

**$N(1675) 5/2^-$**

$I(J^P) = \frac{1}{2}(\frac{5}{2}^-)$  Status: \* \* \* \*

Most of the results published before 1975 were last included in our 1982 edition, Physics Letters **111B** 1 (1982). Some further obsolete results published before 1984 were last included in our 2006 edition, Journal of Physics, G **33** 1 (2006).

### **$N(1675)$ BREIT-WIGNER MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1670 to 1680 (<math>\approx 1675</math>) OUR ESTIMATE</b>			
1664 $\pm 5$	ANISOVICH	12A	DPWA Multichannel
1674.1 $\pm 0.2$	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
1675 $\pm 10$	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1679 $\pm 8$	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1679 $\pm 1$	SHRESTHA	12A	DPWA Multichannel
1678 $\pm 5$	ANISOVICH	10	DPWA Multichannel
1679 $\pm 9$	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1678 $\pm 15$	THOMA	08	DPWA Multichannel
1676.2 $\pm 0.6$	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
1685 $\pm 4$	VRANA	00	DPWA Multichannel
1673 $\pm 5$	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
1673	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
1666	LI	93	IPWA $\gamma N \rightarrow \pi N$
1676 $\pm 2$	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$
1670	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
1650	<sup>1</sup> LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$
1660	<sup>2</sup> LONGACRE	75	IPWA $\pi N \rightarrow N\pi\pi$

### **$N(1675)$ BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>130 to 165 (<math>\approx 150</math>) OUR ESTIMATE</b>			
152 $\pm 7$	ANISOVICH	12A	DPWA Multichannel
146.5 $\pm 1.0$	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
160 $\pm 20$	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
120 $\pm 15$	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
145 $\pm 4$	SHRESTHA	12A	DPWA Multichannel
177 $\pm 15$	ANISOVICH	10	DPWA Multichannel
152 $\pm 8$	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
220 $\pm 25$	THOMA	08	DPWA Multichannel
151.8 $\pm 3.0$	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
131 $\pm 10$	VRANA	00	DPWA Multichannel
154 $\pm 7$	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$

154	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
136	LI	93	IPWA	$\gamma N \rightarrow \pi N$
159 $\pm 7$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N$ & $N\pi\pi$
40	SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$
130	<sup>1</sup> LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$
150	<sup>2</sup> LONGACRE	75	IPWA	$\pi N \rightarrow N\pi\pi$

## ***N*(1675) POLE POSITION**

### **REAL PART**

<i>VALUE</i> (MeV)	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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#### **1655 to 1665 ( $\approx 1660$ ) OUR ESTIMATE**

1654 $\pm 4$	ANISOVICH	12A	DPWA	Multichannel
1657	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
1656	<sup>3</sup> HOEHLER	93	ARGD	$\pi N \rightarrow \pi N$
1660 $\pm 10$	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1656	SHRESTHA	12A	DPWA	Multichannel
1650 $\pm 5$	ANISOVICH	10	DPWA	Multichannel
1658 $\pm 9$	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
1639 $\pm 10$	THOMA	08	DPWA	Multichannel
1659	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
1674	VRANA	00	DPWA	Multichannel
1663	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
1655	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90
1663 or 1668	<sup>4</sup> LONGACRE	78	IPWA	$\pi N \rightarrow N\pi\pi$
1649 or 1650	<sup>1</sup> LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$

### **–2×IMAGINARY PART**

<i>VALUE</i> (MeV)	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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#### **125 to 150 ( $\approx 135$ ) OUR ESTIMATE**

151 $\pm 5$	ANISOVICH	12A	DPWA	Multichannel
139	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
126	<sup>3</sup> HOEHLER	93	ARGD	$\pi N \rightarrow \pi N$
140 $\pm 10$	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
128	SHRESTHA	12A	DPWA	Multichannel
143 $\pm 7$	ANISOVICH	10	DPWA	Multichannel
137 $\pm 7$	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
180 $\pm 20$	THOMA	08	DPWA	Multichannel
146	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
120	VRANA	00	DPWA	Multichannel
152	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
124	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90
146 or 171	<sup>4</sup> LONGACRE	78	IPWA	$\pi N \rightarrow N\pi\pi$
127 or 127	<sup>1</sup> LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$

