

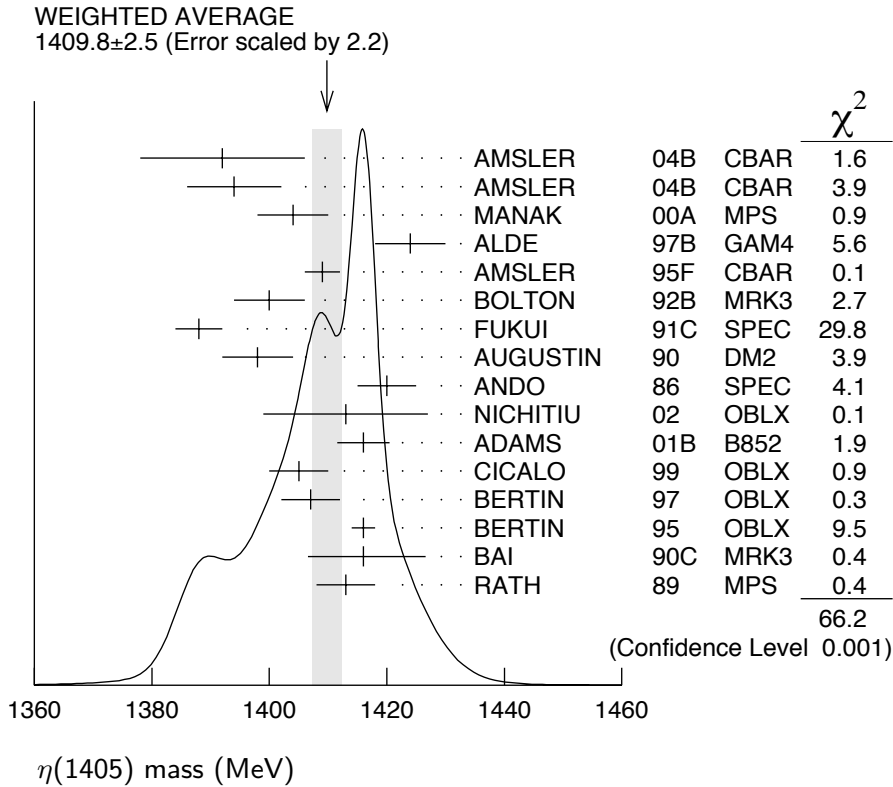
# $\eta(1405)$

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

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## $\eta(1405)$ MASS

VALUE (MeV)                      DOCUMENT ID  
**1409.8 ± 2.5 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 ± 4 OUR AVERAGE** Error includes scale factor of 2.3. See the ideogram below.

1392 ± 14	900 ± 375	AMSLER	04B	CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\eta$
1394 ± 8	6.6 ± 2.0k	AMSLER	04B	CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$
1404 ± 6	9082	MANAK	00A	MPS	18 $\pi^-p \rightarrow \eta\pi^+\pi^-\eta$
1424 ± 6	2200	ALDE	97B	GAM4	100 $\pi^-p \rightarrow \eta\pi^0\pi^0\eta$
1409 ± 3		AMSLER	95F	CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$
1400 ± 6		<sup>1</sup> BOLTON	92B	MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
1388 ± 4		FUKUI	91C	SPEC	8.95 $\pi^-p \rightarrow \eta\pi^+\pi^-\eta$
1398 ± 6	261	<sup>2</sup> AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
1420 ± 5		ANDO	86	SPEC	8 $\pi^-p \rightarrow \eta\pi^+\pi^-\eta$

