

$\psi(4160)$

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

 $\psi(4160)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4191 ± 5 OUR AVERAGE			
4191 $\begin{smallmatrix} +9 \\ -8 \end{smallmatrix}$	AAIJ	13BC LHCb	$B^+ \rightarrow K^+ \mu^+ \mu^-$
4191.7 ± 6.5	¹ ABLIKIM	08D BES2	$e^+ e^- \rightarrow \text{hadrons}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
4193 ± 7	² MO	10 RVUE	$e^+ e^- \rightarrow \text{hadrons}$
4151 ± 4	³ SETH	05A RVUE	$e^+ e^- \rightarrow \text{hadrons}$
4155 ± 5	⁴ SETH	05A RVUE	$e^+ e^- \rightarrow \text{hadrons}$
4159 ± 20	BRANDELIK	78C DASP	$e^+ e^-$

¹ Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (293 \pm 57)^\circ$.

² Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.

³ From a fit to Crystal Ball (OSTERHELD 86) data.

⁴ From a fit to BES (BAI 02C) data.

 $\psi(4160)$ WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
70 ± 10 OUR AVERAGE			
65 $\begin{smallmatrix} +22 \\ -16 \end{smallmatrix}$	AAIJ	13BC LHCb	$B^+ \rightarrow K^+ \mu^+ \mu^-$
71.8 ± 12.3	¹ ABLIKIM	08D BES2	$e^+ e^- \rightarrow \text{hadrons}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
79 ± 14	² MO	10 RVUE	$e^+ e^- \rightarrow \text{hadrons}$
107 ± 10	³ SETH	05A RVUE	$e^+ e^- \rightarrow \text{hadrons}$
107 ± 16	⁴ SETH	05A RVUE	$e^+ e^- \rightarrow \text{hadrons}$
78 ± 20	BRANDELIK	78C DASP	$e^+ e^-$

¹ Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (293 \pm 57)^\circ$.

² Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.

³ From a fit to Crystal Ball (OSTERHELD 86) data.

⁴ From a fit to BES (BAI 02C) data.

$\psi(4160)$ DECAY MODES

Due to the complexity of the $c\bar{c}$ threshold region, in this listing, “seen” (“not seen”) means that a cross section for the mode in question has been measured at effective \sqrt{s} near this particle’s central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in \sqrt{s} or absence thereof. See mode listing(s) for details and references.

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 e^+e^-	$(6.9 \pm 3.3) \times 10^{-6}$	
Γ_2 $\mu^+\mu^-$	seen	
Γ_3 $D\bar{D}$	seen	
Γ_4 $D^0\bar{D}^0$	seen	
Γ_5 D^+D^-	seen	
Γ_6 $D^*\bar{D} + \text{c.c.}$	seen	
Γ_7 $D^*(2007)^0\bar{D}^0 + \text{c.c.}$	seen	
Γ_8 $D^*(2010)^+D^- + \text{c.c.}$	seen	
Γ_9 $D^*\bar{D}^*$	seen	
Γ_{10} $D^*(2007)^0\bar{D}^*(2007)^0$	seen	
Γ_{11} $D^*(2010)^+D^*(2010)^-$	seen	
Γ_{12} $D^0D^-\pi^+ + \text{c.c.}$ (excl. $D^*(2007)^0\bar{D}^0 + \text{c.c.}$, $D^*(2010)^+D^- + \text{c.c.}$)	not seen	
Γ_{13} $D\bar{D}^*\pi + \text{c.c.}$ (excl. $D^*\bar{D}^*$)	seen	
Γ_{14} $D^0D^{*-}\pi^+ + \text{c.c.}$ (excl. $D^*(2010)^+D^*(2010)^-$)	not seen	
Γ_{15} $D_s^+D_s^-$	not seen	
Γ_{16} $D_s^{*+}D_s^- + \text{c.c.}$	seen	
Γ_{17} $J/\psi\pi^+\pi^-$	$< 3 \times 10^{-3}$	90%
Γ_{18} $J/\psi\pi^0\pi^0$	$< 3 \times 10^{-3}$	90%
Γ_{19} $J/\psi K^+K^-$	$< 2 \times 10^{-3}$	90%
Γ_{20} $J/\psi\eta$	$< 8 \times 10^{-3}$	90%
Γ_{21} $J/\psi\pi^0$	$< 1 \times 10^{-3}$	90%
Γ_{22} $J/\psi\eta'$	$< 5 \times 10^{-3}$	90%
Γ_{23} $J/\psi\pi^+\pi^-\pi^0$	$< 1 \times 10^{-3}$	90%
Γ_{24} $\psi(2S)\pi^+\pi^-$	$< 4 \times 10^{-3}$	90%
Γ_{25} $\chi_{c1}\gamma$	$< 5 \times 10^{-3}$	90%
Γ_{26} $\chi_{c2}\gamma$	$< 1.3\%$	90%
Γ_{27} $\chi_{c1}\pi^+\pi^-\pi^0$	$< 2 \times 10^{-3}$	90%
Γ_{28} $\chi_{c2}\pi^+\pi^-\pi^0$	$< 8 \times 10^{-3}$	90%
Γ_{29} $h_c(1P)\pi^+\pi^-$	$< 5 \times 10^{-3}$	90%
Γ_{30} $h_c(1P)\pi^0\pi^0$	$< 2 \times 10^{-3}$	90%
Γ_{31} $h_c(1P)\eta$	$< 2 \times 10^{-3}$	90%
Γ_{32} $h_c(1P)\pi^0$	$< 4 \times 10^{-4}$	90%

