$\chi_{c0}(1P)$

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

$\chi_{c0}(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
3415.1± 1.0 OUR AVERAGE					
3417.8± 0.4±4		[1] GAISER	86	CBAL	$\psi(2S) \to \gamma X$
3414.8± 1.1		[2,3] HIMEL	79	MRK2	$e^+e^- \to$ hadrons
3422 ±10		[2] BARTEL	78B	CNTR	$e^+e^- \to J/\psi 2\gamma$
3416 ± 3 ±4		[2] TANENBAUM	78	MRK1	e^+e^-
3415 ± 9		[2] BIDDICK	77	CNTR	$e^+e^- \to \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3407 ± 8	2	[4] WIIK	75	DASP	$e^+e^- \to J/\psi 2\gamma$

[1] Using mass of $\psi(2S) = 3686.0$ MeV.
[2] Mass value shifted by us by amount appropriate for $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.
[3] Systematic error added linearly by us.
[4] Only two events; this mass apparently never published.

$\chi_{c0}(1P)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
13.5±3.3±4.2	GAISER	86	CBAL	$\psi(2S) \to \gamma X, \gamma\pi^0\pi^0$

$\chi_{c0}(1P)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
	Hadronic decays		
Γ_1	$2(\pi^+\pi^-)$	(3.7±0.7) %	
Γ_2	$\pi^+\pi^- K^+K^-$	(3.0±0.7) %	
Γ_3	$\rho^0\pi^+\pi^-$	(1.6±0.5) %	
Γ_4	$3(\pi^+\pi^-)$	(1.5±0.5) %	
Γ_5	$K^+\overline{K}^*(892)^0\pi^- +$ c.c.	(1.2±0.4) %	
Γ_6	$\pi^+\pi^-$	$(7.5\pm2.1)\times10^{-3}$	
Γ_7	K^+K^-	$(7.1\pm2.4)\times10^{-3}$	
Γ_8	$\pi^+\pi^- p\overline{p}$	$(5.0\pm2.0)\times10^{-3}$	
Γ_9	$\pi^0\pi^0$	$(3.1\pm0.6)\times10^{-3}$	
Γ_{10}	$\eta\eta$	$(2.5\pm1.1)\times10^{-3}$	
Γ_{11}	$p\overline{p}$	$< 9.0 \times10^{-4}$	90%
	Radiative decays		
Γ_{12}	$\gamma J/\psi(1S)$	$(6.6\pm1.8)\times10^{-3}$	
Γ_{13}	$\gamma\gamma$	$(4.0\pm2.3)\times10^{-4}$	

$\chi_{c0}(1P)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$ Γ_{13}

VALUE (keV)	CL%	DOCUMENT ID		TECN	COMMENT
< 6.2	95	CHEN	90B	CLEO	$e^+e^- \to e^+e^-\chi_{c0}$
4.0±2.8		LEE	85	CBAL	$\psi' \to$ photons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<17	95	AIHARA	88D	TPC	$e^+e^- \to e^+e^- X$

$\chi_{c0}(1P)$ BRANCHING RATIOS

HADRONIC DECAYS

$\Gamma(2(\pi^+\pi^-))/\Gamma_{total}$ Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.037±0.007	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(\pi^+\pi^- K^+ K^-)/\Gamma_{total}$ **Γ_2/Γ**

VALUE	DOCUMENT ID		TECN	COMMENT
0.030±0.007	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{total}$ **Γ_3/Γ**

VALUE	DOCUMENT ID		TECN	COMMENT
0.016±0.005	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(3(\pi^+\pi^-))/\Gamma_{total}$ **Γ_4/Γ**

VALUE	DOCUMENT ID		TECN	COMMENT
0.015±0.005	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(K^+\overline{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{total}$ **Γ_5/Γ**

VALUE	DOCUMENT ID		TECN	COMMENT
0.012±0.004	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

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

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
75±21 OUR AVERAGE				
70±30	[5] BRANDELIK	79B	DASP	$\psi(2S) \to \gamma\chi_{c0}$
80±30	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(K^+K^-)/\Gamma_{total}$ **Γ_7/Γ**

