$f_1(1285)$

$I^G(J^{PC}) = 0^+(1^{++})$

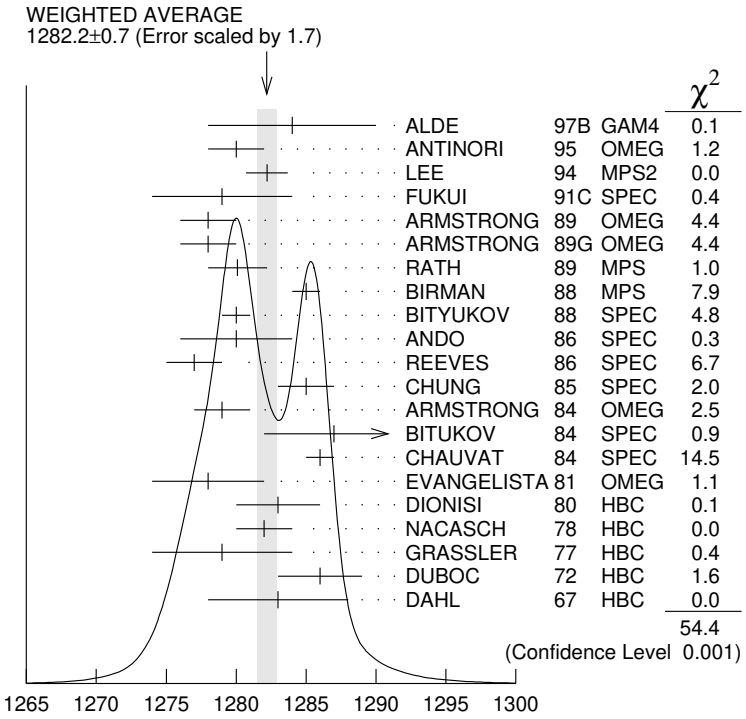
$f_1(1285)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
1282.2± 0.7 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.				
1284 ± 6	1400	ALDE	97B	GAM4		100 $\pi^- p \rightarrow \eta\pi^0\pi^0 n$
1280 ± 2		[1] ANTINORI	95	OMEG		300,450 $pp \rightarrow pp2(\pi^+\pi^-)$
1282.2± 1.5		LEE	94	MPS2		18 $\pi^- p \rightarrow K^+\overline{K}^0 2\pi^- p$
1279 ± 5		FUKUI	91C	SPEC		8.95 $\pi^- p \rightarrow \eta\pi^+\pi^- n$
1278 ± 2	140	ARMSTRONG	89	OMEG		300 $pp \rightarrow K\overline{K}\pi pp$
1278 ± 2		ARMSTRONG	89G	OMEG		85 $\pi^+ p \rightarrow 4\pi\pi p$, $pp \rightarrow 4\pi pp$
1280.1± 2.1	60	RATH	89	MPS		21.4 $\pi^- p \rightarrow K^0_S K^0_S \pi^0 n$
1285 ± 1	4750	[2] BIRMAN	88	MPS		8 $\pi^- p \rightarrow K^+\overline{K}^0\pi^- n$
1280 ± 1	504	BITYUKOV	88	SPEC		32.5 $\pi^- p \rightarrow K^+K^-\pi^0 n$
1280 ± 4		ANDO	86	SPEC		8 $\pi^- p \rightarrow n\eta\pi^+\pi^-$
1277 ± 2	420	REEVES	86	SPEC		6.6 $p\overline{p} \rightarrow K K \pi X$
1285 ± 2		CHUNG	85	SPEC		8 $\pi^- p \rightarrow N K \overline{K}\pi$
1279 ± 2	604	ARMSTRONG	84	OMEG		85 $\pi^+ p \rightarrow K\overline{K}\pi\pi p$, $pp \rightarrow K\overline{K}\pi pp$
1287 ± 5	353	BITUKOV	84	SPEC		32 $\pi^- p \rightarrow K^+K^-\pi^0 n$
1286 ± 1		CHAUVAT	84	SPEC		ISR 31.5 pp
1278 ± 4		EVANGELISTA	81	OMEG		12 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
1283 ± 3	103	DIONISI	80	HBC		4 $\pi^- p \rightarrow K\overline{K}\pi n$
1282 ± 2	320	NACASCH	78	HBC		0.7,0.76 $\overline{p}p \rightarrow K\overline{K}3\pi$
1279 ± 5	210	GRASSLER	77	HBC		16 $\pi^\mp p$
1286 ± 3	180	DUBOC	72	HBC		1.2 $\overline{p}p \rightarrow 2K4\pi$
1283 ± 5		DAHL	67	HBC		1.6–4.2 $\pi^- p$

