$\Lambda(1405)$ S_{01}

$I(J^P) = 0(\frac{1}{2}^-)$ Status: ∗∗∗∗

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$\Lambda(1405)$ MASS

PRODUCTION EXPERIMENTS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1406.5± 4.0		[1] DALITZ	91		M-matrix fit
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1391 ± 1	700	[1] HEMINGWAY	85	HBC	$K^- p$ 4.2 GeV/c
∼1405	400	[2] THOMAS	73	HBC	$\pi^- p$ 1.69 GeV/c
1405	120	BARBARO-...	68B	DBC	$K^- d$ 2.1–2.7 GeV/c
1400 ± 5	67	BIRMINGHAM	66	HBC	$K^- p$ 3.5 GeV/c
1382 ± 8		ENGLER	65	HDBC	$\pi^- p$, $\pi^+ d$ 1.68 GeV/c
1400 ±24		MUSGRAVE	65	HBC	$\overline{p}p$ 3–4 GeV/c
1410		ALEXANDER	62	HBC	$\pi^- p$ 2.1 GeV/c
1405		ALSTON	62	HBC	$K^- p$ 1.2–0.5 GeV/c
1405		ALSTON	61B	HBC	$K^- p$ 1.15 GeV/c

EXTRAPOLATIONS BELOW $N\overline{K}$ THRESHOLD

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1411	[3] MARTIN	81		K-matrix fit
1406	[4] CHAO	73	DPWA	0–range fit (sol. B)
1421	MARTIN	70	RVUE	Constant K-matrix
1416 ±4	MARTIN	69	HBC	Constant K-matrix
1403 ±3	KIM	67	HBC	K-matrix fit
1407.5±1.2	[5] KITTEL	66	HBC	0–effective-range fit
1410.7±1.0	KIM	65	HBC	0–effective-range fit
1409.6±1.7	[5] SAKITT	65	HBC	0–effective-range fit

$\Lambda(1405)$ WIDTH

PRODUCTION EXPERIMENTS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
50 ± 2		[1] DALITZ	91		M-matrix fit
• • • We do not use the following data for averages, fits, limits, etc. • • •					
32 ± 1	700	[1] HEMINGWAY	85	HBC	$K^- p$ 4.2 GeV/c
45 to 55	400	[2] THOMAS	73	HBC	$\pi^- p$ 1.69 GeV/c
35	120	BARBARO-...	68B	DBC	$K^- d$ 2.1–2.7 GeV/c
50 ±10	67	BIRMINGHAM	66	HBC	$K^- p$ 3.5 GeV/c
89 ±20		ENGLER	65	HDBC	
60 ±20		MUSGRAVE	65	HBC	
35 ± 5		ALEXANDER	62	HBC	
50		ALSTON	62	HBC	
20		ALSTON	61B	HBC	

EXTRAPOLATIONS BELOW $N\overline{K}$ THRESHOLD

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
30	[3] MARTIN	81		K-matrix fit
55	[4,6] CHAO	73	DPWA	0–range fit (sol. B)
20	MARTIN	70	RVUE	Constant K-matrix
29 ±6	MARTIN	69	HBC	Constant K-matrix
50 ±5	KIM	67	HBC	K-matrix fit
34.1±4.1	[5] KITTEL	66	HBC	
37.0±3.2	KIM	65	HBC	
28.2±4.1	[5] SAKITT	65	HBC	

$\Lambda(1405)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\Sigma\pi$	100 %
Γ_2	$\Lambda\gamma$	
Γ_3	$\Sigma^0\gamma$	
Γ_4	$N\overline{K}$	

$\Lambda(1405)$ PARTIAL WIDTHS

$\Gamma(\Lambda\gamma)$ — Γ_2

VALUE (keV)	*DOCUMENT ID*		*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
27±8	BURKHARDT	91	Isobar model fit

$\Gamma(\Sigma^0\gamma)$ — Γ_3

VALUE (keV)	*DOCUMENT ID*		*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
10 ± 4 or 23 ± 7	BURKHARDT	91	Isobar model fit

$\Lambda(1405)$ BRANCHING RATIOS

$\Gamma(N\overline{K})/\Gamma(\Sigma\pi)$ — Γ_4/Γ_1

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3	95	HEMINGWAY	85	HBC	$K^- p$ 4.2 GeV/c

$\Lambda(1405)$ FOOTNOTES

[1] DALITZ 91 fits the HEMINGWAY 85 data.
[2] THOMAS 73 data is fit by CHAO 73 (see next section).
[3] The MARTIN 81 fit includes the $K^{\pm}p$ forward scattering amplitudes and the dispersion relations they must satisify.
[4] See also the accompanying paper of THOMAS 73.
[5] Data of SAKITT 65 are used in the fit by KITTEL 66.
[6] An asymmetric shape, with $\Gamma/2 = 41$ MeV below resonance, 14 MeV above.

