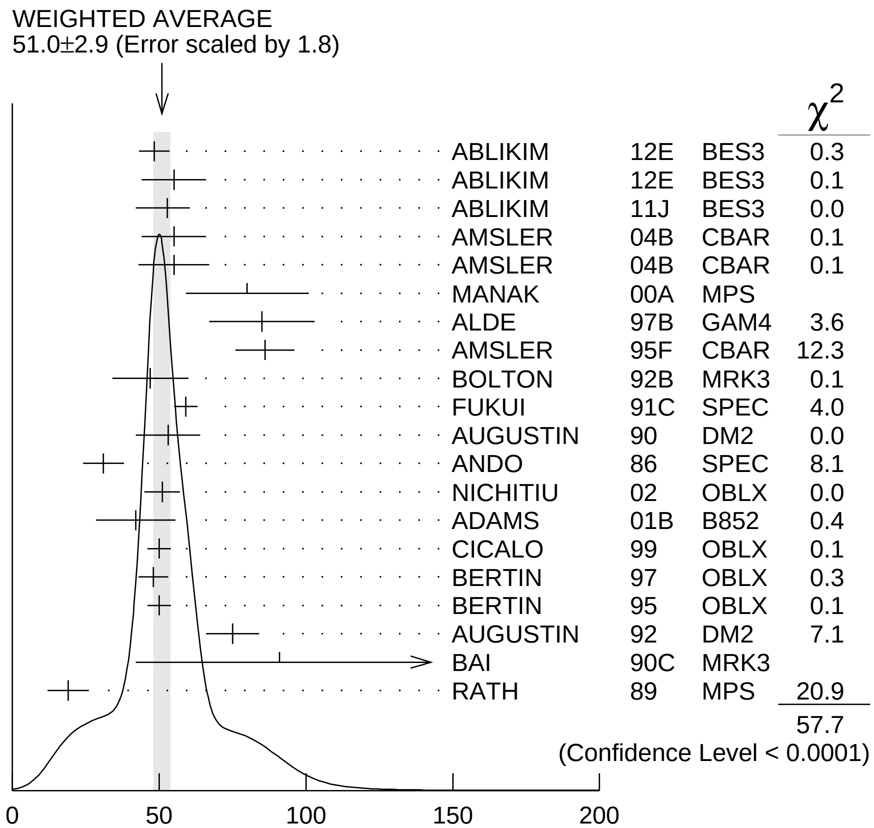
VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1452.7± 3.3	191	[11,12] ABLIKIM	13M	BES3	$\psi(2S) \rightarrow \omega K K \pi$
1437.6± 3.2	249 ± 35	[11,12] ABLIKIM	08E	BES2	$J/\psi \rightarrow \omega K^0_S K^+\pi^-$ + c.c.
1445.9± 5.7	62 ± 18	[11,12] ABLIKIM	08E	BES2	$J/\psi \rightarrow \omega K^+ K^- \pi^0$
1442 ±10	410	[11] BAI	98C	BES	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1445 ± 8	693	[11] AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
1433 ± 8	296	[11] AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1413 ± 8	500	[11] DUCH	89	ASTE	$\overline{p}p \rightarrow \pi^+\pi^- K^\pm \pi^\mp K^0$
1453 ± 7	170	[11] RATH	89	MPS	$21.4\ \pi^- p \rightarrow K^0_S K^0_S \pi^0 n$
1419 ± 1	8800	[11] BIRMAN	88	MPS	$8\ \pi^- p \rightarrow K^+ \overline{K}^0 \pi^- n$
1424 ± 3	620	[11] REEVES	86	SPEC	$6.6\ p\overline{p} \rightarrow K\overline{K}\pi X$
1421 ± 2		[11] CHUNG	85	SPEC	$8\ \pi^- p \rightarrow K\overline{K}\pi n$
1440 $^{+20}_{-15}$	174	[11] EDWARDS	82E	CBAL	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1440 $^{+10}_{-15}$		[11] SCHARRE	80	MRK2	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
1425 ± 7	800	[11,13] BAILLON	67	HBC	$0\ \overline{p}p \rightarrow K\overline{K}\pi\pi\pi$

