

$f_2(1270)$

$$I^G(J^{PC}) = 0^+(2^{++})$$

 $f_2(1270)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1275.1 ± 1.2	OUR AVERAGE	Error includes scale factor of 1.1.		
1262 $\pm \frac{1}{2}$ ±8		ABLIKIM 06V	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$
1275 ±15		ABLIKIM 05	BES2	$J/\psi \rightarrow \phi\pi^+\pi^-$
1283 ± 5		ALDE 98	GAM4	100 $\pi^-p \rightarrow \pi^0\pi^0n$
1278 ± 5		¹ BERTIN 97C	OBLX	0.0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
1272 ± 8	200k	PROKOSHKIN 94	GAM2	38 $\pi^-p \rightarrow \pi^0\pi^0n$
1269.7 ± 5.2	5730	AUGUSTIN 89	DM2	$e^+e^- \rightarrow 5\pi$
1283 ± 8	400	² ALDE 87	GAM4	100 $\pi^-p \rightarrow 4\pi^0n$
1274 ± 5		² AUGUSTIN 87	DM2	$J/\psi \rightarrow \gamma\pi^+\pi^-$
1283 ± 6		³ LONGACRE 86	MPS	22 $\pi^-p \rightarrow n2K_S^0$
1276 ± 7		COURAU 84	DLCO	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
1273.3 ± 2.3		⁴ CHABAUD 83	ASPK	17 π^-p polarized
1280 ± 4		⁵ CASON 82	STRC	8 $\pi^+p \rightarrow \Delta^{++}\pi^0\pi^0$
1281 ± 7	11600	GIDAL 81	MRK2	J/ψ decay
1282 ± 5		⁶ CORDEN 79	OMEG	12–15 $\pi^-p \rightarrow n2\pi$
1269 ± 4	10k	APEL 75	NICE	40 $\pi^-p \rightarrow n2\pi^0$
1272 ± 4	4600	ENGLER 74	DBC	6 $\pi^+n \rightarrow \pi^+\pi^-p$
1277 ± 4	5300	FLATTE 71	HBC	7.0 π^+p
1273 ± 8		² STUNTEBECK 70	HBC	8 π^-p , 5.4 π^+d
1265 ± 8		BOESEBECK 68	HBC	8 π^+p
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1270 ± 8		⁷ ANISOVICH 09	RVUE	0.0 $\bar{p}p$, πN
1277 ± 6	870	⁸ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$
1251 ±10		TIKHOMIROV 03	SPEC	40.0 $\pi^-C \rightarrow K_S^0 K_S^0 K_L^0 X$
1260 ±10		⁹ ALDE 97	GAM2	450 $pp \rightarrow pp\pi^0\pi^0$
1278 ± 6		⁹ GRYGOREV 96	SPEC	40 $\pi^-N \rightarrow K_S^0 K_S^0 X$
1262 ±11		AGUILAR-... 91	EHS	400 pp
1275 ±10		AKER 91	CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0$
1220 ±10		BREAKSTONE 90	SFM	$pp \rightarrow pp\pi^+\pi^-$
1288 ±12		ABACHI 86B	HRS	$e^+e^- \rightarrow \pi^+\pi^-X$
1284 ±30	3k	BINON 83	GAM2	38 $\pi^-p \rightarrow n2\eta$
1280 ±20	3k	APEL 82	CNTR	25 $\pi^-p \rightarrow n2\pi^0$
1284 ±10	16000	DEUTSCH... 76	HBC	16 π^+p
1258 ±10	600	TAKAHASHI 72	HBC	8 $\pi^-p \rightarrow n2\pi$
1275 ±13		ARMENISE 70	HBC	9 $\pi^+n \rightarrow p\pi^+\pi^-$
1261 ± 5	1960	² ARMENISE 68	DBC	5.1 $\pi^+n \rightarrow p\pi^+MM^-$
1270 ±10	360	² ARMENISE 68	DBC	5.1 $\pi^+n \rightarrow p\pi^0MM$
1268 ± 6		¹⁰ JOHNSON 68	HBC	3.7–4.2 π^-p

- ¹ T-matrix pole.
- ² Mass errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.
- ³ From a partial-wave analysis of data using a K-matrix formalism with 5 poles.
- ⁴ From an energy-independent partial-wave analysis.
- ⁵ From an amplitude analysis of the reaction $\pi^+\pi^- \rightarrow 2\pi^0$.
- ⁶ From an amplitude analysis of $\pi^+\pi^- \rightarrow \pi^+\pi^-$ scattering data.
- ⁷ 4-poles, 5-channel K matrix fit.
- ⁸ From analysis of L3 data at 91 and 183–209 GeV.
- ⁹ Systematic uncertainties not estimated.
- ¹⁰ JOHNSON 68 includes BONDAR 63, LEE 64, DERADO 65, EISNER 67.