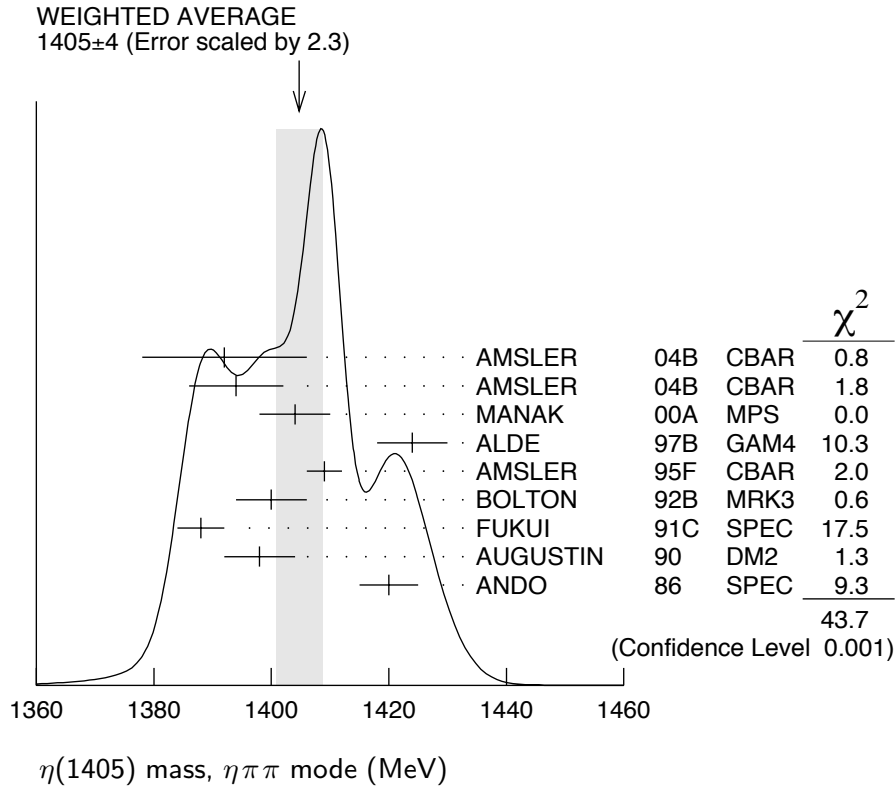
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●

1385 ± 7

BAI

99 BES

$J/\psi \rightarrow \gamma \eta \pi^+ \pi^-$



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

VALUE (MeV)    EVTS    DOCUMENT ID    TECN    COMMENT  
The data in this block is included in the average printed for a previous datablock.

<b>1413.9 ± 1.7 OUR AVERAGE</b>		Error includes scale factor of 1.1.			
1413 ± 14	3651	<sup>3</sup> NICHITIU	02	OBLX	
1416 ± 4 ± 2	20k	ADAMS	01B	B852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
1405 ± 5		<sup>4</sup> CICALO	99	OBLX	0 $\bar{p} p \rightarrow K^\pm K_S^0 \pi^\mp \pi^+ \pi^-$
1407 ± 5		<sup>4</sup> BERTIN	97	OBLX	0 $\bar{p} p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
1416 ± 2		<sup>4</sup> BERTIN	95	OBLX	0 $\bar{p} p \rightarrow K\bar{K} \pi \pi$
1416 ± 8 <sup>+7</sup> / <sub>-5</sub>	700	<sup>5</sup> BAI	90C	MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1413 ± 5		<sup>5</sup> RATH	89	MPS	21.4 $\pi^- p \rightarrow n K_S^0 K_S^0 \pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
1459 ± 5		<sup>6</sup> AUGUSTIN	92	DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$

### $\pi\pi\gamma$ MODE

VALUE (MeV)    EVTS    DOCUMENT ID    TECN    COMMENT  
**1390 ± 12**    235 ± 91    AMSLER    04B CBAR    0  $\bar{p} p \rightarrow \pi^+ \pi^- \pi^+ \pi^- \gamma$

• • • 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		<sup>7,8</sup> AUGUSTIN	90	DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
1432 ± 8		<sup>8</sup> COFFMAN	90	MRK3	$J/\psi \rightarrow \pi^+\pi^-\gamma$

#### 4π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • 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	<sup>9</sup> BISELLO	89B	DM2	$J/\psi \rightarrow 4\pi\gamma$

