# $\phi(1680)$

$I^G(J^{PC}) = 0^-(1^{--})$

## $\phi(1680)$ MASS

### $e^+e^-$ PRODUCTION

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **1680±20 OUR ESTIMATE** | | | | | |
| **1681± 8 OUR AVERAGE** | | | | | |
| 1700±20 | | [1] CLEGG | 94 | RVUE | $e^+e^- \to K^+K^-$, $K^0_S K\pi$ |
| 1657±27 | 367 | BISELLO | 91C | DM2 | $e^+e^- \to K^0_S K^\pm\pi^\mp$ |
| 1680±10 | | [2] BUON | 82 | DM1 | $e^+e^- \to$ hadrons |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1623±20 | 948 | [3] AKHMETSHIN | 03 | CMD2 | 1.05–1.38 $e^+e^- \to K^0_L K^0_S$ |
| ~ 1500 | | [4] ACHASOV | 98H | RVUE | $e^+e^- \to \pi^+\pi^-\pi^0$, $\omega\pi^+\pi^-$, $K^+K^-$ |
| ~ 1900 | | [5] ACHASOV | 98H | RVUE | $e^+e^- \to K^0_S K^\pm\pi^\mp$ |
| 1655±17 | | [6] BISELLO | 88B | DM2 | $e^+e^- \to K^+K^-$ |
| 1677±12 | | [7] MANE | 82 | DM1 | $e^+e^- \to K^0_S K\pi$ |

### PHOTOPRODUCTION

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 1726±22 | BUSENITZ | 89 | TPS | $\gamma p \to K^+K^-X$ |
| 1760±20 | ATKINSON | 85C | OMEG | 20–70 $\gamma p \to K\overline{K}X$ |
| 1690±10 | ASTON | 81F | OMEG | 25–70 $\gamma p \to K^+K^-X$ |

[1] Using BISELLO 88B and MANE 82 data.

[2] From global fit of $\rho$, $\omega$, $\phi$ and their radial excitations to channels $\omega\pi^+\pi^-$, $K^+K^-$, $K^0_S K^0_L$, $K^0_S K^\pm\pi^\mp$. Assume mass 1570 MeV and width 510 MeV for $\rho$ radial excitations, mass 1570 and width 500 MeV for $\omega$ radial excitation.

[3] From the combined fit of AKHMETSHIN 03 and MANE 81 also including $\rho$, $\omega$, and $\phi$. Neither isospin nor flavor structure known.

[4] Using data from IVANOV 81, BARKOV 87, BISELLO 88B, DOLINSKY 91, and ANTONELLI 92.

[5] Using the data from BISELLO 91C.

[6] From global fit including $\rho$, $\omega$, $\phi$ and $\rho(1700)$ assume mass 1570 MeV and width 510 MeV for $\rho$ radial excitation.

[7] Fit to one channel only, neglecting interference with $\omega$, $\rho(1700)$.

# $\phi(1680)$ WIDTH

## $e^+ e^-$ PRODUCTION

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **150±50 OUR ESTIMATE** This is only an educated guess; the error given is larger than the error on the average of the published values. | | | | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 139±60 | 948 | [8] AKHMETSHIN | 03 | CMD2 | 1.05–1.38 $e^+ e^- \to K^0_L K^0_S$ |
| 300±60 | | [9] CLEGG | 94 | RVUE | $e^+ e^- \to K^+ K^-$, $K^0_S K \pi$ |
| 146±55 | 367 | BISELLO | 91C | DM2 | $e^+ e^- \to K^0_S K^\pm \pi^\mp$ |
| 207±45 | | [10] BISELLO | 88B | DM2 | $e^+ e^- \to K^+ K^-$ |
| 185±22 | | [11] BUON | 82 | DM1 | $e^+ e^- \to$ hadrons |
| 102±36 | | [12] MANE | 82 | DM1 | $e^+ e^- \to K^0_S K \pi$ |

## PHOTOPRODUCTION

| *VALUE* (MeV) | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| 121±47 | BUSENITZ | 89 TPS | $\gamma p \to K^+ K^- X$ |
| 80±40 | ATKINSON | 85C OMEG | 20–70 $\gamma p \to K \overline{K} X$ |
| 100±40 | ASTON | 81F OMEG | 25–70 $\gamma p \to K^+ K^- X$ |

[8] From the combined fit of AKHMETSHIN 03 and MANE 81 also including $\rho$, $\omega$, and $\phi$. Neither isospin nor flavor structure known.