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

$\eta(1405)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*

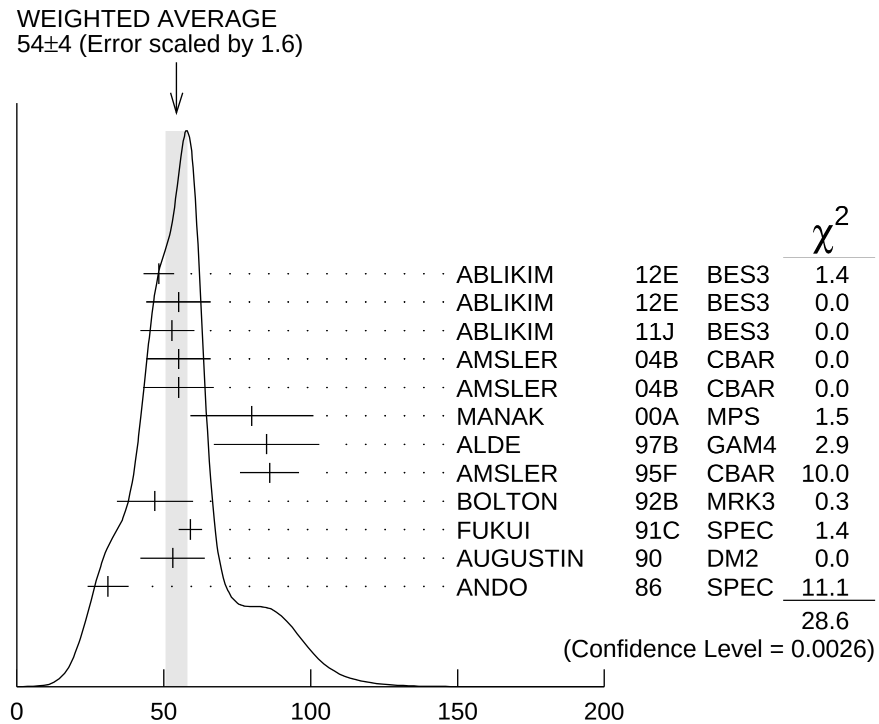
51.0±2.9 OUR AVERAGE Includes data from the 2 datablocks that follow this one. Error includes scale factor of 1.8. See the ideogram below.



$\eta(1405)$ 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.					
54 ± 4 OUR AVERAGE	Error includes scale factor of 1.6. See the ideogram below.				
48.3± 5.2	743	ABLIKIM	12E	BES3	$J/\psi \to \gamma(\pi^+\pi^-\pi^0)$
55.0±11.0	198	ABLIKIM	12E	BES3	$J/\psi \to \gamma(\pi^0\pi^0\pi^0)$
$52.8\pm 7.6^{+0.1}_{-7.6}$		[14] ABLIKIM	11J	BES3	$J/\psi \to \omega(\eta\pi^+\pi^-)$
55 ±11	900 ± 375	AMSLER	04B	CBAR	$0\ \overline{p}p \to \pi^+\pi^-\pi^+\pi^-\eta$
55 ±12	6.6 ± 2.0k	AMSLER	04B	CBAR	$0\ \overline{p}p \to \pi^+\pi^-\pi^0\pi^0\gamma$
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		[15] 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		[16] AUGUSTIN	90	DM2	$J/\psi \to \gamma\eta\pi^+\pi^-$
31 ± 7		ANDO	86	SPEC	$8\ \pi^- p \to \eta\pi^+\pi^- n$



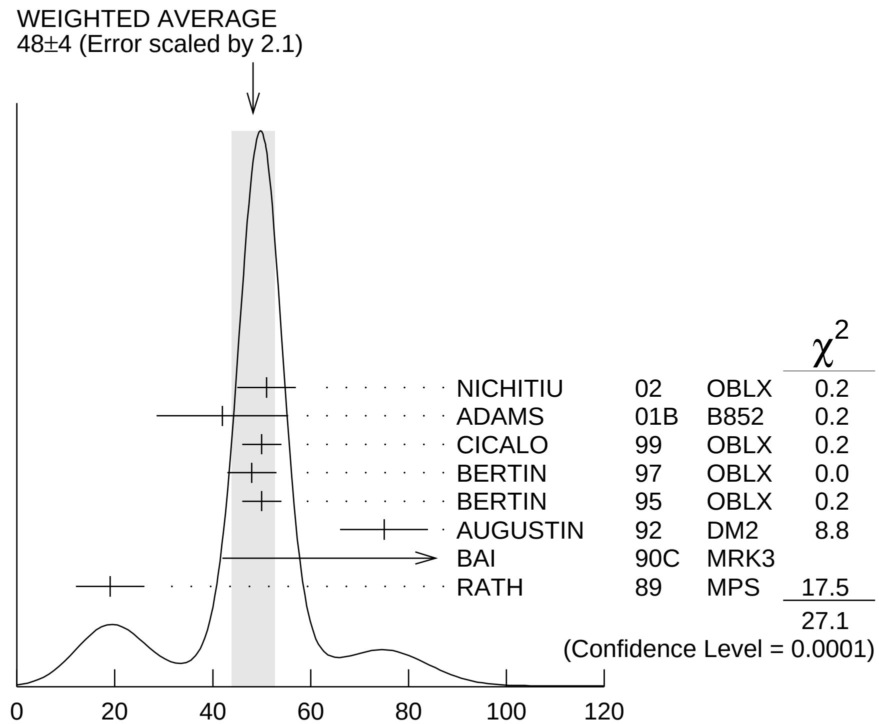
$\eta(1405)$ width $\eta\pi\pi$ mode (MeV)

