# $K^*(892)$

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

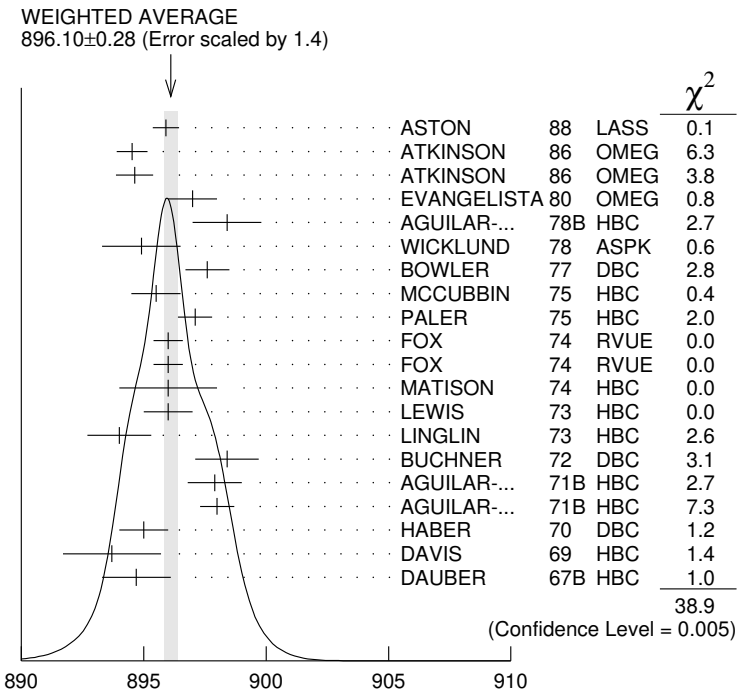
## $K^*(892)$ MASS

### CHARGED ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **891.66±0.26 OUR AVERAGE** | | | | | | |
| 892.6 ±0.5 | 5840 | BAUBILLIER | 84B | HBC | − | 8.25 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 888 ±3 | | NAPIER | 84 | SPEC | + | 200 $\pi^- p \rightarrow 2K^0_S$ X |
| 891 ±1 | | NAPIER | 84 | SPEC | − | 200 $\pi^- p \rightarrow 2K^0_S$ X |
| 891.7 ±2.1 | 3700 | BARTH | 83 | HBC | + | 70 $K^+ p \rightarrow K^0 \pi^+$ X |
| 891 ±1 | 4100 | TOAFF | 81 | HBC | − | 6.5 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 892.8 ±1.6 | | AJINENKO | 80 | HBC | + | 32 $K^+ p \rightarrow K^0 \pi^+$ X |
| 890.7 ±0.9 | 1800 | AGUILAR-... | 78B | HBC | ± | 0.76 $\overline{p}p \rightarrow K^\mp K^0_S \pi^\pm$ |
| 886.6 ±2.4 | 1225 | BALAND | 78 | HBC | ± | 12 $\overline{p}p \rightarrow (K\pi)^\pm$ X |
| 891.7 ±0.6 | 6706 | COOPER | 78 | HBC | ± | 0.76 $\overline{p}p \rightarrow (K\pi)^\pm$ X |
| 891.9 ±0.7 | 9000 [1] | PALER | 75 | HBC | − | 14.3 $K^- p \rightarrow (K\pi)^-$ X |
| 892.2 ±1.5 | 4404 | AGUILAR-... | 71B | HBC | − | 3.9,4.6 $K^- p \rightarrow (K\pi)^- p$ |
| 891 ±2 | 1000 | CRENNELL | 69D | DBC | − | 3.9 $K^- N \rightarrow K^0 \pi^-$ X |
| 890 ±3.0 | 720 | BARLOW | 67 | HBC | ± | 1.2 $\overline{p}p \rightarrow (K^0\pi)^\pm K^\mp$ |
| 889 ±3.0 | 600 | BARLOW | 67 | HBC | ± | 1.2 $\overline{p}p \rightarrow (K^0\pi)^\pm K\pi$ |
| 891 ±2.3 | 620 [2] | DEBAERE | 67B | HBC | + | 3.5 $K^+ p \rightarrow K^0 \pi^+ p$ |
| 891.0 ±1.2 | 1700 [3] | WOJCICKI | 64 | HBC | − | 1.7 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 890.4 ±0.2 ±0.5 | 79709±801 [4] | BIRD | 89 | LASS | − | 11 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 890.0 ±2.3 | 800 [2,3] | CLELAND | 82 | SPEC | + | 30 $K^+ p \rightarrow K^0_S \pi^+ p$ |
| 896.0 ±1.1 | 3200 [2,3] | CLELAND | 82 | SPEC | + | 50 $K^+ p \rightarrow K^0_S \pi^+ p$ |
| 893 ±1 | 3600 [2,3] | CLELAND | 82 | SPEC | − | 50 $K^+ p \rightarrow K^0_S \pi^- p$ |
| 896.0 ±1.9 | 380 | DELFOSSE | 81 | SPEC | + | 50 $K^\pm p \rightarrow K^\pm \pi^0 p$ |
| 886.0 ±2.3 | 187 | DELFOSSE | 81 | SPEC | − | 50 $K^\pm p \rightarrow K^\pm \pi^0 p$ |
| 894.2 ±2.0 | 765 [2] | CLARK | 73 | HBC | − | 3.13 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 894.3 ±1.5 | 1150 [2,3] | CLARK | 73 | HBC | − | 3.3 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 892.0 ±2.6 | 341 [2] | SCHWEING... | 68 | HBC | − | 5.5 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |

