$\eta_c(2S)$

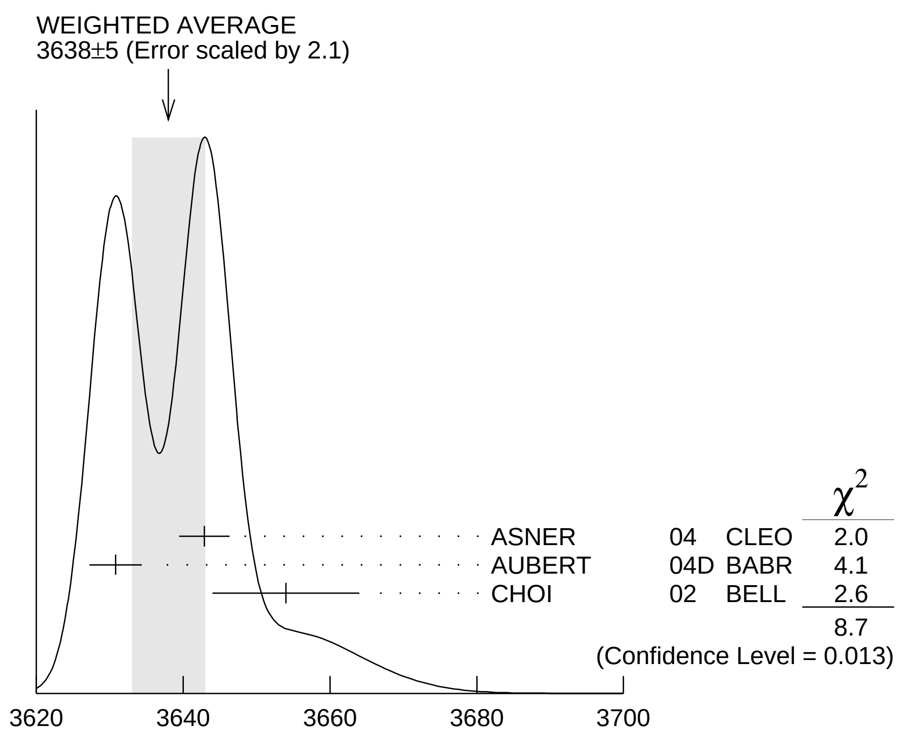
$I^G(J^{PC}) = 0^+(0^{-+})$

Quantum numbers are quark model predictions.

$\eta_c(2S)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3638 ± 5 OUR AVERAGE		Error includes scale factor of 2.1. See the ideogram below.			
3642.9 ± 3.1 ± 1.5	61	ASNER	04	CLEO	$\gamma\gamma \to \eta_c \to K^0_S K^\pm \pi^\mp$
3630.8 ± 3.4 ± 1.0	112 ± 24	AUBERT	04D	BABR	$\gamma\gamma \to \eta_c(2S) \to K\overline{K}\pi$
3654 ± 6 ± 8	39 ± 11	CHOI	02	BELL	$B \to K K_S K^- \pi^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3630 ± 8	164	[1] ABE	04G	BELL	10.6 $e^+e^- \to J/\psi(c\overline{c})$
3622 ± 12	42	[1] ABE,K	02	BELL	10.6 $e^+e^- \to J/\psi + X$
3594 ± 5		[2] EDWARDS	82C	CBAL	$e^+e^- \to \gamma X$

[1] From a fit of the J/ψ recoil mass spectrum. Systematic errors not estimated.
[2] Assuming mass of $\psi(2S) = 3686$ MeV.



