$K_2(1770)$

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

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	−	$18.5\ K^- p \to 3K p$
~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	+	$10\ K^+ p \to K 2\pi N$
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 $K^- p \to K^- 2\pi p$

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

$(f_2(1270) \to \pi\pi)$

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

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

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

$\Gamma(K\omega)/\Gamma_{\text{total}}$ 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 $K^- p \to K^- \omega p$

$K_2(1770)$ REFERENCES

ASTON	93	PL B308 186	+Bienz, Bird+	(SLAC, NAGO, CINC, INUS)
FRAME	86	NP B276 667	+Hughes, Lynch, Minto, McFadzean+	(GLAS)
ARMSTRONG	83	NP B221 1	+	(BARI, BIRM, CERN, MILA, CURIN+)
DAUM	81C	NP B187 1	+Hertzberger+	(AMST, CERN, CRAC, MPIM, OXF+)
OTTER	81	NP B181 1		(AACH3, BERL, LOIC, VIEN, BIRM, BELG, CERN+)
CHUNG	74	PL 51B 413	+Eisner, Protopopescu, Samios, Strand	(BNL)
BLIEDEN	72	PL 39B 668	+Finocchiaro, Bowen, Earles+	(STON, NEAS)
FIRESTONE	72B	PR D5 505	+Goldhaber, Lissauer, Trilling	(LBL)
COLLEY	71	NP B26 71	+Jobes, Kenyon, Pathak, Hughes+	(BIRM, GLAS)
DENEGRI	71	NP B28 13	+Antich, Callahan, Carson, Chien, Cox+	(JHU) JP
AGUILAR-...	70C	PRL 25 54	Aguilar-Benitez, Barnes, Bassano, Chung+	(BNL)
BARTSCH	70C	PL 33B 186	+Deutschmann+	(AACH, BERL, CERN, LOIC, VIEN)
LUDLAM	70	PR D2 1234	+Sandweiss, Slaughter	(YALE)
BARBARO-...	69	PRL 22 1207	Barbaro-Galtieri, Davis, Flatte+	(LRL)

OTHER RELATED PAPERS

BERLINGHIERI	67	PRL 18 1087	+Farber, Ferbel, Forman	(ROCH) I
CARMONY	67	PRL 18 615	+Hendricks, Lander	(UCSD)
JOBES	67	PL 26B 49	+Bassompierre, DeBaere+	(BIRM, CERN, BRUX)
BARTSCH	66	PL 22 357	+Deutschmann+	(AACH, BERL, CERN+)