$\chi_{b0}(2P)$

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

Observed in radiative decay of the $\Upsilon(3S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$.

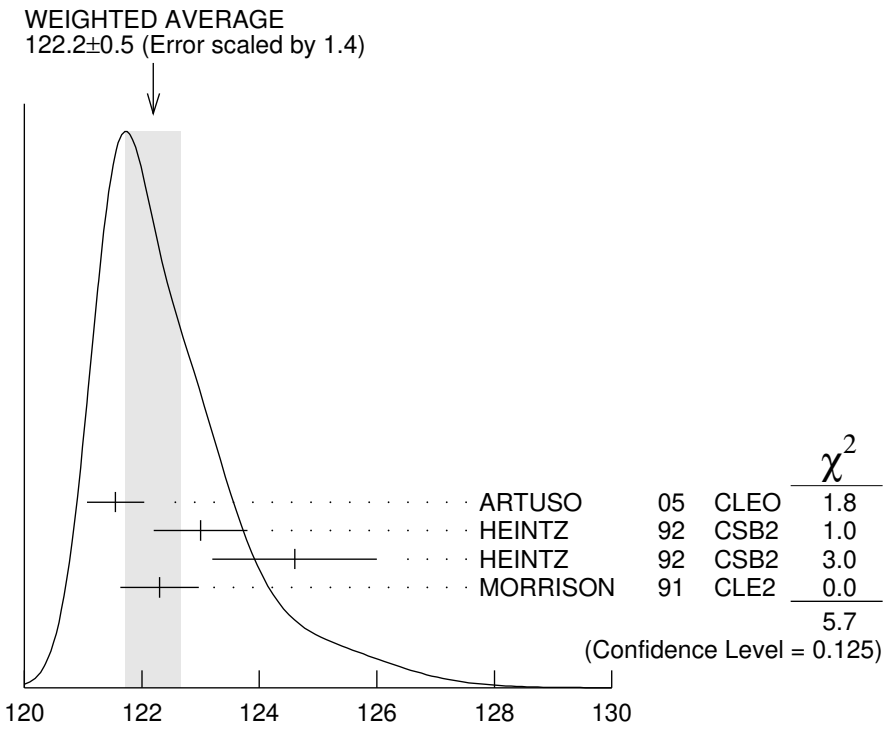
$\chi_{b0}(2P)$ MASS

VALUE (GeV)	DOCUMENT ID
10.2325 ± 0.0004 ± 0.0005 OUR EVALUATION	From γ energy below, using $\Upsilon(3S)$ mass = 10355.2 ± 0.5 MeV

γ ENERGY IN $\Upsilon(3S)$ DECAY

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
121.9 ±0.4 OUR EVALUATION		Treating systematic errors as correlated			
122.2 ±0.5 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.			
121.55 ± 0.16 ± 0.46		ARTUSO	05	CLEO	$\Upsilon(3S) \to \gamma X$
123.0 ±0.8	4959	[1] HEINTZ	92	CSB2	$e^+e^- \to \gamma X$
124.6 ±1.4	17	[2] HEINTZ	92	CSB2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$
122.3 ±0.3 ±0.6	9903	MORRISON	91	CLE2	$e^+e^- \to \gamma X$

[1] A systematic uncertainty on the energy scale of 0.9% not included. Supersedes NARAIN 91.
[2] A systematic uncertainty on the energy scale of 0.9% not included. Supersedes HEINTZ 91.



$\chi_{b0}(2P)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\gamma\,\Upsilon(2S)$	(4.6±2.1) %
Γ_2	$\gamma\,\Upsilon(1S)$	(9 ±6) × 10^{-3}

$\chi_{b0}(2P)$ BRANCHING RATIOS

$\Gamma(\gamma\,\Upsilon(2S))/\Gamma_{total}$ Γ_1/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.089	90	[3] CRAWFORD	92B	CLE2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$
0.046±0.020±0.007		[4] HEINTZ	92	CSB2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$

[3] Using B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.37 ± 0.26)%, B($\Upsilon(3S) \to \gamma\gamma\,\Upsilon(2S)$)×2 B($\Upsilon(2S) \to \mu^+\mu^-$) < 1.19×10^{-4}, and B($\Upsilon(3S) \to \chi_{b0}(2P)\gamma$) = 0.049.

[4] Using B($\Upsilon(2S) \to \mu^+\mu^-$) = (1.44 ± 0.10)%, B($\Upsilon(3S) \to \gamma\chi_{b0}(2P)$) = (6.0 ± 0.4 ± 0.6)% and assuming $e\mu$ universality. Supersedes HEINTZ 91.

$\Gamma(\gamma\,\Upsilon(1S))/\Gamma_{total}$ Γ_2/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.025	90	[5] CRAWFORD	92B	CLE2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$
0.009±0.006±0.001		[6] HEINTZ	92	CSB2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$

[5] Using B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.57 ± 0.07)%, B($\Upsilon(3S) \to \gamma\gamma\,\Upsilon(1S)$)×2 B($\Upsilon(1S) \to \mu^+\mu^-$) < 0.63×10^{-4}, and B($\Upsilon(3S) \to \chi_{b0}(2P)\gamma$) = 0.049.

[6] Using B($\Upsilon(1S) \to \mu^+\mu^-$) = (2.57 ± 0.07)%, B($\Upsilon(3S) \to \gamma\chi_{b0}(2P)$) = (6.0 ± 0.4 ± 0.6)% and assuming $e\mu$ universality. Supersedes HEINTZ 91.

$\chi_{b0}(2P)$ REFERENCES

ARTUSO	05	PRL 94 032001	M. Artuso *et al.*	(CLEO Collab.)
CRAWFORD	92B	PL B294 139	G. Crawford, R. Fulton	(CLEO Collab.)
HEINTZ	92	PR D46 1928	U. Heintz *et al.*	(CUSB II Collab.)
HEINTZ	91	PRL 66 1563	U. Heintz *et al.*	(CUSB Collab.)
MORRISON	91	PRL 67 1696	R.J. Morrison *et al.*	(CLEO Collab.)
NARAIN	91	PRL 66 3113	M. Narain *et al.*	(CUSB Collab.)

OTHER RELATED PAPERS

EIGEN	82	PRL 49 1616	G. Eigen *et al.*	(CUSB Collab.)
HAN	82	PRL 49 1612	K. Han *et al.*	(CUSB Collab.)