$\chi_{b2}(2P)$

$I^G(J^{PC}) = 0^+(2^{++})$
J needs confirmation.

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

$\chi_{b2}(2P)$ MASS

VALUE (GeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
10.2685±0.0004 OUR AVERAGE				
10.2681±0.0004±0.0010	[1] HEINTZ	92	CSB2	$e^+e^- \to \gamma X, \ell^+\ell^-\gamma\gamma$
10.2685±0.0004	[2] MORRISON	91	CLE2	$e^+e^- \to \gamma X$

[1] From the average photon energy for inclusive and exclusive events and assuming $\Upsilon(3S)$ mass = 10355.3 ± 0.5 MeV. Supersedes HEINTZ 91 and NARAIN 91.

[2] From γ energy below, assuming $\Upsilon(3S)$ mass = 10355.3 ± 0.5 MeV. The error on the $\Upsilon(3S)$ mass is not included in the individual measurements. It is included in the final average.

$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)}$

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
13.5±0.4±0.5	[3] HEINTZ	92	CSB2	$e^+e^- \to \gamma X, \ell^+\ell^-\gamma\gamma$

[3] From the average photon energy for inclusive and exclusive events. Supersedes NARAIN 91.

γ ENERGY IN $\Upsilon(3S)$ DECAY

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
86.64±0.23 OUR AVERAGE					
86 ±1	101	CRAWFORD	92B	CLE2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$
86.7 ±0.4	10319	[4] HEINTZ	92	CSB2	$e^+e^- \to \gamma X$
86.9 ±0.4	157	[5] HEINTZ	92	CSB2	$e^+e^- \to \ell^+\ell^-\gamma\gamma$
86.4 ±0.1 ±0.4	30741	MORRISON	91	CLE2	$e^+e^- \to \gamma X$

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

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

$\chi_{b2}(2P)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\gamma\,\Upsilon(2S)$	(16.2±2.4) %
Γ_2	$\gamma\,\Upsilon(1S)$	(7.1±1.0) %

$\chi_{b2}(2P)$ BRANCHING RATIOS

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.162±0.024 OUR AVERAGE				
0.135±0.025±0.035	[6] CRAWFORD	92B	CLE2	$e^+e^- \rightarrow \ell^+\ell^-\gamma\gamma$
0.173±0.021±0.019	[7] HEINTZ	92	CSB2	$e^+e^- \rightarrow \ell^+\ell^-\gamma\gamma$

[6] Using B($\Upsilon(2S) \rightarrow \mu^+\mu^-$) = (1.37 ± 0.26)%, B($\Upsilon(3S) \rightarrow \gamma\gamma\,\Upsilon(2S)$)×2 B($\Upsilon(2S) \rightarrow \mu^+\mu^-$) = $(4.98 \pm 0.94 \pm 0.62) \times 10^{-4}$, and B($\Upsilon(3S) \rightarrow \gamma\chi_{b2}(2P)$) = 0.135 ± 0.003 ± 0.017.

[7] Using B($\Upsilon(2S) \rightarrow \mu^+\mu^-$) = (1.44 ± 0.10)%, B($\Upsilon(3S) \rightarrow \gamma\chi_{b2}(2P)$) = (11.1 ± 0.5 ± 0.4)% and assuming $e\mu$ universality. Supersedes HEINTZ 91.

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.071±0.010 OUR AVERAGE				
0.072±0.014±0.013	[8] CRAWFORD	92B	CLE2	$e^+e^- \rightarrow \ell^+\ell^-\gamma\gamma$
0.070±0.010±0.006	[9] HEINTZ	92	CSB2	$e^+e^- \rightarrow \ell^+\ell^-\gamma\gamma$

[8] Using B($\Upsilon(1S) \rightarrow \mu^+\mu^-$) = (2.57 ± 0.07)%, B($\Upsilon(3S) \rightarrow \gamma\gamma\,\Upsilon(2S)$)×2 B($\Upsilon(1S) \rightarrow \mu^+\mu^-$) = $(5.03 \pm 0.94 \pm 0.63) \times 10^{-4}$, and B($\Upsilon(3S) \rightarrow \gamma\chi_{b2}(2P)$) = 0.135 ± 0.003 ± 0.017.

[9] Using B($\Upsilon(1S) \rightarrow \mu^+\mu^-$) = (2.57 ± 0.07)%, B($\Upsilon(3S) \rightarrow \gamma\chi_{b2}(2P)$) = (11.1 ± 0.5 ± 0.4)% and assuming $e\mu$ universality. Supersedes HEINTZ 91.

$\chi_{b2}(2P)$ REFERENCES

CRAWFORD	92B	PL B294 139	+Fulton	(CLEO Collab.)
HEINTZ	92	PR D46 1928	+Lee, Franzini+	(CUSB II Collab.)
HEINTZ	91	PRL 66 1563	+Kaarsberg+	(CUSB Collab.)
MORRISON	91	PRL 67 1696	+Schmidt+	(CLEO Collab.)
NARAIN	91	PRL 66 3113	+Lovelock+	(CUSB Collab.)

OTHER RELATED PAPERS

EIGEN	82	PRL 49 1616	+Bohringer, Herb+	(CUSB Collab.)
HAN	82	PRL 49 1612	+Horstkotte, Imlay+	(CUSB Collab.)