

# Δ(1940) D<sub>33</sub>

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

OMITTED FROM SUMMARY TABLE

## Δ(1940) BREIT-WIGNER MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>≈ 1940 OUR ESTIMATE</b>			
2057 ± 110	MANLEY	92	IPWA π N → π N & N π π
2058.1 ± 34.5	CHEW	80	BPWA π <sup>+</sup> p → π <sup>+</sup> p
1940 ± 100	CUTKOSKY	80	IPWA π N → π N

## Δ(1940) BREIT-WIGNER WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
460 ± 320	MANLEY	92	IPWA π N → π N & N π π
198.4 ± 45.5	CHEW	80	BPWA π <sup>+</sup> p → π <sup>+</sup> p
200 ± 100	CUTKOSKY	80	IPWA π N → π N

## Δ(1940) POLE POSITION

### REAL PART

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1900 ± 100	CUTKOSKY	80	IPWA π N → π N
1915 or 1926	<sup>1</sup> LONGACRE	78	IPWA π N → N π π

### − 2×IMAGINARY PART

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
200 ± 60	CUTKOSKY	80	IPWA π N → π N
190 or 186	<sup>1</sup> LONGACRE	78	IPWA π N → N π π

## Δ(1940) ELASTIC POLE RESIDUE

### MODULUS |r|

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
8 ± 3	CUTKOSKY	80	IPWA π N → π N

### PHASE θ

<u>VALUE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
135 ± 45	CUTKOSKY	80	IPWA π N → π N

## $\Delta(1940)$ DECAY MODES

Mode	
$\Gamma_1$	$N\pi$
$\Gamma_2$	$\Sigma K$
$\Gamma_3$	$N\pi\pi$
$\Gamma_4$	$\Delta(1232)\pi$ , S-wave
$\Gamma_5$	$\Delta(1232)\pi$ , D-wave
$\Gamma_6$	$N\rho$ , S=3/2, S-wave
$\Gamma_7$	$N\gamma$ , helicity=1/2
$\Gamma_8$	$N\gamma$ , helicity=3/2

## $\Delta(1940)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
$0.18 \pm 0.12$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \text{ \& } N\pi\pi$
0.18	CHEW	80	BPWA	$\pi^+ p \rightarrow \pi^+ p$
$0.05 \pm 0.02$	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow \Delta(1940) \rightarrow \Sigma K$				$(\Gamma_1 \Gamma_2)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
<0.015	CANDLIN	84	DPWA	$\pi^+ p \rightarrow \Sigma^+ K^+$

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow \Delta(1940) \rightarrow \Delta(1232)\pi$ , S-wave				$(\Gamma_1 \Gamma_4)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
$+0.11 \pm 0.10$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \text{ \& } N\pi\pi$

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow \Delta(1940) \rightarrow \Delta(1232)\pi$ , D-wave				$(\Gamma_1 \Gamma_5)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
$+0.27 \pm 0.16$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \text{ \& } N\pi\pi$

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow \Delta(1940) \rightarrow N\rho$ , S=3/2, S-wave				$(\Gamma_1 \Gamma_6)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
$+0.25 \pm 0.10$	MANLEY	92	IPWA	$\pi N \rightarrow \pi N \text{ \& } N\pi\pi$

## $\Delta(1940)$ PHOTON DECAY AMPLITUDES

### $\Delta(1940) \rightarrow N\gamma$ , helicity-1/2 amplitude $A_{1/2}$

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
$-0.036 \pm 0.058$	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$

### $\Delta(1940) \rightarrow N\gamma$ , helicity-3/2 amplitude $A_{3/2}$

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
$-0.031 \pm 0.012$	AWAJI	81	DPWA $\gamma N \rightarrow \pi N$

## $\Delta(1940)$ FOOTNOTES

<sup>1</sup> LONGACRE 78 values are from a search for poles in the unitarized T-matrix. The first (second) value uses, in addition to  $\pi N \rightarrow N\pi\pi$  data, elastic amplitudes from a Saclay (CERN) partial-wave analysis.

## $\Delta(1940)$ REFERENCES

MANLEY	92	PR D45 4002	+Saleski	(KENT) IJP
Also	84	PR D30 904	Manley, Arndt, Goradia, Teplitz	(VPI)
CANDLIN	84	NP B238 477	+Lowe, Peach, Scotland+	(EDIN, RAL, LOWC)
AWAJI	81	Bonn Conf. 352	+Kajikawa	(NAGO)
Also	82	NP B197 365	Fujii, Hayashii, Iwata, Kajikawa+	(NAGO)
CHEW	80	Toronto Conf. 123		(LBL) IJP
CUTKOSKY	80	Toronto Conf. 19	+Forsyth, Babcock, Kelly, Hendrick	(CMU, LBL) IJP
Also	79	PR D20 2839	Cutkosky, Forsyth, Hendrick, Kelly	(CMU, LBL)
LONGACRE	78	PR D17 1795	+Lasinski, Rosenfeld, Smadja+	(LBL, SLAC)