$\psi(4230)$

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

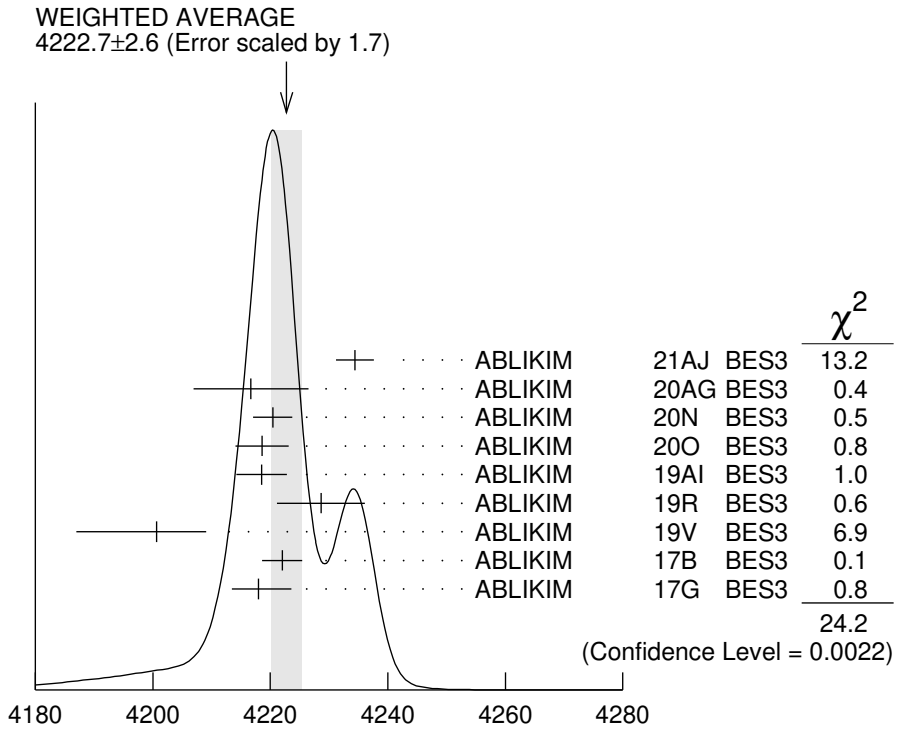
also known as $Y(4230)$; was $\psi(4260)$

The original $\psi(4260)$ (also known as $Y(4260)$) was observed by AUBERT,B 05I as a peak in the energy dependence of the $e^+e^- \to \pi^+\pi^- J/\psi$ cross section and was confirmed by HE 06B, YUAN 07, LEES 12AC, and LIU 13B in the same process. A higher-statistics analysis by ABLIKIM 17B revealed an asymmetry in the cross section and resulted in a shift of the peak position to a lower mass. The $\psi(4260)$ was therefore renamed $\psi(4230)$. The energy-dependent cross sections for e^+e^- to other channels also exhibit peaks in the same mass region. The parameters corresponding to those peaks are also listed here, but the number of states in this region remains to be determined.

For details see the review on "Spectroscopy of mesons containing two heavy quarks."

$\psi(4230)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
4222.7± 2.6 OUR AVERAGE Error includes scale factor of 1.7. See the ideogram below.					
4234.4± 3.2± 0.2		[1] ABLIKIM	21AJ	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
4216.7± 8.9± 4.1		[2] ABLIKIM	20AG	BES3	$e^+e^- \to \mu^+\mu^-$
4220.4± 2.4± 2.3		[3] ABLIKIM	20N	BES3	$e^+e^- \to \pi^0\pi^0 J/\psi$
4218.6± 3.8± 2.5		[3] ABLIKIM	20O	BES3	$e^+e^- \to \eta J/\psi$
4218.5± 1.6± 4.0		[4] 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.
$4200.6^{+7.9}_{-13.3}$ ± 3.0		[5] ABLIKIM	19V	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$
4222.0± 3.1± 1.4		[6] ABLIKIM	17B	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$
$4218\ ^{+5.5}_{-4.5}$ ± 0.9		ABLIKIM	17G	BES3	$e^+e^- \to \pi^+\pi^- h_c$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4231.9± 5.3± 4.9		ABLIKIM	20N	BES3	$e^+e^- \to \pi^0 Z_c(3900)^0$, $Z_c^0 \to \pi^0 J/\psi$
4209.5± 7.4± 1.4		[7] ABLIKIM	17V	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
4209.1± 6.8± 7.0		[6] ZHANG	17B	RVUE	$e^+e^- \to \pi^+\pi^-\psi(2S)$
4223.3± 1.6± 2.5		[8] ZHANG	17C	RVUE	$e^+e^- \to \pi^+\pi^- J/\psi$ or $\psi(2S)$
4230 ± 8 ± 6	180	[9] ABLIKIM	15C	BES3	$e^+e^- \to \omega\chi_{c0}$
4258.6± 8.3±12.1		[10] LIU	13B	BELL	$e^+e^- \to \gamma\pi^+\pi^- J/\psi$
4245 ± 5 ± 4		[11] LEES	12AC	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$4247\ \pm 12\ ^{+17}_{-32}$		[10,12] YUAN	07	BELL	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$4284\ ^{+17}_{-16}$ ± 4	13.6	HE	06B	CLEO	9.4–10.6 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$4259 \pm 8\ ^{+2}_{-6}$	125	[13] AUBERT,B	05I	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$



[1] From a three-resonance fit to the Born cross section in the range $\sqrt{s}$ = 4.008–4.698 GeV.
[2] Solution 1 of 8 with equal fit quality to the $e^+e^- \to \mu^+\mu^-$ cross section between 3.8 and 4.6 GeV to the coherent sum of four resonant amplitudes. Other solutions range from 4212.8 ± 7.2 ± 4.0 to 4219.4 ± 11.2 ± 4.1 MeV.
[3] From a fit of the measured cross section in the range $\sqrt{s}$ = 3.808–4.600 GeV.
[4] From a fit of the measured cross section from $\sqrt{s}$ = 4.178–4.278 GeV. Supersedes ABLIKIM 15C.
[5] Simultaneous fit to $\chi_{c1} \to \omega J/\psi$ and $\chi_{c1} \to \pi^+\pi^- J/\psi$.
[6] From a three-resonance fit.
[7] 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}. Superseded by ABLIKIM 21AJ.
[8] From a combined fit of BELLE, BABAR and BES3 $e^+e^- \to \pi^+\pi^- J/\psi$ and $e^+e^- \to \pi^+\pi^-\psi(2S)$ data.
[9] 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 $\omega \to \pi^+\pi^-\pi^0$.
[10] From a two-resonance fit.
[11] From a single-resonance fit. Supersedes AUBERT,B 05I.
[12] Superseded by LIU 13B.
[13] From a single-resonance fit. Two interfering resonances are not excluded. Superseded by LEES 12AC.

