NODE=M077

$\chi_{b1}(1P)$

$I^G(J^{PC}) = 0^+(1^{++})$
J needs confirmation.

Observed in radiative decay of the $\Upsilon(2S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$. $J = 1$ from SKWARNICKI 87. NODE=M077

$\chi_{b1}(1P)$ MASS

NODE=M077M

VALUE (MeV)	DOCUMENT ID
9892.78±0.26±0.31 OUR EVALUATION	From average γ energy below, using $\Upsilon(2S)$ mass = 10023.26 ± 0.31 MeV

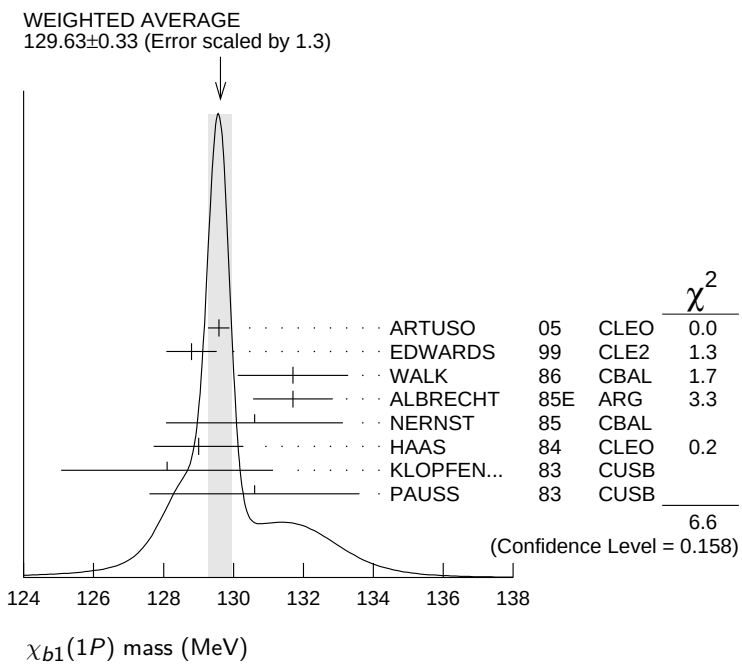
NODE=M077M
→ UNCHECKED ←

γ ENERGY IN $\Upsilon(2S)$ DECAY

NODE=M077DM

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
129.63±0.33 OUR AVERAGE	Error includes scale factor of 1.3.			See the ideogram below.
129.58±0.09±0.29	ARTUSO	05	CLEO	$\Upsilon(2S) \to \gamma X$
128.8 ±0.4 ±0.6	EDWARDS	99	CLE2	$\Upsilon(2S) \to \gamma \chi(1P)$
131.7 ±0.9 ±1.3	WALK	86	CBAL	$\Upsilon(2S) \to \gamma\gamma\ell^+\ell^-$
131.7 ±0.3 ±1.1	ALBRECHT	85E	ARG	$\Upsilon(2S) \to$ conv. γX
130.6 ±0.8 ±2.4	NERNST	85	CBAL	$\Upsilon(2S) \to \gamma$X
129 ±0.8 ±1	HAAS	84	CLEO	$\Upsilon(2S) \to$ conv. γX
128.1 ±0.4 ±3.0	KLOPFEN...	83	CUSB	$\Upsilon(2S) \to \gamma$X
130.6 ±3.0	PAUSS	83	CUSB	$\Upsilon(2S) \to \gamma\gamma\ell^+\ell^-$

