# $K_2^*(1430)$

$I(J^P) = \frac{1}{2}(2^+)$

We consider that phase-shift analyses provide more reliable determinations of the mass and width.

## $K_2^*(1430)$ MASS

### CHARGED ONLY, WITH FINAL STATE $K\pi$

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **1425.6± 1.5 OUR AVERAGE** | | Error includes scale factor of 1.1. | | | | |
| 1420 ± 4 | 1587 | BAUBILLIER | 84B | HBC | − | 8.25 $K^- p \to \overline{K}^0 \pi^- p$ |
| 1436 ± 5.5 | 400 | [1,2] CLELAND | 82 | SPEC | + | 30 $K^+ p \to K_S^0 \pi^+ p$ |
| 1430 ± 3.2 | 1500 | [1,2] CLELAND | 82 | SPEC | + | 50 $K^+ p \to K_S^0 \pi^+ p$ |
| 1430 ± 3.2 | 1200 | [1,2] CLELAND | 82 | SPEC | − | 50 $K^+ p \to K_S^0 \pi^- p$ |
| 1423 ± 5 | 935 | TOAFF | 81 | HBC | − | 6.5 $K^- p \to \overline{K}^0 \pi^- p$ |
| 1428.0± 4.6 | | [3] MARTIN | 78 | SPEC | + | 10 $K^\pm p \to K_S^0 \pi p$ |
| 1423.8± 4.6 | | [3] MARTIN | 78 | SPEC | − | 10 $K^\pm p \to K_S^0 \pi p$ |
| 1420.0± 3.1 | 1400 | AGUILAR-... | 71B | HBC | − | 3.9,4.6 $K^- p$ |
| 1425 ± 8.0 | 225 | [1,2] BARNHAM | 71C | HBC | + | $K^+ p \to K^0 \pi^+ p$ |
| 1416 ±10 | 220 | CRENNELL | 69D | DBC | − | 3.9 $K^- N \to \overline{K}^0 \pi^- N$ |
| 1414 ±13.0 | 60 | [1] LIND | 69 | HBC | + | 9 $K^+ p \to K^0 \pi^+ p$ |
| 1427 ±12 | 63 | [1] SCHWEING... | 68 | HBC | − | 5.5 $K^- p \to \overline{K} \pi N$ |
| 1423 ±11.0 | 39 | [1] BASSANO | 67 | HBC | − | 4.6–5.0 $K^- p \to \overline{K}^0 \pi^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 1423.4± 2 ±3 | 24809± 820 | [4] BIRD | 89 | LASS | − | 11 $K^- p \to \overline{K}^0 \pi^- p$ |

### NEUTRAL ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **1432.4± 1.3 OUR AVERAGE** | | | | | | |
| 1431.2± 1.8± 0.7 | | [5] ASTON | 88 | LASS | 0 | 11 $K^- p \to K^- \pi^+ n$ |
| 1434 ± 4 ± 6 | | [5] ASTON | 87 | LASS | 0 | 11 $K^- p \to \overline{K}^0 \pi^+ \pi^- n$ |
| 1433 ± 6 ±10 | | [5] ASTON | 84B | LASS | 0 | 11 $K^- p \to \overline{K}^0 2\pi n$ |
| 1471 ±12 | | [5] BAUBILLIER | 82B | HBC | 0 | 8.25 $K^- p \to N K_S^0 \pi\pi$ |
| 1428 ± 3 | | [5] ASTON | 81C | LASS | 0 | 11 $K^- p \to K^- \pi^+ n$ |
| 1434 ± 2 | | [5] ESTABROOKS | 78 | ASPK | 0 | 13 $K^\pm p \to p K \pi$ |
| 1440 ±10 | | [5] BOWLER | 77 | DBC | 0 | 5.5 $K^+ d \to K \pi p p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 1420 ± 7 | 300 | HENDRICK | 76 | DBC | | 8.25 $K^+ N \to K^+ \pi N$ |
| 1421.6± 4.2 | 800 | MCCUBBIN | 75 | HBC | 0 | 3.6 $K^- p \to K^- \pi^+ n$ |
| 1420.1± 4.3 | | [6] LINGLIN | 73 | HBC | 0 | 2–13 $K^+ p \to K^+ \pi^- X$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1419.1± 3.7 | 1800 | | AGUILAR-... | 71B | HBC | 0 | 3.9,4.6 $K^- p$ |
| 1416 ± 6 | 600 | | CORDS | 71 | DBC | 0 | 9 $K^+ n \rightarrow K^+ \pi^- p$ |
| 1421.1± 2.6 | 2200 | | DAVIS | 69 | HBC | 0 | 12 $K^+ p \rightarrow K^+ \pi^- X$ |