#### $K\bar{K}\pi$ MODE (unresolved)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1442 ± 10	410	<sup>10</sup> BAI	98C	BES	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1445 ± 8	693	<sup>10</sup> AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1433 ± 8	296	<sup>10</sup> AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1413 ± 8	500	<sup>10</sup> DUCH	89	ASTE	$\bar{p}p \rightarrow \pi^+\pi^- K^\pm \pi^\mp K^0$
1453 ± 7	170	<sup>10</sup> RATH	89	MPS	$21.4 \pi^- p \rightarrow K_S^0 K_S^0 \pi^0 n$
1419 ± 1	8800	<sup>10</sup> BIRMAN	88	MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
1424 ± 3	620	<sup>10</sup> REEVES	86	SPEC	$6.6 p\bar{p} \rightarrow K\bar{K}\pi X$
1421 ± 2		<sup>10</sup> CHUNG	85	SPEC	$8 \pi^- p \rightarrow K\bar{K}\pi n$
1440 <sup>+20</sup> <sub>-15</sub>	174	<sup>10</sup> EDWARDS	82E	CBAL	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1440 <sup>+10</sup> <sub>-15</sub>		<sup>10</sup> SCHARRE	80	MRK2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1425 ± 7	800	<sup>10,11</sup> BAILLON	67	HBC	$0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$

<sup>1</sup> From fit to the  $a_0(980)\pi 0^-+$  partial wave.

<sup>2</sup> Best fit with a single Breit Wigner.

<sup>3</sup> Decaying dominantly directly to  $K^+ K^- \pi^0$ .

<sup>4</sup> Decaying into  $(K\bar{K})_S\pi$ ,  $(K\pi)_S\bar{K}$ , and  $a_0(980)\pi$ .

<sup>5</sup> From fit to the  $a_0(980)\pi 0^-+$  partial wave. Cannot rule out a  $a_0(980)\pi 1^++$  partial wave.

<sup>6</sup> Excluded from averaging because averaging would be meaningless.

<sup>7</sup> Best fit with a single Breit Wigner.

<sup>8</sup> This peak in the  $\gamma\rho$  channel may not be related to the  $\eta(1405)$ .

<sup>9</sup> Estimated by us from various fits.

<sup>10</sup> These experiments identify only one pseudoscalar in the 1400–1500 range. Data could also refer to  $\eta(1475)$ .

<sup>11</sup> From best fit of  $0^-+$  partial wave, 50%  $K^*(892)K$ , 50%  $a_0(980)\pi$ .

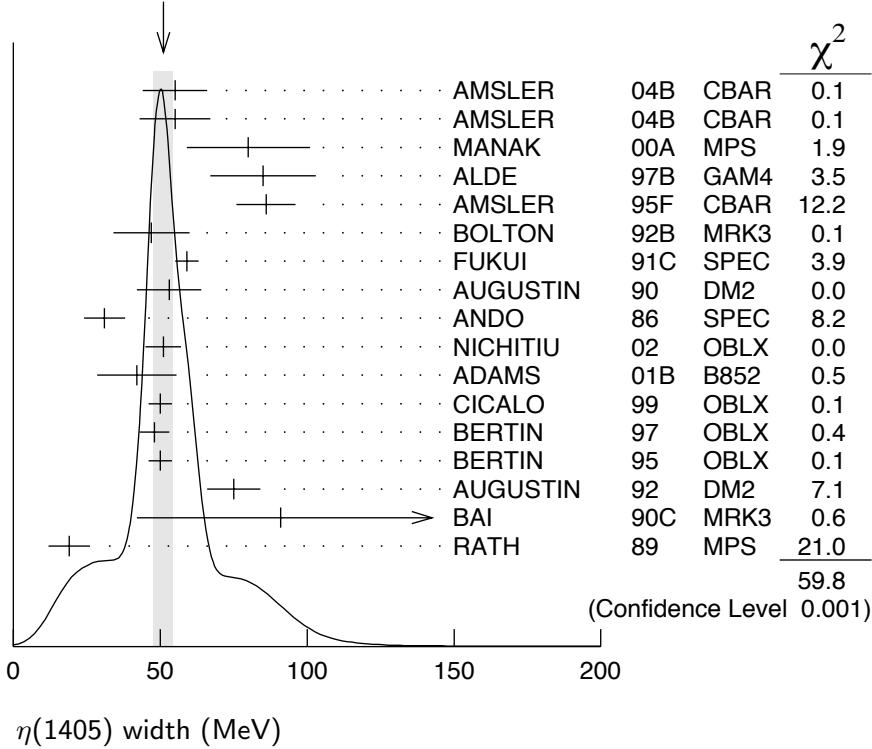
## $\eta(1405)$ WIDTH

VALUE (MeV)

DOCUMENT ID

**51.1±3.4 OUR AVERAGE** Includes data from the 2 datablocks that follow this one. Error includes scale factor of 2.0. See the ideogram below.

