

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

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

$J$  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.

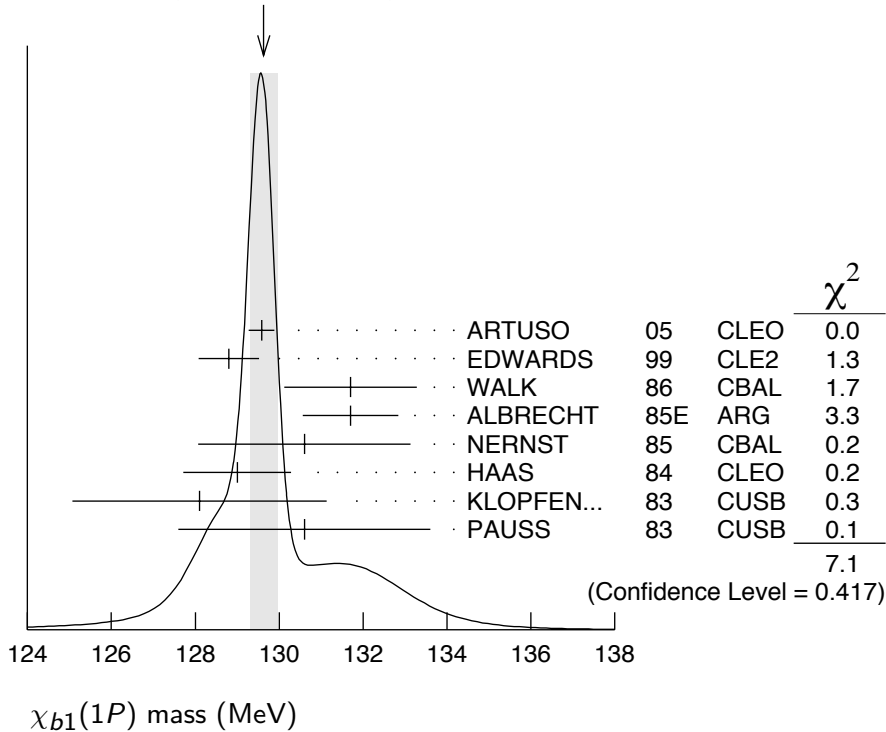
## $\chi_{b1}(1P)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<b>9892.78 ± 0.26 ± 0.31 OUR EVALUATION</b>	From average $\gamma$ energy below, using $\Upsilon(2S)$ mass = 10023.26 ± 0.31 MeV

## $\gamma$ ENERGY IN $\Upsilon(2S)$ DECAY

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

WEIGHTED AVERAGE  
129.63 ± 0.33 (Error scaled by 1.3)



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

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1 \quad \gamma \Upsilon(1S)$	$(35 \pm 8) \%$

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

$\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$	VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_1/\Gamma$
<b><math>0.35 \pm 0.08</math> OUR AVERAGE</b>					
$0.32 \pm 0.06 \pm 0.07$		WALK	86	CBAL	$\Upsilon(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
$0.47 \pm 0.18$		KLOPFEN...	83	CUSB	$\Upsilon(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

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

ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
EDWARDS	99	PR D59 032003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
SKWARNICKI	87	PRL 58 972	T. Skwarnicki <i>et al.</i>	(Crystal Ball Collab.) J
WALK	86	PR D34 2611	W.S. Walk <i>et al.</i>	(Crystal Ball Collab.)
ALBRECHT	85E	PL 160B 331	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
NERNST	85	PRL 54 2195	R. Nernst <i>et al.</i>	(Crystal Ball Collab.)
HAAS	84	PRL 52 799	J. Haas <i>et al.</i>	(CLEO Collab.)
KLOPFEN...	83	PRL 51 160	C. Klopfenstein <i>et al.</i>	(CUSB Collab.)
PAUSS	83	PL 130B 439	F. Pauss <i>et al.</i>	(MPIM, COLU, CORN, LSU+)