[1] Errors enlarged by us to $\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
[2] Number of events in peak re-evaluated by us.
[3] Systematic error added by us.
[4] From a partial wave amplitude analysis.
[5] From phase shift or partial-wave analysis.
[6] From pole extrapolation, using world $K^+ p$ data summary tape.

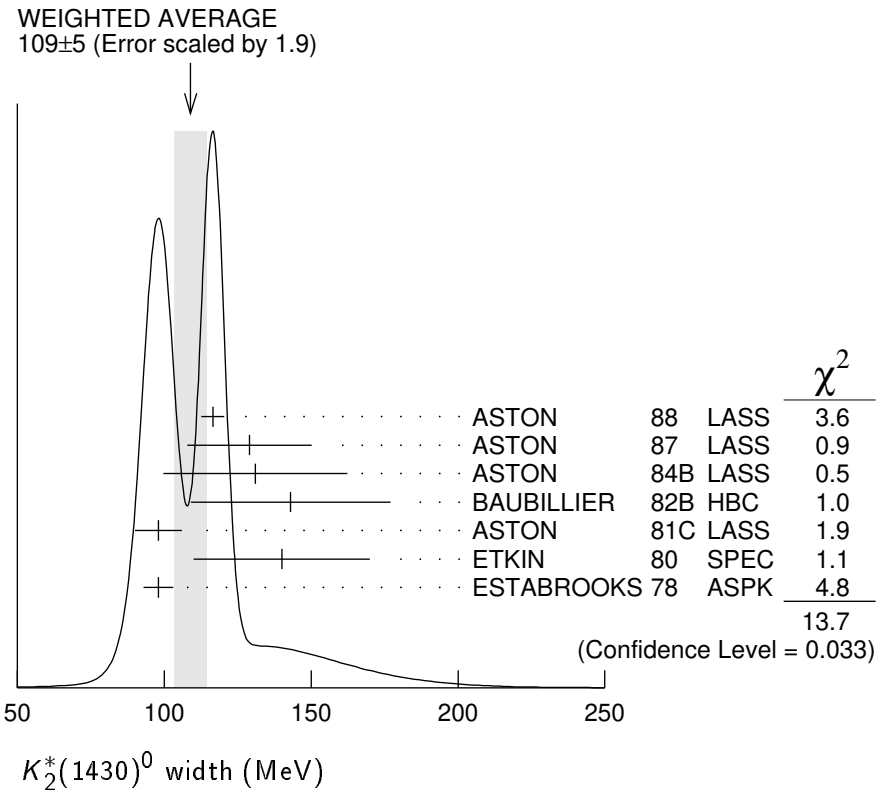
## $K_2^*(1430)$ WIDTH

### CHARGED ONLY, WITH FINAL STATE $K\pi$

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **98.5± 2.7 OUR FIT** Error includes scale factor of 1.1. | | | | | | |
| **98.5± 2.9 OUR AVERAGE** Error includes scale factor of 1.1. | | | | | | |
| 109 ±22 | 400 | [7,8] | CLELAND | 82 | SPEC | + | 30 $K^+ p \rightarrow K^0_S \pi^+ p$ |
| 124 ±12.8 | 1500 | [7,8] | CLELAND | 82 | SPEC | + | 50 $K^+ p \rightarrow K^0_S \pi^+ p$ |
| 113 ±12.8 | 1200 | [7,8] | CLELAND | 82 | SPEC | − | 50 $K^+ p \rightarrow K^0_S \pi^- p$ |
| 85 ±16 | 935 | | TOAFF | 81 | HBC | − | 6.5 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 96.5± 3.8 | | | MARTIN | 78 | SPEC | + | 10 $K^\pm p \rightarrow K^0_S \pi p$ |
| 97.7± 4.0 | | | MARTIN | 78 | SPEC | − | 10 $K^\pm p \rightarrow K^0_S \pi p$ |
| $94.7^{+15.1}_{-12.5}$ | 1400 | | AGUILAR-... | 71B | HBC | − | 3.9,4.6 $K^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | | |
| 98 ± 4 ±4 | 24809± 820 | [9] | BIRD | 89 | LASS | − | 11 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |

### NEUTRAL ONLY

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **109 ± 5 OUR AVERAGE** Error includes scale factor of 1.9. See the ideogram below. | | | | | | |
