NODE=B030

$\Delta(1900)\ 1/2^-$

$I(J^P) = \frac{3}{2}(\frac{1}{2}^-)$ Status: ∗∗∗

NODE=B030

Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics **C38** 070001 (2014).

NODE=B030

Δ(1900) POLE POSITION

NODE=B030215

REAL PART

NODE=B030RE
NODE=B030RE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1830 to 1900 (≈ 1865) OUR ESTIMATE				
1815±20	SARANTSEV	25	DPWA	Multichannel
1865±35±19	[1] SVARC	14	L+P	$\pi N \to \pi N$
1870±40	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1957	HUNT	19	DPWA	Multichannel
1845±20	SOKHOYAN	15A	DPWA	Multichannel
1845±20	GUTZ	14	DPWA	Multichannel
1795	VRANA	00	DPWA	Multichannel
1780	HOEHLER	93	SPED	$\pi N \to \pi N$

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B030RE;LINKAGE=SV

−2×IMAGINARY PART

NODE=B030IM
NODE=B030IM

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
180 to 300 (≈ 240) OUR ESTIMATE				
340±35	SARANTSEV	25	DPWA	Multichannel
187±50±19	[1] SVARC	14	L+P	$\pi N \to \pi N$
180±50	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
447	HUNT	19	DPWA	Multichannel
295±35	SOKHOYAN	15A	DPWA	Multichannel
295±35	GUTZ	14	DPWA	Multichannel
58	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B030IM;LINKAGE=SV

Δ(1900) ELASTIC POLE RESIDUE

NODE=B030220

MODULUS |r|

NODE=B030RER
NODE=B030RER

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
8 to 14 (≈ 11) OUR ESTIMATE				
11±2	SOKHOYAN	15A	DPWA	Multichannel
11±4±2	[1] SVARC	14	L+P	$\pi N \to \pi N$
10±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
11±2	GUTZ	14	DPWA	Multichannel
10±3	ANISOVICH	12A	DPWA	Multichannel

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B030RER;LINKAGE=SV

PHASE θ

NODE=B030IMR
NODE=B030IMR

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−115±20	SOKHOYAN	15A	DPWA	Multichannel
20±27±19	[1] SVARC	14	L+P	$\pi N \to \pi N$
+ 20±40	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−115±20	GUTZ	14	DPWA	Multichannel
−125±20	ANISOVICH	12A	DPWA	Multichannel

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B030IMR;LINKAGE=SV

Δ(1900) INELASTIC POLE RESIDUE

NODE=B030240

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

NODE=B030240

Normalized residue in $N\pi \to \Delta(1900) \to \Sigma K$

NODE=B030RS1
NODE=B030RS1

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.07±0.02	−50 ± 30	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1900) \rightarrow \Delta\pi$, D-wave

NODE=B030RS2
NODE=B030RS2

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.18 ± 0.10	105 ± 25	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.12^{+0.08}_{-0.05}$	110 ± 20	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1900) \rightarrow \Delta(1232)\eta$

NODE=B030RS3
NODE=B030RS3

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.013 ± 0.006	undefined	GUTZ	14	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1900) \rightarrow N(1440)\pi$

NODE=B030RS4
NODE=B030RS4

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.11 ± 0.06	115 ± 30	SOKHOYAN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow \Delta(1900) \rightarrow N(1520)\pi$

NODE=B030RS5
NODE=B030RS5

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.06 ± 0.03	undefined	SOKHOYAN	15A	DPWA	Multichannel

$\Delta(1900)$ BREIT-WIGNER MASS

NODE=B030M

NODE=B030M
→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1840 to 1920 (≈ 1860) OUR ESTIMATE				
1825 ± 20	SARANTSEV	25	DPWA	Multichannel
1989 ± 22	[1] HUNT	19	DPWA	Multichannel
1890 ± 50	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
1908 ± 30	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1840 ± 20	SOKHOYAN	15A	DPWA	Multichannel
1840 ± 20	GUTZ	14	DPWA	Multichannel
1868 ± 12	[1] SHRESTHA	12A	DPWA	Multichannel
1802 ± 87	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B030M;LINKAGE=A

$\Delta(1900)$ BREIT-WIGNER WIDTH

NODE=B030W

NODE=B030W
→ UNCHECKED ←

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
180 to 320 (≈ 250) OUR ESTIMATE				
360 ± 35	SARANTSEV	25	DPWA	Multichannel
457 ± 60	[1] HUNT	19	DPWA	Multichannel
170 ± 50	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
140 ± 40	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
295 ± 30	SOKHOYAN	15A	DPWA	Multichannel
295 ± 30	GUTZ	14	DPWA	Multichannel
234 ± 27	[1] SHRESTHA	12A	DPWA	Multichannel
48 ± 45	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B030W;LINKAGE=B

$\Delta(1900)$ DECAY MODES

NODE=B030225;NODE=B030

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

NODE=B030

	Mode	Fraction (Γ_i/Γ)	
Γ_1	$N\pi$	4–12%	DESIG=1
Γ_2	ΣK	seen	DESIG=2;OUR EST
Γ_3	$N\pi\pi$	> 52%	DESIG=6;OUR EST
Γ_4	$\Delta(1232)\pi$	30–70%	DESIG=11
Γ_5	$N\rho$	22–60 %	DESIG=8;OUR EST
Γ_6	$N\rho$, S=1/2	11–35%	DESIG=12
Γ_7	$N\rho$, S=3/2	11–25%	DESIG=3
Γ_8	$N(1440)\pi$	3–32%	DESIG=14
Γ_9	$N(1520)\pi$	2–10%	DESIG=15
Γ_{10}	$\Delta(1232)\eta$	< 2%	DESIG=13
Γ_{11}	$N\gamma$, helicity=1/2	0.06–0.43 %	DESIG=5;OUR EST