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

1270	±10			AMELIN	95	VES	37 $\pi^- N \to \pi^- \pi^+ \pi^- \gamma N$
1280	± 2			ABATZIS	94	OMEG	450 $pp \to pp2(\pi^+\pi^-)$
1282	± 4			ARMSTRONG	93C	SPEC	$\overline{p}p \to \pi^0\eta\eta \to 6\gamma$
1270	± 6	±10		ARMSTRONG	92C	OMEG	300 $pp \to pp\pi^+\pi^-\gamma$
1264	± 8			AUGUSTIN	90	DM2	$J/\psi \to \gamma\eta\pi^+\pi^-$
1284	± 4			TAKAMATSU	90	SPEC	0 8 $\pi^- p \to K\overline{K}\pi n$
1281	± 1			ARMSTRONG	89E	OMEG	300 $pp \to pp2(\pi^+\pi^-)$
1279	± 6	±10	16	BECKER	87	MRK3	$e^+e^- \to \phi K\overline{K}\pi$
1286	± 9			GIDAL	87	MRK2	$e^+e^- \to e^+e^-\eta\pi^+\pi^-$
~ 1279				[3] TORNQVIST	82B	RVUE	
1275	± 6		31	BROMBERG	80	SPEC	100 $\pi^- p \to K\overline{K}\pi X$
1288	± 9		200	GURTU	79	HBC	4.2 $K^- p \to n\eta 2\pi$
~ 1275.0			46	[4] STANTON	79	CNTR	8.5 $\pi^- p \to n2\gamma 2\pi$
1271	±10		34	CORDEN	78	OMEG	12–15 $\pi^- p \to K^+K^-\pi n$
1295	±12		85	CORDEN	78	OMEG	12–15 $\pi^- p \to n5\pi$
1292	±10		150	DEFOIX	72	HBC	0.7 $\overline{p}p \to 7\pi$
1280	± 3		500	[5] THUN	72	MMS	13.4 $\pi^- p$
1303	± 8			BARDADIN-...	71	HBC	8 $\pi^+ p \to p6\pi$
1283	± 6			BOESEBECK	71	HBC	16.0 $\pi p \to p5\pi$
1270	±10			CAMPBELL	69	DBC	2.7 $\pi^+ d$
1285	± 7			LORSTAD	69	HBC	0.7 $\overline{p}p$, 4,5-body
1290	± 7			D'ANDLAU	68	HBC	1.2 $\overline{p}p$, 5–6 body

[1] Supersedes ABATZIS 94, ARMSTRONG 89E.
[2] From partial wave analysis of $K^+\overline{K}^0\pi^-$ system.
[3] From a unitarized quark-model calculation.
[4] From phase shift analysis of $\eta\pi^+\pi^-$ system.
[5] Seen in the missing mass spectrum.



$f_1(1285)$ mass (MeV)

$f_1(1285)$ WIDTH

Only experiments giving width error less than 20 MeV are kept for averaging.

