

# K<sub>0</sub><sup>\*</sup>(700)

$$I(J^P) = \frac{1}{2}(0^+)$$

also known as  $\kappa$ ; was  $K_0^*(800)$

See the related review(s):

Scalar Mesons below 1 GeV

## K<sub>0</sub><sup>\*</sup>(700) T-Matrix Pole $\sqrt{s}$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>(630–730) = i (260–340) OUR ESTIMATE</b> (see Fig. 64.1 in the review)			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
(648 ± 7) – i (280 ± 16)	<sup>1</sup> PELAEZ	20 RVUE	$\pi K \rightarrow \pi K$
(670 ± 18) – i (295 ± 28)	<sup>2</sup> PELAEZ	17 RVUE	$\pi K \rightarrow \pi K$
(764 ± 63 <sup>+71</sup> <sub>-54</sub> ) – i (306 ± 149 <sup>+143</sup> <sub>-85</sub> )	<sup>3</sup> ABLIKIM	11B BES2	1.3k $J/\psi \rightarrow K_S^0 K_S^0 \pi^+ \pi^-$
(665 ± 9) – i (268 <sup>+21</sup> <sub>-6</sub> )	<sup>4</sup> GUO	11B RVUE	
(849 ± 77 <sup>+18</sup> <sub>-14</sub> ) – i (256 ± 40 <sup>+46</sup> <sub>-22</sub> )	<sup>3</sup> ABLIKIM	10E BES2	1.4k $J/\psi \rightarrow K^\pm K_S^0 \pi^\mp \pi^0$
(663 ± 8 ± 34) – i (329 ± 5 ± 22)	<sup>5</sup> BUGG	10 RVUE	S-matrix pole
(706.0 ± 1.8 ± 22.8) – i (319.4 ± 2.2 ± 20.2)	<sup>6</sup> BONVICINI	08A CLEO	141k $D^+ \rightarrow K^- \pi^+ \pi^+$
(841 ± 30 <sup>+81</sup> <sub>-73</sub> ) – i (309 ± 45 <sup>+48</sup> <sub>-72</sub> )	<sup>3</sup> ABLIKIM	06C BES2	25k $J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
(750 <sup>+30</sup> <sub>-55</sub> ) – i (342 ± 60)	<sup>7</sup> BUGG	06 RVUE	
(658 ± 13) – i (279 ± 12)	<sup>8</sup> DESCOTES-G.	06 RVUE	$\pi K \rightarrow \pi K$
(757 ± 33) – i (279 ± 41)	<sup>9</sup> GUO	06 RVUE	
(694 ± 53) – i (303 ± 30)	<sup>10</sup> ZHOU	06 RVUE	$K p \rightarrow K^- \pi^+ n$
(594 ± 79) – i (362 ± 166)	<sup>10</sup> ZHENG	04 RVUE	$K^- p \rightarrow K^- \pi^+ n$
(722 ± 60) – i (386 ± 50)	<sup>10</sup> BUGG	03 RVUE	11 $K^- p \rightarrow K^- \pi^+ n$
(875 ± 75) – i (335 ± 110)	<sup>11</sup> ISHIDA	97B RVUE	11 $K^- p \rightarrow K^- \pi^+ n$
727 – i 263	<sup>12</sup> VANBEVEREN	86 RVUE	

<sup>1</sup> Extracted employing  $\pi K$  partial wave analysis from ESTABROOKS 78 and ASTON 88, Roy-Steiner equations and once subtracted forward dispersion relations.

<sup>2</sup> Reanalysis of ESTABROOKS 78 and ASTON 88 satisfying Forward Dispersion Relations and using sequences of Pade approximants.

<sup>3</sup> Extracted from Breit-Wigner parameters.

<sup>4</sup> Fit to scattering phase shifts using UChPT amplitudes with explicit resonances.

<sup>5</sup> Supersedes BUGG 06. Combined analysis of ASTON 88, ABLIKIM 06C, AITALA 06, and LINK 09 using an  $s$ -dependent width with couplings to  $K\pi$  and  $K\eta'$ , and the Adler zero near thresholds.

<sup>6</sup> From a complex pole included in the fit. Using parameters from the model that fits data best.

<sup>7</sup> Reanalysis of ASTON 88, AITALA 02, and ABLIKIM 06C using for the  $\kappa$  an  $s$ -dependent width with an Adler zero near threshold.

<sup>8</sup> Using Roy-Steiner equations (ROY 71) consistent with unitarity, analyticity and crossing symmetry constraints.

