$f_0(1500)$

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

See the reviews on "Scalar Mesons below 2 GeV" and on "Non-$q\overline{q}$ Mesons".

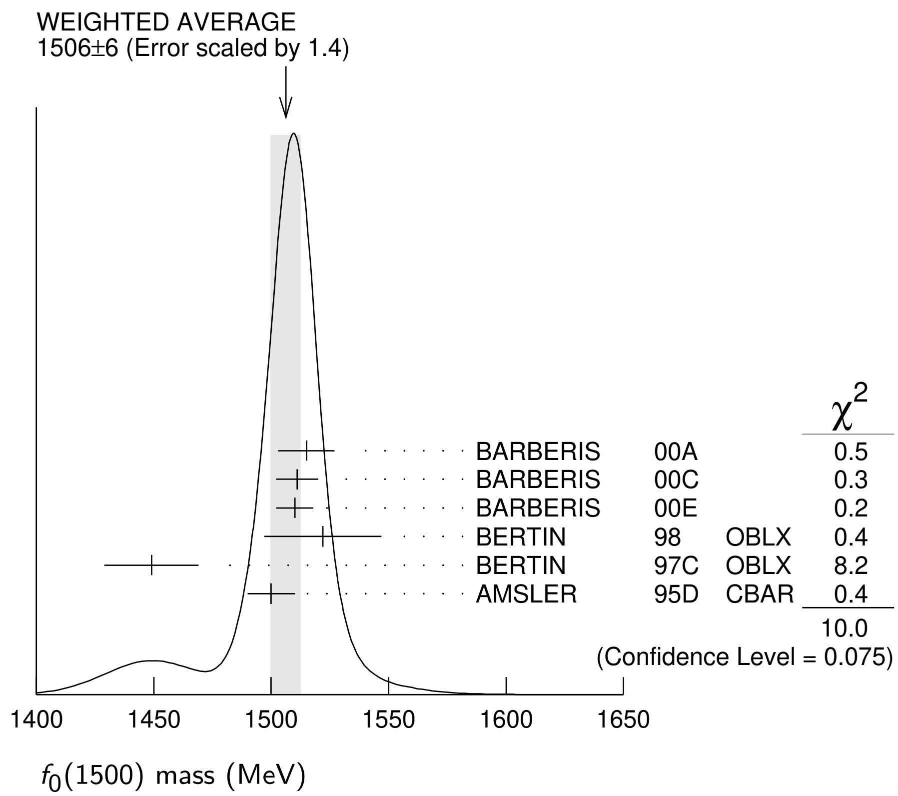
$f_0(1500)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1506 ± 6 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.		
1515 ±12		[1] BARBERIS 00A		450 $pp \to p_f \eta\eta p_s$
1511 ± 9		[1,2] BARBERIS 00C		450 $pp \to p_f 4\pi p_s$
1510 ± 8		[1] BARBERIS 00E		450 $pp \to p_f \eta\eta p_s$
1522 ±25		[1] BERTIN 98	OBLX	0.05–0.405 $\overline{n}p \to \pi^+\pi^+\pi^-$
1449 ±20		[1] BERTIN 97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
1500 ±10		[3] AMSLER 95D	CBAR	0.0 $\overline{p}p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1496 $\pm$ 1.2 $^{+\ 4.4}_{-26.4}$		[4] ALBRECHT 20	RVUE	0.9 $\overline{p}p \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$
1465 ±18		[5] ROPERTZ 18	RVUE	$\overline{B}{}^0_s \to J/\psi(\pi^+\pi^-/K^+K^-)$
1447 ±16 ± 13	163	[6,7] DOBBS 15		$J/\psi \to \gamma\pi^+\pi^-$
1442 ± 9 ± 4	261	[6,7] DOBBS 15		$\psi(2S) \to \gamma\pi^+\pi^-$
1460.9± 2.9		[8] AAIJ 14BR	LHCB	$\overline{B}{}^0_s \to J/\psi\pi^+\pi^-$
1468 $^{+14}_{-15}$ $^{+\ 23}_{-\ 74}$	5.5k	[9] ABLIKIM 13N	BES3	$e^+e^- \to J/\psi \to \gamma\eta\eta$
1486 ±10		[1] ANISOVICH 09	RVUE	0.0 $\overline{p}p$, πN
1470 ±60	568	[10] KLEMPT 08	E791	$D_s^+ \to \pi^-\pi^+\pi^+$
1470 $^{+\ 6}_{-\ 7}$ $^{+\ 72}_{-255}$		[11] UEHARA 08A	BELL	10.6 $e^+e^- \to e^+e^-\pi^0\pi^0$
1466 ± 6 ± 20		[12] ABLIKIM 06V	BES2	$e^+e^- \to J/\psi \to \gamma\pi^+\pi^-$
1495 ± 4		AMSLER 06	CBAR	0.9 $\overline{p}p \to K^+K^-\pi^0$
1539 ±20	9.9k	AUBERT 06O	BABR	$B^+ \to K^+K^+K^-$
1473 ± 5	80k	[12,13] UMAN 06	E835	5.2 $\overline{p}p \to \eta\eta\pi^0$
1478 ± 6		VLADIMIRSK... 06	SPEC	40 $\pi^- p \to K^0_S K^0_S n$
1493 ± 7		[12] BINON 05	GAMS	33 $\pi^- p \to \eta\eta n$
1524 ±14	1400	[14] GARMASH 05	BELL	$B^+ \to K^+K^+K^-$
1489 $^{+\ 8}_{-\ 4}$		[15] ANISOVICH 03	RVUE	
1490 ±30		[12] ABELE 01	CBAR	0.0 $\overline{p}d \to \pi^- 4\pi^0 p$
1497 ±10		[12] BARBERIS 99	OMEG	450 $pp \to p_s p_f K^+K^-$
1502 ±10		[12] BARBERIS 99B	OMEG	450 $pp \to p_s p_f \pi^+\pi^-$
1502 ±12 ± 10		[16] BARBERIS 99D	OMEG	450 $pp \to K^+K^-$, $\pi^+\pi^-$
1530 ±45		[12] BELLAZZINI 99	GAM4	450 $pp \to pp\pi^0\pi^0$
1505 ±18		[12] FRENCH 99		300 $pp \to p_f(K^+K^-)p_s$