ψ(4230) MASS (MeV)

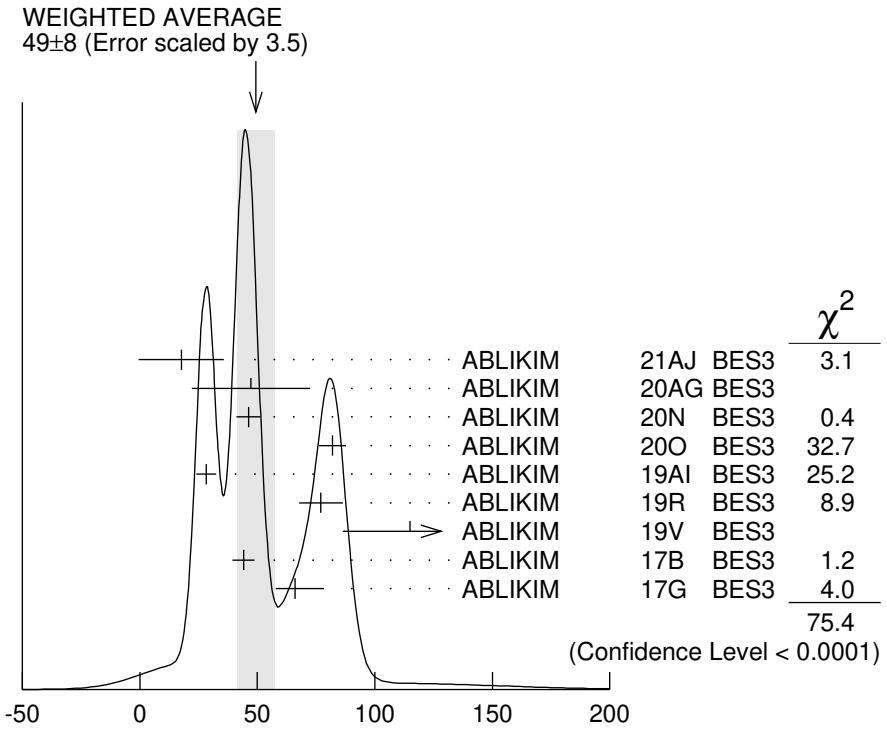
ψ(4230) WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
49 ± 8 OUR AVERAGE		Error includes scale factor of 3.5. See the ideogram below.			
17.6±18.1± 0.9		[1] ABLIKIM	21AJ	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$

$47.2 \pm 22.8 \pm 10.5$	[2] ABLIKIM	20AG	BES3	$e^+e^- \to \mu^+\mu^-$	
$46.2 \pm 4.7 \pm 2.1$	[3] ABLIKIM	20N	BES3	$e^+e^- \to \pi^0\pi^0 J/\psi$	
$82.0 \pm 5.7 \pm 0.4$	[3] ABLIKIM	20O	BES3	$e^+e^- \to \eta J/\psi$	
$28.2 \pm 3.9 \pm 1.6$	[4] ABLIKIM	19AI	BES3	$e^+e^- \to \omega\chi_{c0}$	
$77.0 \pm 6.8 \pm 6.3$	ABLIKIM	19R	BES3	$e^+e^- \to \pi^+ D^0 D^{*-}$ + c.c.	
$115\ ^{+38}_{-26} \pm 12$	[5] ABLIKIM	19V	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$	
$44.1 \pm 4.3 \pm 2.0$	[6] ABLIKIM	17B	BES3	$e^+e^- \to \pi^+\pi^- J/\psi$	
$66.0\ ^{+12.3}_{-8.3} \pm 0.4$	ABLIKIM	17G	BES3	$e^+e^- \to \pi^+\pi^- h_c$	

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

$41.2 \pm 16.0 \pm 16.4$	ABLIKIM	20N	BES3	$e^+e^- \to \pi^0 Z_c(3900)^0,\ Z_c^0 \to \pi^0 J/\psi$	
$80.1 \pm 24.6 \pm 2.9$	[7] ABLIKIM	17V	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$	
$76.6 \pm 14.2 \pm 2.4$	[6] ZHANG	17B	RVUE	$e^+e^- \to \pi^+\pi^-\psi(2S)$	
$54.2 \pm 2.6 \pm 1.0$	[8] ZHANG	17C	RVUE	$e^+e^- \to \pi^+\pi^- J/\psi$ or $\psi(2S)$	
$38 \pm 12 \pm 2$ 180	[9] ABLIKIM	15C	BES3	$e^+e^- \to \omega\chi_{c0}$	
$134.1 \pm 16.4 \pm 5.5$	[10] LIU	13B	BELL	$e^+e^- \to \gamma\pi^+\pi^- J/\psi$	
$114\ ^{+16}_{-15} \pm 7$	[11] LEES	12AC	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$	
$108 \pm 19 \pm 10$	[10,12] YUAN	07	BELL	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$	
$73\ ^{+39}_{-25} \pm 5$ 13.6	HE	06B	CLEO	9.4–10.6 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$	
$88 \pm 23\ ^{+6}_{-4}$ 125	[13] AUBERT,B	05I	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$	



[1] From a three-resonance fit to the Born cross section in the range $\sqrt{s} = 4.008$–4.698 GeV.

