\[ N(1650) S_{11} \]

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

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).

### N(1650) BREIT-WIGNER MASS

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1640 to 1680 (≈ 1650) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1659± 9</td>
<td>MANLEY 92</td>
<td>IPWA</td>
<td>[ \pi N \rightarrow \pi N &amp; N\pi ]</td>
</tr>
<tr>
<td>1650± 30</td>
<td>CUTKOSKY 80</td>
<td>IPWA</td>
<td>[ \pi N \rightarrow \pi N ]</td>
</tr>
<tr>
<td>1670± 8</td>
<td>HOEHLER 79</td>
<td>IPWA</td>
<td>[ \pi N \rightarrow \pi N ]</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>1665± 2</td>
<td>PENNER 02C</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>1647± 20</td>
<td>BAI 01B</td>
<td>BES</td>
<td>[ J/\psi \rightarrow p\bar{\eta} ]</td>
</tr>
<tr>
<td>1689± 12</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>1677± 8</td>
<td>ARNDT 96</td>
<td>IPWA</td>
<td>[ \gamma N \rightarrow \pi N ]</td>
</tr>
<tr>
<td>1667</td>
<td>ARNDT 95</td>
<td>DPWA</td>
<td>[ \pi N \rightarrow N\pi ]</td>
</tr>
<tr>
<td>1712 1</td>
<td>ARNDT 95</td>
<td>DPWA</td>
<td>[ \pi N \rightarrow N\pi ]</td>
</tr>
<tr>
<td>1669± 17</td>
<td>BATINIC 95</td>
<td>DPWA</td>
<td>[ \pi N \rightarrow N\pi, N\eta ]</td>
</tr>
<tr>
<td>1713± 27</td>
<td>BATINIC 95</td>
<td>DPWA</td>
<td>[ \pi N \rightarrow N\pi, N\eta ]</td>
</tr>
<tr>
<td>1674</td>
<td>LI 93</td>
<td>IPWA</td>
<td>[ \gamma N \rightarrow \pi N ]</td>
</tr>
<tr>
<td>1688</td>
<td>CRAWFORD 80</td>
<td>DPWA</td>
<td>[ \gamma N \rightarrow \pi N ]</td>
</tr>
<tr>
<td>1672</td>
<td>MUSSETTE 80</td>
<td>IPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1680</td>
<td>SAXON 80</td>
<td>DPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1680</td>
<td>BAKER 78</td>
<td>DPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1694</td>
<td>BARBOUR 78</td>
<td>DPWA</td>
<td>[ \gamma N \rightarrow \pi N ]</td>
</tr>
<tr>
<td>1700± 5</td>
<td>3 BAKER 77</td>
<td>IPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1680 3</td>
<td>BAKER 77</td>
<td>DPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1700 4</td>
<td>LONGACRE 77</td>
<td>IPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1675</td>
<td>KNADEL 75</td>
<td>DPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
<tr>
<td>1660 5</td>
<td>LONGACRE 75</td>
<td>IPWA</td>
<td>[ \pi^- p \rightarrow \Lambda K^0 ]</td>
</tr>
</tbody>
</table>

### N(1650) BREIT-WIGNER WIDTH

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>145 to 190 (≈ 150) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>167.9± 9.4</td>
<td>GREEN 97</td>
<td>DPWA</td>
<td>[ \pi N \rightarrow \pi N, \eta N ]</td>
</tr>
<tr>
<td>173± 12</td>
<td>MANLEY 92</td>
<td>IPWA</td>
<td>[ \pi N \rightarrow \pi N &amp; N\pi \pi ]</td>
</tr>
<tr>
<td>150± 40</td>
<td>CUTKOSKY 80</td>
<td>IPWA</td>
<td>[ \pi N \rightarrow \pi N ]</td>
</tr>
<tr>
<td>180± 20</td>
<td>HOEHLER 79</td>
<td>IPWA</td>
<td>[ \pi N \rightarrow \pi N ]</td>
</tr>
</tbody>
</table>
We do not use the following data for averages, fits, limits, etc.