$K\overline{K}\pi$ 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	[17] NICHITIU	02	OBLX	
42±10± 9	20k	ADAMS	01B	B852	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		[18] BERTIN	97	OBLX	0.0 $\overline{p} p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
50± 4		[18] BERTIN	95	OBLX	0 $\overline{p} p \rightarrow K \overline{K} \pi\pi\pi$
75± 9		AUGUSTIN	92	DM2	$J/\psi \rightarrow \gamma K \overline{K} \pi$
$91^{+67}_{-31}{}^{+15}_{-38}$		[19] BAI	90C	MRK3	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
19± 7		[19] 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 ($a_0(980)$ π dominant)

$\pi\pi\gamma$ MODE

VALUE (MeV)	EVTS		DOCUMENT ID		TECN	COMMENT
64 ±18	235 ± 91		AMSLER	04B	CBAR	0 $\overline{p}p \to \pi^+\pi^-\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
101.0± 8.8±8.8	547		BAI	04J	BES2	$J/\psi \to \gamma\gamma\pi^+\pi^-$
174 ±44			AUGUSTIN	90	DM2	$J/\psi \to \pi^+\pi^-\gamma\gamma$
90 ±26		20	COFFMAN	90	MRK3	$J/\psi \to \pi^+\pi^- 2\gamma$

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	$J/\psi \to \gamma\pi^+\pi^-\pi^+\pi^-$
144±13	3270	21	BISELLO	89B	DM2	$J/\psi \to 4\pi\gamma$

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

VALUE (MeV)	EVTS		DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
45.9± 8.2	191	22,23	ABLIKIM	13M	BES3	$\psi(2S) \to \omega K K\pi$
48.9± 9.0	249 ± 35	22,23	ABLIKIM	08E	BES2	$J/\psi \to \omega K^0_S K^+\pi^-$ + c.c.
34.2±18.5	62 ± 18	22,23	ABLIKIM	08E	BES2	$J/\psi \to \omega K^+K^-\pi^0$
93 ±14	296	22	AUGUSTIN	90	DM2	$J/\psi \to \gamma K^+K^-\pi^0$
105 ±10	693	22	AUGUSTIN	90	DM2	$J/\psi \to \gamma K^0_S K^\pm\pi^\mp$
62 ±16	500	22	DUCH	89	ASTE	$\overline{p}p \to K\overline{K}\pi\pi\pi$
100 ±11	170	22	RATH	89	MPS	21.4 $\pi^- p \to K^0_S K^0_S \pi^0 n$

66 $\pm$ 2	8800	[22] BIRMAN	88	MPS	$8\ \pi^- p \rightarrow K^+ \overline{K}^0 \pi^- n$
60 $\pm$10	620	[22] REEVES	86	SPEC	$6.6\ p\overline{p} \rightarrow K K \pi X$
60 $\pm$10		[22] CHUNG	85	SPEC	$8\ \pi^- p \rightarrow K \overline{K} \pi n$
55 $^{+20}_{-30}$	174	[22] EDWARDS	82E	CBAL	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
50 $^{+30}_{-20}$		[22] SCHARRE	80	MRK2	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
80 $\pm$10	800	[22,24] BAILLON	67	HBC	$0.0\ \overline{p} p \rightarrow K \overline{K} \pi \pi \pi$

[14] The selected process is $J/\psi \rightarrow \omega a_0(980) \pi$.

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

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

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

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

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

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

[21] Estimated by us from various fits.

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

[23] Systematic uncertainty not evaluated.

