

$N(1680) 5/2^+$ $I(J^P) = \frac{1}{2}(5^+)$ Status: ****Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics **C38** 070001 (2014). **$N(1680)$ POLE POSITION****REAL PART**

| <u>VALUE (MeV)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|--|
| 1665 to 1680 (\approx 1675) OUR ESTIMATE | | | |
| 1678 \pm 5 | SOKHOYAN | 15A | DPWA Multichannel |
| 1674 \pm 2 \pm 1 | ¹ SVARC | 14 | L+P $\pi N \rightarrow \pi N$ |
| 1667 \pm 5 | CUTKOSKY | 80 | IPWA $\pi N \rightarrow \pi N$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 1669 | ROENCHEN | 15A | DPWA Multichannel |
| 1660 | SHKLYAR | 13 | DPWA Multichannel |
| 1676 \pm 6 | ANISOVICH | 12A | DPWA Multichannel |
| 1669 | SHRESTHA | 12A | DPWA Multichannel |
| 1666 \pm 8 | BATINIC | 10 | DPWA $\pi N \rightarrow N\pi, N\eta$ |
| 1674 | ARNDT | 06 | DPWA $\pi N \rightarrow \pi N, \eta N$ |
| 1667 | VRANA | 00 | DPWA Multichannel |
| 1673 | HOEHLER | 93 | ARGD $\pi N \rightarrow \pi N$ |

¹Fit to the amplitudes of HOEHLER 79.**-2xIMAGINARY PART**

| <u>VALUE (MeV)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|--------------------|-------------|--|
| 110 to 135 (\approx 120) OUR ESTIMATE | | | |
| 113 \pm 4 | SOKHOYAN | 15A | DPWA Multichannel |
| 129 \pm 3 \pm 1 | ¹ SVARC | 14 | L+P $\pi N \rightarrow \pi N$ |
| 110 \pm 10 | CUTKOSKY | 80 | IPWA $\pi N \rightarrow \pi N$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 100 | ROENCHEN | 15A | DPWA Multichannel |
| 98 | SHKLYAR | 13 | DPWA Multichannel |
| 113 \pm 4 | ANISOVICH | 12A | DPWA Multichannel |
| 119 | SHRESTHA | 12A | DPWA Multichannel |
| 135 \pm 6 | BATINIC | 10 | DPWA $\pi N \rightarrow N\pi, N\eta$ |
| 115 | ARNDT | 06 | DPWA $\pi N \rightarrow \pi N, \eta N$ |
| 122 | VRANA | 00 | DPWA Multichannel |
| 135 | HOEHLER | 93 | ARGD $\pi N \rightarrow \pi N$ |

¹Fit to the amplitudes of HOEHLER 79. **$N(1680)$ ELASTIC POLE RESIDUE****MODULUS $|r|$**

| <u>VALUE (MeV)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--|--------------------|-------------|--------------------------------|
| 35 to 45 (\approx 40) OUR ESTIMATE | | | |
| 45 \pm 4 | SOKHOYAN | 15A | DPWA Multichannel |
| 44 \pm 1 \pm 1 | ¹ SVARC | 14 | L+P $\pi N \rightarrow \pi N$ |
| 34 \pm 2 | CUTKOSKY | 80 | IPWA $\pi N \rightarrow \pi N$ |

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | | |
|------|-----------|-----|------|-----------------------------------|
| 34 | ROENCHEN | 15A | DPWA | Multichannel |
| 33 | SHKLYAR | 13 | DPWA | Multichannel |
| 43±4 | ANISOVICH | 12A | DPWA | Multichannel |
| 44 | BATINIC | 10 | DPWA | $\pi N \rightarrow N\pi, N\eta$ |
| 42 | ARNDT | 06 | DPWA | $\pi N \rightarrow \pi N, \eta N$ |
| 44 | HOEHLER | 93 | ARGD | $\pi N \rightarrow \pi N$ |

¹ Fit to the amplitudes of HOEHLER 79.