$f_2(1270)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
185.1⁺₋ 2.9 2.4		OUR FIT		Error includes scale factor of 1.5.
184.2⁺₋ 4.0 2.4		OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.
175 ⁺⁶ ₋₄ ±10		ABLIKIM	06V BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$
190 ±20		ABLIKIM	05 BES2	$J/\psi \rightarrow \phi\pi^+\pi^-$
171 ±10		ALDE	98 GAM4	$100 \pi^- p \rightarrow \pi^0\pi^0 n$
204 ±20		¹¹ BERTIN	97C OBLX	$0.0 \bar{p} p \rightarrow \pi^+\pi^-\pi^0$
192 ± 5	200k	PROKOSHKIN	94 GAM2	$38 \pi^- p \rightarrow \pi^0\pi^0 n$
180 ±24		AGUILAR-...	91 EHS	400 pp
169 ± 9	5730	¹² AUGUSTIN	89 DM2	$e^+e^- \rightarrow 5\pi$
150 ±30	400	¹² ALDE	87 GAM4	$100 \pi^- p \rightarrow 4\pi^0 n$
186 ⁺⁹ ₋₂		¹³ LONGACRE	86 MPS	$22 \pi^- p \rightarrow n2K_S^0$
179.2 ⁺ ₋ 6.9 6.6		¹⁴ CHABAUD	83 ASPK	17 $\pi^- p$ polarized
160 ±11		DENNEY	83 LASS	10 $\pi^+ N$
196 ±10	3k	APEL	82 CNTR	$25 \pi^- p \rightarrow n2\pi^0$
152 ± 9		¹⁵ CASON	82 STRC	$8 \pi^+ p \rightarrow \Delta^{++}\pi^0\pi^0$
186 ±27	11600	GIDAL	81 MRK2	J/ψ decay
216 ±13		¹⁶ CORDEN	79 OMEG	$12-15 \pi^- p \rightarrow n2\pi$
190 ±10	10k	APEL	75 NICE	$40 \pi^- p \rightarrow n2\pi^0$
192 ±16	4600	ENGLER	74 DBC	$6 \pi^+ n \rightarrow \pi^+\pi^- p$
183 ±15	5300	FLATTE	71 HBC	$7 \pi^+ p \rightarrow \Delta^{++}f_2$
196 ±30		¹² STUNTEBECK	70 HBC	$8 \pi^- p, 5.4 \pi^+ d$
216 ±20	1960	¹² ARMENISE	68 DBC	$5.1 \pi^+ n \rightarrow p\pi^+MM^-$
128 ±27		¹² BOESEBECK	68 HBC	$8 \pi^+ p$
176 ±21		^{12,17} JOHNSON	68 HBC	$3.7-4.2 \pi^- p$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
194 ±36		¹⁸ ANISOVICH	09 RVUE	$0.0 \bar{p} p, \pi N$
195 ±15	870	¹⁹ SCHEGELSKY	06A RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$
121 ±26		TIKHOMIROV	03 SPEC	$40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
187 ±20		²⁰ ALDE	97 GAM2	$450 pp \rightarrow pp\pi^0\pi^0$
184 ±10		²⁰ GRYGOREV	96 SPEC	$40 \pi^- N \rightarrow K_S^0 K_S^0 X$
200 ±10		AKER	91 CBAR	$0.0 \bar{p} p \rightarrow 3\pi^0$

240	± 40	3k	BINON	83	GAM2	38	$\pi^- p \rightarrow n2\eta$
187	± 30	650	¹² ANTIPOV	77	CIBS	25	$\pi^- p \rightarrow p3\pi$
225	± 38	16000	DEUTSCH...	76	HBC	16	$\pi^+ p$
166	± 28	600	¹² TAKAHASHI	72	HBC	8	$\pi^- p \rightarrow n2\pi$
173	± 53		¹² ARMENISE	70	HBC	9	$\pi^+ n \rightarrow p\pi^+\pi^-$

¹¹ T-matrix pole.

¹² Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

¹³ From a partial-wave analysis of data using a K-matrix formalism with 5 poles.

¹⁴ From an energy-independent partial-wave analysis.