| 116.5± 3.6± 1.7 | | [10] | ASTON | 88 | LASS | 0 | 11 $K^- p \rightarrow K^- \pi^+ n$ |
| 129 ±15 ±15 | | [10] | ASTON | 87 | LASS | 0 | 11 $K^- p \rightarrow \overline{K}^0 \pi^+ \pi^- n$ |
| 131 ±24 ±20 | | [10] | ASTON | 84B | LASS | 0 | 11 $K^- p \rightarrow \overline{K}^0 2\pi n$ |
| 143 ±34 | | [10] | BAUBILLIER | 82B | HBC | 0 | 8.25 $K^- p \rightarrow N K^0_S \pi\pi$ |
| 98 ± 8 | | [10] | ASTON | 81C | LASS | 0 | 11 $K^- p \rightarrow K^- \pi^+ n$ |
| 140 ±30 | | [10] | ETKIN | 80 | SPEC | 0 | 6 $K^- p \rightarrow \overline{K}^0 \pi^+ \pi^- n$ |
| 98 ± 5 | | [10] | ESTABROOKS | 78 | ASPK | 0 | 13 $K^\pm p \rightarrow p K \pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | | |
| 125 ±29 | 300 | [7] | HENDRICK | 76 | DBC | | 8.25 $K^+ N \rightarrow K^+ \pi N$ |
| 116 ±18 | 800 | | MCCUBBIN | 75 | HBC | 0 | 3.6 $K^- p \rightarrow K^- \pi^+ n$ |
| 61 ±14 | | [11] | LINGLIN | 73 | HBC | 0 | 2–13 $K^+ p \rightarrow K^+ \pi^- X$ |
| $116.6^{+10.3}_{-15.5}$ | 1800 | | AGUILAR-... | 71B | HBC | 0 | 3.9,4.6 $K^- p$ |
| 144 ±24.0 | 600 | [7] | CORDS | 71 | DBC | 0 | 9 $K^+ n \rightarrow K^+ \pi^- p$ |
| 101 ±10 | 2200 | | DAVIS | 69 | HBC | 0 | 12 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$ |




[7] Errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
[8] Number of events in peak re-evaluated by us.
[9] From a partial wave amplitude analysis.
[10] From phase shift or partial-wave analysis.
[11] From pole extrapolation, using world $K^+ p$ data summary tape.