PHASE θ

| <u>VALUE (°)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------|--------------------|-------------|----------------|
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−20 to 10 (≈ -5) OUR ESTIMATE

| | | | | |
|----------|--------------------|-----|------|---------------------------|
| 5±10 | SOKHOYAN | 15A | DPWA | Multichannel |
| −16± 1±1 | ¹ SVARC | 14 | L+P | $\pi N \rightarrow \pi N$ |
| −25± 5 | CUTKOSKY | 80 | IPWA | $\pi N \rightarrow \pi N$ |

• • • We do not use the following data for averages, fits, limits, etc. • • •

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|--------|-----------|-----|------|-----------------------------------|
| −19 | ROENCHEN | 15A | DPWA | Multichannel |
| −32 | SHKLYAR | 13 | DPWA | Multichannel |
| − 2±10 | ANISOVICH | 12A | DPWA | Multichannel |
| −19 | BATINIC | 10 | DPWA | $\pi N \rightarrow N\pi, N\eta$ |
| − 4 | ARNDT | 06 | DPWA | $\pi N \rightarrow \pi N, \eta N$ |
| −17 | HOEHLER | 93 | ARGD | $\pi N \rightarrow \pi N$ |

¹ Fit to the amplitudes of HOEHLER 79.

$N(1680)$ INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(1680) \rightarrow \Delta\pi, P$ -wave

| <u>MODULUS</u> | <u>PHASE (°)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------|------------------|--------------------|-------------|----------------|
|----------------|------------------|--------------------|-------------|----------------|

| | | | | |
|-----------|----------|----------|-----|-------------------|
| 0.15±0.03 | −60 ± 30 | SOKHOYAN | 15A | DPWA Multichannel |
|-----------|----------|----------|-----|-------------------|

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | | |
|-----------|----------|-----------|-----|-------------------|
| 0.15±0.03 | −70 ± 45 | ANISOVICH | 12A | DPWA Multichannel |
|-----------|----------|-----------|-----|-------------------|

Normalized residue in $N\pi \rightarrow N(1680) \rightarrow \Delta\pi, F$ -wave

| <u>MODULUS</u> | <u>PHASE (°)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------|------------------|--------------------|-------------|----------------|
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|-----------|---------|----------|-----|-------------------|
| 0.23±0.04 | 90 ± 12 | SOKHOYAN | 15A | DPWA Multichannel |
|-----------|---------|----------|-----|-------------------|

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | | |
|-----------|---------|-----------|-----|-------------------|
| 0.23±0.04 | 85 ± 15 | ANISOVICH | 12A | DPWA Multichannel |
|-----------|---------|-----------|-----|-------------------|

Normalized residue in $N\pi \rightarrow N(1680) \rightarrow N\eta$

| <u>MODULUS</u> | <u>PHASE (°)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------|------------------|--------------------|-------------|----------------|
|----------------|------------------|--------------------|-------------|----------------|

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | | |
|-------|-----|----------|-----|-------------------|
| 0.027 | 136 | ROENCHEN | 15A | DPWA Multichannel |
|-------|-----|----------|-----|-------------------|

Normalized residue in $N\pi \rightarrow N(1680) \rightarrow \Lambda K$

| <u>MODULUS</u> | <u>PHASE (°)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------|------------------|--------------------|-------------|----------------|
|----------------|------------------|--------------------|-------------|----------------|

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | | |
|-------|----|----------|-----|-------------------|
| 0.001 | 90 | ROENCHEN | 15A | DPWA Multichannel |
|-------|----|----------|-----|-------------------|

Normalized residue in $N\pi \rightarrow N(1680) \rightarrow \Sigma K$

| <u>MODULUS</u> | <u>PHASE ($^\circ$)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------|------------------------------------|--------------------|-------------|----------------|
| 0.004 | 148 | ROENCHEN | 15A DPWA | Multichannel |

