α_+ / α_0

Older results have been omitted.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
−0.069±0.013 OUR FIT				
−0.073±0.021	23k	MARRAFFINO 80	HBC	$K^- p$ 0.42–0.5 GeV/c

α_+ FOR $\Sigma^+ \to n\pi^+$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.068±0.013 OUR FIT				
0.066±0.016 OUR AVERAGE				
0.037±0.049	4101	BERLEY 70B	HBC	
0.069±0.017	35k	BANGERTER 69	HBC	$K^- p$ 0.4 GeV/c

ϕ_+ ANGLE FOR $\Sigma^+ \to n\pi^+$ $(\tan\phi_+ = \beta/\gamma)$

VALUE (°)	EVTS	DOCUMENT ID	TECN	COMMENT
167±20 OUR AVERAGE Error includes scale factor of 1.1.				
184±24	1054	[17] BERLEY 70B	HBC	
143±29	560	BANGERTER 69B	HBC	$K^- p$ 0.4 GeV/c

[17] Changed from 176 to 184° to agree with our sign convention.

α_γ FOR $\Sigma^+ \to p\gamma$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
−0.76 ±0.08 OUR AVERAGE				
−0.720±0.086±0.045	35k	FOUCHER 92	SPEC	pCu 800 GeV
−0.86 ±0.13 ±0.04	190	KOBAYASHI 87	CNTR	$\pi^+ p \to \Sigma^+ K^+$
$-0.53\ {}^{+0.38}_{-0.36}$	46	MANZ 80	HBC	$K^- p \to \Sigma^+\pi^-$
$-1.03\ {}^{+0.52}_{-0.42}$	61	GERSHWIN 69B	HBC	$K^- p \to \Sigma^+\pi^-$

Σ^+ REFERENCES

We have omitted some papers that have been superseded by later experiments. The omitted papers may be found in our 1986 edition (Physics Letters **170B**) or in earlier editions.

