

$N(2220) H_{19}$

$$I(J^P) = \frac{1}{2}(\frac{9}{2}^+) \text{ Status: } ****$$

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).

 $N(2220)$ BREIT-WIGNER MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2180 to 2310 (≈ 2220) OUR ESTIMATE			
2230 \pm 80	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
2205 \pm 10	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
2300 \pm 100	HENDRY	78	MPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2258	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
2050	BAKER	79	DPWA $\pi^- p \rightarrow n\eta$

 $N(2220)$ BREIT-WIGNER WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
320 to 550 (≈ 400) OUR ESTIMATE			
500 \pm 150	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
365 \pm 30	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
450 \pm 150	HENDRY	78	MPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
334	ARNDT	95	DPWA $\pi N \rightarrow N\pi$

 $N(2220)$ POLE POSITION**REAL PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2100 to 2240 (≈ 2170) OUR ESTIMATE			
2203	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
2135	¹ HOEHLER	93	ARGD $\pi N \rightarrow \pi N$
2160 \pm 80	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2253	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

-2xIMAGINARY PART

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
370 to 570 (≈ 470) OUR ESTIMATE			
536	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
400	¹ HOEHLER	93	ARGD $\pi N \rightarrow \pi N$
480 \pm 100	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
640	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

***N*(2220) ELASTIC POLE RESIDUE**

MODULUS $|r|$

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
68	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
40	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$
45 ± 20	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
85	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

PHASE θ

<u>VALUE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
-43	ARNDT	95	DPWA $\pi N \rightarrow N\pi$
-50	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$
-45 ± 25	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-62	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

***N*(2220) DECAY MODES**

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

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	10–20 %
Γ_2 $N\eta$	
Γ_3 ΛK	

***N*(2220) BRANCHING RATIOS**

<u>$\Gamma(N\pi)/\Gamma_{\text{total}}$</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_1/Γ</u>
0.1 to 0.2 OUR ESTIMATE				
0.15 ± 0.03	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$	
0.18 ± 0.015	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$	
0.12 ± 0.04	HENDRY	78	MPWA $\pi N \rightarrow \pi N$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.26	ARNDT	95	DPWA $\pi N \rightarrow N\pi$	

<u>$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2220) \rightarrow N\eta$</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.034	BAKER	79	DPWA $\pi^- p \rightarrow n\eta$	

<u>$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(2220) \rightarrow \Lambda K$</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>$(\Gamma_1\Gamma_3)^{1/2}/\Gamma$</u>
not required	BELL	83	DPWA $\pi^- p \rightarrow \Lambda K^0$	
not seen	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$	

$N(2220)$ FOOTNOTES

¹ See HOEHLER 93 for a detailed discussion of the evidence for and the pole parameters of N and Δ resonances as determined from Argand diagrams of πN elastic partial-wave amplitudes and from plots of the speeds with which the amplitudes traverse the diagrams.

$N(2220)$ REFERENCES

For early references, see Physics Letters **111B** 70 (1982).

ARNDT	95	PR C52 2120	R.A. Arndt <i>et al.</i>	(VPI, BRCO)
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)
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
PDG	82	PL 111B	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
Also	79	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
BAKER	79	NP B156 93	R.D. Baker <i>et al.</i>	(RHEL) IJP
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP
Also	80	Toronto Conf. 3	R. Koch	(KARLT) IJP
HENDRY	78	PRL 41 222	A.W. Hendry	(IND, LBL) IJP
Also	81	ANP 136 1	A.W. Hendry	(IND)