

$f_1(1420)$

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

See the minireview under $\eta(1440)$.

$f_1(1420)$ MASS

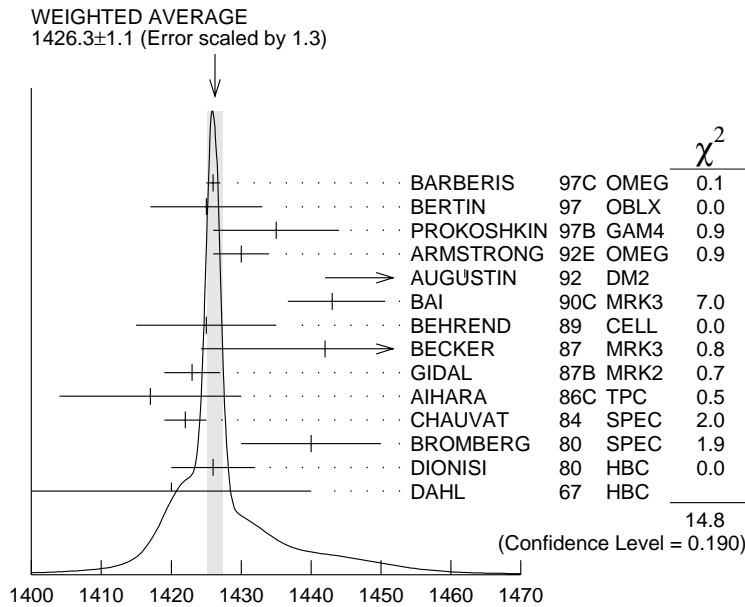
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1426.3 ± 1.1 OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.		
1426 ± 1		BARBERIS	97C OMEG	450 $pp \rightarrow p p K_S^0 K^\pm \pi^\mp$
1425 ± 8		BERTIN	97 OBLX	0.0 $\bar{p}p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
1435 ± 9		PROKOSHKIN	97B GAM4	100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$
1430 ± 4		¹ ARMSTRONG	92E OMEG	85,300 $\pi^+ p, pp \rightarrow \pi^+ p, pp (K \bar{K} \pi)$
1462 ± 20		² AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K \bar{K} \pi$
1443 $\begin{smallmatrix} +7 \\ -6 \end{smallmatrix}$ $\begin{smallmatrix} +3 \\ -2 \end{smallmatrix}$	1100	BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1425 ± 10	17	BEHREND	89 CELL	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
1442 ± 5 $\begin{smallmatrix} +10 \\ -17 \end{smallmatrix}$	111	BECKER	87 MRK3	$e^+ e^-, \omega K \bar{K} \pi$
1423 ± 4		GIDAL	87B MRK2	$e^+ e^- \rightarrow e^+ e^- K \bar{K} \pi$
1417 ± 13	13	AIHARA	86C TPC	$e^+ e^- \rightarrow e^+ e^- K \bar{K} \pi$
1422 ± 3		CHAUVAT	84 SPEC	ISR 31.5 pp
1440 ± 10		³ BROMBERG	80 SPEC	100 $\pi^- p \rightarrow K \bar{K} \pi X$
1426 ± 6	221	DIONISI	80 HBC	4 $\pi^- p \rightarrow K \bar{K} \pi n$
1420 ± 20		DAHL	67 HBC	1.6–4.2 $\pi^- p$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1430.8 ± 0.9		⁴ SOSA	99 SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^+ \pi^-) p_{\text{fast}}$
1433.4 ± 0.8		⁴ SOSA	99 SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^- \pi^+) p_{\text{fast}}$
1429 ± 3	389	ARMSTRONG	89 OMEG	300 $pp \rightarrow K \bar{K} \pi p p$
1425 ± 2	1520	ARMSTRONG	84 OMEG	85 $\pi^+ p, pp \rightarrow (\pi^+, p) (K \bar{K} \pi) p$
~ 1420		BITYUKOV	84 SPEC	32 $K^- p \rightarrow K^+ K^- \pi^0 \gamma$

¹ This result supersedes ARMSTRONG 84, ARMSTRONG 89.

