

# $f_0(1500)$

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

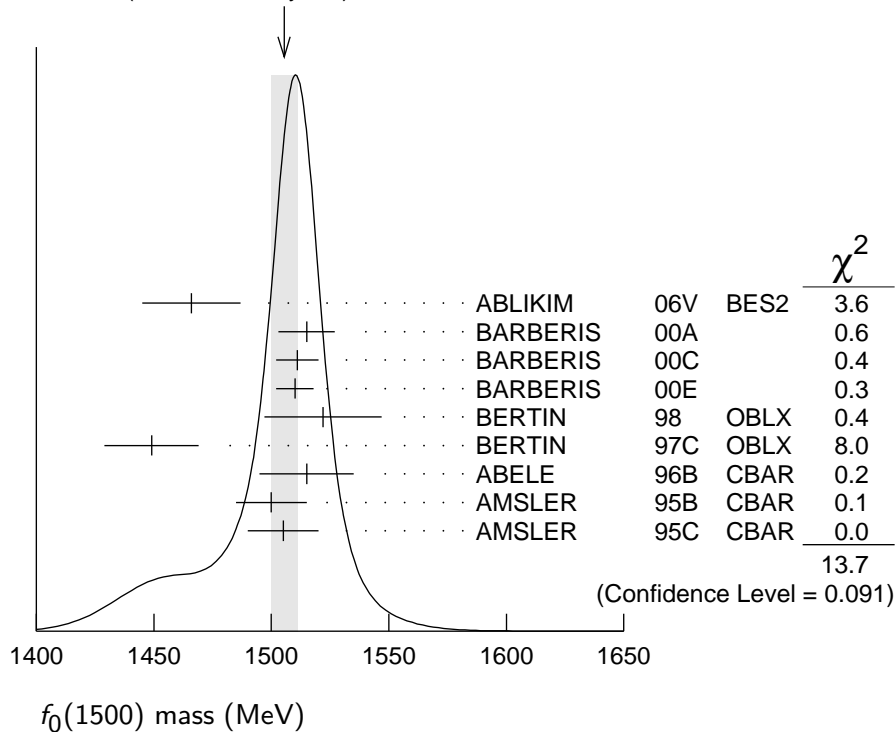
See also the mini-reviews on scalar mesons under  $f_0(500)$  (see the index for the page number) and on non- $q\bar{q}$  candidates in PDG 06, *Journal of Physics* (generic for all A,B,E,G) **G33** 1 (2006).