### N(1650) POLE POSITION

#### REAL PART

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1640 to 1680 (≈ 1660) OUR ESTIMATE</td>
<td>1640 ± 10</td>
<td>6 ARNDT</td>
<td>DPWA π N → π N, η N</td>
</tr>
<tr>
<td>1673</td>
<td>1693</td>
<td>1648 or 1651</td>
<td>170 or 173</td>
</tr>
</tbody>
</table>

#### IMAGINARY PART

<table>
<thead>
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<th>DOCUMENT ID</th>
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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 to 170 (≈ 160) OUR ESTIMATE</td>
<td>140 ± 20</td>
<td>6 ARNDT</td>
<td>DPWA π N → π N, η N</td>
</tr>
<tr>
<td>150 ± 30</td>
<td>163</td>
<td>160</td>
<td>174 or 173</td>
</tr>
</tbody>
</table>

We do not use the following data for averages, fits, limits, etc.
$N(1650)$ ELASTIC POLE RESIDUE

| MODULUS $|r|$ | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| 22 | ARNDT 95 | DPWA | $\pi N \to N\pi$ |
| 72 | ARNDT 95 | DPWA | $\pi N \to N\pi$ |
| 39 | HOEHLER 93 | ARGD | $\pi N \to \pi N$ |
| 60$\pm$10 | CUTKOSKY 80 | IPWA | $\pi N \to \pi N$ |

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

54 | ARNDT 91 | DPWA | $\pi N \to \pi N$ Soln SM90 |

$N(1650)$ DECAY MODES

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

<table>
<thead>
<tr>
<th>Mode</th>
<th>Fraction ($\Gamma_i/\Gamma$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Gamma_1$</td>
<td>$N\pi$</td>
</tr>
<tr>
<td>$\Gamma_2$</td>
<td>$N\eta$</td>
</tr>
<tr>
<td>$\Gamma_3$</td>
<td>$\Lambda K$</td>
</tr>
<tr>
<td>$\Gamma_4$</td>
<td>$\Sigma K$</td>
</tr>
<tr>
<td>$\Gamma_5$</td>
<td>$N\pi\pi$</td>
</tr>
<tr>
<td>$\Gamma_6$</td>
<td>$\Delta\pi$, $D$-wave</td>
</tr>
<tr>
<td>$\Gamma_7$</td>
<td>$\Delta(1232)\pi$, $D$-wave</td>
</tr>
<tr>
<td>$\Gamma_8$</td>
<td>$N\rho$</td>
</tr>
<tr>
<td>$\Gamma_9$</td>
<td>$N\rho$, $S=1/2$, $S$-wave</td>
</tr>
<tr>
<td>$\Gamma_{10}$</td>
<td>$N\rho$, $S=3/2$, $D$-wave</td>
</tr>
<tr>
<td>$\Gamma_{11}$</td>
<td>$N(\pi\pi)_{S=0}$, $S$-wave</td>
</tr>
<tr>
<td>$\Gamma_{12}$</td>
<td>$N(1440)\pi$</td>
</tr>
<tr>
<td>$\Gamma_{13}$</td>
<td>$p\gamma$</td>
</tr>
<tr>
<td>$\Gamma_{14}$</td>
<td>$p\gamma$, helicity=1/2</td>
</tr>
<tr>
<td>$\Gamma_{15}$</td>
<td>$n\gamma$</td>
</tr>
<tr>
<td>$\Gamma_{16}$</td>
<td>$n\gamma$, helicity=1/2</td>
</tr>
</tbody>
</table>
### $N(1650)$ Branching Ratios

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.55 to 0.90 OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.735 ± 0.011</td>
<td>GREEN</td>
<td>97</td>
<td>DPWA $\pi N \rightarrow \pi N, \eta N$</td>
</tr>
<tr>
<td>0.89 ± 0.07</td>
<td>MANLEY</td>
<td>92</td>
<td>DPWA $\pi N \rightarrow \pi N &amp; N\pi \pi$</td>
</tr>
<tr>
<td>0.65 ± 0.10</td>
<td>CUTKOSKY</td>
<td>80</td>
<td>IPWA $\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>0.61 ± 0.04</td>
<td>HOEHLER</td>
<td>79</td>
<td>IPWA $\pi N \rightarrow \pi N$</td>
</tr>
</tbody>
</table>

