$N(2220)\ H_{19}$

$I(J^P) = \frac{1}{2}(\frac{9}{2}^+)$ 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 1980 were last included in our 2006 edition, Journal of Physics, G **33** 1 (2006).

N(2220) BREIT-WIGNER MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2200 to 2300 (≈ 2250) OUR ESTIMATE				
2316.3± 2.9	ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
2230 ± 80	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
2205 ± 10	HOEHLER	79	IPWA	$\pi N \to \pi N$
2300 ±100	HENDRY	78	MPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2270 ± 11	ARNDT	04	DPWA	$\pi N \to \pi N, \eta N$
2258	ARNDT	95	DPWA	$\pi N \to N \pi$

N(2220) BREIT-WIGNER WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
350 to 500 (≈ 400) OUR ESTIMATE				
633± 17	ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
500±150	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
365± 30	HOEHLER	79	IPWA	$\pi N \to \pi N$
450±150	HENDRY	78	MPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
366± 42	ARNDT	04	DPWA	$\pi N \to \pi N, \eta N$
334	ARNDT	95	DPWA	$\pi N \to N \pi$

N(2220) POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2130 to 2200 (≈ 2170) OUR ESTIMATE				
2199	ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
2135	[1] HOEHLER	93	ARGD	$\pi N \to \pi N$
2160±80	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2209	ARNDT	04	DPWA	$\pi N \to \pi N, \eta N$
2203	ARNDT	95	DPWA	$\pi N \to N \pi$
2253	ARNDT	91	DPWA	$\pi N \to \pi N$ Soln SM90

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
400 to 560 (≈ 480) OUR ESTIMATE				
372	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
400	[1] HOEHLER	93	ARGD	$\pi N \to \pi N$
480±100	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
564	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
536	ARNDT	95	DPWA	$\pi N \to N\pi$
640	ARNDT	91	DPWA	$\pi N \to \pi N$ Soln SM90

N(2220) ELASTIC POLE RESIDUE

MODULUS |*r*|

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
33	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
40	HOEHLER	93	ARGD	$\pi N \to \pi N$
45±20	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
96	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
68	ARNDT	95	DPWA	$\pi N \to N\pi$
85	ARNDT	91	DPWA	$\pi N \to \pi N$ Soln SM90

PHASE θ

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
−33	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
−50	HOEHLER	93	ARGD	$\pi N \to \pi N$
−45±25	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−71	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
−43	ARNDT	95	DPWA	$\pi N \to N\pi$
−62	ARNDT	91	DPWA	$\pi N \to \pi N$ 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

$\Gamma(N\pi)/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.1 to 0.2 OUR ESTIMATE				
0.246 ± 0.001	ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
0.15 ± 0.03	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
0.18 ± 0.015	HOEHLER	79	IPWA	$\pi N \to \pi N$
0.12 ± 0.04	HENDRY	78	MPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.200 ± 0.006	ARNDT	04	DPWA	$\pi N \to \pi N, \eta N$
0.26	ARNDT	95	DPWA	$\pi N \to N\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2220) \to \Lambda K$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
not required	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
not seen	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$

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** 1 (1982).

ARNDT	06	PR C74 045205	R.A. Arndt et al.	(GWU)
PDG	06	JPG 33 1	W.-M. Yao et al.	(PDG Collab.)
ARNDT	04	PR C69 035213	R.A. Arndt et al.	(GWU, TRIU)
ARNDT	95	PR C52 2120	R.A. Arndt et al.	(VPI, BRCO)
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)
ARNDT	91	PR D43 2131	R.A. Arndt et al.	(VPI, TELE) IJP
BELL	83	NP B222 389	K.W. Bell et al.	(RL) IJP
PDG	82	PL 111B 1	M. Roos et al.	(HELS, CIT, CERN)
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky et al.	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky et al.	(CMU, LBL) IJP
SAXON	80	NP B162 522	D.H. Saxon et al.	(RHEL, BRIS) IJP
HOEHLER	79	PDAT 12-1	G. Hohler et al.	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP
HENDRY	78	PRL 41 222	A.W. Hendry	(IND, LBL) IJP
Also		ANP 136 1	A.W. Hendry	(IND)