## $f_0(1500)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1505 ± 6 OUR AVERAGE</b>		Error includes scale factor of 1.3. See the ideogram below.		
1466 ± 6 ± 20		ABLIKIM	06V BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$
1515 ± 12		<sup>1</sup> BARBERIS	00A	450 $pp \rightarrow p_f \eta \eta p_S$
1511 ± 9		<sup>1,2</sup> BARBERIS	00C	450 $pp \rightarrow p_f 4\pi p_S$
1510 ± 8		<sup>1</sup> BARBERIS	00E	450 $pp \rightarrow p_f \eta \eta p_S$
1522 ± 25		BERTIN	98 OBLX	0.05–0.405 $\bar{n}p \rightarrow \pi^+\pi^+\pi^-$
1449 ± 20		<sup>1</sup> BERTIN	97C OBLX	0.0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
1515 ± 20		ABELE	96B CBAR	0.0 $\bar{p}p \rightarrow \pi^0 K_L^0 K_L^0$
1500 ± 15		<sup>3</sup> AMSLER	95B CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0$
1505 ± 15		<sup>4</sup> AMSLER	95C CBAR	0.0 $\bar{p}p \rightarrow \eta \eta \pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1486 ± 10		<sup>1</sup> ANISOVICH	09 RVUE	0.0 $\bar{p}p, \pi N$
1470 ± 60	568	<sup>5</sup> KLEMP	08 E791	$D_s^+ \rightarrow \pi^-\pi^+\pi^+$
1470 <sup>+</sup> <sub>−</sub> 6 <sup>+</sup> <sub>7−255</sub>		<sup>6</sup> UEHARA	08A BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
1495 ± 4		AMSLER	06 CBAR	0.9 $\bar{p}p \rightarrow K^+K^-\pi^0$
1539 ± 20	9.9k	AUBERT	06O BABR	$B^+ \rightarrow K^+K^+K^-$
1473 ± 5	80k	<sup>7,8</sup> UMAN	06 E835	5.2 $\bar{p}p \rightarrow \eta \eta \pi^0$
1478 ± 6		VLADIMIRSK...	06 SPEC	40 $\pi^-p \rightarrow K_S^0 K_S^0 n$
1493 ± 7		<sup>7</sup> BINON	05 GAMS	33 $\pi^-p \rightarrow \eta \eta n$
1524 ± 14	1400	<sup>9</sup> GARMASH	05 BELL	$B^+ \rightarrow K^+K^+K^-$
1489 <sup>+</sup> <sub>−</sub> 8 <sub>4</sub>		<sup>10</sup> ANISOVICH	03 RVUE	
1490 ± 30		<sup>7</sup> ABELE	01 CBAR	0.0 $\bar{p}d \rightarrow \pi^-4\pi^0 p$
1497 ± 10		<sup>7</sup> BARBERIS	99 OMEG	450 $pp \rightarrow p_S p_f K^+K^-$
1502 ± 10		<sup>7</sup> BARBERIS	99B OMEG	450 $pp \rightarrow p_S p_f \pi^+\pi^-$
1502 ± 12 ± 10		<sup>11</sup> BARBERIS	99D OMEG	450 $pp \rightarrow K^+K^-, \pi^+\pi^-$
1530 ± 45		<sup>7</sup> BELLAZZINI	99 GAM4	450 $pp \rightarrow p p \pi^0 \pi^0$
1505 ± 18		<sup>7</sup> FRENCH	99	300 $pp \rightarrow p_f (K^+K^-) p_S$
1447 ± 27		<sup>12</sup> KAMINSKI	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
1580 ± 80		<sup>7</sup> ALDE	98 GAM4	100 $\pi^-p \rightarrow \pi^0\pi^0 n$
1499 ± 8		<sup>1</sup> ANISOVICH	98B RVUE	Compilation
~ 1520		REYES	98 SPEC	800 $pp \rightarrow p_S p_f K_S^0 K_S^0$
1510 ± 20		<sup>1</sup> BARBERIS	97B OMEG	450 $pp \rightarrow p p 2(\pi^+\pi^-)$
~ 1475		FRABETTI	97D E687	$D_s^\pm \rightarrow \pi^\mp \pi^\pm \pi^\pm$
~ 1505		ABELE	96 CBAR	0.0 $\bar{p}p \rightarrow 5\pi^0$
1500 ± 8		<sup>1</sup> ABELE	96C RVUE	Compilation
1460 ± 20	120	<sup>7</sup> AMELIN	96B VES	37 $\pi^-A \rightarrow \eta \eta \pi^- A$

1500 ± 8	BUGG	96	RVUE	
1500 ± 10	13 AMSLER	95D	CBAR	0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta \eta, \pi^0 \pi^0 \eta$
1445 ± 5	14 ANTINORI	95	OMEG	300,450 $pp \rightarrow pp2(\pi^+ \pi^-)$
1497 ± 30	7 ANTINORI	95	OMEG	300,450 $pp \rightarrow pp\pi^+ \pi^-$
~ 1505	BUGG	95	MRK3	$J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$
1446 ± 5	7 ABATZIS	94	OMEG	450 $pp \rightarrow pp2(\pi^+ \pi^-)$
1545 ± 25	7 AMSLER	94E	CBAR	0.0 $\bar{p}p \rightarrow \pi^0 \eta \eta'$
1520 ± 25	1,15 ANISOVICH	94	CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0 \eta \eta$
1505 ± 20	1,16 BUGG	94	RVUE	$\bar{p}p \rightarrow 3\pi^0, \eta \eta \pi^0, \eta \pi^0 \pi^0$
1560 ± 25	7 AMSLER	92	CBAR	0.0 $\bar{p}p \rightarrow \pi^0 \eta \eta$
1550 ± 45 ± 30	7 BELADIDZE	92C	VES	36 $\pi^- \text{Be} \rightarrow \pi^- \eta' \eta \text{Be}$
1449 ± 4	7 ARMSTRONG	89E	OMEG	300 $pp \rightarrow pp2(\pi^+ \pi^-)$
1610 ± 20	7 ALDE	88	GAM4	300 $\pi^- N \rightarrow \pi^- N 2\eta$
~ 1525	ASTON	88D	LASS	11 $K^- p \rightarrow K_S^0 K_S^0 \Lambda$
1570 ± 20	600 7 ALDE	87	GAM4	100 $\pi^- p \rightarrow 4\pi^0 n$
1575 ± 45	17 ALDE	86D	GAM4	100 $\pi^- p \rightarrow 2\eta n$
1568 ± 33	7 BINON	84C	GAM2	38 $\pi^- p \rightarrow \eta \eta' n$
1592 ± 25	7 BINON	83	GAM2	38 $\pi^- p \rightarrow 2\eta n$
1525 ± 5	7 GRAY	83	DBC	0.0 $\bar{p}N \rightarrow 3\pi$

WEIGHTED AVERAGE  
1505 ± 6 (Error scaled by 1.3)



<sup>1</sup> T-matrix pole.

<sup>2</sup> Average between  $\pi^+ \pi^- 2\pi^0$  and  $2(\pi^+ \pi^-)$ .

<sup>3</sup> T-matrix pole, supersedes ANISOVICH 94.

<sup>4</sup> T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92.

<sup>5</sup> Reanalysis of AITALA 01A data. This state could also be  $f_0(1370)$ .

<sup>6</sup> Breit-Wigner mass. May also be the  $f_0(1370)$ .

<sup>7</sup> Breit-Wigner mass.

<sup>8</sup> Statistical error only.

<sup>9</sup> Breit-Wigner, solution 1, PWA ambiguous.

<sup>10</sup> K-matrix pole from combined analysis of  $\pi^- p \rightarrow \pi^0 \pi^0 n$ ,  $\pi^- p \rightarrow K \bar{K} n$ ,  $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$ ,  $\bar{p} p \rightarrow \pi^0 \pi^0 \pi^0$ ,  $\pi^0 \eta \eta$ ,  $\pi^0 \pi^0 \eta$ ,  $\pi^+ \pi^- \pi^0$ ,  $K^+ K^- \pi^0$ ,  $K_S^0 K_S^0 \pi^0$ ,  $K^+ K_S^0 \pi^-$  at rest,  $\bar{p} n \rightarrow \pi^- \pi^- \pi^+$ ,  $K_S^0 K^- \pi^0$ ,  $K_S^0 K_S^0 \pi^-$  at rest.

<sup>11</sup> Supersedes BARBERIS 99 and BARBERIS 99B.

<sup>12</sup> T-matrix pole on sheet  $--+$ .

<sup>13</sup> T-matrix pole. Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

<sup>14</sup> Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass.

<sup>15</sup> From a simultaneous analysis of the annihilations  $\bar{p} p \rightarrow 3\pi^0, \pi^0 \eta \eta$ .

<sup>16</sup> Reanalysis of ANISOVICH 94 data.

<sup>17</sup> From central value and spread of two solutions. Breit-Wigner mass.