¹⁵ From an amplitude analysis of the reaction $\pi^+\pi^- \rightarrow 2\pi^0$.

¹⁶ From an amplitude analysis of $\pi^+\pi^- \rightarrow \pi^+\pi^-$ scattering data.

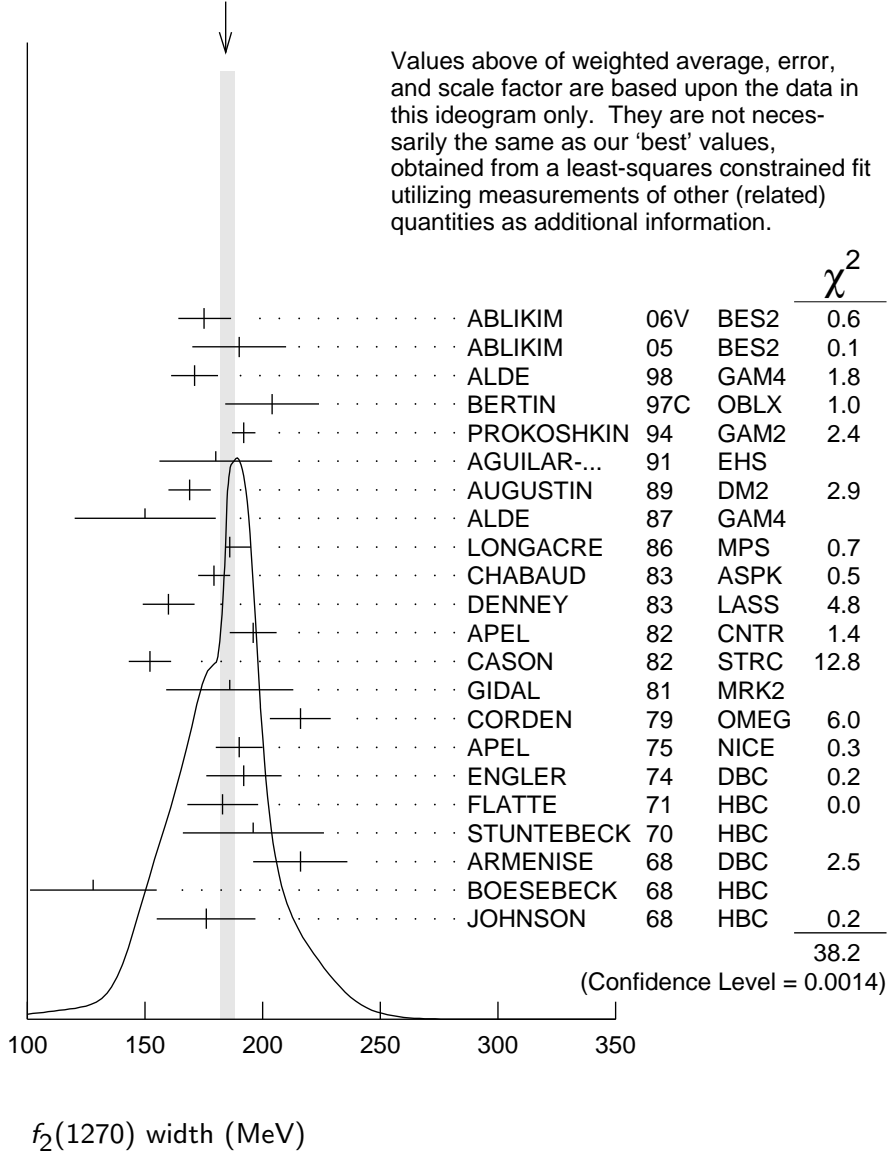
¹⁷ JOHNSON 68 includes BONDAR 63, LEE 64, DERADO 65, EISNER 67.

¹⁸ 4-poles, 5-channel K matrix fit.

¹⁹ From analysis of L3 data at 91 and 183–209 GeV.

²⁰ Systematic uncertainties not estimated.