## NEUTRAL ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **896.10±0.28 OUR AVERAGE** | | Error includes scale factor of 1.4. See the ideogram below. | | | | |
| 895.9 ±0.5 ±0.2 | | ASTON | 88 | LASS | 0 | 11 $K^- p \rightarrow K^- \pi^+ n$ |
| 894.52±0.63 | 25k | [1] ATKINSON | 86 | OMEG | | 20–70 $\gamma p$ |
| 894.63±0.76 | 20k | [1] ATKINSON | 86 | OMEG | | 20–70 $\gamma p$ |
| 897 ±1 | 28k | EVANGELISTA | 80 | OMEG | 0 | 10 $\pi^- p \rightarrow K^+ \pi^- (\Lambda, \Sigma)$ |
| 898.4 ±1.4 | 1180 | AGUILAR-... | 78B | HBC | 0 | 0.76 $\overline{p} p \rightarrow K^\mp K^0_S \pi^\pm$ |
| 894.9 ±1.6 | | WICKLUND | 78 | ASPK | 0 | 3,4,6 $K^\pm N \rightarrow (K\pi)^0 N$ |
| 897.6 ±0.9 | | BOWLER | 77 | DBC | 0 | 5.4 $K^+ d \rightarrow K^+ \pi^- p p$ |
| 895.5 ±1.0 | 3600 | MCCUBBIN | 75 | HBC | 0 | 3.6 $K^- p \rightarrow K^- \pi^+ n$ |
| 897.1 ±0.7 | 22k | [1] PALER | 75 | HBC | 0 | 14.3 $K^- p \rightarrow (K\pi)^0$ X |
| 896.0 ±0.6 | 10k | FOX | 74 | RVUE | 0 | 2 $K^- p \rightarrow K^- \pi^+ n$ |
| 896.0 ±0.6 | | FOX | 74 | RVUE | 0 | 2 $K^+ n \rightarrow K^+ \pi^- p$ |
| 896 ±2 | | [5] MATISON | 74 | HBC | 0 | 12 $K^+ p \rightarrow K^+ \pi^- \Delta$ |
| 896 ±1 | 3186 | LEWIS | 73 | HBC | 0 | 2.1–2.7 $K^+ p \rightarrow K \pi \pi p$ |
| 894.0 ±1.3 | | [5] LINGLIN | 73 | HBC | 0 | 2–13 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$ |
| 898.4 ±1.3 | 1700 | [2] BUCHNER | 72 | DBC | 0 | 4.6 $K^+ n \rightarrow K^+ \pi^- p$ |
| 897.9 ±1.1 | 2934 | [2] AGUILAR-... | 71B | HBC | 0 | 3.9,4.6 $K^- p \rightarrow K^- \pi^+ n$ |
| 898.0 ±0.7 | 5362 | [2] AGUILAR-... | 71B | HBC | 0 | 3.9,4.6 $K^- p \rightarrow K^- \pi^+ \pi^- p$ |
| 895 ±1 | 4300 | [3] HABER | 70 | DBC | 0 | 3 $K^- N \rightarrow K^- \pi^+$ X |
| 893.7 ±2.0 | 10k | DAVIS | 69 | HBC | 0 | 12 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$ |
| 894.7 ±1.4 | 1040 | [2] DAUBER | 67B | HBC | 0 | 2.0 $K^- p \rightarrow K^- \pi^+ \pi^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 900.7 ±1.1 | 5900 | BARTH | 83 | HBC | 0 | 70 $K^+ p \rightarrow K^+ \pi^-$ X |




$K^*(892)^0$ mass (MeV)

[1] Inclusive reaction. Complicated background and phase-space effects.
[2] Mass errors enlarged by us to $\Gamma/\sqrt{N}$. See note.
[3] Number of events in peak reevaluated by us.
[4] From a partial wave amplitude analysis.
[5] From pole extrapolation.