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

η(1405) DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
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	$\rho\rho$	<58 %	99.85%
Γ_8	$\gamma\gamma$		
Γ_9	$\rho^0\gamma$	seen	
Γ_{10}	$\phi\gamma$		
Γ_{11}	$K^*(892) K$	seen	

η(1405) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma$(total)

$\Gamma(K\overline{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_1\Gamma_8/\Gamma$

VALUE (keV)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.035	90	[25,26] AHOHE	05	CLE2	$10.6\ e^+ e^- \rightarrow e^+ e^- K^0_S K^\pm \pi^\mp$

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ $\Gamma_2\Gamma_8/\Gamma$

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

$\Gamma(\rho^0\gamma) \times \Gamma(\gamma\gamma)/\Gamma_{total}$ — $\Gamma_9\Gamma_8/\Gamma$

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	$e^+e^- \to e^+e^-\pi^+\pi^-\gamma$

[25] Using $\eta(1405)$ mass and width 1410 MeV and 51 MeV, respectively.
[26] Assuming three-body phase-space decay to $K^0_S K^\pm \pi^\mp$.

$\eta(1405)$ 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. • • •					
1.09±0.48		[27] AMSLER	04B	CBAR	$0\ \overline{p}p \to \pi^+\pi^-\pi^+\pi^-\eta$
<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	$0.0\ \overline{p}p$

$\Gamma(\rho^0\gamma)/\Gamma(\eta\pi\pi)$ — Γ_9/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
0.111±0.064	AMSLER	04B	CBAR	$0\ \overline{p}p$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
∼ 0.15		[28] BERTIN	95	OBLX	$0\ \overline{p}p \to K\overline{K}\pi\pi\pi$
∼ 0.8	500	[28] DUCH	89	ASTE	$\overline{p}p \to \pi^+\pi^-K^\pm\pi^\mp K^0$
∼ 0.75		[28] 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	[29] ALDE	97B	GAM4	$100\ \pi^- p \to \eta\pi^0\pi^0 n$
0.56±0.04±0.03		[29] 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	[30] MANAK	00A	MPS	$18\ \pi^- p \to \eta\pi^+\pi^- n$
0.70±0.12±0.20		[31] BAI	99	BES	$J/\psi \to \gamma\eta\pi^+\pi^-$

$\Gamma(\rho^0\gamma)/\Gamma(K\overline{K}\pi)$ — Γ_9/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.0152±0.0038	[32] 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	$100\ \pi^- p \to \eta\pi^0\pi^0 n$

$\Gamma(f_0(980)\eta)/\Gamma(\eta\pi\pi)$ — Γ_5/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.32 ± 0.07	[33] ANISOVICH	00	SPEC	$0.9\text{–}1.2\ \overline{p}p \to \eta 3\pi^0$

$\Gamma(\rho\rho)/\Gamma_{\text{total}}$ — Γ_7/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.58	99.85	[27,34] AMSLER	04B	CBAR	$0\ \overline{p}p$

$\Gamma(K^*(892)K)/\Gamma(a_0(980)\pi)$ — Γ_{11}/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.084 ± 0.024	[30] ADAMS	01B	B852	$18\ \text{GeV}\ \pi^- p \to K^+K^-\pi^0 n$

$\Gamma(\phi\gamma)/\Gamma(\rho^0\gamma)$ — Γ_{10}/Γ_9

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.77	95	[35] BAI	04J	BES2	$J/\psi \to \gamma\gamma K^+K^-$

[27] Using the data of BAILLON 67 on $\overline{p}p \to K\overline{K}\pi$.
[28] Assuming that the $a_0(980)$ decays only into $K\overline{K}$.
[29] Assuming that the $a_0(980)$ decays only into $\eta\pi$.
[30] Statistical error only.
[31] Assuming that the $a_0(980)$ decays only into $\eta\pi$.
[32] Using B($J/\psi \to \gamma\eta(1405) \to \gamma K\overline{K}\pi$)$=4.2\times10^{-3}$ and B($J/\psi \to \gamma\eta(1405) \to \gamma\gamma\rho^0$)$=6.4\times10^{-5}$ and assuming that the $\gamma\rho^0$ signal does not come from the $f_1(1420)$.
[33] Using preliminary Crystal Barrel data.
[34] Assuming that the $\eta(1405)$ decays are saturated by the $\pi\pi\eta$, $K\overline{K}\pi$ and $\rho\rho$ modes.
[35] Calculated by us from B($J/\psi \to \eta(1405)\gamma \to \phi\gamma\gamma$) $< 0.82\times10^{-4}$ and B($J/\psi \to \eta(1405)\gamma \to \rho^0\gamma\gamma$) $= (1.07\pm0.17\pm0.11)\times10^{-4}$.