WEIGHTED AVERAGE
184.2±4.0-2.4 (Error scaled by 1.5)



$f_2(1270)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 $\pi\pi$	(84.8 $^{+2.4}_{-1.2}$) %	S=1.2
Γ_2 $\pi^+\pi^-2\pi^0$	(7.1 $^{+1.4}_{-2.7}$) %	S=1.3
Γ_3 $K\bar{K}$	(4.6 ± 0.4) %	S=2.8
Γ_4 $2\pi^+2\pi^-$	(2.8 ± 0.4) %	S=1.2
Γ_5 $\eta\eta$	(4.0 ± 0.8) $\times 10^{-3}$	S=2.1

Γ_6	$4\pi^0$	$(3.0 \pm 1.0) \times 10^{-3}$	
Γ_7	$\gamma\gamma$	$(1.64 \pm 0.19) \times 10^{-5}$	S=1.9
Γ_8	$\eta\pi\pi$	$< 8 \times 10^{-3}$	CL=95%
Γ_9	$K^0 K^- \pi^+ + \text{c.c.}$	$< 3.4 \times 10^{-3}$	CL=95%
Γ_{10}	$e^+ e^-$	$< 6 \times 10^{-10}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to the total width, 4 partial widths, a combination of partial widths obtained from integrated cross sections, and 6 branching ratios uses 44 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 81.8$ for 37 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including 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_2	-91						
x_3	11	-39					
x_4	10	-37	1				
x_5	1	-6	0	0			
x_6	0	-7	0	0	0		
x_7	8	-5	-6	1	0	0	
Γ	-78	71	-11	-8	-1	0	-11
	x_1	x_2	x_3	x_4	x_5	x_6	x_7

Mode		Rate (MeV)		Scale factor
Γ_1	$\pi\pi$	156.9	$+4.0$ -1.2	
Γ_2	$\pi^+ \pi^- 2\pi^0$	13.2	$+2.8$ -5.0	1.3
Γ_3	$K\bar{K}$	8.5	± 0.8	2.9
Γ_4	$2\pi^+ 2\pi^-$	5.2	± 0.7	1.2
Γ_5	$\eta\eta$	0.74	± 0.14	2.1
Γ_6	$4\pi^0$	0.55	± 0.18	
Γ_7	$\gamma\gamma$	0.00303 ± 0.00035		1.9

$f_2(1270)$ PARTIAL WIDTHS

$\Gamma(\pi\pi)$

Γ_1

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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156.9^{+4.0}_{-1.2} OUR FIT

157.0^{+6.0}_{-1.0} 21 LONGACRE 86 MPS 22 $\pi^- p \rightarrow n 2K_S^0$

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

152 ± 8 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(K\bar{K})$

Γ_3

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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8.5 \pm 0.8 OUR FIT Error includes scale factor of 2.9.

9.0^{+0.7}_{-0.3} 21 LONGACRE 86 MPS 22 $\pi^- p \rightarrow n 2K_S^0$

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

7.5 \pm 2.0 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\eta\eta)$

Γ_5

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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0.74 \pm 0.14 OUR FIT Error includes scale factor of 2.1.

1.0 \pm 0.1 21 LONGACRE 86 MPS 22 $\pi^- p \rightarrow n 2K_S^0$

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

1.8 \pm 0.4 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\gamma\gamma)$

Γ_7

The value of this width depends on the theoretical model used. Unitary approaches with scalars typically (with exception of PENNINGTON 08) give values clustering around 2.6 keV; without an S-wave contribution, values are systematically higher (typically around 3 keV).

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
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3.03 \pm 0.35 OUR FIT Error includes scale factor of 1.9.

3.14 \pm 0.20 23,24 PENNINGTON 08 RVUE Compilation

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

3.82 \pm 0.30 24,25 PENNINGTON 08 RVUE Compilation

2.55 \pm 0.15 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

2.84 \pm 0.35 BOGLIONE 99 RVUE $\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$

2.93 \pm 0.23 \pm 0.32 26 YABUKI 95 VNS

2.58 \pm 0.13^{+0.36}_{-0.27} 27 BEHREND 92 CELL $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$

3.10 \pm 0.35 \pm 0.35 28 BLINOV 92 MD1 $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$

2.27 \pm 0.47 \pm 0.11 ADACHI 90D TOPZ $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$

3.15 \pm 0.04 \pm 0.39 BOYER 90 MRK2 $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$

3.19 \pm 0.16^{+0.29}_{-0.28} MARSISKE 90 CBAL $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$

2.35 \pm 0.65 29 MORGAN 90 RVUE $\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$

3.19 \pm 0.09^{+0.22}_{-0.38} 2177 OEST 90 JADE $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$

