$\Upsilon(4S)$ or $\Upsilon(10580)$

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

$\Upsilon(4S)$ MASS

VALUE (GeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
10.5800±0.0035	[1] BEBEK	87	CLEO	$e^+e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10.5774±0.0010	[2] LOVELOCK	85	CUSB	$e^+e^- \rightarrow$ hadrons

[1] Reanalysis of BESSON 85.
[2] No systematic error given.

$\Upsilon(4S)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
14 ±5 OUR AVERAGE Error includes scale factor of 1.7.				
10.0±2.8±2.7	[3] ALBRECHT	95E	ARG	$e^+e^- \rightarrow$ hadrons
20 ±2 ±4	BESSON	85	CLEO	$e^+e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
25 ±2.5	LOVELOCK	85	CUSB	$e^+e^- \rightarrow$ hadrons

[3] Using LEYAOUANC 77 parametrization of $\Gamma(s)$.

$\Upsilon(4S)$ DECAY MODES

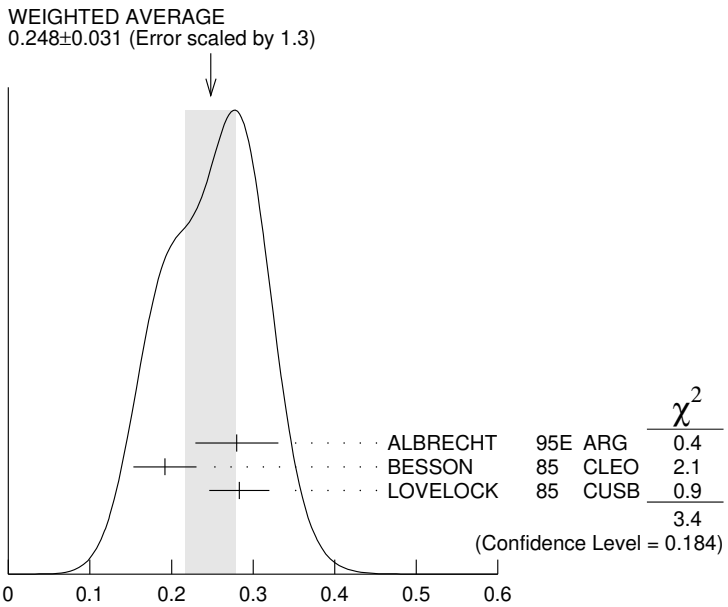
	Mode	Fraction (Γ_i/Γ)		Confidence level
Γ_1	$B\overline{B}$	> 96	%	95%
Γ_2	non-$B\overline{B}$	< 4	%	95%
Γ_3	e^+e^-	$(2.8\pm0.7)\times10^{-5}$		
Γ_4	D^{*+} anything + c.c.	< 7.4	%	90%
Γ_5	ϕ anything	< 2.3	$\times10^{-3}$	90%
Γ_6	$\Upsilon(1S)$ anything	< 4	$\times10^{-3}$	90%
Γ_7	$\Upsilon(1S)\pi^+\pi^-$	< 1.2	$\times10^{-4}$	90%
Γ_8	$\Upsilon(2S)\pi^+\pi^-$	< 3.9	$\times10^{-4}$	90%

$\Upsilon(4S)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ Γ_3

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.248±0.031 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
0.28 ±0.05 ±0.01	[4] ALBRECHT	95E	ARG	$e^+e^- \rightarrow$ hadrons
0.192±0.007±0.038	BESSON	85	CLEO	$e^+e^- \rightarrow$ hadrons
0.283±0.037	LOVELOCK	85	CUSB	$e^+e^- \rightarrow$ hadrons

[4] Using LEYAOUANC 77 parametrization of $\Gamma(s)$.



$\Gamma\left(e^+ e^-\right)$ (keV)

$\Upsilon(4S)$ BRANCHING RATIOS

$\Gamma\left(e^+ e^-\right)/\Gamma_{\text{total}}$ **Γ_3/Γ**

VALUE (units 10^{-5})	*DOCUMENT ID*		*TECN*	*COMMENT*
2.77±0.50±0.49	[5] ALBRECHT	95E	ARG	$e^+ e^- \rightarrow$ hadrons

[5] Using LEYAOUANC 77 parametrization of $\Gamma(s)$.

$\left[\Gamma\left(D^{*+}\text{anything}\right)+\Gamma(\text{c.c.})\right]/\Gamma_{\text{total}}$ **Γ_4/Γ**

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.074	90	[6] ALEXANDER	90C	CLEO	$e^+ e^-$

[6] For $x > 0.473$.

$\Gamma\left(\phi\text{anything}\right)/\Gamma_{\text{total}}$ **Γ_5/Γ**

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.0023	90	[7] ALEXANDER	90C	CLEO	$e^+ e^-$

[7] For $x > 0.52$.

$\Gamma\left(\Upsilon(1S)\text{anything}\right)/\Gamma_{\text{total}}$ **Γ_6/Γ**

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.004	90	ALEXANDER	90C	CLEO	$e^+ e^-$

$\Gamma\left(\Upsilon(1S)\pi^+\pi^-\right)/\Gamma_{\text{total}}$ **Γ_7/Γ**

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<1.2	90	GLENN	99	CLE2	$e^+ e^-$

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma_{total}$ Γ_8/Γ

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<3.9	90	GLENN	99	CLE2	e^+e^-

$\Gamma(\text{non-}B\overline{B})/\Gamma_{total}$ Γ_2/Γ

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.04	95	BARISH	96B	CLEO	e^+e^-

$\Upsilon(4S)$ REFERENCES

GLENN	99	PR D59 052003	S. Glenn *et al.*	
BARISH	96B	PRL 76 1570	B.C. Barish *et al.*	(CLEO Collab.)
ALBRECHT	95E	ZPHY C65 619	H. Albrecht *et al.*	(ARGUS Collab.)
ALEXANDER	90C	PRL 64 2226	J. Alexander *et al.*	(CLEO Collab.)
BEBEK	87	PR D36 1289	C. Bebek *et al.*	(CLEO Collab.)
BESSON	85	PRL 54 381	D. Besson *et al.*	(CLEO Collab.)
LOVELOCK	85	PRL 54 377	D.M.J. Lovelock *et al.*	(CUSB Collab.)
LEYAOUANC	77	PL B71 397	A. Le Yaouanc *et al.*	(ORSAY)

OTHER RELATED PAPERS

HENDERSON	92	PR D45 2212	S. Henderson *et al.*	(CLEO Collab.)
ANDREWS	80B	PRL 45 219	D. Andrews *et al.*	(CLEO Collab.)
FINOCCHI...	80	PRL 45 222	G. Finocchiaro *et al.*	(CUSB Collab.)