## $K^*(892)$ MASSES AND MASS DIFFERENCES

Unrealistically small errors have been reported by some experiments. We use simple "realistic" tests for the minimum errors on the determination of a mass and width from a sample of $N$ events:

$$\delta_{\min}(m) = \frac{\Gamma}{\sqrt{N}}, \quad \delta_{\min}(\Gamma) = 4\frac{\Gamma}{\sqrt{N}} \ .$$

We consistently increase unrealistic errors before averaging. For a detailed discussion, see the 1971 edition of this Note.

### $m_{K^*(892)^0} - m_{K^*(892)^\pm}$

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **6.7±1.2 OUR AVERAGE** | | | | | | |
| 7.7±1.7 | 2980 | AGUILAR-... | 78B | HBC | ±0 | 0.76 $\overline{p}p \rightarrow K^\mp K^0_S \pi^\pm$ |
| 5.7±1.7 | 7338 | AGUILAR-... | 71B | HBC | −0 | 3.9,4.6 $K^- p$ |
| 6.3±4.1 | 283 | [6] BARASH | 67B | HBC | | 0.0 $\overline{p}p$ |

[6] Number of events in peak reevaluated by us.

## $K^*(892)$ RANGE PARAMETER

All from partial wave amplitude analyses.

| VALUE ($GeV^{-1}$) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| 3.4±0.7 | ASTON | 88 | LASS | 0 | 11 $K^- p \rightarrow K^- \pi^+ n$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 12.1±3.2±3.0 | BIRD | 89 | LASS | − | 11 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |

## $K^*(892)$ WIDTH

### CHARGED ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **50.8±0.9 OUR FIT** | | | | | | |
| **50.8±0.9 OUR AVERAGE** | | | | | | |
| 49 ±2 | 5840 | BAUBILLIER | 84B | HBC | − | 8.25 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 56 ±4 | | NAPIER | 84 | SPEC | − | 200 $\pi^- p \rightarrow 2K^0_S$ X |
| 51 ±2 | 4100 | TOAFF | 81 | HBC | − | 6.5 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 50.5±5.6 | | AJINENKO | 80 | HBC | + | 32 $K^+ p \rightarrow K^0 \pi^+$ X |
| 45.8±3.6 | 1800 | AGUILAR-... | 78B | HBC | ± | 0.76 $\overline{p}p \rightarrow K^\mp K^0_S \pi^\pm$ |
| 52.0±2.5 | 6706 | [7] COOPER | 78 | HBC | ± | 0.76 $\overline{p}p \rightarrow (K\pi)^\pm$ X |
| 52.1±2.2 | 9000 | [8] PALER | 75 | HBC | − | 14.3 $K^- p \rightarrow (K\pi)^-$ X |
| 46.3±6.7 | 765 | [7] CLARK | 73 | HBC | − | 3.13 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 48.2±5.7 | 1150 | [7,9] CLARK | 73 | HBC | − | 3.3 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 54.3±3.3 | 4404 | [7] AGUILAR-... | 71B | HBC | − | 3.9,4.6 $K^- p \rightarrow (K\pi)^- p$ |
| 46 ±5 | 1700 | [7,9] WOJCICKI | 64 | HBC | − | 1.7 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 45.2±1 ±2 | 79709± 801 | [10] BIRD | 89 | LASS | − | 11 $K^- p \rightarrow \overline{K}^0 \pi^- p$ |
| 42.8±7.1 | 3700 | BARTH | 83 | HBC | + | 70 $K^+ p \rightarrow K^0 \pi^+$ X |
| 64.0±9.2 | 800 | [7,9] CLELAND | 82 | SPEC | + | 30 $K^+ p \rightarrow K^0_S \pi^+ p$ |
| 62.0±4.4 | 3200 | [7,9] CLELAND | 82 | SPEC | + | 50 $K^+ p \rightarrow K^0_S \pi^+ p$ |
| 55 ±4 | 3600 | [7,9] CLELAND | 82 | SPEC | − | 50 $K^+ p \rightarrow K^0_S \pi^- p$ |
| 62.6±3.8 | 380 | DELFOSSE | 81 | SPEC | + | 50 $K^\pm p \rightarrow K^\pm \pi^0 p$ |
| 50.5±3.9 | 187 | DELFOSSE | 81 | SPEC | − | 50 $K^\pm p \rightarrow K^\pm \pi^0 p$ |