[9] Using BISELLO 88B and MANE 82 data.

[10] From global fit including $\rho$, $\omega$, $\phi$ and $\rho(1700)$

[11] From global fit of $\rho$, $\omega$, $\phi$ and their radial excitations to channels $\omega \pi^+ \pi^-$, $K^+ K^-$, $K^0_S K^0_L$, $K^0_S K^\pm \pi^\mp$. Assume mass 1570 MeV and width 510 MeV for $\rho$ radial excitations, mass 1570 and width 500 MeV for $\omega$ radial excitation.

[12] Fit to one channel only, neglecting interference with $\omega$, $\rho(1700)$.

# $\phi(1680)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $K \overline{K}^*(892) +$ c.c. | dominant |
| $\Gamma_2$ | $K^0_S K \pi$ | seen |
| $\Gamma_3$ | $K \overline{K}$ | seen |
| $\Gamma_4$ | $K^0_L K^0_S$ | |
| $\Gamma_5$ | $e^+ e^-$ | seen |
| $\Gamma_6$ | $\omega \pi \pi$ | not seen |
| $\Gamma_7$ | $K^+ K^- \pi^0$ | |

## $\phi(1680)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

This combination of a branching ratio into channel ($i$) and branching ratio into $e^+e^-$ is directly measured and obtained from the cross section at the peak. We list only data that have not been used to determine the branching ratio into ($i$) or $e^+e^-$.

### $\Gamma(K_L^0 K_S^0) \times \Gamma(e^+e^-)/\Gamma^2_{\text{total}}$ $\Gamma_4\Gamma_5/\Gamma^2$

| *VALUE* (units $10^{-6}$) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $0.131 \pm 0.059$ | 948 | [13] AKHMETSHIN | 03 | CMD2 | 1.05–1.38 $e^+e^- \to K_L^0 K_S^0$ |

### $\Gamma(K\overline{K}^*(892)+\text{c.c.}) \times \Gamma(e^+e^-)/\Gamma^2_{\text{total}}$ $\Gamma_1\Gamma_5/\Gamma^2$

| *VALUE* (units $10^{-6}$) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $3.29 \pm 0.96$ | 367 | [14] AKHMETSHIN | 03 | CMD2 | 1.05–1.38 $e^+e^- \to K_L^0 K_S^0$ |

[13] From the combined fit of AKHMETSHIN 03 and MANE 81 also including $\rho$, $\omega$, and $\phi$. Neither isospin nor flavor structure known. Recaluculated by us.

[14] Recaluculated by us with the published value of $B(K\overline{K}^*(892) + \text{c.c.}) \times \Gamma(e^+e^-)$.

## $\phi(1680)$ BRANCHING RATIOS

### $\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma(K_S^0 K\pi)$ $\Gamma_1/\Gamma_2$

| *VALUE* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| dominant | MANE | 82 | DM1 | $e^+e^- \to K_S^0 K^\pm \pi^\mp$ |

### $\Gamma(K\overline{K})/\Gamma(K\overline{K}^*(892)+\text{c.c.})$ $\Gamma_3/\Gamma_1$

| *VALUE* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **0.07 ±0.01** | BUON | 82 | DM1 | $e^+e^-$ |

### $\Gamma(\omega\pi\pi)/\Gamma(K\overline{K}^*(892)+\text{c.c.})$ $\Gamma_6/\Gamma_1$

| *VALUE* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **<0.10** | BUON | 82 | DM1 | $e^+e^-$ |

## $\phi(1680)$ REFERENCES


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