$f_2(1270)$

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

$f_2(1270)$ MASS

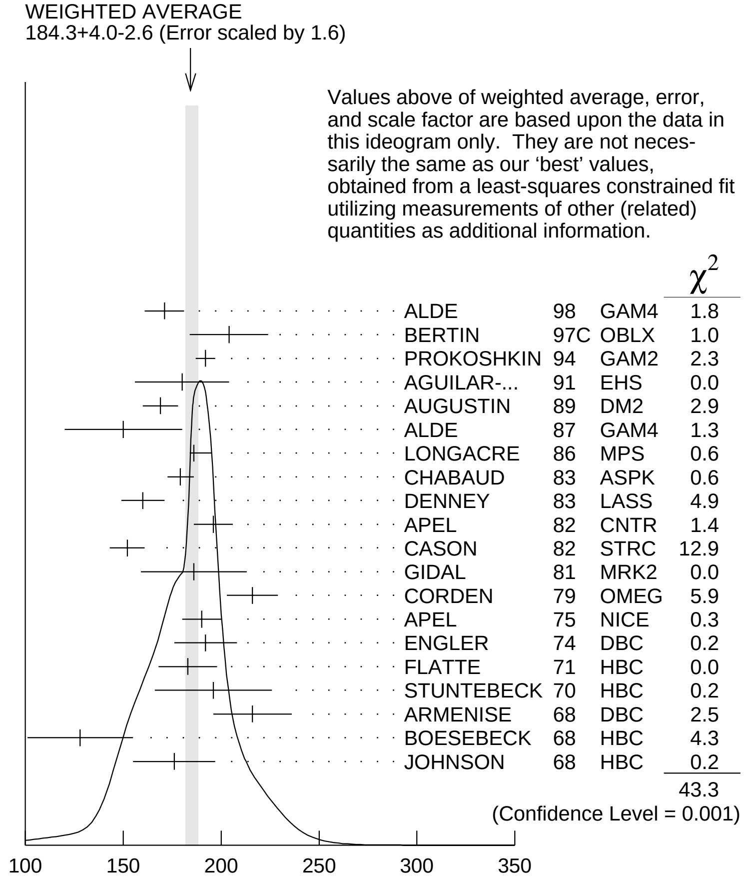
VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1275.4± 1.2 OUR AVERAGE					
1283 ± 5		ALDE	98	GAM4	100 $\pi^- p \to \pi^0 \pi^0 n$
1278 ± 5		[1] BERTIN	97C	OBLX	0.0 $\overline{p} p \to \pi^+ \pi^- \pi^0$
1272 ± 8	200k	PROKOSHKIN	94	GAM2	38 $\pi^- p \to \pi^0 \pi^0 n$
1269.7± 5.2	5730	AUGUSTIN	89	DM2	$e^+ e^- \to 5\pi$
1283 ± 8	400	[2] ALDE	87	GAM4	100 $\pi^- p \to 4\pi^0 n$
1274 ± 5		[2] AUGUSTIN	87	DM2	$J/\psi \to \gamma \pi^+ \pi^-$
1283 ± 6		[3] LONGACRE	86	MPS	22 $\pi^- p \to n 2K^0_S$
1276 ± 7		COURAU	84	DLCO	$e^+ e^- \to e^+ e^- \pi^+ \pi^-$
1273.3± 2.3		[4] CHABAUD	83	ASPK	17 $\pi^- p$ polarized
1280 ± 4		[5] CASON	82	STRC	8 $\pi^+ p \to \Delta^{++} \pi^0 \pi^0$
1281 ± 7	11600	GIDAL	81	MRK2	J/ψ decay
1282 ± 5		[6] CORDEN	79	OMEG	12–15 $\pi^- p \to n 2\pi$
1269 ± 4	10k	APEL	75	NICE	40 $\pi^- p \to n 2\pi^0$
1272 ± 4	4600	ENGLER	74	DBC	6 $\pi^+ n \to \pi^+ \pi^- p$
1277 ± 4	5300	FLATTE	71	HBC	7.0 $\pi^+ p$
1273 ± 8		[2] STUNTEBECK	70	HBC	8 $\pi^- p$, 5.4 $\pi^+ d$
1265 ± 8		BOESEBECK	68	HBC	8 $\pi^+ p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1260 ±10		[7] ALDE	97	GAM2	450 $p p \to p p \pi^0 \pi^0$
1278 ± 6		[7] GRYGOREV	96	SPEC	40 $\pi^- N \to K^0_S K^0_S X$
1262 ±11		AGUILAR-...	91	EHS	400 $p p$
1275 ±10		AKER	91	CBAR	0.0 $\overline{p} p \to 3\pi^0$
1220 ±10		BREAKSTONE	90	SFM	$p p \to p p \pi^+ \pi^-$
1288 ±12		ABACHI	86B	HRS	$e^+ e^- \to \pi^+ \pi^- X$
1284 ±30	3k	BINON	83	GAM2	38 $\pi^- p \to n 2\eta$
1280 ±20	3k	APEL	82	CNTR	25 $\pi^- p \to n 2\pi^0$
1284 ±10	16000	DEUTSCH...	76	HBC	16 $\pi^+ p$
1258 ±10	600	TAKAHASHI	72	HBC	8 $\pi^- p \to n 2\pi$
1275 ±13		ARMENISE	70	HBC	9 $\pi^+ n \to p \pi^+ \pi^-$
1261 ± 5	1960	[2] ARMENISE	68	DBC	5.1 $\pi^+ n \to p \pi^+ MM^-$
1270 ±10	360	[2] ARMENISE	68	DBC	5.1 $\pi^+ n \to p \pi^0 MM$
1268 ± 6		[8] JOHNSON	68	HBC	3.7–4.2 $\pi^- p$