**NEUTRAL ONLY**

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **50.5±0.6 OUR FIT** | Error includes scale factor of 1.1. | | | | | |
| **50.5±0.6 OUR AVERAGE** | Error includes scale factor of 1.1. | | | | | |
| 50.8±0.8±0.9 | | ASTON | 88 | LASS | 0 | 11 $K^- p \rightarrow K^- \pi^+ n$ |
| 46.5±4.3 | 5900 | BARTH | 83 | HBC | 0 | 70 $K^+ p \rightarrow K^+ \pi^- X$ |
| 54 ±2 | 28k | EVANGELISTA | 80 | OMEG | 0 | 10 $\pi^- p \rightarrow K^+ \pi^- (\Lambda, \Sigma)$ |
| 45.9±4.8 | 1180 | AGUILAR-... | 78B | HBC | 0 | 0.76 $\overline{p} p \rightarrow K^\mp K^0_S \pi^\pm$ |
| 51.2±1.7 | | WICKLUND | 78 | ASPK | 0 | 3,4,6 $K^\pm N \rightarrow (K\pi)^0 N$ |
| 48.9±2.5 | | BOWLER | 77 | DBC | 0 | 5.4 $K^+ d \rightarrow K^+ \pi^- p p$ |
| 48 $^{+3}_{-2}$ | 3600 | MCCUBBIN | 75 | HBC | 0 | 3.6 $K^- p \rightarrow K^- \pi^+ n$ |
| 50.6±2.5 | 22k | [8] PALER | 75 | HBC | 0 | 14.3 $K^- p \rightarrow (K\pi)^0$ X |
| 47 ±2 | 10k | FOX | 74 | RVUE | 0 | 2 $K^- p \rightarrow K^- \pi^+ n$ |
| 51 ±2 | | FOX | 74 | RVUE | 0 | 2 $K^+ n \rightarrow K^+ \pi^- p$ |
| 46.0±3.3 | 3186 | [7] LEWIS | 73 | HBC | 0 | 2.1–2.7 $K^+ p \rightarrow K \pi \pi p$ |
| 51.4±5.0 | 1700 | [7] BUCHNER | 72 | DBC | 0 | 4.6 $K^+ n \rightarrow K^+ \pi^- p$ |
| 55.8 $^{+4.2}_{-3.4}$ | 2934 | [7] AGUILAR-... | 71B | HBC | 0 | 3.9,4.6 $K^- p \rightarrow K^- \pi^+ n$ |
| 48.5±2.7 | 5362 | AGUILAR-... | 71B | HBC | 0 | 3.9,4.6 $K^- p \rightarrow K^- \pi^+ \pi^- p$ |
| 54.0±3.3 | 4300 | [7,9] HABER | 70 | DBC | 0 | 3 $K^- N \rightarrow K^- \pi^+ X$ |
| 53.2±2.1 | 10k | [7] DAVIS | 69 | HBC | 0 | 12 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$ |
| 44 ±5.5 | 1040 | [7] DAUBER | 67B | HBC | 0 | 2.0 $K^- p \rightarrow K^- \pi^+ \pi^- p$ |

[7] Width errors enlarged by us to $4 \times \Gamma/\sqrt{N}$; see note.
[8] Inclusive reaction. Complicated background and phase-space effects.
[9] Number of events in peak reevaluated by us.
[10] From a partial wave amplitude analysis.