$\Lambda(1405)$ REFERENCES

BURKHARDT	91	PR C44 607	+Lowe	(NOTT, UNM, BIRM)
DALITZ	91	JPG 17 289	+Deloff	(OXFTP, WINR)
HEMINGWAY	85	NP B253 742		(CERN) J
MARTIN	81	NP B179 33		(DURH)
CHAO	73	NP B56 46	+Kraemer, Thomas, Martin	(RHEL, CMU, LOUC)
THOMAS	73	NP B56 15	+Engler, Fisk, Kraemer	(CMU) J
MARTIN	70	NP B16 479	+Ross	(DURH)
MARTIN	69	PR 183 1352	+Sakitt	(LOUC, BNL)
Also	69B	PR 183 1345	Martin, Sakitt	(LOUC, BNL)
BARBARO-...	68B	PRL 21 573	Barbaro-Galtieri, Chadwick+	(LRL, SLAC)
KIM	67	PRL 19 1074		(YALE)
BIRMINGHAM	66	PR 152 1148		(BIRM, GLAS, LOIC, OXF, RHEL)
KITTEL	66	PL 21 349	+Otter, Wacek	(VIEN)
ENGLER	65	PRL 15 224	+Fisk, Kraemer, Meltzer, Westgard+	(CMU, BNL) IJ
KIM	65	PRL 14 29		(COLU)
MUSGRAVE	65	NC 35 735	+Petmezas+	(BIRM, CERN, EPOL, LOIC, SACL)
SAKITT	65	PR 139B 719	+Day, Glasser, Seeman, Friedman+	(UMD, LRL)
ALEXANDER	62	PRL 8 447	+Kalbfleisch, Miller, Smith	(LRL) I
ALSTON	62	CERN Conf. 311	+Alvarez, Ferro-Luzzi+	(LRL) I
ALSTON	61B	PRL 6 698	+Alvarez, Eberhard, Good+	(LRL) I

OTHER RELATED PAPERS

FINK	90	PR C41 2720	+He, Landau, Schnick	(IBMY, ORST, ANSM)
LEINWEBER	90	ANP 198 203		(MCMS)
MUELLER-GR...	90	NP A513 557	Mueller-Groeling, Holinde, Speth	(JULI)
BARRETT	89	NC 102A 179		(SURR)
BATTY	89	NC 102A 255	+Gal	(RAL, HEBR)
CAPSTICK	89	Excited Baryons '88, p. 32		(GUEL)
LOWE	89	NC 102A 167		(BIRM)
WHITEHOUSE	89	PRL 63 1352	+	(BIRM, BOST, BRCO, BNL, CASE, BUDA, TRIU)
SIEGEL	88	PR C38 2221	+Weise	(REGE)
WORKMAN	88	PR D37 3117	+Fearing	(TRIU)
SCHNICK	87	PRL 58 1719	+Landau	(ORST)
CAPSTICK	86	PR D34 2809	+Isgur	(TNTO)
JENNINGS	86	PL B176 229		(TRIU)
MALTMAN	86	PR D34 1372	+Isgur	(LANL, TNTO)
ZHONG	86	PL B171 471	+Thomas, Jennings, Barrett	(ADLD, TRIU, SURR)
BURKHARDT	85	NP A440 653	+Lowe, Rosenthal	(NOTT, BIRM, WMIU)
DAREWYCH	85	PR D32 1765	+Koniuk, Isgur	(YORKC, TNTO)
VEIT	85	PR D31 1033	+Jennings, Thomas, Barrett	(TRIU, ADLD, SURR)
KIANG	84	PR C30 1638	+Kumar, Nogami, VanDijk	(DALH, MCMS)
MILLER	84			(LOUC)
Conf. Intersections between Particle and Nuclear Physics, p. 783				
VANDIJK	84	PR D30 937		(MCMS)
VEIT	84	PL 137B 415	+Jennings, Barrett, Thomas	(TRIU, SURR, CERN)
DALITZ	82		+McGinley, Belyea, Anthony	(OXFTP)
Heidelberg Conf., p. 201				
DALITZ	81		+McGinley	(OXFTP)
Low and Intermediate Energy Kaon-Nucleon Physics, p.381				
MARTIN	81B	Low and Intermediate Energy Kaon-Nucleon Phys., p. 97		(DURH)
OADES	77	NC 42A 462	+Rasche	(AARH, ZURI)
SHAW	73	Purdue Conf. 417		(UCI)
BARBARO-...	72	LBL-555	Barbaro-Galtieri	(LBL)
DOBSON	72	PR D6 3256	+McElhaney	(HAWA)
RAJASEKA...	72	PR D5 610	Rajasekaran	(TATA)
Earlier papers also cited in RAJASEKARAN 72.				
CLINE	71	PRL 26 1194	+Laumann, Mapp	(WISC)
MARTIN	71	PL 35B 62	+Martin, Ross	(DURH, LOUC, RHEL)
DALITZ	67	PR 153 1617	+Wong, Rajasekaran	(OXFTP, BOMB)
DONALD	66	PL 22 711	+Edwards, Lys, Nisar, Moore	(LIVP)
KADYK	66	PRL 17 599	+Oren, Goldhaber, Goldhaber, Trilling	(LRL)
ABRAMS	65	PR 139B 454	+Sechi-Zorn	(UMD)