$X(1835)$

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

OMITTED FROM SUMMARY TABLE
Could be a superposition of several states.

$X(1835)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
$1835.7^{+\,5.0}_{-\,3.2}$ OUR AVERAGE					
$1836.5\pm 3.0^{+\,5.6}_{-\,2.1}$	4265	[1] ABLIKIM	11C	BES3	$J/\psi \to \gamma\pi^+\pi^-\eta'$
$1833.7\pm 6.1\pm 2.7$	264	ABLIKIM	05R	BES2	$J/\psi \to \gamma\pi^+\pi^-\eta'$
$\bullet\,\bullet\,\bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet\,\bullet\,\bullet$					
$1877.3\pm 6.3^{+\,3.4}_{-\,7.4}$		[2] ABLIKIM	11J	BES3	$J/\psi \to \omega(\eta\pi^+\pi^-)$
$1837\ ^{+10}_{-12}\ ^{+\,9}_{-\,7}$	231	[3,4] ALEXANDER	10	CLEO	$J/\psi \to \gamma p\overline{p}$
$1831\ \pm 7$		[4,5] ABLIKIM	05R	BES2	$J/\psi \to \gamma p\overline{p}$
$1859\ ^{+\,3}_{-10}\ ^{+\,5}_{-25}$		[4] BAI	03F	BES2	$J/\psi \to \gamma p\overline{p}$

[1] From a fit of the $\pi^+\pi^-\eta'$ mass distribution to a combination of $\gamma f_1(1510)$, $\gamma X(1835)$, and two unconfirmed states $\gamma X(2120)$, and $\gamma X(2370)$, for $M(p\overline{p}) < 2.8$ GeV, and accounting for backgrounds from non-η' events and $J/\psi \to \pi^0\pi^+\pi^-\eta'$.

[2] The selected process is $J/\psi \to \omega a_0(980)\pi$. This state may be due also to $\eta_2(1870)$ or to a combination of $X(1835)$ and $\eta_2(1870)$.

[3] From a fit of the $p\overline{p}$ mass distribution to a combination of $\gamma X(1835)$, γR with $M(R)$ = 2100 MeV and $\Gamma(R)$ = 160 MeV, and $\gamma p\overline{p}$ phase space, for $M(p\overline{p}) < 2.85$ GeV.

[4] Evidence for a threshold enhancement in the $p\overline{p}$ mass spectrum was also reported by ABE 02K, AUBERT,B 05L, and WANG 05A in $B^+ \to p\overline{p}K^+$, WANG 05A in $B^0 \to p\overline{p}K^0_S$, ABE 02W in $\overline{B}^0 \to p\overline{p}D^0$, and WEI 08 in $B^+ \to p\overline{p}\pi^+$ decays. Not seen by ATHAR 06 in $\Upsilon(1S) \to p\overline{p}\gamma$.

[5] From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A. Systematic errors not estimated.

$X(1835)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
99 ± 50 OUR AVERAGE Error includes scale factor of 2.8.						
$190\ \pm 9\ ^{+38}_{-36}$		4265	[6] ABLIKIM	11C	BES3	$J/\psi \to \gamma\pi^+\pi^-\eta'$
$67.7\pm 20.3\pm 7.7$		264	ABLIKIM	05R	BES2	$J/\psi \to \gamma\pi^+\pi^-\eta'$
$\bullet\,\bullet\,\bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet\,\bullet\,\bullet$						
$57\ \pm 12\ ^{+19}_{-\,4}$			[7] ABLIKIM	11J	BES3	$J/\psi \to \omega(\eta\pi^+\pi^-)$
$0\ ^{+44}_{-\,0}$		231	[8,9] ALEXANDER	10	CLEO	$J/\psi \to \gamma p\overline{p}$
< 153	90		[9,10] ABLIKIM	05R	BES2	$J/\psi \to \gamma p\overline{p}$
< 30			[9] BAI	03F	BES2	$J/\psi \to \gamma p\overline{p}$

[6] From a fit of the $\pi^+\pi^-\eta'$ mass distribution to a combination of $\gamma f_1(1510)$, $\gamma X(1835)$, and two unconfirmed states $\gamma X(2120)$, and $\gamma X(2370)$, for $M(p\overline{p}) < 2.8$ GeV, and accounting for backgrounds from non-η' events and $J/\psi \to \pi^0\pi^+\pi^-\eta'$.

[7] The selected process is $J/\psi \to \omega a_0(980)\pi$. This state may be due also to $\eta_2(1870)$ or to a combination of $X(1835)$ and $\eta_2(1870)$.

[8] From a fit of the $p\overline{p}$ mass distribution to a combination of $\gamma X(1835)$, γR with $M(R) = 2100$ MeV and $\Gamma(R) = 160$ MeV, and $\gamma p\overline{p}$ phase space, for $M(p\overline{p}) < 2.85$ GeV.

[9] Evidence for a threshold enhancement in the $p\overline{p}$ mass spectrum was also reported by ABE 02K, AUBERT,B 05L, and WANG 05A in $B^+ \to p\overline{p}K^+$, WANG 05A in $B^0 \to p\overline{p}K^0_S$, ABE 02W in $\overline{B}^0 \to p\overline{p}D^0$, and WEI 08 in $B^+ \to p\overline{p}\pi^+$ decays. Not seen by ATHAR 06 in $\Upsilon(1S) \to p\overline{p}\gamma$.

[10] From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A. Systematic errors not estimated.

$X(1835)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$p\overline{p}$	seen
Γ_2	$\pi^+\pi^-\eta'$	seen

$X(1835)$ BRANCHING RATIOS

$\Gamma(p\overline{p})/\Gamma(\pi^+\pi^-\eta')$ $\hspace{4cm}$ Γ_1/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.333	ABLIKIM	05R	BES2	$J/\psi \to \gamma\pi^+\pi^-\eta'$

$X(1835)$ REFERENCES

ABLIKIM	11C	PRL 106 072002	M. Ablikim *et al.*	(BES III Collab.)
ABLIKIM	11J	PRL 107 182001	M. Ablikim *et al.*	(BES III Collab.)
ALEXANDER	10	PR D82 092002	J.P. Alexander *et al.*	(CLEO Collab.)
WEI	08	PL B659 80	J.-T. Wei *et al.*	(BELLE Collab.)
ATHAR	06	PR D73 032001	S.B. Athar *et al.*	(CLEO Collab.)
ABLIKIM	05R	PRL 95 262001	M. Ablikim *et al.*	(BES Collab.)
AUBERT,B	05L	PR D72 051101R	B. Aubert *et al.*	(BABAR Collab.)
SIBIRTSEV	05A	PR D71 054010	A. Sibirtsev, J. Haidenbauer	
WANG	05A	PL B617 141	M.-Z. Wang *et al.*	(BELLE Collab.)
BAI	03F	PRL 91 022001	J.Z. Bai *et al.*	(BES II Collab.)
ABE	02K	PRL 88 181803	K. Abe *et al.*	(BELLE Collab.)
ABE	02W	PRL 89 151802	K. Abe *et al.*	(BELLE Collab.)