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

#### $\Gamma(N\eta)/\Gamma_{\text{total}}$  

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.023 ± 0.022 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.010 ± 0.006</td>
<td>PENNER</td>
<td>02c</td>
<td>DPWA Multichannel</td>
</tr>
<tr>
<td>0.06 ± 0.01</td>
<td>VRANA</td>
<td>00</td>
<td>DPWA Multichannel</td>
</tr>
</tbody>
</table>

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

#### $(\Gamma_1\Gamma_r)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1650) \rightarrow N\eta$  

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>–0.09</td>
<td>9 BAKER</td>
<td>79</td>
<td>DPWA $\pi^- p \rightarrow n\eta$</td>
</tr>
</tbody>
</table>

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

#### $\Gamma(\Lambda K)/\Gamma_{\text{total}}$  

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.027 ± 0.004</td>
<td>PENNER</td>
<td>02c</td>
<td>DPWA Multichannel</td>
</tr>
</tbody>
</table>

#### $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$  

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>–0.27 to –0.17 OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–0.22</td>
<td>BELL</td>
<td>83</td>
<td>DPWA $\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>–0.22</td>
<td>SAXON</td>
<td>80</td>
<td>DPWA $\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
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<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>–0.25</td>
<td>10 BAKER</td>
<td>78</td>
<td>DPWA See SAXON 80</td>
</tr>
<tr>
<td>–0.23 ± 0.01</td>
<td>3 BAKER</td>
<td>77</td>
<td>IPWA $\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>–0.25</td>
<td>3 BAKER</td>
<td>77</td>
<td>DPWA $\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>0.12</td>
<td>KNAISEL</td>
<td>75</td>
<td>DPWA $\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
</tbody>
</table>
We do not use the following data for averages, fits, limits, etc.:  

\(\Gamma_f / \Gamma_{\text{total}}\) in \(N(1650) \to N\pi\) 

<table>
<thead>
<tr>
<th>Value</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.254</td>
<td>LIVANOS</td>
<td>80</td>
<td>DPWA (\pi \to \Sigma K)</td>
</tr>
<tr>
<td>0.066 to 0.137</td>
<td>DEANS</td>
<td>11</td>
<td>DPWA (N \to \Sigma K)</td>
</tr>
<tr>
<td>0.20</td>
<td>KNASEL</td>
<td>75</td>
<td>DPWA</td>
</tr>
</tbody>
</table>

Note: Signs of couplings from \(\pi N \to N\pi\) analyses were changed in the 1986 edition to agree with the baryon-first convention; the overall phase ambiguity is resolved by choosing a negative sign for the \(\Delta(1620) S_{31}\) coupling to \(\Delta(1232)\).
\[
\Gamma (N(\pi )^{\pm =0}_{\text{S-wave}})/\Gamma_{\text{total}}
\]

\[
\Gamma_{11}/\Gamma
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 ± 0.01</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td></td>
</tr>
</tbody>
</table>

\[
(\Gamma_i \Gamma_i)^{1/2}/\Gamma_{\text{total}} \text{ in } N\pi \rightarrow N(1650) \rightarrow N(1440)\pi
\]

\[
(\Gamma_1 \Gamma_2)^{1/2}/\Gamma
\]

<table>
<thead>
<tr>
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<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.11 ± 0.06</td>
<td>MANLEY 92</td>
<td>IPWA</td>
<td>(\pi N \rightarrow \pi N &amp; N\pi)</td>
</tr>
</tbody>
</table>

\[
\Gamma(N(1440)\pi)/\Gamma_{\text{total}}
\]

\[
\Gamma_{12}/\Gamma
\]

<table>
<thead>
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<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>0.03 ± 0.01</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td></td>
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</tbody>
</table>