1447 ± 27			[17] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\sigma\sigma$
1580 ± 80			[12] ALDE	98	GAM4	100 $\pi^- p \to \pi^0 \pi^0 n$
1499 $\pm$ 8			[1] ANISOVICH	98B	RVUE	Compilation
$\sim$ 1520			REYES	98	SPEC	800 $p p \to p_s p_f K^0_S K^0_S$
1510 ± 20			[1] BARBERIS	97B	OMEG	450 $p p \to p p 2(\pi^+ \pi^-)$
$\sim$ 1475			FRABETTI	97D	E687	$D^\pm_s \to \pi^\mp \pi^\pm \pi^\pm$
$\sim$ 1505			ABELE	96	CBAR	0.0 $\overline{p} p \to 5\pi^0$
1515 ± 20			ABELE	96B	CBAR	0.0 $\overline{p} p \to \pi^0 K^0_L K^0_L$
1500 $\pm$ 8			[1] ABELE	96C	RVUE	Compilation
1460 ± 20		120	[12] AMELIN	96B	VES	37 $\pi^- A \to \eta\eta\pi^- A$
1500 $\pm$ 8			BUGG	96	RVUE	
1500 ± 15			[18] AMSLER	95B	CBAR	0.0 $\overline{p} p \to 3\pi^0$
1505 ± 15			[19] AMSLER	95C	CBAR	0.0 $\overline{p} p \to \eta\eta\pi^0$
1445 $\pm$ 5			[20] ANTINORI	95	OMEG	300,450 $p p \to p p 2(\pi^+ \pi^-)$
1497 ± 30			[12] ANTINORI	95	OMEG	300,450 $p p \to p p \pi^+ \pi^-$
$\sim$ 1505			BUGG	95	MRK3	$J/\psi \to \gamma \pi^+ \pi^- \pi^+ \pi^-$
1446 $\pm$ 5			[12] ABATZIS	94	OMEG	450 $p p \to p p 2(\pi^+ \pi^-)$
1545 ± 25			[12] AMSLER	94E	CBAR	0.0 $\overline{p} p \to \pi^0 \eta\eta'$
1520 ± 25			[1,21] ANISOVICH	94	CBAR	0.0 $\overline{p} p \to 3\pi^0, \pi^0 \eta\eta$
1505 ± 20			[1,22] BUGG	94	RVUE	$\overline{p} p \to 3\pi^0$, $\eta\eta\pi^0$, $\eta\pi^0\pi^0$
1560 ± 25			[12] AMSLER	92	CBAR	0.0 $\overline{p} p \to \pi^0 \eta\eta$
1550 ± 45	$\pm$ 30		[12] BELADIDZE	92C	VES	36 π^- Be $\to \pi^- \eta' \eta$ Be
1449 $\pm$ 4			[12] ARMSTRONG	89E	OMEG	300 $p p \to p p 2(\pi^+ \pi^-)$
1610 ± 20			[12] ALDE	88	GAM4	300 $\pi^- N \to \pi^- N 2\eta$
$\sim$ 1525			ASTON	88D	LASS	11 $K^- p \to K^0_S K^0_S \Lambda$
1570 ± 20		600	[12] ALDE	87	GAM4	100 $\pi^- p \to 4\pi^0 n$
1575 ± 45			[23] ALDE	86D	GAM4	100 $\pi^- p \to 2\eta n$
1568 ± 33			[12] BINON	84C	GAM2	38 $\pi^- p \to \eta\eta' n$
1592 ± 25			[12] BINON	83	GAM2	38 $\pi^- p \to 2\eta n$
1525 $\pm$ 5			[12] GRAY	83	DBC	0.0 $\overline{p} N \to 3\pi$

