$\psi(4230)$

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

also known as $Y(4230)$; was $X(4230)$

The recent measurement of $e^+e^- \to J/\psi\pi\pi$ (ABLIKIM 17B) led to a downward shift in the mass of the $\psi(4260)$, also known as Y(4260), such that a distinction between the $\psi(4260)$ and $\psi(4230)$ no longer appears justified. Therefore, starting from this edition, we include the data of ABLIKIM 17B in this node and have listed the $\psi(4230)$ in the summary tables instead of the $\psi(4260)$.

$\psi(4230)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
4220 ±15 OUR ESTIMATE					
4218.7± 2.8 OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.			
4218.5± 1.6±4.0		[1] ABLIKIM	19AI	BES3	$e^+e^- \to \omega\chi_{c0}$
4228.6± 4.1±6.3		ABLIKIM	19R	BES3	$e^+e^- \to \pi^+ D^0 D^{*-}$ + c.c.
$4200.6^{+\ 7.9}_{-13.3}\pm 3.0$		[2] ABLIKIM	19V	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$
4222.0± 3.1±1.4		[3] ABLIKIM	17B	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$
$4218\ ^{+\ 5.5}_{-\ 4.5}\pm 0.9$		ABLIKIM	17G	BES3	$e^+e^- \to \pi^+\pi^- h_c$
4209.5± 7.4±1.4		[4] ABLIKIM	17V	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4230 ± 8 ±6	180	[5] ABLIKIM	15C	BES3	$e^+e^- \to \omega\chi_{c0}$

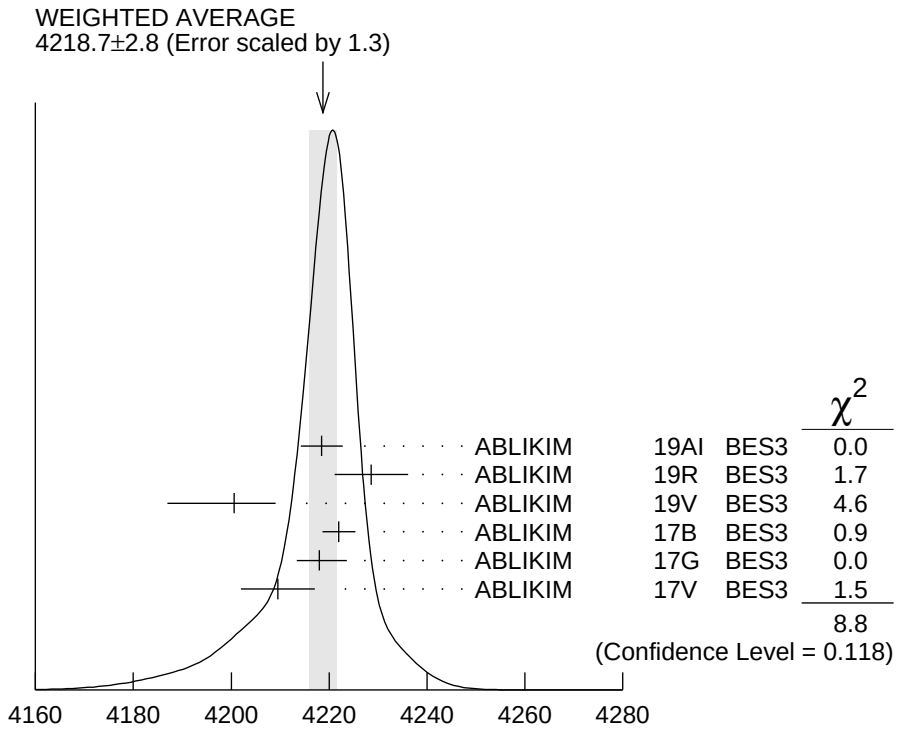
[1] From a fit of the measured cross section from $\sqrt{s} = 4.178$–4.278 GeV. Supersedes ABLIKIM 15C.

[2] Simultaneous fit to $\chi_{c1} \to \omega J/\psi$ and $\chi_{c1} \to \pi^+\pi^- J/\psi$.

[3] From a three-resonance fit.

[4] From a fit to the cross section for $e^+e^- \to \pi^+\pi^-\psi(2S) \to 2(\pi^+\pi^-)\ell^+\ell^-$ obtained from 16 center-of-mass energies between 4.008 and 4.600 GeV and comprising 5.1 fb^{-1}.