3.2 ±0.1 ±0.4	³⁰ AIHARA	86B	TPC	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
2.5 ±0.1 ±0.5	BEHREND	84B	CELL	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
2.85±0.25±0.5	³¹ BERGER	84	PLUT	$e^+e^- \rightarrow e^+e^-2\pi$
2.70±0.05±0.20	COURAU	84	DLCO	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
2.52±0.13±0.38	³² SMITH	84C	MRK2	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
2.7 ±0.2 ±0.6	EDWARDS	82F	CBAL	$e^+e^- \rightarrow e^+e^-2\pi^0$
2.9 ^{+0.6} _{-0.4} ±0.6	³³ EDWARDS	82F	CBAL	$e^+e^- \rightarrow e^+e^-2\pi^0$
3.2 ±0.2 ±0.6	BRANDELIK	81B	TASS	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
3.6 ±0.3 ±0.5	ROUSSARIE	81	MRK2	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
2.3 ±0.8	³⁴ BERGER	80B	PLUT	e^+e^-

$\Gamma(e^+e^-)$

Γ_{10}

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<0.11	90	ACHASOV	00K	SND $e^+e^- \rightarrow \pi^0\pi^0$

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

<1.7	90	VOROBYEV	88	ND $e^+e^- \rightarrow \pi^0\pi^0$
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²¹ From a partial-wave analysis of data using a K-matrix formalism with 5 poles.

²² From analysis of L3 data at 91 and 183–209 GeV and using SU(3) relations.

²³ Solution A (preferred solution based on χ^2 -analysis).

²⁴ Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.

²⁵ Solution B (worse than solution A; still acceptable when systematic uncertainties are included).

²⁶ With a narrow scalar state around 1220 MeV.

²⁷ Using a unitarized model with a 300 - 500 keV wide scalar at 1100 MeV.

²⁸ Using the unitarized model of LYTH 85.

²⁹ Error includes spread of different solutions. Data of MARK2 and CRYSTAL BALL used in the analysis. Authors report strong correlations with $\gamma\gamma$ width of $f_0(1370)$: $\Gamma(f_2) + 1/4 \Gamma(f^0) = 3.6 \pm 0.3$ KeV.

³⁰ Radiative corrections modify the partial widths; for instance the COURAU 84 value becomes 2.66 ± 0.21 in the calculation of LANDRO 86.

³¹ Using the MENNESSIER 83 model.

³² Superseded by BOYER 90.

³³ If helicity = 2 assumption is not made.

³⁴ Using mass, width and $B(f_2(1270) \rightarrow 2\pi)$ from PDG 78.

$f_2(1270) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

$\Gamma_3\Gamma_7/\Gamma$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
0.139±0.019 OUR FIT	Error includes scale factor of 1.9.		
0.091±0.007±0.027	³⁵ ALBRECHT	90G	ARG $e^+e^- \rightarrow e^+e^-K^+K^-$
0.104±0.007±0.072	³⁶ ALBRECHT	90G	ARG $e^+e^- \rightarrow e^+e^-K^+K^-$

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

³⁵ Using an incoherent background.

³⁶ Using a coherent background.

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

³⁵ Using an incoherent background.

³⁶ Using a coherent background.

$\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_5\Gamma_7/\Gamma$
VALUE (eV)	DOCUMENT ID	TECN	COMMENT		
$11.5^{+1.8+4.5}_{-2.0-3.7}$	37 UEHARA	10A BELL	10.6 $e^+e^- \rightarrow e^+e^-\eta\eta$		

³⁷ Including interference with the $f_2'(1525)$ (parameters fixed to the values from the 2008 edition of this review, PDG 08) and $f_0(Y)$.

Helicity-0/Helicity-2 RATIO IN $\gamma\gamma \rightarrow f_2(1270) \rightarrow \pi\pi$

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
$3.7 \pm 0.3^{+15.9}_{-2.9}$	UEHARA	08A BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$

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

13 38,39 PENNINGTON 08 RVUE Compilation

26 39,40 PENNINGTON 08 RVUE Compilation

³⁸ Solution A (preferred solution based on χ^2 -analysis).

³⁹ Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.

⁴⁰ Solution B (worse than solution A; still acceptable when systematic uncertainties are included).

$f_2(1270)$ BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	

$0.848^{+0.024}_{-0.012}$ OUR FIT Error includes scale factor of 1.2.

0.837 ± 0.020 OUR AVERAGE

0.849 ± 0.025 CHABAUD 83 ASPK 17 π^-p polarized

0.85 ± 0.05 250 BEAUPRE 71 HBC 8 $\pi^+p \rightarrow \Delta^{++}f_2$

0.8 ± 0.04 600 OH 70 HBC 1.26 $\pi^-p \rightarrow \pi^+\pi^-n$

$\Gamma(\pi^+\pi^-2\pi^0)/\Gamma(\pi\pi)$					Γ_2/Γ_1
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Should be twice $\Gamma(2\pi^+2\pi^-)/\Gamma(\pi\pi)$ if decay is $\rho\rho$. (See ASCOLI 68D.)

