$f_0(1810)$

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

OMITTED FROM SUMMARY TABLE
was $f_0(1770)$

Evidence for two isoscalar scales, $f_0(1710)$ and $f_0(1810)$, was first reported by SARANTSEV 21 and ABLIKIM 22F. The data assignments to either $f_0(1710)$ or $f_0(1810)$ are tentative. See the review on "Spectroscopy of Light Meson Resonances."

$f_0(1810)$ T-MATRIX POLE $\sqrt{s}$

Note that $\Gamma = -2\ \mathrm{Im}(\sqrt{s})$.

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$(1765 \pm 15) - i\ (90 \pm 10)$	SARANTSEV	21	RVUE	$J/\psi \to \gamma\ (\pi\pi,\ K\overline{K},\ \eta\eta,\ \omega\phi)$
$(1803 \pm 3.5^{+45.5}_{-10.4}) - i\ (145 \pm 2.5^{+16.3}_{-9.6})$	[1] ALBRECHT	20	RVUE	$0.9\ \overline{p}p \to \pi^0\pi^0\eta,\ \pi^0\eta\eta,\ \pi^0 K^+K^-$

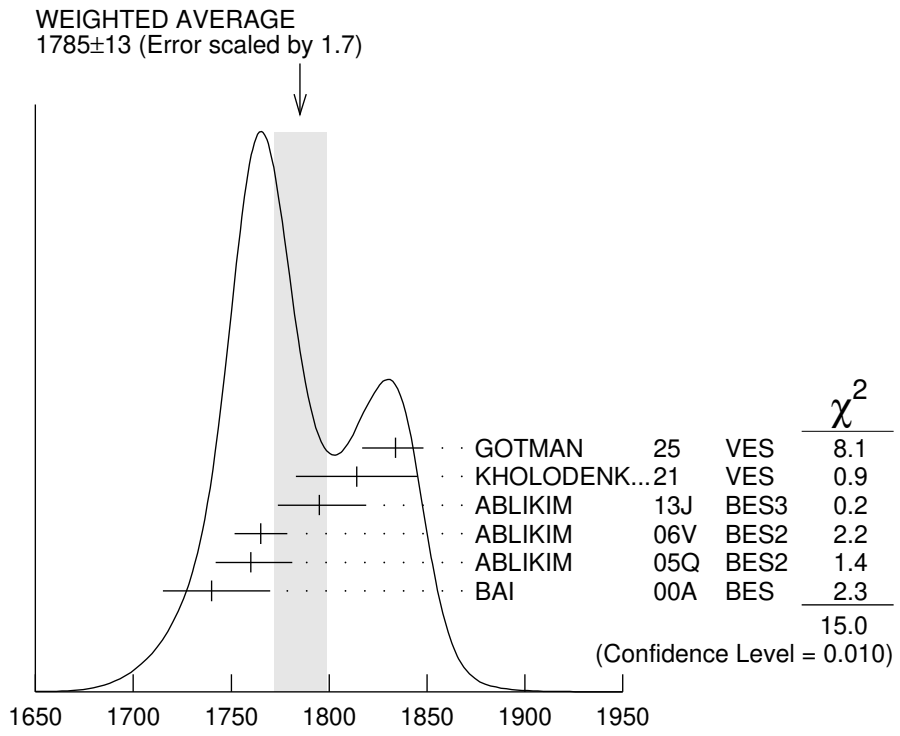
[1] T-matrix pole, 5 poles, 5 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\overline{K}$), BINON 83 ($\eta\eta$), and BINON 84C ($\eta\eta'$).

$f_0(1810)$ Breit-Wigner MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1785 ± 13 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.			
$1834 \pm 14^{+\ 2}_{-10}$		[1] GOTMAN	25	VES	$29\ \pi^-\mathrm{Be} \to \mathrm{A}\omega\phi$
1814 ± 31	7.2k	[2] KHOLODENK..	21	VES	$29\ \pi^- p \to n\omega\phi$
$1795 \pm\ 7^{+23}_{-20}$		ABLIKIM	13J	BES3	$J/\psi \to \gamma\omega\phi$
$1765^{+\ 4}_{-\ 3} \pm 13$		ABLIKIM	06V	BES2	$e^+e^- \to J/\psi \to \gamma\pi^+\pi^-$
$1760 \pm 15^{+15}_{-10}$		ABLIKIM	05Q	BES2	$\psi(2S) \to \gamma\pi^+\pi^- K^+K^-$
1740^{+30}_{-25}		BAI	00A	BES	$J/\psi \to \gamma(\pi^+\pi^-\pi^+\pi^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1834 \pm 14^{+\ 2}_{-10}$		[3] DOROFEEV	24	VES	$29\ \pi^-\mathrm{Be} \to \mathrm{A}\omega\phi$
1814 ± 18		[4,5] AAIJ	14BR	LHCB	$\overline{B}{}^0_s \to J/\psi\pi^+\pi^-$
$1812^{+19}_{-26} \pm 18$		[6] ABLIKIM	06J	BES2	$J/\psi \to \gamma\omega\phi$
1790^{+40}_{-30}		ABLIKIM	05	BES2	$J/\psi \to \phi\pi^+\pi^-$