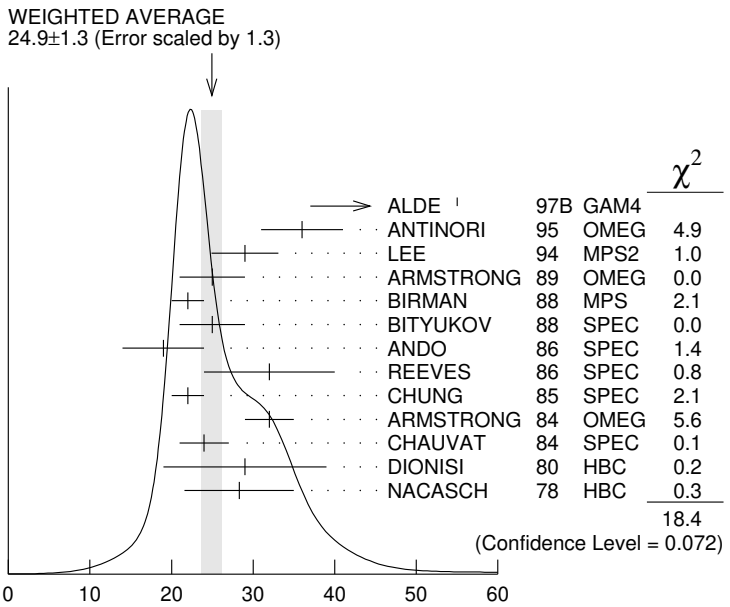
VALUE (MeV)	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
24.9± 1.3 OUR AVERAGE			Error includes scale factor of 1.3. See the ideogram below.				
55 ±18		1400	ALDE	97B	GAM4		100 $\pi^- p \rightarrow \eta\pi^0\pi^0 n$
36 ± 5			[6] ANTINORI	95	OMEG		300,450 $pp \rightarrow pp2(\pi^+\pi^-)$
29.0± 4.1			LEE	94	MPS2		18 $\pi^- p \rightarrow K^+\overline{K}^0 2\pi^- p$
25 ± 4		140	ARMSTRONG	89	OMEG		300 $pp \rightarrow K\overline{K}\pi pp$
22 ± 2		4750	[7] BIRMAN	88	MPS		8 $\pi^- p \rightarrow K^+\overline{K}^0\pi^- n$
25 ± 4		504	BITYUKOV	88	SPEC		32.5 $\pi^- p \rightarrow K^+K^-\pi^0 n$
19 ± 5			ANDO	86	SPEC		8 $\pi^- p \rightarrow n\eta\pi^+\pi^-$

32	± 8	420		REEVES	86	SPEC	6.6 $p\overline{p} \to K K \pi X$
22	± 2			CHUNG	85	SPEC	8 $\pi^- p \to N K \overline{K} \pi$
32	± 3	604		ARMSTRONG	84	OMEG	85 $\pi^+ p \to K \overline{K} \pi \pi p$, $p p \to K \overline{K} \pi p p$
24	± 3			CHAUVAT	84	SPEC	ISR 31.5 $p p$
29	±10	103		DIONISI	80	HBC	4 $\pi^- p \to K \overline{K} \pi n$
28.3	± 6.7	320		NACASCH	78	HBC	0.7,0.76 $\overline{p} p \to K \overline{K} 3\pi$

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

40	± 5			ABATZIS	94	OMEG	450 $p p \to p p 2(\pi^+ \pi^-)$
44	±20			AUGUSTIN	90	DM2	$J/\psi \to \gamma \eta \pi^+ \pi^-$
22	± 5			TAKAMATSU	90	SPEC 0	8 $\pi^- p \to K \overline{K} \pi n$
<20		90		TAKAMATSU	90	SPEC 0	8.95 $\pi^- p \to \eta \pi^+ \pi^- n$
31	± 5			ARMSTRONG	89E	OMEG	300 $p p \to p p 2(\pi^+ \pi^-)$
41	±12			ARMSTRONG	89G	OMEG	85 $\pi^+ p \to 4\pi \pi p$, $p p \to 4\pi p p$
17.9	±10.9	60		RATH	89	MPS	21.4 $\pi^- p \to K^0_S K^0_S \pi^0 n$
14	$^{+20}_{-14}$ ±10	16		BECKER	87	MRK3	$e^+ e^- \to \phi K \overline{K} \pi$
26	±12			EVANGELISTA	81	OMEG	12 $\pi^- p \to \eta \pi^+ \pi^- \pi^- p$
25	±15	200		GURTU	79	HBC	4.2 $K^- p \to n \eta 2\pi$
~ 10			[8]	STANTON	79	CNTR	8.5 $\pi^- p \to n 2\gamma 2\pi$
24	±18	210		GRASSLER	77	HBC	16 $\pi^{\mp} p$
28	± 5	150	[9]	DEFOIX	72	HBC	0.7 $\overline{p} p \to 7\pi$
46	± 9	180	[9]	DUBOC	72	HBC	1.2 $\overline{p} p \to 2K 4\pi$
37	± 5	500	[10]	THUN	72	MMS	13.4 $\pi^- p$
10	±10			BOESEBECK	71	HBC	16.0 $\pi p \to p 5\pi$
30	±15			CAMPBELL	69	DBC	2.7 $\pi^+ d$
60	±15		[9]	LORSTAD	69	HBC	0.7 $\overline{p} p$, 4,5-body
35	±10		[9]	DAHL	67	HBC	1.6–4.2 $\pi^- p$

