$K_2(1770)$

$I(J^P) = \frac{1}{2}(2^-)$

THE $K_2(1770)$ AND THE $K_2(1820)$

A partial-wave analysis of the $K^-\omega$ system based on about 100,000 $K^-p \to K^-\omega p$ events (ASTON 93) gives evidence for two $q\bar{q}$ D-wave states near 1.8 GeV. A previous analysis based on about 200,000 diffractively produced $K^-p \to K^-\pi^+\pi^-p$ events (DAUM 81) gave evidence for two $J^P = 2^-$ states in this region, with masses $\sim$ 1780 MeV and $\sim$ 1840 MeV and widths $\sim$ 200 MeV, in good agreement with the results of ASTON 93. In contrast, the masses obtained using a single resonance do not agree well: ASTON 93 obtains 1728 $\pm$ 7 MeV, while DAUM 81 estimates $\sim$ 1820 MeV. We conclude that there are indeed two K_2 resonances here.

We list under the $K_2(1770)$ other measurements that do not resolve the two-resonance structure of the enhancement.

$K_2(1770)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
1773± 8		[1] ASTON	93	LASS		11 $K^-p \to K^-\omega p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1810±20		FRAME	86	OMEG	+	13 $K^+p \to \phi K^+p$
~ 1730		ARMSTRONG	83	OMEG	−	18.5 $K^-p \to 3Kp$
~ 1780		[2] DAUM	81C	CNTR	−	63 $K^-p \to K^-2\pi p$
1710±15	60	CHUNG	74	HBC	−	7.3 $K^-p \to K^-\omega p$
1767± 6		BLIEDEN	72	MMS	−	11–16 K^-p
1730±20	306	[3] FIRESTONE	72B	DBC	+	12 K^+d
1765±40		[4] COLLEY	71	HBC	+	10 $K^+p \to K2\pi N$
1740		DENEGRI	71	DBC	−	12.6 $K^-d \to \overline{K}2\pi d$
1745±20		AGUILAR-...	70C	HBC	−	4.6 K^-p
1780±15		BARTSCH	70C	HBC	−	10.1 K^-p
1760±15		LUDLAM	70	HBC	−	12.6 K^-p

[1] From a partial wave analysis of the $K^-\omega$ system.
[2] From a partial wave analysis of the $K^-2\pi$ system.
[3] Produced in conjunction with excited deuteron.
[4] Systematic errors added correspond to spread of different fits.

$K_2(1770)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
186±14		[5] ASTON	93	LASS		$11 K^- p \to K^- \omega p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
140±40		FRAME	86	OMEG	+	$13 K^+ p \to \phi K^+ p$
~ 220		ARMSTRONG	83	OMEG	−	$18.5 K^- p \to 3K p$
~ 210		[6] DAUM	81C	CNTR	−	$63 K^- p \to K^- 2\pi p$
110±50	60	CHUNG	74	HBC	−	$7.3 K^- p \to K^- \omega p$
100±26		BLIEDEN	72	MMS	−	11–16 $K^- p$
210±30	306	[7] FIRESTONE	72B	DBC	+	$12 K^+ d$
90±70		[8] COLLEY	71	HBC	+	$10 K^+ p \to K 2\pi N$
130		DENEGRI	71	DBC	−	$12.6 K^- d \to \overline{K} 2\pi d$
100±50		AGUILAR-...	70C	HBC	−	$4.6 K^- p$
138±40		BARTSCH	70C	HBC	−	$10.1 K^- p$
50^{+40}_{-20}		LUDLAM	70	HBC	−	$12.6 K^- p$

[5] From a partial wave analysis of the $K^- \omega$ system.
[6] From a partial wave analysis of the $K^- 2\pi$ system.
[7] Produced in conjunction with excited deuteron.
[8] Systematic errors added correspond to spread of different fits.

$K_2(1770)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$K\pi\pi$	
Γ_2	$K_2^*(1430)\pi$	dominant
Γ_3	$K^*(892)\pi$	seen
Γ_4	$K f_2(1270)$	seen
Γ_5	$K\phi$	seen
Γ_6	$K\omega$	seen

$K_2(1770)$ BRANCHING RATIOS

$\Gamma(K_2^*(1430)\pi)/\Gamma(K\pi\pi)$ — Γ_2/Γ_1

$(K_2^*(1430) \to K\pi)$

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.03	DAUM	81C	CNTR		$63 K^- p \to K^- 2\pi p$
~ 1.0	[9] FIRESTONE	72B	DBC	+	$12 K^+ d$
<1.0	COLLEY	71	HBC		$10 K^+ p$
0.2 ±0.2	AGUILAR-...	70C	HBC	−	$4.6 K^- p$
<1.0	BARTSCH	70C	HBC	−	$10.1 K^- p$
1.0	BARBARO-...	69	HBC	+	$12.0 K^+ p$

[9] Produced in conjunction with excited deuteron.

$\Gamma(K^*(892)\pi)/\Gamma(K\pi\pi)$ — Γ_3/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 0.23	DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$

$\Gamma(K f_2(1270))/\Gamma(K\pi\pi)$ — Γ_4/Γ_1

($f_2(1270) \rightarrow \pi\pi$)

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 0.74	DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$

$\Gamma(K\phi)/\Gamma_{total}$ — Γ_5/Γ

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
seen	ARMSTRONG	83	OMEG	–	18.5 $K^- p \rightarrow K^- \phi N$

$\Gamma(K\omega)/\Gamma_{total}$ — Γ_6/Γ

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
seen	OTTER	81	HBC	$\pm$	8.25,10,16 $K^\pm p$
seen	CHUNG	74	HBC	–	7.3 $K^- p \rightarrow K^- \omega p$

$K_2(1770)$ REFERENCES

ASTON	93	PL B308 186	D. Aston et al.	(SLAC, NAGO, CINC, INUS)
FRAME	86	NP B276 667	D. Frame et al.	(GLAS)
ARMSTRONG	83	NP B221 1	T.A. Armstrong et al.	(BARI, BIRM, CERN+)
DAUM	81C	NP B187 1	C. Daum et al.	(AMST, CERN, CRAC, MPIM+)
OTTER	81	NP B181 1	G. Otter	(AACH3, BERL, LOIC, VIEN, BIRM+)
CHUNG	74	PL 51B 413	S.U. Chung et al.	(BNL)
BLIEDEN	72	PL 39B 668	H.R. Blieden et al.	(STON, NEAS)
FIRESTONE	72B	PR D5 505	A. Firestone et al.	(LBL)
COLLEY	71	NP B26 71	D.C. Colley et al.	(BIRM, GLAS)
DENEGRI	71	NP B28 13	D. Denegri et al.	(JHU) JP
AGUILAR-...	70C	PRL 25 54	M. Aguilar-Benitez et al.	(BNL)
BARTSCH	70C	PL 33B 186	J. Bartsch et al.	(AACH, BERL, CERN+)
LUDLAM	70	PR D2 1234	T. Ludlam, J. Sandweiss, A.J. Slaughter	(YALE)
BARBARO-...	69	PRL 22 1207	A. Barbaro-Galtieri et al.	(LRL)

OTHER RELATED PAPERS

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JOBES	67	PL 26B 49	M. Jobes et al.	(BIRM, CERN, BRUX)
BARTSCH	66	PL 22 357	J. Bartsch et al.	(AACH, BERL, CERN+)