NODE=M076

$\chi_{b0}(1P)$

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

Observed in radiative decay of the $\Upsilon(2S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$.

NODE=M076

$\chi_{b0}(1P)$ MASS

NODE=M076M

VALUE (MeV)	DOCUMENT ID
9859.44±0.42±0.31 OUR EVALUATION	From average γ energy below, using $\Upsilon(2S)$ mass = 10023.26 ± 0.31 MeV

NODE=M076M
→ UNCHECKED ←

$m_{\chi_{b1}(1P)} - m_{\chi_{b0}(1P)}$

NODE=M076M2
NODE=M076M2

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
32.49±0.93	LEES	14M	BABR	$\Upsilon(2S) \to \gamma\gamma\mu^+\mu^-$

γ ENERGY IN $\Upsilon(2S)$ DECAY

NODE=M076DM

NODE=M076DM

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
162.5 ±0.4 OUR AVERAGE				
162.56±0.19±0.42	ARTUSO	05	CLEO	$\Upsilon(2S) \to \gamma X$
162.0 ±0.8 ±1.2	EDWARDS	99	CLE2	$\Upsilon(2S) \to \gamma\chi(1P)$
162.1 ±0.5 ±1.4	ALBRECHT	85E	ARG	$\Upsilon(2S) \to$ conv. γX
163.8 ±1.6 ±2.7	NERNST	85	CBAL	$\Upsilon(2S) \to \gamma X$
158.0 ±7 ±1	HAAS	84	CLEO	$\Upsilon(2S) \to$ conv. γX
• • • We do not use the following data for averages, fits, limits, etc. • • •				
149.4 ±0.7 ±5.0	KLOPFEN...	83	CUSB	$\Upsilon(2S) \to \gamma X$

$\chi_{b0}(1P)$ DECAY MODES

NODE=M076215;NODE=M076

	Mode	Fraction (Γ_i/Γ)	Confidence level	
Γ_1	$\gamma\,\Upsilon(1S)$	(1.94±0.27) %		DESIG=1
Γ_2	$D^0 X$	< 10.4 %	90%	DESIG=2
Γ_3	$\pi^+\pi^-K^+K^-\pi^0$	< 1.6 $\times 10^{-4}$	90%	DESIG=3
Γ_4	$2\pi^+\pi^-K^-K^0_S$	< 5 $\times 10^{-5}$	90%	DESIG=4
Γ_5	$2\pi^+\pi^-K^-K^0_S 2\pi^0$	< 5 $\times 10^{-4}$	90%	DESIG=5
Γ_6	$2\pi^+2\pi^-2\pi^0$	< 2.1 $\times 10^{-4}$	90%	DESIG=6
Γ_7	$2\pi^+2\pi^-K^+K^-$	(1.1 ±0.6) $\times 10^{-4}$		DESIG=7
Γ_8	$2\pi^+2\pi^-K^+K^-\pi^0$	< 2.7 $\times 10^{-4}$	90%	DESIG=8
Γ_9	$2\pi^+2\pi^-K^+K^-2\pi^0$	< 5 $\times 10^{-4}$	90%	DESIG=9
Γ_{10}	$3\pi^+2\pi^-K^-K^0_S\pi^0$	< 1.6 $\times 10^{-4}$	90%	DESIG=10
Γ_{11}	$3\pi^+3\pi^-$	< 8 $\times 10^{-5}$	90%	DESIG=11
Γ_{12}	$3\pi^+3\pi^-2\pi^0$	< 6 $\times 10^{-4}$	90%	DESIG=12
Γ_{13}	$3\pi^+3\pi^-K^+K^-$	(2.4 ±1.2) $\times 10^{-4}$		DESIG=13
Γ_{14}	$3\pi^+3\pi^-K^+K^-\pi^0$	< 1.0 $\times 10^{-3}$	90%	DESIG=14
Γ_{15}	$4\pi^+4\pi^-$	< 8 $\times 10^{-5}$	90%	DESIG=15
Γ_{16}	$4\pi^+4\pi^-2\pi^0$	< 2.1 $\times 10^{-3}$	90%	DESIG=16
Γ_{17}	$J/\psi J/\psi$	< 7 $\times 10^{-5}$	90%	DESIG=17
Γ_{18}	$J/\psi\,\psi(2S)$	< 1.2 $\times 10^{-4}$	90%	DESIG=18
Γ_{19}	$\psi(2S)\,\psi(2S)$	< 3.1 $\times 10^{-5}$	90%	DESIG=19
Γ_{20}	$J/\psi(1S)$ anything	< 2.3 $\times 10^{-3}$	90%	DESIG=20