- <sup>9</sup> From UChPT fitted to MERCER 71, BINGHAM 72 and ESTABROOKS 78. Amplitude shown to be consistent with data of ABLIKIM 06C.  
<sup>10</sup> Reanalysis of ASTON 88 data.  
<sup>11</sup> Reanalysis of ASTON 88 using interfering Breit-Wigner amplitudes. Extracted from Breit-Wigner parameters.  
<sup>12</sup> Unitarized Quark Model.

### $K_0^*(700)$ Breit-Wigner Mass

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>845 ± 17</b>	<b>OUR AVERAGE</b>			
826 ± 49 +49 -34	1.3k	<sup>1</sup> ABLIKIM	11B BES2	$J/\psi \rightarrow K_S^0 K_S^0 \pi^+ \pi^-$
810 ± 68 +15 -24	1.4k	<sup>2</sup> ABLIKIM	10E BES2	$J/\psi \rightarrow K^\pm K_S^0 \pi^\mp \pi^0$
856 ± 17 ± 13	54k	LINK	07B FOCS	$D^+ \rightarrow K^- \pi^+ \pi^+$
878 ± 23 +64 -55	25k	<sup>3</sup> ABLIKIM	06C BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
797 ± 19 ± 43	15k	<sup>4,5</sup> AITALA	02 E791	$D^+ \rightarrow K^- \pi^+ \pi^+$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
888.0 ± 1.9	141k	<sup>6</sup> BONVICINI	08A CLEO	$D^+ \rightarrow K^- \pi^+ \pi^+$
855 ± 15	0.6k	<sup>7</sup> CAWLFIELD	06A CLEO	$D^0 \rightarrow K^+ K^- \pi^0$
905 +65 -30		<sup>8</sup> ISHIDA	97B RVUE	11 $K^- p \rightarrow K^- \pi^+ n$

<sup>1</sup> The Breit-Wigner parameters from a fit with seven intermediate resonances. The  $S$ -matrix pole position is  $(764 \pm 63^{+71}_{-54}) - i(306 \pm 149^{+143}_{-85})$  MeV.

<sup>2</sup> From a fit including ten additional resonances and energy-independent Breit-Wigner width.

<sup>3</sup> A fit in the  $K_0^*(700) + K^*(892) + K^*(1410)$  model with mass and width of the  $K_0^*(700)$  from ABLIKIM 06C well describes the left slope of the  $K_S^0 \pi^-$  invariant mass spectrum in  $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$  decay studied by EPIFANOV 07. Averaged value from different parameterizations.

<sup>4</sup> Not seen by KOPP 01 using 7070 events of  $D^0 \rightarrow K^- \pi^+ \pi^0$ . LINK 02E and LINK 05I show clear evidence for a constant non-resonant scalar amplitude rather than  $K_0^*(700)$  in their high statistics analysis of  $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$ .

<sup>5</sup> AUBERT 07T does not find evidence for the charged  $K_0^*(700)$  using 11k events of  $D^0 \rightarrow K^- K^+ \pi^0$ .

<sup>6</sup> Using parameters from the model that fits data best.

<sup>7</sup> Breit-Wigner parameters. A significant  $S$ -wave can be also modeled as a non-resonant contribution.

<sup>8</sup> Reanalysis of ASTON 88 using interfering Breit-Wigner amplitudes.

### $K_0^*(700)$ Breit-Wigner Width

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>468 ± 30</b>	<b>OUR AVERAGE</b>			
449 ± 156 +144 -81	1.3k	<sup>1</sup> ABLIKIM	11B BES2	$J/\psi \rightarrow K_S^0 K_S^0 \pi^+ \pi^-$
536 ± 87 +106 -47	1.4k	<sup>2</sup> ABLIKIM	10E BES2	$J/\psi \rightarrow K^\pm K_S^0 \pi^\mp \pi^0$
464 ± 28 ± 22	54k	LINK	07B FOCS	$D^+ \rightarrow K^- \pi^+ \pi^+$
499 ± 52 +55 -87	25k	<sup>3</sup> ABLIKIM	06C BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
410 ± 43 ± 87	15k	<sup>4,5</sup> AITALA	02 E791	$D^+ \rightarrow K^- \pi^+ \pi^+$

• • • We do not use the following data for averages, fits, limits, etc. • • •

550.4 ± 11.8	141k	<sup>6</sup> BONVICINI	08A CLEO	$D^+ \rightarrow K^- \pi^+ \pi^+$
251 ± 48	0.6k	<sup>7</sup> CAWLFIELD	06A CLEO	$D^0 \rightarrow K^+ K^- \pi^0$
545 <sup>+235</sup> -110		<sup>8</sup> ISHIDA	97B RVUE	11 $K^- p \rightarrow K^- \pi^+ n$

<sup>1</sup> The Breit-Wigner parameters from a fit with seven intermediate resonances. The S-matrix pole position is  $(764 \pm 63^{+71}_{-54}) - i(306 \pm 149^{+143}_{-85})$  MeV.