[1] T-matrix pole.
[2] Average between $\pi^+ \pi^- 2\pi^0$ and $2(\pi^+ \pi^-)$.
[3] T-matrix pole. Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.
[4] T-matrix pole, 5 poles, 5 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\overline{K}$), BINON 83 ($\eta\eta$), and BINON 84C ($\eta\eta'$).
[5] T-matrix pole of 3 channel unitary model fit to data from AAIJ 14BR and AAIJ 17V extracted using Pade approximants.
[6] Using CLEO-c data but not authored by the CLEO Collaboration.
[7] From a fit to a Breit-Wigner line shape with fixed $\Gamma = 109$ MeV.
[8] Solution I, statistical error only.
[9] From partial wave analysis including all possible combinations of 0^{++}, 2^{++}, and 4^{++} resonances.
[10] Reanalysis of AITALA 01A data. This state could also be $f_0(1370)$.
[11] Breit-Wigner mass. May also be the $f_0(1370)$.
[12] Breit-Wigner mass.
[13] Statistical error only.

[14] Breit-Wigner, solution 1, PWA ambiguous.
[15] K-matrix pole from combined analysis of $\pi^- p \to \pi^0 \pi^0 n$, $\pi^- p \to K \overline{K} n$, $\pi^+ \pi^- \to \pi^+ \pi^-$, $\overline{p} p \to \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K^0_S K^0_S \pi^0$, $K^+ K^0_S \pi^-$ at rest, $\overline{p} n \to \pi^- \pi^- \pi^+$, $K^0_S K^- \pi^0$, $K^0_S K^0_S \pi^-$ at rest.
[16] Supersedes BARBERIS 99 and BARBERIS 99B.
[17] T-matrix pole on sheet $--+$.
[18] T-matrix pole, supersedes ANISOVICH 94.
[19] T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92.
[20] Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass.
[21] From a simultaneous analysis of the annihilations $\overline{p} p \to 3\pi^0, \pi^0 \eta \eta$.
[22] Reanalysis of ANISOVICH 94 data.
[23] From central value and spread of two solutions. Breit-Wigner mass.



$f_0(1500)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
112 ± 9 OUR AVERAGE					
110 ± 24		[1] BARBERIS	00A		450 $p p \to p_f \eta \eta p_s$
102 ± 18		[1,2] BARBERIS	00C		450 $p p \to p_f 4\pi p_s$
110 ± 16		[1] BARBERIS	00E		450 $p p \to p_f \eta \eta p_s$
108 ± 33		[1] BERTIN	98	OBLX	0.05–0.405 $\overline{n} p \to \pi^+ \pi^+ \pi^-$
114 ± 30		[1] BERTIN	97C	OBLX	0.0 $\overline{p} p \to \pi^+ \pi^- \pi^0$
154 ± 30		[3] AMSLER	95D	CBAR	0.0 $\overline{p} p \to \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$