NODE=M077DM



$\chi_{b1}(1P)$ DECAY MODES

NODE=M077215;NODE=M077

	Mode	Fraction (Γ_i/Γ)	Confidence level	
Γ_1	$\gamma\,\Upsilon(1S)$	(33.9±2.2) %		DESIG=1
Γ_2	$D^0 X$	(12.6±2.2) %		DESIG=2
Γ_3	$\pi^+\pi^- K^+ K^- \pi^0$	$(2.0\pm0.6)\times10^{-4}$		DESIG=3
Γ_4	$2\pi^+\pi^- K^- K^0_S$	$(1.3\pm0.5)\times10^{-4}$		DESIG=4
Γ_5	$2\pi^+\pi^- K^- K^0_S 2\pi^0$	$< 6 \times10^{-4}$	90%	DESIG=5
Γ_6	$2\pi^+2\pi^-2\pi^0$	$(8.0\pm2.5)\times10^{-4}$		DESIG=6
Γ_7	$2\pi^+2\pi^- K^+ K^-$	$(1.5\pm0.5)\times10^{-4}$		DESIG=7
Γ_8	$2\pi^+2\pi^- K^+ K^- \pi^0$	$(3.5\pm1.2)\times10^{-4}$		DESIG=8
Γ_9	$2\pi^+2\pi^- K^+ K^- 2\pi^0$	$(8.6\pm3.2)\times10^{-4}$		DESIG=9

Γ_{10}	$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	$(9.3 \pm 3.3) \times 10^{-4}$		DESIG=10
Γ_{11}	$3\pi^+ 3\pi^-$	$(1.9 \pm 0.6) \times 10^{-4}$		DESIG=11
Γ_{12}	$3\pi^+ 3\pi^- 2\pi^0$	$(1.7 \pm 0.5) \times 10^{-3}$		DESIG=12
Γ_{13}	$3\pi^+ 3\pi^- K^+ K^-$	$(2.6 \pm 0.8) \times 10^{-4}$		DESIG=13
Γ_{14}	$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(7.5 \pm 2.6) \times 10^{-4}$		DESIG=14
Γ_{15}	$4\pi^+ 4\pi^-$	$(2.6 \pm 0.9) \times 10^{-4}$		DESIG=15
Γ_{16}	$4\pi^+ 4\pi^- 2\pi^0$	$(1.4 \pm 0.6) \times 10^{-3}$		DESIG=16
Γ_{17}	$J/\psi J/\psi$	$< 2.7 \times 10^{-5}$	90%	DESIG=17
Γ_{18}	$J/\psi \psi(2S)$	$< 1.7 \times 10^{-5}$	90%	DESIG=18
Γ_{19}	$\psi(2S) \psi(2S)$	$< 6 \times 10^{-5}$	90%	DESIG=19

$\chi_{b1}(1P)$ BRANCHING RATIOS

NODE=M077220

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

NODE=M077R1
NODE=M077R1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.339±0.022 OUR AVERAGE					
0.331±0.018±0.017	3222	[1,2] KORNICER	11	CLEO	$e^+ e^- \to \gamma\gamma \ell^+ \ell^-$
0.350±0.023±0.018	13k	[3] LEES	11J	BABR	$\Upsilon(2S) \to X\gamma$
0.32 ±0.06 ±0.07		WALK	86	CBAL	$\Upsilon(2S) \to \gamma\gamma \ell^+ \ell^-$
0.47 ±0.18		KLOPFEN...	83	CUSB	$\Upsilon(2S) \to \gamma\gamma \ell^+ \ell^-$

[1] Assuming $B(\Upsilon(1S) \to \ell^+ \ell^-) = (2.48 \pm 0.05)\%$.

NODE=M077R1;LINKAGE=KA

[2] KORNICER 11 reports $[\Gamma(\chi_{b1}(1P) \to \gamma \Upsilon(1S))/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma \chi_{b1}(1P))] = (22.8 \pm 0.4 \pm 1.2) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R1;LINKAGE=KR

[3] LEES 11J reports $[\Gamma(\chi_{b1}(1P) \to \gamma \Upsilon(1S))/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma \chi_{b1}(1P))] = (24.1 \pm 0.6 \pm 1.5) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R1;LINKAGE=LE

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

NODE=M077R01
NODE=M077R01

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
12.6±1.9±1.1	2310	[4] BRIERE	08	CLEO	$\Upsilon(2S) \to \gamma D^0 X$

[4] For $p_{D^0} > 2.5$ GeV/c.