[1] T-matrix pole.
[2] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; 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 $\pi^+ \pi^- \to 2\pi^0$.
[6] From an amplitude analysis of $\pi^+ \pi^- \to \pi^+ \pi^-$ scattering data.
[7] Systematic uncertainties not estimated.
[8] JOHNSON 68 includes BONDAR 63, LEE 64, DERADO 65, EISNER 67.

$f_2(1270)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
$185.1^{+3.4}_{-2.6}$ OUR FIT		Error includes scale factor of 1.5.			
$184.3^{+4.0}_{-2.6}$ OUR AVERAGE		Error includes scale factor of 1.6. See the ideogram below.			
171 ±10		ALDE	98	GAM4	100 $\pi^- p \to \pi^0 \pi^0 n$
204 ±20		[9] BERTIN	97C	OBLX	0.0 $\overline{p} p \to \pi^+ \pi^- \pi^0$
192 ± 5	200k	PROKOSHKIN	94	GAM2	38 $\pi^- p \to \pi^0 \pi^0 n$
180 ±24		AGUILAR-...	91	EHS	400 $p p$
169 ± 9	5730	[10] AUGUSTIN	89	DM2	$e^+ e^- \to 5\pi$
150 ±30	400	[10] ALDE	87	GAM4	100 $\pi^- p \to 4\pi^0 n$
186^{+9}_{-2}		[11] LONGACRE	86	MPS	22 $\pi^- p \to n 2K^0_S$
$179.2^{+6.9}_{-6.6}$		[12] CHABAUD	83	ASPK	17 $\pi^- p$ polarized
160 ±11		DENNEY	83	LASS	10 $\pi^+ N$
196 ±10	3k	APEL	82	CNTR	25 $\pi^- p \to n 2\pi^0$
152 ± 9		[13] CASON	82	STRC	8 $\pi^+ p \to \Delta^{++} \pi^0 \pi^0$
186 ±27	11600	GIDAL	81	MRK2	J/ψ decay
216 ±13		[14] CORDEN	79	OMEG	12–15 $\pi^- p \to n 2\pi$
190 ±10	10k	APEL	75	NICE	40 $\pi^- p \to n 2\pi^0$
192 ±16	4600	ENGLER	74	DBC	6 $\pi^+ n \to \pi^+ \pi^- p$
183 ±15	5300	FLATTE	71	HBC	7 $\pi^+ p \to \Delta^{++} f_2$
196 ±30		[10] STUNTEBECK	70	HBC	8 $\pi^- p$, 5.4 $\pi^+ d$
216 ±20	1960	[10] ARMENISE	68	DBC	5.1 $\pi^+ n \to p \pi^+ MM^-$
128 ±27		[10] BOESEBECK	68	HBC	8 $\pi^+ p$
176 ±21		[10,15] JOHNSON	68	HBC	3.7–4.2 $\pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
187 ±20		[16] ALDE	97	GAM2	450 $p p \to p p \pi^0 \pi^0$
184 ±10		[16] GRYGOREV	96	SPEC	40 $\pi^- N \to K^0_S K^0_S X$
