$\Sigma(1580)\ D_{13}$

$I(J^P) = 1(\frac{3}{2}^-)$ 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 $K^-p \to \Lambda\pi^0$ 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 $K_L^0 p \to \Lambda\pi^+$ and $\Sigma^0\pi^+$).

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

$\Sigma(1580)$ MASS

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

$\Sigma(1580)$ WIDTH

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

$\Sigma(1580)$ DECAY MODES

	Mode
Γ_1	$N\overline{K}$
Γ_2	$\Lambda\pi$
Γ_3	$\Sigma\pi$

$\Sigma(1580)$ 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±0.01	[2] LITCHFIELD	74	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{\frac{1}{2}}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Sigma(1580) \to \Lambda\pi$ $(\Gamma_1\Gamma_2)^{\frac{1}{2}}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	CAMERON	78C	HBC	$K_L^0 p \to \Lambda\pi^+$
not seen	ENGLER	78	HBC	$K_L^0 p \to \Lambda\pi^+$
+0.10±0.02	[2] LITCHFIELD	74	DPWA	$K^-p \to \Lambda\pi^0$

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\mathbf{total}}$ in $N\overline{K} \to \Sigma(1580) \to \Sigma\pi$ $(\Gamma_1 \Gamma_3)^{1/2}/\Gamma$

VALUE		DOCUMENT ID		TECN	COMMENT
not seen			CAMERON	78C	HBC	$K^0_L p \to \Sigma^0 \pi^+$
not seen			ENGLER	78	HBC	$K^0_L p \to \Sigma^0 \pi^+$
$+0.03\pm0.04$		[2] LITCHFIELD	74	DPWA	$\overline{K}N$ multichannel

$\Sigma(1580)$ FOOTNOTES

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

[2] The main effect observed by LITCHFIELD 74 is in the $\Lambda\pi$ final state; the $\overline{K}N$ 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 *et al.*	(BNL Crystal Ball Collab.)
PRAKHOV	04	PR C69 042202R	S. Prakhov *et al.*	(BNL Crystal Ball Collab.)
CAMERON	78C	NP B132 189	W. Cameron *et al.*	(BGNA, EDIN, GLAS+) I
ENGLER	78	PR D18 3061	A. Engler *et al.*	(CMU, ANL)
CARROLL	76	PRL 37 806	A.S. Carroll *et al.*	(BNL) I
LITCHFIELD	74	PL 51B 509	P.J. Litchfield	(CERN) IJP
LI	73	Purdue Conf. 283	K.K. Li	(BNL) I