

$N(1860) 5/2^+$ $I(J^P) = \frac{1}{2}(5/2^+)$ 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 $N(2000)$.

 $N(1860)$ POLE POSITION**REAL PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$1834 \pm 19 \pm 6$	¹ SVARC 14	L+P	$\pi N \rightarrow \pi N$
1830^{+120}_{-60}	ANISOVICH 12A	DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1871	HUNT 19	DPWA	Multichannel
1807	ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$

¹ Fit to the amplitudes of HOEHLER 79.**−2×IMAGINARY PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$122 \pm 34 \pm 7$	² SVARC 14	L+P	$\pi N \rightarrow \pi N$
250^{+150}_{-50}	ANISOVICH 12A	DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
337	HUNT 19	DPWA	Multichannel
109	ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$

² Fit to the amplitudes of HOEHLER 79. **$N(1860)$ ELASTIC POLE RESIDUE****MODULUS $|r|$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$4 \pm 1 \pm 1$	³ SVARC 14	L+P	$\pi N \rightarrow \pi N$
50 ± 20	ANISOVICH 12A	DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
60	ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$

³ Fit to the amplitudes of HOEHLER 79.**PHASE θ**

VALUE (°)	DOCUMENT ID	TECN	COMMENT
$-39 \pm 18 \pm 9$	⁴ SVARC 14	L+P	$\pi N \rightarrow \pi N$
-80 ± 40	ANISOVICH 12A	DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
−67	ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$

⁴ Fit to the amplitudes of HOEHLER 79.***N*(1860) BREIT-WIGNER MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1928 ± 21	⁵ HUNT	19	DPWA Multichannel
1860 $\begin{smallmatrix} +120 \\ -60 \end{smallmatrix}$	ANISOVICH	12A	DPWA Multichannel
1882 ± 10	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1900 ± 7	⁵ SHRESTHA	12A	DPWA Multichannel
1817.7	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$

⁵ Statistical error only.***N*(1860) BREIT-WIGNER WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
376 ± 58	⁶ HUNT	19	DPWA Multichannel
270 $\begin{smallmatrix} +140 \\ -50 \end{smallmatrix}$	ANISOVICH	12A	DPWA Multichannel
95 ± 20	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
219 ± 23	⁶ SHRESTHA	12A	DPWA Multichannel
117.6	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$

⁶ Statistical error only.***N*(1860) DECAY MODES**

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	4–20 %
Γ_2 $N\eta$	2–6 %
Γ_3 ΛK	
Γ_4 $N\pi\pi$	
Γ_5 $\Delta\pi$	
Γ_6 $\Delta\pi, P\text{-wave}$	
Γ_7 $\Delta\pi, F\text{-wave}$	
Γ_8 $N\rho$	
Γ_9 $N\rho, S=3/2, P\text{-wave}$	
Γ_{10} $N\rho, S=3/2, F\text{-wave}$	
Γ_{11} $N\sigma$	35–47 %
Γ_{12} $p\gamma$	
Γ_{13} $p\gamma, \text{helicity}=1/2$	seen
Γ_{14} $p\gamma, \text{helicity}=3/2$	seen
Γ_{15} $n\gamma$	0.0017–0.062 %
Γ_{16} $n\gamma, \text{helicity}=1/2$	0.0003–0.019 %
Γ_{17} $n\gamma, \text{helicity}=3/2$	0.0014–0.043 %

$N(1860)$ BRANCHING RATIOS **$\Gamma(N\pi)/\Gamma_{\text{total}}$ Γ_1/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
8.0 ± 0.1	⁷ HUNT 19	DPWA	Multichannel
20 ± 6	ANISOVICH 12A	DPWA	Multichannel
4 ± 2	HOEHLER 79	IPWA	$\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
17 ± 1	⁷ SHRESTHA 12A	DPWA	Multichannel
12.7	ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$

⁷ Statistical error only. **$\Gamma(N\eta)/\Gamma_{\text{total}}$ Γ_2/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.11 ± 0.09	⁸ HUNT 19	DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
4 ± 2	⁸ SHRESTHA 12A	DPWA	Multichannel

⁸ Statistical error only. **$\Gamma(\Lambda K)/\Gamma_{\text{total}}$ Γ_3/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
< 0.01	⁹ HUNT 19	DPWA	Multichannel

⁹ Statistical error only. **$\Gamma(\Delta\pi, P\text{-wave})/\Gamma_{\text{total}}$ Γ_6/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
10 ± 6	¹⁰ HUNT 19	DPWA	Multichannel

¹⁰ Statistical error only. **$\Gamma(\Delta\pi, F\text{-wave})/\Gamma_{\text{total}}$ Γ_7/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
27 ± 11	¹¹ HUNT 19	DPWA	Multichannel

¹¹ Statistical error only. **$\Gamma(N\rho, S=3/2, P\text{-wave})/\Gamma_{\text{total}}$ Γ_9/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
< 8.5	¹² HUNT 19	DPWA	Multichannel

¹² Statistical error only. **$\Gamma(N\rho, S=3/2, F\text{-wave})/\Gamma_{\text{total}}$ Γ_{10}/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
< 0.1	¹³ HUNT 19	DPWA	Multichannel

¹³ Statistical error only.

$\Gamma(N\sigma)/\Gamma_{\text{total}}$		Γ_{11}/Γ
VALUE (%)	DOCUMENT ID	TECN COMMENT
51 ± 10	¹⁴ HUNT	19 DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
41 ± 6	¹⁴ SHRESTHA	12A DPWA Multichannel
¹⁴ Statistical error only.		

$N(1860)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES

$N(1860) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN COMMENT
-0.022 ± 0.020	¹⁵ HUNT	19 DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
-0.017 ± 0.003	¹⁵ SHRESTHA	12A DPWA Multichannel
¹⁵ Statistical error only.		

$N(1860) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE	DOCUMENT ID	TECN COMMENT
-0.032 ± 0.034	¹⁶ HUNT	19 DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
0.029 ± 0.004	¹⁶ SHRESTHA	12A DPWA Multichannel
¹⁶ Statistical error only.		

$N(1860) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN COMMENT
0.021 ± 0.029	¹⁷ HUNT	19 DPWA Multichannel
0.021 ± 0.013	ANISOVICH	13B DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
0.010 ± 0.005	¹⁷ SHRESTHA	12A DPWA Multichannel
¹⁷ Statistical error only.		

$N(1860) \rightarrow n\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN COMMENT
0.070 ± 0.035	¹⁸ HUNT	19 DPWA Multichannel
0.034 ± 0.017	ANISOVICH	13B DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •		
-0.009 ± 0.005	¹⁸ SHRESTHA	12A DPWA Multichannel
¹⁸ Statistical error only.		

$N(1860)$ REFERENCES

HUNT	19	PR C99 055205	B.C. Hunt, D.M. Manley	
SVARC	14	PR C89 045205	A. Svarc <i>et al.</i>	(RBI Zagreb, UNI Tuzla)
ANISOVICH	13B	EPJ A49 67	A.V. Anisovich <i>et al.</i>	
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT)