

**$N(2000) 5/2^+$**  $I(J^P) = \frac{1}{2}(5/2^+)$  Status: \*\*

## OMITTED FROM SUMMARY TABLE

Before the 2012 Review, all the evidence for a  $J^P = 5/2^+$  state with a mass above 1800 MeV was filed under a two-star  $N(2000)$ . There is now some evidence from ANISOVICH 12A for two  $5/2^+$  states in this region, so we have split the older data (according to mass) between two two-star  $5/2^+$  states, an  $N(1860)$  and an  $N(2000)$ .

 **$N(2000)$  BREIT-WIGNER MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1950 to 2150 (<math>\approx</math> 2050) OUR ESTIMATE</b>			
2090 $\pm$ 120	ANISOVICH	12A DPWA	Multichannel
2025	AYED	76 IPWA	$\pi N \rightarrow \pi N$
1970	<sup>1</sup> LANGBEIN	73 IPWA	$\pi N \rightarrow \Sigma K$ (sol. 2)
2175	ALMEHED	72 IPWA	$\pi N \rightarrow \pi N$
1930	DEANS	72 MPWA	$\gamma p \rightarrow \Lambda K$ (sol. D)

 **$N(2000)$  BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
460 $\pm$ 100	ANISOVICH	12A DPWA	Multichannel
157	AYED	76 IPWA	$\pi N \rightarrow \pi N$
170	<sup>1</sup> LANGBEIN	73 IPWA	$\pi N \rightarrow \Sigma K$ (sol. 2)
150	ALMEHED	72 IPWA	$\pi N \rightarrow \pi N$
112	DEANS	72 MPWA	$\gamma p \rightarrow \Lambda K$ (sol. D)

 **$N(2000)$  POLE POSITION****REAL PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2030 $\pm$ 110	ANISOVICH	12A DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1779	ARNDT	04 DPWA	$\pi N \rightarrow \pi N, \eta N$

**−2×IMAGINARY PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
480 $\pm$ 100	ANISOVICH	12A DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
248	ARNDT	04 DPWA	$\pi N \rightarrow \pi N, \eta N$

## N(2000) ELASTIC POLE RESIDUE

### MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$35^{+80}_{-15}$	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
47	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$

### PHASE $\theta$

VALUE (°)	DOCUMENT ID	TECN	COMMENT
$-100 \pm 40$	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
- 61	ARNDT	04	DPWA $\pi N \rightarrow \pi N, \eta N$

## N(2000) DECAY MODES

Mode
$\Gamma_1$ $N\pi$
$\Gamma_2$ $N\eta$
$\Gamma_3$ $\Lambda K$
$\Gamma_4$ $\Sigma K$
$\Gamma_5$ $p\gamma$

## N(2000) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	COMMENT	$\Gamma_1/\Gamma$
VALUE (%)				
$9 \pm 4$	ANISOVICH	12A	DPWA Multichannel	
8	AYED	76	IPWA $\pi N \rightarrow \pi N$	
25	ALMEHED	72	IPWA $\pi N \rightarrow \pi N$	

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2000) \rightarrow N\eta$	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_2)^{1/2}/\Gamma$
VALUE				
+0.03	BAKER	79	DPWA $\pi^- p \rightarrow n\eta$	

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2000) \rightarrow \Lambda K$	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_3)^{1/2}/\Gamma$
VALUE				
not seen	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$	

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2000) \rightarrow \Sigma K$	DOCUMENT ID	TECN	COMMENT	$(\Gamma_1 \Gamma_4)^{1/2}/\Gamma$
VALUE				
0.022	<sup>2</sup> DEANS	75	DPWA $\pi N \rightarrow \Sigma K$	
0.05	<sup>1</sup> LANGBEIN	73	IPWA $\pi N \rightarrow \Sigma K$ (sol. 2)	

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $p\gamma \rightarrow N(2000) \rightarrow \Lambda K$	$(\Gamma_5 \Gamma_3)^{1/2} / \Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT
0.0022	DEANS	72	MPWA $\gamma p \rightarrow \Lambda K$ (sol. D)

### **$N(2000)$ PHOTON DECAY AMPLITUDES**

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

#### **$N(2000) \rightarrow p\gamma$ , helicity-1/2 amplitude $A_{1/2}$**

VALUE (GeV <sup>-1/2</sup> )	DOCUMENT ID	TECN	COMMENT
0.035 ± 0.015	<sup>3</sup> ANISOVICH	12A	DPWA Phase = (15 ± 40)°

#### **$N(2000) \rightarrow p\gamma$ , helicity-3/2 amplitude $A_{3/2}$**

VALUE (GeV <sup>-1/2</sup> )	DOCUMENT ID	TECN	COMMENT
0.050 ± 0.014	<sup>3</sup> ANISOVICH	12A	DPWA Phase = (-130 ± 40)°

### **$N(2000)$ FOOTNOTES**

<sup>1</sup> Not seen in solution 1 of LANGBEIN 73.

<sup>2</sup> Value given is from solution 1 of DEANS 75; not present in solutions 2, 3, or 4.

<sup>3</sup> This ANISOVICH 12A value is the complex helicity amplitude at the pole position.

### **$N(2000)$ REFERENCES**

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
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)
SAXON	80	NP B162 522	D.H. Saxon <i>et al.</i>	(RHEL, BRIS) IJP
BAKER	79	NP B156 93	R.D. Baker <i>et al.</i>	(RHEL) IJP
AYED	76	Thesis CEA-N-1921	R. Ayed	(SACL) IJP
DEANS	75	NP B96 90	S.R. Deans <i>et al.</i>	(SFLA, ALAH) IJP
LANGBEIN	73	NP B53 251	W. Langbein, F. Wagner	(MUNI) IJP
ALMEHED	72	NP B40 157	S. Almeded, C. Lovelace	(LUND, RUTG) IJP
DEANS	72	PR D6 1906	S.R. Deans <i>et al.</i>	(SFLA) IJP