$\chi_{b0}(1P)$ BRANCHING RATIOS

NODE=M076220

$\Gamma(\gamma\,\Upsilon(1S))/\Gamma_{total}$ Γ_1/Γ

NODE=M076R1
NODE=M076R1

VALUE (%)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.94±0.27 OUR AVERAGE						
2.07±0.24±0.21			[1,2] LEES	14M	BABR	$\Upsilon(2S) \to \gamma\gamma\mu^+\mu^-$
1.76±0.30±0.18		87	[3,4] KORNICER	11	CLEO	$e^+e^- \to \gamma\gamma\ell^+\ell^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 4.6	90	[5] LEES	11J	BABR	$\Upsilon(2S) \to X\gamma$
< 6	90	WALK	86	CBAL	$\Upsilon(2S) \to \gamma\gamma\ell^+\ell^-$
<11	90	PAUSS	83	CUSB	$\Upsilon(2S) \to \gamma\gamma\ell^+\ell^-$

[1] LEES 14M quotes $\Gamma(\chi_{b0}(1P) \to \gamma\Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(2S) \to \gamma\chi_{b0}(1P))/\Gamma_{\text{total}} = (7.75 \pm 0.91) \times 10^{-4}$ combining the results from samples of $\Upsilon(2S) \to \gamma\gamma\mu^+\mu^-$ with and without converted photons. Assumes $B(\Upsilon(1S) \to \mu^+\mu^-) = (2.48 \pm 0.05)\%$. NODE=M076R1;LINKAGE=A

[2] LEES 14M reports $[\Gamma(\chi_{b0}(1P) \to \gamma\Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] = (7.75 \pm 0.91) \times 10^{-4}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=M076R1;LINKAGE=B

[3] Assuming $B(\Upsilon(1S) \to \ell^+\ell^-) = (2.48 \pm 0.05)\%$. NODE=M076R1;LINKAGE=KA

[4] KORNICER 11 reports $[\Gamma(\chi_{b0}(1P) \to \gamma\Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] = (6.59 \pm 0.96 \pm 0.60) \times 10^{-4}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=M076R1;LINKAGE=KR

[5] LEES 11J quotes a central value of $\Gamma(\chi_{b0}(1P) \to \gamma\Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(2S) \to \gamma\chi_{b0}(1P))/\Gamma_{\text{total}} = (8.3 \pm 5.6^{+3.7}_{-2.6}) \times 10^{-4}$. NODE=M076R1;LINKAGE=LE

$\Gamma(D^0 X)/\Gamma_{\text{total}}$ Γ_2/Γ

NODE=M076R01
NODE=M076R01

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<10.4 \times 10^{-2}$	90	[6,7] BRIERE	08	CLEO	$\Upsilon(2S) \to \gamma D^0 X$

[6] For $p_{D^0} > 2.5$ GeV/c. NODE=M076R01;LINKAGE=BR

[7] The authors also present their result as $(5.6 \pm 3.6 \pm 0.5) \times 10^{-2}$. NODE=M076R01;LINKAGE=RI

$\Gamma(\pi^+\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$ Γ_3/Γ

NODE=M076R02
NODE=M076R02

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.6	90	[8] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma\pi^+\pi^- K^+ K^- \pi^0$

[8] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to \pi^+\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 6 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$. NODE=M076R02;LINKAGE=AS

$\Gamma(2\pi^+\pi^- K^- K^0_S)/\Gamma_{\text{total}}$ Γ_4/Γ

NODE=M076R03
NODE=M076R03

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.5	90	[9] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+\pi^- K^- K^0_S$

[9] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 2\pi^+\pi^- K^- K^0_S)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 2 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$. NODE=M076R03;LINKAGE=AS

$\Gamma(2\pi^+\pi^- K^- K^0_S 2\pi^0)/\Gamma_{\text{total}}$ Γ_5/Γ

NODE=M076R04
NODE=M076R04

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<5	90	[10] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+\pi^- K^- 2\pi^0$

[10] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 2\pi^+\pi^- K^- K^0_S 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 18 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$. NODE=M076R04;LINKAGE=AS

$\Gamma(2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}$ Γ_6/Γ

NODE=M076R05
NODE=M076R05

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2.1	90	[11] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- 2\pi^0$