### $f_0(1500)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>109 ± 7</b>	<b>OUR AVERAGE</b>			
108 <sup>+</sup> <sub>11</sub> ± 25		ABLIKIM	06V BES2	$e^+ e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$
110 ± 24		<sup>18</sup> BARBERIS	00A	450 $p p \rightarrow p_f \eta \eta p_S$
102 ± 18		<sup>18,19</sup> BARBERIS	00C	450 $p p \rightarrow p_f 4\pi p_S$
110 ± 16		<sup>18</sup> BARBERIS	00E	450 $p p \rightarrow p_f \eta \eta p_S$
108 ± 33		BERTIN	98 OBLX	0.05–0.405 $\bar{p} p \rightarrow \pi^+ \pi^+ \pi^-$
114 ± 30		<sup>18</sup> BERTIN	97C OBLX	0.0 $\bar{p} p \rightarrow \pi^+ \pi^- \pi^0$
105 ± 15		ABELE	96B CBAR	0.0 $\bar{p} p \rightarrow \pi^0 K_L^0 K_L^0$
120 ± 25		<sup>20</sup> AMSLER	95B CBAR	0.0 $\bar{p} p \rightarrow 3\pi^0$
120 ± 30		<sup>21</sup> AMSLER	95C CBAR	0.0 $\bar{p} p \rightarrow \eta \eta \pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
114 ± 10		<sup>18</sup> ANISOVICH	09 RVUE	0.0 $\bar{p} p, \pi N$
90 <sup>+</sup> <sub>1</sub> ± 2 <sup>+50</sup> <sub>1-22</sub>		<sup>22</sup> UEHARA	08A BELL	10.6 $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
121 ± 8		AMSLER	06 CBAR	0.9 $\bar{p} p \rightarrow K^+ K^- \pi^0$
257 ± 33	9.9k	AUBERT	06O BABR	$B^+ \rightarrow K^+ K^+ K^-$
108 ± 9	80k	<sup>23,24</sup> UMAN	06 E835	5.2 $\bar{p} p \rightarrow \eta \eta \pi^0$
119 ± 10		VLADIMIRSK...	06 SPEC	40 $\pi^- p \rightarrow K_S^0 K_S^0 n$
90 ± 15		<sup>23</sup> BINON	05 GAMS	33 $\pi^- p \rightarrow \eta \eta n$
136 ± 23	1400	<sup>25</sup> GARMASH	05 BELL	$B^+ \rightarrow K^+ K^+ K^-$
102 ± 10		<sup>26</sup> ANISOVICH	03 RVUE	
140 ± 40		<sup>23</sup> ABELE	01 CBAR	0.0 $\bar{p} d \rightarrow \pi^- 4\pi^0 p$
104 ± 25		<sup>23</sup> BARBERIS	99 OMEG	450 $p p \rightarrow p_S p_f K^+ K^-$
131 ± 15		<sup>23</sup> BARBERIS	99B OMEG	450 $p p \rightarrow p_S p_f \pi^+ \pi^-$
98 ± 18 ± 16		<sup>27</sup> BARBERIS	99D OMEG	450 $p p \rightarrow K^+ K^-, \pi^+ \pi^-$
160 ± 50		<sup>23</sup> BELLAZZINI	99 GAM4	450 $p p \rightarrow p p \pi^0 \pi^0$
100 ± 33		<sup>23</sup> FRENCH	99	300 $p p \rightarrow p_f (K^+ K^-) p_S$
108 ± 46		<sup>28</sup> KAMINSKI	99 RVUE	$\pi \pi \rightarrow \pi \pi, K \bar{K}, \sigma \sigma$
280 ± 100		<sup>23</sup> ALDE	98 GAM4	100 $\pi^- p \rightarrow \pi^0 \pi^0 n$
130 ± 20		<sup>18</sup> ANISOVICH	98B RVUE	Compilation

120 ± 35		18 BARBERIS	97B OMEG	450 $p\bar{p} \rightarrow p\rho 2(\pi^+\pi^-)$
~ 100		FRABETTI	97D E687	$D_S^\pm \rightarrow \pi^\mp \pi^\pm \pi^\pm$
~ 169		ABELE	96 CBAR	$0.0 \bar{p}p \rightarrow 5\pi^0$
100 ± 30	120	23 AMELIN	96B VES	$37 \pi^- A \rightarrow \eta\eta\pi^- A$
132 ± 15		BUGG	96 RVUE	
154 ± 30		29 AMSLER	95D CBAR	$0.0 \bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta,$ $\pi^0\pi^0\eta$
65 ± 10		30 ANTINORI	95 OMEG	300,450 $p\bar{p} \rightarrow p\rho 2(\pi^+\pi^-)$
199 ± 30		23 ANTINORI	95 OMEG	300,450 $p\bar{p} \rightarrow p\rho\pi^+\pi^-$
56 ± 12		23 ABATZIS	94 OMEG	450 $p\bar{p} \rightarrow p\rho 2(\pi^+\pi^-)$
100 ± 40		23 AMSLER	94E CBAR	$0.0 \bar{p}p \rightarrow \pi^0\eta\eta'$
148 <sup>+</sup> <sub>25</sub>		18,31 ANISOVICH	94 CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0, \pi^0\eta\eta$
150 ± 20		18,32 BUGG	94 RVUE	$\bar{p}p \rightarrow 3\pi^0, \eta\eta\pi^0, \eta\pi^0\pi^0$
245 ± 50		23 AMSLER	92 CBAR	$0.0 \bar{p}p \rightarrow \pi^0\eta\eta$
153 ± 67 ± 50		23 BELADIDZE	92C VES	$36 \pi^- \text{Be} \rightarrow \pi^- \eta' \eta \text{Be}$
78 ± 18		23 ARMSTRONG	89E OMEG	300 $p\bar{p} \rightarrow p\rho 2(\pi^+\pi^-)$
170 ± 40		23 ALDE	88 GAM4	300 $\pi^- N \rightarrow \pi^- N 2\eta$
150 ± 20	600	23 ALDE	87 GAM4	100 $\pi^- p \rightarrow 4\pi^0 n$
265 ± 65		33 ALDE	86D GAM4	100 $\pi^- p \rightarrow 2\eta n$
260 ± 60		23 BINON	84C GAM2	38 $\pi^- p \rightarrow \eta\eta' n$
210 ± 40		23 BINON	83 GAM2	38 $\pi^- p \rightarrow 2\eta n$
101 ± 13		23 GRAY	83 DBC	$0.0 \bar{p}N \rightarrow 3\pi$

