

Σ(2250)

$$I(J^P) = 1(?^?) \quad \text{Status: } ***$$

Results from partial-wave analyses are too weak to warrant separating them from the production and cross-section experiments. LASINSKI 71 in $\bar{K}N$ using a Pomeron + resonances model, and DEBELLEFON 76, DEBELLEFON 77, and DEBELLEFON 78 in energy-dependent partial-wave analyses of $\bar{K}N \rightarrow \Lambda\pi$, $\Sigma\pi$, and $N\bar{K}$, respectively, suggest two resonances around this mass.

Σ(2250) MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2210 to 2280 (≈ 2250) OUR ESTIMATE			
2270 ± 50	DEBELLEFON 78	DPWA	D_5 wave
2210 ± 30	DEBELLEFON 78	DPWA	G_9 wave
2275 ± 20	DEBELLEFON 77	DPWA	D_5 wave
2215 ± 20	DEBELLEFON 77	DPWA	G_9 wave
2300 ± 30	¹ DEBELLEFON 75B	HBC	$K^- p \rightarrow \Xi^{*0} K^0$
2251 ⁺³⁰ ₋₂₀	VANHORN 75	DPWA	$K^- p \rightarrow \Lambda\pi^0, F_5$ wave
2280 ± 14	AGUILAR-... 70B	HBC	$K^- p$ 3.9, 4.6 GeV/c
2237 ± 11	BRICMAN 70	CNTR	Total, charge exchange
2255 ± 10	COOL 70	CNTR	$K^- p, K^- d$ total
2250 ± 7	BUGG 68	CNTR	$K^- p, K^- d$ total
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2260	DEBELLEFON 76	IPWA	D_5 wave
2215	DEBELLEFON 76	IPWA	G_9 wave
2250 ± 20	LU 70	CNTR	$\gamma p \rightarrow K^+ Y^*$
2245	BLANPIED 65	CNTR	$\gamma p \rightarrow K^+ Y^*$
2299 ± 6	BOCK 65	HBC	$\bar{p} p$ 5.7 GeV/c

Σ(2250) WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
60 to 150 (≈ 100) OUR ESTIMATE			
120 ± 40	DEBELLEFON 78	DPWA	D_5 wave
80 ± 20	DEBELLEFON 78	DPWA	G_9 wave
70 ± 20	DEBELLEFON 77	DPWA	D_5 wave
60 ± 20	DEBELLEFON 77	DPWA	G_9 wave
130 ± 20	¹ DEBELLEFON 75B	HBC	$K^- p \rightarrow \Xi^{*0} K^0$
192 ± 30	VANHORN 75	DPWA	$K^- p \rightarrow \Lambda\pi^0, F_5$ wave
100 ± 20	AGUILAR-... 70B	HBC	$K^- p$ 3.9, 4.6 GeV/c
164 ± 50	BRICMAN 70	CNTR	Total, charge exchange
230 ± 20	BUGG 68	CNTR	$K^- p, K^- d$ total

• • • We do not use the following data for averages, fits, limits, etc. • • •

100	DEBELLEFON 76	IPWA	D_5 wave
140	DEBELLEFON 76	IPWA	G_9 wave
170	COOL 70	CNTR	$K^- p, K^- d$ total
125	LU 70	CNTR	$\gamma p \rightarrow K^+ Y^*$
150	BLANPIED 65	CNTR	$\gamma p \rightarrow K^+ Y^*$
21^{+17}_{-21}	BOCK 65	HBC	$\bar{p} p$ 5.7 GeV/c

$\Sigma(2250)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\bar{K}$	<10 %
Γ_2 $\Lambda\pi$	seen
Γ_3 $\Sigma\pi$	seen
Γ_4 $N\bar{K}\pi$	
Γ_5 $\Xi(1530)K$	

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

$\Sigma(2250)$ BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on Λ and Σ Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$				Γ_1/Γ
VALUE	DOCUMENT ID	TECN	COMMENT	
<0.1 OUR ESTIMATE				
0.08 ± 0.02	DEBELLEFON 78	DPWA	D_5 wave	
0.02 ± 0.01	DEBELLEFON 78	DPWA	G_9 wave	

