$\psi(4040)$

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

$\psi(4040)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
4039± 1 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4037± 2	[1] SETH	05A	RVUE	$e^+e^- \to$ hadrons
4040± 1	[2] SETH	05A	RVUE	$e^+e^- \to$ hadrons
4040±10	BRANDELIK	78C	DASP	e^+e^-

[1] From a fit to Crystal Ball (OSTERHELD 86) data.
[2] From a fit to BES (BAI 02C) data.

$\psi(4040)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
80±10 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
85±10	[3] SETH	05A	RVUE	$e^+e^- \to$ hadrons
89± 6	[4] SETH	05A	RVUE	$e^+e^- \to$ hadrons
52±10	BRANDELIK	78C	DASP	e^+e^-

[3] From a fit to Crystal Ball (OSTERHELD 86) data.
[4] From a fit to BES (BAI 02C) data.

$\psi(4040)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)		Confidence level
Γ_1	e^+e^-	$(1.07\pm0.16)\times10^{-5}$		
Γ_2	$D^0\overline{D}^0$	seen		
Γ_3	$D^*(2007)^0\overline{D}^0$ + c.c.	seen		
Γ_4	$D^*(2007)^0\overline{D}^*(2007)^0$	seen		
Γ_5	$J/\psi(1S)$ hadrons			
Γ_6	$J/\psi\pi^+\pi^-$	< 4	$\times10^{-3}$	90%
Γ_7	$J/\psi\pi^0\pi^0$	< 2	$\times10^{-3}$	90%
Γ_8	$J/\psi\eta$	< 7	$\times10^{-3}$	90%
Γ_9	$J/\psi\pi^0$	< 2	$\times10^{-3}$	90%
Γ_{10}	$J/\psi\pi^+\pi^-\pi^0$	< 2	$\times10^{-3}$	90%
Γ_{11}	$\chi_{c1}\gamma$	< 1.1	%	90%
Γ_{12}	$\chi_{c2}\gamma$	< 1.7	%	90%
Γ_{13}	$\chi_{c1}\pi^+\pi^-\pi^0$	< 1.1	%	90%
Γ_{14}	$\chi_{c2}\pi^+\pi^-\pi^0$	< 3.2	%	90%
Γ_{15}	$\phi\pi^+\pi^-$	< 3	$\times10^{-3}$	90%
Γ_{16}	$\mu^+\mu^-$			

$\psi(4040)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ — Γ_1

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
0.86±0.07 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.88±0.11	[5] SETH	05A	RVUE	$e^+e^- \to$ hadrons
0.91±0.13	[6] SETH	05A	RVUE	$e^+e^- \to$ hadrons
0.75±0.15	BRANDELIK	78C	DASP	e^+e^-

[5] From a fit to Crystal Ball (OSTERHELD 86) data.
[6] From a fit to BES (BAI 02C) data.

$\psi(4040)$ BRANCHING RATIOS

$\Gamma(e^+e^-)/\Gamma_{total}$ — Γ_1/Γ

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 1.0	FELDMAN	77	MRK1	e^+e^-

$\Gamma(D^0\overline{D}^0)/\Gamma(D^*(2007)^0\overline{D}^0 + c.c.)$ — Γ_2/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
0.05±0.03	[7] GOLDHABER	77	MRK1	e^+e^-

$\Gamma(D^*(2007)^0\overline{D}^*(2007)^0)/\Gamma(D^*(2007)^0\overline{D}^0 + c.c.)$ — Γ_4/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
32.0±12.0	[7] GOLDHABER	77	MRK1	e^+e^-

$\Gamma(J/\psi\pi^+\pi^-)/\Gamma_{total}$ — Γ_6/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<4	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(J/\psi\pi^0\pi^0)/\Gamma_{total}$ — Γ_7/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(J/\psi\eta)/\Gamma_{total}$ — Γ_8/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<7	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(J/\psi\pi^0)/\Gamma_{total}$ — Γ_9/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(J/\psi\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(\chi_{c1}\gamma)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<11	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(\chi_{c2}\gamma)/\Gamma_{total}$ — Γ_{12}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<17	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(\chi_{c1}\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{13}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<11	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(\chi_{c2}\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{14}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<32	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

$\Gamma(\phi\pi^+\pi^-)/\Gamma_{total}$ — Γ_{15}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<3	90	COAN	06	CLEO	3.97–4.06 $e^+e^- \to$ hadrons

[7] Phase-space factor (p^3) explicitly removed.

$\psi(4040)$ REFERENCES

COAN	06	PRL 96 162003	T.E. Coan *et al.*	(CLEO Collab.)
SETH	05A	PR D72 017501	K.K. Seth	
BAI	02C	PRL 88 101802	J.Z. Bai *et al.*	(BES Collab.)
OSTERHELD	86	SLAC-PUB-4160	A. Osterheld *et al.*	(SLAC Crystal Ball Collab.)
BRANDELIK	78C	PL 76B 361	R. Brandelik *et al.*	(DASP Collab.)
Also		ZPHY C1 233	R. Brandelik *et al.*	(DASP Collab.)
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)
GOLDHABER	77	PL 69B 503	G. Goldhaber *et al.*	(Mark I Collab.)

OTHER RELATED PAPERS

PAKHLOVA	07	PRL 98 092001	G. Pakhlova *et al.*	(BELLE Collab.)
DUBYNSKIY	06A	MPL A21 2779	S. Dubynskiy, M.B. Voloshin	
HEIKKILA	84	PR D29 110	K. Heikkila, N.A. Tornqvist, S. Ono	(HELS, AACHT)
ONO	84	ZPHY C26 307	S. Ono	(ORSAY)
SIEGRIST	82	PR D26 969	J.L. Siegrist *et al.*	(SLAC, LBL)
AUGUSTIN	75	PRL 34 764	J.E. Augustin *et al.*	(SLAC, LBL)
BACCI	75	PL 58B 481	C. Bacci *et al.*	(ROMA, FRAS)
BOYARSKI	75B	PRL 34 762	A.M. Boyarski *et al.*	(SLAC, LBL)
ESPOSITO	75	PL 58B 478	B. Esposito *et al.*	(FRAS, NAPL, PADO+)