WEIGHTED AVERAGE  
51.1±3.4 (Error scaled by 2.0)



## $\eta\pi\pi$ MODE

VALUE (MeV)

EVTS

DOCUMENT ID

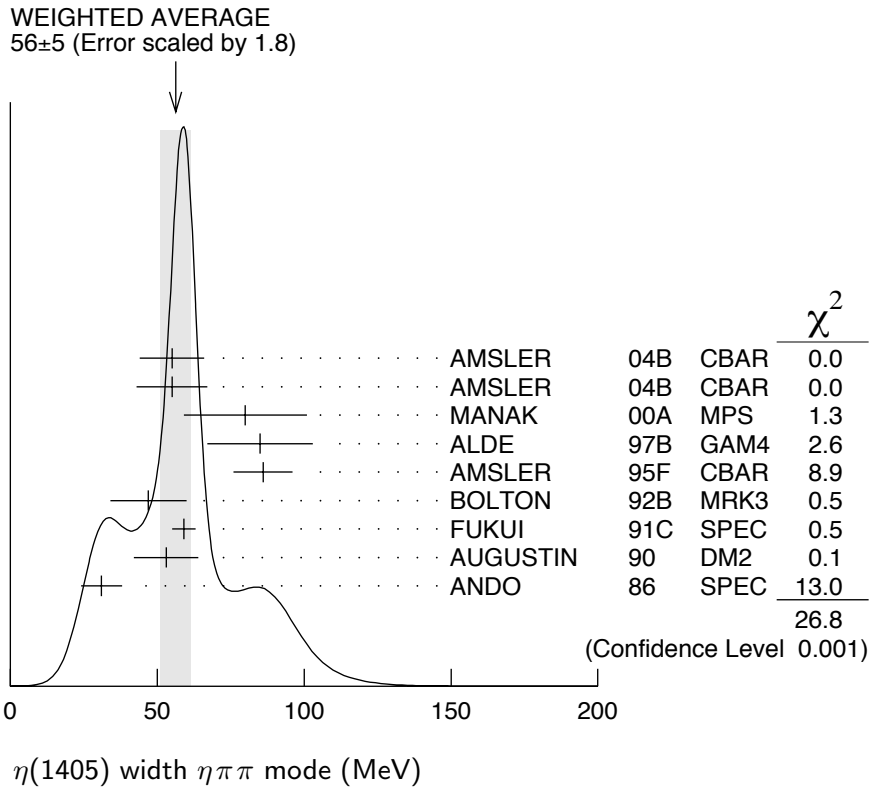
TECN

COMMENT

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

**56± 5 OUR AVERAGE** Error includes scale factor of 1.8. See the ideogram below.

55±11	900 ± 375	AMSLER	04B	CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\eta$
55±12	6.6 ± 2.0k	AMSLER	04B	CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\gamma$
80±21	9082	MANAK	00A	MPS	18 $\pi^-p \rightarrow \eta\pi^+\pi^-n$
85±18	2200	ALDE	97B	GAM4	100 $\pi^-p \rightarrow \eta\pi^0\pi^0n$
86±10		AMSLER	95F	CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$
47±13		<sup>12</sup> BOLTON	92B	MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
59± 4		FUKUI	91C	SPEC	8.95 $\pi^-p \rightarrow \eta\pi^+\pi^-n$
53±11		<sup>13</sup> AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
31± 7		ANDO	86	SPEC	8 $\pi^-p \rightarrow \eta\pi^+\pi^-n$