[1] GOTMAN 25 attributes these data to the $f_0(1710)$.
[2] From partial wave analysis of $\omega\phi$ invariant mass including 0^{++}, 2^{++}, and 0^{-+} resonances.
[3] Superseded by GOTMAN 25.
[4] Second solution: 1800 ± 22 MeV. The fit favors $f_0(1810)$ to $f_0(1710)$.
[5] Statistical error only.

[6] Not seen by LIU 09 in $B^{\pm} \to K^{\pm}\omega\phi$.



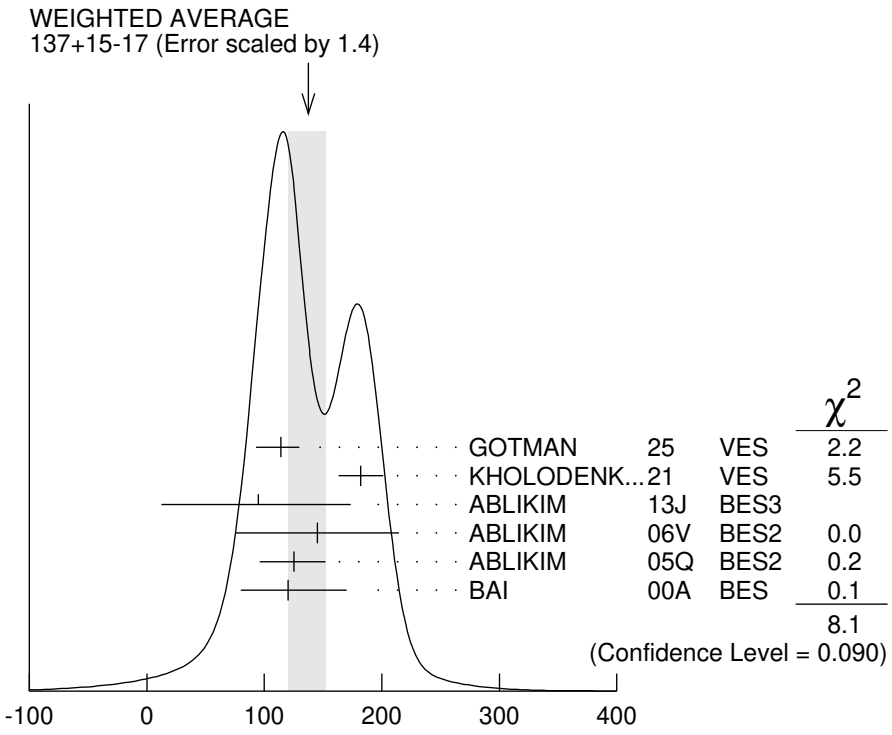
$f_0(1810)$ Breit-Wigner WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
137^{+15}_{-17} OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.			
$114 \pm 15^{+5}_{-15}$		[1] GOTMAN	25	VES	29 π^- Be $\to$ A$\omega\phi$
182 ± 19	7.2k	[2] KHOLODENK..	21	VES	29 $\pi^- p \to n\omega\phi$
$95 \pm 10^{+78}_{-82}$		ABLIKIM	13J	BES3	$J/\psi \to \gamma\omega\phi$
$145 \pm 8 \pm 69$		ABLIKIM	06V	BES2	$e^+e^- \to J/\psi \to \gamma\pi^+\pi^-$
$125 \pm 25^{+10}_{-15}$		ABLIKIM	05Q	BES2	$\psi(2S) \to \gamma\pi^+\pi^- K^+K^-$
120^{+50}_{-40}		BAI	00A	BES	$J/\psi \to \gamma(\pi^+\pi^-\pi^+\pi^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$114 \pm 15^{+5}_{-15}$		[3] DOROFEEV	24	VES	29 π^- Be $\to$ A$\omega\phi$
328 ± 34		[4,5] AAIJ	14BR	LHCB	$\overline{B}{}^0_s \to J/\psi\pi^+\pi^-$
$105 \pm 20 \pm 28$		[6] ABLIKIM	06J	BES2	$J/\psi \to \gamma\omega\phi$
270^{+60}_{-30}		[7] ABLIKIM	05	BES2	$J/\psi \to \phi\pi^+\pi^-$

[1] GOTMAN 25 attributes these data to the $f_0(1710)$.