Γ_{33}	$\phi\pi^+\pi^-$	< 2	$\times 10^{-3}$	90%
Γ_{34}	$\gamma\chi_{c1}(3872) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 6.8	$\times 10^{-5}$	90%
Γ_{35}	$\gamma X(3915) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 1.36	$\times 10^{-4}$	90%
Γ_{36}	$\gamma X(3930) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 1.18	$\times 10^{-4}$	90%
Γ_{37}	$\gamma X(3940) \rightarrow \gamma J/\psi\pi^+\pi^-$	< 1.47	$\times 10^{-4}$	90%
Γ_{38}	$\gamma\chi_{c1}(3872) \rightarrow \gamma\gamma J/\psi$	< 1.05	$\times 10^{-4}$	90%
Γ_{39}	$\gamma X(3915) \rightarrow \gamma\gamma J/\psi$	< 1.26	$\times 10^{-4}$	90%
Γ_{40}	$\gamma X(3930) \rightarrow \gamma\gamma J/\psi$	< 8.8	$\times 10^{-5}$	90%
Γ_{41}	$\gamma X(3940) \rightarrow \gamma\gamma J/\psi$	< 1.79	$\times 10^{-4}$	90%
Γ_{42}	K^+K^-			

$\psi(4160)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ Γ_1

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
0.48±0.22	¹ ABLIKIM	08D	BES2 $e^+e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.4 to 1.1	² MO	10	RVUE $e^+e^- \rightarrow$ hadrons
0.83±0.08	³ SETH	05A	RVUE $e^+e^- \rightarrow$ hadrons
0.84±0.13	⁴ SETH	05A	RVUE $e^+e^- \rightarrow$ hadrons
0.77±0.23	BRANDELIK	78C	DASP e^+e^-

¹ Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (293 \pm 57)^\circ$.

² Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects. Four sets of solutions are obtained with the same fit quality, mass and total width, but with different e^+e^- partial widths. We quote only the range of values.

³ From a fit to Crystal Ball (OSTERHELD 86) data.

⁴ From a fit to BES (BAI 02C) data.

$\psi(4160) \Gamma(i) \times \Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\chi_{c1}\gamma) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{25}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<2.2	90	¹ HAN	15	BELL $10.58 e^+e^- \rightarrow \chi_{c1}\gamma$

¹ Using $B(\eta \rightarrow \gamma\gamma) = (39.41 \pm 0.21)\%$.

$\Gamma(\chi_{c2}\gamma) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{26}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<6.1	90	¹ HAN	15	BELL $10.58 e^+e^- \rightarrow \chi_{c2}\gamma$

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

¹ Using $B(\eta \rightarrow \gamma\gamma) = (39.41 \pm 0.21)\%$.

$\psi(4160) \Gamma(i) \times \Gamma(e^+ e^-) / \Gamma^2(\text{total})$

$\Gamma(J/\psi\eta) / \Gamma_{\text{total}} \times \Gamma(e^+ e^-) / \Gamma_{\text{total}} \qquad \Gamma_{20} / \Gamma \times \Gamma_1 / \Gamma$

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

2.8±0.9±0.9	¹ WANG	13B	BELL $e^+ e^- \rightarrow J/\psi\eta\gamma$
12.8±1.7±2.0	² WANG	13B	BELL $e^+ e^- \rightarrow J/\psi\eta\gamma$

¹ Solution I of two equivalent solutions in a fit using two interfering resonances. Mass and width fixed at 4153 MeV and 103 MeV, respectively.

² Solution II of two equivalent solutions in a fit using two interfering resonances. Mass and width fixed at 4153 MeV and 103 MeV, respectively.