$\Delta(1900)$ BRANCHING RATIOS

NODE=B030230

$\Gamma(N\pi)/\Gamma_{total}$ — Γ_1/Γ

NODE=B030R1
NODE=B030R1

VALUE (%)	DOCUMENT ID		TECN	COMMENT
4–12% OUR ESTIMATE				
4 ± 4	SEIFEN	25	DPWA	Multichannel
3.7± 0.8	[1] HUNT	19	DPWA	Multichannel
10 ± 3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
8 ± 4	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
7 ± 2	SOKHOYAN	15A	DPWA	Multichannel
7 ± 2	GUTZ	14	DPWA	Multichannel
8 ± 1	[1] SHRESTHA	12A	DPWA	Multichannel
33 ±10	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Statistical error only.

NODE=B030R1;LINKAGE=A

$\Gamma(\Delta(1232)\pi)/\Gamma_{total}$ — Γ_4/Γ

NODE=B030R7
NODE=B030R7

VALUE (%)	DOCUMENT ID		TECN	COMMENT
30–70% OUR ESTIMATE				
64±15	SARANTSEV	25	DPWA	Multichannel
60±25	SEIFEN	25	DPWA	Multichannel
42± 8	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
50±20	SOKHOYAN	15A	DPWA	Multichannel
56± 6	[1] SHRESTHA	12A	DPWA	Multichannel
28± 1	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Statistical error only.

NODE=B030R7;LINKAGE=A

$\Gamma(N\rho)/\Gamma_{total}$ — Γ_5/Γ

NODE=B030R00
NODE=B030R00

VALUE (%)	DOCUMENT ID		TECN	COMMENT
38±13	SARANTSEV	25	DPWA	Multichannel

$\Gamma(N\rho, S{=}1/2)/\Gamma_{total}$ — Γ_6/Γ

NODE=B030R5
NODE=B030R5

VALUE (%)	DOCUMENT ID		TECN	COMMENT
11–35% OUR ESTIMATE				
18± 8	SARANTSEV	25	DPWA	Multichannel
23±12	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
12± 4	[1] SHRESTHA	12A	DPWA	Multichannel
30± 2	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Statistical error only.

NODE=B030R5;LINKAGE=A

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

NODE=B030R6
NODE=B030R6

VALUE (%)	DOCUMENT ID		TECN	COMMENT
11–25% OUR ESTIMATE				
20±10	SARANTSEV	25	DPWA	Multichannel
18± 7	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
23± 5	[1] SHRESTHA	12A	DPWA	Multichannel
5± 1	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Statistical error only.

NODE=B030R6;LINKAGE=A

$\Gamma(N(1440)\pi)/\Gamma_{total}$ — Γ_8/Γ

NODE=B030R13
NODE=B030R13

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3–32% OUR ESTIMATE				
15±12	SEIFEN	25	DPWA	Multichannel
12± 9	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
20±12	SOKHOYAN	15A	DPWA	Multichannel
< 1	[1] SHRESTHA	12A	DPWA	Multichannel
4± 1	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Statistical error only.

NODE=B030R13;LINKAGE=A

$\Gamma(N(1520)\pi)/\Gamma_{total}$ — Γ_9/Γ

NODE=B030R14
NODE=B030R14

VALUE (%)	DOCUMENT ID		TECN	COMMENT
2–10% OUR ESTIMATE				
10±7	SEIFEN	25	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6±4	SOKHOYAN	15A	DPWA	Multichannel

→ UNCHECKED ←

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

NODE=B030R01
NODE=B030R01

VALUE (%)	DOCUMENT ID		TECN	COMMENT
< 2% OUR ESTIMATE				
1±1	GUTZ	14	DPWA	Multichannel

→ UNCHECKED ←

Δ(1900) PHOTON DECAY AMPLITUDES AT THE POLE

NODE=B030260

Δ(1900) → $N\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B030PA1
NODE=B030PA1

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.075±0.015	−65 ± 25	SARANTSEV	25	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.064±0.015	60 ± 20	SOKHOYAN	15A	DPWA	Multichannel

Δ(1900) BREIT-WIGNER PHOTON DECAY AMPLITUDES

NODE=B030235

Δ(1900) → $N\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B030A1
NODE=B030A1

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.075±0.015	SARANTSEV	25	DPWA	Multichannel
0.212±0.029	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.065±0.015	SOKHOYAN	15A	DPWA	Multichannel
0.057±0.014	GUTZ	14	DPWA	Multichannel
−0.082±0.009	[1] SHRESTHA	12A	DPWA	Multichannel

[1] Statistical error only.

NODE=B030A1;LINKAGE=A

Δ(1900) REFERENCES

NODE=B030

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

NODE=B030

SARANTSEV	25	PR C112 015202	A.V. Sarantsev *et al.*	(Bonn-Gatchina Collab.)	REFID=63294
SEIFEN	25	EPJ A61 173	T. Seifen *et al.*	(CBELSA/TAPS Collab.)	REFID=63593
HUNT	19	PR C99 055205	B.C. Hunt, D.M. Manley		REFID=59985
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	CP C38 070001	K. Olive *et al.*	(PDG Collab.)	REFID=55687
SVARC	14	PR C89 045205	A. Svarc *et al.*	(RBI Zagreb, UNI Tuzla)	REFID=55775
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
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