200 ±10		AKER	91	CBAR	0.0 $\overline{p} p \to 3\pi^0$
240 ±40	3k	BINON	83	GAM2	38 $\pi^- p \to n 2\eta$
187 ±30	650	[10] ANTIPOV	77	CIBS	25 $\pi^- p \to p 3\pi$
225 ±38	16000	DEUTSCH...	76	HBC	16 $\pi^+ p$
166 ±28	600	[10] TAKAHASHI	72	HBC	8 $\pi^- p \to n 2\pi$
173 ±53		[10] ARMENISE	70	HBC	9 $\pi^+ n \to p \pi^+ \pi^-$

[9] T-matrix pole.
[10] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
[11] From a partial-wave analysis of data using a K-matrix formalism with 5 poles.
[12] From an energy-independent partial-wave analysis.
[13] From an amplitude analysis of the reaction $\pi^+ \pi^- \to 2\pi^0$.
[14] From an amplitude analysis of $\pi^+ \pi^- \to \pi^+ \pi^-$ scattering data.
[15] JOHNSON 68 includes BONDAR 63, LEE 64, DERADO 65, EISNER 67.
[16] Systematic uncertainties not estimated.



$f_2(1270)$ width (MeV)

$f_2(1270)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$\pi\pi$	$(84.7\ ^{+2.4}_{-1.3})$ %	S=1.3
Γ_2	$\pi^+\pi^-2\pi^0$	$(\ 7.1\ ^{+1.5}_{-2.6})$ %	S=1.3
Γ_3	$K\overline{K}$	$(\ 4.6\ \pm 0.5)$ %	S=2.8
Γ_4	$2\pi^+2\pi^-$	$(\ 2.8\ \pm 0.4)$ %	S=1.2
Γ_5	$\eta\eta$	$(\ 4.5\ \pm 1.0) \times 10^{-3}$	S=2.4

Γ_6	$4\pi^0$		$(3.0 \pm 1.0) \times 10^{-3}$	
Γ_7	$\gamma\gamma$		$(1.41 \pm 0.13) \times 10^{-5}$	
Γ_8	$\eta\pi\pi$	$<$	8×10^{-3}	CL=95%
Γ_9	$K^0 K^- \pi^+ +$ c.c.	$<$	3.4×10^{-3}	CL=95%
Γ_{10}	$e^+ e^-$	$<$	6×10^{-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 41 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 73.5$ for 34 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\left\langle \delta p_i \delta p_j \right\rangle / (\delta p_i \cdot \delta p_j)$, 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	11	−36	1				
x_5	2	−9	0	0			
x_6	0	−7	0	0	0		
x_7	11	−7	−9	1	0	0	
Γ	−79	73	−11	−8	−3	0	−15
	x_1	x_2	x_3	x_4	x_5	x_6	x_7

