

$\psi(4160)$

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

$\psi(4160)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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4153 ± 3 OUR ESTIMATE

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

4151 ± 4	¹ SETH	05A	RVUE	e ⁺ e ⁻ → hadrons
4155 ± 5	² SETH	05A	RVUE	e ⁺ e ⁻ → hadrons
4159 ± 20	BRANDELIK	78C	DASP	e ⁺ e ⁻

¹ From a fit to Crystal Ball (OSTERHELD 86) data.

² From a fit to BES (BAI 02c) data.

$\psi(4160)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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103 ± 8 OUR ESTIMATE

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

107 ± 10	³ SETH	05A	RVUE	e ⁺ e ⁻ → hadrons
107 ± 16	⁴ SETH	05A	RVUE	e ⁺ e ⁻ → hadrons
78 ± 20	BRANDELIK	78C	DASP	e ⁺ e ⁻

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

⁴ From a fit to BES (BAI 02c) data.

$\psi(4160)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 e ⁺ e ⁻	(8.1 ± 0.9) × 10 ⁻⁶	
Γ_2 J/ψ π ⁺ π ⁻	< 3 × 10 ⁻³	90%
Γ_3 J/ψ π ⁰ π ⁰	< 3 × 10 ⁻³	90%
Γ_4 J/ψ K ⁺ K ⁻	< 2 × 10 ⁻³	90%
Γ_5 J/ψ η	< 8 × 10 ⁻³	90%
Γ_6 J/ψ π ⁰	< 1 × 10 ⁻³	90%
Γ_7 J/ψ η'	< 5 × 10 ⁻³	90%
Γ_8 J/ψ π ⁺ π ⁻ π ⁰	< 1 × 10 ⁻³	90%
Γ_9 ψ(2S) π ⁺ π ⁻	< 4 × 10 ⁻³	90%
Γ_{10} χ _{c1} γ	< 7 × 10 ⁻³	90%
Γ_{11} χ _{c2} γ	< 1.3 %	90%
Γ_{12} χ _{c1} π ⁺ π ⁻ π ⁰	< 2 × 10 ⁻³	90%
Γ_{13} χ _{c2} π ⁺ π ⁻ π ⁰	< 8 × 10 ⁻³	90%
Γ_{14} φ π ⁺ π ⁻	< 2 × 10 ⁻³	90%

$\psi(4160)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ Γ_1

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
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0.83±0.07 OUR ESTIMATE

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

0.83±0.08	⁵ SETH	05A	RVUE $e^+e^- \rightarrow$ hadrons
0.84±0.13	⁶ SETH	05A	RVUE $e^+e^- \rightarrow$ hadrons
0.77±0.23	BRANDELIK	78C	DASP e^+e^-

⁵ From a fit to Crystal Ball (OSTERHELD 86) data.

⁶ From a fit to BES (BAI 02C) data.

$\psi(4160)$ BRANCHING RATIOS

$\Gamma(J/\psi\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<3	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(J/\psi\pi^0\pi^0)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<3	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(J/\psi K^+K^-)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<2	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(J/\psi\eta)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<8	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(J/\psi\pi^0)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<1	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(J/\psi\eta')/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<5	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(J/\psi\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<1	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(\psi(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
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<4	90	COAN	06	CLEO 4.12–4.2 $e^+e^- \rightarrow$ hadrons
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$\Gamma(\chi_{c1}\gamma)/\Gamma_{\text{total}}$					Γ_{10}/Γ
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
<7	90	COAN	06	CLEO	4.12–4.2 $e^+e^- \rightarrow$ hadrons
$\Gamma(\chi_{c2}\gamma)/\Gamma_{\text{total}}$					Γ_{11}/Γ
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
<13	90	COAN	06	CLEO	4.12–4.2 $e^+e^- \rightarrow$ hadrons
$\Gamma(\chi_{c1}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
<2	90	COAN	06	CLEO	4.12–4.2 $e^+e^- \rightarrow$ hadrons
$\Gamma(\chi_{c2}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{13}/Γ
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
<8	90	COAN	06	CLEO	4.12–4.2 $e^+e^- \rightarrow$ hadrons
$\Gamma(\phi\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
<2	90	COAN	06	CLEO	4.12–4.2 $e^+e^- \rightarrow$ hadrons

$\psi(4160)$ REFERENCES

COAN	06	PRL 96 162003	T.E. Coan <i>et al.</i>	(CLEO Collab.)
SETH	05A	PR D72 017501	K.K. Seth	
BAI	02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)
OSTERHELD	86	SLAC-PUB-4160	A. Osterheld <i>et al.</i>	(SLAC Crystal Ball Collab.)
BRANDELIK	78C	PL 76B 361	R. Brandelik <i>et al.</i>	(DASP Collab.)

OTHER RELATED PAPERS

PAKHLOVA	07	PRL 98 092001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
IDDIR	98	PL B433 125	F. Iddir <i>et al.</i>	
ONO	84	ZPHY C26 307	S. Ono	(ORSAY)
BURMESTER	77	PL 66B 395	J. Burmester <i>et al.</i>	(DESY, HAMB, SIEG+)