[2] Solution 1 of 8 with equal fit quality to the $e^+e^- \to \mu^+\mu^-$ cross section between 3.8 and 4.6 GeV to the coherent sum of four resonant amplitudes. Other solutions range from 36.4 ± 16.8 ± 8.1 to 49.6 ± 22.6 ± 11.0 MeV.
[3] From a fit of the measured cross section in the range $\sqrt{s}$ = 3.808–4.600 GeV.
[4] From a fit of the measured cross section from $\sqrt{s}$ = 4.178–4.278 GeV. Supersedes ABLIKIM 15C.
[5] Simultaneous fit to $\chi_{c1} \to \omega J/\psi$ and $\chi_{c1} \to \pi^+\pi^- J/\psi$.
[6] From a three-resonance fit.
[7] 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}. Superseded by ABLIKIM 21AJ.
[8] From a combined fit of BELLE, BABAR and BES3 $e^+e^- \to \pi^+\pi^- J/\psi$ and $e^+e^- \to \pi^+\pi^-\psi(2S)$ data.
[9] 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 $\omega \to \pi^+\pi^-\pi^0$.
[10] From a two-resonance fit.
[11] From a single-resonance fit. Supersedes AUBERT,B 05I.
[12] Superseded by LIU 13B.
[13] From a single-resonance fit. Two interfering resonances are not excluded. Superseded by LEES 12AC.

ψ(4230) WIDTH (MeV)

ψ(4230) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	e^+e^-	
Γ_2	$\mu^+\mu^-$	$(3.1\pm2.8)\times10^{-5}$
Γ_3	$\eta_c(1S)\pi^+\pi^-$	not seen
Γ_4	$\eta_c(1S)\pi^+\pi^-\pi^0$	seen
Γ_5	$J/\psi\pi^+\pi^-$	seen
Γ_6	$J/\psi f_0(980)$, $f_0(980) \to \pi^+\pi^-$	seen
Γ_7	$Z_c(3900)^\pm\pi^\mp$, $Z_c^\pm \to J/\psi\pi^\pm$	seen
Γ_8	$J/\psi\pi^0\pi^0$	seen
Γ_9	$J/\psi K^+K^-$	seen
Γ_{10}	$J/\psi K_S^0 K_S^0$	not seen
Γ_{11}	$J/\psi\eta$	seen
Γ_{12}	$J/\psi\pi^0$	not seen
Γ_{13}	$J/\psi\eta'$	seen
Γ_{14}	$J/\psi\pi^+\pi^-\pi^0$	not seen
Γ_{15}	$J/\psi\eta\pi^0$	not seen
Γ_{16}	$J/\psi\eta\eta$	not seen
Γ_{17}	$\psi(2S)\pi^+\pi^-$	seen
Γ_{18}	$\psi(2S)\eta$	not seen
Γ_{19}	$\chi_{c0}\omega$	seen
Γ_{20}	$\chi_{c1}\pi^+\pi^-\pi^0$	not seen
Γ_{21}	$\chi_{c2}\pi^+\pi^-\pi^0$	not seen
Γ_{22}	$h_c(1P)\pi^+\pi^-$	seen

Γ_{23}	$\phi\pi^+\pi^-$	not seen
Γ_{24}	$\phi f_0(980) \rightarrow \phi\pi^+\pi^-$	not seen
Γ_{25}	$D\overline{D}$	not seen
Γ_{26}	$D^0\overline{D}^0$	not seen
Γ_{27}	D^+D^-	not seen
Γ_{28}	$D^*\overline{D}$+c.c.	not seen
Γ_{29}	$D^*(2007)^0\overline{D}^0$+c.c.	not seen
Γ_{30}	$D^*(2010)^+D^-$+c.c.	not seen
Γ_{31}	$D^*\overline{D}^*$	
Γ_{32}	$D^*(2007)^0\overline{D}^*(2007)^0$	not seen
Γ_{33}	$D^*(2010)^+D^*(2010)^-$	not seen
Γ_{34}	$D\overline{D}\pi$+c.c.	
Γ_{35}	$D^0D^-\pi^+$+c.c. (excl. $D^*(2007)^0\overline{D}^{*0}$ +c.c., $D^*(2010)^+D^-$ +c.c.)	not seen
Γ_{36}	$D\overline{D}^*\pi$+c.c. (excl. $D^*\overline{D}^*$)	not seen
Γ_{37}	$D^0D^{*-}\pi^+$+c.c. (excl. $D^*(2010)^+D^*(2010)^-$)	not seen
Γ_{38}	$D^0D^*(2010)^-\pi^+$+c.c.	seen
Γ_{39}	$D_1(2420)\overline{D}$+ c.c.	not seen
Γ_{40}	$D^*\overline{D}^*\pi$	not seen
Γ_{41}	$D_s^+D_s^-$	not seen
Γ_{42}	$D_s^{*+}D_s^-$+c.c.	not seen
Γ_{43}	$D_s^{*+}D_s^{*-}$	not seen
Γ_{44}	$p\overline{p}$	not seen
Γ_{45}	$p\overline{p}\pi^0$	not seen
Γ_{46}	$p\overline{p}\eta$	not seen
Γ_{47}	$p\overline{p}\omega$	not seen
Γ_{48}	$\Xi^-\overline{\Xi}^+$	not seen
Γ_{49}	$\pi^+\pi^+\pi^-\pi^-$	not seen
Γ_{50}	$\pi^+\pi^+\pi^-\pi^-\pi^0$	not seen
Γ_{51}	$K_S^0K^\pm\pi^\mp$	not seen
Γ_{52}	$K_S^0K^\pm\pi^\mp\pi^0$	not seen
Γ_{53}	$K_S^0K^\pm\pi^\mp\eta$	not seen
Γ_{54}	$K^+K^-\pi^0$	not seen
Γ_{55}	$K^+K^-\pi^+\pi^-$	not seen
Γ_{56}	$K^+K^-\pi^+\pi^-\pi^0$	not seen
Γ_{57}	$K^+K^+K^-K^-$	not seen
Γ_{58}	$K^+K^+K^-K^-\pi^0$	not seen
Γ_{59}	$p\overline{p}\pi^+\pi^-$	not seen
Γ_{60}	$p\overline{p}\pi^+\pi^-\pi^0$	not seen
Γ_{61}	$p\overline{p}p\overline{p}$	not seen
Γ_{62}	$\Lambda\overline{\Lambda}$	not seen