	Mode	Rate (MeV)	Scale factor
Γ_1	$\pi\pi$	$156.9^{+3.8}_{-1.3}$	
Γ_2	$\pi^+\pi^- 2\pi^0$	$13.1^{+3.0}_{-4.9}$	1.3
Γ_3	$K\overline{K}$	8.6 ± 0.8	2.9
Γ_4	$2\pi^+ 2\pi^-$	5.2 ± 0.7	1.2
Γ_5	$\eta\eta$	0.83 ± 0.18	2.4
Γ_6	$4\pi^0$	0.55 ± 0.19	
Γ_7	$\gamma\gamma$	0.00260 ± 0.00024	

$f_2(1270)$ PARTIAL WIDTHS

$\Gamma(\pi\pi)$ Γ_1

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{156.9^{+3.8}_{-1.3}}$ **OUR FIT**				
$\mathbf{157.0^{+6.0}_{-1.0}}$	[18] LONGACRE	86	MPS	$22\ \pi^- p \rightarrow n 2K^0_S$

$\Gamma(K\overline{K})$ — Γ_3

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
8.6 ±0.8 OUR FIT Error includes scale factor of 2.9.				
9.0 $^{+0.7}_{-0.3}$	[18] LONGACRE	86	MPS	$22\ \pi^- p \rightarrow n 2K^0_S$

$\Gamma(\eta\eta)$ — Γ_5

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
0.83±0.18 OUR FIT Error includes scale factor of 2.4.				
1.0 ±0.1	[18] LONGACRE	86	MPS	$22\ \pi^- p \rightarrow n 2K^0_S$

$\Gamma(\gamma\gamma)$ — Γ_7

The value of this width depends on the theoretical model used. Unitarised models with scalars give values clustering around $\simeq$ 2.6 keV; without an S-wave contribution, values are systematically higher (typically around 3 keV).

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
2.60±0.24 OUR FIT					
2.71 $^{+0.26}_{-0.23}$ **OUR AVERAGE**					
2.84±0.35		BOGLIONE	99	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$
$2.58\pm0.13^{+0.36}_{-0.27}$		[19] BEHREND	92	CELL	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.93±0.23±0.32		[17] YABUKI	95	VNS	
3.10±0.35±0.35		[20] BLINOV	92	MD1	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
2.27±0.47±0.11		ADACHI	90D	TOPZ	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
3.15±0.04±0.39		BOYER	90	MRK2	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-$
$3.19\pm0.16^{+0.29}_{-0.28}$		MARSISKE	90	CBAL	$e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
2.35±0.65		[21] MORGAN	90	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$
$3.19\pm0.09^{+0.22}_{-0.38}$	2177	OEST	90	JADE	$e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
3.2 ±0.1 ±0.4		[22] 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		[23] 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		[24] 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		[25] 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		[26] BERGER	80B	PLUT	e^+e^-

[17] With a narrow scalar state around 1220 MeV.

$\Gamma(e^+e^-)$ Γ_{10}

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.11	90	ACHASOV	00K	SND	$e^+e^- \to \pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.7	90	VOROBYEV	88	ND	$e^+e^- \to \pi^0\pi^0$

[18] From a partial-wave analysis of data using a K-matrix formalism with 5 poles.
[19] Using a unitarized model with a 300 - 500 keV wide scalar at 1100 MeV.
[20] Using the unitarized model of LYTH 85.
[21] 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.
[22] Radiative corrections modify the partial widths; for instance the COURAU 84 value becomes 2.66 ± 0.21 in the calculation of LANDRO 86.
[23] Using the MENNESSIER 83 model.
[24] Superseded by BOYER 90.
[25] If helicity = 2 assumption is not made.
[26] Using mass, width and B($f_2(1270) \to 2\pi$) from PDG 78.

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

$\Gamma(K\overline{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_3\Gamma_7/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
0.121±0.015 OUR FIT Error includes scale factor of 1.3.				
0.091±0.007±0.027	[27] ALBRECHT	90G	ARG	$e^+e^- \to e^+e^-K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.104±0.007±0.072	[28] ALBRECHT	90G	ARG	$e^+e^- \to e^+e^-K^+K^-$

[27] Using an incoherent background.
[28] Using a coherent background.

