# $f_0(1710)$

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

See the review on "Spectroscopy of Light Meson Resonances."

## $f_0(1710)$ T-MATRIX POLE $\sqrt{s}$

Note that $\Gamma = -2\ \mathrm{Im}(\sqrt{s})$.

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **(1680–1820) − *i* (50–180) OUR ESTIMATE** | | | | |
| $(1769 \pm 8) - i\ (78 \pm 6)$ | [1] RODAS | 22 | RVUE | $J/\psi(1S) \to \gamma\ (\pi\pi, K\overline{K})$ |
| $(1700 \pm 18) - i\ (127 \pm 12)$ | SARANTSEV | 21 | RVUE | $J/\psi(1S) \to \gamma\ (\pi\pi, K\overline{K}, \eta\eta, \omega\phi)$ |
| $(1803 \pm 3.5^{+45.5}_{-10.4}) - i\ (145 \pm 2.5^{+16.3}_{-9.6})$ | [2] ALBRECHT | 20 | RVUE | $0.9\ \overline{p}p \to \pi^0\pi^0\eta, \pi^0\eta\eta, \pi^0 K^+K^-$ |
| $(1732 \pm 15) - i\ (160^{+25}_{-10})$ | [3] ANISOVICH | 03 | RVUE | $\pi\pi, K\overline{K}, \eta\eta, \eta\eta', \pi\pi\pi\pi$ |
| $(1698 \pm 18) - i\ (60 \pm 13)$ | BARBERIS | 00E | OMEG | $450\ pp \to p_f \eta\eta p_s$ |
| $(1770 \pm 12) - i\ (110 \pm 20)$ | [4] ANISOVICH | 99B | SPEC | $0.6–1.2\ p\overline{p} \to \eta\eta\pi^0$ |
| $(1727 \pm 12 \pm 11) - i\ (63 \pm 8 \pm 9)$ | BARBERIS | 99D | OMEG | $450\ pp \to K^+K^-, \pi^+\pi^-$ |
| $(1750 \pm 30) - i\ (125 \pm 70)$ | ANISOVICH | 98B | RVUE | Compilation |

[1] T-matrix pole from coupled channel K-matrix fit to data on $J/\psi \to \gamma\pi^0\pi^0$ (ABLIKIM 15AE) and $J/\psi \to \gamma K^0_S K^0_S$ (ABLIKIM 18AA).

[2] T-matrix pole, 5 poles, 5 channels, including scattering data from HYAMS 75 ($\pi\pi$), LONGACRE 86 ($K\overline{K}$), BINON 83 ($\eta\eta$), and BINON 84C ($\eta\eta'$).

[3] Solution I.

[4] Not seen by AMSLER 02.

## $f_0(1710)$ Breit-Wigner MASS

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **$1733^{+8}_{-7}$ OUR AVERAGE** | | Error includes scale factor of 1.5. See the ideogram below. | | | |
| $1757 \pm 24 \pm 9$ | | LEES | 21A | BABR | $\eta_c(1S) \to \eta' K^+K^-$ |
| $1759 \pm 6^{+14}_{-25}$ | 5.5k | [1] ABLIKIM | 13N | BES3 | $e^+e^- \to J/\psi \to \gamma\eta\eta$ |
| $1750^{+6}_{-7}{}^{+29}_{-18}$ | | [2] UEHARA | 13 | BELL | $\gamma\gamma \to K^0_S K^0_S$ |
| $1701 \pm 5^{+9}_{-2}$ | 4k | [3] CHEKANOV | 08 | ZEUS | $ep \to K^0_S K^0_S X$ |
| $1765^{+4}_{-3} \pm 13$ | | ABLIKIM | 06V | BES2 | $e^+e^- \to J/\psi \to \gamma\pi^+\pi^-$ |
| $1738 \pm 30$ | | ABLIKIM | 04E | BES2 | $J/\psi \to \omega K^+K^-$ |
| $1740 \pm 4^{+10}_{-25}$ | | BAI | 03G | BES | $J/\psi \to \gamma K\overline{K}$ |
| $1740^{+30}_{-25}$ | | BAI | 00A | BES | $J/\psi \to \gamma(\pi^+\pi^-\pi^+\pi^-)$ |
| $1710 \pm 25$ | | [4] FRENCH | 99 | | $300\ pp \to p_f(K^+K^-)p_s$ |

