NODE=M152

$f_0(1500)$

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

See the review on "Spectroscopy of Light Meson Resonances."

NODE=M152

$f_0(1500)$ T-MATRIX POLE $\sqrt{s}$

NODE=M152PP

Note that $\Gamma = -2\ \mathrm{Im}(\sqrt{s})$.

NODE=M152PP

NODE=M152PP

→ UNCHECKED ←

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
(1430–1530) − *i* (40–90) OUR ESTIMATE				
$(1450 \pm 10) - i\,(53 \pm 8)$	[1] RODAS	22	RVUE	$J/\psi(1S) \to \gamma\,(\pi\pi,\ K\overline{K})$
$(1483 \pm 15) - i\,(58 \pm 6)$	SARANTSEV	21	RVUE	$J/\psi(1S) \to \gamma\,(\pi\pi,\ K\overline{K},\ \eta\eta,\ \omega\phi)$
$(1496 \pm 1.2^{+\ 4.4}_{-26.4}) - i\,(40.4 \pm 0.3^{+10.0}_{-\ 2.5})$	[2] ALBRECHT	20	RVUE	$0.9\ \overline{p}p \to \pi^0\pi^0\eta,\ \pi^0\eta\eta,\ \pi^0 K^+ K^-$
$(1465 \pm 18) - i\,(50 \pm 9)$	[3] ROPERTZ	18	RVUE	$\overline{B}{}^0_s \to J/\psi(\pi^+\pi^- / K^+K^-)$
$(1486 \pm 10) - i\,(57 \pm 5)$	ANISOVICH	09	RVUE	$0.0\ \overline{p}p,\ \pi N$
$(1489^{+8}_{-4}) - i\,(51 \pm 5)$	[4] ANISOVICH	03	RVUE	
$(1515 \pm 12) - i\,(55 \pm 12)$	BARBERIS	00A		$450\ pp \to p_f\,(\eta\eta',\ \eta'\eta')\,p_s$
$(1511 \pm 9) - i\,(51 \pm 9)$	[5] BARBERIS	00C		$450\ pp \to p_f\,4\pi\,p_s$
$(1510 \pm 8) - i\,(55 \pm 8)$	BARBERIS	00E		$450\ pp \to p_f\,\eta\eta\,p_s$
$(1502 \pm 12 \pm 10) - i\,(49 \pm 9 \pm 8)$	[6] BARBERIS	99D	OMEG	$450\ pp \to K^+K^-,\ \pi^+\pi^-$
$(1447 \pm 27) - i\,(54 \pm 23)$	[7] KAMINSKI	99	RVUE	$\pi\pi \to \pi\pi,\ K\overline{K},\ \sigma\sigma$
$(1499 \pm 8) - i\,(65 \pm 10)$	ANISOVICH	98B	RVUE	Compilation.
$(1510 \pm 20) - i\,(60 \pm 18)$	BARBERIS	97B	OMEG	$450\ pp \to pp2(\pi^+\pi^-)$
$(1449 \pm 20) - i\,(57 \pm 15)$	BERTIN	97C	OBLX	$0.0\ \overline{p}p \to \pi^+\pi^-\pi^0$
$(1515 \pm 20) - i\,(53 \pm 8)$	ABELE	96B	CBAR	$0.0\ \overline{p}p \to \pi^0 K^0_L K^0_L$
$(1500 \pm 8) - i\,(66 \pm 8)$	ABELE	96C	RVUE	Compilation.
$(1500 \pm 10) - i\,(77 \pm 15)$	[8] AMSLER	95D	CBAR	$0.0\ \overline{p}p \to \pi^0\pi^0\pi^0,\ \pi^0\eta\eta,\ \pi^0\pi^0\eta$
$(1520 \pm 25) - i\,(74^{+10}_{-13})$	[9] ANISOVICH	94	CBAR	$0.0\ \overline{p}p \to 3\pi^0,\ \pi^0\eta\eta$
$(1505 \pm 20) - i\,(75 \pm 10)$	[10] BUGG	94	RVUE	$\overline{p}p \to 3\pi^0,\ \eta\eta\pi^0,\ \eta\pi^0\pi^0$