Normalized residue in $N\pi \rightarrow N(1680) \rightarrow N(\pi\pi)_{S\text{-wave}}^{I=0}$

| <u>MODULUS</u> | <u>PHASE ($^\circ$)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------|------------------------------------|--------------------|-------------|----------------|
| 0.29 ± 0.06 | -45 ± 15 | SOKHOYAN | 15A DPWA | Multichannel |
| 0.26 ± 0.04 | -56 ± 15 | ANISOVICH | 12A DPWA | Multichannel |

 $N(1680)$ BREIT-WIGNER MASS

| <u>VALUE (MeV)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|--------------------------------------|
| 1680 to 1690 (≈ 1685) OUR ESTIMATE | | | |
| 1686 ± 5 | GOLOVATCH | 19 DPWA | $\gamma p \rightarrow \pi^+ \pi^- p$ |
| 1690 ± 5 | SOKHOYAN | 15A DPWA | Multichannel |
| 1676 ± 2 | ¹ SHKLYAR | 13 DPWA | Multichannel |
| 1682.7 ± 0.5 | ¹ SHRESTHA | 12A DPWA | Multichannel |
| 1680.1 ± 0.2 | ¹ ARNDT | 06 DPWA | $\pi N \rightarrow \pi N, \eta N$ |
| 1680 ± 10 | CUTKOSKY | 80 IPWA | $\pi N \rightarrow \pi N$ |
| 1684 ± 3 | HOEHLER | 79 IPWA | $\pi N \rightarrow \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 1689 ± 6 | ANISOVICH | 12A DPWA | Multichannel |
| 1680 ± 7 | BATINIC | 10 DPWA | $\pi N \rightarrow N\pi, N\eta$ |
| 1679 ± 3 | VRANA | 00 DPWA | Multichannel |

¹Statistical error only. **$N(1680)$ BREIT-WIGNER WIDTH**

| <u>VALUE (MeV)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-----------------------|-------------|--------------------------------------|
| 115 to 130 (≈ 120) OUR ESTIMATE | | | |
| 118 ± 20 | GOLOVATCH | 19 DPWA | $\gamma p \rightarrow \pi^+ \pi^- p$ |
| 119 ± 4 | SOKHOYAN | 15A DPWA | Multichannel |
| 115 ± 1 | ¹ SHKLYAR | 13 DPWA | Multichannel |
| 126 ± 1 | ¹ SHRESTHA | 12A DPWA | Multichannel |
| 128.0 ± 1.1 | ¹ ARNDT | 06 DPWA | $\pi N \rightarrow \pi N, \eta N$ |
| 120 ± 10 | CUTKOSKY | 80 IPWA | $\pi N \rightarrow \pi N$ |
| 128 ± 8 | HOEHLER | 79 IPWA | $\pi N \rightarrow \pi N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 118 ± 6 | ANISOVICH | 12A DPWA | Multichannel |
| 142 ± 7 | BATINIC | 10 DPWA | $\pi N \rightarrow N\pi, N\eta$ |
| 128 ± 9 | VRANA | 00 DPWA | Multichannel |

¹Statistical error only.

$N(1680)$ DECAY MODES

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

| Mode | Fraction (Γ_i/Γ) |
|--|--------------------------------|
| Γ_1 $N\pi$ | 60–70 % |
| Γ_2 $N\eta$ | <1 % |
| Γ_3 $N\pi\pi$ | 20–40 % |
| Γ_4 $\Delta(1232)\pi$ | 11–23 % |
| Γ_5 $\Delta(1232)\pi$, P -wave | 4–10 % |
| Γ_6 $\Delta(1232)\pi$, F -wave | 1–13 % |
| Γ_7 $N\sigma$ | 9–19 % |
| Γ_8 $p\gamma$ | 0.21–0.32 % |
| Γ_9 $p\gamma$, helicity=1/2 | 0.001–0.011 % |
| Γ_{10} $p\gamma$, helicity=3/2 | 0.20–0.32 % |
| Γ_{11} $n\gamma$ | 0.021–0.046 % |
| Γ_{12} $n\gamma$, helicity=1/2 | 0.004–0.029 % |
| Γ_{13} $n\gamma$, helicity=3/2 | 0.01–0.024 % |