Radiative decays

Γ_{63}	$\eta_c(1S)\gamma$	possibly seen
Γ_{64}	$\eta_c(1S)\pi^0\gamma$	not seen
Γ_{65}	$\chi_{c1}\gamma$	not seen
Γ_{66}	$\chi_{c2}\gamma$	not seen
Γ_{67}	$\chi_{c1}(3872)\gamma$	seen

$\psi(4230)$ PARTIAL WIDTHS

$\Gamma(\mu^+\mu^-)$ Γ_2

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1.53±1.26±0.54	[1,2] ABLIKIM	20AG	BES3	$e^+e^- \to \mu^+\mu^-$

[1] From a fit to the $e^+e^- \to \mu^+\mu^-$ cross section between 3.8 and 4.6 GeV to the coherent sum of four resonant amplitudes assuming $\Gamma(\mu^+\mu^-) = \Gamma(e^+e^-)$.

[2] From solution 1 of 8 with equal fit quality. Other solutions range from $1.09 \pm 0.84 \pm 0.39$ to $1.53 \pm 1.26 \pm 0.54$ keV.

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

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

VALUE (eV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
9.2±1.0 OUR AVERAGE					
9.2±0.8±0.7		[1] LEES	12AC	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$8.9^{+3.9}_{-3.1}\pm1.8$	8.1	HE	06B	CLEO	9.4–10.6 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.4±0.8±0.6		[2] LIU	13B	BELL	$e^+e^- \to \gamma\pi^+\pi^- J/\psi$
20.5±1.4±2.0		[3] LIU	13B	BELL	$e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$6.0\pm1.2^{+4.7}_{-0.5}$		[2,4] YUAN	07	BELL	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$20.6\pm2.3^{+9.1}_{-1.7}$		[3,4] YUAN	07	BELL	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$
$5.5\pm1.0^{+0.8}_{-0.7}$	125	[5] AUBERT,B	05I	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$

[1] From a single-resonance fit. Supersedes AUBERT,B 05I.

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

[3] Solution II of two equivalent solutions in a fit using two interfering resonances.

[4] Superseded by LIU 13B.

[5] From a single-resonance fit. Two interfering resonances are not excluded. Superseded by LEES 12AC.

$\Gamma(J/\psi K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_9\Gamma_1/\Gamma$

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<1.7	90	[1] SHEN	14	BELL	9.4–10.9 $e^+e^- \to \gamma K^+K^- J/\psi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.2	90	[2] YUAN	08	BELL	$e^+e^- \to \gamma K^+K^- J/\psi$

[1] From a fit of the broad $K^+K^- J/\psi$ enhancement including a coherent $\psi(4260)$ amplitude with mass and width from LIU 13B. Supersedes YUAN 08. The shape of the cross section observed by ABLIKIM 18N between 2.2 and 2.3 GeV is incompatible with that of

$e^+e^- \to \pi^+\pi^- J/\psi$ in ABLIKIM 13T and ABLIKIM 17B. They also observe a broad enhancement around 2.5 GeV.

[2] From a fit of the broad $K^+K^- J/\psi$ enhancement including a coherent $\psi(4260)$ amplitude with mass and width from YUAN 07.

$\Gamma(J/\psi K^0_S K^0_S) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{10}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.85	90	[1] SHEN	14	BELL	9.4–10.9 $e^+e^- \to \gamma K^0_S K^0_S J/\psi$

[1] From a fit of the $K^0_S K^0_S J/\psi$ mass range from 4.4 to 5.5 GeV including a coherent $\psi(4260)$ amplitude with mass and width from LIU 13B.

$\Gamma(J/\psi\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{11}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.0±1.7		[1] ABLIKIM	20O	BES3	$e^+e^- \to \eta J/\psi$
4.8±1.0		[2] ABLIKIM	20O	BES3	$e^+e^- \to \eta J/\psi$
7.0±1.5		[3] ABLIKIM	20O	BES3	$e^+e^- \to \eta J/\psi$
<14.2	90	WANG	13B	BELL	$e^+e^- \to J/\psi\eta\gamma$

[1] Solution 1 of three equivalent fit solutions using three resonant structures.

[2] Solution 2 of three equivalent fit solutions using three resonant structures.

[3] Solution 3 of three equivalent fit solutions using three resonant structures.

$\Gamma(J/\psi\eta') \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{13}\Gamma_1/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.06±0.03	46	[1,2] ABLIKIM	20A	BES3	$e^+e^- \to \eta' J/\psi$
1.38±0.11	46	[1,3] ABLIKIM	20A	BES3	$e^+e^- \to \eta' J/\psi$

[1] Based on a fit to $\sigma(e^+e^- \to \eta' J/\psi)$ from $\sqrt{s} = 4.18$ to 4.60 GeV assuming interfering $\psi(4160)$ and $\psi(4260)$ contributions. At $\sqrt{s} = 4.23$ GeV, $\sigma(e^+e^- \to \eta' J/\psi) = 3.6 \pm 0.6 \pm 0.3$ pb.

[2] Solution I of the fit, corresponding to a phase of -0.03 ± 0.44 rad.

[3] Solution II of the fit, corresponding to a phase of 2.54 ± 0.04 rad.