## *K**(892) DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Confidence level |
|---|---|---|---|
| $\Gamma_1$ | $K\pi$ | $\sim$ 100 % | |
| $\Gamma_2$ | $(K\pi)^\pm$ | ( 99.901±0.009 ) % | |
| $\Gamma_3$ | $(K\pi)^0$ | ( 99.770±0.020 ) % | |
| $\Gamma_4$ | $K^0\gamma$ | ( 2.30 ±0.20 ) $\times 10^{-3}$ | |
| $\Gamma_5$ | $K^\pm\gamma$ | ( 9.9 ±0.9 ) $\times 10^{-4}$ | |
| $\Gamma_6$ | $K\pi\pi$ | < 7 $\times 10^{-4}$ | 95% |

### CONSTRAINED FIT INFORMATION

An overall fit to the total width and a partial width uses 13 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 7.8$ for 11 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.

| | | |
|---|---|---|
| $x_5$ | −100 | |
| $\Gamma$ | 19 | −19 |
| | $x_2$ | $x_5$ |

| | Mode | Rate (MeV) |
|---|---|---|
| $\Gamma_2$ | $(K\pi)^{\pm}$ | 50.7 ±0.9 |
| $\Gamma_5$ | $K^{\pm}\gamma$ | 0.050 ±0.005 |

### CONSTRAINED FIT INFORMATION

An overall fit to the total width and a partial width uses 18 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 18.4$ for 16 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.

| | | |
|---|---|---|
| $x_4$ | −100 | |
| $\Gamma$ | 14 | −14 |
| | $x_3$ | $x_4$ |

| | Mode | Rate (MeV) | Scale factor |
|---|---|---|---|
| $\Gamma_3$ | $(K\pi)^0$ | 50.4 ±0.6 | 1.1 |
| $\Gamma_4$ | $K^0\gamma$ | 0.117 ±0.010 | |

## $K^*(892)$ PARTIAL WIDTHS

### $\Gamma(K^0\gamma)$ $\Gamma_4$

| *VALUE* (keV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **116 ±10 OUR FIT** | | | | | | |
| **116.5± 9.9** | 584 | CARLSMITH | 86 | SPEC | 0 | $K_L^0 A \rightarrow K_S^0 \pi^0 A$ |

### $\Gamma(K^{\pm}\gamma)$ $\Gamma_5$

| *VALUE* (keV) | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| **50± 5 OUR FIT** | | | | | |
| **50± 5 OUR AVERAGE** | | | | | |
| 48±11 | BERG | 83 | SPEC | – | 156 $K^-$ A → $\overline{K}\pi$ A |
| 51± 5 | CHANDLEE | 83 | SPEC | + | 200 $K^+$ A → $K\pi$ A |

## $K^*(892)$ BRANCHING RATIOS

### $\Gamma(K^0\gamma)/\Gamma_{total}$ $\Gamma_4/\Gamma$

| *VALUE* (units $10^{-3}$) | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| **2.30±0.20 OUR FIT** | | | | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1.5 ±0.7 | CARITHERS | 75B | CNTR | 0 | 8–16 $\overline{K}^0$ A |

### $\Gamma(K^{\pm}\gamma)/\Gamma_{total}$ $\Gamma_5/\Gamma$

| *VALUE* (units $10^{-3}$) | *CL%* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **0.99±0.09 OUR FIT** | | | | | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <1.6 | 95 | BEMPORAD | 73 | CNTR | + | 10–16 $K^+$ A |

### $\Gamma(K\pi\pi)/\Gamma((K\pi)^{\pm})$ $\Gamma_6/\Gamma_2$

| *VALUE* | *CL%* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **<0.0007** | 95 | JONGEJANS | 78 | HBC | | 4 $K^-$ $p$ → $p\overline{K}^0 2\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <0.002 | | WOJCICKI | 64 | HBC | – | 1.7 $K^-$ $p$ → $\overline{K}^0\pi^-$ $p$ |