 $N(1680)$ BRANCHING RATIOS

| $\Gamma(N\pi)/\Gamma_{\text{total}}$ | | | | | Γ_1/Γ |
|---|-----------------------|------|---------|-----------------------------------|-------------------|
| VALUE (%) | DOCUMENT ID | TECN | COMMENT | | |
| 60 to 70 (≈ 65) OUR ESTIMATE | | | | | |
| 62 ± 4 | SOKHOYAN | 15A | DPWA | Multichannel | |
| 68 ± 1 | ¹ SHKLYAR | 13 | DPWA | Multichannel | |
| 68.0 \pm 0.5 | ¹ SHRESTHA | 12A | DPWA | Multichannel | |
| 70.1 \pm 0.1 | ¹ ARNDT | 06 | DPWA | $\pi N \rightarrow \pi N, \eta N$ | |
| 62 ± 5 | CUTKOSKY | 80 | IPWA | $\pi N \rightarrow \pi N$ | |
| 65 ± 2 | HOEHLER | 79 | IPWA | $\pi N \rightarrow \pi N$ | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 64 ± 5 | ANISOVICH | 12A | DPWA | Multichannel | |
| 67 ± 3 | BATINIC | 10 | DPWA | $\pi N \rightarrow N\pi, N\eta$ | |
| 69 ± 2 | VRANA | 00 | DPWA | Multichannel | |

¹Statistical error only.

| $\Gamma(N\eta)/\Gamma_{\text{total}}$ | | | | | Γ_2/Γ |
|---|-----------------------|------|---------|---------------------------------|-------------------|
| VALUE (%) | DOCUMENT ID | TECN | COMMENT | | |
| <1 | SHKLYAR | 13 | DPWA | Multichannel | |
| 1.0 \pm 0.3 | ¹ SHRESTHA | 12A | DPWA | Multichannel | |
| 0.15 ^{+0.35} _{-0.10} | TIATOR | 99 | DPWA | $\gamma p \rightarrow p\eta$ | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.4 \pm 0.2 | BATINIC | 10 | DPWA | $\pi N \rightarrow N\pi, N\eta$ | |
| <1 | THOMA | 08 | DPWA | Multichannel | |
| 0 \pm 1 | VRANA | 00 | DPWA | Multichannel | |

¹Statistical error only.

$\Gamma(N\pi\pi)/\Gamma_{\text{total}}$ Γ_3/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|------------------|--------------------|-------------|--------------------------------------|
| 0.24±0.04 | GOLOVATCH 19 | DPWA | $\gamma p \rightarrow \pi^+ \pi^- p$ |

 $\Gamma(\Delta(1232)\pi, P\text{-wave})/\Gamma_{\text{total}}$ Γ_5/Γ

| <u>VALUE (%)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------------|-------------|----------------|
| 7 ±3 | SOKHOYAN 15A | DPWA | Multichannel |
| 10.5±0.9 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 5 ±3 | ANISOVICH 12A | DPWA | Multichannel |
| 14 ±3 | VRANA 00 | DPWA | Multichannel |

¹Statistical error only. $\Gamma(\Delta(1232)\pi, F\text{-wave})/\Gamma_{\text{total}}$ Γ_6/Γ

| <u>VALUE (%)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------------|-------------|----------------|
| 10 ±3 | SOKHOYAN 15A | DPWA | Multichannel |
| 1.0±0.1 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 10 ±3 | ANISOVICH 12A | DPWA | Multichannel |
| 1 ±1 | VRANA 00 | DPWA | Multichannel |

¹Statistical error only. $\Gamma(N\sigma)/\Gamma_{\text{total}}$ Γ_7/Γ

| <u>VALUE (%)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|---------------------------|-------------|----------------|
| 14 ±5 | SOKHOYAN 15A | DPWA | Multichannel |
| 9.4±0.8 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 14 ±7 | ANISOVICH 12A | DPWA | Multichannel |
| 9 ±1 | VRANA 00 | DPWA | Multichannel |

