

# $\eta_c(2S)$

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

OMITTED FROM SUMMARY TABLE

Needs confirmation. Quantum numbers are quark model predictions.

## $\eta_c(2S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3654 ± 10 OUR NEW AVERAGE</b>		[3594 ± 5 MeV OUR 2002 AVERAGE]		
<b>3654 ± 6 ± 8</b>	39 ± 11	CHOI	02 BELL	$B \rightarrow K K_S K^- \pi^+$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
3622 ± 12	42	<sup>1</sup> ABE,K	02 BELL	$10.6 e^+ e^- \rightarrow J/\psi + X$
3594 ± 5		<sup>2</sup> EDWARDS	82C CBAL	$e^+ e^- \rightarrow \gamma X$
<sup>1</sup> From a fit of the $J/\psi$ recoil mass spectrum. Systematic errors not estimated.				
<sup>2</sup> Assuming mass of $\psi(2S) = 3686$ MeV.				

## $\eta_c(2S)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
< 55	90	39 ± 11	<sup>3</sup> CHOI	02 BELL	$B \rightarrow K K_S K^- \pi^+$
< 8.0	95		<sup>4</sup> EDWARDS	82C CBAL	$e^+ e^- \rightarrow \gamma X$
<sup>3</sup> For a mass value of $3654 \pm 6$ MeV					
<sup>4</sup> For a mass value of $3594 \pm 5$ MeV					

## $\eta_c(2S)$ DECAY MODES

Mode
$\Gamma_1$ hadrons
$\Gamma_2$ $K \bar{K} \pi$
$\Gamma_3$ $p \bar{p}$
$\Gamma_4$ $\gamma \gamma$

## $\eta_c(2S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma^2(\text{total})$

$\Gamma(p\bar{p}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}^2$	$\Gamma_3\Gamma_4/\Gamma^2$			
VALUE (units $10^{-8}$ )	CL%	DOCUMENT ID	TECN	COMMENT
< <b>5.6</b>	90	<sup>5,6,7</sup> AMBROGIANI 01	E835	$\bar{p}p \rightarrow \gamma\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 8.0	90	<sup>5,6,8</sup> AMBROGIANI 01	E835	$\bar{p}p \rightarrow \gamma\gamma$
< 12.0	90	<sup>6,8</sup> AMBROGIANI 01	E835	$\bar{p}p \rightarrow \gamma\gamma$

<sup>5</sup> Including the measurements of of ARMSTRONG 95F in the AMBROGIANI 01 analysis.

<sup>6</sup> For a total width  $\Gamma=5$  MeV.

<sup>7</sup> For the resonance mass region 3589–3599 MeV/ $c^2$ .

<sup>8</sup> For the resonance mass region 3575–3660 MeV/ $c^2$ .

## $\eta_c(2S)$ BRANCHING RATIOS

### $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$ $\Gamma_1/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
not seen	ABREU	980 DLPH	$e^+e^- \rightarrow e^+e^-$ +hadrons
seen	<sup>9</sup> EDWARDS	82C CBAL	$e^+e^- \rightarrow \gamma X$

### $\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$ $\Gamma_2/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
seen	$39 \pm 11$	<sup>10</sup> CHOI	02 BELL	$B \rightarrow K K_S K^- \pi^+$

### $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_4/\Gamma$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<0.01	90	LEE	85 CBAL	$\psi' \rightarrow \text{photons}$
<sup>9</sup> For a mass value of $3594 \pm 5$ MeV				
<sup>10</sup> For a mass value of $3654 \pm 6$ MeV				

## $\eta_c(2S)$ REFERENCES

ABE,K	02	PRL 89 142001	K. Abe <i>et al.</i>	(Belle Collab.)
CHOI	02	PRL 89 102001	S.-K. Choi <i>et al.</i>	(BELLE Collab.)
AMBROGIANI	01	PR D64 052003	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
ABREU	980	PL B441 479	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
LEE	85	SLAC 282	R.A. Lee	(SLAC)
EDWARDS	82C	PRL 48 70	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)

## OTHER RELATED PAPERS

EICHTEN	02	PRL 89 162002	E.J. Eichten, K. Lane, C. Quigg	
ACCIARRI	99T	PL B461 155	M. Acciarri <i>et al.</i>	(L3 Collab.)
OREGLIA	82	PR D25 2259	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)
PORTER	81	SLAC Summer Inst. 355	F.C. Porter <i>et al.</i>	(CIT, HARV, PRIN+)
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)