## N(1675) ELASTIC POLE RESIDUE

### MODULUS $|r|$

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>27±5 OUR ESTIMATE</b>			
28±1	ANISOVICH	12A	DPWA Multichannel
27	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
23	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$
31±5	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
25	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
29	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
29	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
28	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

### PHASE $\theta$

<u>VALUE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>-25± 6 OUR ESTIMATE</b>			
-26± 4	ANISOVICH	12A	DPWA Multichannel
-21	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
-22	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$
-30±10	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-16	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
-22	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
- 6	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
-17	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

## N(1675) INELASTIC POLE RESIDUE

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

### Normalized residue in $N\pi \rightarrow N(1675) \rightarrow \Delta\pi, D\text{-wave}$

<u>MODULUS (%)</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>33±5</b>	<b>82 ± 10</b>	ANISOVICH	12A	DPWA Multichannel

### Normalized residue in $N\pi \rightarrow N(1675) \rightarrow N\sigma$

<u>MODULUS (%)</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>15±4</b>	<b>132 ± 18</b>	ANISOVICH	12A	DPWA Multichannel

## N(1675) DECAY MODES

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\pi$	35–45 %
$\Gamma_2$ $N\eta$	( 0.0± 1.0) %
$\Gamma_3$ $\Lambda K$	<1 %
$\Gamma_4$ $\Sigma K$	
$\Gamma_5$ $N\pi\pi$	50–60 %

$\Gamma_6$	$\Delta\pi$	50–60 %
$\Gamma_7$	$\Delta(1232)\pi$ , <i>D</i> -wave	(50 $\pm$ 15 ) %
$\Gamma_8$	$\Delta(1232)\pi$ , <i>G</i> -wave	
$\Gamma_9$	$N\rho$	< 1–3 %
$\Gamma_{10}$	$N\rho$ , <i>S</i> =1/2, <i>D</i> -wave	( 0.0 $\pm$ 1.0 ) %
$\Gamma_{11}$	$N\rho$ , <i>S</i> =3/2, <i>D</i> -wave	( 1.0 $\pm$ 1.0 ) %
$\Gamma_{12}$	$N\rho$ , <i>S</i> =3/2, <i>G</i> -wave	
$\Gamma_{13}$	$N(\pi\pi)_{S\text{-wave}}^{I=0}$	( 7.0 $\pm$ 3.0 ) %
$\Gamma_{14}$	$p\gamma$	0–0.02 %
$\Gamma_{15}$	$p\gamma$ , helicity=1/2	0–0.01 %
$\Gamma_{16}$	$p\gamma$ , helicity=3/2	0–0.01 %
$\Gamma_{17}$	$n\gamma$	0–0.15 %
$\Gamma_{18}$	$n\gamma$ , helicity=1/2	0–0.05 %
$\Gamma_{19}$	$n\gamma$ , helicity=3/2	0–0.10 %

### ***N*(1675) BRANCHING RATIOS**

#### **$\Gamma(N\pi)/\Gamma_{\text{total}}$ $\Gamma_1/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>35 to 45 OUR ESTIMATE</b>			
40 $\pm$ 3	ANISOVICH	12A	DPWA Multichannel
39.3 $\pm$ 0.1	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
38 $\pm$ 5	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
38 $\pm$ 3	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
38.6 $\pm$ 0.6	SHRESTHA	12A	DPWA Multichannel
37 $\pm$ 5	ANISOVICH	10	DPWA Multichannel
35 $\pm$ 4	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
30 $\pm$ 8	THOMA	08	DPWA Multichannel
40.0 $\pm$ 0.2	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$
35 $\pm$ 1	VRANA	00	DPWA Multichannel
38	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
47 $\pm$ 2	MANLEY	92	IPWA $\pi N \rightarrow \pi N \& N\pi\pi$

#### **$\Gamma(N\eta)/\Gamma_{\text{total}}$ $\Gamma_2/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0 <math>\pm</math> 1</b>	VRANA	00	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
<1	SHRESTHA	12A	DPWA Multichannel
0.1 $\pm$ 0.1	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
3 $\pm$ 3	THOMA	08	DPWA Multichannel

$(\Gamma_j \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1675) \rightarrow \Lambda K$				$(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
<b><math>\pm 0.04</math> to <math>\pm 0.08</math> OUR ESTIMATE</b>				
-0.01	BELL	83	DPWA	$\pi^- p \rightarrow \Lambda K^0$
+0.036	<sup>5</sup> SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.03 $\pm 0.01$	SHRESTHA	12A	DPWA	Multichannel

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  $\Delta(1232)\pi$ .