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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$0.084^{+0.018}_{-0.033}$ OUR FIT Error includes scale factor of 1.3.

0.15 ± 0.06 600 EISENBERG 74 HBC 4.9 $\pi^+p \rightarrow \Delta^{++}f_2$

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

0.07 EMMS 75D DBC 4 $\pi^+n \rightarrow pf_2$

$\Gamma(K\bar{K})/\Gamma(\pi\pi)$					Γ_3/Γ_1
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We average only experiments which either take into account $f_2(1270)$ - $a_2(1320)$ interference explicitly or demonstrate that $a_2(1320)$ production is negligible.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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$0.054^{+0.005}_{-0.006}$ OUR FIT Error includes scale factor of 2.8.

0.041 ± 0.004 OUR AVERAGE

0.045 ± 0.01 ⁴¹ BARGIOTTI 03 OBLX $\bar{p}p$

0.037⁺0.008
-0.021 ETKIN 82B MPS 23 $\pi^-p \rightarrow n2K_S^0$

0.045±0.009		CHABAUD	81	ASPK	17	$\pi^- p$	polarized
0.039±0.008		LOVERRE	80	HBC	4	$\pi^- p \rightarrow K \bar{K} N$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●							
0.052±0.025		ABLIKIM	04E	BES2		$J/\psi \rightarrow \omega K^+ K^-$	
0.036±0.005		42 COSTA...	80	OMEG	1-2.2	$\pi^- p \rightarrow K^+ K^- n$	
0.030±0.005		43 MARTIN	79	RVUE			
0.027±0.009		44 POLYCHRO...	79	STRC	7	$\pi^- p \rightarrow n 2K_S^0$	
0.025±0.015		EMMS	75D	DBC	4	$\pi^+ n \rightarrow p f_2$	
0.031±0.012	20	ADERHOLZ	69	HBC	8	$\pi^+ p \rightarrow K^+ K^- \pi^+ p$	

$\Gamma(2\pi^+ 2\pi^-)/\Gamma(\pi\pi)$

Γ_4/Γ_1

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.033±0.005 OUR FIT	Error includes scale factor of 1.2.			
0.033±0.004 OUR AVERAGE	Error includes scale factor of 1.1.			
0.024±0.006	160	EMMS	75D DBC	$4 \pi^+ n \rightarrow p f_2$
0.051±0.025	70	EISENBERG	74 HBC	$4.9 \pi^+ p \rightarrow \Delta^{++} f_2$
0.043 ^{+0.007} _{-0.011}	285	LOUIE	74 HBC	$3.9 \pi^- p \rightarrow n f_2$
0.037±0.007	154	ANDERSON	73 DBC	$6 \pi^+ n \rightarrow p f_2$
0.047±0.013		OH	70 HBC	$1.26 \pi^- p \rightarrow \pi^+ \pi^- n$

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

Γ_5/Γ

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4.0±0.8 OUR FIT	Error includes scale factor of 2.1.		
2.9±0.5 OUR AVERAGE			
2.7±0.7	BINON	05 GAMS	$33 \pi^- p \rightarrow \eta\eta n$
2.8±0.7	ALDE	86D GAM4	$100 \pi^- p \rightarrow 2\eta n$
5.2±1.7	BINON	83 GAM2	$38 \pi^- p \rightarrow 2\eta n$

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

Γ_5/Γ_1

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.003±0.001		BARBERIS	00E	$450 p p \rightarrow p_f \eta \eta p_S$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<0.05	95	EDWARDS	82F CBAL	$e^+ e^- \rightarrow e^+ e^- 2\eta$
<0.016	95	EMMS	75D DBC	$4 \pi^+ n \rightarrow p f_2$
<0.09	95	EISENBERG	74 HBC	$4.9 \pi^+ p \rightarrow \Delta^{++} f_2$

$\Gamma(4\pi^0)/\Gamma_{\text{total}}$

Γ_6/Γ

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0030±0.0010 OUR FIT				
0.003 ±0.001	400 ± 50	ALDE	87 GAM4	$100 \pi^- p \rightarrow 4\pi^0 n$

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

Γ_7/Γ

<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1.57±0.01 ^{+1.39} _{-0.14}	UEHARA	08A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$

$\Gamma(\eta\pi\pi)/\Gamma(\pi\pi)$					Γ_8/Γ_1
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.010	95	EMMS	75D DBC	$4\pi^+n \rightarrow pf_2$	

$\Gamma(K^0K^-\pi^+ + c.c.)/\Gamma(\pi\pi)$					Γ_9/Γ_1
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.004	95	EMMS	75D DBC	$4\pi^+n \rightarrow pf_2$	

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$					Γ_{10}/Γ
VALUE (units 10^{-10})	CL%	DOCUMENT ID	TECN	COMMENT	
<6	90	ACHASOV	00K SND	$e^+e^- \rightarrow \pi^0\pi^0$	

⁴¹ Coupled channel analysis of $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, and $K^\pm K_S^0\pi^\mp$.