[2] From partial wave analysis of $\omega\phi$ invariant mass including 0^{++}, 2^{++}, and 0^{-+} resonances.

[3] Superseded by GOTMAN 25.
[4] Second solution: 263 ± 30 MeV. The fit favors $f_0(1810)$ to $f_0(1710)$.
[5] Statistical error only.
[6] Not seen by LIU 09 in $B^{\pm} \to K^{\pm}\omega\phi$.
[7] $f_0(1710)$ width fixed to PDG value.



$f_0(1810)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\pi\pi$	seen
Γ_2	$K\overline{K}$	seen
Γ_3	$\eta\eta$	seen
Γ_4	$\omega\phi$	seen

$f_0(1810)$ BRANCHING RATIOS

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

VALUE	DOCUMENT ID		TECN	COMMENT
seen	SARANTSEV	21	RVUE	$J/\psi \to \gamma\,(\pi\pi,\ K\overline{K},\ \eta\eta,\ \omega\phi)$
seen	AAIJ	14BR	LHCB	$\overline{B}{}^0_s \to J/\psi\pi^+\pi^-$
seen	ABLIKIM	05	BES2	$J/\psi \to \phi\pi^+\pi^-$

$\Gamma(K\overline{K})/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	SARANTSEV	21	RVUE	$J/\psi \to \gamma$ ($\pi\pi$, $K\overline{K}$, $\eta\eta$, $\omega\phi$)

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	SARANTSEV	21	RVUE	$J/\psi \to \gamma$ ($\pi\pi$, $K\overline{K}$, $\eta\eta$, $\omega\phi$)

$\Gamma(\omega\phi)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	7.2k	KHOLODENK..	21	VES	29 $\pi^- p \to n\omega\phi$
seen		SARANTSEV	21	RVUE	$J/\psi \to \gamma$ ($\pi\pi$, $K\overline{K}$, $\eta\eta$, $\omega\phi$)

$\Gamma(\pi\pi)/\Gamma_{\text{total}} \times \Gamma(\omega\phi)/\Gamma_{\text{total}}$ $\Gamma_1/\Gamma \times \Gamma_4/\Gamma$

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.8 ± 1.2	[1] DOROFEEV	24	VES	29 π^- Be $\to$ A$\omega\phi$

[1] Using one-pion exchange. Assigning this resonance to be $f_0(1710)$ instead gives $B(f_0 \to \pi\pi) \times B(f_0 \to \omega\phi) = (3.9 \pm 1.0) \times 10^{-3}$.

$f_0(1810)$ REFERENCES

GOTMAN	25	PPN 56 743	V.G. Gotman *et al.*	(VES Collab.)
DOROFEEV	24	EPJ A60 105	V.A. Dorofeev *et al.*	(VES Collab.)
ABLIKIM	22F	PR D105 L051103	M. Ablikim *et al.*	(BESIII Collab.)
KHOLODENK...	21	PAN 83 1602	M.S. Kholodenko	(VES Collab.)
SARANTSEV	21	PL B816 136227	A.V. Sarantsev *et al.*	(BONN, PNPI)
ALBRECHT	20	EPJ C80 453	M. Albrecht *et al.*	(Crystal Barrel Collab.)
AAIJ	14BR	PR D89 092006	R. Aaij *et al.*	(LHCb Collab.)
ABLIKIM	13J	PR D87 032008	M. Ablikim *et al.*	(BESIII Collab.)
LIU	09	PR D79 071102	C. Liu *et al.*	(BELLE Collab.)
ABLIKIM	06J	PRL 96 162002	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	06V	PL B642 441	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05	PL B607 243	M. Ablikim *et al.*	(BES Collab.)
ABLIKIM	05Q	PR D72 092002	M. Ablikim *et al.*	(BES Collab.)
BAI	00A	PL B472 207	J.Z. Bai *et al.*	(BES Collab.)
LONGACRE	86	PL B177 223	R.S. Longacre *et al.*	(BNL, BRAN, CUNY+)
BINON	84C	NC 80A 363	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
BINON	83	NC 78A 313	F.G. Binon *et al.*	(BELG, LAPP, SERP+)
HYAMS	75	NP B100 205	B.D. Hyams *et al.*	(CERN, MPIM)