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).

RIPANI 03, in a study of $e p \rightarrow e' p \pi^+ \pi^-$, finds some evidence for another $P_{13}$ resonance in this region.

### $N(1720)$ 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>1700 to 1750 ($\approx 1720$) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1749.6 ± 4.5</td>
<td>ARNDT 04</td>
<td>DPWA</td>
<td>$\pi N \rightarrow \pi N, \eta N$</td>
</tr>
<tr>
<td>1717 ± 31</td>
<td>MANLEY 92</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N &amp; N \pi \pi$</td>
</tr>
<tr>
<td>1700 ± 50</td>
<td>CUTKOSKY 80</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>1710 ± 20</td>
<td>HOEHLER 79</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• • • We do not use the following data for averages, fits, limits, etc. • • •</td>
</tr>
<tr>
<td>1705 ± 10</td>
<td>PENNER 02C</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>1716 ± 112</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>1713 ± 10</td>
<td>ARNDT 96</td>
<td>IPWA</td>
<td>$\gamma N \rightarrow \pi N$</td>
</tr>
<tr>
<td>1820</td>
<td>ARNDT 95</td>
<td>DPWA</td>
<td>$\pi N \rightarrow N \pi$</td>
</tr>
<tr>
<td>1711 ± 26</td>
<td>BATINIC 95</td>
<td>DPWA</td>
<td>$\pi N \rightarrow N \pi, N \eta$</td>
</tr>
<tr>
<td>1720</td>
<td>LI 93</td>
<td>IPWA</td>
<td>$\gamma N \rightarrow \pi N$</td>
</tr>
<tr>
<td>1785</td>
<td>CRAWFORD 80</td>
<td>DPWA</td>
<td>$\gamma N \rightarrow \pi N$</td>
</tr>
<tr>
<td>1690</td>
<td>SAXON 80</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>1710 to 1790</td>
<td>BAKER 78</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>1809</td>
<td>BARBOUR 78</td>
<td>DPWA</td>
<td>$\gamma N \rightarrow \pi N$</td>
</tr>
<tr>
<td>1640 ± 10</td>
<td>1 BAKER 77</td>
<td>IPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>1710</td>
<td>1 BAKER 77</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>1750</td>
<td>2 LONGACRE 77</td>
<td>IPWA</td>
<td>$\pi N \rightarrow N \pi \pi$</td>
</tr>
<tr>
<td>1850</td>
<td>KNASEL 75</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>1720</td>
<td>3 LONGACRE 75</td>
<td>IPWA</td>
<td>$\pi N \rightarrow N \pi \pi$</td>
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### $N(1720)$ 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>150 to 300 ($\approx 200$) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>256 ± 22</td>
<td>ARNDT 04</td>
<td>DPWA</td>
<td>$\pi N \rightarrow \pi N, \eta N$</td>
</tr>
<tr>
<td>380 ± 180</td>
<td>MANLEY 92</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N &amp; N \pi \pi$</td>
</tr>
<tr>
<td>125 ± 70</td>
<td>CUTKOSKY 80</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>190 ± 30</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>Energy (MeV)</th>
<th>Reference</th>
<th>Method</th>
<th>Channels</th>
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<tbody>
<tr>
<td>237 ± 73</td>
<td>Penner</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>121 ± 39</td>
<td>Penner</td>
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<td>Multichannel</td>
</tr>
<tr>
<td>153 ± 15</td>
<td>Arndt</td>
<td>IPWA</td>
<td>γN → Nπ</td>
</tr>
<tr>
<td>354</td>
<td>Arndt</td>
<td>DPWA</td>
<td>πN → Nπ</td>
</tr>
<tr>
<td>235 ± 51</td>
<td>Batinic</td>
<td>DPWA</td>
<td>πN → Nπ, Nη</td>
</tr>
<tr>
<td>200</td>
<td>Li</td>
<td>IPWA</td>
<td>γN → Nπ</td>
</tr>
<tr>
<td>308</td>
<td>Crawford</td>
<td>DPWA</td>
<td>γN → Nπ</td>
</tr>
<tr>
<td>120</td>
<td>Saxon</td>
<td>DPWA</td>
<td>π⁻ p → ΛK⁰</td>
</tr>
<tr>
<td>447</td>
<td>Baker</td>
<td>DPWA</td>
<td>π⁻ p → nη</td>
</tr>
<tr>
<td>300 to 400</td>
<td>Baker</td>
<td>DPWA</td>
<td>π⁻ p → ΛK⁰</td>
</tr>
<tr>
<td>285</td>
<td>Barbour</td>
<td>DPWA</td>
<td>γN → Nπ</td>
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<tr>
<td>200 ± 50</td>
<td>Baker</td>
<td>IPWA</td>
<td>π⁻ p → ΛK⁰</td>
</tr>
<tr>
<td>500</td>
<td>Baker</td>
<td>DPWA</td>
<td>π⁻ p → ΛK⁰</td>
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<tr>
<td>130</td>
<td>Longacre</td>
<td>IPWA</td>
<td>πN → Nππ</td>
</tr>
<tr>
<td>327</td>
<td>Knasel</td>
<td>DPWA</td>
<td>πN → Nππ</td>
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<tr>
<td>150</td>
<td>Longacre</td>
<td>IPWA</td>
<td>πN → Nππ</td>
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### N(1720) Pole Position

