# $\Xi(1530)\ 3/2^+$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$ Status: ****

This is the only $\Xi$ resonance whose properties are all reasonably well known. Assuming that the $\Lambda_c^+$ has $J^P = 1/2^+$, AUBERT 08AK, in a study of $\Lambda_c^+ \to \Xi^-\pi^+K^+$, finds conclusively that the spin of the $\Xi(1530)^0$ is 3/2. In conjunction with SCHLEIN 63B and BUTTON-SHAFER 66, this proves also that the parity is +.

We use only those determinations of the mass and width that are accompanied by some discussion of systematics and resolution.

## $\Xi(1530)$ POLE POSITIONS

### $\Xi(1530)^0$ REAL PART

| *VALUE* | *DOCUMENT ID* | *COMMENT* |
|---|---|---|
| 1531.6±0.4 | LICHTENBERG74 | Using HABIBI 73 |

### $\Xi(1530)^0$ IMAGINARY PART

| *VALUE* | *DOCUMENT ID* | *COMMENT* |
|---|---|---|
| 4.45±0.35 | LICHTENBERG74 | Using HABIBI 73 |

### $\Xi(1530)^-$ REAL PART

| *VALUE* | *DOCUMENT ID* | *COMMENT* |
|---|---|---|
| 1534.4±1.1 | LICHTENBERG74 | Using HABIBI 73 |

### $\Xi(1530)^-$ IMAGINARY PART

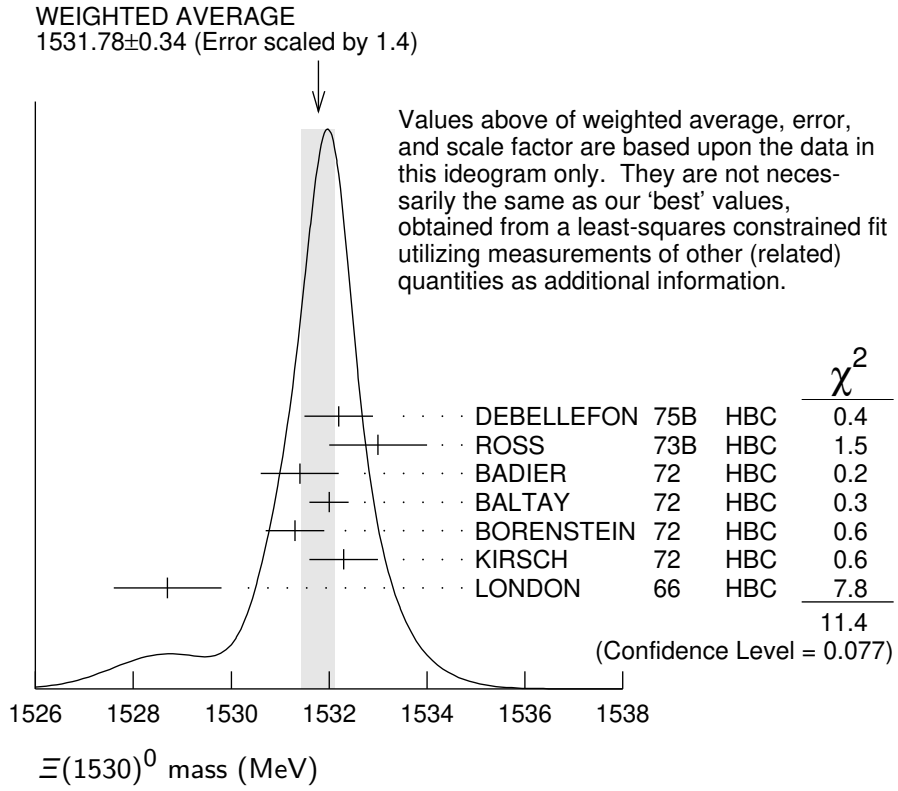
| *VALUE* | *DOCUMENT ID* | *COMMENT* |
|---|---|---|
| $3.9^{+1.75}_{-3.9}$ | LICHTENBERG74 | Using HABIBI 73 |

