

$\Delta(2000) 5/2^+$  $I(J^P) = \frac{3}{2}(\frac{5}{2}^+)$  Status: \*\*

NODE=B139

OMITTED FROM SUMMARY TABLE

 **$\Delta(2000)$  POLE POSITION**

NODE=B139215

**REAL PART**

| VALUE (MeV)                                                                   | DOCUMENT ID        | TECN | COMMENT                        |
|-------------------------------------------------------------------------------|--------------------|------|--------------------------------|
| 1998 $\pm$ 4 $\pm$ 4                                                          | <sup>1</sup> SVARC | 14   | L+P $\pi N \rightarrow \pi N$  |
| 1976                                                                          | SHRESTHA           | 12A  | DPWA Multichannel              |
| 2150 $\pm$ 100                                                                | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                    |      |                                |
| 1697                                                                          | VRANA              | 00   | DPWA Multichannel              |

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.NODE=B139RE  
NODE=B139RE

OCCUR=2

NODE=B139RE;LINKAGE=SV

**−2×IMAGINARY PART**

| VALUE (MeV)                                                                   | DOCUMENT ID        | TECN | COMMENT                        |
|-------------------------------------------------------------------------------|--------------------|------|--------------------------------|
| 404 $\pm$ 10 $\pm$ 4                                                          | <sup>1</sup> SVARC | 14   | L+P $\pi N \rightarrow \pi N$  |
| 350 $\pm$ 100                                                                 | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                    |      |                                |
| 488                                                                           | SHRESTHA           | 12A  | DPWA Multichannel              |
| 112                                                                           | VRANA              | 00   | DPWA Multichannel              |

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.NODE=B139IM  
NODE=B139IM

OCCUR=2

NODE=B139IM;LINKAGE=SV

 **$\Delta(2000)$  ELASTIC POLE RESIDUE**

NODE=B139220

**MODULUS  $|r|$** 

| VALUE (MeV)        | DOCUMENT ID        | TECN | COMMENT                        |
|--------------------|--------------------|------|--------------------------------|
| 34 $\pm$ 1 $\pm$ 1 | <sup>1</sup> SVARC | 14   | L+P $\pi N \rightarrow \pi N$  |
| 16 $\pm$ 5         | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$ |

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.NODE=B139RER  
NODE=B139RER

OCCUR=2

NODE=B139RER;LINKAGE=SV

**PHASE  $\theta$** 

| VALUE (°)           | DOCUMENT ID        | TECN | COMMENT                        |
|---------------------|--------------------|------|--------------------------------|
| 110 $\pm$ 1 $\pm$ 3 | <sup>1</sup> SVARC | 14   | L+P $\pi N \rightarrow \pi N$  |
| 150 $\pm$ 90        | CUTKOSKY           | 80   | IPWA $\pi N \rightarrow \pi N$ |

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.NODE=B139IMR  
NODE=B139IMR

OCCUR=2

NODE=B139IMR;LINKAGE=SV

 **$\Delta(2000)$  BREIT-WIGNER MASS**

NODE=B139M

| VALUE (MeV)                                                                   | DOCUMENT ID           | TECN | COMMENT                                    |
|-------------------------------------------------------------------------------|-----------------------|------|--------------------------------------------|
| 2015 $\pm$ 24                                                                 | <sup>1</sup> SHRESTHA | 12A  | DPWA Multichannel                          |
| 2200 $\pm$ 125                                                                | CUTKOSKY              | 80   | IPWA $\pi N \rightarrow \pi N$             |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                       |      |                                            |
| 1724 $\pm$ 61                                                                 | VRANA                 | 00   | DPWA Multichannel                          |
| 1752 $\pm$ 32                                                                 | MANLEY                | 92   | IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$ |

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

NODE=B139M

OCCUR=2

NODE=B139M;LINKAGE=A

 **$\Delta(2000)$  BREIT-WIGNER WIDTH**

NODE=B139W

| VALUE (MeV)                                                                   | DOCUMENT ID           | TECN | COMMENT                                    |
|-------------------------------------------------------------------------------|-----------------------|------|--------------------------------------------|
| 500 $\pm$ 52                                                                  | <sup>1</sup> SHRESTHA | 12A  | DPWA Multichannel                          |
| 400 $\pm$ 125                                                                 | CUTKOSKY              | 80   | IPWA $\pi N \rightarrow \pi N$             |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                       |      |                                            |
| 138 $\pm$ 68                                                                  | VRANA                 | 00   | DPWA Multichannel                          |
| 251 $\pm$ 93                                                                  | MANLEY                | 92   | IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$ |