<sup>2</sup> From a fit including ten additional resonances and energy-independent Breit-Wigner width.

<sup>3</sup> A fit in the  $K_0^*(700) + K^*(892) + K^*(1410)$  model with mass and width of the  $K_0^*(700)$  from ABLIKIM 06C well describes the left slope of the  $K_S^0 \pi^-$  invariant mass spectrum in  $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$  decay studied by EPIFANOV 07. Averaged value from different parameterizations.

<sup>4</sup> Not seen by KOPP 01 using 7070 events of  $D^0 \rightarrow K^- \pi^+ \pi^0$ . LINK 02E and LINK 05I show clear evidence for a constant non-resonant scalar amplitude rather than  $K_0^*(700)$  in their high statistics analysis of  $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$ .

<sup>5</sup> AUBERT 07T does not find evidence for the charged  $K_0^*(700)$  using 11k events of  $D^0 \rightarrow K^- K^+ \pi^0$ .

<sup>6</sup> Using parameters from the model that fits data best.

<sup>7</sup> Statistical error only. A fit to the Dalitz plot including the  $K_0^*(700)^\pm$ ,  $K^*(892)^\pm$ , and  $\phi$  resonances modeled as Breit-Wigners. A significant S-wave can be also modeled as a non-resonant contribution.

<sup>8</sup> Reanalysis of ASTON 88 using interfering Breit-Wigner amplitudes.

### $K_0^*(700)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $K\pi$	100 %

### $K_0^*(700)$ REFERENCES

PELAEZ	20	PRL 124 172001	J.R. Pelaez <i>et al.</i>	
PELAEZ	17	EPJ C77 91	J.R. Pelaez, A.Rodas, J.R. de Elvira	
ABLIKIM	11B	PL B698 183	M. Ablikim <i>et al.</i>	(BES II Collab.)
GUO	11B	PR D84 034005	Z.-H. Guo, J.A. Oller	
ABLIKIM	10E	PL B693 88	M. Ablikim <i>et al.</i>	(BES II Collab.)
BUGG	10	PR D81 014002	D.V. Bugg	(LOQM)
LINK	09	PL B681 14	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
BONVICINI	08A	PR D78 052001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
AUBERT	07T	PR D76 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)
EPIFANOV	07	PL B654 65	D. Epifanov <i>et al.</i>	(BELLE Collab.)
LINK	07B	PL B653 1	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
ABLIKIM	06C	PL B633 681	M. Ablikim <i>et al.</i>	(BES Collab.)
AITALA	06	PR D73 032004	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
Also		PR D74 059901 (errata.)	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BUGG	06	PL B632 471	D.V. Bugg	(LOQM)
CAWLFIELD	06A	PR D74 031108	C. Cawfield <i>et al.</i>	(CLEO Collab.)
DESCOTES-G...	06	EPJ C48 553	S. Descotes-Genon, B. Moussallam	
GUO	06	NP A773 78	F.K. Guo <i>et al.</i>	
ZHOU	06	NP A775 212	Z.Y. Zhou, H.Q. Zheng	
LINK	05I	PL B621 72	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
ZHENG	04	NP A733 235	H.Q. Zheng <i>et al.</i>	

BUGG	03	PL B572 1	D.V. Bugg	
AITALA	02	PRL 89 121801	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
LINK	02E	PL B535 43	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
KOPP	01	PR D63 092001	S. Kopp <i>et al.</i>	(CLEO Collab.)
ISHIDA	97B	PTP 98 621	S. Ishida <i>et al.</i>	
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
VANBEVEREN	86	ZPHY C30 615	E. van Beveren <i>et al.</i>	(NIJM, BIEL)
ESTABROOKS	78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)
BINGHAM	72	NP B41 1	H.H. Bingham <i>et al.</i>	(International $K^+$ Collab.)
MERCER	71	NP B32 381	R. Mercer <i>et al.</i>	(JHU)
ROY	71	PL 36B 353	S.M. Roy	

---