

$$\Delta(1930) \ 5/2^-$$

$$I(J^P) = \frac{3}{2}(\frac{5}{2}^-) \text{ Status: } ***$$

Older and obsolete values are listed and referenced in the 2014 edition, *Chinese Physics C* **38** 070001 (2014).

### $\Delta(1930)$ POLE POSITION

#### REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1840 to 1960 (<math>\approx</math> 1900) OUR ESTIMATE</b>			
1848 $\pm$ 9 $\pm$ 19	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
2001	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
1850	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
1890 $\pm$ 50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1882	SHRESTHA	12A	DPWA Multichannel
1883	VRANA	00	DPWA Multichannel

#### –2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>175 to 360 (<math>\approx</math> 270) OUR ESTIMATE</b>			
321 $\pm$ 17 $\pm$ 7	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
387	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
180	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
260 $\pm$ 60	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
187	SHRESTHA	12A	DPWA Multichannel
250	VRANA	00	DPWA Multichannel

### $\Delta(1930)$ ELASTIC POLE RESIDUE

#### MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>8 to 20 (<math>\approx</math> 14) OUR ESTIMATE</b>			
9 $\pm$ 1 $\pm$ 1	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
7	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
20	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
18 $\pm$ 6	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$

#### PHASE $\theta$

VALUE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
<b>–10 to –40 (<math>\approx</math> –30) OUR ESTIMATE</b>			
–37 $\pm$ 3 $\pm$ 7	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
–12	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
–20 $\pm$ 40	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$

**$\Delta(1930)$  BREIT-WIGNER MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1900 to 2000 (<math>\approx</math> 1950) OUR ESTIMATE</b>			
2233 $\pm$ 53	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
1940 $\pm$ 30	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1901 $\pm$ 15	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1930 $\pm$ 12	SHRESTHA	12A	DPWA Multichannel
1932 $\pm$ 100	VRANA	00	DPWA Multichannel

 **$\Delta(1930)$  BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>220 to 500 (<math>\approx</math> 360) OUR ESTIMATE</b>			
773 $\pm$ 187	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
320 $\pm$ 60	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
195 $\pm$ 60	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
235 $\pm$ 39	SHRESTHA	12A	DPWA Multichannel
316 $\pm$ 237	VRANA	00	DPWA Multichannel

 **$\Delta(1930)$  DECAY MODES**

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

Mode	Fraction ( $\Gamma_j/\Gamma$ )
$\Gamma_1$ $N\pi$	5–15 %
$\Gamma_2$ $N\gamma$	0.0–0.01 %
$\Gamma_3$ $N\gamma$ , helicity=1/2	0.0–0.005 %
$\Gamma_4$ $N\gamma$ , helicity=3/2	0.0–0.004 %

 **$\Delta(1930)$  BRANCHING RATIOS**

<u><math>\Gamma(N\pi)/\Gamma_{\text{total}}</math></u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u><math>\Gamma_1/\Gamma</math></u>
<b>5 to 15 OUR ESTIMATE</b>				
8.1 $\pm$ 1.2	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$	
14 $\pm$ 4	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$	
4 $\pm$ 3	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
7.9 $\pm$ 0.4	SHRESTHA	12A	DPWA Multichannel	
9 $\pm$ 8	VRANA	00	DPWA Multichannel	

**$\Delta(1930)$  BREIT-WIGNER PHOTON DECAY AMPLITUDES** **$\Delta(1930) \rightarrow N\gamma$ , helicity-1/2 amplitude  $A_{1/2}$** 

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
-0.007±0.010	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.011±0.003	SHRESTHA	12A	DPWA Multichannel

 **$\Delta(1930) \rightarrow N\gamma$ , helicity-3/2 amplitude  $A_{3/2}$** 

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.005±0.010	ARNDT	96	IPWA $\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.002±0.002	SHRESTHA	12A	DPWA Multichannel

 **$\Delta(1930)$  FOOTNOTES**

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

 **$\Delta(1930)$  REFERENCES**

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

PDG	14	CPC 38 070001	K. Olive <i>et al.</i>	(PDG Collab.)
SVARC	14	PR C89 045205	A. Svarc <i>et al.</i>	
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
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)
ARNDT	96	PR C53 430	R.A. Arndt, I.I. Strakovsky, R.L. Workman	(VPI)
HOEHLER	93	$\pi N$ 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