18 T-matrix pole.

19 Average between  $\pi^+\pi^-\pi^0$  and  $2(\pi^+\pi^-)$ .

20 T-matrix pole, supersedes ANISOVICH 94.

21 T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92.

22 Breit-Wigner width. May also be the  $f_0(1370)$ .

23 Breit-Wigner width.

24 Statistical error only.

25 Breit-Wigner, solution 1, PWA ambiguous.

26 K-matrix pole from combined analysis of  $\pi^- p \rightarrow \pi^0\pi^0 n$ ,  $\pi^- p \rightarrow K\bar{K}n$ ,  $\pi^+\pi^- \rightarrow \pi^+\pi^-$ ,  $\bar{p}p \rightarrow \pi^0\pi^0\pi^0$ ,  $\pi^0\eta\eta$ ,  $\pi^0\pi^0\eta$ ,  $\pi^+\pi^-\pi^0$ ,  $K^+K^-\pi^0$ ,  $K_S^0 K_S^0 \pi^0$ ,  $K^+ K_S^0 \pi^-$  at rest,  $\bar{p}n \rightarrow \pi^-\pi^-\pi^+$ ,  $K_S^0 K^-\pi^0$ ,  $K_S^0 K_S^0 \pi^-$  at rest.

27 Supersedes BARBERIS 99 and BARBERIS 99B.

28 T-matrix pole on sheet  $--+$ .

29 T-matrix pole. Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

30 Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass.

31 From a simultaneous analysis of the annihilations  $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta\eta$ .

32 Reanalysis of ANISOVICH 94 data.

33 From central value and spread of two solutions. Breit-Wigner mass.

## $f_0(1500)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor
$\Gamma_1$ $\pi\pi$	$(34.9 \pm 2.3) \%$	1.2
$\Gamma_2$ $\pi^+\pi^-$	seen	
$\Gamma_3$ $2\pi^0$	seen	
$\Gamma_4$ $4\pi$	$(49.5 \pm 3.3) \%$	1.2
$\Gamma_5$ $4\pi^0$	seen	
$\Gamma_6$ $2\pi^+2\pi^-$	seen	
$\Gamma_7$ $2(\pi\pi)_{S\text{-wave}}$	seen	
$\Gamma_8$ $\rho\rho$	seen	
$\Gamma_9$ $\pi(1300)\pi$	seen	
$\Gamma_{10}$ $a_1(1260)\pi$	seen	
$\Gamma_{11}$ $\eta\eta$	$(5.1 \pm 0.9) \%$	1.4
$\Gamma_{12}$ $\eta\eta'(958)$	$(1.9 \pm 0.8) \%$	1.7
$\Gamma_{13}$ $K\bar{K}$	$(8.6 \pm 1.0) \%$	1.1
$\Gamma_{14}$ $\gamma\gamma$	not seen	

### CONSTRAINED FIT INFORMATION

An overall fit to 6 branching ratios uses 10 measurements and one constraint to determine 5 parameters. The overall fit has a  $\chi^2 = 11.4$  for 6 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients  $\langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j)$ , in percent, from the fit to the branching fractions,  $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$ . The fit constrains the  $x_i$  whose labels appear in this array to sum to one.

