

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

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

$J$  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.

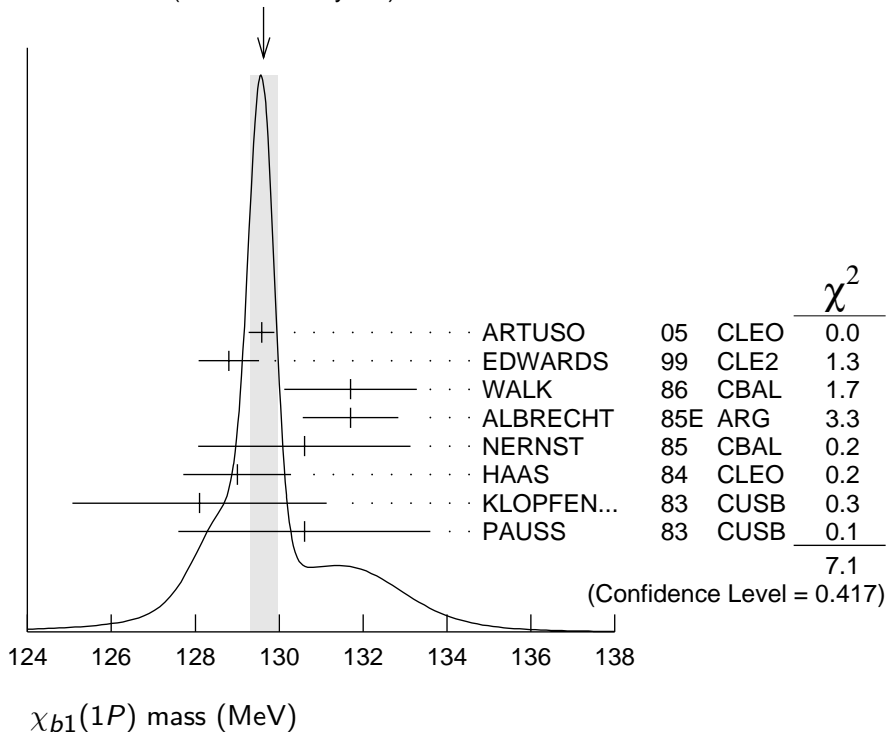
## $\chi_{b1}(1P)$ MASS

| <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+) |