$\Sigma(2250)$

$I(J^P) = 1(?^?)$ Status: ***

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

$\Sigma(2250)$ 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	$\overline{p} p$ 5.7 GeV/c

$\Sigma(2250)$ 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	$\overline{p} p$ 5.7 GeV/c

$\Sigma(2250)$ DECAY MODES

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

$\Gamma(N\overline{K})/\Gamma_{total}$ — 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

$(J+\frac{1}{2})\times\Gamma(N\overline{K})/\Gamma_{total}$ — 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	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(2250) \rightarrow \Lambda\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(2250) \rightarrow \Sigma\pi$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
$+0.06\pm0.02$	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

$\Gamma(N\overline{K})/\Gamma(\Sigma\pi)$ — 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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(2250) \rightarrow \Xi(1530)K$ — $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
0.18 ± 0.04	[1] DEBELLEFON 75B	HBC	$K^- p \rightarrow \Xi^{*0} K^0$

$\Sigma(2250)$ 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 et al.	(CDEF, SACL) IJP
DEBELLEFON	77	NC 37A 175	A. de Bellefon et al.	(CDEF, SACL) IJP
DEBELLEFON	76	NP B109 129	A. de Bellefon, A. Berthon	(CDEF) IJP
Also		NP B90 1	A. de Bellefon et al.	(CDEF, SACL) IJP
DEBELLEFON	75B	NC 28A 289	A. de Bellefon et al.	(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 et al.	(BNL, SYRA)
BARBARO-...	70	Duke Conf. 173 Hyperon Resonances, 1970	A. Barbaro-Galtieri	(LRL) IJP
BRICMAN	70	PL 31B 152	C. Bricman et al.	(CERN, CAEN, SACL)
COOL	70	PR D1 1887	R.L. Cool et al.	(BNL) I
Also		PRL 16 1228	R.L. Cool et al.	(BNL) I
LU	70	PR D2 1846	D.C. Lu et al.	(YALE)
BARNES	69	PRL 22 479	V.E. Barnes et al.	(BNL, SYRA)
BUGG	68	PR 168 1466	D.V. Bugg et al.	(RHEL, BIRM, CAVE) I
BLANPIED	65	PRL 14 741	W.A. Blanpied et al.	(YALE, CEA)
BOCK	65	PL 17 166	R.K. Bock et al.	(CERN, SACL)