NODE=M077R01;LINKAGE=BR

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

NODE=M077R02
NODE=M077R02

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.0±0.6±0.1	18	[5] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma \pi^+ \pi^- K^+ K^- \pi^0$

[5] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to \pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma \chi_{b1}(1P))] = (14 \pm 3 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R02;LINKAGE=AS

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

NODE=M077R03
NODE=M077R03

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.3±0.5±0.1	11	[6] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ \pi^- K^- K^0_S$

[6] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 2\pi^+ \pi^- K^- K^0_S)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma \chi_{b1}(1P))] = (9 \pm 3 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R03;LINKAGE=AS

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

NODE=M077R04
NODE=M077R04

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<6	90	[7] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ \pi^- K^- 2\pi^0$

[7] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 2\pi^+ \pi^- K^- K^0_S 2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma \chi_{b1}(1P))] < 42 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma \chi_{b1}(1P)) = 6.9 \times 10^{-2}$.

NODE=M077R04;LINKAGE=AS

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

NODE=M077R05
NODE=M077R05

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.0±2.4±0.4	46	[8] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- 2\pi^0$

[8] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 2\pi^+2\pi^-2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (55 \pm 9 \pm 14) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R05;LINKAGE=AS

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

NODE=M077R06
NODE=M077R06

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.5±0.5±0.1	18	[9] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- K^+ K^-$

[9] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 2\pi^+2\pi^-K^+K^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (10 \pm 3 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R06;LINKAGE=AS

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

NODE=M077R07
NODE=M077R07

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.5±1.2±0.2	22	[10] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$

[10] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 2\pi^+2\pi^-K^+K^-\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (24 \pm 6 \pm 6) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R07;LINKAGE=AS

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

NODE=M077R08
NODE=M077R08

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.6±3.2±0.4	26	[11] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$

[11] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 2\pi^+2\pi^-K^+K^-2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (59 \pm 14 \pm 17) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R08;LINKAGE=AS

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

NODE=M077R09
NODE=M077R09

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
9.3±3.3±0.5	21	[12] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 2\pi^- K^- K^0_S \pi^0$

[12] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 3\pi^+2\pi^-K^-K^0_S\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (64 \pm 16 \pm 16) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R09;LINKAGE=AS

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

NODE=M077R10
NODE=M077R10

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.9±0.6±0.1	25	[13] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^-$

[13] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 3\pi^+3\pi^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (13 \pm 3 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R10;LINKAGE=AS

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

NODE=M077R11
NODE=M077R11

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
17±5±1	56	[14] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^- 2\pi^0$

[14] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 3\pi^+3\pi^-2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (119 \pm 18 \pm 32) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R11;LINKAGE=AS

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

NODE=M077R12
NODE=M077R12

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.6±0.8±0.1	21	[15] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^- K^+ K^-$

[15] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 3\pi^+3\pi^-K^+K^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (18 \pm 4 \pm 4) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R12;LINKAGE=AS

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

NODE=M077R13
NODE=M077R13

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.5±2.6±0.4	28	[16] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$

[16] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (52 \pm 11 \pm 14) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=M077R13;LINKAGE=AS

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

NODE=M077R14
NODE=M077R14

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.6±0.9±0.1	24	[17] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 4\pi^+ 4\pi^-$

[17] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 4\pi^+ 4\pi^-)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (18 \pm 4 \pm 5) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=M077R14;LINKAGE=AS

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

NODE=M077R15
NODE=M077R15

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
14±5±1	26	[18] ASNER	08A	CLEO	$\Upsilon(2S) \to \gamma 4\pi^+ 4\pi^- 2\pi^0$

[18] ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \to 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))] = (96 \pm 24 \pm 29) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=M077R15;LINKAGE=AS