## $\Xi(1530)$ MASSES

### $\Xi(1530)^0$ MASS

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **1531.80±0.32 OUR FIT** Error includes scale factor of 1.3. | | | | | |
| **1531.78±0.34 OUR AVERAGE** Error includes scale factor of 1.4. See the ideogram below. | | | | | |
| 1532.2 ±0.7 | | DEBELLEFON | 75B | HBC | $K^-p \to \Xi^-\overline{K}\pi$ |
| 1533 ±1 | | ROSS | 73B | HBC | $K^-p \to \Xi\overline{K}\pi(\pi)$ |
| 1531.4 ±0.8 | 59 | BADIER | 72 | HBC | $K^-p$ 3.95 GeV/$c$ |
| 1532.0 ±0.4 | 1262 | BALTAY | 72 | HBC | $K^-p$ 1.75 GeV/$c$ |
| 1531.3 ±0.6 | 324 | BORENSTEIN | 72 | HBC | $K^-p$ 2.2 GeV/$c$ |
| 1532.3 ±0.7 | 286 | KIRSCH | 72 | HBC | $K^-p$ 2.87 GeV/$c$ |
| 1528.7 ±1.1 | 76 | LONDON | 66 | HBC | $K^-p$ 2.24 GeV/$c$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1532.1 ±0.4 | 1244 | ASTON | 85B | LASS | $K^-p$ 11 GeV/$c$ |
| 1532.1 ±0.6 | 2700 | [1] BAUBILLIER | 81B | HBC | $K^-p$ 8.25 GeV/$c$ |
| 1530 ±1 | 450 | BIAGI | 81 | SPEC | SPS hyperon beam |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1527 | ±6 | 80 | SIXEL | 79 | HBC | $K^- p$ 10 GeV/$c$ |
| 1535 | ±4 | 100 | SIXEL | 79 | HBC | $K^- p$ 16 GeV/$c$ |
| 1533.6 | ±1.4 | 97 | BERTHON | 74 | HBC | Quasi-2-body $\sigma$ |




## Ξ(1530)⁻ MASS

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **1535.0±0.6 OUR FIT** | | | | | |
| **1535.2±0.8 OUR AVERAGE** | | | | | |
| 1534.5±1.2 | | DEBELLEFON | 75B | HBC | $K^- p \to \Xi^- \overline{K} \pi$ |
| 1535.3±2.0 | | ROSS | 73B | HBC | $K^- p \to \Xi \overline{K} \pi(\pi)$ |
| 1536.2±1.6 | 185 | KIRSCH | 72 | HBC | $K^- p$ 2.87 GeV/$c$ |
| 1535.7±3.2 | 38 | LONDON | 66 | HBC | $K^- p$ 2.24 GeV/$c$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1540 ±3 | 48 | BERTHON | 74 | HBC | Quasi-2-body $\sigma$ |
| 1534.7±1.1 | 334 | BALTAY | 72 | HBC | $K^- p$ 1.75 GeV/$c$ |

## $m_{\Xi(1530)^-} - m_{\Xi(1530)}$

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **3.2±0.6 OUR FIT** | | | | |
| **2.9±0.9 OUR AVERAGE** | | | | |
| 2.7±1.0 | BALTAY | 72 | HBC | $K^- p$ 1.75 GeV/$c$ |
| 2.0±3.2 | MERRILL | 66 | HBC | $K^- p$ 1.7–2.7 GeV/$c$ |
| 5.7±3.0 | PJERROU | 65B | HBC | $K^- p$ 1.8–1.95 GeV/$c$ |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.9±1.8 | | [2] KIRSCH | 72 | HBC | $K^- p$ 2.87 GeV/$c$ |
| 7 ±4 | | [2] LONDON | 66 | HBC | $K^- p$ 2.24 GeV/$c$ |

## Ξ(1530) WIDTHS

### Ξ(1530)$^0$ WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **9.1±0.5 OUR AVERAGE** | | | | | |
| 9.5±1.2 | | DEBELLEFON | 75B | HBC | $K^- p \to \Xi^- \overline{K} \pi$ |
| 9.1±2.4 | | ROSS | 73B | HBC | $K^- p \to \Xi \overline{K} \pi(\pi)$ |
| 11 ±2 | | BADIER | 72 | HBC | $K^- p$ 3.95 GeV/$c$ |
| 9.0±0.7 | | BALTAY | 72 | HBC | $K^- p$ 1.75 GeV/$c$ |
| 8.4±1.4 | | BORENSTEIN | 72 | HBC | $\Xi^- \pi^+$ |
| 11.0±1.8 | | KIRSCH | 72 | HBC | $\Xi^- \pi^+$ |
| 7 ±7 | | BERGE | 66 | HBC | $K^- p$ 1.5–1.7 GeV/$c$ |
| 8.5±3.5 | | LONDON | 66 | HBC | $K^- p$ 2.24 GeV/$c$ |
| 7 ±2 | | SCHLEIN | 63B | HBC | $K^- p$ 1.8, 1.95 GeV/$c$ |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 12.8±1.0 | 2700 | [1] BAUBILLIER | 81B | HBC | $K^- p$ 8.25 GeV/$c$ |
| 19 ±6 | 80 | [3] SIXEL | 79 | HBC | $K^- p$ 10 GeV/$c$ |
| 14 ±5 | 100 | [3] SIXEL | 79 | HBC | $K^- p$ 16 GeV/$c$ |

### Ξ(1530)$^-$ WIDTH

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **$9.9^{+1.7}_{-1.9}$ OUR AVERAGE** | | | | |
| 9.6±2.8 | DEBELLEFON | 75B | HBC | $K^- p \to \Xi^- \overline{K} \pi$ |
| 8.3±3.6 | ROSS | 73B | HBC | $K^- p \to \Xi \overline{K} \pi(\pi)$ |
| $7.8^{+3.5}_{-7.8}$ | BALTAY | 72 | HBC | $K^- p$ 1.75 GeV/$c$ |
| 16.2±4.6 | KIRSCH | 72 | HBC | $\Xi^- \pi^0$, $\Xi^0 \pi^-$ |