## $K_2^*(1430)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level |
|---|---|---|---|
| $\Gamma_1$ | $K\pi$ | (49.9±1.2) % | |
| $\Gamma_2$ | $K^*(892)\pi$ | (24.7±1.5) % | |
| $\Gamma_3$ | $K^*(892)\pi\pi$ | (13.4±2.2) % | |
| $\Gamma_4$ | $K\rho$ | ( 8.7±0.8) % | S=1.2 |
| $\Gamma_5$ | $K\omega$ | ( 2.9±0.8) % | |
| $\Gamma_6$ | $K^+\gamma$ | ( 2.4±0.5) $\times 10^{-3}$ | S=1.1 |
| $\Gamma_7$ | $K\eta$ | ( $1.5^{+3.4}_{-1.0}$) $\times 10^{-3}$ | S=1.3 |
| $\Gamma_8$ | $K\omega\pi$ | < 7.2 $\times 10^{-4}$ | CL=95% |
| $\Gamma_9$ | $K^0\gamma$ | < 9 $\times 10^{-4}$ | CL=90% |

## CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and 10 branching ratios uses 31 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 20.2$ for 24 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters $p_i$, including the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. The fit constrains the $x_i$ whose labels appear in this array to sum to one.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $x_2$ | −9 | | | | | | |
| $x_3$ | −40 | −73 | | | | | |
| $x_4$ | −8 | 36 | −52 | | | | |
| $x_5$ | −11 | −3 | −26 | −7 | | | |
| $x_6$ | −1 | −1 | −1 | −1 | 0 | | |
| $x_7$ | −4 | −7 | −5 | −5 | −2 | 0 | |
| $\Gamma$ | 0 | 0 | 0 | 0 | 0 | −13 | 0 |
| | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ | $x_7$ |

| | Mode | Rate (MeV) | Scale factor |
|---|---|---|---|
| $\Gamma_1$ | $K\pi$ | 49.1 ±1.8 | |
| $\Gamma_2$ | $K^*(892)\pi$ | 24.3 ±1.6 | |
| $\Gamma_3$ | $K^*(892)\pi\pi$ | 13.2 ±2.2 | |
| $\Gamma_4$ | $K\rho$ | 8.5 ±0.8 | 1.2 |
| $\Gamma_5$ | $K\omega$ | 2.9 ±0.8 | |
| $\Gamma_6$ | $K^+\gamma$ | $0.24 \pm 0.05$ | 1.1 |
| $\Gamma_7$ | $K\eta$ | $0.15^{+0.33}_{-0.10}$ | 1.3 |

## $K_2^*(1430)$ PARTIAL WIDTHS

### $\Gamma(K^+\gamma)$ $\Gamma_6$

| VALUE (keV) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **241±50 OUR FIT** | Error includes scale factor of 1.1. | | | | |
| **240±45** | CIHANGIR | 82 | SPEC | + | 200 $K^+$ Z → Z $K^+\pi^0$, Z $K^0_S\pi^+$ |

### $\Gamma(K^0\gamma)$ $\Gamma_9$

| VALUE (keV) | CL% | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **< 5.4** | 90 | ALAVI-HARATI | 02B | KTEV | | $K + A \rightarrow K^* + A$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <84 | 90 | CARLSMITH | 87 | SPEC | 0 | 60–200 $K^0_L$ A → $K^0_S\pi^0$ A |

## $K_2^*(1430)$ BRANCHING RATIOS

### $\Gamma(K\pi)/\Gamma_{total}$ $\Gamma_1/\Gamma$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.499±0.012 OUR FIT** | | | | | |
| **0.488±0.014 OUR AVERAGE** | | | | | |
| 0.485±0.006±0.020 | [12] ASTON | 88 | LASS | 0 | 11 $K^- p \to K^- \pi^+ n$ |
| 0.49 ±0.02 | [12] ESTABROOKS | 78 | ASPK | ± | 13 $K^\pm p \to p K \pi$ |