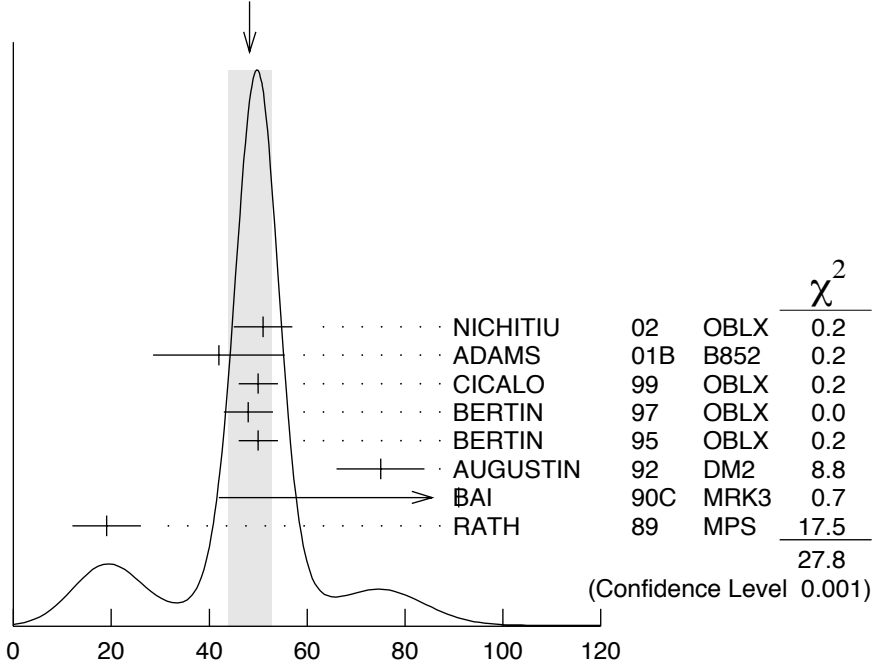
**$K\bar{K}\pi$  MODE ( $a_0(980)\pi$  or direct  $K\bar{K}\pi$ )**

VALUE (MeV)    EVTS    DOCUMENT ID    TECN    COMMENT  
 The data in this block is included in the average printed for a previous datablock.

**$48 \pm 4$  OUR AVERAGE**    Error includes scale factor of 2.1. See the ideogram below.

$51 \pm 6$	3651	<sup>14</sup> NICHITIU	02	OBLX	
$42 \pm 10 \pm 9$	20k	ADAMS	01B	B852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
$50 \pm 4$		CICALO	99	OBLX	$0 \bar{p} p \rightarrow K^\pm K_S^0 \pi^\mp \pi^+ \pi^-$
$48 \pm 5$		<sup>15</sup> BERTIN	97	OBLX	$0.0 \bar{p} p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
$50 \pm 4$		<sup>15</sup> BERTIN	95	OBLX	$0 \bar{p} p \rightarrow K\bar{K}\pi\pi\pi$
$75 \pm 9$		AUGUSTIN	92	DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$
$91^{+67}_{-31} +15_{-38}$		<sup>16</sup> BAI	90C	MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
$19 \pm 7$		<sup>16</sup> RATH	89	MPS	$21.4 \pi^- p \rightarrow n K_S^0 K_S^0 \pi^0$

WEIGHTED AVERAGE  
 $48 \pm 4$  (Error scaled by 2.1)



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

### $\pi\pi\gamma$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>64 ± 18</b>	235 ± 91	AMSLER	04B CBAR	$0 \bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
101.0 ± 8.8 ± 8.8	547	BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
174 ± 44		AUGUSTIN	90 DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
90 ± 26		17 COFFMAN	90 MRK3	$J/\psi \rightarrow \pi^+\pi^-2\gamma$

### $4\pi$ 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	$J/\psi \rightarrow 4\pi\gamma$

### $K\bar{K}\pi$ 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	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
62 ± 16	500	19 DUCH	89 ASTE	$\bar{p}p \rightarrow K\bar{K}\pi\pi\pi$
100 ± 11	170	19 RATH	89 MPS	$21.4 \pi^- p \rightarrow K_S^0 K_S^0 \pi^0 n$
66 ± 2	8800	19 BIRMAN	88 MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$

60±10	620	19 REEVES	86	SPEC	6.6	$p\bar{p} \rightarrow K\bar{K}\pi X$
60±10		19 CHUNG	85	SPEC	8	$\pi^- p \rightarrow K\bar{K}\pi n$
55 <sup>+20</sup> <sub>-30</sub>	174	19 EDWARDS	82E	CBAL		$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
50 <sup>+30</sup> <sub>-20</sub>		19 SCHARRE	80	MRK2		$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
80±10	800	19,20 BAILLON	67	HBC	0.0	$\bar{p}p \rightarrow K\bar{K}\pi\pi\pi$

<sup>12</sup> From fit to the  $a_0(980)\pi 0^-+$  partial wave.