**N(1650) PHOTON DECAY AMPLITUDES**

\textbf{N(1650) \rightarrow p\gamma, helicity-1/2 amplitude } A_{1/2}

<table>
<thead>
<tr>
<th>VALUE ((\text{GeV}^{-1/2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.053 ± 0.016 OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.069 ± 0.005</td>
<td>ARNDT 96</td>
<td>IPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>0.033 ± 0.015</td>
<td>CRAWFORD 83</td>
<td>IPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>0.050 ± 0.010</td>
<td>AWAJI 81</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>0.065 ± 0.005</td>
<td>ARAI 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N \text{ (fit 1)})</td>
</tr>
<tr>
<td>0.061 ± 0.005</td>
<td>ARAI 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N \text{ (fit 2)})</td>
</tr>
<tr>
<td>0.031 ± 0.017</td>
<td>CRAWFORD 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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<tbody>
<tr>
<td>0.049</td>
<td>PENNER 02d</td>
<td>DPWA</td>
<td></td>
</tr>
<tr>
<td>0.066 ± 0.003</td>
<td>LI 93</td>
<td>IPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>0.091</td>
<td>WADA 84</td>
<td>DPWA</td>
<td>Compton scattering</td>
</tr>
<tr>
<td>+0.048 ± 0.017</td>
<td>BARBOUR 78</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>+0.068 ± 0.009</td>
<td>FELLER 76</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
</tbody>
</table>

\textbf{N(1650) \rightarrow n\gamma, helicity-1/2 amplitude } A_{1/2}

<table>
<thead>
<tr>
<th>VALUE ((\text{GeV}^{-1/2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−0.015 ± 0.021 OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>−0.015 ± 0.005</td>
<td>ARNDT 96</td>
<td>IPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>−0.008 ± 0.004</td>
<td>AWAJI 81</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>−0.004 ± 0.004</td>
<td>FUJII 81</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>−0.010 ± 0.020</td>
<td>ARAI 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N \text{ (fit 1)})</td>
</tr>
<tr>
<td>−0.008 ± 0.019</td>
<td>ARAI 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N \text{ (fit 2)})</td>
</tr>
<tr>
<td>−0.068 ± 0.040</td>
<td>CRAWFORD 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>−0.011 ± 0.011</td>
<td>TAKEDA 80</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
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<tr>
<td>−0.011</td>
<td>PENNER 02d</td>
<td>DPWA</td>
<td></td>
</tr>
<tr>
<td>−0.002 ± 0.002</td>
<td>LI 93</td>
<td>IPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
<tr>
<td>−0.045 ± 0.024</td>
<td>BARBOUR 78</td>
<td>DPWA</td>
<td>(\gamma N \rightarrow \pi N)</td>
</tr>
</tbody>
</table>
$N(1650)$ \( \gamma p \rightarrow \Lambda K^+ \) AMPLITUDES

\[
\frac{(\Gamma_i \Gamma_f)^{1/2}}{\Gamma_{\text{total}}} \quad \text{in } p\gamma \rightarrow N(1650) \rightarrow \Lambda K^+ \quad (E_{0+} \text{ amplitude})
\]

<table>
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\[
p\gamma \rightarrow N(1650) \rightarrow \Lambda K^+ \quad \text{phase angle } \theta \quad (E_{0+} \text{ amplitude})
\]

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<td>(-107 \pm 3)</td>
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$N(1650)$ FOOTNOTES

1. ARNDT 95 finds two distinct states.
2. BATINIC 95 finds two distinct states. This second resonance was associated with the \(N(2090) \, S_{11}\).
3. The two BAKER 77 entries are from an IPWA using the Barrelet-zero method and from a conventional energy-dependent analysis.
4. LONGACRE 77 pole positions are from a search for poles in the unitarized T-matrix; the first (second) value uses, in addition to \(\pi N \rightarrow N\pi\pi\) data, elastic amplitudes from a Saclay (CERN) partial-wave analysis. The other LONGACRE 77 values are from eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.
5. From method II of LONGACRE 75: eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.
6. ARNDT 98 also lists pole residues, which display more model dependence than do the associated pole positions.
7. 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.
8. LONGACRE 78 values are from a search for poles in the unitarized T-matrix. The first (second) value uses, in addition to \(\pi N \rightarrow N\pi\pi\) data, elastic amplitudes from a Saclay (CERN) partial-wave analysis.
9. BAKER 79 fixed this coupling during fitting, but the negative sign relative to the \(N(1535)\) is well determined.
10. The overall phase of BAKER 78 couplings has been changed to agree with previous conventions. Superseded by SAXON 80.
11. The range given for DEANS 75 is from the four best solutions.
12. LONGACRE 77 considers this coupling to be well determined.

$N(1650)$ REFERENCES

For early references, see Physics Letters 111B 70 (1982).
<table>
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<tr>
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<td>95</td>
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