### $\Gamma(K^*(892)\pi)/\Gamma(K\pi)$ $\Gamma_2/\Gamma_1$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.496±0.034 OUR FIT** | | | | | |
| **0.47 ±0.04 OUR AVERAGE** | | | | | |
| 0.44 ±0.09 | ASTON | 84B | LASS | 0 | 11 $K^- p \to \overline{K}^0 2\pi n$ |
| 0.62 ±0.19 | LAUSCHER | 75 | HBC | 0 | 10,16 $K^- p \to K^- \pi^+ n$ |
| 0.54 ±0.16 | DEHM | 74 | DBC | 0 | 4.6 $K^+ N$ |
| 0.47 ±0.08 | AGUILAR-... | 71B | HBC | | 3.9,4.6 $K^- p$ |
| 0.47 ±0.10 | BASSANO | 67 | HBC | −0 | 4.6,5.0 $K^- p$ |
| 0.45 ±0.13 | BADIER | 65C | HBC | − | 3 $K^- p$ |

### $\Gamma(K\omega)/\Gamma(K\pi)$ $\Gamma_5/\Gamma_1$

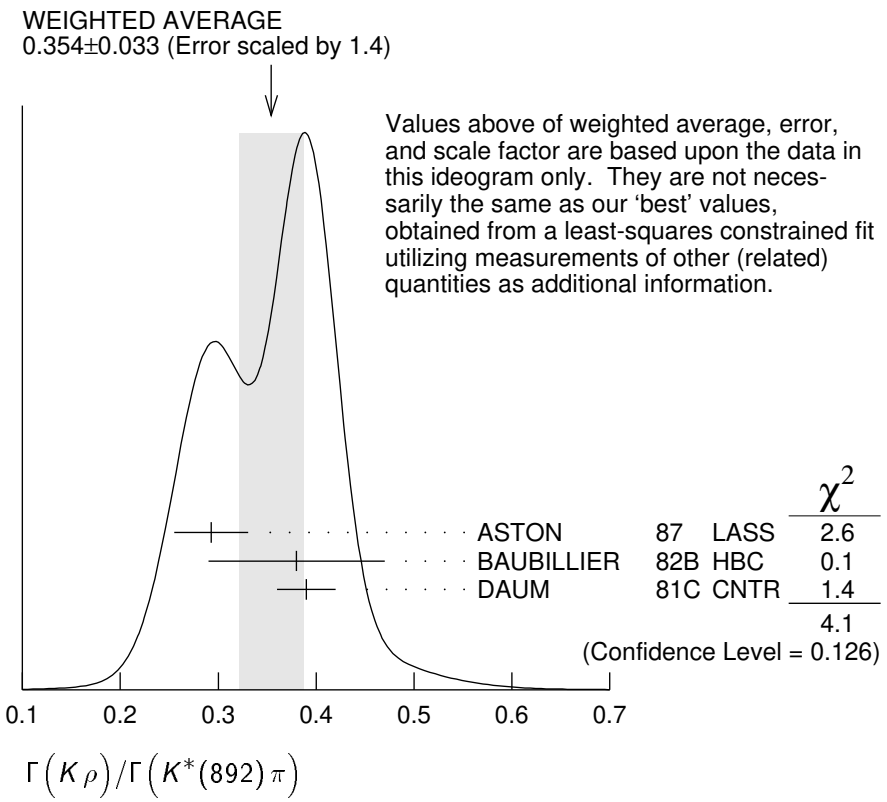
| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.059±0.017 OUR FIT** | | | | | |
| **0.070±0.035 OUR AVERAGE** | | | | | |
| 0.05 ±0.04 | AGUILAR-... | 71B | HBC | | 3.9,4.6 $K^- p$ |
| 0.13 ±0.07 | BASSOMPIE... | 69 | HBC | 0 | 5 $K^+ p$ |

### $\Gamma(K\rho)/\Gamma(K\pi)$ $\Gamma_4/\Gamma_1$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.174±0.017 OUR FIT** | Error includes scale factor of 1.2. | | | | |
| **$0.150^{+0.029}_{-0.017}$ OUR AVERAGE** | | | | | |
| 0.18 ±0.05 | ASTON | 84B | LASS | 0 | 11 $K^- p \to \overline{K}^0 2\pi n$ |
| $0.02^{+0.10}_{-0.02}$ | DEHM | 74 | DBC | 0 | 4.6 $K^+ N$ |
| 0.16 ±0.05 | AGUILAR-... | 71B | HBC | | 3.9,4.6 $K^- p$ |
| 0.14 ±0.10 | BASSANO | 67 | HBC | −0 | 4.6,5.0 $K^- p$ |
| 0.14 ±0.07 | BADIER | 65C | HBC | − | 3 $K^- p$ |