¹Statistical error only. **$N(1680)$ PHOTON DECAY AMPLITUDES AT THE POLE** **$N(1680) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$**

| <u>MODULUS ($\text{GeV}^{-1/2}$)</u> | <u>PHASE ($^\circ$)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------------------------------|--------------------|-------------|----------------|
| -0.013±0.003 | -20 ± 17 | SOKHOYAN 15A | DPWA | Multichannel |
| -0.013 ^{+0.002} _{-0.005} | -42 ⁺⁹ ₋₁₈ | ROENCHEN 14 | DPWA | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| -0.022 | -28 | ROENCHEN 15A | DPWA | Multichannel |

 $N(1680) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

| <u>MODULUS ($\text{GeV}^{-1/2}$)</u> | <u>PHASE ($^\circ$)</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|------------------------------------|--------------------|-------------|----------------|
| 0.135±0.005 | 1 ± 3 | SOKHOYAN 15A | DPWA | Multichannel |
| 0.126 ^{+0.001} _{-0.002} | -7 ⁺³ ₋₂ | ROENCHEN 14 | DPWA | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 0.102 | -11 | ROENCHEN 15A | DPWA | Multichannel |

$N(1680)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES **$N(1680) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$**

| VALUE (GeV ^{-1/2}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------------|------|--------------------------------------|
| -0.018 to -0.005 (≈ -0.010) OUR ESTIMATE | | | |
| -0.0278 ± 0.0036 | GOLOVATCH 19 | DPWA | $\gamma p \rightarrow \pi^+ \pi^- p$ |
| -0.015 ± 0.002 | SOKHOYAN 15A | DPWA | Multichannel |
| 0.003 ± 0.001 | ¹ SHKLYAR 13 | DPWA | Multichannel |
| -0.007 ± 0.002 | ¹ WORKMAN 12A | DPWA | $\gamma N \rightarrow N\pi$ |
| -0.017 ± 0.001 | ¹ DUGGER 07 | DPWA | $\gamma N \rightarrow \pi N$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.013 ± 0.003 | ANISOVICH 12A | DPWA | Multichannel |
| -0.017 ± 0.001 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| -0.025 | DRECHSEL 07 | DPWA | $\gamma N \rightarrow \pi N$ |
| ¹ Statistical error only. | | | |

 $N(1680) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

| VALUE (GeV ^{-1/2}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------------|------|--------------------------------------|
| 0.130 to 0.140 (≈ 0.135) OUR ESTIMATE | | | |
| 0.128 ± 0.011 | GOLOVATCH 19 | DPWA | $\gamma p \rightarrow \pi^+ \pi^- p$ |
| 0.136 ± 0.005 | SOKHOYAN 15A | DPWA | Multichannel |
| 0.116 ± 0.001 | ¹ SHKLYAR 13 | DPWA | Multichannel |
| 0.140 ± 0.002 | ¹ WORKMAN 12A | DPWA | $\gamma N \rightarrow N\pi$ |
| 0.134 ± 0.002 | ¹ DUGGER 07 | DPWA | $\gamma N \rightarrow \pi N$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.135 ± 0.006 | ANISOVICH 12A | DPWA | Multichannel |
| 0.136 ± 0.001 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| 0.134 | DRECHSEL 07 | DPWA | $\gamma N \rightarrow \pi N$ |
| ¹ Statistical error only. | | | |

 $N(1680) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

| VALUE (GeV ^{-1/2}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------------|------|------------------------------|
| 0.020 to 0.040 (≈ 0.030) OUR ESTIMATE | | | |
| 0.034 ± 0.006 | ANISOVICH 13B | DPWA | Multichannel |
| 0.026 ± 0.004 | ¹ CHEN 12A | DPWA | $\gamma N \rightarrow \pi N$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.029 ± 0.002 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| 0.028 | DRECHSEL 07 | DPWA | $\gamma N \rightarrow \pi N$ |
| ¹ Statistical error only. | | | |