$\eta_c(2S)$ mass (MeV)

$\eta_c(2S)$ WIDTH

VALUE (MeV)	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
14 ± 7 OUR AVERAGE						
6.3±12.4±4.0		61	ASNER	04	CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K^0_S K^\pm \pi^\mp$
17.0± 8.3±2.5		112±24	AUBERT	04D	BABR	$\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K\overline{K}\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<55	90	39 ± 11	[3] CHOI	02	BELL	$B \rightarrow K K_S K^- \pi^+$
< 8.0	95		[4] EDWARDS	82C	CBAL	$e^+ e^- \rightarrow \gamma X$

[3] For a mass value of 3654 ± 6 MeV
[4] For a mass value of 3594 ± 5 MeV

$\eta_c(2S)$ DECAY MODES

	Mode
Γ_1	hadrons
Γ_2	$K\overline{K}\pi$
Γ_3	$p\overline{p}$
Γ_4	$\gamma\gamma$

$\eta_c(2S)$ PATRIAL WIDTHS

$\Gamma(\gamma\gamma)$ Γ_4

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.3±0.6	[5] ASNER	04	CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K^0_S K^\pm \pi^\mp$

[5] They measure $\Gamma(\eta_c(2S)\gamma\gamma)$ B($\eta_c(2S) \rightarrow K\overline{K}\pi$) = $(0.18 \pm 0.05 \pm 0.02)$ $\Gamma(\eta_c(1S)\gamma\gamma)$ B($\eta_c(1S) \rightarrow K\overline{K}\pi$). The vaule for $\Gamma(\eta_c(2S) \rightarrow \gamma\gamma)$ is derived assuming that the branching fractions for $\eta_c(2S)$ and $\eta_c(1S)$ decays to $K_S K\pi$ are equal and using $\Gamma(\eta_c(1S) \rightarrow \gamma\gamma) = 7.4 \pm 0.4 \pm 2.3$ keV.

$\eta_c(2S)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma^2$(total)

$\Gamma(p\overline{p}) \times \Gamma(\gamma\gamma)/\Gamma^2_{total}$ $\Gamma_3\Gamma_4/\Gamma^2$

VALUE (units 10^{-8})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
< 5.6	90	[6,7,8] AMBROGIANI	01	E835	$\overline{p}p \rightarrow \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 8.0	90	[6,7,9] AMBROGIANI	01	E835	$\overline{p}p \rightarrow \gamma\gamma$
<12.0	90	[7,9] AMBROGIANI	01	E835	$\overline{p}p \rightarrow \gamma\gamma$

[6] Including the measurements of of ARMSTRONG 95F in the AMBROGIANI 01 analysis.
[7] For a total width Γ=5 MeV.
[8] For the resonance mass region 3589–3599 MeV/c^2.
[9] For the resonance mass region 3575–3660 MeV/c^2.

$\eta_c(2S)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	ABREU	98O	DLPH	$e^+e^- \to e^+e^-$ +hadrons
seen	[10] EDWARDS	82C	CBAL	$e^+e^- \to \gamma X$

$\Gamma(K\overline{K}\pi)/\Gamma_{\text{total}}$ — Γ_2/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	39 ± 11	[11] CHOI	02	BELL	$B \to K K_S K^- \pi^+$

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — Γ_4/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.01	90	LEE	85	CBAL	$\psi' \to$ photons

[10] For a mass value of 3594 ± 5 MeV
[11] For a mass value of 3654 ± 6 MeV

$\eta_c(2S)$ REFERENCES

ABE	04G	PR D70 071102	K. Abe *et al.*	(BELLE Collab.)
ASNER	04	PRL 92 142001	D.M. Asner *et al.*	(CLEO Collab.)
AUBERT	04D	PRL 92 142002	B. Aubert *et al.*	(BABAR Collab.)
ABE,K	02	PRL 89 142001	K. Abe *et al.*	(BELLE Collab.)
CHOI	02	PRL 89 102001	S.-K. Choi *et al.*	(BELLE Collab.)
AMBROGIANI	01	PR D64 052003	M. Ambrogiani *et al.*	(FNAL E835 Collab.)
ABREU	98O	PL B441 479	P. Abreu *et al.*	(DELPHI Collab.)
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
LEE	85	SLAC 282	R.A. Lee	(SLAC)
EDWARDS	82C	PRL 48 70	C. Edwards *et al.*	(CIT, HARV, PRIN+)

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