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
71±24 OUR AVERAGE				
60±30	[5] BRANDELIK	79B	DASP	$\psi(2S) \to \gamma\chi_{c0}$
90±40	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(\pi^+\pi^- p\overline{p})/\Gamma_{total}$ **Γ_8/Γ**

VALUE	DOCUMENT ID		TECN	COMMENT
0.005 ±0.002	[5] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(\pi^0\pi^0)/\Gamma_{total}$ **Γ_9/Γ**

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
3.1±0.4±0.5	[6] LEE	85	CBAL	$\psi' \to$ photons

$\Gamma(\eta\eta)/\Gamma_{total}$ **Γ_{10}/Γ**

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
2.5±0.8±0.8	[6] LEE	85	CBAL	$\psi' \to$ photons

$\Gamma(p\overline{p})/\Gamma_{total}$ **Γ_{11}/Γ**

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<9.0	90	[5] BRANDELIK	79B	DASP	$\psi(2S) \to \gamma\chi_{c0}$

[5] Calculated using B($\psi(2S) \to \gamma\chi_{c0}(1P)$) = 0.094; the errors do not contain the uncertainty in the $\psi(2S)$ decay.

[6] Calculated using B($\psi(2S) \to \gamma\chi_{c0}(1P)$) = 0.093 ± 0.008.

RADIATIVE DECAYS

$\Gamma(\gamma J/\psi(1S))/\Gamma_{total}$ **Γ_{12}/Γ**

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
66± 18 OUR AVERAGE				
60± 18	GAISER	86	CBAL	$\psi(2S) \to \gamma\chi_{c0}$
320±210	[7] BRANDELIK	79B	DASP	$\psi(2S) \to \gamma\chi_{c0}$
150±100	[7] BARTEL	78B	CNTR	$\psi(2S) \to \gamma\chi_{c0}$
210±210	[7] TANENBAUM	78	MRK1	$\psi(2S) \to \gamma\chi_{c0}$

$\Gamma(\gamma\gamma)/\Gamma_{total}$ **Γ_{13}/Γ**

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
4.0±2.0±1.1		[6] LEE	85	CBAL	$\psi' \to$ photons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<15	90	[7] YAMADA	77	DASP	$e^+e^- \to 3\gamma$

[7] Calculated using B($\psi(2S) \to \gamma\chi_{c0}(1P)$) = 0.094; the errors do not contain the uncertainty in the $\psi(2S)$ decay.

$\chi_{c0}(1P)$ REFERENCES

CHEN	90B	PL B243 169	+McIlwain+	(CLEO Collab.)
AIHARA	88D	PRL 60 2355	+Alston-Garnjost+	(TPC Collab.)
GAISER	86	PR D34 711	+Bloom, Bulos, Godfrey+	(Crystal Ball Collab.)
LEE	85	SLAC 282		(SLAC)
BRANDELIK	79B	NP B160 426	+Cords+	(DASP Collab.)
HIMEL	79	Thesis SLAC-0223		(SLAC)
Also	82	Private Comm.	Trilling	(LBL, UCB)
BARTEL	78B	PL 79B 492	+Dittmann, Duinker, Olsson, O'Neill+	(DESY, HEIDP)
TANENBAUM	78	PR D17 1731	+Alam, Boyarski+	(SLAC, LBL)
Also	82	Private Comm.	Trilling	(LBL, UCB)
BIDDICK	77	PRL 38 1324	+Burnett+ (UCSD, UMD, PAVI, PRIN, SLAC, STAN)	
YAMADA	77	Hamburg Conf. 69		(DASP Collab.)
WIIK	75	Stanford Symp. 69		(DESY)

OTHER RELATED PAPERS

OREGLIA	82	PR D25 2259	+Partridge+ (SLAC, CIT, HARV, PRIN, STAN)	
FELDMAN	75B	PRL 35 821	+Jean-Marie, Sadoulet, Vannucci+	(LBL, SLAC)
Also	75C	PRL 35 1189	Feldman	
Erratum.				
TANENBAUM	75	PRL 35 1323	+Whitaker, Abrams+	(LBL, SLAC)