NODE=B010

$\Delta(1700)\ 3/2^-$

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

Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics C **38** 070001 (2014). NODE=B010

$\Delta(1700)$ POLE POSITION

NODE=B010215

REAL PART

NODE=B010RE
NODE=B010RE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1620 to 1680 (≈ 1650) OUR ESTIMATE				→ UNCHECKED ←
1685±10	SOKHOYAN	15A	DPWA	Multichannel
1643± 6±3	[1] SVARC	14	L+P	$\pi N \to \pi N$
1632	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
1651	HOEHLER	93	SPED	$\pi N \to \pi N$
1675±25	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1685±10	GUTZ	14	DPWA	Multichannel
1680±10	ANISOVICH	12A	DPWA	Multichannel
1656	SHRESTHA	12A	DPWA	Multichannel
1726	VRANA	00	DPWA	Multichannel

−2×IMAGINARY PART

NODE=B010IM
NODE=B010IM

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
160 to 300 (≈ 230) OUR ESTIMATE				→ UNCHECKED ←
300±15	SOKHOYAN	15A	DPWA	Multichannel
217±10±8	[1] SVARC	14	L+P	$\pi N \to \pi N$
253	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
159	HOEHLER	93	SPED	$\pi N \to \pi N$
220±40	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300±15	GUTZ	14	DPWA	Multichannel
305±15	ANISOVICH	12A	DPWA	Multichannel
226	SHRESTHA	12A	DPWA	Multichannel
118	VRANA	00	DPWA	Multichannel

$\Delta(1700)$ ELASTIC POLE RESIDUE

NODE=B010220

MODULUS $|r|$

NODE=B010RER
NODE=B010RER

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
10 to 40 (≈ 25) OUR ESTIMATE				→ UNCHECKED ←
40±6	SOKHOYAN	15A	DPWA	Multichannel
13±1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
18	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
10	HOEHLER	93	SPED	$\pi N \to \pi N$
13±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
40±6	GUTZ	14	DPWA	Multichannel
42±7	ANISOVICH	12A	DPWA	Multichannel

PHASE θ

NODE=B010IMR
NODE=B010IMR

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−40 to 0 (≈ −20) OUR ESTIMATE				→ UNCHECKED ←
− 1±10	SOKHOYAN	15A	DPWA	Multichannel
−30± 4±3	[1] SVARC	14	L+P	$\pi N \to \pi N$
−40	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
−20±25	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
− 1±10	GUTZ	14	DPWA	Multichannel
− 3±15	ANISOVICH	12A	DPWA	Multichannel

$\Delta(1700)$ INELASTIC POLE RESIDUE

NODE=B010240

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

NODE=B010240

Normalized residue in $N\pi \rightarrow \Delta(1700) \rightarrow \Delta\eta$

NODE=B010RS1
NODE=B010RS1

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.12±0.02	−60 ± 12	GUTZ	14	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.12±0.03	−60 ± 15	ANISOVICH	12A	DPWA	Multichannel

OCCUR=2

Normalized residue in $N\pi \rightarrow \Delta(1700) \rightarrow N(1535)\pi$

NODE=B010RS2
NODE=B010RS2

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.035±0.015	−75 ± 30	GUTZ	14	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1700) \rightarrow \Delta(1232)\pi$, S-wave

NODE=B010RS3
NODE=B010RS3

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.25±0.12	135 ± 45	SOKHOYAN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1700) \rightarrow \Delta(1232)\pi$, D-wave

NODE=B010RS4
NODE=B010RS4

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.12±0.06	−160 ± 30	SOKHOYAN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1700) \rightarrow N(1520)\pi$, P-wave

NODE=B010RS5
NODE=B010RS5

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.10±0.03	−10 ± 20	SOKHOYAN	15A	DPWA	Multichannel

$\Delta(1700)$ BREIT-WIGNER MASS

NODE=B010M

NODE=B010M

→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1670 to 1750 (≈ 1700) OUR ESTIMATE				
1715 ±20	SOKHOYAN	15A	DPWA	Multichannel
1695.0± 1.3	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
1710 ±30	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
1680 ±70	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1715 ±20	GUTZ	14	DPWA	Multichannel
1715 $^{+30}_{-15}$	ANISOVICH	12A	DPWA	Multichannel
1691 ± 4	SHRESTHA	12A	DPWA	Multichannel
1678 ± 1	PENNER	02C	DPWA	Multichannel
1732 ±23	VRANA	00	DPWA	Multichannel

$\Delta(1700)$ BREIT-WIGNER WIDTH

NODE=B010W

NODE=B010W

→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
200 to 400 (≈ 300) OUR ESTIMATE				
300 ±25	SOKHOYAN	15A	DPWA	Multichannel
375.5± 7.0	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
280 ±80	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
230 ±80	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300 ±25	GUTZ	14	DPWA	Multichannel
310 $^{+40}_{-15}$	ANISOVICH	12A	DPWA	Multichannel
248 ± 9	SHRESTHA	12A	DPWA	Multichannel
606 ±15	PENNER	02C	DPWA	Multichannel
119 ±70	VRANA	00	DPWA	Multichannel

$\Delta(1700)$ DECAY MODES

NODE=B010225;NODE=B010

The following branching fractions are our estimates, not fits or averages.

