$\Delta(2200)\ 7/2^-$

$I(J^P) = \frac{3}{2}(\frac{7}{2}^-)$ Status: ***

Δ(2200) POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2050 to 2150 (≈ 2100) OUR ESTIMATE				
1963± 1	ROENCHEN	22	DPWA	Multichannel
2100±50	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2142	ROENCHEN	15A	DPWA	Multichannel

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
260 to 420 (≈ 340) OUR ESTIMATE				
328± 2	ROENCHEN	22	DPWA	Multichannel
340±80	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
486	ROENCHEN	15A	DPWA	Multichannel

Δ(2200) ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
6.8±0.3	ROENCHEN	22	DPWA	Multichannel
8 ±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
17	ROENCHEN	15A	DPWA	Multichannel

PHASE θ

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−80± 1	ROENCHEN	22	DPWA	Multichannel
−70±40	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−56	ROENCHEN	15A	DPWA	Multichannel

Δ(2200) INELASTIC POLE RESIDUE

The "normalized residue" is the residue divided by $\Gamma_{pole}/2$.

Normalized residue in $N\pi \to \Delta(2200) \to \Sigma K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.001±0.002	−123 ± 1	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.005	−103	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(2200) \rightarrow \Delta\pi$, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.16±0.01	100 ± 1	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.23	107	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(2200) \rightarrow \Delta\pi$, G-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.003±0.001	152 ± 3	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.022	−151	ROENCHEN	15A	DPWA	Multichannel

$\Delta(2200)$ BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2150 to 2250 (≈ 2200) OUR ESTIMATE				
2176±40	ANISOVICH	17	DPWA	Multichannel
2200±80	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
2215±60	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$

$\Delta(2200)$ BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
200 to 500 (≈ 350) OUR ESTIMATE				
210± 70	ANISOVICH	17	DPWA	Multichannel
450±100	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
400±100	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$

$\Delta(2200)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\pi$	2–8 %
Γ_2	ΣK	1–7 %
Γ_3	$N\pi\pi$	>45 %
Γ_4	$\Delta\pi$	>45 %
Γ_5	$\Delta\pi$, D-wave	>40 %
Γ_6	$\Delta\pi$, G-wave	5–25 %
Γ_7	$\Delta\eta$	
Γ_8	$\Delta\eta$, D-wave	seen

$\Delta(2200)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
2–8 % OUR ESTIMATE				
3.5±1.5	ANISOVICH	17	DPWA	Multichannel
6 ±2	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
5 ±2	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$

$\Gamma(\Sigma K)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.04 ± 0.03	ANISOVICH	17	DPWA	Multichannel

$\Gamma(\Delta\pi, D\text{-wave})/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
>40 % OUR ESTIMATE				
0.70 ± 0.30	ANISOVICH	17	DPWA	Multichannel

$\Gamma(\Delta\pi, G\text{-wave})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.15 ± 0.10	ANISOVICH	17	DPWA	Multichannel

$\Gamma(\Delta\eta, D\text{-wave})/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
~ 0.01	ANISOVICH	17	DPWA	Multichannel

$\Delta(2200)$ PHOTON DECAY AMPLITUDES AT THE POLE

$\Delta(2200) \to N\gamma$, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.104 ± 0.011	-139 ± 2	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.106	-23	ROENCHEN	15A	DPWA	Multichannel

$\Delta(2200) \to N\gamma$, helicity-3/2 amplitude $A_{3/2}$

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.021 ± 0.013	-180 ± 20	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.157	-60	ROENCHEN	15A	DPWA	Multichannel

$\Delta(2200)$ REFERENCES

ROENCHEN	22	EPJ A58 229	D. Roenchen *et al.*	(JULI, GWU, BONN+)
ANISOVICH	17	PL B766 357	A.V. Anisovich *et al.*	
ROENCHEN	15A	EPJ A51 70	D. Roenchen *et al.*	
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
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP