

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

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

$\Delta(2200)$ 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 $\pi N \rightarrow \pi N$
• • • 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 $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
486	ROENCHEN	15A	DPWA Multichannel

$\Delta(2200)$ ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
6.8 ± 0.3	ROENCHEN	22	DPWA Multichannel
8 ± 3	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • 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 $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
−56	ROENCHEN	15A	DPWA Multichannel

$\Delta(2200)$ INELASTIC POLE RESIDUE

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

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

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

<i>MODULUS</i>	<i>PHASE (°)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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

<i>MODULUS</i>	<i>PHASE (°)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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

<i>VALUE (MeV)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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

<i>VALUE (MeV)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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			
<i>VALUE (%)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>	
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

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

MODULUS ($\text{GeV}^{-1/2}$)	PHASE ($^\circ$)	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

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

MODULUS ($\text{GeV}^{-1/2}$)	PHASE ($^\circ$)	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 <i>et al.</i>	(JULI, GWU, BONN+)
ANISOVICH 17	PL B766 357	A.V. Anisovich <i>et al.</i>	
ROENCHEN 15A	EPJ A51 70	D. Roenchen <i>et al.</i>	
CUTKOSKY 80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
Also	PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
HOEHLER 79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP
Also	Toronto Conf. 3	R. Koch	(KARLT) IJP