### $\Gamma(K\rho)/\Gamma(K^*(892)\pi)$ $\Gamma_4/\Gamma_2$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.350±0.031 OUR FIT** | Error includes scale factor of 1.4. | | | | |
| **0.354±0.033 OUR AVERAGE** | Error includes scale factor of 1.4. See the ideogram below. | | | | |
| 0.293±0.032±0.020 | ASTON | 87 | LASS | 0 | 11 $K^- p \to \overline{K}^0 \pi^+ \pi^- n$ |
| 0.38 ±0.09 | BAUBILLIER | 82B | HBC | 0 | 8.25 $K^- p \to N K^0_S \pi\pi$ |
| 0.39 ±0.03 | DAUM | 81C | CNTR | | 63 $K^- p \to K^- 2\pi p$ |




## $\Gamma(K\omega)/\Gamma(K^*(892)\pi)$ $\Gamma_5/\Gamma_2$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.118±0.034 OUR FIT** | | | | | |
| **0.10 ±0.04** | FIELD | 67 | HBC | – | 3.8 $K^- p$ |

## $\Gamma(K\eta)/\Gamma(K^*(892)\pi)$ $\Gamma_7/\Gamma_2$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **$0.006^{+0.014}_{=0.004}$ OUR FIT** | Error includes scale factor of 1.2. | | | | |
| **0.07 ±0.04** | FIELD | 67 | HBC | – | 3.8 $K^- p$ |

## $\Gamma(K\eta)/\Gamma(K\pi)$ $\Gamma_7/\Gamma_1$

| VALUE | CL% | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **$0.0030^{+0.0068}_{=0.0020}$ OUR FIT** | Error includes scale factor of 1.3. | | | | | |
| **0 ±0.0056** | | [13] ASTON | 88B | LASS | – | 11 $K^- p \rightarrow K^- \eta p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <0.04 | 95 | AGUILAR-... | 71B | HBC | | 3.9,4.6 $K^- p$ |
| <0.065 | | [14] BASSOMPIE... | 69 | HBC | | 5.0 $K^+ p$ |
| <0.02 | | BISHOP | 69 | HBC | | 3.5 $K^+ p$ |

## $\Gamma(K^*(892)\pi\pi)/\Gamma_{total}$ $\Gamma_3/\Gamma$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.134±0.022 OUR FIT** | | | | | |
| **0.12 ±0.04** | [15] GOLDBERG | 76 | HBC | – | 3 $K^- p \rightarrow p\overline{K}^0 \pi\pi\pi$ |

## $\Gamma(K^*(892)\pi\pi)/\Gamma(K\pi)$ $\Gamma_3/\Gamma_1$

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **0.27±0.05 OUR FIT** | | | | | |
| **0.21±0.08** | [14,15] JONGEJANS | 78 | HBC | – | 4 $K^- p \rightarrow p\overline{K}^0 \pi\pi\pi$ |

## $\Gamma(K\omega\pi)/\Gamma_{total}$ $\Gamma_8/\Gamma$

| VALUE (units $10^{-3}$) | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| **<0.72** | 95 | 0 | JONGEJANS | 78 | HBC | 4 $K^- p \rightarrow p\overline{K}^0 4\pi$ |

[12] From phase shift analysis.
[13] ASTON 88B quote < 0.0092 at CL=95%. We convert this to a central value and 1 sigma error in order to be able to use it in our constrained fit.
[14] Restated by us.
[15] Assuming $\pi\pi$ system has isospin 1, which is supported by the data.

## $K_2^*(1430)$ REFERENCES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