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

$80.8 \pm 0.6^{+20.0}_{-5.0}$		[4] ALBRECHT	20	RVUE	$0.9\ \overline{p}p \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0K^+K^-$
100 ± 18		[5] ROPERTZ	18	RVUE	$\overline{B}^0_s \to J/\psi(\pi^+\pi^-/K^+K^-)$
124 ± 7		[6] AAIJ	14BR	LHCB	$\overline{B}^0_s \to J/\psi\pi^+\pi^-$
$136^{+41}_{-26}{}^{+28}_{-100}$	5.5k	[7] ABLIKIM	13N	BES3	$e^+e^- \to J/\psi \to \gamma\eta\eta$
114 ± 10		[1] ANISOVICH	09	RVUE	$0.0\ \overline{p}p$, πN
$90^{+2}_{-1}{}^{+50}_{-22}$		[8] UEHARA	08A	BELL	$10.6\ e^+e^- \to e^+e^-\pi^0\pi^0$
$108^{+14}_{-11} \pm 25$		[9] ABLIKIM	06V	BES2	$e^+e^- \to J/\psi \to \gamma\pi^+\pi^-$
121 ± 8		AMSLER	06	CBAR	$0.9\ \overline{p}p \to K^+K^-\pi^0$
257 ± 33	9.9k	AUBERT	06O	BABR	$B^+ \to K^+K^+K^-$
108 ± 9	80k	[9,10] UMAN	06	E835	$5.2\ \overline{p}p \to \eta\eta\pi^0$
119 ± 10		VLADIMIRSK...	06	SPEC	$40\ \pi^-p \to K^0_S K^0_S n$
90 ± 15		[9] BINON	05	GAMS	$33\ \pi^-p \to \eta\eta n$
136 ± 23	1400	[11] GARMASH	05	BELL	$B^+ \to K^+K^+K^-$
102 ± 10		[12] ANISOVICH	03	RVUE	
140 ± 40		[9] ABELE	01	CBAR	$0.0\ \overline{p}d \to \pi^-4\pi^0 p$
104 ± 25		[9] BARBERIS	99	OMEG	$450\ pp \to p_s p_f K^+K^-$
131 ± 15		[9] BARBERIS	99B	OMEG	$450\ pp \to p_s p_f \pi^+\pi^-$
$98 \pm 18 \pm 16$		[13] BARBERIS	99D	OMEG	$450\ pp \to K^+K^-$, $\pi^+\pi^-$
160 ± 50		[9] BELLAZZINI	99	GAM4	$450\ pp \to pp\pi^0\pi^0$
100 ± 33		[9] FRENCH	99		$300\ pp \to p_f(K^+K^-)p_s$
108 ± 46		[14] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi$, $K\overline{K}$, $\sigma\sigma$
280 ± 100		[9] ALDE	98	GAM4	$100\ \pi^-p \to \pi^0\pi^0 n$
130 ± 20		[1] ANISOVICH	98B	RVUE	Compilation
120 ± 35		[1] BARBERIS	97B	OMEG	$450\ pp \to pp2(\pi^+\pi^-)$
~ 100		FRABETTI	97D	E687	$D^\pm_s \to \pi^\mp\pi^\pm\pi^\pm$
~ 169		ABELE	96	CBAR	$0.0\ \overline{p}p \to 5\pi^0$
105 ± 15		ABELE	96B	CBAR	$0.0\ \overline{p}p \to \pi^0K^0_L K^0_L$
100 ± 30	120	[9] AMELIN	96B	VES	$37\ \pi^-A \to \eta\eta\pi^-A$
132 ± 15		BUGG	96	RVUE	
120 ± 25		[15] AMSLER	95B	CBAR	$0.0\ \overline{p}p \to 3\pi^0$
120 ± 30		[16] AMSLER	95C	CBAR	$0.0\ \overline{p}p \to \eta\eta\pi^0$
65 ± 10		[17] ANTINORI	95	OMEG	$300,450\ pp \to pp2(\pi^+\pi^-)$
199 ± 30		[9] ANTINORI	95	OMEG	$300,450\ pp \to pp\pi^+\pi^-$
56 ± 12		[9] ABATZIS	94	OMEG	$450\ pp \to pp2(\pi^+\pi^-)$
100 ± 40		[9] AMSLER	94E	CBAR	$0.0\ \overline{p}p \to \pi^0\eta\eta'$
148^{+20}_{-25}		[1,18] ANISOVICH	94	CBAR	$0.0\ \overline{p}p \to 3\pi^0, \pi^0\eta\eta$
150 ± 20		[1,19] BUGG	94	RVUE	$\overline{p}p \to 3\pi^0$, $\eta\eta\pi^0$, $\eta\pi^0\pi^0$

245 ± 50		[9] AMSLER	92	CBAR	0.0 $\overline{p}p \to \pi^0\eta\eta$
153 ± 67 ± 50		[9] BELADIDZE	92C	VES	36 π^- Be $\to \pi^-\eta'\eta$Be
78 ± 18		[9] ARMSTRONG	89E	OMEG	300 $pp \to pp2(\pi^+\pi^-)$
170 ± 40		[9] ALDE	88	GAM4	300 $\pi^- N \to \pi^- N 2\eta$
150 ± 20	600	[9] ALDE	87	GAM4	100 $\pi^- p \to 4\pi^0 n$
265 ± 65		[20] ALDE	86D	GAM4	100 $\pi^- p \to 2\eta n$
260 ± 60		[9] BINON	84C	GAM2	38 $\pi^- p \to \eta\eta' n$
210 ± 40		[9] BINON	83	GAM2	38 $\pi^- p \to 2\eta n$
101 ± 13		[9] GRAY	83	DBC	0.0 $\overline{p}N \to 3\pi$

