

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

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

## $\Delta(2200)$ POLE POSITION

### REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>2050 to 2150 (<math>\approx</math> 2100) OUR ESTIMATE</b>			
2090 $\pm$ 20	SARANTSEV 25	DPWA	Multichannel
1963 $\pm$ 1	ROENCHEN 22	DPWA	Multichannel
2100 $\pm$ 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
<b>260 to 420 (<math>\approx</math> 340) OUR ESTIMATE</b>			
360 $\pm$ 35	SARANTSEV 25	DPWA	Multichannel
328 $\pm$ 2	ROENCHEN 22	DPWA	Multichannel
340 $\pm$ 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 $\pm$ 0.3	ROENCHEN 22	DPWA	Multichannel
8 $\pm$ 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 $\theta$

VALUE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
–80 $\pm$ 1	ROENCHEN 22	DPWA	Multichannel
–70 $\pm$ 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 ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
0.001 $\pm$ 0.002	–123 $\pm$ 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**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.16 \pm 0.01$	$100 \pm 1$	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**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.003 \pm 0.001$	$152 \pm 3$	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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2150 to 2250 (<math>\approx 2200</math>) OUR ESTIMATE</b>			
$2180 \pm 30$	SARANTSEV	25	DPWA Multichannel
$2200 \pm 80$	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
$2215 \pm 60$	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$2176 \pm 40$	ANISOVICH	17	DPWA Multichannel

**$\Delta(2200)$  BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>200 to 500 (<math>\approx 350</math>) OUR ESTIMATE</b>			
$420 \pm 50$	SARANTSEV	25	DPWA Multichannel
$450 \pm 100$	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
$400 \pm 100$	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$210 \pm 70$	ANISOVICH	17	DPWA Multichannel

**$\Delta(2200)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\pi$	2–8 %
$\Gamma_2$ $\Sigma K$	1–7 %
$\Gamma_3$ $N\pi\pi$	>45 %
$\Gamma_4$ $\Delta\pi$	>45 %
$\Gamma_5$ $\Delta\pi$ , $D$ -wave	$(70 \pm 30)$ %
$\Gamma_6$ $\Delta\pi$ , $G$ -wave	5–25 %
$\Gamma_7$ $\Delta\eta$	
$\Gamma_8$ $\Delta\eta$ , $D$ -wave	seen

## $\Delta(2200)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>2-8 % OUR ESTIMATE</b>				
3.5 ± 1.5	ANISOVICH	17	DPWA	Multichannel
6 ± 2	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
5 ± 2	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
<hr/>				
$\Gamma(\Sigma K)/\Gamma_{\text{total}}$				$\Gamma_2/\Gamma$
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
4 ± 3	ANISOVICH	17	DPWA	Multichannel
<hr/>				
$\Gamma(\Delta\pi)/\Gamma_{\text{total}}$				$\Gamma_4/\Gamma$
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2 ± 2	SARANTSEV	25	DPWA	Multichannel
<hr/>				
$\Gamma(\Delta\pi, D\text{-wave})/\Gamma_{\text{total}}$				$\Gamma_5/\Gamma$
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
70 ± 30	ANISOVICH	17	DPWA	Multichannel
<hr/>				
$\Gamma(\Delta\pi, G\text{-wave})/\Gamma_{\text{total}}$				$\Gamma_6/\Gamma$
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1 ± 1	SARANTSEV	25	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
15 ± 10	ANISOVICH	17	DPWA	Multichannel
<hr/>				
$\Gamma(\Delta\eta, D\text{-wave})/\Gamma_{\text{total}}$				$\Gamma_8/\Gamma$
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
~ 1	ANISOVICH	17	DPWA	Multichannel

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

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

<u>MODULUS (<math>\text{GeV}^{-1/2}</math>)</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.120 ± 0.015	-35 ± 20	SARANTSEV	25	DPWA Multichannel
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 $A_{3/2}$

<u>MODULUS (<math>\text{GeV}^{-1/2}</math>)</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.073 ± 0.012	-30 ± 20	SARANTSEV	25	DPWA Multichannel
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

## $\Delta(2200)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES

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

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.125 ± 0.016	SARANTSEV 25	DPWA	Multichannel

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

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.075 ± 0.012	SARANTSEV 25	DPWA	Multichannel

## $\Delta(2200)$ REFERENCES

SARANTSEV 25	PR C112 015202	A.V. Sarantsev <i>et al.</i>	(Bonn-Gatchina Collab.)
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