NODE=B010

	Mode	Fraction (Γ_i/Γ)	
Γ_1	$N\pi$	10–20 %	DESIG=1;OUR EST
Γ_2	$N\pi\pi$	10–55 %	DESIG=3;OUR EST
Γ_3	$\Delta(1232)\pi$	10–50 %	DESIG=181;OUR EST
Γ_4	$\Delta(1232)\pi$, S-wave	5–35 %	DESIG=4;OUR EST
Γ_5	$\Delta(1232)\pi$, D-wave	4–16 %	DESIG=5;OUR EST
Γ_6	$N\rho$		DESIG=182
Γ_7	$N\rho$, S=3/2, S-wave	seen	DESIG=7;OUR EST
Γ_8	$N(1520)\pi$, P-wave	1–5 %	DESIG=11;OUR EST
Γ_9	$N(1535)\pi$	0.5–1.5 %	DESIG=186;OUR EST
Γ_{10}	$\Delta(1232)\eta$	3–7 %	DESIG=187;OUR EST
Γ_{11}	$N\gamma$	0.22–0.60 %	DESIG=185;OUR EST
Γ_{12}	$N\gamma$, helicity=1/2	0.12–0.30 %	DESIG=9;OUR EST
Γ_{13}	$N\gamma$, helicity=3/2	0.10–0.30 %	DESIG=10;OUR EST

$\Delta(1700)$ BRANCHING RATIOS

NODE=B010230

$\Gamma(N\pi)/\Gamma_{total}$ — Γ_1/Γ

NODE=B010R1
NODE=B010R1

VALUE (%)	DOCUMENT ID		TECN	COMMENT
10 to 20 OUR ESTIMATE				→ UNCHECKED ←
22 ±4	SOKHOYAN	15A	DPWA	Multichannel
15.6±0.1	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
12 ±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
20 ±3	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
22 ±4	GUTZ	14	DPWA	Multichannel
22 ±4	ANISOVICH	12A	DPWA	Multichannel
14 ±1	SHRESTHA	12A	DPWA	Multichannel
14 ±1	PENNER	02C	DPWA	Multichannel
5 ±1	VRANA	00	DPWA	Multichannel

$\Gamma(\Delta(1232)\pi, S\text{-wave})/\Gamma_{total}$ — Γ_4/Γ

NODE=B010R10
NODE=B010R10

VALUE (%)	DOCUMENT ID		TECN	COMMENT
20±15	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
20^{+25}_{-13}	ANISOVICH	12A	DPWA	Multichannel
54± 3	SHRESTHA	12A	DPWA	Multichannel
90± 2	VRANA	00	DPWA	Multichannel

$\Gamma(\Delta(1232)\pi, D\text{-wave})/\Gamma_{total}$ — Γ_5/Γ

NODE=B010R9
NODE=B010R9

VALUE (%)	DOCUMENT ID		TECN	COMMENT
10± 6	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
12^{+14}_{-7}	ANISOVICH	12A	DPWA	Multichannel
1± 1	SHRESTHA	12A	DPWA	Multichannel
4± 1	VRANA	00	DPWA	Multichannel

$\Gamma(N\rho, S=3/2, S\text{-wave})/\Gamma_{total}$ — Γ_7/Γ

NODE=B010R8
NODE=B010R8

VALUE (%)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
30±3	SHRESTHA	12A	DPWA	Multichannel
1±1	VRANA	00	DPWA	Multichannel

$\Gamma(N(1520)\pi, P\text{-wave})/\Gamma_{total}$ — Γ_8/Γ

NODE=B010R14
NODE=B010R14

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3±2	SOKHOYAN	15A	DPWA	Multichannel

$\Gamma(N(1535)\pi)/\Gamma_{total}$ — Γ_9/Γ

NODE=B010R11
NODE=B010R11

VALUE (%)	DOCUMENT ID		TECN	COMMENT
1.0±0.5	GUTZ	14	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4 ±2	HORN	08A	DPWA	Multichannel

$\Gamma(\Delta(1232)\eta)/\Gamma_{total}$ — Γ_{10}/Γ

NODE=B010R12
NODE=B010R12

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5±2	GUTZ	14	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5±2	ANISOVICH	12A	DPWA	Multichannel