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

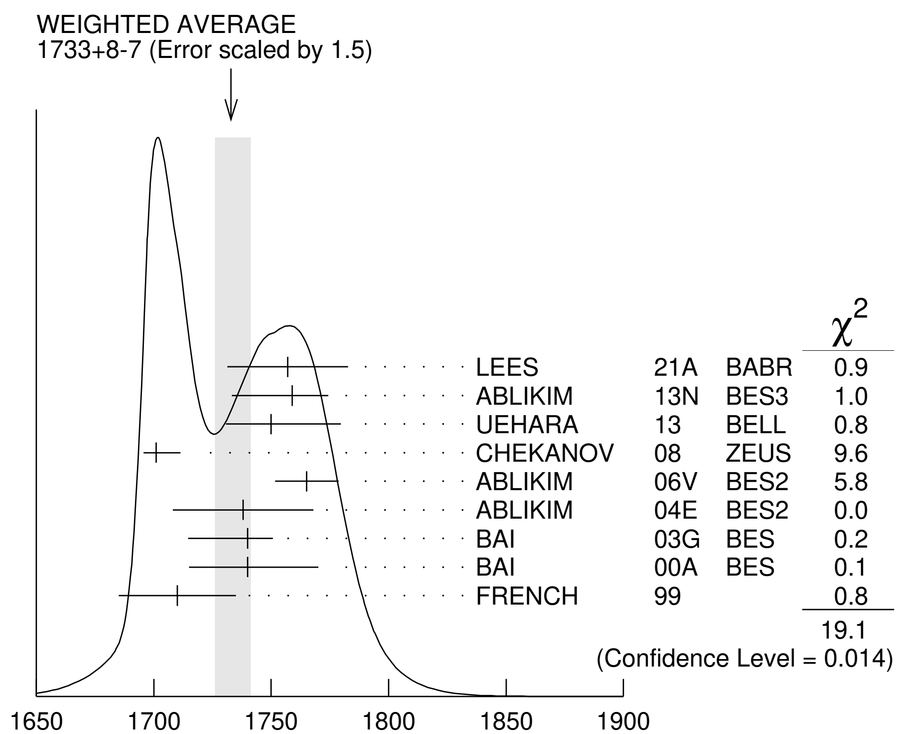
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1744 ± 7 | ± 5 | 381 | [5,6] | DOBBS | 15 | | $J/\psi \to \gamma \pi^+ \pi^-$ |
| 1705 ± 11 | ± 5 | 237 | [5,6] | DOBBS | 15 | | $\psi(2S) \to \gamma \pi^+ \pi^-$ |
| 1706 ± 4 | ± 5 | 1.0k | [5,6] | DOBBS | 15 | | $J/\psi \to \gamma K^+ K^-$ |
| 1690 ± 8 | ± 3 | 349 | [5,6] | DOBBS | 15 | | $\psi(2S) \to \gamma K^+ K^-$ |
| 1750 ± 13 | | | | AMSLER | 06 | CBAR | $1.64\ \overline{p}p \to K^+ K^- \pi^0$ |
| 1747 ± 5 | | 80k | [7] | UMAN | 06 | E835 | $5.2\ \overline{p}p \to \eta\eta\pi^0$ |
| 1776 ± 15 | | | | VLADIMIRSK... | 06 | SPEC | $40\ \pi^- p \to K^0_S K^0_S n$ |
| 1670 ± 20 | | | | BINON | 05 | GAMS | $33\ \pi^- p \to \eta\eta n$ |
| 1682 ± 16 | | | | TIKHOMIROV | 03 | SPEC | $40.0\ \pi^- \mathrm{C} \to K^0_S K^0_S K^0_L X$ |
| 1670 ± 26 | | 3.6k | [8] | NICHITIU | 02 | OBLX | $0\ \overline{p}p \to K^+ K^- \pi^+ \pi^- \pi^0$ |
| 1730 ± 15 | | | | BARBERIS | 99 | OMEG | $450\ pp \to p_s p_f K^+ K^-$ |
| 1750 ± 20 | | | | BARBERIS | 99B | OMEG | $450\ pp \to p_s p_f \pi^+ \pi^-$ |
| 1720 ± 39 | | | | BAI | 98H | BES | $J/\psi \to \gamma \pi^0 \pi^0$ |
| 1775 ± 1.5 | | 57 | [9] | BARKOV | 98 | | $\pi^- p \to K^0_S K^0_S n$ |
| 1690 ± 11 | | | [10] | ABREU | 96C | DLPH | $Z^0 \to K^+ K^- + X$ |
| 1696 ± 5 | $^{+9}_{-34}$ | | [11] | BAI | 96C | BES | $J/\psi \to \gamma K^+ K^-$ |
| 1781 ± 8 | $^{+10}_{-31}$ | | | BAI | 96C | BES | $J/\psi \to \gamma K^+ K^-$ |
| 1768 ± 14 | | | | BALOSHIN | 95 | SPEC | $40\ \pi^- \mathrm{C} \to K^0_S K^0_S X$ |