$x_4$	-83			
$x_{11}$	11	-52		
$x_{12}$	-5	-31	29	
$x_{13}$	39	-67	33	6
	$x_1$	$x_4$	$x_{11}$	$x_{12}$

### $f_0(1500)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	CL%	DOCUMENT ID	TECN	COMMENT	$\Gamma_1\Gamma_{14}/\Gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
$33^{+12+1809}_{-6-21}$		<sup>34</sup> UEHARA	08A BELL	$10.6 e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
not seen		ACCIARRI	01H L3	$\gamma\gamma \rightarrow K_S^0 K_S^0, E_{\text{cm}}^{ee} = 91, 183\text{--}209 \text{ GeV}$	
<460	95	BARATE	00E ALEP	$\gamma\gamma \rightarrow \pi^+\pi^-$	
<sup>34</sup> May also be the $f_0(1370)$ . Multiplied by us by 3 to obtain the $\pi\pi$ value.					

## $f_0(1500)$ BRANCHING RATIOS

### $\Gamma(\pi\pi)/\Gamma_{\text{total}}$

$\Gamma_1/\Gamma$

VALUE DOCUMENT ID TECN

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

0.454 ± 0.104      BUGG      96      RVUE

### $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

$\Gamma_2/\Gamma$

VALUE DOCUMENT ID TECN COMMENT

**seen**      BERTIN      98      OBLX      0.05–0.405  $\bar{p}p \rightarrow \pi^+\pi^+\pi^-$

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

possibly seen      FRABETTI      97D      E687       $D_S^\pm \rightarrow \pi^\mp \pi^\pm \pi^\pm$

### $\Gamma(4\pi)/\Gamma(\pi\pi)$

$\Gamma_4/\Gamma_1$

VALUE DOCUMENT ID TECN COMMENT

**1.42 ± 0.18 OUR FIT** Error includes scale factor of 1.2.

**1.42 ± 0.18 OUR AVERAGE** Error includes scale factor of 1.2.

1.37 ± 0.16      BARBERIS      00D      450  $pp \rightarrow p_f 4\pi p_S$

2.1 ± 0.6      35 AMSLER      98      RVUE

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

2.1 ± 0.2      36 ANISOVICH      02D      SPEC      Combined fit

3.4 ± 0.8      35 ABELE      96      CBAR      0.0  $\bar{p}p \rightarrow 5\pi^0$

### $\Gamma(2(\pi\pi)_{S\text{-wave}})/\Gamma(\pi\pi)$

$\Gamma_7/\Gamma_1$

VALUE DOCUMENT ID TECN COMMENT

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

0.42 ± 0.26      37 ABELE      01      CBAR      0.0  $\bar{p}d \rightarrow \pi^- 4\pi^0 p$

### $\Gamma(2(\pi\pi)_{S\text{-wave}})/\Gamma(4\pi)$

$\Gamma_7/\Gamma_4$

VALUE DOCUMENT ID TECN COMMENT

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

0.26 ± 0.07      ABELE      01B      CBAR      0.0  $\bar{p}d \rightarrow 5\pi p$

### $\Gamma(\rho\rho)/\Gamma(4\pi)$

$\Gamma_8/\Gamma_4$

VALUE DOCUMENT ID TECN COMMENT

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

0.13 ± 0.08      ABELE      01B      CBAR      0.0  $\bar{p}d \rightarrow 5\pi p$

### $\Gamma(\rho\rho)/\Gamma(2(\pi\pi)_{S\text{-wave}})$

$\Gamma_8/\Gamma_7$

VALUE DOCUMENT ID COMMENT

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

3.3 ± 0.5      BARBERIS      00C      450  $pp \rightarrow p_f \pi^+ \pi^- 2\pi^0 p_S$

2.6 ± 0.4      BARBERIS      00C      450  $pp \rightarrow p_f 2(\pi^+ \pi^-) p_S$

### $\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$

$\Gamma_9/\Gamma_4$

VALUE DOCUMENT ID TECN COMMENT

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

0.50 ± 0.25      ABELE      01B      CBAR      0.0  $\bar{p}d \rightarrow 5\pi p$