MORELOS	93	PRL 71 3417	+Albuquerque, Bondar, Carrigan+	(FNAL E761 Collab.)
FOUCHER	92	PRL 68 3004	+Albuquerque, Bondar+	(FNAL E761 Collab.)
HESSEY	89	ZPHY C42 175	+Booth, Fickinger, Gall+	(BNL-811 Collab.)
KOBAYASHI	87	PRL 59 868	+Haba, Homma, Kawai, Miyake+	(KYOT)
WILKINSON	87	PRL 58 855	+Handler+	(WISC, MICH, RUTG, MINN)
BIAGI	85	ZPHY C28 495	+Bourquin+	(CERN WA62 Collab.)
ANKENBRA...	83	PRL 51 863	Ankenbrandt, Berge+	(FNAL, IOWA, ISU, YALE)
MANZ	80	PL 96B 217	+Reucroft, Settles, Wolf+	(MPIM, VAND)
MARRAFFINO	80	PR D21 2501	+Reucroft, Roos, Waters+	(VAND, MPIM)
NOWAK	78	NP B139 61	+Armstrong, Davis+	(LOUC, BELG, DURH, WARS)
CONFORTO	76	NP B105 189	+Gopal, Kalmus, Litchfield, Ross+	(RHEL, LOIC)
EBENHOH	74	ZPHY 266 367	+Eisele, Engelmann, Filthuth, Hepp+	(HEIDT)
EBENHOH	73	ZPHY 264 413	+Eisele, Filthuth, Hepp, Leitner, Thouw+	(HEIDT)
LIPMAN	73	PL 43B 89	+Uto, Walker, Montgomery+	(RHEL, SUSS, LOWC)
PDG	73	RMP 45 No. 2 Pt. II	Lasinski, Barbaro-Galtieri, Kelly+	(LBL, BRAN, CERN+)
SECHI-ZORN	73	PR D8 12	+Snow	(UMD)
BELLAMY	72	PL 39B 299	+Anderson, Crawford+	(LOWC, RHEL, SUSS)
BOHM	72	NP B48 1	+	(BERL, KIDR, BRUX, IASD, DUUC, LOUC+)
Also	73	IIHE-73.2 Nov	Bohm	(BERL, KIDR, BRUX, IASD, DUUC, LOUC+)
BAKKER	71	LNC 1 37	+Hoogland, Kluyver, Massard+	(SABRE Collab.)
COLE	71	PR D4 631	+Lee-Franzini, Loveless, Baltay+	(STON, COLU)
TOVEE	71	NP B33 493	+	(LOUC, KIDR, BERL, BRUX, DUUC, WARS)
BERLEY	70B	PR D1 2015	+Yamin, Hertzbach, Kofler+	(BNL, MASA, YALE)
EISELE	70	ZPHY 238 372	+Filthuth, Hepp, Presser, Zech	(HEID)
HARRIS	70	PRL 24 165	+Overseth, Pondrom, Dettmann	(MICH, WISC)
PDG	70	RMP 42 No. 1	Barbaro-Galtieri, Derenzo, Price+	(LRL, BRAN, CERN+)
ANG	69B	ZPHY 228 151	+Ebenhoh, Eisele, Engelmann, Filthuth+	(HEID)
BAGGETT	69B	MDDP-TR-973 Thesis		(UMD)
BALTAY	69	PRL 22 615	+Franzini, Newman, Norton+	(COLU, STON)
BANGERTER	69	UCRL 19244 Thesis		(LRL)
BANGERTER	69B	PR 187 1821	+Alston-Garnjost, Galtieri, Gershwin+	(LRL)
BARLOUTAUD	69	NP B14 153	+DeBellefon, Granet+	(SACL, CERN, HEID)
EISELE	69	ZPHY 221 1	+Engelmann, Filthuth, Fohlisch, Hepp+	(HEID)
Also	64	PRL 13 291	Willis, Courant+	(BNL, CERN, HEID, UMD)
EISELE	69B	ZPHY 221 401	+Engelmann, Filthuth, Fohlisch, Hepp+	(HEID)
GERSHWIN	69B	PR 188 2077	+Alston-Garnjost, Bangerter+	(LRL)
Also	69	UCRL 19246 Thesis	Gershwin	(LRL)
NORTON	69	Nevis 175 Thesis		(COLU)
BAGGETT	67	PRL 19 1458	+Day, Glasser, Kehoe, Knop+	(UMD)
Also	68	Vienna Abs. 374	Baggett, Kehoe	(UMD)
Also	68B	Private Comm.	Baggett	(UMD)
BARASH	67	PRL 19 181	+Day, Glasser, Kehoe, Knop+	(UMD)
EISELE	67	ZPHY 205 409	+Engelmann, Filthuth, Folish, Hepp+	(HEID)
HYMAN	67	PL 25B 376	+Loken, Pewitt, McKenzie+	(ANL, CMU, NWES)
PDG	67	RMP 39 1	Rosenfeld, Barbaro-Galtieri, Podolsky+	(LRL, CERN, YALE)
CHANG	66	PR 151 1081		(COLU)
Also	65	Nevis 145 Thesis	Chang	(COLU)
COOK	66	PRL 17 223	+Ewart, Masek, Orr, Platner	(WASH)
BALTAY	65	PR 140B 1027	+Sandweiss, Culwick, Kopp+	(YALE, BNL)
BAZIN	65	PRL 14 154	+Blumenfeld, Nauenberg+	(PRIN, COLU)
BAZIN	65B	PR 140B 1358	+Plano, Schmidt+	(PRIN, RUTG, COLU)
CARAYAN...	65	PR 138B 433	Carayannopoulos, Tautfest, Willmann	(PURD)
SCHMIDT	65	PR 140B 1328		(COLU)
BHOWMIK	64	NP 53 22	+Jain, Mathur, Lakshmi	(DELH)
COURANT	64	PR 136B 1791	+Filthuth+	(CERN, HEID, UMD, NRL, BNL)
NAUENBERG	64	PRL 12 679	+Marateck+	(COLU, RUTG, PRIN)
BARKAS	63	PRL 11 26	+Dyer, Heckman	(LRL)
Also	61	UCRL 9450 Thesis	Dyer	(LRL)
GALTIERI	62	PRL 9 26	+Barkas, Heckman, Patrick, Smith	(LRL)
GRARD	62	PR 127 607	+Smith	(LRL)
HUMPHREY	62	PR 127 1305	+Ross	(LRL)

Σ^0

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

The spin and parity have not been measured directly. They are of course assumed to be the same as for the Σ^+ and Σ^-.