² From fit to the $K^*(892) K 1^{++}$ partial wave.

³ Mass error increased to account for $a_0(980)$ mass cut uncertainties.

⁴ No systematic error given.



$f_1(1420)$ mass (MeV)

$f_1(1420)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
55.5 ± 2.9 OUR AVERAGE				
58 ± 4		BARBERIS	97C OMEG	450 $pp \rightarrow ppK_S^0 K^\pm \pi^\mp$
45 ± 10		BERTIN	97 OBLX	0.0 $\bar{p}p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
90 ± 25		PROKOSHKIN	97B GAM4	100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$
58 ± 10		⁵ ARMSTRONG	92E OMEG	85,300 $\pi^+ p, pp \rightarrow \pi^+ p, pp(K\bar{K}\pi)$
129 ± 41		⁶ AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$
68 ⁺²⁹ / ₋₁₈ ⁺⁸ / ₋₉	1100	BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
42 ± 22	17	BEHREND	89 CELL	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
40 ⁺¹⁷ / ₋₁₃ ± 5	111	BECKER	87 MRK3	$e^+ e^- \rightarrow \omega K\bar{K}\pi$
35 ⁺⁴⁷ / ₋₂₀	13	AIHARA	86C TPC	$e^+ e^- \rightarrow e^+ e^- K\bar{K}\pi$
47 ± 10		CHAUVAT	84 SPEC	ISR 31.5 pp
62 ± 14		BROMBERG	80 SPEC	100 $\pi^- p \rightarrow K\bar{K}\pi X$
40 ± 15	221	DIONISI	80 HBC	4 $\pi^- p \rightarrow K\bar{K}\pi n$
60 ± 20		DAHL	67 HBC	1.6–4.2 $\pi^- p$

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

68.7 ± 2.9	⁷ SOSA	99	SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^+ \pi^-) p_{\text{fast}}$
58.8 ± 3.3	⁷ SOSA	99	SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^- \pi^+) p_{\text{fast}}$
58 ± 8	389	ARMSTRONG	89	OMEG 300 $pp \rightarrow K \bar{K} \pi pp$
62 ± 5	1520	ARMSTRONG	84	OMEG 85 $\pi^+ p, pp \rightarrow (\pi^+, p)(K \bar{K} \pi) p$
~ 50		BITYUKOV	84	SPEC 32 $K^- p \rightarrow K^+ K^- \pi^0 \gamma$

⁵ This result supersedes ARMSTRONG 84, ARMSTRONG 89.

⁶ From fit to the $K^*(892) K 1^{++}$ partial wave.

⁷ No systematic error given.

$f_1(1420)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K \bar{K} \pi$	dominant
Γ_2 $K \bar{K}^*(892) + \text{c.c.}$	dominant
Γ_3 $\eta \pi \pi$	possibly seen
Γ_4 $a_0(980) \pi$	
Γ_5 $\pi \pi \rho$	
Γ_6 4π	
Γ_7 $\rho^0 \gamma$	
Γ_8 $\phi \gamma$	seen

$f_1(1420) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K \bar{K} \pi) \times / \Gamma_{\text{total}}$	$\Gamma_1 \Gamma_0 / \Gamma$
VALUE (keV) CL%	DOCUMENT ID TECN COMMENT
1.7 ± 0.4 OUR AVERAGE	
$3.0 \pm 0.9 \pm 0.7$	^{8,9} BEHREND 89 CELL $e^+ e^- \rightarrow e^+ e^- K_S^0 K \pi$
$2.3^{+1.0}_{-0.9} \pm 0.8$	HILL 89 JADE $e^+ e^- \rightarrow e^+ e^- K^\pm K_S^0 \pi^\mp$
$1.3 \pm 0.5 \pm 0.3$	AIHARA 88B TPC $e^+ e^- \rightarrow e^+ e^- K^\pm K_S^0 \pi^\mp$
$1.6 \pm 0.7 \pm 0.3$	^{8,10} GIDAL 87B MRK2 $e^+ e^- \rightarrow e^+ e^- K \bar{K} \pi$
< 8.0	95 JENNI 83 MRK2 $e^+ e^- \rightarrow e^+ e^- K \bar{K} \pi$

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

⁸ Assume a ρ -pole form factor.