$\eta(1405)$ REFERENCES

ABLIKIM	13M	PR D87 092006	M. Ablikim et al.	(BES III Collab.)
ABLIKIM	12E	PRL 108 182001	M. Ablikim et al.	(BES III Collab.)
ABLIKIM	11J	PRL 107 182001	M. Ablikim et al.	(BES III Collab.)
ABLIKIM	08E	PR D77 032005	M. Ablikim et al.	(BES Collab.)
AHOHE	05	PR D71 072001	R. Ahohe et al.	(CLEO Collab.)
AMSLER	04B	EPJ C33 23	C. Amsler et al.	(Crystal Barrel Collab.)
BAI	04J	PL B594 47	J.Z. Bai et al.	(BES Collab.)
NICHITIU	02	PL B545 261	F. Nichitiu et al.	(OBELIX Collab.)
ACCIARRI	01G	PL B501 1	M. Acciarri et al.	(L3 Collab.)
ADAMS	01B	PL B516 264	G.S. Adams et al.	(BNL E852 Collab.)
ANISOVICH	01	NP A690 567	A.V. Anisovich et al.	
ANISOVICH	00	PL B472 168	A.V. Anisovich et al.	
MANAK	00A	PR D62 012003	J.J. Manak et al.	(BNL E852 Collab.)
BAI	99	PL B446 356	J.Z. Bai et al.	(BES Collab.)
CICALO	99	PL B462 453	C. Cicalo et al.	(OBELIX Collab.)
ABELE	98E	NP B514 45	A. Abele et al.	(Crystal Barrel Collab.)

BAI	98C	PL B440 217	J.Z. Bai *et al.*	(BES Collab.)	
ALDE	97B	PAN 60 386	D. Alde *et al.*	(GAMS Collab.)	
		Translated from YAF 60 458.			
BERTIN	97	PL B400 226	A. Bertin *et al.*	(OBELIX Collab.)	
AMSLER	95F	PL B358 389	C. Amsler *et al.*	(Crystal Barrel Collab.)	
BERTIN	95	PL B361 187	A. Bertin *et al.*	(OBELIX Collab.)	
BUGG	95	PL B353 378	D.V. Bugg *et al.*	(LOQM, PNPI, WASH)	
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)	
BOLTON	92B	PRL 69 1328	T. Bolton *et al.*	(Mark III Collab.)	
FUKUI	91C	PL B267 293	S. Fukui *et al.*	(SUGI, NAGO, KEK, KYOT+)	
AUGUSTIN	90	PR D42 10	J.E. Augustin *et al.*	(DM2 Collab.)	
BAI	90C	PRL 65 2507	Z. Bai *et al.*	(Mark III Collab.)	
COFFMAN	90	PR D41 1410	D.M. Coffman *et al.*	(Mark III Collab.)	
BISELLO	89B	PR D39 701	G. Busetto *et al.*	(DM2 Collab.)	
DUCH	89	ZPHY C45 223	K.D. Duch *et al.*	(ASTERIX Collab.)	JP
RATH	89	PR D40 693	M.G. Rath *et al.*	(NDAM, BRAN, BNL, CUNY+)	
BIRMAN	88	PRL 61 1557	A. Birman *et al.*	(BNL, FSU, IND, MASD)	JP
ANDO	86	PRL 57 1296	A. Ando *et al.*	(KEK, KYOT, NIRS, SAGA+)	IJP
REEVES	86	PR D34 1960	D.F. Reeves *et al.*	(FLOR, BNL, IND+)	JP
CHUNG	85	PRL 55 779	S.U. Chung *et al.*	(BNL, FLOR, IND+)	JP
ALTHOFF	84E	PL 147B 487	M. Althoff *et al.*	(TASSO Collab.)	
EDWARDS	83B	PRL 51 859	C. Edwards *et al.*	(CIT, HARV, PRIN+)	
EDWARDS	82E	PRL 49 259	C. Edwards *et al.*	(CIT, HARV, PRIN+)	
Also		PRL 50 219	C. Edwards *et al.*	(CIT, HARV, PRIN+)	
SCHARRE	80	PL 97B 329	D.L. Scharre *et al.*	(SLAC, LBL)	
FOSTER	68B	NP B8 174	M. Foster *et al.*	(CERN, CDEF)	
BAILLON	67	NC 50A 393	P.H. Baillon *et al.*	(CERN, CDEF, IRAD)	