$\psi(4160)$ BRANCHING RATIOS

$\Gamma(\mu^+ \mu^-) / \Gamma_{\text{total}} \qquad \Gamma_2 / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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seen ¹ AAIJ 13BC LHCb $B^+ \rightarrow K^+ \mu^+ \mu^-$

¹ AAIJ 13BC report $B(B^+ \rightarrow K^+ \psi(4160)) B(\psi(4160) \rightarrow \mu^+ \mu^-) = (3.5^{+0.9}_{-0.8}) \times 10^{-9}$.

$\Gamma(D\bar{D}) / \Gamma(D^* \bar{D}^*) \qquad \Gamma_3 / \Gamma_9$

VALUE	DOCUMENT ID	TECN	COMMENT
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0.02±0.03±0.02 AUBERT 09M BABR $e^+ e^- \rightarrow \gamma D^{(*)} \bar{D}^{(*)}$

$\Gamma(D^0 \bar{D}^0) / \Gamma_{\text{total}} \qquad \Gamma_4 / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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seen CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^0 \bar{D}^0$

seen PAKHLOVA 08 BELL $e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$

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

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$

$\Gamma(D^+ D^-) / \Gamma_{\text{total}} \qquad \Gamma_5 / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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seen CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^+ D^-$

seen PAKHLOVA 08 BELL $e^+ e^- \rightarrow D^+ D^- \gamma$

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

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^+ D^- \gamma$

$\Gamma(D^*(2007)^0 \bar{D}^0 + \text{c.c.}) / \Gamma_{\text{total}} \qquad \Gamma_7 / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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seen AUBERT 09M BABR $e^+ e^- \rightarrow D^{*0} \bar{D}^0 \gamma$

seen CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*0} \bar{D}^0$

$\Gamma(D^*(2010)^+ D^- + c.c.)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	¹ ZHUKOVA 18	BELL	$e^+ e^- \rightarrow D^{*+} D^- \gamma$
seen	AUBERT 09M	BABR	$e^+ e^- \rightarrow D^{*+} D^- \gamma$
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^{*+} D^-$

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

seen	PAKHLOVA 07	BELL	$e^+ e^- \rightarrow D^{*+} D^- \gamma$
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¹ Supersedes PAKHLOVA 07.

$\Gamma(D^* \bar{D} + c.c.)/\Gamma(D^* \bar{D}^*)$ Γ_6/Γ_9

VALUE	DOCUMENT ID	TECN	COMMENT
0.34 ± 0.14 ± 0.05	AUBERT 09M	BABR	$e^+ e^- \rightarrow \gamma D^{(*)} \bar{D}^{(*)}$

$\Gamma(D^*(2007)^0 \bar{D}^*(2007)^0)/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	AUBERT 09M	BABR	$e^+ e^- \rightarrow D^{*0} \bar{D}^{*0} \gamma$
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^{*0} \bar{D}^{*0}$

$\Gamma(D^*(2010)^+ D^*(2010)^-)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	¹ ZHUKOVA 18	BELL	$e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$
seen	AUBERT 09M	BABR	$e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^{*+} D^{*-}$

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

seen	PAKHLOVA 07	BELL	$e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$
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¹ Supersedes PAKHLOVA 07.

$\Gamma(D^0 D^- \pi^+ + c.c. (\text{excl. } D^*(2007)^0 \bar{D}^0 + c.c., D^*(2010)^+ D^- + c.c.))/\Gamma_{\text{total}}$ Γ_{12}/Γ

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

$\Gamma(D \bar{D}^* \pi + c.c. (\text{excl. } D^* \bar{D}^*))/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D \bar{D}^* \pi$

$\Gamma(D^0 D^{*-} \pi^+ + c.c. (\text{excl. } D^*(2010)^+ D^*(2010)^-))/\Gamma_{\text{total}}$ Γ_{14}/Γ

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

$\Gamma(D_s^+ D_s^-)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	PAKHLOVA 11	BELL	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
not seen	DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
not seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D_s^+ D_s^-$

$\Gamma(D_s^{*+} D_s^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{16}/Γ

<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
seen		PAKHLOVA	11	BELL $e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$
seen		DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$
seen		CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D_s^{*+} D_s^-$

$\Gamma(J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{17}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<3	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(J/\psi \pi^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{18}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<3	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(J/\psi K^+ K^-)/\Gamma_{\text{total}}$ Γ_{19}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(J/\psi \eta)/\Gamma_{\text{total}}$ Γ_{20}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<8	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

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

possibly seen	¹ ABLIKIM	15L	BES3	$e^+ e^- \rightarrow J/\psi \eta$
seen	WANG	13B	BELL	$e^+ e^- \rightarrow J/\psi \eta \gamma$

¹ An enhancement around 4.2 GeV is observed.

