

$\Delta(2400) \ 9/2^-$

$I(J^P) = \frac{3}{2}(\frac{9}{2}^-)$  Status: \*\*

OMITTED FROM SUMMARY TABLE

$\Delta(2400)$  POLE POSITION

REAL PART

| VALUE (MeV)                                                                   | DOCUMENT ID  | TECN | COMMENT                           |
|-------------------------------------------------------------------------------|--------------|------|-----------------------------------|
| 2458± 2                                                                       | ROENCHEN 22  | DPWA | Multichannel                      |
| 2260±60                                                                       | CUTKOSKY 80  | IPWA | $\pi N \rightarrow \pi N$         |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |              |      |                                   |
| 1931                                                                          | ROENCHEN 15A | DPWA | Multichannel                      |
| 1983                                                                          | ARNDT 06     | DPWA | $\pi N \rightarrow \pi N, \eta N$ |

−2×IMAGINARY PART

| VALUE (MeV)                                                                   | DOCUMENT ID  | TECN | COMMENT                           |
|-------------------------------------------------------------------------------|--------------|------|-----------------------------------|
| 280± 2                                                                        | ROENCHEN 22  | DPWA | Multichannel                      |
| 320±160                                                                       | CUTKOSKY 80  | IPWA | $\pi N \rightarrow \pi N$         |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |              |      |                                   |
| 442                                                                           | ROENCHEN 15A | DPWA | Multichannel                      |
| 878                                                                           | ARNDT 06     | DPWA | $\pi N \rightarrow \pi N, \eta N$ |

$\Delta(2400)$  ELASTIC POLE RESIDUE

MODULUS  $|r|$

| VALUE (MeV)                                                                   | DOCUMENT ID  | TECN | COMMENT                           |
|-------------------------------------------------------------------------------|--------------|------|-----------------------------------|
| 5.4±2.7                                                                       | ROENCHEN 22  | DPWA | Multichannel                      |
| 8 ±4                                                                          | CUTKOSKY 80  | IPWA | $\pi N \rightarrow \pi N$         |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |              |      |                                   |
| 13                                                                            | ROENCHEN 15A | DPWA | Multichannel                      |
| 24                                                                            | ARNDT 06     | DPWA | $\pi N \rightarrow \pi N, \eta N$ |

PHASE  $\theta$

| VALUE (°)                                                                     | DOCUMENT ID  | TECN | COMMENT                           |
|-------------------------------------------------------------------------------|--------------|------|-----------------------------------|
| 8.4±17                                                                        | ROENCHEN 22  | DPWA | Multichannel                      |
| − 25 ±15                                                                      | CUTKOSKY 80  | IPWA | $\pi N \rightarrow \pi N$         |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |              |      |                                   |
| − 96                                                                          | ROENCHEN 15A | DPWA | Multichannel                      |
| − 139                                                                         | ARNDT 06     | DPWA | $\pi N \rightarrow \pi N, \eta N$ |

$\Delta(2400)$  INELASTIC POLE RESIDUE

The “normalized residue” is the residue divided by  $\Gamma_{pole}/2$ .

Normalized residue in  $N\pi \rightarrow \Delta(2400) \rightarrow \Sigma K$

| MODULUS                                                                       | PHASE (°) | DOCUMENT ID  | TECN | COMMENT      |
|-------------------------------------------------------------------------------|-----------|--------------|------|--------------|
| 0.004±0.003                                                                   | 17 ± 15   | ROENCHEN 22  | DPWA | Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |           |              |      |              |
| 0.009                                                                         | 25        | ROENCHEN 15A | DPWA | Multichannel |

Normalized residue in  $N\pi \rightarrow \Delta(2400) \rightarrow \Delta\pi$ , G-wave

| MODULUS                                                                       | PHASE ( $^{\circ}$ ) | DOCUMENT ID | TECN | COMMENT           |
|-------------------------------------------------------------------------------|----------------------|-------------|------|-------------------|
| $0.10 \pm 0.05$                                                               | $17 \pm 11$          | ROENCHEN    | 22   | DPWA Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                      |             |      |                   |
| 0.18                                                                          | $-110$               | ROENCHEN    | 15A  | DPWA Multichannel |

Normalized residue in  $N\pi \rightarrow \Delta(2400) \rightarrow \Delta\pi$ , I-wave

| MODULUS                                                                       | PHASE ( $^{\circ}$ ) | DOCUMENT ID | TECN | COMMENT           |
|-------------------------------------------------------------------------------|----------------------|-------------|------|-------------------|
| $0.019 \pm 0.003$                                                             | $-120 \pm 25$        | ROENCHEN    | 22   | DPWA Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                      |             |      |                   |
| 0.012                                                                         | $-1.0$               | ROENCHEN    | 15A  | DPWA Multichannel |

$\Delta(2400)$  BREIT-WIGNER MASS

| VALUE (MeV)    | DOCUMENT ID        | TECN | COMMENT                                |
|----------------|--------------------|------|----------------------------------------|
| $2643 \pm 141$ | <sup>1</sup> ARNDT | 06   | DPWA $\pi N \rightarrow \pi N, \eta N$ |
| $2300 \pm 100$ | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$         |
| $2468 \pm 50$  | HOEHLER            | 79   | IPWA $\pi N \rightarrow \pi N$         |

<sup>1</sup>Statistical error only.