$(\Gamma_j \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1675) \rightarrow \Delta(1232)\pi, D\text{-wave}$				$(\Gamma_1 \Gamma_7)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
<b>+0.46 to +0.50 OUR ESTIMATE</b>				
+0.46	<sup>1,6</sup> LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$
+0.50	<sup>2</sup> LONGACRE	75	IPWA	$\pi N \rightarrow N\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.496 $\pm 0.003$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \& N\pi\pi$

$\Gamma(\Delta(1232)\pi, D\text{-wave}) / \Gamma_{\text{total}}$				$\Gamma_7 / \Gamma$
VALUE (%)	DOCUMENT ID	TECN	COMMENT	
<b>50 <math>\pm 15</math> OUR ESTIMATE</b>				
33 $\pm 8$	ANISOVICH	12A	DPWA	Multichannel
63 $\pm 2$	VRANA	00	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
46 $\pm 1$	SHRESTHA	12A	DPWA	Multichannel
24 $\pm 8$	THOMA	08	DPWA	Multichannel

$(\Gamma_j \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1675) \rightarrow N\rho, S=1/2, D\text{-wave}$				$(\Gamma_1 \Gamma_{10})^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.04 $\pm 0.02$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \& N\pi\pi$

$\Gamma(N\rho, S=1/2, D\text{-wave}) / \Gamma_{\text{total}}$				$\Gamma_{10} / \Gamma$
VALUE (%)	DOCUMENT ID	TECN	COMMENT	
<b>0 <math>\pm 1</math></b>				
	VRANA	00	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1	SHRESTHA	12A	DPWA	Multichannel

$(\Gamma_j \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1675) \rightarrow N\rho, S=3/2, D\text{-wave}$				$(\Gamma_1 \Gamma_{11})^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
<b>-0.12 to -0.06 OUR ESTIMATE</b>				
-0.15	<sup>1,6</sup> LONGACRE	77	IPWA	$\pi N \rightarrow N\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.03 $\pm 0.02$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \& N\pi\pi$

$\Gamma(N\rho, S=3/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{11}/\Gamma$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b>1±1</b>	VRANA	00	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
<1	SHRESTHA	12A	DPWA Multichannel

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\pi \rightarrow N(1675) \rightarrow N(\pi\pi)_{S\text{-wave}}^{I=0}$   $(\Gamma_1 \Gamma_{13})^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
+0.03	1,6 LONGACRE	77	IPWA $\pi N \rightarrow N\pi\pi$

$\Gamma(N(\pi\pi)_{S\text{-wave}}^{I=0})/\Gamma_{\text{total}}$   $\Gamma_{13}/\Gamma$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b>7±3</b>	ANISOVICH	12A	DPWA Multichannel

### N(1675) PHOTON DECAY AMPLITUDES

Papers on  $\gamma N$  amplitudes predating 1981 may be found in our 2006 edition, Journal of Physics, G **33** 1 (2006).

#### $N(1675) \rightarrow p\gamma$ , helicity-1/2 amplitude $A_{1/2}$

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
<b>+0.019±0.008 OUR ESTIMATE</b>			
0.024±0.003	ANISOVICH	12A	DPWA Multichannel
0.013±0.001	WORKMAN	12A	DPWA $\gamma N \rightarrow N\pi$
0.018±0.002	DUGGER	07	DPWA $\gamma N \rightarrow \pi N$
0.021±0.011	CRAWFORD	83	IPWA $\gamma N \rightarrow \pi N$
0.034±0.005	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
0.011±0.001	SHRESTHA	12A	DPWA Multichannel
0.021±0.004	ANISOVICH	10	DPWA Multichannel
0.015	DRECHSEL	07	DPWA $\gamma N \rightarrow \pi N$
0.015±0.010	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
0.012±0.002	LI	93	IPWA $\gamma N \rightarrow \pi N$