[1] T-matrix pole.
[2] Average between $\pi^+\pi^- 2\pi^0$ and $2(\pi^+\pi^-)$.
[3] T-matrix pole. Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.
[4] T-matrix pole, 5 poles, 5 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\overline{K}$), BINON 83 ($\eta\eta$), and BINON 84C ($\eta\eta'$).
[5] T-matrix pole of 3 channel unitary model fit to data from AAIJ 14BR and AAIJ 17V extracted using Pade approximants.
[6] Solution I, statistical error only.
[7] From partial wave analysis including all possible combinations of 0^{++}, 2^{++}, and 4^{++} resonances.
[8] Breit-Wigner width. May also be the $f_0(1370)$.
[9] Breit-Wigner width.
[10] Statistical error only.
[11] Breit-Wigner, solution 1, PWA ambiguous.
[12] K-matrix pole from combined analysis of $\pi^- p \to \pi^0\pi^0 n$, $\pi^- p \to K\overline{K} n$, $\pi^+\pi^- \to \pi^+\pi^-$, $\overline{p}p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$, $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, $K^0_S K^0_S \pi^0$, $K^+ K^0_S \pi^-$ at rest, $\overline{p}n \to \pi^-\pi^-\pi^+$, $K^0_S K^-\pi^0$, $K^0_S K^0_S \pi^-$ at rest.
[13] Supersedes BARBERIS 99 and BARBERIS 99B.
[14] T-matrix pole on sheet $--+$.
[15] T-matrix pole, supersedes ANISOVICH 94.
[16] T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92.
[17] Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass.
[18] From a simultaneous analysis of the annihilations $\overline{p}p \to 3\pi^0, \pi^0\eta\eta$.
[19] Reanalysis of ANISOVICH 94 data.
[20] From central value and spread of two solutions. Breit-Wigner mass.

$f_0(1500)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor
Γ_1	$\pi\pi$	(34.5±2.2) %	1.2
Γ_2	$\pi^+\pi^-$	seen	
Γ_3	$2\pi^0$	seen	
Γ_4	4π	(48.9±3.3) %	1.2
Γ_5	$4\pi^0$	seen	
Γ_6	$2\pi^+2\pi^-$	seen	
Γ_7	$2(\pi\pi)_{S\text{-wave}}$	seen	
Γ_8	$\rho\rho$	seen	
Γ_9	$\pi(1300)\pi$	seen	

Γ_{10}	$a_1(1260)\pi$	seen	
Γ_{11}	$\eta\eta$	(6.0±0.9) %	1.1
Γ_{12}	$\eta\eta'(958)$	(2.2±0.8) %	1.4
Γ_{13}	$K\overline{K}$	(8.5±1.0) %	1.1
Γ_{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 χ^2 = 5.6 for 6 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\left\langle\delta x_i \delta x_j\right\rangle/(\delta x_i{\cdot}\delta x_j)$, 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	−88			
x_{11}	27	−56		
x_{12}	3	−32	26	
x_{13}	43	−64	20	2
	x_1	x_4	x_{11}	x_{12}

$f_0(1500)$ Γ(i)Γ($\gamma\gamma$)/Γ(total)

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_1\Gamma_{14}/\Gamma$

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$33^{+12}_{-6}{}^{+1809}_{-21}$		[1] UEHARA	08A	BELL	10.6 $e^+e^- \to e^+e^-\pi^0\pi^0$
not seen		ACCIARRI	01H	L3	$\gamma\gamma \to K^0_S K^0_S$, E^{ee}_{cm}= 91, 183–209 GeV
<460	95	BARATE	00E	ALEP	$\gamma\gamma \to \pi^+\pi^-$

[1] May also be the $f_0(1370)$. Multiplied by us by 3 to obtain the $\pi\pi$ value.

$f_0(1500)$ BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.454±0.104	BUGG	96	RVUE

$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ — Γ_2/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
seen	BERTIN	98	OBLX	0.05–0.405 $\overline{n}p \to \pi^+\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
possibly seen	FRABETTI	97D	E687	$D^\pm_s \to \pi^\mp\pi^\pm\pi^\pm$

$\Gamma(4\pi)/\Gamma(\pi\pi)$ — Γ_4/Γ_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 $p p \to p_f 4\pi p_s$
2.1 ±0.6	[1] AMSLER	98	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.1 ±0.2	[2] ANISOVICH	02D	SPEC	Combined fit
3.4 ±0.8	[1] ABELE	96	CBAR	0.0 $\overline{p} p \to 5\pi^0$

[1] Excluding $\rho\rho$ contribution to 4π.