#### REAL PART

<table>
<thead>
<tr>
<th>Value (MeV)</th>
<th>Document ID</th>
<th>Method</th>
<th>Comment</th>
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<tbody>
<tr>
<td>1660 to 1690 (≈ 1675) OUR ESTIMATE</td>
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<td></td>
<td></td>
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<tr>
<td>1655</td>
<td>Arndt 04</td>
<td>DPWA</td>
<td>πN → πN, ηN</td>
</tr>
<tr>
<td>1686</td>
<td>Hoehler 93</td>
<td>SPED</td>
<td>πN → πN</td>
</tr>
<tr>
<td>1680±30</td>
<td>Cutkosky 80</td>
<td>IPWA</td>
<td>πN → πN</td>
</tr>
<tr>
<td>1692</td>
<td>Vran 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>1717</td>
<td>Arndt 95</td>
<td>DPWA</td>
<td>πN → Nπ</td>
</tr>
<tr>
<td>1675</td>
<td>Arndt 91</td>
<td>DPWA</td>
<td>πN → Nπ Soln SM90</td>
</tr>
<tr>
<td>1716 or 1716</td>
<td>Longacre 78</td>
<td>IPWA</td>
<td>πN → Nππ</td>
</tr>
<tr>
<td>1745 or 1748</td>
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<td>IPWA</td>
<td>πN → Nππ</td>
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#### −2×IMAGINARY PART

<table>
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<tr>
<td>115 to 275 OUR ESTIMATE</td>
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<td>278</td>
<td>Arndt 04</td>
<td>DPWA</td>
<td>πN → πN, ηN</td>
</tr>
<tr>
<td>187</td>
<td>Hoehler 93</td>
<td>SPED</td>
<td>πN → πN</td>
</tr>
<tr>
<td>120±40</td>
<td>Cutkosky 80</td>
<td>IPWA</td>
<td>πN → πN</td>
</tr>
<tr>
<td>94</td>
<td>Vran 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>388</td>
<td>Arndt 95</td>
<td>DPWA</td>
<td>πN → Nπ</td>
</tr>
<tr>
<td>114</td>
<td>Arndt 91</td>
<td>DPWA</td>
<td>πN → Nπ Soln SM90</td>
</tr>
<tr>
<td>124 or 126</td>
<td>Longacre 78</td>
<td>IPWA</td>
<td>πN → Nππ</td>
</tr>
<tr>
<td>135 or 123</td>
<td>Longacre 77</td>
<td>IPWA</td>
<td>πN → Nππ</td>
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**N(1720) ELASTIC POLE RESIDUE**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>DOCUMENT ID</th>
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<th>COMMENT</th>
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<tbody>
<tr>
<td>$</td>
<td>r</td>
<td>$</td>
<td>ARNDT 04</td>
</tr>
<tr>
<td>20</td>
<td>HOEHLER 93</td>
<td>SPED</td>
<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>15</td>
<td>CUTKOSKY 80</td>
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<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>8$\pm 2$</td>
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<td>We do not use the following data for averages, fits, limits, etc. $\cdots$</td>
</tr>
<tr>
<td>39</td>
<td>ARNDT 95</td>
<td>DPWA</td>
<td>$\pi N \rightarrow N\pi$</td>
</tr>
<tr>
<td>11</td>
<td>ARNDT 91</td>
<td>DPWA</td>
<td>$\pi N \rightarrow \pi N$ Soln SM90</td>
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</tbody>
</table>