⁴² Re-evaluated by CHABAUD 83.

⁴³ Includes PAWLICKI 77 data.

⁴⁴ Takes into account the $f_2(1270)$ - $f_2'(1525)$ interference.

$f_2(1270)$ REFERENCES

UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
PENNINGTON	08	EPJ C56 1	M.R. Pennington <i>et al.</i>	
UEHARA	08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)
MORI	07	PR D75 051101R	T. Mori <i>et al.</i>	(BELLE Collab.)
ABLIKIM	06V	PL B642 441	M. Ablikim <i>et al.</i>	(BES Collab.)
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>	
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)
BINON	05	PAN 68 960	F. Binon <i>et al.</i>	
ABLIKIM	04E	PL B603 138	M. Ablikim <i>et al.</i>	(BES Collab.)
BARGIOTTI	03	EPJ C26 371	M. Bargiotti <i>et al.</i>	(OBELIX Collab.)
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>	
ACHASOV	00K	PL B492 8	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
BARBERIS	00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington	
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)
Also		PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)
ALDE	97	PL B397 350	D.M. Alde <i>et al.</i>	(GAMS Collab.)
BERTIN	97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)
GRYGOREV	96	PAN 59 2105	V.K. Grigoriev, O.N. Baloshin, B.P. Barkov	(ITEP)
YABUKI	95	JPSJ 64 435	F. Yabuki <i>et al.</i>	(VENUS Collab.)
PROKOSHKIN	94	SPD 39 420	Y.D. Prokoshkin, A.A. Kondashov	(SERP)
BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.)
BLINOV	92	ZPHY C53 33	A.E. Blinov <i>et al.</i>	(NOVO)
AGUILAR-...	91	ZPHY C50 405	M. Aguilar-Benitez <i>et al.</i>	(LEBC-EHS Collab.)
AKER	91	PL B260 249	E. Aker <i>et al.</i>	(Crystal Barrel Collab.)
ADACHI	90D	PL B234 185	I. Adachi <i>et al.</i>	(TOPAZ Collab.)
ALBRECHT	90G	ZPHY C48 183	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BOYER	90	PR D42 1350	J. Boyer <i>et al.</i>	(Mark II Collab.)
BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone <i>et al.</i>	(ISU, BGNA, CERN+)
MARSISKE	90	PR D41 3324	H. Marsiske <i>et al.</i>	(Crystal Ball Collab.)
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)
OEST	90	ZPHY C47 343	T. Oest <i>et al.</i>	(JADE Collab.)
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)
		Translated from YAF 48 436.		