$f_2(1270)$ BRANCHING RATIOS

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.847^{+0.024}_{-0.013}$ OUR FIT Error includes scale factor of 1.3.					
0.837±0.020 OUR AVERAGE					
0.849±0.025		CHABAUD	83	ASPK	17 $\pi^- p$ polarized
0.85 ±0.05	250	BEAUPRE	71	HBC	8 $\pi^+ p \to \Delta^{++} f_2$
0.8 ±0.04	600	OH	70	HBC	1.26 $\pi^- p \to \pi^+\pi^- n$

$\Gamma(\pi^+\pi^-2\pi^0)/\Gamma(\pi\pi)$ Γ_2/Γ_1

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
$0.083^{+0.019}_{-0.033}$ OUR FIT Error includes scale factor of 1.3.					
0.15 ±0.06	600	EISENBERG	74	HBC	4.9 $\pi^+ p \to \Delta^{++} f_2$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.07		EMMS	75D	DBC	4 $\pi^+ n \to p f_2$

$\Gamma(K\overline{K})/\Gamma(\pi\pi)$ — Γ_3/Γ_1

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
$\mathbf{0.055^{+0.005}_{-0.006}}$ **OUR FIT** Error includes scale factor of 2.8.					
$\mathbf{0.040^{+0.005}_{-0.006}}$ **OUR AVERAGE**					
$0.037^{+0.008}_{-0.021}$		ETKIN	82B	MPS	23 $\pi^- p \rightarrow n 2K^0_S$
0.045 ± 0.009		CHABAUD	81	ASPK	17 $\pi^- p$ polarized
0.039 ± 0.008		LOVERRE	80	HBC	4 $\pi^- p \rightarrow K\overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.036 ± 0.005		[29] COSTA...	80	OMEG	1–2.2 $\pi^- p \rightarrow K^+ K^- n$
0.030 ± 0.005		[30] MARTIN	79	RVUE	
0.027 ± 0.009		[31] POLYCHRO...	79	STRC	7 $\pi^- p \rightarrow n 2K^0_S$
0.025 ± 0.015		EMMS	75D	DBC	4 $\pi^+ n \rightarrow p f_2$
0.031 ± 0.012	20	ADERHOLZ	69	HBC	8 $\pi^+ p \rightarrow K^+ K^- \pi^+ p$

[29] Re-evaluated by CHABAUD 83.
[30] Includes PAWLICKI 77 data.
[31] Takes into account the $f_2(1270)$-$f'_2(1525)$ interference.

$\Gamma(2\pi^+2\pi^-)/\Gamma(\pi\pi)$ — Γ_4/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.033\pm0.005}$ **OUR FIT** Error includes scale factor of 1.2.					
$\mathbf{0.033\pm0.004}$ **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

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$\mathbf{4.5\pm1.0}$ **OUR FIT** Error includes scale factor of 2.4.				
$\mathbf{3.1\pm0.8}$ **OUR AVERAGE** Error includes scale factor of 1.3.				
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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.003\ \pm0.001}$		BARBERIS	00E		450 $pp \rightarrow p_f \eta\eta p_s$
• • • 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 $\pi^+ p \rightarrow \Delta^{++} f_2$

$\Gamma(4\pi^0)/\Gamma_{total}$ — Γ_6/Γ

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

$\Gamma(\eta\pi\pi)/\Gamma(\pi\pi)$ — Γ_8/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.010	95	EMMS	75D	DBC	4 $\pi^+ n \rightarrow p f_2$

$\Gamma(K^0 K^- \pi^+ + \text{c.c.})/\Gamma(\pi\pi)$ — Γ_9/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.004	95	EMMS	75D	DBC	4 $\pi^+ n \rightarrow p f_2$