[1] T-matrix pole from coupled channel K-matrix fit to data on $J/\psi \to \gamma\pi^0\pi^0$ (ABLIKIM 15AE) and $J/\psi \to \gamma K^0_S K^0_S$ (ABLIKIM 18AA). NODE=M152PP;LINKAGE=E

[2] 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 ($\eta\eta'$). NODE=M152PP;LINKAGE=A

[3] T-matrix pole of 3 channel unitary model fit to data from AAIJ 14BR and AAIJ 17V extracted using Pade approximants. NODE=M152PP;LINKAGE=F

[4] Pole position 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. NODE=M152PP;LINKAGE=G

[5] Average between $\pi^+\pi^-2\pi^0$ and $2(\pi^+\pi^-)$. NODE=M152PP;LINKAGE=C

[6] Supersedes BARBERIS 99 and BARBERIS 99B. NODE=M152PP;LINKAGE=H

[7] T-matrix pole on sheet $--+$. NODE=M152PP;LINKAGE=I

[8] Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D. NODE=M152PP;LINKAGE=D

[9] From a simultaneous analysis of the annihilations $\overline{p}p \to 3\pi^0,\ \pi^0\eta\eta$. NODE=M152PP;LINKAGE=J

[10] Reanalysis of ANISOVICH 94 data. NODE=M152PP;LINKAGE=K

$f_0(1500)$ MASS

NODE=M152M

NODE=M152M

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1522 ±25		[1] 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. • • •					
$1492.5 \pm 3.6^{+\ 2.4}_{-20.5}$		[2] ABLIKIM	22G	BES3	$J/\psi \to \gamma\pi^+\pi^-\eta'$
$1447 \pm 16 \pm 13$	163	[3,4] DOBBS	15		$J/\psi \to \gamma\pi^+\pi^-$

$1442 \pm 9 \pm 4$	261	[3,4] DOBBS	15		$\psi(2S) \to \gamma\pi^+\pi^-$	OCCUR=2
1460.9 ± 2.9		[5] AAIJ	14BR	LHCB	$\overline{B}^0_s \to J/\psi\pi^+\pi^-$	
$1468 {}^{+14}_{-15} {}^{+23}_{-74}$	5.5k	[6] ABLIKIM	13N	BES3	$e^+e^- \to J/\psi \to \gamma\eta\eta$	
1470 ± 60	568	[7] KLEMPT	08	E791	$D^+_s \to \pi^-\pi^+\pi^+$	
$1470 {}^{+6}_{-7} {}^{+72}_{-255}$		[8] UEHARA	08A	BELL	$10.6\ e^+e^- \to e^+e^-\pi^0\pi^0$	
$1466 \pm 6 \pm 20$		[9] 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	[9,10] 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		[9] BINON	05	GAMS	$33\ \pi^-p \to \eta\eta n$	
1524 ± 14	1400	[11] GARMASH	05	BELL	$B^+ \to K^+K^+K^-$	
1490 ± 30		[9] ABELE	01	CBAR	$0.0\ \overline{p}d \to \pi^-4\pi^0 p$	
1497 ± 10		[9] BARBERIS	99	OMEG	$450\ pp \to p_s p_f K^+K^-$	
1502 ± 10		[9] BARBERIS	99B	OMEG	$450\ pp \to p_s p_f \pi^+\pi^-$	
1530 ± 45		[9] BELLAZZINI	99	GAM4	$450\ pp \to pp\pi^0\pi^0$	
1505 ± 18		[9] FRENCH	99		$300\ pp \to p_f(K^+K^-)p_s$	
1580 ± 80		[9] ALDE	98	GAM4	$100\ \pi^-p \to \pi^0\pi^0 n$	
~ 1520		REYES	98	SPEC	$800\ pp \to p_s p_f K^0_S K^0_S$	
~ 1475		FRABETTI	97D	E687	$D^\pm_s \to \pi^\mp\pi^\pm\pi^\pm$	
~ 1505		ABELE	96	CBAR	$0.0\ \overline{p}p \to 5\pi^0$	
1460 ± 20	120	[9] AMELIN	96B	VES	$37\ \pi^-A \to \eta\eta\pi^-A$	
1500 ± 8		BUGG	96	RVUE		
1500 ± 15		[12] AMSLER	95B	CBAR	$0.0\ \overline{p}p \to 3\pi^0$	
1505 ± 15		[13] AMSLER	95C	CBAR	$0.0\ \overline{p}p \to \eta\eta\pi^0$	OCCUR=2
1445 ± 5		[14] ANTINORI	95	OMEG	$300{,}450\ pp \to pp2(\pi^+\pi^-)$	
1497 ± 30		[9] ANTINORI	95	OMEG	$300{,}450\ pp \to pp\pi^+\pi^-$	OCCUR=2
~ 1505		BUGG	95	MRK3	$J/\psi \to \gamma\pi^+\pi^-\pi^+\pi^-$	
1446 ± 5		[9] ABATZIS	94	OMEG	$450\ pp \to pp2(\pi^+\pi^-)$	
1545 ± 25		[9] AMSLER	94E	CBAR	$0.0\ \overline{p}p \to \pi^0\eta\eta'$	
1560 ± 25		[9] AMSLER	92	CBAR	$0.0\ \overline{p}p \to \pi^0\eta\eta$	
$1550 \pm 45 \pm 30$		[9] BELADIDZE	92C	VES	$36\ \pi^-\mathrm{Be} \to \pi^-\eta'\eta\mathrm{Be}$	
1449 ± 4		[9] ARMSTRONG	89E	OMEG	$300\ pp \to pp2(\pi^+\pi^-)$	
1610 ± 20		[9] ALDE	88	GAM4	$300\ \pi^-N \to \pi^-N2\eta$	
~ 1525		ASTON	88D	LASS	$11\ K^-p \to K^0_S K^0_S \Lambda$	
1570 ± 20	600	[9] ALDE	87	GAM4	$100\ \pi^-p \to 4\pi^0 n$	
1575 ± 45		[15] ALDE	86D	GAM4	$100\ \pi^-p \to 2\eta n$	
1568 ± 33		[9] BINON	84C	GAM2	$38\ \pi^-p \to \eta\eta' n$	
1592 ± 25		[9] BINON	83	GAM2	$38\ \pi^-p \to 2\eta n$	
1525 ± 5		[9] GRAY	83	DBC	$0.0\ \overline{p}N \to 3\pi$	