$\Gamma(\psi(2S)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{17}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.59±0.75		[1] ABLIKIM	21AJ	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
1.63±0.78		[2] ABLIKIM	21AJ	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
0.02±0.01		[3] ABLIKIM	21AJ	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
1.6 ±1.3		[4] ABLIKIM	19K	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
1.8 ±1.4		[5] ABLIKIM	19K	BES3	$e^+e^- \to \pi^+\pi^-\psi(2S)$
<4.3	90	[6] LIU	08H	RVUE	10.58 $e^+e^- \to \psi(2S)\pi^+\pi^-\gamma$
$7.4\ ^{+2.1}_{-1.7}$		[7] LIU	08H	RVUE	10.58 $e^+e^- \to \psi(2S)\pi^+\pi^-\gamma$

[1] Solution I of four equivalent solutions in a fit using three interfering resonances.

[2] Solution II of four equivalent solutions in a fit using three interfering resonances

[3] Solutions III and IV of four equivalent solutions in a fit using three interfering resonances.

[4] Solution I of two equivalent solutions in a fit using two interfering resonances.

[5] Solution II of two equivalent solutions in a fit using two interfering resonances.

[6] For constructive interference with the $\psi(4360)$ in a combined fit of AUBERT 07S and WANG 07D data with three resonances.
[7] For destructive interference with the $\psi(4360)$ in a combined fit of AUBERT 07S and WANG 07D data with three resonances.

$\Gamma(\chi_{c0}\omega) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{19}\Gamma_1/\Gamma$

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 $\omega \to \pi^+\pi^-\pi^0$.

$\Gamma(h_c(1P)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{22}\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
$\mathbf{4.6^{+2.9}_{-1.4}\pm0.8}$	ABLIKIM	17G	BES3	$e^+e^- \to \pi^+\pi^- h_c$

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{23}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.4	90	AUBERT,BE	06D	BABR	10.6 $e^+e^- \to K^+K^-\pi^+\pi^-\gamma$

$\Gamma(\phi f_0(980) \to \phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{24}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.28	90	[1] AUBERT	07AK	BABR	10.6 $e^+e^- \to \pi^+\pi^- K^+K^-\gamma$

[1] AUBERT 07AK reports $[\Gamma(\psi(4230) \to \phi f_0(980) \to \phi\pi^+\pi^-) \times \Gamma(\psi(4230) \to e^+e^-)/\Gamma_{total}] \times [B(\phi(1020) \to K^+K^-)] <$ 0.14 eV which we divide by our best value $B(\phi(1020) \to K^+K^-) = 49.1 \times 10^{-2}$.

$\Gamma(\Xi^-\overline{\Xi}^+) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{48}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
$<2.7\times10^{-4}$	90	ABLIKIM	20C	BES3	$e^+e^- \to \Xi^-\overline{\Xi}^+$

$\Gamma(\pi^+\pi^+\pi^-\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{49}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<32	90	ABLIKIM	21AW	BES3	$e^+e^- \to 2\pi^+2\pi^-$

$\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{50}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<16	90	ABLIKIM	21AW	BES3	$e^+e^- \to 2\pi^+2\pi^-\pi^0$

$\Gamma(K^0_S K^\pm \pi^\mp) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{51}\Gamma_1/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.04 ±0.19 ±0.09	[1] ABLIKIM	19AE	BES3	$e^+e^- \to K^0_S K^\pm \pi^\mp$
0.0027±0.0023±0.0001	[2] ABLIKIM	19AE	BES3	$e^+e^- \to K^0_S K^\pm \pi^\mp$
< 0.5 at 90% CL	AUBERT	08S	BABR	10.6 $e^+e^- \to K^0_S K^\pm \pi^\mp \gamma$

[1] Solution I of the fit including the $\psi(4160)$ with mass 4191 ± 5 MeV and width 70 ± 10 MeV from PDG 16 and the $\psi(4230)$ with mass 4219.6 ± 3.3 ± 5.1 MeV and width 56.0 ± 3.6 ± 6.9 MeV from GAO 17.
[2] Solution II of the fit including the $\psi(4160)$ with mass 4191 ± 5 MeV and width 70 ± 10 MeV from PDG 16 and the $\psi(4230)$ with mass 4219.6 ± 3.3 ± 5.1 MeV and width 56.0 ± 3.6 ± 6.9 MeV from GAO 17.

$\Gamma(K^0_S K^\pm \pi^\mp \pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{52}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.05	90	ABLIKIM	19	BES3	$e^+e^- \to K^0_S K^\pm \pi^\mp \pi^0$

$\Gamma(K^0_S K^\pm \pi^\mp \eta) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{53}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<0.19	90	ABLIKIM	19	BES3	$e^+e^- \to K^0_S K^\pm \pi^\mp \eta$

$\Gamma(K^+K^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{54}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.6	90	AUBERT	08S	BABR	10.6 $e^+e^- \to K^+K^-\pi^0\gamma$

$\Gamma(K^+K^-\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{55}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<20	90	ABLIKIM	21AW	BES3	$e^+e^- \to K^+K^-\pi^+\pi^-$

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{56}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<43	90	ABLIKIM	21AW	BES3	$e^+e^- \to K^+K^-\pi^+\pi^-\pi^0$

$\Gamma(K^+K^+K^-K^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{57}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<3.8	90	ABLIKIM	21AW	BES3	$e^+e^- \to 2K^+2K^-$

$\Gamma(K^+K^+K^-K^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{58}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<2.1	90	ABLIKIM	21AW	BES3	$e^+e^- \to 2K^+2K^-\pi^0$

$\Gamma(p\overline{p}\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{59}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<7.2	90	ABLIKIM	21AW	BES3	$e^+e^- \to p\overline{p}\pi^+\pi^-$

$\Gamma(p\overline{p}\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{60}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<15	90	ABLIKIM	21AW	BES3	$e^+e^- \to p\overline{p}\pi^+\pi^-\pi^0$

$\Gamma(\Lambda\overline{\Lambda}) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{62}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
$<0.8 \times 10^{-3}$	90	[1] ABLIKIM	21AS	BES3	$e^+e^- \to \psi(4260)$

[1] From a measurement of the $e^+e^- \to \Lambda\overline{\Lambda}$ cross section between 3.5 and 4.6 GeV.

$\Gamma(\chi_{c1}\gamma) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{65}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<1.4	90	[1] HAN	15	BELL	10.58 $e^+e^- \to \chi_{c1}\gamma$

[1] Using B($\eta \to \gamma\gamma$) = (39.41 ± 0.21)%.