$\Gamma(N(1535)\pi)/\Gamma(\Delta(1232)\eta)$ — Γ_9/Γ_{10}

NODE=B010R13
NODE=B010R13

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.67	KASHEVAROV	09	CBAL	$\gamma p \rightarrow p\pi^0\eta$

$\Delta(1700)$ PHOTON DECAY AMPLITUDES AT THE POLE

NODE=B010260

$\Delta(1700) \rightarrow N\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B010PA1
NODE=B010PA1

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.175±0.020	50 ± 10	SOKHOYAN	15A	DPWA	Multichannel

$\Delta(1700) \rightarrow N\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B010PA2
NODE=B010PA2

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.180±0.020	45 ± 10	SOKHOYAN	15A	DPWA	Multichannel

$\Delta(1700)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES

NODE=B010235

$\Delta(1700) \rightarrow N\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B010A1
NODE=B010A1

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.140±0.030 OUR ESTIMATE				→ UNCHECKED ←
0.165±0.020	SOKHOYAN	15A	DPWA	Multichannel
0.132±0.005	DUGGER	13	DPWA	$\gamma N \rightarrow \pi N$
0.105±0.005	WORKMAN	12A	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.165±0.020	GUTZ	14	DPWA	Multichannel
0.160±0.020	ANISOVICH	12A	DPWA	Multichannel
0.058±0.010	SHRESTHA	12A	DPWA	Multichannel
0.226	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$
0.125±0.003	DUGGER	07	DPWA	$\gamma N \rightarrow \pi N$
0.096	PENNER	02D	DPWA	Multichannel

$\Delta(1700) \rightarrow N\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B010A2
NODE=B010A2

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.140±0.030 OUR ESTIMATE				→ UNCHECKED ←
0.170±0.025	SOKHOYAN	15A	DPWA	Multichannel
0.108±0.005	DUGGER	13	DPWA	$\gamma N \rightarrow \pi N$
0.092±0.004	WORKMAN	12A	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.170±0.025	GUTZ	14	DPWA	Multichannel
0.165±0.025	ANISOVICH	12A	DPWA	Multichannel
0.097±0.008	SHRESTHA	12A	DPWA	Multichannel
0.210	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$
0.105±0.003	DUGGER	07	DPWA	$\gamma N \rightarrow \pi N$
0.154	PENNER	02D	DPWA	Multichannel

$\Delta(1700)$ FOOTNOTES

NODE=B010

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B010RE;LINKAGE=SV

Δ(1700) REFERENCES

NODE=B010

For early references, see Physics Letters **111B** 1 (1982).

NODE=B010

SOKHOYAN	15A	EPJ A51 95	V. Sokhoyan *et al.*	(CBELSA/TAPS Collab.)	REFID=56757
GUTZ	14	EPJ A50 74	E. Gutz *et al.*	(CBELSA/TAPS Collab.)	REFID=55697
PDG	14	CPC 38 070001	K. Olive *et al.*	(PDG Collab.)	REFID=55687
SVARC	14	PR C89 045205	A. Svarc *et al.*		REFID=55775
DUGGER	13	PR C88 065203	M. Dugger *et al.*	(JLab CLAS Collab.)	REFID=55645
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich *et al.*	(BONN, PNPI)	REFID=54041
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)	REFID=54862
WORKMAN	12A	PR C86 015202	R. Workman *et al.*	(GWU)	REFID=54335
KASHEVAROV	09	EPJ A42 141	V.L. Kashevarov *et al.*	(MAMI Crystal Ball/TAPS)	REFID=53070
HORN	08A	EPJ A38 173	I. Horn *et al.*	(CB-ELSA Collab.)	REFID=52706
Also		PRL 101 202002	I. Horn *et al.*	(CB-ELSA Collab.)	REFID=52567
DRECHSEL	07	EPJ A34 69	D. Drechsel, S.S. Kamalov, L. Tiator	(MAINZ, JINR)	REFID=52105
DUGGER	07	PR C76 025211	M. Dugger *et al.*	(JLab CLAS Collab.)	REFID=52039
ARNDT	06	PR C74 045205	R.A. Arndt *et al.*	(GWU)	REFID=51535
PENNER	02C	PR C66 055211	G. Penner, U. Mosel	(GIES)	REFID=49129
PENNER	02D	PR C66 055212	G. Penner, U. Mosel	(GIES)	REFID=49130
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT, ANL)	REFID=47593
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)	REFID=43821
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky *et al.*	(CMU, LBL) IJP	REFID=30064
Also		PR D20 2839	R.E. Cutkosky *et al.*	(CMU, LBL) IJP	REFID=40096
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT) IJP	REFID=30058
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP	REFID=30859