<sup>13</sup> From  $\eta\pi^+\pi^-$  mass distribution - mainly  $a_0(980)\pi$  - no spin-parity determination available.

<sup>14</sup> Decaying dominantly directly to  $K^+K^-\pi^0$ .

<sup>15</sup> Decaying into  $(K\bar{K})_S\pi$ ,  $(K\pi)_S\bar{K}$ , and  $a_0(980)\pi$ .

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

<sup>17</sup> This peak in the  $\gamma\rho$  channel may not be related to the  $\eta(1405)$ .

<sup>18</sup> Estimated by us from various fits.

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

<sup>20</sup> From best fit to  $0^-+$  partial wave, 50%  $K^*(892)K$ , 50%  $a_0(980)\pi$ .

### $\eta(1405)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
$\Gamma_1$ $K\bar{K}\pi$	seen	
$\Gamma_2$ $\eta\pi\pi$	seen	
$\Gamma_3$ $a_0(980)\pi$	seen	
$\Gamma_4$ $\eta(\pi\pi)_S$ -wave	seen	
$\Gamma_5$ $f_0(980)\eta$	seen	
$\Gamma_6$ $4\pi$	seen	
$\Gamma_7$ $\rho\rho$	<58 %	99.85%
$\Gamma_8$ $\gamma\gamma$		
$\Gamma_9$ $\rho^0\gamma$		
$\Gamma_{10}$ $\phi\gamma$		
$\Gamma_{11}$ $K^*(892)K$	seen	

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

$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_1\Gamma_8/\Gamma$
VALUE (keV)	CL%	DOCUMENT ID	TECN	COMMENT	

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

<0.035	90	21,22 AHOHE	05	CLE2	10.6 $e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$
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$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_2\Gamma_8/\Gamma$
VALUE (keV)	CL%	DOCUMENT ID	TECN	COMMENT	

<0.095	95	ACCIARRI	01G	L3	183–202 $e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$
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$\Gamma(\rho^0\gamma) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$   $\Gamma_9/\Gamma_8/\Gamma$

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

<sup>21</sup> Using  $\eta(1405)$  mass and width 1410 MeV and 51 MeV, respectively.

<sup>22</sup> Assuming three-body phase-space decay to  $K_S^0 K^\pm \pi^\mp$ .

**$\eta(1405)$  BRANCHING RATIOS**

$\Gamma(\eta\pi\pi)/\Gamma(K\bar{K}\pi)$   $\Gamma_2/\Gamma_1$

VALUE                      CL%                      DOCUMENT ID      TECN      COMMENT

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

1.09 ± 0.48                      <sup>23</sup> AMSLER              04B      CBAR       $0 \bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\eta$

<0.5                      90                      EDWARDS              83B      CBAL       $J/\psi \rightarrow \eta\pi\pi\gamma$

<1.1                      90                      SCHARRE              80      MRK2       $J/\psi \rightarrow \eta\pi\pi\gamma$

<1.5                      95                      FOSTER              68B      HBC       $0.0 \bar{p}p$

$\Gamma(\rho^0\gamma)/\Gamma(\eta\pi\pi)$   $\Gamma_9/\Gamma_2$

VALUE                      DOCUMENT ID      TECN      COMMENT

**0.111 ± 0.064**                      AMSLER              04B      CBAR       $0 \bar{p}p$

$\Gamma(a_0(980)\pi)/\Gamma(K\bar{K}\pi)$   $\Gamma_3/\Gamma_1$

VALUE                      EVTS                      DOCUMENT ID      TECN      COMMENT

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

~ 0.15                      <sup>24</sup> BERTIN              95      OBLX       $0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$

~ 0.8                      500                      <sup>24</sup> DUCH              89      ASTE       $\bar{p}p \rightarrow \pi^+\pi^-\pi^+K^\pm\pi^\mp K^0$

~ 0.75                      <sup>24</sup> REEVES              86      SPEC       $6.6 \rho\bar{p} \rightarrow KK\pi X$

$\Gamma(a_0(980)\pi)/\Gamma(\eta\pi\pi)$   $\Gamma_3/\Gamma_2$

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       $0 \rho\bar{p} \rightarrow \eta\pi^0\pi^0\pi^0$