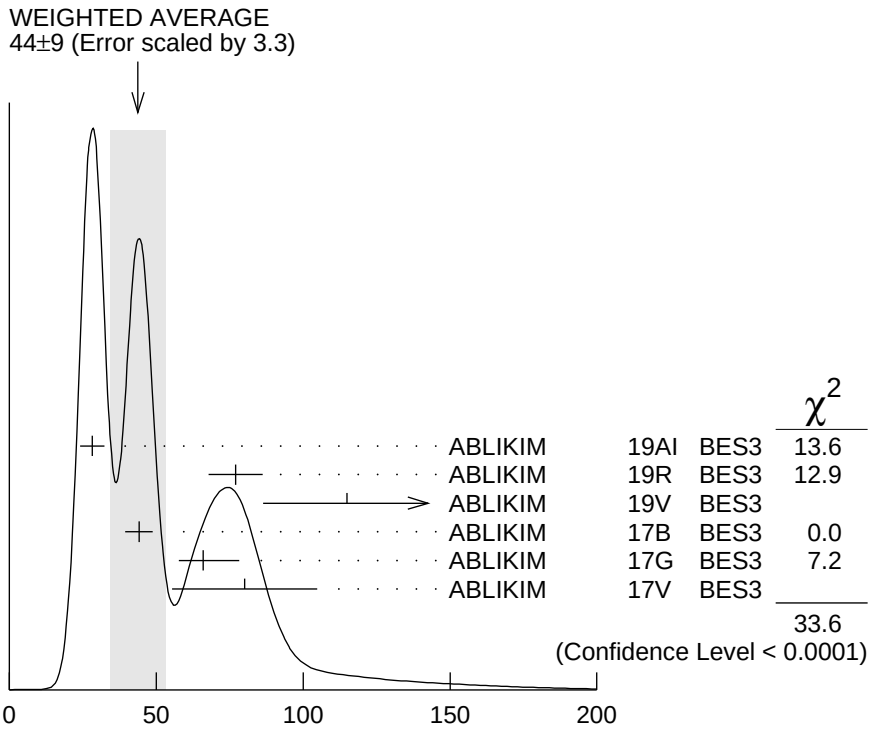
[5] From a 3-parameter fit of measured cross sections from $\sqrt{s} = 4.21$–4.42 GeV to a phase-space modified Breit-Wigner function, using the decays $\chi_{c0} \to \pi^+\pi^-$, $\chi_{c0} \to K^+K^-$, and $\omega \to \pi^+\pi^-\pi^0$.



$\psi(4230)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
20 to 100 OUR ESTIMATE					
44 ± 9 OUR AVERAGE		Error includes scale factor of 3.3. See the ideogram below.			
28.2± 3.9± 1.6		[1] ABLIKIM	19AI	BES3	$e^+e^- \to \omega\chi_{c0}$
77.0± 6.8± 6.3		ABLIKIM	19R	BES3	$e^+e^- \to \pi^+ D^0 D^{*-}$ + c.c.
$115\ ^{+38}_{-26}\ \pm 12$		[2] ABLIKIM	19V	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$
44.1± 4.3± 2.0		[3] ABLIKIM	17B	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$
$66.0^{+12.3}_{-8.3}\pm 0.4$		ABLIKIM	17G	BES3	$e^+e^- \to \pi^+\pi^- h_c$
80.1±24.6± 2.9		[4] ABLIKIM	17V	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
38 ±12 ± 2	180	[5] ABLIKIM	15C	BES3	$e^+e^- \to \omega\chi_{c0}$

[1] From a fit of the measured cross section from $\sqrt{s}$ = 4.178–4.278 GeV. Supersedes ABLIKIM 15C.
[2] Simultaneous fit to $\chi_{c1} \to \omega J/\psi$ and $\chi_{c1} \to \pi^+\pi^- J/\psi$.
[3] From a three-resonance fit.
[4] From a fit to the cross section for $e^+e^- \to \pi^+\pi^-\psi(2S) \to 2(\pi^+\pi^-)\ell^+\ell^-$ obtained from 16 center-of-mass energies between 4.008 and 4.600 GeV and comprising 5.1 fb^{-1}.
[5] From a 3-parameter fit of measured cross sections from $\sqrt{s}$ = 4.21–4.42 GeV to a phase-space modified Breit-Wigner function, using the decays $\chi_{c0} \to \pi^+\pi^-$, $\chi_{c0} \to K^+K^-$, and $\omega \to \pi^+\pi^-\pi^0$.