$\Gamma(\chi_{c2}\gamma) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{66}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<4.0	90	[1] HAN	15	BELL	10.58 $e^+e^- \to \chi_{c2}\gamma$

[1] Using B($\eta \to \gamma\gamma$) = (39.41 ± 0.21)%.

$\psi(4230)$ BRANCHING RATIOS

$\Gamma(\eta_c(1S)\pi^+\pi^-)/\Gamma_{total}$ Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	[1] ABLIKIM	21B	BES3	$e^+e^- \to \pi^+\pi^-\eta_c$

[1] Not seen in $e^+e^- \to \pi^+\pi^-\eta_c$ at $\sqrt{s}$ = 4.226 GeV with a 90% C.L. upper limit on the cross section of 16.8 pb.

$\Gamma(\eta_c(1S)\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_4/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	[1] ABLIKIM	21B	BES3	$e^+e^- \to \pi^+\pi^-\pi^0\eta_c$

[1] Seen as a peak in the $e^+e^- \to \pi^+\pi^-\pi^0\eta_c$ cross section with a peak value of $46.1^{+9.5}_{-9.4} \pm 6.6$ pb at $\sqrt{s}$ = 4.226 GeV.

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

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

$\Gamma(J/\psi f_0(980), f_0(980) \to \pi^+\pi^-)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_6/Γ_5

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.17±0.13	[1] LEES	12AC	BABR	10.58 $e^+e^- \to \gamma\pi^+\pi^- J/\psi$

[1] Systematic uncertainties not estimated.

$\Gamma(Z_c(3900)^{\pm}\pi^{\mp},\ Z_c^{\pm}\to J/\psi\pi^{\pm})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_7/Γ_5

VALUE	DOCUMENT ID		TECN	COMMENT
0.215±0.033±0.075	[1] ABLIKIM	13T	BES3	$e^+e^-\to\ \pi^+\pi^- J/\psi$

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

0.29 ±0.08	[2] LIU	13B	BELL	$e^+e^-\to\ \gamma\pi^+\pi^- J/\psi$

[1] Assuming that the cross section of $e^+e^-\to\ \pi^+\pi^- J/\psi$ is fully due to the $\psi(4260)$.
[2] Systematic error not evaluated.

$\Gamma(J/\psi\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	[1] ABLIKIM	20N	BES3	$e^+e^-\to\ \pi^0\pi^0 J/\psi$

[1] From a fit to the cross section $e^+e^-\to\pi^0\pi^0 J/\psi$ at center-of-mass energies between 3.808 and 4.600 GeV.

$\Gamma(J/\psi K_S^0 K_S^0)/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	SHEN	14	BELL	9.4–10.9 $e^+e^-\to\ \gamma K_S^0 K_S^0 J/\psi$

$\Gamma(J/\psi\eta)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	ABLIKIM	20O	BES3	$e^+e^-\to\ \eta J/\psi$

$\Gamma(J/\psi\eta\pi^0)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	ABLIKIM	15Q	BES3	4.0–4.6 $e^+e^-\to\ J/\psi\eta\pi^0$

$\Gamma(\psi(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{17}/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}.

$\Gamma(\psi(2S)\pi^+\pi^-)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{17}/Γ_5

VALUE	DOCUMENT ID		TECN	COMMENT

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

(0.11±0.03±0.03) to (0.55± 0.18 ± 0.19)	[1] ZHANG	17C	RVUE	$e^+e^-\to\ \pi^+\pi^- J/\psi$ or $\psi(2S)$

[1] From a combined fit of BELLE, BABAR and BES3 $e^+e^-\to\ \pi^+\pi^- J/\psi$ and $e^+e^-\to\ \pi^+\pi^-\psi(2S)$ data.

$\Gamma(\chi_{c0}\omega)/\Gamma_{\text{total}}$ Γ_{19}/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 $\omega\to\ \pi^+\pi^-\pi^0$.

$\Gamma(h_c(1P)\pi^+\pi^-)/\Gamma_{total}$ Γ_{22}/Γ

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

$\Gamma(h_c(1P)\pi^+\pi^-)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{22}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.0	90	[1] PEDLAR	11	CLEO	$e^+e^- \to h_c(1P)\pi^+\pi^-$

[1] At $\sqrt{s} = 4260$ MeV, PEDLAR 11 measures $\sigma(e^+e^- \to h_c(1P)\pi^+\pi^-) = 32 \pm 17 \pm 6 \pm 6$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \to \pi^0 h_c(1P))$, respectively.

$\Gamma(D\overline{D})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{25}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.0	90	[1] AUBERT	07BE	BABR	$e^+e^- \to D\overline{D}\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4.0	90	CRONIN-HEN..09		CLEO	e^+e^-

[1] Using 4259 ± 10 MeV for the mass and 88 ± 24 MeV for the width of $\psi(4260)$.

$\Gamma(D^0\overline{D}^0)/\Gamma_{total}$ Γ_{26}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^0\overline{D}^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AUBERT	09M	BABR	$e^+e^- \to D^0\overline{D}^0\gamma$
not seen	PAKHLOVA	08	BELL	$e^+e^- \to D^0\overline{D}^0\gamma$

$\Gamma(D^+D^-)/\Gamma_{total}$ Γ_{27}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^+D^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AUBERT	09M	BABR	$e^+e^- \to D^+D^-\gamma$
not seen	PAKHLOVA	08	BELL	$e^+e^- \to D^+D^-\gamma$

$\Gamma(D^*\overline{D}+\text{c.c.})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{28}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<34	90	AUBERT	09M	BABR	$e^+e^- \to \gamma D^*\overline{D}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<45	90	CRONIN-HEN..09		CLEO	e^+e^-

$\Gamma(D^*(2007)^0\overline{D}^0+\text{c.c.})/\Gamma_{total}$ Γ_{29}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^{*0}\overline{D}^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AUBERT	09M	BABR	$e^+e^- \to D^{*0}\overline{D}^0\gamma$