[6] Supersedes ABATZIS 94, ARMSTRONG 89E.
[7] From partial wave analysis of $K^+ \overline{K^0} \pi^-$ system.
[8] From phase shift analysis of $\eta \pi^+ \pi^-$ system.
[9] Resolution is not unfolded.
[10] Seen in the missing mass spectrum.



$f_1(1285)$ width (MeV)

$f_1(1285)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	4π	(29 ± 6) %	
Γ_2	$\pi^0\pi^0\pi^+\pi^-$	(15 $^{+\ 9}_{-\ 8}$) %	S=1.1
Γ_3	$2\pi^+2\pi^-$	(15 ± 6) %	
Γ_4	$\rho^0\pi^+\pi^-$	dominates $2\pi^+\ 2\pi^-$	
Γ_5	$4\pi^0$	$< 7 \times 10^{-4}$	CL=90%
Γ_6	$\eta\pi\pi$	(54 ±15) %	
Γ_7	$a_0(980)\pi$ [ignoring $a_0(980) \to K\overline{K}$]	(44 ± 7) %	S=1.1
Γ_8	$\eta\pi\pi$ [excluding $a_0(980)\pi$]	(10 $^{+\ 7}_{-\ 6}$) %	S=1.1
Γ_9	$K\overline{K}\pi$	(9.7± 1.6) %	S=1.2
Γ_{10}	$K\overline{K}^*(892)$	not seen	
Γ_{11}	$\gamma\rho^0$	(6.6± 1.3) %	S=1.5
Γ_{12}	$\phi\gamma$	(8.0± 3.1) $\times 10^{-4}$	
Γ_{13}	$\gamma\gamma^*$		
Γ_{14}	$\gamma\gamma$		

CONSTRAINED FIT INFORMATION

An overall fit to 7 branching ratios uses 13 measurements and one constraint to determine 6 parameters. The overall fit has a $\chi^2 = 11.4$ for 8 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, 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_3	−87				
x_7	−33	13			
x_8	−4	−5	−78		
x_9	46	−19	−38	−12	
x_{11}	−59	45	30	−11	−41
	x_2	x_3	x_7	x_8	x_9

$f_1(1285)$ Γ(i)Γ(γγ)/Γ(total)

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_6\Gamma_{14}/\Gamma = (\Gamma_7+\Gamma_8)\Gamma_{14}/\Gamma$

VALUE (keV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.62	95	GIDAL	87	MRK2	$e^+e^- \to e^+e^-\eta\pi^+\pi^-$

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma^*)/\Gamma_{\text{total}}$ $\Gamma_6\Gamma_{13}/\Gamma = (\Gamma_7+\Gamma_8)\Gamma_{13}/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
1.4 ±0.4 OUR AVERAGE		Error includes scale factor of 1.4.			
1.18±0.25±0.20	26	[11,12] AIHARA	88B	TPC	$e^+e^- \to e^+e^-\eta\pi^+\pi^-$
2.30±0.61±0.42		[11,13] GIDAL	87	MRK2	$e^+e^- \to e^+e^-\eta\pi^+\pi^-$

[11] Assuming a ρ-pole form factor.
[12] Published value multiplied by $\eta\pi\pi$ branching ratio 0.49.
[13] Published value divided by 2 and multiplied by the $\eta\pi\pi$ branching ratio 0.49.