[11] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 8 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$. NODE=M076R05;LINKAGE=AS

$\Gamma(2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$ Γ_7/Γ

NODE=M076R06
NODE=M076R06

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.1±0.6±0.1	7	[12] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- K^+ K^-$

[12] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] = (4 \pm 2 \pm 1) \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value. NODE=M076R06;LINKAGE=AS

$\Gamma(2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{total}$ Γ_8/Γ

NODE=M076R07

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2.7	90	[13] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$

[13] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 10 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R07;LINKAGE=AS

$\Gamma(2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{total}$ Γ_9/Γ

NODE=M076R08

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<5	90	[14] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$

[14] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 20 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R08;LINKAGE=AS

$\Gamma(3\pi^+ 2\pi^- K^- K^0_S \pi^0)/\Gamma_{total}$ Γ_{10}/Γ

NODE=M076R09

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.6	90	[15] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 2\pi^- K^- K^0_S \pi^0$

[15] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 3\pi^+ 2\pi^- K^- K^0_S \pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 6 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R09;LINKAGE=AS

$\Gamma(3\pi^+ 3\pi^-)/\Gamma_{total}$ Γ_{11}/Γ

NODE=M076R10

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.8	90	[16] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^-$

[16] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 3\pi^+ 3\pi^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 3 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R10;LINKAGE=AS

$\Gamma(3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{total}$ Γ_{12}/Γ

NODE=M076R11

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<6	90	[17] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^- 2\pi^0$

[17] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 22 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R11;LINKAGE=AS

$\Gamma(3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{total}$ Γ_{13}/Γ

NODE=M076R12

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.4±1.2±0.2	9	[18] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^- K^+ K^-$

[18] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] = (9 \pm 4 \pm 2) \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best (shown rounded) value.

NODE=M076R12;LINKAGE=AS

$\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{total}$ Γ_{14}/Γ

NODE=M076R13

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<10	90	[19] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$

[19] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 37 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R13;LINKAGE=AS

$\Gamma(4\pi^+ 4\pi^-)/\Gamma_{total}$ Γ_{15}/Γ

NODE=M076R14

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.8	90	[20] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 4\pi^+ 4\pi^-$

[20] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \to 4\pi^+ 4\pi^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b0}(1P))] < 3 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \to \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R14;LINKAGE=AS

$\Gamma(4\pi^+4\pi^-2\pi^0)/\Gamma_{total}$ Γ_{16}/Γ

NODE=M076R15
NODE=M076R15

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<21	90	[21] ASNER	08A	CLEO	$\Upsilon(2S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$

[21] ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 4\pi^+4\pi^-2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] < 77 \times 10^{-6}$ which we divide by our best (shown rounded) value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

NODE=M076R15;LINKAGE=AS

$\Gamma(J/\psi J/\psi)/\Gamma_{total}$ Γ_{17}/Γ

NODE=M076R16
NODE=M076R16

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<7	90	[22] SHEN	12	BELL	$\Upsilon(2S) \rightarrow \gamma\psi X$

[22] SHEN 12 reports $< 7.1 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{b0}(1P) \rightarrow J/\psi J/\psi)/\Gamma_{total}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))]$ assuming $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$.

NODE=M076R16;LINKAGE=SH

$\Gamma(J/\psi\psi(2S))/\Gamma_{total}$ Γ_{18}/Γ

NODE=M076R17
NODE=M076R17

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<12	90	[23] SHEN	12	BELL	$\Upsilon(2S) \rightarrow \gamma\psi X$

[23] SHEN 12 reports $< 12 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{b0}(1P) \rightarrow J/\psi\psi(2S))/\Gamma_{total}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))]$ assuming $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$.

NODE=M076R17;LINKAGE=SH

$\Gamma(\psi(2S)\psi(2S))/\Gamma_{total}$ Γ_{19}/Γ

NODE=M076R18
NODE=M076R18

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<3.1	90	[24] SHEN	12	BELL	$\Upsilon(2S) \rightarrow \gamma\psi X$

[24] SHEN 12 reports $< 3.1 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{b0}(1P) \rightarrow \psi(2S)\psi(2S))/\Gamma_{total}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))]$ assuming $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$.

