

$f_2(1565)$

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

OMITTED FROM SUMMARY TABLE

Seen mostly in antinucleon-nucleon annihilation. Needs confirmation in other channels. See the review on "Spectroscopy of Light Meson Resonances."

$f_2(1565)$ T-MATRIX POLE \sqrt{s}

Note that $\Gamma \approx 2 \text{Im}(\sqrt{s})$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(1495–1560) – i (40–110) OUR ESTIMATE			
$(1560 \pm 15) - i (140 \pm 20)$	¹ ANISOVICH	09	RVUE $0.0 \bar{p}p, \pi N$
$(1552 \pm 13) - i (57 \pm 12)$	AMSLER	02	CBAR $0.9 \bar{p}p \rightarrow \pi^0 \eta \eta,$ $\pi^0 \pi^0 \pi^0$
$(1507 \pm 15) - i (65 \pm 10)$	BERTIN	97C	OBLX $0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
$(1534 \pm 20) - i (90 \pm 30)$	² ABELE	96C	RVUE Compilation
$(\sim 1552) - i (\sim 71)$	³ AMSLER	95D	CBAR $0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0,$ $\pi^0 \eta \eta, \pi^0 \pi^0 \eta$

¹ On sheet II in a two-pole solution.

² T-matrix pole, large coupling to $\rho\rho$ and $\omega\omega$, could be $f_2(1640)$.

³ Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

$f_2(1565)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1575 ± 18	⁴ BERTIN	98	OBLX $0.05\text{--}0.405 \bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1590 ± 10	^{5,6} AMELIN	06	VES $36 \pi^- p \rightarrow \omega \omega n$
$1550 \pm 10 \pm 20$	⁶ AMELIN	00	VES $37 \pi^- p \rightarrow \eta \pi^+ \pi^- n$
$1598 \pm 11 \pm 9$	BAKER	99B	SPEC $0 \bar{p}p \rightarrow \omega \omega \pi^0$
1598 ± 72	BALOSHIN	95	SPEC $40 \pi^- C \rightarrow K_S^0 K_S^0 X$
1566^{+80}_{-50}	⁷ ANISOVICH	94	CBAR $0.0 \bar{p}p \rightarrow 3\pi^0, \eta \eta \pi^0$
1502 ± 9	ADAMO	93	OBLX $\bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$
1488 ± 10	⁸ ARMSTRONG	93C	E760 $\bar{p}p \rightarrow \pi^0 \eta \eta \rightarrow 6\gamma$
1508 ± 10	⁸ ARMSTRONG	93D	E760 $\bar{p}p \rightarrow 3\pi^0 \rightarrow 6\gamma$
1525 ± 10	⁸ ARMSTRONG	93D	E760 $\bar{p}p \rightarrow \eta \pi^0 \pi^0 \rightarrow 6\gamma$
~ 1504	⁹ WEIDENAUER	93	ASTE $0.0 \bar{p}N \rightarrow 3\pi^- 2\pi^+$
1540 ± 15	⁸ ADAMO	92	OBLX $\bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$
1515 ± 10	¹⁰ AKER	91	CBAR $0.0 \bar{p}p \rightarrow 3\pi^0$
1565 ± 20	MAY	90	ASTE $0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
1477 ± 5	BRIDGES	86C	DBC $0.0 \bar{p}N \rightarrow 3\pi^- 2\pi^+$

⁴ Breit-Wigner mass.

⁵ Supersedes the $\omega\omega$ state of BELADIDZE 92B earlier assigned to the $f_2(1640)$.

⁶ Breit-Wigner width.

- ⁷ From a simultaneous analysis of the annihilations $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta\eta$ including AKER 91 data.
- ⁸ J^P not determined, could be partly $f_0(1500)$.
- ⁹ J^P not determined.
- ¹⁰ Superseded by AMSLER 95B.

$f_2(1565)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
119 ± 24	¹¹ BERTIN	98 OBLX	0.05–0.405 $\bar{p}p \rightarrow \pi^+\pi^+\pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
140 ± 11	^{12,13} AMELIN	06 VES	36 $\pi^-p \rightarrow \omega\omega n$
130 ± 20 ± 40	¹³ AMELIN	00 VES	37 $\pi^-p \rightarrow \eta\pi^+\pi^-n$
263 ± 101	BALOSHIN	95 SPEC	40 $\pi^-C \rightarrow K_S^0 K_S^0 X$
166 ⁺ _{−20} 80	¹⁴ ANISOVICH	94 CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0, \eta\eta\pi^0$
130 ± 10	¹⁵ ADAMO	93 OBLX	$\bar{p}p \rightarrow \pi^+\pi^+\pi^-$
148 ± 27	¹⁶ ARMSTRONG	93C E760	$\bar{p}p \rightarrow \pi^0\eta\eta \rightarrow 6\gamma$
103 ± 15	¹⁶ ARMSTRONG	93D E760	$\bar{p}p \rightarrow 3\pi^0 \rightarrow 6\gamma$
111 ± 10	¹⁶ ARMSTRONG	93D E760	$\bar{p}p \rightarrow \eta\pi^0\pi^0 \rightarrow 6\gamma$
~ 206	¹⁷ WEIDENAUER	93 ASTE	0.0 $\bar{p}N \rightarrow 3\pi^-2\pi^+$
132 ± 37	¹⁶ ADAMO	92 OBLX	$\bar{p}p \rightarrow \pi^+\pi^+\pi^-$
120 ± 10	¹⁸ AKER	91 CBAR	0.0 $\bar{p}p \rightarrow 3\pi^0$
170 ± 40	MAY	90 ASTE	0.0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
116 ± 9	BRIDGES	86C DBC	0.0 $\bar{p}N \rightarrow 3\pi^-2\pi^+$

- ¹¹ Breit-Wigner width.
- ¹² Supersedes the $\omega\omega$ state of BELADIDZE 92B earlier assigned to the $f_2(1640)$.
- ¹³ Breit-Wigner width.
- ¹⁴ From a simultaneous analysis of the annihilations $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta\eta$ including AKER 91 data.
- ¹⁵ Supersedes ADAMO 92.
- ¹⁶ J^P not determined, could be partly $f_0(1500)$.
- ¹⁷ J^P not determined.
- ¹⁸ Superseded by AMSLER 95B.