Σ^0 MASS

The fit uses Σ^+, Σ^0, Σ^-, and Λ mass and mass-difference measurements.

VALUE (MeV)	DOCUMENT ID
1192.55±0.08 OUR FIT Error includes scale factor of 1.2.	

$m_{\Sigma^-} - m_{\Sigma^0}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
4.88±0.08 OUR FIT Error includes scale factor of 1.2.				
4.86±0.08 OUR AVERAGE Error includes scale factor of 1.2.				
4.87±0.12	37	DOSCH 65	HBC	
5.01±0.12	12	SCHMIDT 65	HBC	See note with Λ mass
4.75±0.1	18	BURNSTEIN 64	HBC	

$m_{\Sigma^0} - m_\Lambda$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
76.87±0.08 OUR FIT Error includes scale factor of 1.2.				
76.55±0.25 OUR AVERAGE				
76.23±0.55	109	COLAS 75	HLBC	$\Sigma^0 \to \Lambda\gamma$
76.63±0.28	208	SCHMIDT 65	HBC	See note with Λ mass

Σ^0 MEAN LIFE

These lifetimes are deduced from measurements of the cross sections for the Primakoff process $\Lambda \to \Sigma^0$ in nuclear Coulomb fields. An alternative expression of the same information is the Σ^0-Λ transition magnetic moment given in the following section. The relation is $(\mu_{\Sigma\Lambda}/\mu_N)^2\ \tau = 1.92951 \times 10^{-19}$ s (see DEVLIN 86).

VALUE (10^{-20} s)	DOCUMENT ID	TECN	COMMENT
7.4±0.7 OUR EVALUATION Using $\mu_{\Sigma\Lambda}$ (see the above note).			
$6.5^{+1.7}_{-1.1}$	[1] DEVLIN 86	SPEC	Primakoff effect
7.6±0.5±0.7	[2] PETERSEN 86	SPEC	Primakoff effect
• • • We do not use the following data for averages, fits, limits, etc. • • •			
5.8±1.3	[1] DYDAK 77	SPEC	See DEVLIN 86

[1] DEVLIN 86 is a recalculation of the results of DYDAK 77 removing a numerical approximation made in that work.
[2] An additional uncertainty of the Primakoff formalism is estimated to be < 5%.

$|\mu(\Sigma^0 \to \Lambda)|$ TRANSITION MAGNETIC MOMENT

See the note in the Σ^0 mean-life section above. Also, see the Note on Baryon Magnetic Moments in the Λ Listings.

VALUE (μ_N)	DOCUMENT ID	TECN	COMMENT
1.61±0.08 OUR AVERAGE			
$1.72^{+0.17}_{-0.19}$	[3] DEVLIN 86	SPEC	Primakoff effect
1.59±0.05±0.07	[4] PETERSEN 86	SPEC	Primakoff effect
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$1.82^{+0.25}_{-0.18}$	[3] DYDAK 77	SPEC	See DEVLIN 86

[3] DEVLIN 86 is a recalculation of the results of DYDAK 77 removing a numerical approximation made in that work.
[4] An additional uncertainty of the Primakoff formalism is estimated to be < 2.5%.

Σ^0 DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$\Lambda\gamma$	100 %	
Γ_2	$\Lambda\gamma\gamma$	< 3 %	90%
Γ_3	$\Lambda e^+ e^-$	[a] 5×10^{-3}	

[a] A theoretical value using QED.

Σ^0 BRANCHING RATIOS

$\Gamma(\Lambda\gamma\gamma)/\Gamma_{total}$ Γ_2/Γ

VALUE	CL%	DOCUMENT ID	TECN
<0.03	90	COLAS 75	HLBC

$\Gamma(\Lambda e^+ e^-)/\Gamma_{total}$ Γ_3/Γ

VALUE	DOCUMENT ID	COMMENT
0.00545	FEINBERG 58	Theoretical QED calculation