[2] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K} n$) data.

$\Gamma(2(\pi\pi)_{S\text{-wave}})/\Gamma(\pi\pi)$ — Γ_7/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.42±0.26	[1] ABELE	01	CBAR	0.0 $\overline{p} d \to \pi^- 4\pi^0 p$

[1] From the combined data of ABELE 96 and ABELE 96C.

$\Gamma(2(\pi\pi)_{S\text{-wave}})/\Gamma(4\pi)$ — Γ_7/Γ_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 $\overline{p} d \to 5\pi p$

$\Gamma(\rho\rho)/\Gamma(4\pi)$ — Γ_8/Γ_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 $\overline{p} d \to 5\pi p$

$\Gamma(\rho\rho)/\Gamma(2(\pi\pi)_{S\text{-wave}})$ — Γ_8/Γ_7

VALUE	DOCUMENT ID		COMMENT
2.87±0.34 OUR AVERAGE Error includes scale factor of 1.1.			
3.3 ±0.5	BARBERIS	00C	450 $p p \to p_f \pi^+ \pi^- 2\pi^0 p_s$
2.6 ±0.4	BARBERIS	00C	450 $p p \to p_f 2(\pi^+ \pi^-) p_s$

$\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$ — Γ_9/Γ_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 $\overline{p} d \to 5\pi p$

$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$ — Γ_{10}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.12±0.05	ABELE	01B	CBAR	0.0 $\overline{p} d \to 5\pi p$

$\Gamma(\eta\eta)/\Gamma_{\rm total}$ Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
large	ALDE	88	GAM4	300 $\pi^- N \to \eta\eta\pi^- N$
large	BINON	83	GAM2	38 $\pi^- p \to 2\eta n$

$\Gamma(\eta\eta)/\Gamma(\pi\pi)$ Γ_{11}/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.173±0.024 OUR FIT Error includes scale factor of 1.1.				
0.175±0.027 OUR AVERAGE				
0.18 ±0.03	BARBERIS	00E		450 $p p \to p_f \eta\eta p_s$
0.157±0.060	[1] AMSLER	95D	CBAR	0.0 $\overline{p} p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.080±0.033	AMSLER	02	CBAR	0.9 $\overline{p} p \to \pi^0\eta\eta$, $\pi^0\pi^0\pi^0$
0.11 ±0.03	[2] ANISOVICH	02D	SPEC	Combined fit
0.078±0.013	[3] ABELE	96C	RVUE	Compilation
0.230±0.097	[4] AMSLER	95C	CBAR	0.0 $\overline{p} p \to \eta\eta\pi^0$

[1] Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.
[2] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K} n$) data.
[3] 2π width determined to be 60 ± 12 MeV.
[4] Using AMSLER 95B ($3\pi^0$).

$\Gamma(4\pi^0)/\Gamma(\eta\eta)$ Γ_5/Γ_{11}

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

$\Gamma(\eta\eta'(958))/\Gamma(\pi\pi)$ Γ_{12}/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.064±0.022 OUR FIT Error includes scale factor of 1.4.				
0.095±0.026	BARBERIS	00A		450 $p p \to p_f \eta\eta p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.005±0.003	[1] ANISOVICH	02D	SPEC	Combined fit

[1] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K} n$) data.

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.37±0.13 OUR FIT Error includes scale factor of 1.5.				
0.29±0.10	[1] AMSLER	95C	CBAR	0.0 $\overline{p} p \to \eta\eta\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.05±0.03	[2] ANISOVICH	02D	SPEC	Combined fit
0.84±0.23	ABELE	96C	RVUE	Compilation
2.7 ±0.8	BINON	84C	GAM2	38 $\pi^- p \to \eta\eta' n$

[1] Using AMSLER 94E ($\eta\eta'\pi^0$).
[2] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K} n$) data.

$\Gamma(K\overline{K})/\Gamma_{total}$ — Γ_{13}/Γ

VALUE	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.044 ± 0.021	BUGG	96	RVUE

$\Gamma(K\overline{K})/\Gamma(\pi\pi)$ — Γ_{13}/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
0.246±0.025 OUR FIT				
0.236±0.026 OUR AVERAGE				
$0.25\ \pm0.03$	[1] BARGIOTTI	03	OBLX	$\overline{p}p$
$0.19\ \pm0.07$	[2] ABELE	98	CBAR	$0.0\ \overline{p}p \to K^0_L K^\pm \pi^\mp$
$0.20\ \pm0.08$	[3] ABELE	96B	CBAR	$0.0\ \overline{p}p \to \pi^0 K^0_L K^0_L$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.16\ \pm0.05$	[4] ANISOVICH	02D	SPEC	Combined fit
$0.33\ \pm0.03\ \pm0.07$	BARBERIS	99D	OMEG	$450\ pp \to K^+K^-, \pi^+\pi^-$

[1] Coupled channel analysis of $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, and $K^\pm K^0_S \pi^\mp$.