[1] Breit-Wigner mass. NODE=M152M;LINKAGE=PP

[2] The $\pi^+\pi^-$ mass spectrum is described by a coherent sum of two Breit-Wigner resonances, $f_0(1500)$ and a new $X(1540)$ with mass $1540.2 \pm 7.0 {}^{+36.3}_{-6.1}$ MeV and width $157 \pm 19 {}^{+11}_{-77}$ MeV. NODE=M152M;LINKAGE=M

[3] Using CLEO-c data but not authored by the CLEO Collaboration. NODE=M152M;LINKAGE=F

[4] From a fit to a Breit-Wigner line shape with fixed $\Gamma = 109$ MeV. NODE=M152M;LINKAGE=G

[5] Solution I, statistical error only. NODE=M152M;LINKAGE=I

[6] From partial wave analysis including all possible combinations of 0^{++}, 2^{++}, and 4^{++} resonances. NODE=M152M;LINKAGE=C

[7] Reanalysis of AITALA 01A data. This state could also be $f_0(1370)$. NODE=M152M;LINKAGE=KL

[8] Breit-Wigner mass. May also be the $f_0(1370)$. NODE=M152M;LINKAGE=UE

[9] Breit-Wigner mass. NODE=M152M;LINKAGE=E

[10] Statistical error only. NODE=M152M;LINKAGE=ST

[11] Breit-Wigner, solution 1, PWA ambiguous. NODE=M152M;LINKAGE=GA

[12] T-matrix pole, supersedes ANISOVICH 94. NODE=M152M;LINKAGE=D

[13] T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92. NODE=M152M;LINKAGE=D1

[14] Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass. NODE=M152M;LINKAGE=B