 $N(1680) \rightarrow n\gamma$, helicity-3/2 amplitude $A_{3/2}$

| VALUE (GeV ^{-1/2}) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------------|------|------------------------------|
| -0.050 to -0.025 (≈ -0.035) OUR ESTIMATE | | | |
| -0.044 ± 0.009 | ANISOVICH 13B | DPWA | Multichannel |
| -0.029 ± 0.002 | ¹ CHEN 12A | DPWA | $\gamma N \rightarrow \pi N$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| -0.059 ± 0.002 | ¹ SHRESTHA 12A | DPWA | Multichannel |
| -0.038 | DRECHSEL 07 | DPWA | $\gamma N \rightarrow \pi N$ |

¹ Statistical error only.**N(1680) REFERENCES**

For early references, see Physics Letters **111B** 1 (1982). For very early references, see Reviews of Modern Physics **37** 633 (1965).

| | | | | |
|-----------|-----|------------------------|--------------------------------------|--------------------------|
| GOLOVATCH | 19 | PL B788 371 | E. Golovatch <i>et al.</i> | (CLAS Collab.) |
| ROENCHEN | 15A | EPJ A51 70 | D. Roenchen <i>et al.</i> | |
| SOKHOYAN | 15A | EPJ A51 95 | V. Sokhoyan <i>et al.</i> | (CBELSA/TAPS Collab.) |
| PDG | 14 | CP C38 070001 | K. Olive <i>et al.</i> | (PDG Collab.) |
| ROENCHEN | 14 | EPJ A50 101 | D. Roenchen <i>et al.</i> | |
| Also | | EPJ A51 63 (errat.) | D. Roenchen <i>et al.</i> | |
| SVARC | 14 | PR C89 045205 | A. Svarc <i>et al.</i> | (RBI Zagreb, UNI Tuzla) |
| ANISOVICH | 13B | EPJ A49 67 | A.V. Anisovich <i>et al.</i> | |
| SHKLYAR | 13 | PR C87 015201 | V. Shklyar, H. Lenske, U. Mosel | (GIES) |
| ANISOVICH | 12A | EPJ A48 15 | A.V. Anisovich <i>et al.</i> | (BONN, PNPI) |
| CHEN | 12A | PR C86 015206 | W. Chen <i>et al.</i> | (DUKE, GWU, MSST, ITEP+) |
| SHRESTHA | 12A | PR C86 055203 | M. Shrestha, D.M. Manley | (KSU) |
| WORKMAN | 12A | PR C86 015202 | R. Workman <i>et al.</i> | (GWU) |
| BATINIC | 10 | PR C82 038203 | M. Batinic <i>et al.</i> | (ZAGR) |
| THOMA | 08 | PL B659 87 | U. Thoma <i>et al.</i> | (CB-ELSA Collab.) |
| DRECHSEL | 07 | EPJ A34 69 | D. Drechsel, S.S. Kamalov, L. Tiator | (MAINZ, JINR) |
| DUGGER | 07 | PR C76 025211 | M. Dugger <i>et al.</i> | (JLab CLAS Collab.) |
| ARNDT | 06 | PR C74 045205 | R.A. Arndt <i>et al.</i> | (GWU) |
| VRANA | 00 | PRPL 328 181 | T.P. Vrana, S.A. Dytman, T.-S.H. Lee | (PITT, ANL) |
| TIATOR | 99 | PR C60 035210 | L. Tiator <i>et al.</i> | |
| HOEHLER | 93 | πN Newsletter 9 1 | G. Hohler | (KARL) |
| 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) IJP |
| HOEHLER | 79 | PDAT 12-1 | G. Hohler <i>et al.</i> | (KARLT) IJP |
| Also | | Toronto Conf. 3 | R. Koch | (KARLT) IJP |