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

NODE=B139W

OCCUR=2

NODE=B139W;LINKAGE=A

**$\Delta(2000)$  DECAY MODES**

NODE=B139225;NODE=B139

| Mode                                     | Fraction ( $\Gamma_i/\Gamma$ ) |
|------------------------------------------|--------------------------------|
| $\Gamma_1$ $N\pi$                        | 3–11 %                         |
| $\Gamma_2$ $N\pi\pi$                     | >87 %                          |
| $\Gamma_3$ $\Delta(1232)\pi$             | <9 %                           |
| $\Gamma_4$ $\Delta(1232)\pi$ , $P$ -wave | <6 %                           |
| $\Gamma_5$ $\Delta(1232)\pi$ , $F$ -wave | <3 %                           |
| $\Gamma_6$ $N\rho$ , $S=3/2$ , $P$ -wave | seen                           |
| $\Gamma_7$ $N(1440)\pi$                  |                                |
| $\Gamma_8$ $N(1520)\pi$ , $S$ -wave      |                                |
| $\Gamma_9$ $N(1535)\pi$                  |                                |
| $\Gamma_{10}$ $N\gamma$                  |                                |
| $\Gamma_{11}$ $N\gamma$ , helicity=1/2   | seen                           |
| $\Gamma_{12}$ $N\gamma$ , helicity=3/2   | seen                           |

DESIG=1;OUR EST  
DESIG=3;OUR EST  
DESIG=7;OUR EST  
DESIG=11;OUR EST  
DESIG=12;OUR EST  
DESIG=2;OUR EST  
DESIG=13  
DESIG=14  
DESIG=15  
DESIG=4  
DESIG=5;OUR EST  
DESIG=6;OUR EST

 **$\Delta(2000)$  BRANCHING RATIOS**

NODE=B139230

| $\Gamma(N\pi)/\Gamma_{\text{total}}$                                          |                       |      |         |                                       | $\Gamma_1/\Gamma$ |
|-------------------------------------------------------------------------------|-----------------------|------|---------|---------------------------------------|-------------------|
| VALUE (%)                                                                     | DOCUMENT ID           | TECN | COMMENT |                                       |                   |
| 11±5                                                                          | SEIFEN                | 25   | DPWA    | Multichannel                          |                   |
| 7±1                                                                           | <sup>1</sup> SHRESTHA | 12A  | DPWA    | Multichannel                          |                   |
| 7±4                                                                           | CUTKOSKY              | 80   | IPWA    | $\pi N \rightarrow \pi N$             |                   |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● |                       |      |         |                                       |                   |
| 0±1                                                                           | VRANA                 | 00   | DPWA    | Multichannel                          |                   |
| 2±1                                                                           | MANLEY                | 92   | IPWA    | $\pi N \rightarrow \pi N$ & $N\pi\pi$ |                   |
| <sup>1</sup> Statistical error only.                                          |                       |      |         |                                       |                   |

NODE=B139R2  
NODE=B139R2

OCCUR=2

NODE=B139R2;LINKAGE=A

| $\Gamma(\Delta(1232)\pi, P\text{-wave})/\Gamma_{\text{total}}$                |                       |      |         |              | $\Gamma_4/\Gamma$ |
|-------------------------------------------------------------------------------|-----------------------|------|---------|--------------|-------------------|
| VALUE (%)                                                                     | DOCUMENT ID           | TECN | COMMENT |              |                   |
| 14±6                                                                          | SEIFEN                | 25   | DPWA    | Multichannel |                   |
| 3±3                                                                           | <sup>1</sup> SHRESTHA | 12A  | DPWA    | Multichannel |                   |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● |                       |      |         |              |                   |
| 0±1                                                                           | VRANA                 | 00   | DPWA    | Multichannel |                   |
| <sup>1</sup> Statistical error only.                                          |                       |      |         |              |                   |

NODE=B139R5  
NODE=B139R5

NODE=B139R5;LINKAGE=A

| $\Gamma(\Delta(1232)\pi, F\text{-wave})/\Gamma_{\text{total}}$                |             |     |      |              | $\Gamma_5/\Gamma$ |
|-------------------------------------------------------------------------------|-------------|-----|------|--------------|-------------------|
| VALUE (%)                                                                     | DOCUMENT ID |     | TECN | COMMENT      |                   |
| $3\pm 2$                                                                      | SEIFEN      | 25  | DPWA | Multichannel |                   |
| $< 3$                                                                         | SHRESTHA    | 12A | DPWA | Multichannel |                   |
| • • • We do not use the following data for averages, fits, limits, etc. • • • |             |     |      |              |                   |
| $40\pm 1$                                                                     | VRANA       | 00  | DPWA | Multichannel |                   |