$(J+\frac{1}{2}) \times \Gamma(N\bar{K})/\Gamma_{\text{total}}$				Γ_1/Γ
VALUE	DOCUMENT ID	TECN	COMMENT	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.16 ± 0.12	BRICMAN 70	CNTR	Total, charge exchange
0.42	COOL 70	CNTR	$K^- p, K^- d$ total
0.47	BUGG 68	CNTR	

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(2250) \rightarrow \Lambda\pi$				$(\Gamma_1 \Gamma_2)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
-0.16 ± 0.03	VANHORN 75	DPWA	$K^- p \rightarrow \Lambda\pi^0, F_5$ wave	

• • • We do not use the following data for averages, fits, limits, etc. • • •

+0.11	DEBELLEFON 76	IPWA	D_5 wave
-0.10	DEBELLEFON 76	IPWA	G_9 wave
-0.18	BARBARO-... 70	DPWA	$K^- p \rightarrow \Lambda\pi^0, G_9$ wave

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(2250) \rightarrow \Sigma \pi$			$(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
+0.06 ± 0.02	DEBELLEFON 77	DPWA	D_5 wave
-0.03 ± 0.02	DEBELLEFON 77	DPWA	G_9 wave
+0.07	BARBARO-... 70	DPWA	$K^- p \rightarrow \Sigma \pi, G_9$ wave

$\Gamma(N\bar{K}) / \Gamma(\Sigma \pi)$			Γ_1 / Γ_3
VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<0.18	BARNES 69	HBC	1 standard dev. limit

$\Gamma(\Lambda \pi) / \Gamma(\Sigma \pi)$			Γ_2 / Γ_3
VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<0.18	BARNES 69	HBC	1 standard dev. limit

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(2250) \rightarrow \Xi(1530) K$			$(\Gamma_1 \Gamma_5)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT
0.18 ± 0.04	¹ DEBELLEFON 75B	HBC	$K^- p \rightarrow \Xi^* K^0$

$\Sigma(2250)$ FOOTNOTES

¹ Seen in the (initial and final state) D_5 wave. Isospin not determined.

$\Sigma(2250)$ REFERENCES

DEBELLEFON 78	NC 42A 403	A. de Bellefon <i>et al.</i>	(CDEF, SACL) IJP
DEBELLEFON 77	NC 37A 175	A. de Bellefon <i>et al.</i>	(CDEF, SACL) IJP
DEBELLEFON 76	NP B109 129	A. de Bellefon, A. Berthon	(CDEF) IJP
Also	NP B90 1	A. de Bellefon <i>et al.</i>	(CDEF, SACL) IJP
DEBELLEFON 75B	NC 28A 289	A. de Bellefon <i>et al.</i>	(CDEF, SACL)
VANHORN 75	NP B87 145	A.J. van Horn	(LBL) IJP
Also	NP B87 157	A.J. van Horn	(LBL) IJP
LASINSKI 71	NP B29 125	T.A. Lasinski	(EFI) IJP
AGUILAR-... 70B	PRL 25 58	M. Aguilar-Benitez <i>et al.</i>	(BNL, SYRA)
BARBARO-... 70	Duke Conf. 173	A. Barbaro-Galtieri	(LRL) IJP
Hyperon Resonances, 1970			
BRICMAN 70	PL 31B 152	C. Bricman <i>et al.</i>	(CERN, CAEN, SACL)
COOL 70	PR D1 1887	R.L. Cool <i>et al.</i>	(BNL) I
Also	PRL 16 1228	R.L. Cool <i>et al.</i>	(BNL) I
LU 70	PR D2 1846	D.C. Lu <i>et al.</i>	(YALE)
BARNES 69	PRL 22 479	V.E. Barnes <i>et al.</i>	(BNL, SYRA)
BUGG 68	PR 168 1466	D.V. Bugg <i>et al.</i>	(RHEL, BIRM, CAVE) I
BLANPIED 65	PRL 14 741	W.A. Blanpied <i>et al.</i>	(YALE, CEA)
BOCK 65	PL 17 166	R.K. Bock <i>et al.</i>	(CERN, SACL)