$f_2(1565)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $\pi\pi$	seen
Γ_2 $\pi^+\pi^-$	seen
Γ_3 $\pi^0\pi^0$	seen
Γ_4 $\rho^0\rho^0$	seen
Γ_5 $2\pi^+2\pi^-$	seen
Γ_6 $\eta\eta$	seen
Γ_7 $\omega\omega$	seen
Γ_8 $K\bar{K}$	seen
Γ_9 $\gamma\gamma$	seen

$f_2(1565)$ PARTIAL WIDTHS

$\Gamma(\eta\eta)$ Γ_6

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.2 ± 0.3	870	¹⁹ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(K\bar{K})$ Γ_8

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2.0 ± 1.0	870	¹⁹ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\gamma\gamma)$ Γ_9

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.70 ± 0.14	870	¹⁹ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

¹⁹ From analysis of L3 data at 91 and 183–209 GeV, using $f_2(1565)$ mass of 1570 MeV, width of 160 MeV, $\Gamma(\pi\pi) = 25$ MeV, and SU(3) relations.

$f_2(1565)$ BRANCHING RATIOS

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

VALUE	DOCUMENT ID	TECN	COMMENT
seen	BAKER	99B	SPEC $0 \bar{p}p \rightarrow \omega\omega\pi^0$

$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	BERTIN	98	OBLX $0.05\text{--}0.405 \bar{p}p \rightarrow \pi^+\pi^+\pi^-$
not seen	²⁰ ANISOVICH	94B	RVUE $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
seen	MAY	89	ASTE $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$

²⁰ ANISOVICH 94B is from a reanalysis of MAY 90.

$\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	AMSLER	95B	CBAR $0.0 \bar{p}p \rightarrow 3\pi^0$

$\Gamma(\pi^+\pi^-)/\Gamma(\rho^0\rho^0)$ Γ_2/Γ_4

VALUE	DOCUMENT ID	TECN	COMMENT
0.042 ± 0.013	BRIDGES	86B	DBC $\bar{p}N \rightarrow 3\pi^- 2\pi^+$

$\Gamma(\eta\eta)/\Gamma(\pi^0\pi^0)$

Γ_6/Γ_3

VALUE DOCUMENT ID TECN COMMENT

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

$0.024 \pm 0.005 \pm 0.012$ ²¹ ARMSTRONG 93C E760 $\bar{p}p \rightarrow \pi^0\eta\eta \rightarrow 6\gamma$
²¹ J^P not determined, could be partly $f_0(1500)$.

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

Γ_7/Γ

VALUE DOCUMENT ID TECN COMMENT

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

seen BAKER 99B SPEC 0 $\bar{p}p \rightarrow \omega\omega\pi^0$

$f_2(1565)$ REFERENCES

ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	(PNPI)
AMELIN	06	PAN 69 690	D.V. Amelin <i>et al.</i>	(VES Collab.)
		Translated from YAF 69 715.		
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>	
AMSLER	02	EPJ C23 29	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
AMELIN	00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)
BAKER	99B	PL B467 147	C.A. Baker <i>et al.</i>	
BERTIN	98	PR D57 55	A. Bertin <i>et al.</i>	(OBELIX Collab.)
BERTIN	97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)
ABELE	96C	NP A609 562	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
AMSLER	95B	PL B342 433	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
AMSLER	95C	PL B353 571	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
AMSLER	95D	PL B355 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
BALOSHIN	95	PAN 58 46	O.N. Baloshin <i>et al.</i>	(ITEP)
		Translated from YAF 58 50.		
AMSLER	94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
ANISOVICH	94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.)
ANISOVICH	94B	PR D50 1972	V.V. Anisovich <i>et al.</i>	(LOQM)
ADAMO	93	NP A558 13C	A. Adamo <i>et al.</i>	(OBELIX Collab.)
ARMSTRONG	93C	PL B307 394	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
ARMSTRONG	93D	PL B307 399	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
WEIDENAUER	93	ZPHY C59 387	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)
ADAMO	92	PL B287 368	A. Adamo <i>et al.</i>	(OBELIX Collab.)
BELADIDZE	92B	ZPHY C54 367	G.M. Beladidze <i>et al.</i>	(VES Collab.)
AKER	91	PL B260 249	E. Aker <i>et al.</i>	(Crystal Barrel Collab.)
MAY	90	ZPHY C46 203	B. May <i>et al.</i>	(ASTERIX Collab.)
MAY	89	PL B225 450	B. May <i>et al.</i>	(ASTERIX Collab.) IJP
BRIDGES	86B	PRL 56 215	D.L. Bridges <i>et al.</i>	(SYRA, CASE)
BRIDGES	86C	PRL 57 1534	D.L. Bridges <i>et al.</i>	(SYRA)