ALDE	87	PL B198 286	D.M. Alde <i>et al.</i>	(LANL, BRUX, SERP, LAPP)
AUGUSTIN	87	ZPHY C36 369	J.E. Augustin <i>et al.</i>	(LALO, CLER, FRAS+)
ABACHI	86B	PRL 57 1990	S. Abachi <i>et al.</i>	(PURD, ANL, IND, MICH+)
AIHARA	86B	PRL 57 404	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)
ALDE	86D	NP B269 485	D.M. Alde <i>et al.</i>	(BELG, LAPP, SERP, CERN+)
LANDRO	86	PL B172 445	M. Landro, K.J. Mork, H.A. Olsen	(UTRO)
LONGACRE	86	PL B177 223	R.S. Longacre <i>et al.</i>	(BNL, BRAN, CUNY+)
LYTH	85	JPG 11 459	D.H. Lyth	
BEHREND	84B	ZPHY C23 223	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
BERGER	84	ZPHY C26 199	C. Berger <i>et al.</i>	(PLUTO Collab.)
COURAU	84	PL 147B 227	A. Courau <i>et al.</i>	(CIT, SLAC)
SMITH	84C	PR D30 851	J.R. Smith <i>et al.</i>	(SLAC, LBL, HARV)
BINON	83	NC 78A 313	F.G. Binon <i>et al.</i>	(BELG, LAPP, SERP+)
Also		SJNP 38 561	F.G. Binon <i>et al.</i>	(BELG, LAPP, SERP+)
		Translated from YAF 38 934.		
CHABAUD	83	NP B223 1	V. Chabaud <i>et al.</i>	(CERN, CRAC, MPIM)
DENNEY	83	PR D28 2726	D.L. Denney <i>et al.</i>	(IOWA, MICH)
MENNESSIER	83	ZPHY C16 241	G. Mennessier	(MONP)
APEL	82	NP B201 197	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA, SERP+)
CASON	82	PRL 48 1316	N.M. Cason <i>et al.</i>	(NDAM, ANL)
EDWARDS	82F	PL 110B 82	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)
BRANDELIK	81B	ZPHY C10 117	R. Brandelik <i>et al.</i>	(TASSO Collab.)
CHABAUD	81	APP B12 575	V. Chabaud <i>et al.</i>	(CERN, CRAC, MPIM)
GIDAL	81	PL 107B 153	G. Gidal <i>et al.</i>	(SLAC, LBL)
ROUSSARIE	81	PL 105B 304	A. Roussarie <i>et al.</i>	(SLAC, LBL)
BERGER	80B	PL 94B 254	C. Berger <i>et al.</i>	(PLUTO Collab.)
COSTA...	80	NP B175 402	G. Costa de Beauregard <i>et al.</i>	(BARI, BONN+)
LOVERRE	80	ZPHY C6 187	P.F. Loverre <i>et al.</i>	(CERN, CDEF, MADR+)
CORDEN	79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+)
MARTIN	79	NP B158 520	A.D. Martin, E.N. Ozmutlu	(DURH)
POLYCHRO...	79	PR D19 1317	V.A. Polychronakos <i>et al.</i>	(NDAM, ANL)
PDG	78	PL 75B 1	C. Bricman <i>et al.</i>	
ANTIPOV	77	NP B119 45	Y.M. Antipov <i>et al.</i>	(SERP, GEVA)
PAWLICKI	77	PR D15 3196	A.J. Pawlicki <i>et al.</i>	(ANL)
DEUTSCH...	76	NP B103 426	M. Deutschmann <i>et al.</i>	(AACH3, BERL, BONN+)
APEL	75	PL 57B 398	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA, SERP+)
EMMS	75D	NP B96 155	M.J. Emms <i>et al.</i>	(BIRM, DURH, RHEL)
EISENBERG	74	PL 52B 239	Y. Eisenberg <i>et al.</i>	(REHO)
ENGLER	74	PR D10 2070	A. Engler <i>et al.</i>	(CMU, CASE)
LOUIE	74	PL 48B 385	J. Louie <i>et al.</i>	(SACL, CERN)
ANDERSON	73	PRL 31 562	J.C. Anderson <i>et al.</i>	(CMU, CASE)
TAKAHASHI	72	PR D6 1266	K. Takahashi <i>et al.</i>	(TOHOK, PENN, NDAM+)
BEAUPRE	71	NP B28 77	J.V. Beaupre <i>et al.</i>	(AACH, BERL, CERN)
FLATTE	71	PL 34B 551	S.M. Flatte <i>et al.</i>	(LBL)
ARMENISE	70	LNC 4 199	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ)
OH	70	PR D1 2494	B.Y. Oh <i>et al.</i>	(WISC, TINTO) JP
STUNTEBECK	70	PL 32B 391	P.H. Stuntebeck <i>et al.</i>	(NDAM)
ADERHOLZ	69	NP B11 259	M. Aderholz <i>et al.</i>	(AACH3, BERL, CERN+)
ARMENISE	68	NC 54A 999	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ+)
ASCOLI	68D	PRL 21 1712	G. Ascoli <i>et al.</i>	(ILL)
BOESEBECK	68	NP B4 501	K. Boesebeck <i>et al.</i>	(AACH, BERL, CERN)
JOHNSON	68	PR 176 1651	P.B. Johnson <i>et al.</i>	(NDAM, PURD, SLAC)
EISNER	67	PR 164 1699	R.L. Eisner <i>et al.</i>	(PURD)
DERADO	65	PRL 14 872	I. Derado <i>et al.</i>	(NDAM)
LEE	64	PRL 12 342	Y.Y. Lee <i>et al.</i>	(MICH)
BONDAR	63	PL 5 153	L. Bondar <i>et al.</i>	(AACH, BIRM, BONN, DESY+)