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

NODE=M077R16
NODE=M077R16

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<2.7	90	[19] SHEN	12	BELL	$\Upsilon(2S) \to \gamma\psi X$

[19] SHEN 12 reports $< 2.7 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{b1}(1P) \to J/\psi J/\psi)/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))]$ assuming $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. NODE=M077R16;LINKAGE=SH

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

NODE=M077R17
NODE=M077R17

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<1.7	90	[20] SHEN	12	BELL	$\Upsilon(2S) \to \gamma\psi X$

[20] SHEN 12 reports $< 1.7 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{b1}(1P) \to J/\psi\psi(2S))/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))]$ assuming $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. NODE=M077R17;LINKAGE=SH

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

NODE=M077R18
NODE=M077R18

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<6	90	[21] SHEN	12	BELL	$\Upsilon(2S) \to \gamma\psi X$

[21] SHEN 12 reports $< 6.2 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{b1}(1P) \to \psi(2S)\psi(2S))/\Gamma_{total}] \times [B(\Upsilon(2S) \to \gamma\chi_{b1}(1P))]$ assuming $B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. NODE=M077R18;LINKAGE=SH

$\chi_{b1}(1P)$ Cross-Particle Branching Ratios

NODE=M077230

$\Gamma(\chi_{b1}(1P) \to \gamma\Upsilon(1S))/\Gamma_{total} \times \Gamma(\Upsilon(2S) \to \gamma\chi_{b1}(1P))/\Gamma_{total}$ — $\Gamma_1/\Gamma \times \Gamma_{45}^{\Upsilon(2S)}/\Gamma^{\Upsilon(2S)}$

NODE=M077B03
NODE=M077B03

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
24.1±0.6±1.5	13k	LEES	11J	BABR	$\Upsilon(2S) \to X\gamma$

$B(\chi_{b1}(1P) \to \gamma\Upsilon(1S)) \times B(\Upsilon(2S) \to \gamma\chi_{b1}(1P)) \times B(\Upsilon(1S) \to \ell^+\ell^-)$

NODE=M077B01
NODE=M077B01

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
5.65±0.11±0.27	3222	KORNICER	11	CLEO	$e^+e^- \to \gamma\gamma\ell^+\ell^-$

$B(\chi_{b1}(1P) \to \gamma\Upsilon(1S)) \times B(\Upsilon(3S) \to \gamma\chi_{b1}(1P)) \times B(\Upsilon(1S) \to \ell^+\ell^-)$

NODE=M077B02
NODE=M077B02

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
1.33±0.30±0.23	50	KORNICER	11	CLEO	$e^+e^- \to \gamma\gamma\ell^+\ell^-$

$B(\chi_{b2}(1P) \to pX + \bar{p}X)/B(\chi_{b1}(1P) \to pX + \bar{p}X)$

NODE=M077R20
NODE=M077R20

VALUE	DOCUMENT ID		TECN	COMMENT
1.068±0.010±0.040	BRIERE	07	CLEO	$\Upsilon(2S) \to \gamma\chi_{b,J}(1P)$

$B(\chi_{b0}(1P) \rightarrow pX + \bar{p}X)/B(\chi_{b1}(1P) \rightarrow pX + \bar{p}X)$

NODE=M077R21
NODE=M077R21

VALUE	DOCUMENT ID		TECN	COMMENT
1.11±0.15±0.20	BRIERE	07	CLEO	$\Upsilon(2S) \rightarrow \gamma \chi_{b,J}(1P)$

$\chi_{b1}(1P)$ REFERENCES

NODE=M077

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
BRIERE	07	PR D76 012005	R.A. Briere *et al.*	(CLEO Collab.)	REFID=51887
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
SKWARNICKI	87	PRL 58 972	T. Skwarnicki *et al.*	(Crystal Ball Collab.) J	REFID=40019
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
PAUSS	83	PL 130B 439	F. Pauss *et al.*	(MPIM, COLU, CORN, LSU+)	REFID=22286