## $K^*(892)$ REFERENCES


| | | | |
|---|---|---|---|
| BIRD | 89 | SLAC-332 | (SLAC) |
| ASTON | 88 | NP B296 493 | +Awaji, Bienz, Bird+ (SLAC, NAGO, CINC, INUS) |
| ATKINSON | 86 | ZPHY C30 521 | + (BONN, CERN, GLAS, LANC, MCHS, CURIN+) |
| CARLSMITH | 86 | PRL 56 18 | +Bernstein, Peyaud, Turlay (EFI, SACL) |
| BAUBILLIER | 84B | ZPHY C26 37 | + (BIRM, CERN, GLAS, MICH, CURIN) |
| NAPIER | 84 | PL 149B 514 | +Chen+ (TUFTS, ARIZ, FNAL, FLOR, NDAM+) |
| BARTH | 83 | NP B223 296 | +Drevermann+ (BRUX, CERN, GENO, MONS+) |
| BERG | 83 | Thesis UMI 83-21652 | (ROCH) |
| CHANDLEE | 83 | PRL 51 168 | +Berg, Cihangir, Collick+ (ROCH, FNAL, MINN) |
| CLELAND | 82 | NP B208 189 | +Delfosse, Dorsaz, Gloor (DURH, GEVA, LAUS, PITT) |
| DELFOSSE | 81 | NP B183 349 | +Guisan, Martin, Muhlemann, Weill+ (GEVA, LAUS) |
| TOAFF | 81 | PR D23 1500 | +Musgrave, Ammar, Davis, Ecklund+ (ANL, KANS) |
| AJINENKO | 80 | ZPHY C5 177 | +Barth, Dujardin+ (SERP, BRUX, MONS, SACL) |
| EVANGELISTA | 80 | NP B165 383 | + (BARI, BONN, CERN, DARE, GLAS, LIVP+) |
| AGUILAR-... | 78B | NP B141 101 | Aguilar-Benitez+ (MADR, TATA, CERN+) |
| BALAND | 78 | NP B140 220 | +Grard+ (MONS, BELG, CERN, LOIC, LALO) |
| COOPER | 78 | NP B136 365 | +Gurtu+ (TATA, CERN, CDEF+) |
| JONGEJANS | 78 | NP B139 383 | +Cerrada+ (ZEEM, CERN, NIJM, OXF) |
| WICKLUND | 78 | PR D17 1197 | +Ayres, Diebold, Greene, Kramer, Pawlicki (ANL) |
| BOWLER | 77 | NP B126 31 | +Dainton, Drake, Williams (OXF) |

| | | | | |
|---|---|---|---|---|
| CARITHERS | 75B | PRL 35 349 | +Muhlemann, Underwood+ | (ROCH, MCGI) |
| MCCUBBIN | 75 | NP B86 13 | +Lyons | (OXF) |
| PALER | 75 | NP B96 1 | +Tovey, Shah, Spiro+ | (RHEL, SACL, EPOL) |
| FOX | 74 | NP B80 403 | +Griss | (CIT) |
| MATISON | 74 | PR D9 1872 | +Galtieri, Alston-Garnjost, Flatte, Friedman+ | (LBL) |
| BEMPORAD | 73 | NP B51 1 | +Beusch, Freudenreich+ | (CERN, ETH, LOIC) |
| CLARK | 73 | NP B54 432 | +Lyons, Radojicic | (OXF) |
| LEWIS | 73 | NP B60 283 | +Allen, Jacobs+ | (LOWC, LOIC, CDEF) |
| LINGLIN | 73 | NP B55 408 | | (CERN) |
| BUCHNER | 72 | NP B45 333 | +Dehm, Charriere, Cornet+ | (MPIM, CERN, BRUX) |
| AGUILAR-... | 71B | PR D4 2583 | Aguilar-Benitez, Eisner, Kinson | (BNL) |
| HABER | 70 | NP B17 289 | +Shapira, Alexander+ | (REHO, SACL, BGNA, EPOL) |
| CRENNELL | 69D | PRL 22 487 | +Karshon, Lai, O'Neall, Scarr | (BNL) |
| DAVIS | 69 | PRL 23 1071 | +Derenzo, Flatte, Garnjost, Lynch, Solmitz | (LRL) |
| SCHWEING... | 68 | PR 166 1317 | Schweingruber, Derrick, Fields+ | (ANL, NWES) |
| BARASH | 67B | PR 156 1399 | +Kirsch, Miller, Tan | (COLU) |
| BARLOW | 67 | NC 50A 701 | +Lillestol, Montanet+ | (CERN, CDEF, IRAD, LIVP) |
| DAUBER | 67B | PR 153 1403 | +Schlein, Slater, Ticho | (UCLA) |
| DEBAERE | 67B | NC 51A 401 | +Goldschmidt-Clermont, Henri+ | (BRUX, CERN) |
| WOJCICKI | 64 | PR 135B 484 | | (LRL) |


## OTHER RELATED PAPERS


| | | | | |
|---|---|---|---|---|
| KAMAL | 92 | PL B284 421 | +Xu | (ALBE) |
| NAPIER | 84 | PL 149B 514 | +Chen+ | (TUFTS, ARIZ, FNAL, FLOR, NDAM+) |
| CLELAND | 82 | NP B208 189 | +Delfosse, Dorsaz, Gloor | (DURH, GEVA, LAUS, PITT) |
| ALEXANDER | 62 | PRL 8 447 | +Kalbfleisch, Miller, Smith | (LRL) |
| ALSTON | 61 | PRL 6 300 | +Alvarez, Eberhard, Good+ | (LRL) |