# $\Delta(2420)$ $H_{3,11}$

$I(J^P) = \frac{3}{2}(\frac{11}{2}^+)$ Status: ****

Most of the results published before 1975 are now obsolete and have been omitted. They may be found in our 1982 edition, Physics Letters **111B** (1982).

## $\Delta(2420)$ MASS

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **2300 to 2500 (≈ 2420) OUR ESTIMATE** | | | | |
| 2400 ±125 | CUTKOSKY | 80 | IPWA | $\pi N \to \pi N$ |
| 2416 ± 17 | HOEHLER | 79 | IPWA | $\pi N \to \pi N$ |
| 2400 ± 60 | HENDRY | 78 | MPWA | $\pi N \to \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 2400 | CANDLIN | 84 | DPWA | $\pi^+ p \to \Sigma^+ K^+$ |
| 2358.0± 9.0 | CHEW | 80 | BPWA | $\pi^+ p \to \pi^+ p$ |

## $\Delta(2420)$ WIDTH

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **300 to 500 (≈ 400) OUR ESTIMATE** | | | | |
| 450 ±150 | CUTKOSKY | 80 | IPWA | $\pi N \to \pi N$ |
| 340 ± 28 | HOEHLER | 79 | IPWA | $\pi N \to \pi N$ |
| 460 ±100 | HENDRY | 78 | MPWA | $\pi N \to \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 400 | CANDLIN | 84 | DPWA | $\pi^+ p \to \Sigma^+ K^+$ |
| 202.2± 45.0 | CHEW | 80 | BPWA | $\pi^+ p \to \pi^+ p$ |

## $\Delta(2420)$ POLE POSITION

### REAL PART

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| 2300 | [1] HOEHLER | 93 | ARGD | $\pi N \to \pi N$ |
| 2360±100 | CUTKOSKY | 80 | IPWA | $\pi N \to \pi N$ |

### −2×IMAGINARY PART

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| 620 | [1] HOEHLER | 93 | ARGD | $\pi N \to \pi N$ |
| 420±100 | CUTKOSKY | 80 | IPWA | $\pi N \to \pi N$ |

## $\Delta(2420)$ ELASTIC POLE RESIDUE

### MODULUS $|r|$

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| 39 | HOEHLER | 93 | ARGD | $\pi N \to \pi N$ |
| 18±6 | CUTKOSKY | 80 | IPWA | $\pi N \to \pi N$ |

### PHASE $\theta$

| VALUE (°) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-60$ | HOEHLER | 93 | ARGD | $\pi N \rightarrow \pi N$ |
| $-30 \pm 40$ | CUTKOSKY | 80 | IPWA | $\pi N \rightarrow \pi N$ |

## $\Delta(2420)$ DECAY MODES

The following branching fractions are our estimates, not fits or averages.

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $N\pi$ | 5–15 % |
| $\Gamma_2$ | $\Sigma K$ | |

## $\Delta(2420)$ BRANCHING RATIOS

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

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.05 to 0.15 OUR ESTIMATE** | | | | |
| $0.08 \pm 0.03$ | CUTKOSKY | 80 | IPWA | $\pi N \rightarrow \pi N$ |
| $0.08 \pm 0.015$ | HOEHLER | 79 | IPWA | $\pi N \rightarrow \pi N$ |
| $0.11 \pm 0.02$ | HENDRY | 78 | MPWA | $\pi N \rightarrow \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.22 | CHEW | 80 | BPWA | $\pi^+ p \rightarrow \pi^+ p$ |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow \Delta(2420) \rightarrow \Sigma K$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-0.016$ | CANDLIN | 84 | DPWA | $\pi^+ p \rightarrow \Sigma^+ K^+$ |

## $\Delta(2420)$ FOOTNOTES

[1] See HOEHLER 93 for a detailed discussion of the evidence for and the pole parameters of $N$ and $\Delta$ resonances as determined from Argand diagrams of $\pi N$ elastic partial-wave amplitudes and from plots of the speeds with which the amplitudes traverse the diagrams.

## $\Delta(2420)$ REFERENCES


| | | | | |
|---|---|---|---|---|
| HOEHLER | 93 | $\pi N$ Newsletter 9 1 | | (KARL) |
| CANDLIN | 84 | NP B238 477 | +Lowe, Peach, Scotland+ | (EDIN, RAL, LOWC) |
| PDG | 82 | PL 111B | Roos, Porter, Aguilar-Benitez+ | (HELS, CIT, CERN) |
| CHEW | 80 | Toronto Conf. 123 | | (LBL) IJP |
| CUTKOSKY | 80 | Toronto Conf. 19 | +Forsyth, Babcock, Kelly, Hendrick | (CMU, LBL) IJP |
| Also | 79 | PR D20 2839 | Cutkosky, Forsyth, Hendrick, Kelly | (CMU, LBL) |
| HOEHLER | 79 | PDAT 12-1 | +Kaiser, Koch, Pietarinen | (KARLT) IJP |
| Also | 80 | Toronto Conf. 3 | Koch | (KARLT) IJP |
| HENDRY | 78 | PRL 41 222 | | (IND, LBL) IJP |
| Also | 81 | ANP 136 1 | Hendry | (IND) |