#### $N(1675) \rightarrow p\gamma$ , helicity-3/2 amplitude $A_{3/2}$

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
<b>+0.015±0.009 OUR ESTIMATE</b>			
0.025±0.007	ANISOVICH	12A	DPWA Multichannel
0.016±0.001	WORKMAN	12A	DPWA $\gamma N \rightarrow N\pi$
0.021±0.001	DUGGER	07	DPWA $\gamma N \rightarrow \pi N$
0.015±0.009	CRAWFORD	83	IPWA $\gamma N \rightarrow \pi N$
0.024±0.008	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
0.020±0.001	SHRESTHA	12A	DPWA Multichannel
0.024±0.008	ANISOVICH	10	DPWA Multichannel
0.022	DRECHSEL	07	DPWA $\gamma N \rightarrow \pi N$
0.010±0.007	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
0.021±0.002	LI	93	IPWA $\gamma N \rightarrow \pi N$

### $N(1675) \rightarrow n\gamma$ , helicity-1/2 amplitude $A_{1/2}$

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
<b>-0.043±0.012 OUR ESTIMATE</b>			
-0.058±0.002	CHEN	12A	DPWA $\gamma N \rightarrow \pi N$
-0.057±0.024	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
-0.033±0.004	FUJII	81	DPWA $\gamma N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.040±0.004	SHRESTHA	12A	DPWA Multichannel
-0.062	DRECHSEL	07	DPWA $\gamma N \rightarrow \pi N$
-0.049±0.010	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
-0.060±0.003	LI	93	IPWA $\gamma N \rightarrow \pi N$

### $N(1675) \rightarrow n\gamma$ , helicity-3/2 amplitude $A_{3/2}$

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
<b>-0.058±0.013 OUR ESTIMATE</b>			
-0.080±0.005	CHEN	12A	DPWA $\gamma N \rightarrow \pi N$
-0.077±0.018	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$
-0.069±0.004	FUJII	81	DPWA $\gamma N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.068±0.004	SHRESTHA	12A	DPWA Multichannel
-0.084	DRECHSEL	07	DPWA $\gamma N \rightarrow \pi N$
-0.051±0.010	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
-0.074±0.003	LI	93	IPWA $\gamma N \rightarrow \pi N$

### $N(1675)$ FOOTNOTES

- <sup>1</sup> 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.
- <sup>2</sup> From method II of LONGACRE 75: eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.
- <sup>3</sup> 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.
- <sup>4</sup> 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.
- <sup>5</sup> SAXON 80 finds the coupling phase is near  $90^\circ$ .
- <sup>6</sup> LONGACRE 77 considers this coupling to be well determined.

### $N(1675)$ REFERENCES

For early references, see Physics Letters **111B** 1 (1982).

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)
ANISOVICH	10	EPJ A44 203	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
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>	(Jefferson Lab CLAS Collab.)
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)

PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
ARNDT	04	PR C69 035213	R.A. Arndt <i>et al.</i>	(GWU, TRIU)
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman,, T.-S.H. Lee	(PITT+)
ARNDT	96	PR C53 430	R.A. Arndt, I.I. Strakovsky, R.L. Workman	(VPI)
ARNDT	95	PR C52 2120	R.A. Arndt <i>et al.</i>	(VPI, BRCO)
HOEHLER	93	$\pi N$ Newsletter 9 1	G. Hohler	(KARL)
LI	93	PR C47 2759	Z.J. Li <i>et al.</i>	(VPI)
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)
ARNDT	91	PR D43 2131	R.A. Arndt <i>et al.</i>	(VPI, TELE) IJP
BELL	83	NP B222 389	K.W. Bell <i>et al.</i>	(RL) IJP
CRAWFORD	83	NP B211 1	R.L. Crawford, W.T. Morton	(GLAS)
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELSE, CIT, CERN)
AWAJI	81	Bonn Conf. 352	N. Awaji, R. Kajikawa	(NAGO)
Also		NP B197 365	K. Fujii <i>et al.</i>	(NAGO)
FUJII	81	NP B187 53	K. Fujii <i>et al.</i>	(NAGO, OSAK)
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
SAXON	80	NP B162 522	D.H. Saxon <i>et al.</i>	(RHEL, BRIS) IJP
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP
LONGACRE	78	PR D17 1795	R.S. Longacre <i>et al.</i>	(LBL, SLAC)
LONGACRE	77	NP B122 493	R.S. Longacre, J. Dolbeau	(SACL) IJP
Also		NP B108 365	J. Dolbeau <i>et al.</i>	(SACL) IJP
LONGACRE	75	PL 55B 415	R.S. Longacre <i>et al.</i>	(LBL, SLAC) IJP