$\Gamma(J/\psi \pi^0)/\Gamma_{\text{total}}$ Γ_{21}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(J/\psi \eta')/\Gamma_{\text{total}}$ Γ_{22}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<5	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(J/\psi \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{23}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(\psi(2S) \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{24}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<4	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(\chi_{c1} \gamma)/\Gamma_{\text{total}}$ Γ_{25}/Γ

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<7	90	COAN	06	CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons

$\Gamma(\chi_{c2}\gamma)/\Gamma_{\text{total}}$ **Γ_{26}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<13	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons

$\Gamma(\chi_{c1}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ **Γ_{27}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons

$\Gamma(\chi_{c2}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ **Γ_{28}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<8	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons

$\Gamma(h_c(1P)\pi^+\pi^-)/\Gamma_{\text{total}}$ **Γ_{29}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<5	90	¹ PEDLAR	11	CLEO $e^+e^- \rightarrow h_c(1P)\pi^+\pi^-$

¹ At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+e^- \rightarrow h_c(1P)\pi^+\pi^-) = 15.6 \pm 2.3 \pm 1.9 \pm 3.0$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.

$\Gamma(h_c(1P)\pi^0\pi^0)/\Gamma_{\text{total}}$ **Γ_{30}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2	90	¹ PEDLAR	11	CLEO $e^+e^- \rightarrow h_c(1P)\pi^0\pi^0$

¹ At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+e^- \rightarrow h_c(1P)\pi^0\pi^0) = 3.0 \pm 3.3 \pm 1.1 \pm 0.6$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.

$\Gamma(h_c(1P)\eta)/\Gamma_{\text{total}}$ **Γ_{31}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2	90		¹ PEDLAR	11	CLEO $e^+e^- \rightarrow h_c(1P)\eta$

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

possibly seen 41 ² ABLIKIM 17R BES3 $e^+e^- \rightarrow h_c(1P)\eta$

¹ At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+e^- \rightarrow h_c(1P)\eta) = 4.7 \pm 1.7 \pm 1.0 \pm 0.9$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.

² An enhancement around 4.2 GeV is observed.

$\Gamma(h_c(1P)\pi^0)/\Gamma_{\text{total}}$ **Γ_{32}/Γ**

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.4	90	¹ PEDLAR	11	CLEO $e^+e^- \rightarrow h_c(1P)\pi^0$

¹ At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+e^- \rightarrow h_c(1P)\pi^0) = -0.7 \pm 1.8 \pm 0.7 \pm 0.1$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.

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

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons

$\Gamma(\gamma\chi_{c1}(3872) \rightarrow \gamma J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{34}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<0.68 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma J/\psi \pi^+ \pi^-$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma X(3915) \rightarrow \gamma J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{35}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<1.36 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma J/\psi \pi^+ \pi^-$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma X(3930) \rightarrow \gamma J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{36}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<1.18 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma J/\psi \pi^+ \pi^-$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma X(3940) \rightarrow \gamma J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{37}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<1.47 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma J/\psi \pi^+ \pi^-$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma\chi_{c1}(3872) \rightarrow \gamma\gamma J/\psi)/\Gamma_{\text{total}}$ Γ_{38}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<1.05 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma\gamma J/\psi$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma X(3915) \rightarrow \gamma\gamma J/\psi)/\Gamma_{\text{total}}$ Γ_{39}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<1.26 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma\gamma J/\psi$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma X(3930) \rightarrow \gamma\gamma J/\psi)/\Gamma_{\text{total}}$ Γ_{40}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<0.88 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma\gamma J/\psi$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(\gamma X(3940) \rightarrow \gamma\gamma J/\psi)/\Gamma_{\text{total}}$ Γ_{41}/Γ

VALUE	CL%	DOCUMENT ID	COMMENT
$<1.79 \times 10^{-4}$	90	¹ XIAO 13	$\psi(4160) \rightarrow \gamma\gamma J/\psi$

¹ Obtained by analyzing CLEO data but not authored by the CLEO Collaboration.

$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$ Γ_{42}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2 \times 10^{-5}$	90	¹ DRUZHININ 15	RVUE	$e^+ e^- \rightarrow \psi(3770)$

¹ DRUZHININ 15 uses BABAR and CLEO data taking into account interference of the processes $e^+ e^- \rightarrow K^+ K^-$ and $e^+ e^- \rightarrow K_S^0 K_L^0$.

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