$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$

$\Gamma_{10}/\Gamma_4$

VALUE	DOCUMENT ID	TECN	COMMENT
0.12 ± 0.05	ABELE	01B	CBAR 0.0 $\bar{p}d \rightarrow 5\pi p$

$\Gamma(\eta\eta)/\Gamma_{total}$

$\Gamma_{11}/\Gamma$

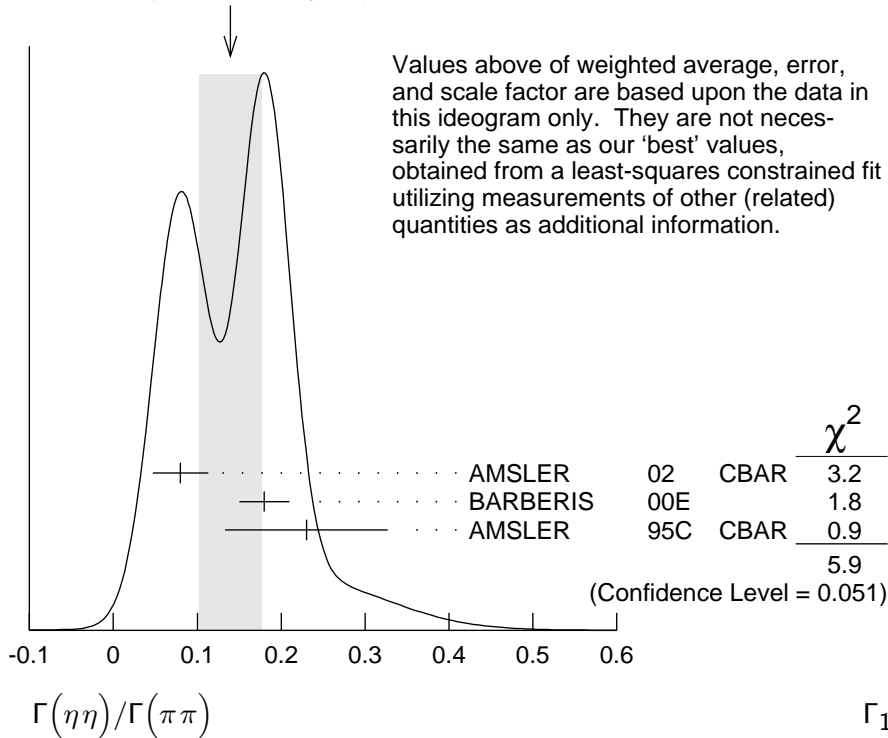
VALUE	DOCUMENT ID	TECN	COMMENT
large	ALDE	88	GAM4 300 $\pi^- N \rightarrow \eta\eta\pi^- N$
large	BINON	83	GAM2 38 $\pi^- p \rightarrow 2\eta n$

$\Gamma(\eta\eta)/\Gamma(\pi\pi)$

$\Gamma_{11}/\Gamma_1$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.145 ± 0.027 OUR FIT</b>	Error includes scale factor of 1.5.		
<b>0.14 ± 0.04 OUR AVERAGE</b>	Error includes scale factor of 1.7. See the ideogram below.		
0.080 ± 0.033	AMSLER	02	CBAR 0.9 $\bar{p}p \rightarrow \pi^0\eta\eta, \pi^0\pi^0\pi^0$
0.18 ± 0.03	BARBERIS	00E	450 $p p \rightarrow p_f \eta\eta p_s$
0.230 ± 0.097	38 AMSLER	95C	CBAR 0.0 $\bar{p}p \rightarrow \eta\eta\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.11 ± 0.03	36 ANISOVICH	02D	SPEC Combined fit
0.078 ± 0.013	39 ABELE	96C	RVUE Compilation
0.157 ± 0.060	40 AMSLER	95D	CBAR 0.0 $\bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$

WEIGHTED AVERAGE  
0.14 ± 0.04 (Error scaled by 1.7)



$\Gamma(4\pi^0)/\Gamma(\eta\eta)$   $\Gamma_5/\Gamma_{11}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.8 \pm 0.3$	ALDE	87	GAM4 100 $\pi^- p \rightarrow 4\pi^0 n$