⁹ A ϕ - pole form factor gives considerably smaller widths.

¹⁰ Published value divided by 2.

$f_1(1420)$ BRANCHING RATIOS

$\Gamma(K\bar{K}^*(892)+c.c.)/\Gamma(K\bar{K}\pi)$ Γ_2/Γ_1

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.76±0.06	BROMBERG	80	SPEC 100 $\pi^- p \rightarrow K\bar{K}\pi X$
0.86±0.12	DIONISI	80	HBC 4 $\pi^- p \rightarrow K\bar{K}\pi n$

$\Gamma(\pi\pi\rho)/\Gamma(K\bar{K}\pi)$ Γ_5/Γ_1

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.3	95	CORDEN	78	OMEG 12–15 $\pi^- p$
<2.0		DAHL	67	HBC 1.6–4.2 $\pi^- p$

$\Gamma(\eta\pi\pi)/\Gamma(K\bar{K}\pi)$ Γ_3/Γ_1

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.1	95	ARMSTRONG	91B	OMEG 300 $p p \rightarrow p p \eta \pi^+ \pi^-$
1.35±0.75		KOPKE	89	MRK3 $J/\psi \rightarrow \omega \eta \pi \pi (K\bar{K}\pi)$
<0.6	90	GIDAL	87	MRK2 $e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$
<0.5	95	CORDEN	78	OMEG 12–15 $\pi^- p$
1.5 ±0.8		DEFOIX	72	HBC 0.7 $\bar{p} p$

$\Gamma(a_0(980)\pi)/\Gamma(\eta\pi\pi)$ Γ_4/Γ_3

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
>0.1	90	PROKOSHKIN	97B	GAM4 100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$
not seen in either mode		ANDO	86	SPEC 8 $\pi^- p$
not seen in either mode		CORDEN	78	OMEG 12–15 $\pi^- p$
0.4±0.2		DEFOIX	72	HBC 0.7 $\bar{p} p \rightarrow 7\pi$

$\Gamma(4\pi)/\Gamma(K\bar{K}^*(892)+c.c.)$ Γ_6/Γ_2

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.90	95	DIONISI	80	HBC 4 $\pi^- p$

$\Gamma(K\bar{K}\pi)/[\Gamma(K\bar{K}^*(892)+c.c.)+\Gamma(a_0(980)\pi)]$ $\Gamma_1/(\Gamma_2+\Gamma_4)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.65±0.27	¹¹ DIONISI	80	HBC 4 $\pi^- p$

¹¹ Calculated using $\Gamma(K\bar{K})/\Gamma(\eta\pi) = 0.24 \pm 0.07$ for $a_0(980)$ fractions.

$\Gamma(a_0(980)\pi)/\Gamma(K\bar{K}^*(892)+c.c.)$ Γ_4/Γ_2

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04 ±0.01 ±0.01		BARBERIS	98C	OMEG 450 $p p \rightarrow p_f f_1(1420) p_S$
<0.04	68	ARMSTRONG	84	OMEG 85 $\pi^+ p$

$\Gamma(4\pi)/\Gamma(K\bar{K}\pi)$			Γ_6/Γ_1	
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.62	95	ARMSTRONG 89G	OMEG	85 $\pi p \rightarrow 4\pi X$

$\Gamma(\rho^0\gamma)/\Gamma_{\text{total}}$			Γ_7/Γ	
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.08	95	¹² ARMSTRONG 92C	SPEC	300 $p p \rightarrow p p \pi^+ \pi^- \gamma$

¹² Using the data on the $\bar{K} K \pi$ mode from ARMSTRONG 89.