$f_1(1285)$ BRANCHING RATIOS

$\Gamma(K\overline{K}\pi)/\Gamma(4\pi)$ $\Gamma_9/\Gamma_1 = \Gamma_9/(\Gamma_2+\Gamma_3)$

VALUE	DOCUMENT ID		TECN	COMMENT
0.33±0.04 OUR FIT	Error includes scale factor of 1.2.			
0.32±0.04 OUR AVERAGE	Error includes scale factor of 1.2.			
0.28±0.05	[14] ARMSTRONG	89E	OMEG	300 $pp \to pp f_1(1285)$
0.37±0.03±0.05	[15] ARMSTRONG	89G	OMEG	85 $\pi p \to 4\pi X$

[14] Assuming $\rho\pi\pi$ and $a_0(980)\pi$ intermediate states.
[15] 4π consistent with being entirely $\rho\pi\pi$.

$\Gamma(K\overline{K}\pi)/\Gamma(\eta\pi\pi)$ $\Gamma_9/\Gamma_6 = \Gamma_9/(\Gamma_7+\Gamma_8)$

VALUE	DOCUMENT ID		TECN	COMMENT
0.18±0.04 OUR FIT Error includes scale factor of 1.1.				
0.23±0.06 OUR AVERAGE Error includes scale factor of 1.2.				
0.42±0.15	GURTU	79	HBC	4.2 K^-p
0.5 ±0.2	CORDEN	78	OMEG	12–15 π^-p
0.20±0.08	[16] DEFOIX	72	HBC	0.7 $\overline{p}p \rightarrow 7\pi$
0.16±0.08	CAMPBELL	69	DBC	2.7 $\pi^+ d$

[16] $K\overline{K}$ system characterized by the $I = 1$ threshold enhancement. (See under $a_0(980)$).

$\Gamma(a_0(980)\pi$ [ignoring $a_0(980) \rightarrow K\overline{K}]$)$/\Gamma(\eta\pi\pi)$ $\Gamma_7/\Gamma_6 = \Gamma_7/(\Gamma_7+\Gamma_8)$

VALUE	DOCUMENT ID		TECN	COMMENT
0.82±0.12 OUR FIT Error includes scale factor of 1.1.				
$0.69^{+0.13}_{-0.12}$ OUR AVERAGE				
0.72±0.15	GURTU	79	HBC	4.2 K^-p
$0.6\ ^{+0.3}_{-0.2}$	CORDEN	78	OMEG	12–15 π^-p
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.0 ±0.3	GRASSLER	77	HBC	16 $\pi^\mp p$

$\Gamma(4\pi)/\Gamma(\eta\pi\pi)$ $\Gamma_1/\Gamma_6 = (\Gamma_2+\Gamma_3)/(\Gamma_7+\Gamma_8)$

VALUE	DOCUMENT ID		TECN	COMMENT
0.54±0.12 OUR FIT Error includes scale factor of 1.1.				
0.41±0.14 OUR AVERAGE				
0.37±0.11±0.11	BOLTON	92	MRK3	$J/\psi \rightarrow \gamma f_1(1285)$
0.64±0.40	GURTU	79	HBC	4.2 K^-p
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.93±0.30	[17] GRASSLER	77	HBC	16 $\pi^\mp p$

[17] Assuming $\rho\pi\pi$ and $a_0(980)\pi$ intermediate states.

$\Gamma(K\overline{K}^*(892))/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	NACASCH	78	HBC	0.7,0.76 $\overline{p}p \rightarrow K\overline{K}3\pi$

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2\pi^+2\pi^-)$ Γ_4/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.0±0.4	GRASSLER	77	HBC	16 GeV $\pi^\pm p$

$\Gamma(4\pi^0)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<7	90	ALDE	87	GAM4	100 $\pi^- p \rightarrow 4\pi^0 n$

$\Gamma(\phi\gamma)/\Gamma(K\overline{K}\pi)$ Γ_{12}/Γ_9

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.82±0.21±0.20		19	BITYUKOV	88	SPEC	32.5 $\pi^- p \rightarrow K^+ K^- \pi^0 n$

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

<0.93	95		AMELIN	95	VES	37 $\pi^- N \rightarrow \pi^- \pi^+ \pi^- \gamma N$

$\Gamma(\gamma\rho^0)/\Gamma(K\overline{K}\pi)$ Γ_{11}/Γ_9

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>0.035	90	[18] COFFMAN	90	MRK3	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$

[18] Using B($J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma\gamma\rho^0$)=0.25 × 10^{-4} and B($J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma K\overline{K}\pi$)=< 0.72 × 10^{-3}.