$\Gamma(\eta\eta'(958))/\Gamma(\pi\pi)$   $\Gamma_{12}/\Gamma_1$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.055 ± 0.024 OUR FIT</b> Error includes scale factor of 1.8.			
<b>0.095 ± 0.026</b>	BARBERIS	00A	450 $pp \rightarrow p_f \eta \eta p_S$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.005 \pm 0.003$	<sup>36</sup> ANISOVICH	02D	SPEC Combined fit

$\Gamma(\eta\eta'(958))/\Gamma(\eta\eta)$   $\Gamma_{12}/\Gamma_{11}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.38 ± 0.16 OUR FIT</b> Error includes scale factor of 1.9.			
<b>0.29 ± 0.10</b>	<sup>41</sup> AMSLER	95C	CBAR 0.0 $\bar{p}p \rightarrow \eta\eta\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.05 \pm 0.03$	<sup>36</sup> ANISOVICH	02D	SPEC Combined fit
$0.84 \pm 0.23$	ABELE	96C	RVUE Compilation
$2.7 \pm 0.8$	BINON	84C	GAM2 38 $\pi^- p \rightarrow \eta\eta' n$

$\Gamma(K\bar{K})/\Gamma_{total}$   $\Gamma_{13}/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.044 \pm 0.021$	BUGG	96	RVUE

$\Gamma(K\bar{K})/\Gamma(\pi\pi)$   $\Gamma_{13}/\Gamma_1$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.246 ± 0.026 OUR FIT</b>			
<b>0.241 ± 0.028 OUR AVERAGE</b>			
$0.25 \pm 0.03$	<sup>42</sup> BARGIOTTI	03	OBLX $\bar{p}p$
$0.19 \pm 0.07$	<sup>43</sup> ABELE	98	CBAR 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.16 \pm 0.05$	<sup>36</sup> ANISOVICH	02D	SPEC Combined fit
$0.33 \pm 0.03 \pm 0.07$	BARBERIS	99D	OMEG 450 $pp \rightarrow K^+ K^-, \pi^+ \pi^-$
$0.20 \pm 0.08$	<sup>44</sup> ABELE	96B	CBAR 0.0 $\bar{p}p \rightarrow \pi^0 K_L^0 K_L^0$

$\Gamma(K\bar{K})/\Gamma(\eta\eta)$   $\Gamma_{13}/\Gamma_{11}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1.69 ± 0.33 OUR FIT</b> Error includes scale factor of 1.4.				
<b>1.85 ± 0.41</b>		BARBERIS	00E	450 $pp \rightarrow p_f \eta \eta p_S$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.5 \pm 0.6$		<sup>36</sup> ANISOVICH	02D	SPEC Combined fit
<0.4	90	<sup>45</sup> PROKOSHKIN	91	GAM4 300 $\pi^- p \rightarrow \pi^- p \eta \eta$
<0.6		<sup>46</sup> BINON	83	GAM2 38 $\pi^- p \rightarrow 2\eta n$



- 35 Excluding  $\rho\rho$  contribution to  $4\pi$ .  
 36 From a combined K-matrix analysis of Crystal Barrel ( $0^- \rho\bar{\rho} \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$ ), GAMS ( $\pi\rho \rightarrow \pi^0\pi^0n, \eta\eta n, \eta\eta' n$ ), and BNL ( $\pi\rho \rightarrow K\bar{K}n$ ) data.  
 37 From the combined data of ABELE 96 and ABELE 96C.  
 38 Using AMSLER 95B ( $3\pi^0$ ).  
 39  $2\pi$  width determined to be  $60 \pm 12$  MeV.  
 40 Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.  
 41 Using AMSLER 94E ( $\eta\eta'\pi^0$ ).  
 42 Coupled channel analysis of  $\pi^+\pi^-\pi^0, K^+K^-\pi^0$ , and  $K^\pm K_S^0\pi^\mp$ .  
 43 Using  $\pi^0\pi^0$  from AMSLER 95B.  
 44 Using AMSLER 95B ( $3\pi^0$ ), AMSLER 94C ( $2\pi^0\eta$ ) and SU(3).  
 45 Combining results of GAM4 with those of WA76 on  $K\bar{K}$  central production.  
 46 Using ETKIN 82B and COHEN 80.

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