$\psi(4230)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$e^+ e^-$	
Γ_2	$\omega\chi_{c0}$	seen
Γ_3	$\pi^+\pi^- h_c$	seen
Γ_4	$\pi^+\pi^- J/\psi$	seen
Γ_5	$\pi^+\pi^-\psi(2S)$	seen
Γ_6	$\pi^+ D^0 D^{*-}$ + c.c.	seen
Γ_7	$\Xi^-\overline{\Xi}^+$	
Γ_8	$\gamma\chi_{c1}(3872)$	seen

$\psi(4230)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma(total)$

$\Gamma(\omega\chi_{c0}) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_2\Gamma_1/\Gamma$

VALUE (eV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2.5±0.2±0.3		[1] ABLIKIM	19AI	BES3	$e^+e^- \to \omega\chi_{c0}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.7±0.5±0.4	180	[2] ABLIKIM	15C	BES3	$e^+e^- \to \omega\chi_{c0}$

[1] From a fit of the measured cross section from $\sqrt{s}$ = 4.178–4.278 GeV. Supersedes ABLIKIM 15C.

[2] From a 3-parameter fit of measured cross sections from $\sqrt{s}$ = 4.21–4.42 GeV to a phase-space modified Breit-Wigner function, using the decays $\chi_{c0} \to \pi^+\pi^-$, $\chi_{c0} \to K^+K^-$, and $\omega \to \pi^+\pi^-\pi^0$.

$\Gamma(\pi^+\pi^-\psi(2S)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_5\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.6 ± 1.3	[1] ABLIKIM	19K	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
1.8 ± 1.4	[2] ABLIKIM	19K	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$

[1] Solution I of two equivalent solutions in a fit using two interfering resonances.
[2] Solution II of two equivalent solutions in a fit using two interfering resonances.

$\Gamma(\Xi^-\overline{\Xi}^+) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_7\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
$<3.3\times10^{-4}$	90	ABLIKIM	20C	BES3	$e^+e^- \to \Xi^-\overline{\Xi}^+$

$\psi(4230)$ BRANCHING RATIOS

$\Gamma(\omega\chi_{c0})/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	180	[1] ABLIKIM	15C	BES3	$e^+e^- \to \omega\chi_{c0}$

[1] From a 3-parameter fit of measured cross sections from $\sqrt{s} = 4.21$–4.42 GeV to a phase-space modified Breit-Wigner function, using the decays $\chi_{c0} \to \pi^+\pi^-$, $\chi_{c0} \to K^+K^-$, and $\omega \to \pi^+\pi^-\pi^0$.

$\Gamma(\pi^+\pi^- h_c)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	ABLIKIM	17G	BES3	$e^+e^- \to \pi^+\pi^- h_c$

$\Gamma(\pi^+\pi^- J/\psi)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	ABLIKIM	17B	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$

$\Gamma(\pi^+\pi^-\psi(2S))/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	[1] ABLIKIM	17V	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$

[1] From a fit to the cross section for $e^+e^- \to \pi^+\pi^-\psi(2S) \to 2(\pi^+\pi^-)\ell^+\ell^-$ obtained from 16 center-of-mass energies between 4.008 and 4.600 GeV and comprising 5.1 fb^{-1}.

$\Gamma(\pi^+ D^0 D^{*-} + \text{c.c.})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	ABLIKIM	19R	BES3	$e^+e^- \to \pi^+ D^0 D^{*-}$ + c.c.

$\Gamma(\gamma\chi_{c1}(3872))/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	ABLIKIM	19V	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$

ψ(4230) REFERENCES

ABLIKIM	20C	PRL 124 032002	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19AI	PR D99 091103	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19K	PR D99 019903 (errat.)	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19R	PRL 122 102002	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19V	PRL 122 232002	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	17B	PRL 118 092001	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	17G	PRL 118 092002	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	17V	PR D96 032004	M. Ablikim *et al.*	(BESIII Collab.)
Also		PR D99 019903 (errat.)	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	15C	PRL 114 092003	M. Ablikim *et al.*	(BESIII Collab.)