

$\Sigma(2250)$  $I(J^P) = 1(?^?)$  Status: \*\*\*

Results from partial-wave analyses are too weak to warrant separating them from the production and cross-section experiments. LASINSKI 71 in  $\bar{K}N$  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.

 **$\Sigma(2250)$  MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2210 to 2280 (<math>\approx 2250</math>) OUR ESTIMATE</b>			
2270 $\pm$ 50	DEBELLEFON 78	DPWA	$D_5$ wave
2210 $\pm$ 30	DEBELLEFON 78	DPWA	$G_9$ wave
2275 $\pm$ 20	DEBELLEFON 77	DPWA	$D_5$ wave
2215 $\pm$ 20	DEBELLEFON 77	DPWA	$G_9$ wave
2300 $\pm$ 30	<sup>1</sup> 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 $\pm$ 14	AGUILAR-...	70B	HBC $K^- p$ 3.9, 4.6 GeV/c
2237 $\pm$ 11	BRICMAN	70	CNTR Total, charge exchange
2255 $\pm$ 10	COOL	70	CNTR $K^- p, K^- d$ total
2250 $\pm$ 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 $\pm$ 20	LU	70	CNTR $\gamma p \rightarrow K^+ Y^*$
2245	BLANPIED	65	CNTR $\gamma p \rightarrow K^+ Y^*$
2299 $\pm$ 6	BOCK	65	HBC $\bar{p}p$ 5.7 GeV/c

 **$\Sigma(2250)$  WIDTH**

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

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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 ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	<10 %
$\Gamma_2$ $\Lambda\pi$	seen
$\Gamma_3$ $\Sigma\pi$	seen
$\Gamma_4$ $N\bar{K}\pi$	
$\Gamma_5$ $\Xi(1530)K$	

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  $\Lambda$  and  $\Sigma$  Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
<b>&lt;0.1 OUR ESTIMATE</b>				
$0.08 \pm 0.02$	DEBELLEFON 78	DPWA	$D_5$ wave	
$0.02 \pm 0.01$	DEBELLEFON 78	DPWA	$G_9$ wave	

$(J+\frac{1}{2}) \times \Gamma(N\bar{K})/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	

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

$0.16 \pm 0.12$	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	
$-0.16 \pm 0.03$	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	

$\Gamma(N\bar{K}) / \Gamma(\Sigma\pi)$				$\Gamma_1 / \Gamma_3$
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

$\Gamma(\Lambda\pi) / \Gamma(\Sigma\pi)$				$\Gamma_2 / \Gamma_3$
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	<sup>1</sup> DEBELLEFON 75B	HBC	$K^- p \rightarrow \Xi^* K^0$	

### $\Sigma(2250)$ FOOTNOTES

<sup>1</sup> Seen in the (initial and final state)  $D_5$  wave. Isospin not determined.

### $\Sigma(2250)$ REFERENCES

DEBELLEFON 78	NC 42A 403	De Bellefon, Berthon, Billoir+	(CDEF, SACL) IJP
DEBELLEFON 77	NC 37A 175	De Bellefon, Berthon, Billoir+	(CDEF, SACL) IJP
DEBELLEFON 76	NP B109 129	De Bellefon, Berthon	(CDEF) IJP
Also	75 NP B90 1	De Bellefon, Berthon, Brunet+	(CDEF, SACL) IJP
DEBELLEFON 75B	NC 28A 289	De Bellefon, Berthon, Billoir+	(CDEF, SACL)
VANHORN 75	NP B87 145	VanHorn	(LBL) IJP
Also	75B NP B87 157		(LBL) IJP
LASINSKI 71	NP B29 125		(EFI) IJP
AGUILAR-... 70B	PRL 25 58	Aguilar-Benitez, Barnes, Bassano+	(BNL, SYRA)
BARBARO-... 70	Duke Conf. 173	Barbaro-Galtieri	(LRL) IJP
BRICMAN 70	PL 31B 152	+Ferro-Luzzi, Perreau+	(CERN, CAEN, SACL)
COOL 70	PR D1 1887	+Giacomelli, Kycia, Leontic, Li+	(BNL) I
Also	66 PRL 16 1228	Cool, Giacomelli, Kycia, Leontic, Lundby+	(BNL) I
LU 70	PR D2 1846	+Greenberg, Hughes, Minehart, Mori+	(YALE)
BARNES 69	PRL 22 479	+Flaminio, Montanet, Samios+	(BNL, SYRA)
BUGG 68	PR 168 1466	+Gilmore, Knight+	(RHEL, BIRM, CAVE) I
BLANPIED 65	PRL 14 741	+Greenberg, Hughes, Kitching, Lu+	(YALE, CEA)
BOCK 65	PL 17 166	+Cooper, French, Kinson+	(CERN, SACL)