# $\Xi_b^0$, $\Xi_b^-$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$ Status: ***
$I$, $J$, $P$ need confirmation.

In the quark model, $\Xi_b^0$ and $\Xi_b^-$ are an isodoublet ($usb$, $dsb$) state; the lowest $\Xi_b^0$ and $\Xi_b^-$ ought to have $J^P = 1/2^+$. None of $I$, $J$, or $P$ have actually been measured.

## $\Xi_b$ MASSES

### $\Xi_b^-$ MASS

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **5792.4± 3.0 OUR AVERAGE** | | | | |
| 5792.9± 2.5± 1.7 | [1] AALTONEN | 07A | CDF | $p\overline{p}$ at 1.96 TeV |
| 5774 ±11 ±15 | [2] ABAZOV | 07K | D0 | $p\overline{p}$ at 1.96 TeV |

[1] Observed in $\Xi_b^- \to J/\psi\Xi^-$ decays with 17.5 ± 4.3 candidates, a significance of 7.7 sigma.
[2] Observed in $\Xi_b^- \to J/\psi\Xi^-$ decays with $15.2 \pm 4.4^{+1.9}_{-0.4}$ candidates, a significance of 5.5 sigma.

## $\Xi_b$ MEAN LIFE

This is actually a measurement of the average lifetime of $b$-baryons that decay to a jet containing a same-sign $\Xi^{\mp}\ell^{\mp}$ pair. Presumably the mix is mainly $\Xi_b$, with some $\Lambda_b$.

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

| VALUE ($10^{-12}$ s) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **$1.42^{+0.28}_{-0.24}$ OUR EVALUATION** | | | | | |
| $1.48^{+0.40}_{-0.31} \pm 0.12$ | | [3] ABDALLAH | 05C | DLPH | $e^+e^- \to Z^0$ |
| $1.35^{+0.37}_{-0.28}{}^{+0.15}_{-0.17}$ | | [4] BUSKULIC | 96T | ALEP | $e^+e^- \to Z$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $1.5\ ^{+0.7}_{-0.4}$ ±0.3 | 8 | [5] ABREU | 95V | DLPH | Repl. by ABDALLAH 05C |

[3] Used the decay length of $\Xi^-$ accompanied by a lepton of the same sign.
[4] Excess $\Xi^-\ell^-$, impact parameters.
[5] Excess $\Xi^-\ell^-$, decay lengths.

## $\Xi_b$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Scale factor |
|---|---|---|---|
| $\Gamma_1$ | $\Xi_b \to \Xi^- \ell^- \overline{\nu}_\ell X \times B(\overline{b} \to \Xi_b)$ | $(3.9 \pm 1.2) \times 10^{-4}$ | 1.4 |
| $\Gamma_2$ | $\Xi_b^- \to J/\psi \Xi^- \times B(\overline{b} \to \Xi_b^-)/B(\overline{b} \to \Lambda_b)$ | $(1.3 \pm 1.0) \times 10^{-4}$ | |

## $\Xi_b$ BRANCHING RATIOS

### $\Gamma(\Xi^- \ell^- \overline{\nu}_\ell X \times B(\overline{b} \to \Xi_b))/\Gamma_{total}$ $\Gamma_1/\Gamma$

| *VALUE* (units $10^{-4}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **3.9±1.2 OUR AVERAGE** | Error includes scale factor of 1.4. | | | |
| 3.0±1.0±0.3 | ABDALLAH | 05C | DLPH | $e^+ e^- \to Z^0$ |
| 5.4±1.1±0.8 | BUSKULIC | 96T | ALEP | Excess $\Xi^- \ell^-$ over $\Xi^- \ell^+$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 5.9±2.1±1.0 | ABREU | 95V | DLPH | Repl. by ABDALLAH 05C |

### $\Gamma(J/\psi \Xi^- \times B(\overline{b} \to \Xi_b^-)/B(\overline{b} \to \Lambda_b))/\Gamma_{total}$ $\Gamma_2/\Gamma$

| *VALUE* (units $10^{-4}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **1.3±0.6±0.8** | [6] ABAZOV | 07K | D0 | $p\overline{p}$ at 1.96 TeV |

[6] ABAZOV 07K reports $[B(\Xi_b^- \to J/\psi \Xi^- \times B(\overline{b} \to \Xi_b^-)/B(\overline{b} \to \Lambda_b))] / [B(\Lambda_b^0 \to J/\psi(1S)\Lambda)] = 0.28 \pm 0.09^{+0.09}_{-0.08}$. We multiply by our best value $B(\Lambda_b^0 \to J/\psi(1S)\Lambda) = (4.7 \pm 2.8) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

## $\Xi_b$ REFERENCES


| | | | | |
|---|---|---|---|---|
| AALTONEN | 07A | PRL 99 052002 | T. Aaltonen *et al.* | (CDF Colab.) |
| ABAZOV | 07K | PRL 99 052001 | V.M. Abazov *et al.* | (D0 Colab.) |
| ABDALLAH | 05C | EPJ C44 299 | J. Abdallah *et al.* | (DELPHI Collab.) |
| BUSKULIC | 96T | PL B384 449 | D. Buskulic *et al.* | (ALEPH Collab.) |
| ABREU | 95V | ZPHY C68 541 | P. Abreu *et al.* | (DELPHI Collab.) |