[2] Using $\pi^0\pi^0$ from AMSLER 95B.

[3] Using AMSLER 95B ($3\pi^0$), AMSLER 94C ($2\pi^0\eta$) and SU(3).

[4] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K}n$) data.

$\Gamma(K\overline{K})/\Gamma(\eta\eta)$ — Γ_{13}/Γ_{11}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
1.43±0.24 OUR FIT	Error includes scale factor of 1.1.				
1.85±0.41		BARBERIS	00E		$450\ pp \to p_f \eta\eta p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.5\ \pm0.6$		[1] ANISOVICH	02D	SPEC	Combined fit
<0.4	90	[2] PROKOSHKIN	91	GAM4	$300\ \pi^- p \to \pi^- p\eta\eta$
<0.6		[3] BINON	83	GAM2	$38\ \pi^- p \to 2\eta n$

[1] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K}n$) data.

[2] Combining results of GAM4 with those of WA76 on $K\overline{K}$ central production.

[3] Using ETKIN 82B and COHEN 80.

$f_0(1500)$ REFERENCES

ALBRECHT	20	EPJ C80 453	M. Albrecht et al.	(Crystal Barrel Collab.)
ROPERTZ	18	EPJ C78 1000	S. Ropertz, C. Hanhart, B. Kubis	(BONN, JULI)
AAIJ	17V	JHEP 1708 037	R. Aaij et al.	(LHCb Collab.)
DOBBS	15	PR D91 052006	S. Dobbs et al.	(NWES)
AAIJ	14BR	PR D89 092006	R. Aaij et al.	(LHCb Collab.)
ABLIKIM	13N	PR D87 092009	Ablikim M. et al.	(BESIII Collab.)
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
KLEMPT	08	EPJ C55 39	E. Klempt, M. Matveev, A.V. Sarantsev	(BONN+)
UEHARA	08A	PR D78 052004	S. Uehara et al.	(BELLE Collab.)
ABLIKIM	06V	PL B642 441	M. Ablikim et al.	(BES Collab.)
AMSLER	06	PL B639 165	C. Amsler et al.	(Crystal Barrel Collab.)
AUBERT	06O	PR D74 032003	B. Aubert et al.	(BABAR Collab.)
UMAN	06	PR D73 052009	I. Uman et al.	(FNAL E835)
VLADIMIRSK...	06	PAN 69 493	V.V. Vladimirsky et al.	(ITEP, Moscow)
		Translated from YAF 69 515.		
BINON	05	PAN 68 960	F. Binon et al.	
		Translated from YAF 68 998.		