[15] From central value and spread of two solutions. Breit-Wigner mass. NODE=M152M;LINKAGE=AZ

f_0(1500) WIDTH

NODE=M152W

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT	
108± 33		[1] BERTIN	98	OBLX	0.05–0.405 $\overline{n}p \to \pi^+\pi^+\pi^-$	NODE=M152W
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$107 \pm 9^{+21}_{-7}$		[2] ABLIKIM	22G	BES3	$J/\psi \to \gamma\pi^+\pi^-\eta'$	
124± 7		[3] AAIJ	14BR	LHCB	$\overline{B}{}^0_s \to J/\psi\pi^+\pi^-$	
$136^{+41}_{-26}{}^{+28}_{-100}$	5.5k	[4] ABLIKIM	13N	BES3	$e^+e^- \to J/\psi \to \gamma\eta\eta$	
$90^{+2}_{-1}{}^{+50}_{-22}$		[5] UEHARA	08A	BELL	10.6 $e^+e^- \to e^+e^-\pi^0\pi^0$	
$108^{+14}_{-11} \pm 25$		[6] 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	[6,7] 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		[6] BINON	05	GAMS	33 $\pi^- p \to \eta\eta n$	
136± 23	1400	[8] GARMASH	05	BELL	$B^+ \to K^+K^+K^-$	
140± 40		[6] ABELE	01	CBAR	0.0 $\overline{p}d \to \pi^- 4\pi^0 p$	
104± 25		[6] BARBERIS	99	OMEG	450 $pp \to p_s p_f K^+K^-$	
131± 15		[6] BARBERIS	99B	OMEG	450 $pp \to p_s p_f \pi^+\pi^-$	
160± 50		[6] BELLAZZINI	99	GAM4	450 $pp \to pp\pi^0\pi^0$	
100± 33		[6] FRENCH	99		300 $pp \to p_f(K^+K^-)p_s$	
280±100		[6] ALDE	98	GAM4	100 $\pi^- p \to \pi^0\pi^0 n$	
∼ 100		FRABETTI	97D	E687	$D^\pm_s \to \pi^\mp\pi^\pm\pi^\pm$	
∼ 169		ABELE	96	CBAR	0.0 $\overline{p}p \to 5\pi^0$	
100± 30	120	[6] AMELIN	96B	VES	37 $\pi^- A \to \eta\eta\pi^- A$	
132± 15		BUGG	96	RVUE		
120± 25		[9] AMSLER	95B	CBAR	0.0 $\overline{p}p \to 3\pi^0$	
120± 30		[10] AMSLER	95C	CBAR	0.0 $\overline{p}p \to \eta\eta\pi^0$	OCCUR=2
65± 10		[11] ANTINORI	95	OMEG	300,450 $pp \to pp2(\pi^+\pi^-)$	
199± 30		[6] ANTINORI	95	OMEG	300,450 $pp \to pp\pi^+\pi^-$	OCCUR=2
56± 12		[6] ABATZIS	94	OMEG	450 $pp \to pp2(\pi^+\pi^-)$	
100± 40		[6] AMSLER	94E	CBAR	0.0 $\overline{p}p \to \pi^0\eta\eta'$	
245± 50		[6] AMSLER	92	CBAR	0.0 $\overline{p}p \to \pi^0\eta\eta$	
153± 67± 50		[6] BELADIDZE	92C	VES	36 π^-Be $\to \pi^-\eta'\eta$Be	
78± 18		[6] ARMSTRONG	89E	OMEG	300 $pp \to pp2(\pi^+\pi^-)$	
170± 40		[6] ALDE	88	GAM4	300 $\pi^- N \to \pi^- N 2\eta$	
150± 20	600	[6] ALDE	87	GAM4	100 $\pi^- p \to 4\pi^0 n$	
265± 65		[12] ALDE	86D	GAM4	100 $\pi^- p \to 2\eta n$	
260± 60		[6] BINON	84C	GAM2	38 $\pi^- p \to \eta\eta' n$	
210± 40		[6] BINON	83	GAM2	38 $\pi^- p \to 2\eta n$	
101± 13		[6] GRAY	83	DBC	0.0 $\overline{p}N \to 3\pi$	