$\Gamma(\rho^0\gamma)/\Gamma(K\bar{K}\pi)$			Γ_7/Γ_1	
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.02	95	BARBERIS	98C OMEG	450 $p p \rightarrow p_f f_1(1420) p_S$

$\Gamma(\phi\gamma)/\Gamma(K\bar{K}\pi)$			Γ_8/Γ_1	
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
0.003 ± 0.001 ± 0.001		BARBERIS	98C OMEG	450 $p p \rightarrow p_f f_1(1420) p_S$

$f_1(1420)$ REFERENCES

SOSA	99	PRL 83 913	M. Sosa <i>et al.</i>	
BARBERIS	98C	PL B440 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS	97C	PL B413 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BERTIN	97	PL B400 226	A. Bertin <i>et al.</i>	(OBELIX Collab.)
PROKOSHKIN	97B	SPD 42 298	Yu.D. Prokoshkin, S.A. Sadovsky	
		Translated from DANS 354 751.		
ARMSTRONG	92C	ZPHY C54 371	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)
ARMSTRONG	92E	ZPHY C56 29	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+) JPC
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)
BAI	90C	PRL 65 2507	Z. Bai <i>et al.</i>	(Mark III Collab.)
ARMSTRONG	89	PL B221 216	T.A. Armstrong <i>et al.</i>	(CERN, CDEF, BIRM+) JPC
ARMSTRONG	89G	ZPHY C43 55	T.A. Armstrong <i>et al.</i>	(CERN, BIRM, BARI+)
BEHREND	89	ZPHY C42 367	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
HILL	89	ZPHY C42 355	P. Hill <i>et al.</i>	(JADE Collab.) JP
KOPKE	89	PRPL 174 67	L. Kopke <i>et al.</i>	(CERN)
AIHARA	88B	PL B209 107	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)
BECKER	87	PRL 59 186	J.J. Becker <i>et al.</i>	(Mark III Collab.) JP
GIDAL	87	PRL 59 2012	G. Gidal <i>et al.</i>	(LBL, SLAC, HARV)
GIDAL	87B	PRL 59 2016	G. Gidal <i>et al.</i>	(LBL, SLAC, HARV)
AIHARA	86C	PRL 57 2500	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.) JP
ANDO	86	PRL 57 1296	A. Ando <i>et al.</i>	(KEK, KYOT, NIRS, SAGA+)
ARMSTRONG	84	PL 146B 273	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+) JP
BITYUKOV	84	SJNP 39 735	S. Bitjukov <i>et al.</i>	(SERP)
		Translated from YAF 39 1165.		
CHAUVAT	84	PL 148B 382	P. Chauvat <i>et al.</i>	(CERN, CLER, UCLA+)
JENNI	83	PR D27 1031	P. Jenni <i>et al.</i>	(SLAC, LBL)
BROMBERG	80	PR D22 1513	C.M. Bromberg <i>et al.</i>	(CIT, FNAL, ILLC+)
DIONISI	80	NP B169 1	C. Dionisi <i>et al.</i>	(CERN, MADR, CDEF+) IJP
CORDEN	78	NP B144 253	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+)
DEFOIX	72	NP B44 125	C. Defoix <i>et al.</i>	(CDEF, CERN)
DAHL	67	PR 163 1377	O.I. Dahl <i>et al.</i>	(LRL) IJP
Also	65	PRL 14 1074	D.H. Miller <i>et al.</i>	(LRL, UCB)

————— **OTHER RELATED PAPERS** —————

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PROKOSHKIN	99	PAN 62 356	Yu.D. Prokoshkin	
		Translated from YAF 62 396.		
IIZUKA	91	PTP 86 885	J. Iizuka, H. Koibuchi	(NAGO)
ISHIDA	89	PTP 82 119	S. Ishida <i>et al.</i>	(NIHO)
AIHARA	88C	PR D38 1	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.) JPC
BITYUKOV	88	PL B203 327	S.I. Bitjukov <i>et al.</i>	(SERP)
PROTOPOP...	87B	Hadron 87 Conf.	S.D. Protopopescu, S.U. Chung	(BNL)