$\Gamma(D^*(2010)^+ D^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{30}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^{*+}D^-$
not seen	PAKHLOVA	07	BELL	$e^+e^- \to D^{*+}D^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AUBERT	09M	BABR	$e^+e^- \to D^{*+}D^-\gamma$

$\Gamma(D^*\overline{D}^*)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{31}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<11	90	CRONIN-HEN..09		CLEO	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<40	90	AUBERT	09M	BABR	$e^+e^- \to \gamma D^*\overline{D}^*$

$\Gamma(D^*(2007)^0\overline{D}^*(2007)^0)/\Gamma_{\text{total}}$ Γ_{32}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^{*0}\overline{D}^{*0}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AUBERT	09M	BABR	$e^+e^- \to D^{*0}\overline{D}^{*0}\gamma$

$\Gamma(D^*(2010)^+ D^*(2010)^-)/\Gamma_{\text{total}}$ Γ_{33}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^{*+}D^{*-}$
not seen	PAKHLOVA	07	BELL	$e^+e^- \to D^{*+}D^{*-}\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AUBERT	09M	BABR	$e^+e^- \to D^{*+}D^{*-}\gamma$

$\Gamma(D^0 D^-\pi^+ + \text{c.c. (excl. } D^*(2007)^0\overline{D}^{*0} + \text{c.c., } D^*(2010)^+ D^- + \text{c.c.}))/\Gamma_{\text{total}}$ Γ_{35}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	PAKHLOVA	08A	BELL	10.6 $e^+e^- \to D^0 D^-\pi^+\gamma$

$\Gamma(D\overline{D}^*\pi + \text{c.c. (excl. } D^*\overline{D}^*))/\Gamma_{\text{total}}$ Γ_{36}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D^*\overline{D}\pi$

$\Gamma(D\overline{D}^*\pi + \text{c.c. (excl. } D^*\overline{D}^*))/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{36}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<15	90	CRONIN-HEN..09		CLEO	e^+e^-

$\Gamma(D^0 D^{*-}\pi^+ + \text{c.c. (excl. } D^*(2010)^+ D^*(2010)^-))/\Gamma_{\text{total}}$ Γ_{37}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	PAKHLOVA	09	BELL	$e^+e^- \to D^0 D^{*-}\pi^+\gamma$

$\Gamma(D^0 D^*(2010)^-\pi^+ + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{38}/Γ

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

$\Gamma(D^0 D^*(2010)^- \pi^+ + \text{c.c.})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{38}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<9	90	PAKHLOVA	09	BELL	$e^+e^- \to D^0 D^{*-}\pi^+$

$\Gamma(D^0 D^*(2010)^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{38}/\Gamma \times \Gamma_1/\Gamma$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<0.42 \times 10^{-6}$	90	[1] PAKHLOVA	09	BELL	$e^+e^- \to D^0 D^{*-}\pi^+$

[1] Using 4263^{+8}_{-9} MeV for the mass of $\psi(4260)$.

$\Gamma(D_1(2420)\overline{D} + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{39}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	[1] ABLIKIM	19AR	BES3	$e^+e^- \to \pi^+\pi^- D\overline{D}$

[1] Results from a measurement of $\sigma(e^+e^- \to D_1(2420)\overline{D} + \text{c.c.})$ between $\sqrt{s} = 4.3$ and 4.6 GeV.

$\Gamma(D^*\overline{D}^*\pi)/\Gamma_{\text{total}}$ Γ_{40}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..	09	CLEO	$e^+e^- \to D^*\overline{D}^*\pi$

$\Gamma(D^*\overline{D}^*\pi)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{40}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<8.2	90	CRONIN-HEN..	09	CLEO	e^+e^-

$\Gamma(D_s^+ D_s^-)/\Gamma_{\text{total}}$ Γ_{41}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	DEL-AMO-SA..	10N	BABR	$e^+e^- \to D_s^+ D_s^-\gamma$
not seen	CRONIN-HEN..	09	CLEO	$e^+e^- \to D_s^+ D_s^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	PAKHLOVA	11	BELL	$e^+e^- \to D_s^+ D_s^-\gamma$

$\Gamma(D_s^+ D_s^-)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{41}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.7	95	DEL-AMO-SA..	10N	BABR	10.6 e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.3	90	CRONIN-HEN..	09	CLEO	e^+e^-

$\Gamma(D_s^{*+} D_s^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{42}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	DEL-AMO-SA..	10N	BABR	$e^+e^- \to D_s^{*+} D_s^-\gamma$
not seen	CRONIN-HEN..	09	CLEO	$e^+e^- \to D_s^{*+} D_s^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	PAKHLOVA	11	BELL	$e^+e^- \to D_s^{*+} D_s^-\gamma$

$\Gamma(D_s^{*+} D_s^- + \text{c.c.})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{42}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
< 0.8	90	CRONIN-HEN..	09	CLEO	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<44	95	DEL-AMO-SA..	10N	BABR	10.6 e^+e^-

$\Gamma(D_s^{*+} D_s^{*-})/\Gamma_{\text{total}}$ Γ_{43}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CRONIN-HEN..09		CLEO	$e^+e^- \to D_s^{*+} D_s^{*-}$

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

not seen	PAKHLOVA	11	BELL	$e^+e^- \to D_s^{*+} D_s^{*-}\gamma$
not seen	DEL-AMO-SA..10N		BABR	$e^+e^- \to D_s^{*+} D_s^{*-}\gamma$

$\Gamma(D_s^{*+} D_s^{*-})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{43}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
< 9.5	90	CRONIN-HEN..09		CLEO	e^+e^-

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

<30	95	DEL-AMO-SA..10N		BABR	10.6 e^+e^-

$\Gamma(p\overline{p})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{44}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.13	90	[1] AUBERT	06B	BABR	$e^+e^- \to p\overline{p}\gamma$

[1] Using 4259 ± 10 MeV for the mass and 88 ± 24 MeV for the width of $\psi(4260)$.