$\Delta(2400)$  BREIT-WIGNER WIDTH

| VALUE (MeV)   | DOCUMENT ID        | TECN | COMMENT                                |
|---------------|--------------------|------|----------------------------------------|
| $895 \pm 432$ | <sup>2</sup> ARNDT | 06   | DPWA $\pi N \rightarrow \pi N, \eta N$ |
| $330 \pm 100$ | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$         |
| $480 \pm 100$ | HOEHLER            | 79   | IPWA $\pi N \rightarrow \pi N$         |

<sup>2</sup>Statistical error only.

$\Delta(2400)$  DECAY MODES

| Mode              | Fraction ( $\Gamma_i/\Gamma$ ) |
|-------------------|--------------------------------|
| $\Gamma_1$ $N\pi$ | 3–9 %                          |

$\Delta(2400)$  BRANCHING RATIOS

| $\Gamma(N\pi)/\Gamma_{\text{total}}$ | DOCUMENT ID        | TECN | COMMENT                                | $\Gamma_1/\Gamma$ |
|--------------------------------------|--------------------|------|----------------------------------------|-------------------|
| $6.4 \pm 2.2$                        | <sup>3</sup> ARNDT | 06   | DPWA $\pi N \rightarrow \pi N, \eta N$ |                   |
| $5 \pm 2$                            | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$         |                   |
| $6 \pm 3$                            | HOEHLER            | 79   | IPWA $\pi N \rightarrow \pi N$         |                   |

<sup>3</sup>Statistical error only.

**$\Delta(2400)$  PHOTON DECAY AMPLITUDES AT THE POLE**

**$\Delta(2400) \rightarrow N\gamma$ , helicity-1/2 amplitude  $A_{1/2}$**

| <i>MODULUS</i> ( $\text{GeV}^{-1/2}$ )                                        | <i>PHASE</i> ( $^\circ$ ) | <i>DOCUMENT ID</i> | <i>TECN</i> | <i>COMMENT</i>    |
|-------------------------------------------------------------------------------|---------------------------|--------------------|-------------|-------------------|
| $0.021 \pm 0.007$                                                             | $-67 \pm 12$              | ROENCHEN           | 22          | DPWA Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                           |                    |             |                   |
| $-0.034$                                                                      | 63                        | ROENCHEN           | 15A         | DPWA Multichannel |

**$\Delta(2400) \rightarrow N\gamma$ , helicity-3/2 amplitude  $A_{3/2}$**

| <i>MODULUS</i> ( $\text{GeV}^{-1/2}$ )                                        | <i>PHASE</i> ( $^\circ$ ) | <i>DOCUMENT ID</i> | <i>TECN</i> | <i>COMMENT</i>    |
|-------------------------------------------------------------------------------|---------------------------|--------------------|-------------|-------------------|
| $0.022 \pm 0.007$                                                             | $122 \pm 7$               | ROENCHEN           | 22          | DPWA Multichannel |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                           |                    |             |                   |
| 0.054                                                                         | $-75$                     | ROENCHEN           | 15A         | DPWA Multichannel |

**$\Delta(2400)$  REFERENCES**

|          |     |                  |                             |                    |
|----------|-----|------------------|-----------------------------|--------------------|
| ROENCHEN | 22  | EPJ A58 229      | D. Roenchen <i>et al.</i>   | (JULI, GWU, BONN+) |
| ROENCHEN | 15A | EPJ A51 70       | D. Roenchen <i>et al.</i>   |                    |
| ARNDT    | 06  | PR C74 045205    | R.A. Arndt <i>et al.</i>    | (GWU)              |
| CUTKOSKY | 80  | Toronto Conf. 19 | R.E. Cutkosky <i>et al.</i> | (CMU, LBL) IJP     |
| Also     |     | PR D20 2839      | R.E. Cutkosky <i>et al.</i> | (CMU, LBL)         |
| HOEHLER  | 79  | PDAT 12-1        | G. Hohler <i>et al.</i>     | (KARLT) IJP        |
| Also     |     | Toronto Conf. 3  | R. Koch                     | (KARLT) IJP        |