$\Gamma(\gamma\rho^0)/\Gamma(2\pi^+2\pi^-)$ Γ_{11}/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
0.45±0.18 OUR FIT				
0.45±0.18	[19] COFFMAN	90	MRK3	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$

[19] Using B($J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma\gamma\rho^0$)=0.25 × 10^{-4} and B($J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma 2\pi^+ 2\pi^-$)=0.55 × 10^{-4} given by MIR 88.

$\Gamma(\gamma\rho^0)/\Gamma(a_0(980)\pi$ [ignoring $a_0(980) \rightarrow K\overline{K}$]) Γ_{11}/Γ_7

VALUE	DOCUMENT ID		TECN	COMMENT
0.15±0.04 OUR FIT Error includes scale factor of 1.6.				
0.10±0.03±0.02	[20] BURCHELL	91	MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$

[20] Uses a result from COFFMAN 90, and includes an unknown branching ratio for $a_0(980) \rightarrow \eta\pi$.

$\Gamma(\gamma\rho^0)/\Gamma_{total}$ Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.028±0.007±0.006		AMELIN	95	VES	37 $\pi^- N \rightarrow \pi^- \pi^+ \pi^- \gamma N$

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

<0.05	95	BITYUKOV	91B	SPEC	32 $\pi^- p \rightarrow \pi^+ \pi^- \gamma n$

$\Gamma(\eta\pi\pi)/\Gamma(\gamma\rho^0)$ $\Gamma_6/\Gamma_{11} = (\Gamma_7+\Gamma_8)/\Gamma_{11}$

VALUE	DOCUMENT ID		TECN	COMMENT
8.2±1.6 OUR FIT Error includes scale factor of 1.8.				
7.5±1.0	[21] ARMSTRONG	92C	OMEG	300 $pp \rightarrow pp\pi^+\pi^-\gamma$, $pp\eta\pi^+\pi^-$

[21] Published value multiplied by 1.5.