$\Gamma(e^+ e^-)/\Gamma_{total}$ — Γ_{10}/Γ

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

$f_2(1270)$ REFERENCES

ACHASOV	00K	PL B492 8	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
BARBERIS	00E	PL B479 59	D. Barberis *et al.*	(WA 102 Collab.)
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington	
ALDE	98	EPJ A3 361	D. Alde *et al.*	(GAM4 Collab.)
Also	99	PAN 62 405	D. Alde *et al.*	(GAMS Collab.)
ALDE	97	PL B397 350	D.M. Alde *et al.*	(GAMS Collab.)
BERTIN	97C	PL B408 476	A. Bertin *et al.*	(OBELIX Collab.)
GRYGOREV	96	PAN 59 2105	V.K. Grigoriev, O.N. Baloshin, B.P. Barkov	(ITEP)
		Translated from YAF 59 2187.		
YABUKI	95	JPSJ 54 435	F. Yabuki *et al.*	(VENUS Collab.)
PROKOSHKIN	94	SPD 39 420	Y.D. Prokoshkin, A.A. Kondashov	(SERP)
		Translated from DANS 336 613.		
BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.)
BLINOV	92	ZPHY C53 33	A.E. Blinov *et al.*	(NOVO)
AGUILAR-...	91	ZPHY C50 405	M. Aguilar-Benitez *et al.*	(LEBC-EHS Collab.)
AKER	91	PL B260 249	E. Aker *et al.*	(Crystal Barrel Collab.)
ADACHI	90D	PL B234 185	I. Adachi *et al.*	(TOPAZ Collab.)
ALBRECHT	90G	ZPHY C48 183	H. Albrecht *et al.*	(ARGUS Collab.)
BOYER	90	PR D42 1350	J. Boyer *et al.*	(Mark II Collab.)
BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone *et al.*	(ISU, BGNA, CERN+)
MARSISKE	90	PR D41 3324	H. Marsiske *et al.*	(Crystal Ball Collab.)
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)
OEST	90	ZPHY C47 343	T. Oest *et al.*	(JADE Collab.)
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev *et al.*	(NOVO)
		Translated from YAF 48 436.		
ALDE	87	PL B198 286	D.M. Alde *et al.*	(LANL, BRUX, SERP, LAPP)
AUGUSTIN	87	ZPHY C36 369	J.E. Augustin *et al.*	(LALO, CLER, FRAS+)
ABACHI	86B	PRL 57 1990	S. Abachi *et al.*	(PURD, ANL, IND, MICH+)
AIHARA	86B	PRL 57 404	H. Aihara *et al.*	(TPC-2γ Collab.)
ALDE	86D	NP B269 485	D.M. Alde *et al.*	(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 *et al.*	(BNL, BRAN, CUNY+)
LYTH	85	JPG 11 459	D.H. Lyth	
BEHREND	84B	ZPHY C23 223	H.J. Behrend *et al.*	(CELLO Collab.)
BERGER	84	ZPHY C26 199	C. Berger *et al.*	(PLUTO Collab.)
COURAU	84	PL 147B 227	A. Courau *et al.*	(CIT, SLAC)
SMITH	84C	PR D30 851	J.R. Smith *et al.*	(SLAC, LBL, HARV)
BINON	83	NC 78A 313	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
Also	83B	SJNP 38 561	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
		Translated from YAF 38 934.		