$\Gamma(p\overline{p}\pi^0)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{45}/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2\times10^{-4}$	90	ABLIKIM	17F	BES3	$e^+e^- \to \psi(4260) \to$ hadrons

$\Gamma(p\overline{p}\eta)/\Gamma_{\text{total}}$ Γ_{46}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	ABLIKIM	21AN	BES3	$e^+e^- \to p\overline{p}\eta$

$\Gamma(p\overline{p}\omega)/\Gamma_{\text{total}}$ Γ_{47}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	ABLIKIM	21AN	BES3	$e^+e^- \to p\overline{p}\omega$

$\Gamma(p\overline{p}p\overline{p})/\Gamma_{\text{total}}$ Γ_{61}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	ABLIKIM	21D	BES3	4.0–4.6 $e^+e^- \to p\overline{p}p\overline{p}$

Radiative decays

$\Gamma(\eta_c(1S)\gamma)/\Gamma_{\text{total}}$ Γ_{63}/Γ

VALUE	DOCUMENT ID		COMMENT
possibly seen	[1] ABLIKIM	17W	$e^+e^- \to \gamma\eta_c(1S)$

[1] Significance ranges from 4.2 σ to as low as 1.5 σ for a flat component plus $\psi(4260)$ spectrum. Needs confirmation.

$\Gamma(\eta_c(1S)\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_{64}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	[1] ABLIKIM	21B	BES3	$e^+e^- \to \gamma\pi^0\eta_c$

[1] Not seen in $e^+e^- \to \gamma\pi^0\eta_c$ at $\sqrt{s} = 4.226$ GeV with a 90% C.L. upper limit on the cross section of 11.2 pb.

$\Gamma(\chi_{c1}(3872)\gamma)/\Gamma_{\text{total}}$ Γ_{67}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen		ABLIKIM	19V	BES3	$e^+e^- \to \gamma\chi_{c1}(3872)$
seen	20 ± 5	ABLIKIM	14	BES3	$e^+e^- \to J/\psi\pi^+\pi^-\gamma$

$\psi(4230)$ REFERENCES

ABLIKIM	21AJ	PR D104 052012	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21AN	PR D104 092008	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21AS	PR D104 L091104	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21AW	PR D104 112009	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21B	PR D103 032006	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	21D	PR D103 052003	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20A	PR D101 012008	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20AG	PR D102 112009	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20C	PRL 124 032002	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20N	PR D102 012009	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	20O	PR D102 031101	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19	PR D99 012003	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19AE	PR D99 072005	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19AI	PR D99 091103	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	19AR	PR D100 032005	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	18N	PR D97 071101	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	17B	PRL 118 092001	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	17F	PL B771 45	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	17W	PR D96 051101	M. Ablikim *et al.*	(BESIII Collab.)
GAO	17	PR D95 092007	X.Y. Gao, C.P. Shen, C.Z. Yuan	
ZHANG	17B	PR D96 054008	J. Zhang, J. Zhang	
ZHANG	17C	EPJ C77 727	J. Zhang, L. Yuan	
PDG	16	CP C40 100001	C. Patrignani *et al.*	(PDG Collab.)
ABLIKIM	15C	PRL 114 092003	M. Ablikim *et al.*	(BESIII Collab.)
ABLIKIM	15Q	PR D92 012008	M. Ablikim *et al.*	(BESIII Collab.)
HAN	15	PR D92 012011	Y.L. Han *et al.*	(BELLE Collab.)
ABLIKIM	14	PRL 112 092001	M. Ablikim *et al.*	(BESIII Collab.)
SHEN	14	PR D89 072015	C.P. Shen *et al.*	(BELLE Collab.)
ABLIKIM	13T	PRL 110 252001	M. Ablikim *et al.*	(BESIII Collab.)
LIU	13B	PRL 110 252002	Z.Q. Liu *et al.*	(BELLE Collab.)
WANG	13B	PR D87 051101	X.L. Wang *et al.*	(BELLE Collab.)
LEES	12AC	PR D86 051102	J.P. Lees *et al.*	(BABAR Collab.)
PAKHLOVA	11	PR D83 011101	G. Pakhlova *et al.*	(BELLE Collab.)
PEDLAR	11	PRL 107 041803	T. Pedlar *et al.*	(CLEO Collab.)
DEL-AMO-SA...	10N	PR D82 052004	P. del Amo Sanchez *et al.*	(BABAR Collab.)
AUBERT	09M	PR D79 092001	B. Aubert *et al.*	(BABAR Collab.)
CRONIN-HEN...	09	PR D80 072001	D. Cronin-Hennessy *et al.*	(CLEO Collab.)
PAKHLOVA	09	PR D80 091101	G. Pakhlova *et al.*	(BELLE Collab.)
AUBERT	08S	PR D77 092002	B. Aubert *et al.*	(BABAR Collab.)
LIU	08H	PR D78 014032	Z.Q. Liu, X.S. Qin, C.Z. Yuan	
PAKHLOVA	08	PR D77 011103	G. Pakhlova *et al.*	(BELLE Collab.)
PAKHLOVA	08A	PRL 100 062001	G. Pakhlova *et al.*	(BELLE Collab.)
YUAN	08	PR D77 011105	C.Z. Yuan *et al.*	(BELLE Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	07BE	PR D76 111105	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	07S	PRL 98 212001	B. Aubert *et al.*	(BABAR Collab.)
PAKHLOVA	07	PRL 98 092001	G. Pakhlova *et al.*	(BELLE Collab.)
WANG	07D	PRL 99 142002	X.L. Wang *et al.*	(BELLE Collab.)
YUAN	07	PRL 99 182004	C.Z. Yuan *et al.*	(BELLE Collab.)
AUBERT	06B	PR D73 012005	B. Aubert *et al.*	(BABAR Collab.)
AUBERT,BE	06D	PR D74 091103	B. Aubert *et al.*	(BABAR Collab.)
HE	06B	PR D74 091104	Q. He *et al.*	(CLEO Collab.)
AUBERT,B	05I	PRL 95 142001	B. Aubert *et al.*	(BABAR Collab.)