GARMASH	05	PR D71 092003	A. Garmash *et al.*	(BELLE Collab.)
ANISOVICH	03	EPJ A16 229	V.V. Anisovich *et al.*	
BARGIOTTI	03	EPJ C26 371	M. Bargiotti *et al.*	(OBELIX Collab.)
AMSLER	02	EPJ C23 29	C. Amsler *et al.*	
ANISOVICH	02D	PAN 65 1545	V.V. Anisovich *et al.*	
		Translated from YAF 65 1583.		
ABELE	01	EPJ C19 667	A. Abele *et al.*	(Crystal Barrel Collab.)
ABELE	01B	EPJ C21 261	A. Abele *et al.*	(Crystal Barrel Collab.)
ACCIARRI	01H	PL B501 173	M. Acciarri *et al.*	(L3 Collab.)
AITALA	01A	PRL 86 765	E.M. Aitala *et al.*	(FNAL E791 Collab.)
BARATE	00E	PL B472 189	R. Barate *et al.*	(ALEPH Collab.)
BARBERIS	00A	PL B471 429	D. Barberis *et al.*	(WA 102 Collab.)
BARBERIS	00C	PL B471 440	D. Barberis *et al.*	(WA 102 Collab.)
BARBERIS	00D	PL B474 423	D. Barberis *et al.*	(WA 102 Collab.)
BARBERIS	00E	PL B479 59	D. Barberis *et al.*	(WA 102 Collab.)
BARBERIS	99	PL B453 305	D. Barberis *et al.*	(Omega Expt.)
BARBERIS	99B	PL B453 316	D. Barberis *et al.*	(Omega Expt.)
BARBERIS	99D	PL B462 462	D. Barberis *et al.*	(Omega Expt.)
BELLAZZINI	99	PL B467 296	R. Bellazzini *et al.*	
FRENCH	99	PL B460 213	B. French *et al.*	(WA76 Collab.)
KAMINSKI	99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN)
ABELE	98	PR D57 3860	A. Abele *et al.*	(Crystal Barrel Collab.)
ALDE	98	EPJ A3 361	D. Alde *et al.*	(GAM4 Collab.)
Also		PAN 62 405	D. Alde *et al.*	(GAMS Collab.)
		Translated from YAF 62 446.		
AMSLER	98	RMP 70 1293	C. Amsler	
ANISOVICH	98B	SPU 41 419	V.V. Anisovich *et al.*	
		Translated from UFN 168 481.		
BERTIN	98	PR D57 55	A. Bertin *et al.*	(OBELIX Collab.)
REYES	98	PRL 81 4079	M.A. Reyes *et al.*	
BARBERIS	97B	PL B413 217	D. Barberis *et al.*	(WA 102 Collab.)
BERTIN	97C	PL B408 476	A. Bertin *et al.*	(OBELIX Collab.)
FRABETTI	97D	PL B407 79	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
ABELE	96	PL B380 453	A. Abele *et al.*	(Crystal Barrel Collab.)
ABELE	96B	PL B385 425	A. Abele *et al.*	(Crystal Barrel Collab.)
ABELE	96C	NP A609 562	A. Abele *et al.*	(Crystal Barrel Collab.)
AMELIN	96B	PAN 59 976	D.V. Amelin *et al.*	(SERP, TBIL)
		Translated from YAF 59 1021.		
BUGG	96	NP B471 59	D.V. Bugg, A.V. Sarantsev, B.S. Zou	(LOQM, PNPI)
AMSLER	95B	PL B342 433	C. Amsler *et al.*	(Crystal Barrel Collab.)
AMSLER	95C	PL B353 571	C. Amsler *et al.*	(Crystal Barrel Collab.)
AMSLER	95D	PL B355 425	C. Amsler *et al.*	(Crystal Barrel Collab.)
ANTINORI	95	PL B353 589	F. Antinori *et al.*	(ATHU, BARI, BIRM+)
BUGG	95	PL B353 378	D.V. Bugg *et al.*	(LOQM, PNPI, WASH)
ABATZIS	94	PL B324 509	S. Abatzis *et al.*	(ATHU, BARI, BIRM+)
AMSLER	94C	PL B327 425	C. Amsler *et al.*	(Crystal Barrel Collab.)
AMSLER	94D	PL B333 277	C. Amsler *et al.*	(Crystal Barrel Collab.)
AMSLER	94E	PL B340 259	C. Amsler *et al.*	(Crystal Barrel Collab.)
ANISOVICH	94	PL B323 233	V.V. Anisovich *et al.*	(Crystal Barrel Collab.)
BUGG	94	PR D50 4412	D.V. Bugg *et al.*	(LOQM)
AMSLER	92	PL B291 347	C. Amsler *et al.*	(Crystal Barrel Collab.)
BELADIDZE	92C	SJNP 55 1535	G.M. Beladidze, S.I. Bityukov, G.V. Borisov	(SERP+)
		Translated from YAF 55 2748.		
PROKOSHKIN	91	SPD 36 155	Y.D. Prokoshkin	(GAM2 and GAM4 Collab.)
		Translated from DANS 316 900.		
ARMSTRONG	89E	PL B228 536	T.A. Armstrong, M. Benayoun	(ATHU, BARI, BIRM+)
ALDE	88	PL B201 160	D.M. Alde *et al.*	(SERP, BELG, LANL, LAPP+)
ASTON	88D	NP B301 525	D. Aston *et al.*	(SLAC, NAGO, CINC, INUS)
ALDE	87	PL B198 286	D.M. Alde *et al.*	(LANL, BRUX, SERP, LAPP)
ALDE	86D	NP B269 485	D.M. Alde *et al.*	(BELG, LAPP, SERP, CERN+)
LONGACRE	86	PL B177 223	R.S. Longacre *et al.*	(BNL, BRAN, CUNY+)
BINON	84C	NC 80A 363	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
BINON	83	NC 78A 313	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
Also		SJNP 38 561	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
		Translated from YAF 38 934.		
GRAY	83	PR D27 307	L. Gray *et al.*	(SYRA)
ETKIN	82B	PR D25 1786	A. Etkin *et al.*	(BNL, CUNY, TUFTS, VAND)
COHEN	80	PR D22 2595	D. Cohen *et al.*	(ANL)
HYAMS	75	NP B100 205	B.D. Hyams *et al.*	(CERN, MPIM)