## Ξ(1530) DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Confidence level |
|---|---|---|---|
| $\Gamma_1$ | $\Xi\pi$ | 100 % | |
| $\Gamma_2$ | $\Xi\gamma$ | <3.7 % | 90% |

## Ξ(1530) BRANCHING RATIOS

### $\Gamma(\Xi\gamma)/\Gamma_{total}$ $\Gamma_2/\Gamma$

| VALUE | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **<0.037** | 90 | ABLIKIM | 20 | BES3 | $J/\psi \to \Xi(1530)^- \overline{\Xi}^+$ |

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

| | | | | | |
|---|---|---|---|---|---|
| <0.04 | 90 | KALBFLEISCH | 75 | HBC | $K^- p$ 2.18 GeV/$c$ |

## Ξ(1530) FOOTNOTES

[1] BAUBILLIER 81B is a fit to the inclusive spectrum. The resolution (5 MeV) is not unfolded.
[2] Redundant with data in the mass Listings.
[3] SIXEL 79 doesn't unfold the experimental resolution of 15 MeV.

## Ξ(1530) REFERENCES


| | | | | |
|---|---|---|---|---|
| ABLIKIM | 20 | PR D101 012004 | M. Ablikim *et al.* | (BESIII Collab.) |
| AUBERT | 08AK | PR D78 034008 | B. Aubert *et al.* | (BABAR Collab.) |
| ASTON | 85B | PR D32 2270 | D. Aston *et al.* | (SLAC, CARL, CNRC, CINC) |
| BAUBILLIER | 81B | NP B192 1 | M. Baubillier *et al.* | (BIRM, CERN, GLAS+) |
| BIAGI | 81 | ZPHY C9 305 | S.F. Biagi *et al.* | (BRIS, CAVE, GEVA+) |
| SIXEL | 79 | NP B159 125 | P. Sixel *et al.* | (AACH3, BERL, CERN, LOIC+) |
| DEBELLEFON | 75B | NC 28A 289 | A. de Bellefon *et al.* | (CDEF, SACL) |
| KALBFLEISCH | 75 | PR D11 987 | G.R. Kalbfleisch, R.C. Strand, J.W. Chapman | (BNL+) |
| BERTHON | 74 | NC 21A 146 | A. Berthon *et al.* | (CDEF, RHEL, SACL+) |
| LICHTENBERG | 74 | PR D10 3865 | D.B. Lichtenberg | (IND) |
| Also | | Private Comm. | D.B. Lichtenberg | (IND) |
| HABIBI | 73 | Thesis Nevis 199 | M. Habibi | (COLU) |
| ROSS | 73B | Purdue Conf. 355 | R.T. Ross, J.L. Lloyd, D. Radojicic | (OXF) |
| BADIER | 72 | NP B37 429 | J. Badier *et al.* | (EPOL) |
| BALTAY | 72 | PL 42B 129 | C. Baltay *et al.* | (COLU, BING) |
| BORENSTEIN | 72 | PR D5 1559 | S.R. Borenstein *et al.* | (BNL, MICH) I |
| KIRSCH | 72 | NP B40 349 | L.E. Kirsch *et al.* | (BRAN, UMD, SYRA+) I |
| BERGE | 66 | PR 147 945 | J.P. Berge *et al.* | (LRL) I |
| BUTTON-... | 66 | PR 142 883 | J. Button-Shafer *et al.* | (LRL) JP |
| LONDON | 66 | PR 143 1034 | G.W. London *et al.* | (BNL, SYRA) IJ |
| MERRILL | 66 | Thesis UCRL 16455 | D.W. Merrill | (LRL) JP |
| PJERROU | 65B | PRL 14 275 | G.M. Pjerrou *et al.* | (UCLA) |
| SCHLEIN | 63B | PRL 11 167 | P.E. Schlein *et al.* | (UCLA) IJP |


## OTHER RELATED PAPERS


| | | | | |
|---|---|---|---|---|
| MAZZUCATO | 81 | NP B178 1 | M. Mazzucato *et al.* | (AMST, CERN, NIJM+) |
| BRIEFEL | 77 | PR D16 2706 | E. Briefel *et al.* | (BRAN, UMD, SYRA+) |
| BRIEFEL | 75 | PR D12 1859 | E. Briefel *et al.* | (BRAN, UMD, SYRA+) |
| HUNGERBU... | 74 | PR D10 2051 | V. Hungerbuhler *et al.* | (YALE, FNAL, BNL+) |
| BUTTON-... | 66 | PR 142 883 | J. Button-Shafer *et al.* | (LRL) JP |