**PHASE $\theta$**

<table>
<thead>
<tr>
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<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>$-88$</td>
<td>ARNDT 04</td>
<td>DPWA</td>
<td>$\pi N \rightarrow \pi N, \eta N$</td>
</tr>
<tr>
<td>$-160\pm 30$</td>
<td>CUTKOSKY 80</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>$\cdots$</td>
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<td></td>
<td>We do not use the following data for averages, fits, limits, etc. $\cdots$</td>
</tr>
<tr>
<td>$-70$</td>
<td>ARNDT 95</td>
<td>DPWA</td>
<td>$\pi N \rightarrow N\pi$</td>
</tr>
<tr>
<td>$-130$</td>
<td>ARNDT 91</td>
<td>DPWA</td>
<td>$\pi N \rightarrow \pi N$ Soln SM90</td>
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</tbody>
</table>

**N(1720) 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>$\Gamma_1$ $N\pi$</td>
<td>10–20 %</td>
</tr>
<tr>
<td>$\Gamma_2$ $N\eta$</td>
<td>$(4.0\pm 1.0)$ %</td>
</tr>
<tr>
<td>$\Gamma_3$ $\Lambda K$</td>
<td>1–15 %</td>
</tr>
<tr>
<td>$\Gamma_4$ $\Sigma K$</td>
<td>&gt;70 %</td>
</tr>
<tr>
<td>$\Gamma_5$ $N\pi \pi$</td>
<td>&gt;70 %</td>
</tr>
<tr>
<td>$\Gamma_6$ $\Delta \pi$</td>
<td></td>
</tr>
<tr>
<td>$\Gamma_7$ $\Delta(1232) \pi$, $P$-wave</td>
<td></td>
</tr>
<tr>
<td>$\Gamma_8$ $N\rho$</td>
<td>70–85 %</td>
</tr>
<tr>
<td>$\Gamma_9$ $N\rho$, $S=1/2$, $P$-wave</td>
<td></td>
</tr>
<tr>
<td>$\Gamma_{10}$ $N\rho$, $S=3/2$, $P$-wave</td>
<td></td>
</tr>
<tr>
<td>$\Gamma_{11}$ $N(\pi\pi)^{I=0}_{S=0}$, $S$-wave</td>
<td></td>
</tr>
<tr>
<td>$\Gamma_{12}$ $p\gamma$</td>
<td>0.003–0.10 %</td>
</tr>
<tr>
<td>$\Gamma_{13}$ $p\gamma$, helicity=1/2</td>
<td>0.003–0.08 %</td>
</tr>
<tr>
<td>$\Gamma_{14}$ $p\gamma$, helicity=3/2</td>
<td>0.001–0.03 %</td>
</tr>
<tr>
<td>$\Gamma_{15}$ $n\gamma$</td>
<td>0.002–0.39 %</td>
</tr>
<tr>
<td>$\Gamma_{16}$ $n\gamma$, helicity=1/2</td>
<td>0.0–0.002 %</td>
</tr>
<tr>
<td>$\Gamma_{17}$ $n\gamma$, helicity=3/2</td>
<td>0.001–0.39 %</td>
</tr>
</tbody>
</table>
## $N(1720)$ 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>0.10 to 0.20 OUR ESTIMATE</td>
<td>ARNDT 04</td>
<td>DPWA</td>
<td>$\pi N \rightarrow \pi N, \eta N$</td>
</tr>
<tr>
<td>0.190 ± 0.004</td>
<td>PENNER 02c</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>0.13 ± 0.05</td>
<td>MANLEY 92</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N$ &amp; $N\pi\pi$</td>
</tr>
<tr>
<td>0.10 ± 0.04</td>
<td>CUTKOSKY 80</td>
<td>IPWA</td>
<td>$\pi N \rightarrow \pi N$</td>
</tr>
<tr>
<td>0.14 ± 0.03</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</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.17 ± 0.02</td>
<td>PENNER 02c</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>0.05 ± 0.05</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>0.16</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>0.18 ± 0.04</td>
<td>BATICNIC 95</td>
<td>DPWA</td>
<td>$\pi N \rightarrow N\pi, N\eta$</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Value</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.04 ± 0.01</td>
<td>VRANA 00</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
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*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>
<tbody>
<tr>
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<td>PENNER 02c</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
<tr>
<td>0.002 ± 0.01</td>
<td>BATICNIC 95</td>
<td>DPWA</td>
<td>$\pi N \rightarrow N\pi, N\eta$</td>
</tr>
</tbody>
</table>