0.19 ± 0.04                      2200                      <sup>25</sup> ALDE              97B      GAM4       $100 \pi^-p \rightarrow \eta\pi^0\pi^0n$

0.56 ± 0.04 ± 0.03                      <sup>25</sup> AMSLER              95F      CBAR       $0 \bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$

$\Gamma(a_0(980)\pi)/\Gamma(\eta(\pi\pi)_{\text{S-wave}})$   $\Gamma_3/\Gamma_4$

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       $0.0 \bar{p}p \rightarrow \eta\pi^+\pi^-\pi^+\pi^-$

0.15 ± 0.04                      9082                      MANAK              00A      MPS       $18 \pi^-p \rightarrow \eta\pi^+\pi^-n$

0.70 ± 0.12 ± 0.20                      <sup>26</sup> BAI              99      BES       $J/\psi \rightarrow \gamma\eta\pi^+\pi^-$



$\Gamma(\rho^0\gamma)/\Gamma(K\bar{K}\pi)$

$\Gamma_9/\Gamma_1$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.0152±0.0038</b>	<sup>27</sup> COFFMAN 90	MRK3	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$

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

$\Gamma_4/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.81±0.04	2200	ALDE	97B	GAM4 100 $\pi^- p \rightarrow \eta\pi^0\pi^0 n$
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$\Gamma(a_0(980)\pi)/\Gamma(\eta(\pi\pi)_{S\text{-wave}})$

$\Gamma_3/\Gamma_4$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.32±0.07	<sup>28</sup> ANISOVICH 99	SPEC	0.9–1.2 $\bar{p}p \rightarrow \eta 3\pi^0$
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$\Gamma(\rho\rho)/\Gamma_{\text{total}}$

$\Gamma_7/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt;0.58</b>	99.85 <sup>23,29</sup>	AMSLER	04B	CBAR 0 $\bar{p}p$
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$\Gamma(K^*(892)K)/\Gamma(a_0(980)\pi)$

$\Gamma_{11}/\Gamma_3$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.084±0.024	<sup>30</sup> ADAMS	01B	B852 18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
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$\Gamma(\phi\gamma)/\Gamma(\rho^0\gamma)$

$\Gamma_{10}/\Gamma_9$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.77	95	<sup>31</sup> BAI	04J	BES2 $J/\psi \rightarrow \gamma\gamma K^+ K^-$
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<sup>23</sup> Using the data of BAILLON 67 on  $\bar{p}p \rightarrow K\bar{K}\pi$ .

<sup>24</sup> Assuming that the  $a_0(980)$  decays only into  $K\bar{K}$ .

<sup>25</sup> Assuming that the  $a_0(980)$  decays only into  $\eta\pi$ .

<sup>26</sup> Assuming that the  $a_0(980)$  decays only into  $\eta\pi$ .

<sup>27</sup> Using  $B(J/\psi \rightarrow \gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi) = 4.2 \times 10^{-3}$  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  $f_1(1420)$ .

<sup>28</sup> Using preliminary Crystal Barrel data.

<sup>29</sup> Assuming that the  $\eta(1405)$  decays are saturated by the  $\pi\pi\eta$ ,  $K\bar{K}\pi$  and  $\rho\rho$  modes.

<sup>30</sup> Statistical error only.

<sup>31</sup> Calculated by us from  $B(J/\psi \rightarrow \eta(1405)\gamma \rightarrow \phi\gamma\gamma) < 0.82 \times 10^{-4}$  and  $B(J/\psi \rightarrow \eta(1405)\gamma \rightarrow \rho^0\gamma\gamma) = (1.07 \pm 0.17 \pm 0.11) \times 10^{-4}$ .

