

$\Sigma(1580) \ 3/2^-$

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

OMITTED FROM SUMMARY TABLE

Seen in the isospin-1 $\overline{K}N$ cross section at BNL (LI 73, CARROLL 76) and in a partial-wave analysis of $K^-p \rightarrow \Lambda\pi^0$ for c.m. energies 1560–1600 MeV by LITCHFIELD 74. LITCHFIELD 74 finds $J^P = 3/2^-$. Not seen by ENGLER 78 or by CAMERON 78C (with larger statistics in $K_L^0 p \rightarrow \Lambda\pi^+$ and $\Sigma^0\pi^+$).

Neither OLMSTED 04 (in $K^-p \rightarrow \Lambda\pi^0$) nor PRAKHOV 04 (in $K^-p \rightarrow \Lambda\pi^0\pi^0$) see any evidence for this state.

$\Sigma(1580)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
≈ 1580 OUR ESTIMATE			
1583 $\pm$ 4	¹ CARROLL	76	DPWA Isospin-1 total σ
1582 $\pm$ 4	² LITCHFIELD	74	DPWA $K^-p \rightarrow \Lambda\pi^0$

$\Sigma(1580)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
15	¹ CARROLL	76	DPWA Isospin-1 total σ
11 $\pm$ 4	² LITCHFIELD	74	DPWA $K^-p \rightarrow \Lambda\pi^0$

$\Sigma(1580)$ DECAY MODES

Mode
$\Gamma_1 \quad N\overline{K}$
$\Gamma_2 \quad \Lambda\pi$
$\Gamma_3 \quad \Sigma\pi$

$\Sigma(1580)$ BRANCHING RATIOS

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

$\Gamma(N\overline{K})/\Gamma_{\text{total}}$				Γ_1/Γ
VALUE	DOCUMENT ID	TECN	COMMENT	
+0.03 $\pm$ 0.01	² LITCHFIELD	74	DPWA $\overline{K}N$ multichannel	
$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \rightarrow \Sigma(1580) \rightarrow \Lambda\pi$				$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
not seen	CAMERON	78C	HBC $K_L^0 p \rightarrow \Lambda\pi^+$	
not seen	ENGLER	78	HBC $K_L^0 p \rightarrow \Lambda\pi^+$	
+0.10 $\pm$ 0.02	² LITCHFIELD	74	DPWA $K^-p \rightarrow \Lambda\pi^0$	

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1580) \rightarrow \Sigma\pi$				$(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
not seen	CAMERON	78C	HBC	$K_L^0 p \rightarrow \Sigma^0 \pi^+$
not seen	ENGLER	78	HBC	$K_L^0 p \rightarrow \Sigma^0 \pi^+$
$+0.03 \pm 0.04$	² LITCHFIELD	74	DPWA	$\bar{K}N$ multichannel

$\Sigma(1580)$ FOOTNOTES

¹ CARROLL 76 sees a total-cross-section bump with $(J+1/2) \Gamma_{\text{el}} / \Gamma_{\text{total}} = 0.06$.

² The main effect observed by LITCHFIELD 74 is in the $\Lambda\pi$ final state; the $\bar{K}N$ and $\Sigma\pi$ couplings are estimated from a multichannel fit including total-cross-section data of LI 73.

$\Sigma(1580)$ REFERENCES

OLMSTED	04	PL B588 29	J. Olmsted <i>et al.</i>	(BNL Crystal Ball Collab.)
PRAKHOV	04	PR C69 042202	S. Prakhov <i>et al.</i>	(BNL Crystal Ball Collab.)
CAMERON	78C	NP B132 189	W. Cameron <i>et al.</i>	(BGNA, EDIN, GLAS+) I
ENGLER	78	PR D18 3061	A. Engler <i>et al.</i>	(CMU, ANL)
CARROLL	76	PRL 37 806	A.S. Carroll <i>et al.</i>	(BNL) I
LITCHFIELD	74	PL 51B 509	P.J. Litchfield	(CERN) IJP
LI	73	Purdue Conf. 283	K.K. Li	(BNL) I