[1] Breit-Wigner width. NODE=M152W;LINKAGE=PP

[2] The $\pi^+\pi^-$ mass spectrum is described by a coherent sum of two Breit-Wigner resonances, f_0(1500) and a new X(1540) with mass $1540.2 \pm 7.0^{+36.3}_{-6.1}$ MeV and width $157 \pm 19^{+11}_{-77}$ MeV. NODE=M152W;LINKAGE=J

[3] Solution I, statistical error only. NODE=M152W;LINKAGE=G

[4] From partial wave analysis including all possible combinations of 0^{++}, 2^{++}, and 4^{++} resonances. NODE=M152W;LINKAGE=C

[5] Breit-Wigner width. May also be the f_0(1370). NODE=M152W;LINKAGE=UE

[6] Breit-Wigner width. NODE=M152W;LINKAGE=E

[7] Statistical error only. NODE=M152W;LINKAGE=ST

[8] Breit-Wigner, solution 1, PWA ambiguous. NODE=M152W;LINKAGE=GA

[9] T-matrix pole, supersedes ANISOVICH 94. NODE=M152W;LINKAGE=D

[10] T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92. NODE=M152W;LINKAGE=D1

[11] Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass. NODE=M152W;LINKAGE=B

[12] From central value and spread of two solutions. Breit-Wigner mass. NODE=M152W;LINKAGE=AZ

$f_0(1500)$ DECAY MODES

NODE=M152215;NODE=M152

	Mode	Fraction (Γ_i/Γ)	Scale factor	
Γ_1	$\pi\pi$	(34.5±2.2) %	1.2	DESIG=8
Γ_2	$\pi^+\pi^-$	seen		DESIG=9
Γ_3	$2\pi^0$	seen		DESIG=3;OUR EST;→ UNCHECKED ←
Γ_4	4π	(48.9±3.3) %	1.2	DESIG=7
Γ_5	$4\pi^0$	seen		DESIG=5;OUR EST;→ UNCHECKED ←
Γ_6	$2\pi^+2\pi^-$	seen		DESIG=6;OUR EST;→ UNCHECKED ←
Γ_7	$2(\pi\pi)_{S\text{-wave}}$	seen		DESIG=11;OUR EST;→ UNCHECKED ←
Γ_8	$\rho\rho$	seen		DESIG=12;OUR EST;→ UNCHECKED ←
Γ_9	$\pi(1300)\pi$	seen		DESIG=13;OUR EST;→ UNCHECKED ←
Γ_{10}	$a_1(1260)\pi$	seen		DESIG=14;OUR EST;→ UNCHECKED ←
Γ_{11}	$\eta\eta$	(6.0±0.9) %	1.1	DESIG=1
Γ_{12}	$\eta\eta'(958)$	(2.2±0.8) %	1.4	DESIG=2
Γ_{13}	$K\overline{K}$	(8.5±1.0) %	1.1	DESIG=4
Γ_{14}	$\gamma\gamma$	not seen		DESIG=10;OUR EST;→ UNCHECKED ←

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 $\chi^2 =$ 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}

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

NODE=M152217

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

NODE=M152G1
NODE=M152G1

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.

NODE=M152G1;LINKAGE=UE

$f_0(1500)$ BRANCHING RATIOS

NODE=M152220

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$ $\quad\Gamma_1/\Gamma$

NODE=M152R8
NODE=M152R8

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

$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ $\quad\Gamma_2/\Gamma$

NODE=M152R10
NODE=M152R10

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

NODE=M152R6
NODE=M152R6

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	[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 $\overline{p}p \rightarrow 5\pi^0$

[1] Excluding $\rho\rho$ contribution to 4π. NODE=M152R6;LINKAGE=C
[2] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \rightarrow \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \rightarrow K\overline{K} n$) data. NODE=M152R6;LINKAGE=CH

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

NODE=M152R14
NODE=M152R14

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 $\overline{p}d \rightarrow \pi^- 4\pi^0 p$

[1] From the combined data of ABELE 96 and ABELE 96C. NODE=M152R;LINKAGE=KZ

$\Gamma(2(\pi\pi)_{S\text{-wave}})/\Gamma(4\pi)$ — Γ_7/Γ_4

NODE=M152R15
NODE=M152R15

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 $\overline{p}d \rightarrow 5\pi p$