### $(\Gamma_1\Gamma_2)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1720) \rightarrow N\eta$

<table>
<thead>
<tr>
<th>Value</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>−0.08</td>
<td>BAKER 79</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow n\eta$</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>0.09 ± 0.03</td>
<td>PENNER 02c</td>
<td>DPWA</td>
<td>Multichannel</td>
</tr>
</tbody>
</table>

### $(\Gamma_1\Gamma_3)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1720) \rightarrow \Lambda K$

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<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>−0.14 to −0.06 OUR ESTIMATE</td>
<td>BELL 83</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>−0.09</td>
<td>BAKER 78</td>
<td>DPWA</td>
<td>See Saxon 80</td>
</tr>
<tr>
<td>−0.11</td>
<td>SAXON 80</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Value</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>−0.09</td>
<td>BAKER 77</td>
<td>IPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
<tr>
<td>−0.09</td>
<td>BAKER 77</td>
<td>DPWA</td>
<td>$\pi^- p \rightarrow \Lambda K^0$</td>
</tr>
</tbody>
</table>
\[(\Gamma_1 \Gamma_4)^{1/2}/\Gamma\]

\[\text{We do not use the following data for averages, fits, limits, etc.} \]

\[0.051 \text{ to } 0.087\]

\[\text{DEANS 75 DPWA } \pi N \rightarrow \Sigma K\]

Note: Signs of couplings from \(\pi N \rightarrow N \pi \pi\) 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 \(\Delta(1232)\).

\[(\Gamma_1 \Gamma_7)^{1/2}/\Gamma\]

\[\pm 0.27 \text{ to } \pm 0.37 \text{ OUR ESTIMATE}\]

\[-0.17\]

\[\text{LONGACRE 77 IPWA } \pi N \rightarrow N \pi \pi\]

\[(\Gamma_1 \Gamma_9)^{1/2}/\Gamma\]

\[\Gamma(N, S=1/2, P\text{-wave})/\Gamma_{\text{total}}\]

\[0.91 \pm 0.01\]

\[\text{VRANA 00 DPWA Multichannel}\]

\[(\Gamma_1 \Gamma_{10})^{1/2}/\Gamma\]

\[\Gamma(N, S=3/2, P\text{-wave})/\Gamma_{\text{total}}\]

\[0.15\]

\[\text{LONGACRE 77 IPWA } \pi N \rightarrow N \pi \pi\]

\[(\Gamma_1 \Gamma_{11})^{1/2}/\Gamma\]

\[\Gamma(N, S=0, S\text{-wave})/\Gamma_{\text{total}}\]

\[0.19\]

\[\text{LONGACRE 77 IPWA } \pi N \rightarrow N \pi \pi\]

\section{\(N(1720)\) PHOTON DECAY AMPLITUDES}

\[N(1720) \rightarrow p \gamma, \text{ helicity-1/2 amplitude} A_{1/2}\]

\[(\Gamma_1 \Gamma_{f})^{1/2}/\Gamma_{\text{total}}\]

\[0.015 \pm 0.015\]

\[\text{ARNDT 96 IPWA } \gamma N \rightarrow \pi N\]

\[0.044 \pm 0.066\]

\[\text{CRAWFORD 83 IPWA } \gamma N \rightarrow \pi N\]

\[-0.004 \pm 0.007\]

\[\text{AWAJI 81 DPWA } \gamma N \rightarrow \pi N\]

\[0.051 \pm 0.009\]

\[\text{ARAI 80 DPWA } \gamma N \rightarrow \pi N \text{ (fit 1)}\]

\[0.071 \pm 0.010\]

\[\text{ARAI 80 DPWA } \gamma N \rightarrow \pi N \text{ (fit 2)}\]

\[0.038 \pm 0.050\]

\[\text{CRAWFORD 80 DPWA } \gamma N \rightarrow \pi N\]

\[\text{We do not use the following data for averages, fits, limits, etc.} \]

\[-0.053\]

\[\text{PENNER 02D DPWA Multichannel}\]

\[0.012 \pm 0.003\]

\[\text{LI 93 DPWA } \gamma N \rightarrow \pi N\]

\[+0.111 \pm 0.047\]

\[\text{BARBOUR 78 DPWA } \gamma N \rightarrow \pi N\]
\[ N(1720) \rightarrow p\gamma, \text{ helicity-3/2 amplitude } A_{3/2} \]