CHABAUD	83	NP B223 1	V. Chabaud *et al.*	(CERN, CRAC, MPIM)
DENNEY	83	PR D28 2726	D.L. Denney *et al.*	(IOWA, MICH)
MENNESSIER	83	ZPHY C16 241	G. Mennessier	(MONP)
APEL	82	NP B201 197	W.D. Apel *et al.*	(KARLK, KARLE, PISA, SERP+)
CASON	82	PRL 48 1316	N.M. Cason *et al.*	(NDAM, ANL)
EDWARDS	82F	PL 110B 82	C. Edwards *et al.*	(CIT, HARV, PRIN+)
ETKIN	82B	PR D25 1786	A. Etkin *et al.*	(BNL, CUNY, TUFTS, VAND)
BRANDELIK	81B	ZPHY C10 117	R. Brandelik *et al.*	(TASSO Collab.)
CHABAUD	81	APP B12 575	V. Chabaud *et al.*	(CERN, CRAC, MPIM)
GIDAL	81	PL 107B 153	G. Gidal *et al.*	(SLAC, LBL)
ROUSSARIE	81	PL 105B 304	A. Roussarie *et al.*	(SLAC, LBL)
BERGER	80B	PL 94B 254	C. Berger *et al.*	(PLUTO Collab.)
COSTA...	80	NP B175 402	G. Costa de Beauregard *et al.*	(BARI, BONN+)
LOVERRE	80	ZPHY C6 187	P.F. Loverre *et al.*	(CERN, CDEF, MADR+)
CORDEN	79	NP B157 250	M.J. Corden *et al.*	(BIRM, RHEL, TELA+)
MARTIN	79	NP B158 520	A.D. Martin, E.N. Ozmutlu	(DURH)
POLYCHRO...	79	PR D19 1317	V.A. Polychronakos *et al.*	(NDAM, ANL)
PDG	78	PL 75B	C. Bricman *et al.*	
ANTIPOV	77	NP B119 45	Y.M. Antipov *et al.*	(SERP, GEVA)
PAWLICKI	77	PR D15 3196	A.J. Pawlicki *et al.*	(ANL)
DEUTSCH...	76	NP B103 426	M. Deutschmann *et al.*	(AACH3, BERL, BONN+)
APEL	75	PL 57B 398	W.D. Apel *et al.*	(KARLK, KARLE, PISA, SERP+)
EMMS	75D	NP B96 155	M.J. Emms *et al.*	(BIRM, DURH, RHEL)
EISENBERG	74	PL 52B 239	Y. Eisenberg *et al.*	(REHO)
ENGLER	74	PR D10 2070	A. Engler *et al.*	(CMU, CASE)
LOUIE	74	PL 48B 385	J. Louie *et al.*	(SACL, CERN)
ANDERSON	73	PRL 31 562	J.C. Anderson *et al.*	(CMU, CASE)
TAKAHASHI	72	PR D6 1266	K. Takahashi *et al.*	(TOHOK, PENN, NDAM+)
BEAUPRE	71	NP B28 77	J.V. Beaupre *et al.*	(AACH, BERL, CERN)
FLATTE	71	PL 34B 551	S.M. Flatte *et al.*	(LBL)
ARMENISE	70	LNC 4 199	N. Armenise *et al.*	(BARI, BGNA, FIRZ)
OH	70	PR D1 2494	B.Y. Oh *et al.*	(WISC, TNTO) JP
STUNTEBECK	70	PL 32B 391	P.H. Stuntebeck *et al.*	(NDAM)
ADERHOLZ	69	NP B11 259	M. Aderholz *et al.*	(AACH3, BERL, CERN+)
ARMENISE	68	NC 54A 999	N. Armenise *et al.*	(BARI, BGNA, FIRZ+)
ASCOLI	68D	PRL 21 1712	G. Ascoli *et al.*	(ILL)
BOESEBECK	68	NP B4 501	K. Boesebeck *et al.*	(AACH, BERL, CERN)
JOHNSON	68	PR 176 1651	P.B. Johnson *et al.*	(NDAM, PURD, SLAC)
EISNER	67	PR 164 1699	R.L. Eisner *et al.*	(PURD)
DERADO	65	PRL 14 872	I. Derado *et al.*	(NDAM)
LEE	64	PRL 12 342	Y.Y. Lee *et al.*	(MICH)
BONDAR	63	PL 5 153	L. Bondar *et al.*	(AACH, BIRM, BONN, DESY+)