$f_1(1285)$ REFERENCES

ALDE	97B	PAN 60 386	+Binon, Bricman	(GAMS Collab.)	
		Translated from YAF 60 458.			
AMELIN	95	ZPHY C66 71	+Berdnikov+	(VES Collab.)	
ANTINORI	95	PL B353 589	+Barberis, Bayes+	(ATHU, BARI, BIRM, CERN, JINR)	
ABATZIS	94	PL B324 509	+Antinori, Barberis+	(ATHU, BARI, BIRM, CERN, JINR)	
LEE	94	PL B323 227	+Chung, Kirk+	(BNL, IND, KYUN, MASD, RICE)	
ARMSTRONG	93C	PL B307 394	+Bettoni+	(FNAL, FERR, GENO, UCI, NWES+)	
ARMSTRONG	92C	ZPHY C54 371	+Barnes, Benayoun+	(ATHU, BARI, BIRM, CERN, CDEF)	
BOLTON	92	PL B278 495	+Brown, Bunnell+	(Mark III Collab.)	
BITYUKOV	91B	SJNP 54 318	+Borisov, Viktorov+	(SERP)	
		Translated from YAF 54 529.			
BURCHELL	91	NP B21 132 (suppl)		(Mark III Collab.)	
FUKUI	91C	PL B267 293	+	(SUGI, NAGO, KEK, KYOT, MIYA, AKIT)	
AUGUSTIN	90	PR D42 10	+Cosme+	(DM2 Collab.)	
COFFMAN	90	PR D41 1410	+De Jongh+	(Mark III Collab.)	
TAKAMATSU	90	Hadron 89 Conf. p 71	+Ando+	(KEK)	
ARMSTRONG	89	PL B221 216	+Benayoun+	(CERN, CDEF, BIRM, BARI, ATHU, CURIN+)	JPC
ARMSTRONG	89E	PL B228 536	+Benayoun	(ATHU, BARI, BIRM, CERN, CDEF, CURIN+)	
ARMSTRONG	89G	ZPHY C43 55	+Bloodworth+	(CERN, BIRM, BARI, ATHU, CURIN+)	
RATH	89	PR D40 693	+Cason+	(NDAM, BRAN, BNL, CUNY, DUKE)	
AIHARA	88B	PL B209 107	+Alston-Garnjost+	(TPC-2γ Collab.)	
BIRMAN	88	PRL 61 1557	+Chung, Peaslee+	(BNL, FSU, IND, MASD)	JP
BITYUKOV	88	PL B203 327	+Borisov, Dorofeev+	(SERP)	
MIR	88	Photon-Photon 88 Conf., 126		(Mark III Collab.)	
ALDE	87	PL B198 286	+Binon, Bricman+	(LANL, BRUX, SERP, LAPP)	
BECKER	87	PRL 59 186	+Blaylock, Bolton, Brown+	(Mark III Collab.)	
GIDAL	87	PRL 59 2012	+Boyer, Butler, Cords, Abrams+	(LBL, SLAC, HARV)	
ANDO	86	PRL 57 1296	+Imai+	(KEK, KYOT, NIRS, SAGA, INUS, TSUK+)	IJP
REEVES	86	PR 34 1960	+Chung, Crittenden+	(FLOR, BNL, IND, MASD)	JP
CHUNG	85	PRL 55 779	+Fernow, Boehnlein+	(BNL, FLOR, IND, MASD)	JP
ARMSTRONG	84	PL 146B 273	+Bloodworth, Burns+	(ATHU, BARI, BIRM, CERN)	JP
BITUKOV	84	PL 144B 133	+Dorofeev, Dzhelyadin, Golovkin, Kulik+	(SERP)	
CHAUVAT	84	PL 148B 382	+Meritet, Bonino+	(CERN, CLER, UCLA, SACL)	
TORNQVIST	82B	NP B203 268		(HELS)	
EVANGELISTA	81	NP B178 197	+	(BARI, BONN, CERN, DARE, LIVP+)	
BROMBERG	80	PR D22 1513	+Haggerty, Abrams, Dzierba	(CIT, FNAL, ILLC, IND)	
DIONISI	80	NP B169 1	+Gavillet+	(CERN, MADR, CDEF, STOH)	
GURTU	79	NP B151 181	+Gavillet, Blokzijl+	(CERN, ZEEM, NIJM, OXF)	
STANTON	79	PRL 42 346	+Brockman+	(OSU, CARL, MCGI, TNTO)	JP
CORDEN	78	NP B144 253	+Corbett, Alexander+	(BIRM, RHEL, TELA, LOWC)	JP
NACASCH	78	NP B135 203	+Defoix, Dobrzynski+	(PARIS, MADR, CERN)	
GRASSLER	77	NP B121 189	+	(AACH3, BERL, BONN, CERN, CRAC, HEIDH+)	
DEFOIX	72	NP B44 125	+Nascimento, Bizzarri+	(CDEF, CERN)	
DUBOC	72	NP B46 429	+Goldberg, Makowski, Donald+	(PARIS, LIVP)	
THUN	72	PRL 28 1733	+Blieden, Finocchiaro, Bowen+	(STON, NEAS)	
BARDADIN-...	71	PR D4 2711	Bardadin-Otwinowska, Hofmokl+	(WARS)	
BOESEBECK	71	PL 34B 659		(AACH, BERL, BONN, CERN, CRAC, HEID, WARS)	
CAMPBELL	69	PRL 22 1204	+Lichtman, Loeffler+	(PURD)	
LORSTAD	69	NP B14 63	+D'Andlau, Astier+	(CDEF, CERN)	JP
D'ANDLAU	68	NP B5 693	+Astier, Barlow+	(CDEF, CERN, IRAD, LIVP)	IJP
DAHL	67	PR 163 1377	+Hardy, Hess, Kirz, Miller	(LRL)	IJP

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ATKINSON	84E	PL 138B 459	+	(BONN, CERN, GLAS, LANC, MCHS, CURIN+)	
GAVILLET	82	ZPHY C16 119	+Armenteros+	(CERN, CDEF, PADO, ROMA)	
D'ANDLAU	65	PL 17 347	+Barlow, Adamson+	(CDEF, CERN, IRAD, LIVP)	
MILLER	65	PRL 14 1074	+Chung, Dahl, Hess, Hardy, Kirz+	(LRL, UCB)	