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<th>TECN</th>
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<td>IPWA (\gamma N \rightarrow \pi N)</td>
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<td>DPWA (\gamma N \rightarrow \pi N) (fit 1)</td>
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<tr>
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<td>ARAI</td>
<td>80</td>
<td>DPWA (\gamma N \rightarrow \pi N) (fit 2)</td>
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<tr>
<td>−0.014±0.040</td>
<td>CRAWFORD</td>
<td>80</td>
<td>DPWA (\gamma N \rightarrow \pi N)</td>
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</tbody>
</table>

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

0.027 PENNER 02D DPWA Multichannel
0.022±0.003 LI 93 IPWA \(\gamma N \rightarrow \pi N\)
0.063±0.032 BARBOUR 78 DPWA \(\gamma N \rightarrow \pi N\)

\[ N(1720) \rightarrow n\gamma, \text{ helicity-1/2 amplitude } A_{1/2} \]

<table>
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<th>VALUE (GeV(^{-1/2}))</th>
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<tr>
<td>0.002±0.005</td>
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<td>DPWA (\gamma N \rightarrow \pi N) (fit 1)</td>
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<tr>
<td>0.001±0.038</td>
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<td>DPWA (\gamma N \rightarrow \pi N) (fit 2)</td>
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<tr>
<td>−0.003±0.034</td>
<td>CRAWFORD</td>
<td>80</td>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

−0.004 PENNER 02D DPWA Multichannel
0.050±0.004 LI 93 IPWA \(\gamma N \rightarrow \pi N\)
+0.007±0.020 BARBOUR 78 DPWA \(\gamma N \rightarrow \pi N\)

\[ N(1720) \rightarrow n\gamma, \text{ helicity-3/2 amplitude } A_{3/2} \]

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<td>DPWA (\gamma N \rightarrow \pi N)</td>
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<td>−0.139±0.039</td>
<td>ARAI</td>
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<td>−0.134±0.044</td>
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<td>0.018±0.028</td>
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<td>80</td>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.003 PENNER 02D DPWA Multichannel
0.017±0.004 LI 93 IPWA \(\gamma N \rightarrow \pi N\)
+0.051±0.051 BARBOUR 78 DPWA \(\gamma N \rightarrow \pi N\)

\[ N(1720) \quad \gamma p \rightarrow \Lambda K^+ \text{ AMPLITUDES} \]

\[ (\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}} \text{ in } p\gamma \rightarrow N(1720) \rightarrow \Lambda K^+ \] (\(E_{1+}\) amplitude)

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<td>9.52</td>
<td>TANABE</td>
<td>89</td>
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• • • We do not use the following data for averages, fits, limits, etc. • • •
\( p\gamma \rightarrow N(1720) \rightarrow \Lambda K^+ \) phase angle \( \theta \) 

<table>
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<th>VALUE (degrees)</th>
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<td>103.4</td>
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\( (\Gamma_i/\Gamma_f)^{1/2}/\Gamma_{\text{total}} \) in \( p\gamma \rightarrow N(1720) \rightarrow \Lambda K^+ \) 

<table>
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<td>4.5 ± 0.2</td>
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<td>3.18</td>
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\( N(1720) \) FOOTNOTES

1. The two BAKER 77 entries are from an IPWA using the Barrelet-zero method and from a conventional energy-dependent analysis.
2. 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.
3. From method II of LONGACRE 75: eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.
4. 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.
5. 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.
6. The overall phase of BAKER 78 couplings has been changed to agree with previous conventions.
7. The range given is from the four best solutions. DEANS 75 disagrees with \( \pi^+ p \rightarrow \Sigma^+ K^- \) data of WINNIK 77 around 1920 MeV.

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PDG 82 PL 111B M. Roos et al. (HELS, CIT, CERN)

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<td>N. Awaji, R. Kajikawa</td>
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