$\Gamma(\rho\rho)/\Gamma(4\pi)$ — Γ_8/Γ_4

NODE=M152R16
NODE=M152R16

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 $\overline{p}d \rightarrow 5\pi p$

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

NODE=M152R11
NODE=M152R11

VALUE	DOCUMENT ID	COMMENT
2.87±0.34 OUR AVERAGE Error includes scale factor of 1.1.		
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 $pp \rightarrow p_f 2(\pi^+\pi^-) p_s$

OCCUR=2

$\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$ — Γ_9/Γ_4

NODE=M152R17
NODE=M152R17

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 $\overline{p}d \rightarrow 5\pi p$

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

NODE=M152R18
NODE=M152R18

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 $\overline{p}d \rightarrow 5\pi p$

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

NODE=M152R1
NODE=M152R1

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

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

NODE=M152R13
NODE=M152R13

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 $pp \rightarrow p_f \eta\eta p_s$
0.157±0.060	[1] AMSLER 95D	CBAR	0.0 $\overline{p}p \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.080±0.033	AMSLER 02	CBAR	0.9 $\overline{p}p \rightarrow \pi^0\eta\eta$, $\pi^0\pi^0\pi^0$
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 $\overline{p}p \rightarrow \eta\eta\pi^0$

[1] Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D. NODE=M152R3;LINKAGE=AB
[2] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \rightarrow \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \rightarrow K\overline{K} n$) data. NODE=M152R;LINKAGE=CH
[3] 2π width determined to be 60 ± 12 MeV. NODE=M152R3;LINKAGE=CM
[4] Using AMSLER 95B ($3\pi^0$). NODE=M152R3;LINKAGE=A

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

NODE=M152R5
NODE=M152R5

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

NODE=M152R12
NODE=M152R12

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
6.4±2.2 OUR FIT Error includes scale factor of 1.4.				
9.5±2.6	BARBERIS	00A		450 $pp \to p_f \eta\eta p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$16.6^{+4.2}_{-4.0}$	[1] ABLIKIM	22AS	BES3	$J/\psi(1S) \to \gamma\eta\eta'$
0.5±0.3	[2] ANISOVICH	02D	SPEC	Combined fit

[1] From a Breit-Wigner fit involving 9 resonances and a resonating exotic $\eta_1(1855) \to \eta\eta'$ P-wave.
NODE=M152R12;LINKAGE=A

[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.
NODE=M152R12;LINKAGE=CH

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

NODE=M152R2
NODE=M152R2

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 ($\eta\eta'\pi^0$).
NODE=M152R2;LINKAGE=A

[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.
NODE=M152R2;LINKAGE=CH

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

NODE=M152R9
NODE=M152R9

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

NODE=M152R7
NODE=M152R7

VALUE	DOCUMENT ID		TECN	COMMENT
0.246±0.025 OUR FIT				
0.236±0.026 OUR AVERAGE				
0.25 ±0.03	[1] BARGIOTTI	03	OBLX	$\overline{p}p$
0.19 ±0.07	[2] ABELE	98	CBAR	0.0 $\overline{p}p \to K^0_L K^\pm \pi^\mp$
0.20 ±0.08	[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 ±0.05	[4] ANISOVICH	02D	SPEC	Combined fit
0.33 ±0.03 ±0.07	BARBERIS	99D	OMEG	450 $pp \to K^+K^-$, $\pi^+\pi^-$

[1] Coupled channel analysis of $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, and $K^\pm K^0_S \pi^\mp$.
NODE=M152R;LINKAGE=BG

[2] Using $\pi^0\pi^0$ from AMSLER 95B.
NODE=M152R7;LINKAGE=A

[3] Using AMSLER 95B ($3\pi^0$), AMSLER 94C ($2\pi^0\eta$) and SU(3).
NODE=M152R7;LINKAGE=D

[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.
NODE=M152R7;LINKAGE=CH

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

NODE=M152R4
NODE=M152R4

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 ±0.6		[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.
NODE=M152R4;LINKAGE=CH

[2] Combining results of GAM4 with those of WA76 on $K\overline{K}$ central production.
NODE=M152R4;LINKAGE=BZ

[3] Using ETKIN 82B and COHEN 80.
NODE=M152R4;LINKAGE=A

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