## $\eta(1405)$ REFERENCES

AHOHE	05	PR D71 072001	R. Ahohe <i>et al.</i>	(CLEO Collab.)
AMSLER	04B	EPJ C33 23	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
BAI	04J	PL B594 47	J.Z. Bai <i>et al.</i>	(BES Collab.)
NICHITIU	02	PL B545 261	F. Nichitiu <i>et al.</i>	(OBELIX Collab.)
ACCIARRI	01G	PL B501 1	M. Acciari <i>et al.</i>	(L3 Collab.)
ADAMS	01B	PL B516 264	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)
ANISOVICH	01	NP A690 567	A.V. Anisovich <i>et al.</i>	
MANAK	00A	PR D62 012003	J.J. Manak <i>et al.</i>	(BNL E852 Collab.)
ANISOVICH	99I	PL B468 304	A.V. Anisovich <i>et al.</i>	
BAI	99	PL B446 356	J.Z. Bai <i>et al.</i>	(BES Collab.)
CICALO	99	PL B462 453	C. Cicalo <i>et al.</i>	(OBELIX Collab.)
ABELE	98E	NP B514 45	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
BAI	98C	PL B440 217	J.Z. Bai <i>et al.</i>	(BES Collab.)
ALDE	97B	PAN 60 386	D. Alde <i>et al.</i>	(GAMS Collab.)
		Translated from YAF 60 458.		
BERTIN	97	PL B400 226	A. Bertin <i>et al.</i>	(OBELIX Collab.)
AMSLER	95F	PL B358 389	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
BERTIN	95	PL B361 187	A. Bertin <i>et al.</i>	(OBELIX Collab.)
BUGG	95	PL B353 378	D.V. Bugg <i>et al.</i>	(LOQM, PNPI, WASH)
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)
BOLTON	92B	PRL 69 1328	T. Bolton <i>et al.</i>	(Mark III Collab.)
FUKUI	91C	PL B267 293	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)
AUGUSTIN	90	PR D42 10	J.E. Augustin <i>et al.</i>	(DM2 Collab.)
BAI	90C	PRL 65 2507	Z. Bai <i>et al.</i>	(Mark III Collab.)
COFFMAN	90	PR D41 1410	D.M. Coffman <i>et al.</i>	(Mark III Collab.)
BISELLO	89B	PR D39 701	G. Busetto <i>et al.</i>	(DM2 Collab.)
DUCH	89	ZPHY C45 223	K.D. Duch <i>et al.</i>	(ASTERIX Collab.) JP
RATH	89	PR D40 693	M.G. Rath <i>et al.</i>	(NDAM, BRAN, BNL, CUNY+)
BIRMAN	88	PRL 61 1557	A. Birman <i>et al.</i>	(BNL, FSU, IND, MASD) JP
ANDO	86	PRL 57 1296	A. Ando <i>et al.</i>	(KEK, KYOT, NIRS, SAGA+) IJP
REEVES	86	PR D34 1960	D.F. Reeves <i>et al.</i>	(FLOR, BNL, IND+) JP
CHUNG	85	PRL 55 779	S.U. Chung <i>et al.</i>	(BNL, FLOR, IND+) JP
ALTHOFF	84E	PL 147B 487	M. Althoff <i>et al.</i>	(TASSO Collab.)
EDWARDS	83B	PRL 51 859	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)
EDWARDS	82E	PRL 49 259	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)
		Also PRL 50 219	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)
SCHARRE	80	PL 97B 329	D.L. Scharre <i>et al.</i>	(SLAC, LBL)
FOSTER	68B	NP B8 174	M. Foster <i>et al.</i>	(CERN, CDEF)
BAILLON	67	NC 50A 393	P.H. Baillon <i>et al.</i>	(CERN, CDEF, IRAD)

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LI	03C	EPJ C28 335	D.M. Li <i>et al.</i>	
LI	03D	IJMP A18 3335	D.M. Li <i>et al.</i>	
ADAMS	01	PRL 87 041801	T. Adams <i>et al.</i>	(NuTeV Collab.)
ANISOVICH	00F	EPJ A6 247	A.V. Anisovich <i>et al.</i>	
CARVALHO	99	EPJ C7 95	W.S. Carvalho <i>et al.</i>	
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CLOSE	97B	PR D55 5749	F. Close <i>et al.</i>	(RAL, RUTG, BEIJT)
CLOSE	97D	ZPHY C76 469	F.E. Close <i>et al.</i>	
BERTIN	96	PL B385 493	A. Bertin <i>et al.</i>	(Obelix Collab.)
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CALDWELL	90	Hadron 89 Conf. p 127	D.O. Caldwell	(UCSB)
LONGACRE	90	PR D42 874	R.S. Longacre	(BNL)
AHMAD	89	NP B (PROC.)8 50	S. Ahmad <i>et al.</i>	(ASTERIX Collab.)

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