NODE=M076R18;LINKAGE=SH

$\Gamma(J/\psi(1S)\,\text{anything})/\Gamma_{total}$ Γ_{20}/Γ

NODE=M076R00
NODE=M076R00

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.3 \times 10^{-3}$	90	JIA	17A	BELL	$e^+e^- \rightarrow$ hadrons

$\chi_{b0}(1P)$ CROSS-PARTICLE BRANCHING RATIOS

NODE=M076230

$\Gamma(\chi_{b0}(1P) \rightarrow \gamma\Upsilon(1S))/\Gamma_{total} \times \Gamma(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))/\Gamma_{total}$ $\Gamma_1/\Gamma \times \Gamma_{80}^{\Upsilon(2S)}/\Gamma^{\Upsilon(2S)}$

NODE=M076B02
NODE=M076B02

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.7 \times 10^{-3}$	90	[25] LEES	11J	BABR	$\Upsilon(2S) \rightarrow X\gamma$

[25] LEES 11J quotes a central value of $\Gamma(\chi_{b0}(1P) \rightarrow \gamma\Upsilon(1S))/\Gamma_{total} \times \Gamma(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))/\Gamma_{total} = (8.3 \pm 5.6^{+3.7}_{-2.6}) \times 10^{-4}$ and derives a 90% CL upper limit of $\Gamma(\gamma\Upsilon(1S))/\Gamma_{total} < 4.6\%$ using $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4)\%$.

NODE=M076B02;LINKAGE=LE

$B(\chi_{b0}(1P) \rightarrow \gamma\Upsilon(1S)) \times B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) \times B(\Upsilon(1S) \rightarrow \ell^+\ell^-)$

NODE=M076B01
NODE=M076B01

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.67±0.28 OUR AVERAGE					
$2.9\ ^{+1.7}_{-1.4}\ ^{+0.1}_{-0.8}$		[26] LEES	14M	BABR	$\Upsilon(2S) \rightarrow \gamma\gamma\mu^+\mu^-$
$1.63 \pm 0.24 \pm 0.15$	87	KORNICER	11	CLEO	$e^+e^- \rightarrow \gamma\gamma\ell^+\ell^-$

[26] From a sample of $\Upsilon(2S) \rightarrow \gamma\gamma\mu^+\mu^-$ with one converted photon.

NODE=M076B01;LINKAGE=A

$[B(\chi_{b0}(1P) \rightarrow \gamma\Upsilon(1S)) \times B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] / [B(\chi_{b1}(1P) \rightarrow \gamma\Upsilon(1S)) \times B(\Upsilon(2S) \rightarrow \gamma\chi_{b1}(1P))]$

NODE=M076A01
NODE=M076A01

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3.28±0.37	[27] LEES	14M	BABR	$\Upsilon(2S) \rightarrow \gamma\gamma\mu^+\mu^-$

[27] From a sample of $\Upsilon(2S) \rightarrow \gamma\gamma\mu^+\mu^-$ without converted photons.

NODE=M076A01;LINKAGE=A

$\chi_{b0}(1P)$ REFERENCES

NODE=M076

JIA	17A	PR D96 112002	S. Jia *et al.*	(BELLE Collab.)	REFID=58318
LEES	14M	PR D90 112010	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56343
SHEN	12	PR D85 071102	C.P. Shen *et al.*	(BELLE Collab.)	REFID=54313
KORNICER	11	PR D83 054003	M. Kornicer *et al.*	(CLEO Collab.)	REFID=16769
LEES	11J	PR D84 072002	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53936
ASNER	08A	PR D78 091103	D.M. Asner *et al.*	(CLEO Collab.)	REFID=52574
BRIERE	08	PR D78 092007	R.A. Briere *et al.*	(CLEO Collab.)	REFID=52577
ARTUSO	05	PRL 94 032001	M. Artuso *et al.*	(CLEO Collab.)	REFID=50454
EDWARDS	99	PR D59 032003	K.W. Edwards *et al.*	(CLEO Collab.)	REFID=46612
WALK	86	PR D34 2611	W.S. Walk *et al.*	(Crystal Ball Collab.)	REFID=22290
ALBRECHT	85E	PL 160B 331	H. Albrecht *et al.*	(ARGUS Collab.)	REFID=22288
NERNST	85	PRL 54 2195	R. Nernst *et al.*	(Crystal Ball Collab.)	REFID=22289
HAAS	84	PRL 52 799	J. Haas *et al.*	(CLEO Collab.)	REFID=22287
KLOPFEN...	83	PRL 51 160	C. Klopfenstein *et al.*	(CUSB Collab.)	REFID=22285
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