NODE=B139R6  
NODE=B139R6

| $\Gamma(N\rho, S=3/2, P\text{-wave})/\Gamma_{\text{total}}$                   |                       |      |         |              | $\Gamma_6/\Gamma$ |
|-------------------------------------------------------------------------------|-----------------------|------|---------|--------------|-------------------|
| VALUE (%)                                                                     | DOCUMENT ID           | TECN | COMMENT |              |                   |
| 90 ± 3                                                                        | <sup>1</sup> SHRESTHA | 12A  | DPWA    | Multichannel |                   |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● |                       |      |         |              |                   |
| 60 ± 60                                                                       | VRANA                 | 00   | DPWA    | Multichannel |                   |
| <sup>1</sup> Statistical error only.                                          |                       |      |         |              |                   |

NODE=B139R7  
NODE=B139R7

NODE=B139R7;LINKAGE=A

| $\Gamma(N(1440)\pi)/\Gamma_{\text{total}}$ |             |      |         |              | $\Gamma_7/\Gamma$ |
|--------------------------------------------|-------------|------|---------|--------------|-------------------|
| VALUE (%)                                  | DOCUMENT ID | TECN | COMMENT |              |                   |
| 9±6                                        | SEIFEN      | 25   | DPWA    | Multichannel |                   |

NODE=B139R00  
NODE=B139R00

| $\Gamma(N(1520)\pi, S\text{-wave})/\Gamma_{\text{total}}$ |             |      |         |              | $\Gamma_8/\Gamma$ |
|-----------------------------------------------------------|-------------|------|---------|--------------|-------------------|
| VALUE (%)                                                 | DOCUMENT ID | TECN | COMMENT |              |                   |
| <1                                                        | SEIFEN      | 25   | DPWA    | Multichannel |                   |

NODE=B139R01  
NODE=B139R01

| $\Gamma(N(1535)\pi)/\Gamma_{\text{total}}$ |             |      |         |              | $\Gamma_9/\Gamma$ |
|--------------------------------------------|-------------|------|---------|--------------|-------------------|
| VALUE (%)                                  | DOCUMENT ID | TECN | COMMENT |              |                   |
| <1                                         | SEIFEN      | 25   | DPWA    | Multichannel |                   |

NODE=B139R02  
NODE=B139R02

**$\Delta(2000)$  BREIT-WIGNER PHOTON DECAY AMPLITUDES**

**$\Delta(2000) \rightarrow p\gamma$ , helicity-1/2 amplitude  $A_{1/2}$**

| VALUE (GeV <sup>-1/2</sup> )                                                  | DOCUMENT ID           | TECN | COMMENT           |
|-------------------------------------------------------------------------------|-----------------------|------|-------------------|
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                       |      |                   |
| -0.061±0.018                                                                  | <sup>1</sup> SHRESTHA | 12A  | DPWA Multichannel |
| <sup>1</sup> Statistical error only.                                          |                       |      |                   |

**$\Delta(2000) \rightarrow p\gamma$ , helicity-3/2 amplitude  $A_{3/2}$**

| VALUE (GeV <sup>-1/2</sup> )                                                  | DOCUMENT ID           | TECN | COMMENT           |
|-------------------------------------------------------------------------------|-----------------------|------|-------------------|
| • • • We do not use the following data for averages, fits, limits, etc. • • • |                       |      |                   |
| 0.158±0.032                                                                   | <sup>1</sup> SHRESTHA | 12A  | DPWA Multichannel |
| <sup>1</sup> Statistical error only.                                          |                       |      |                   |

**$\Delta(2000)$  REFERENCES**

|          |     |                  |                                      |                         |
|----------|-----|------------------|--------------------------------------|-------------------------|
| SEIFEN   | 25  | EPJ A61 173      | T. Seifen <i>et al.</i>              | (CBELSA/TAPS Collab.)   |
| SVARC    | 14  | PR C89 045205    | A. Svarc <i>et al.</i>               | (RBI Zagreb, UNI Tuzla) |
| SHRESTHA | 12A | PR C86 055203    | M. Shrestha, D.M. Manley             | (KSU)                   |
| VRANA    | 00  | PRPL 328 181     | T.P. Vrana, S.A. Dytman, T.-S.H. Lee | (PITT, ANL)             |
| MANLEY   | 92  | PR D45 4002      | D.M. Manley, E.M. Saleski            | (KSA) IJP               |
| Also     |     | PR D30 904       | D.M. Manley <i>et al.</i>            | (VPI)                   |
| CUTKOSKY | 80  | Toronto Conf. 19 | R.E. Cutkosky <i>et al.</i>          | (CMU, LBL)              |
| 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)                 |

NODE=B139235

NODE=B139A01  
NODE=B139A01

NODE=B139A01;LINKAGE=A

NODE=B139A02  
NODE=B139A02

NODE=B139A02;LINKAGE=A

NODE=B139

REFID=63593  
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