$\Sigma(2030)$ F_{17}

$I(J^P) = 1(\frac{7}{2}^+)$ Status: ****

Discovered by COOL 66 and by WOHL 66. For most results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** (1982).

This entry only includes results from partial-wave analyses. Parameters of peaks seen in cross sections and invariant-mass distributions around 2030 MeV may be found in our 1984 edition, Reviews of Modern Physics **56** No. 2 Pt. II (1984).

$\Sigma(2030)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2025 to 2040 (≈ 2030) OUR ESTIMATE				
2036 ± 5	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
2038 ± 10	CORDEN	77B		$K^-N \to N\overline{K}^*$
2040 ± 5	GOPAL	77	DPWA	$\overline{K}N$ multichannel
2030 ± 3	[1] CORDEN	76	DPWA	$K^-n \to \Lambda\pi^-$
2035 ± 15	BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$
2038 ± 10	HEMINGWAY	75	DPWA	$K^-p \to \overline{K}N$
2042 ± 11	VANHORN	75	DPWA	$K^-p \to \Lambda\pi^0$
2020 ± 6	KANE	74	DPWA	$K^-p \to \Sigma\pi$
2035 ± 10	LITCHFIELD	74B	DPWA	$K^-p \to \Lambda(1520)\pi^0$
2020 ± 30	LITCHFIELD	74C	DPWA	$K^-p \to \Delta(1232)\overline{K}$
2025 ± 10	LITCHFIELD	74D	DPWA	$K^-p \to \Lambda(1820)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2027 to 2057	GOYAL	77	DPWA	$K^-N \to \Sigma\pi$
2030	DEBELLEFON	76	IPWA	$K^-p \to \Lambda\pi^0$

$\Sigma(2030)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
150 to 200 (≈ 180) OUR ESTIMATE				
172 ± 10	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
137 ± 40	CORDEN	77B		$K^-N \to N\overline{K}^*$
190 ± 10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
201 ± 9	[1] CORDEN	76	DPWA	$K^-n \to \Lambda\pi^-$
180 ± 20	BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$
172 ± 15	HEMINGWAY	75	DPWA	$K^-p \to \overline{K}N$
178 ± 13	VANHORN	75	DPWA	$K^-p \to \Lambda\pi^0$
111 ± 5	KANE	74	DPWA	$K^-p \to \Sigma\pi$
160 ± 20	LITCHFIELD	74B	DPWA	$K^-p \to \Lambda(1520)\pi^0$
200 ± 30	LITCHFIELD	74C	DPWA	$K^-p \to \Delta(1232)\overline{K}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
260	DECLAIS	77	DPWA	$\overline{K}N \to \overline{K}N$
126 to 195	GOYAL	77	DPWA	$K^-N \to \Sigma\pi$
160	DEBELLEFON	76	IPWA	$K^-p \to \Lambda\pi^0$
70 to 125	LITCHFIELD	74D	DPWA	$K^-p \to \Lambda(1820)\pi^0$

$\Sigma(2030)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	17–23 %
Γ_2	$\Lambda\pi$	17–23 %
Γ_3	$\Sigma\pi$	5–10 %
Γ_4	ΞK	< 2 %
Γ_5	$\Sigma(1385)\pi$	5–15 %
Γ_6	$\Sigma(1385)\pi$, *F*-wave	
Γ_7	$\Lambda(1520)\pi$	10–20 %
Γ_8	$\Lambda(1520)\pi$, *D*-wave	
Γ_9	$\Lambda(1520)\pi$, *G*-wave	
Γ_{10}	$\Delta(1232)\overline{K}$	10–20 %
Γ_{11}	$\Delta(1232)\overline{K}$, *F*-wave	
Γ_{12}	$\Delta(1232)\overline{K}$, *H*-wave	
Γ_{13}	$N\overline{K}^*(892)$	< 5 %
Γ_{14}	$N\overline{K}^*(892)$, S=1/2, *F*-wave	
Γ_{15}	$N\overline{K}^*(892)$, S=3/2, *F*-wave	
Γ_{16}	$\Lambda(1820)\pi$, *P*-wave	

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

$\Sigma(2030)$ 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
0.17 to 0.23 OUR ESTIMATE				
0.19 ± 0.03	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.18 ± 0.03	HEMINGWAY	75	DPWA	$K^-p \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.15	DECLAIS	77	DPWA	$\overline{K}N \to \overline{K}N$
0.24 ± 0.02	GOPAL	77	DPWA	See GOPAL 80

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Lambda\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+ 0.18 ± 0.02	GOPAL	77	DPWA	$\overline{K}N$ multichannel
+ 0.20 ± 0.01	[1] CORDEN	76	DPWA	$K^-n \to \Lambda\pi^-$
+ 0.18 ± 0.02	BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$
+ 0.20 ± 0.01	VANHORN	75	DPWA	$K^-p \to \Lambda\pi^0$
+ 0.195 ± 0.053	DEVENISH	74B		Fixed-t dispersion rel.
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.20	DEBELLEFON	76	IPWA	$K^-p \to \Lambda\pi^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Sigma\pi$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
− 0.09 ± 0.01	[2] CORDEN	77C		$K^-n \to \Sigma\pi$
− 0.06 ± 0.01	[2] CORDEN	77C		$K^-n \to \Sigma\pi$
− 0.15 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
− 0.10 ± 0.01	KANE	74	DPWA	$K^-p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
− 0.085 ± 0.02	[3] GOYAL	77	DPWA	$K^-N \to \Sigma\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Xi K$ $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.023	MULLER	69B	DPWA	$K^-p \to \Xi K$
< 0.05	BURGUN	68	DPWA	$K^-p \to \Xi K$
< 0.05	TRIPP	67	RVUE	$K^-p \to \Xi K$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Lambda(1820)\pi$, *P*-wave $(\Gamma_1\Gamma_{16})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.14 ± 0.02	CORDEN	75B	DBC	$K^-n \to N\overline{K}\pi^-$
0.18 ± 0.04	LITCHFIELD	74D	DPWA	$K^-p \to \Lambda(1820)\pi^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Lambda(1520)\pi$, *D*-wave $(\Gamma_1\Gamma_8)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+ 0.114 ± 0.010	[4] CAMERON	77	DPWA	$K^-p \to \Lambda(1520)\pi^0$
0.14 ± 0.03	LITCHFIELD	74B	DPWA	$K^-p \to \Lambda(1520)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.10 ± 0.03	[5] CORDEN	75B	DBC	$K^-n \to N\overline{K}\pi^-$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Lambda(1520)\pi$, *G*-wave $(\Gamma_1\Gamma_9)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+ 0.146 ± 0.010	[4] CAMERON	77	DPWA	$K^-p \to \Lambda(1520)\pi^0$
0.02 ± 0.02	LITCHFIELD	74B	DPWA	$K^-p \to \Lambda(1520)\pi^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Delta(1232)\overline{K}$, *F*-wave $(\Gamma_1\Gamma_{11})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.16 ± 0.03	LITCHFIELD	74C	DPWA	$K^-p \to \Delta(1232)\overline{K}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.17 ± 0.03	[5] CORDEN	75B	DBC	$K^-n \to N\overline{K}\pi^-$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Delta(1232)\overline{K}$, *H*-wave $(\Gamma_1\Gamma_{12})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.00 ± 0.02	LITCHFIELD	74C	DPWA	$K^-p \to \Delta(1232)\overline{K}$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to \Sigma(1385)\pi$ $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+ 0.153 ± 0.026	[4] CAMERON	78	DPWA	$K^-p \to \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(2030) \to N\overline{K}^*(892)$, S=1/2, *F*-wave $(\Gamma_1\Gamma_{14})^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+ 0.06 ± 0.03	[4] CAMERON	78B	DPWA	$K^-p \to N\overline{K}^*$
− 0.02 ± 0.01	CORDEN	77B		$K^-d \to NN\overline{K}^*$