| 1750 ± 15 | | | [12] | BUGG | 95 | MRK3 | $J/\psi \to \gamma \pi^+ \pi^- \pi^+ \pi^-$ |
| 1620 ± 16 | | | [11] | BUGG | 95 | MRK3 | $J/\psi \to \gamma \pi^+ \pi^- \pi^+ \pi^-$ |
| 1748 ± 10 | | | [13] | ARMSTRONG | 93C | E760 | $\overline{p}p \to \pi^0 \eta\eta \to 6\gamma$ |
| ∼ 1750 | | | | BREAKSTONE | 93 | SFM | $pp \to pp\pi^+ \pi^- \pi^+ \pi^-$ |
| 1744 ± 15 | | | [14] | ALDE | 92D | GAM2 | $38\ \pi^- p \to \eta\eta n$ |
| 1713 ± 10 | | | [15] | ARMSTRONG | 89D | OMEG | $300\ pp \to ppK^+ K^-$ |
| 1706 ± 10 | | | [15] | ARMSTRONG | 89D | OMEG | $300\ pp \to ppK^0_S K^0_S$ |
| 1707 ± 10 | | | [13] | AUGUSTIN | 88 | DM2 | $J/\psi \to \gamma K^+ K^-, K^0_S K^0_S$ |
| 1700 ± 15 | | | [11] | BOLONKIN | 88 | SPEC | $40\ \pi^- p \to K^0_S K^0_S n$ |
| 1720 ± 60 | | | | BOLONKIN | 88 | SPEC | $40\ \pi^- p \to K^0_S K^0_S n$ |
| 1638 ± 10 | | | [16] | FALVARD | 88 | DM2 | $J/\psi \to \phi K^+ K^-, K^0_S K^0_S$ |
| 1690 ± 4 | | | [17] | FALVARD | 88 | DM2 | $J/\psi \to \phi K^+ K^-, K^0_S K^0_S$ |
| 1698 ± 15 | | | [13] | AUGUSTIN | 87 | DM2 | $J/\psi \to \gamma \pi^+ \pi^-$ |
| 1720 ± 10 | ± 10 | | [11] | BALTRUSAIT... | 87 | MRK3 | $J/\psi \to \gamma K^+ K^-$ |
| 1755 ± 8 | | | [18] | ALDE | 86C | GAM2 | $38\ \pi^- p \to n2\eta$ |
| $1730^{+2}_{-10}$ | | | [19] | LONGACRE | 86 | RVUE | $22\ \pi^- p \to n2K^0_S$ |
| 1742 ± 15 | | | [13] | WILLIAMS | 84 | MPSF | $200\ \pi^- N \to 2K^0_S X$ |
| 1670 ± 50 | | | | BLOOM | 83 | CBAL | $J/\psi \to \gamma 2\eta$ |
| 1650 ± 50 | | | | BURKE | 82 | MRK2 | $J/\psi \to \gamma 2\rho$ |
| 1640 ± 50 | | | [20,21] | EDWARDS | 82D | CBAL | $J/\psi \to \gamma 2\eta$ |
| 1730 ± 10 | ± 20 | | [22] | ETKIN | 82C | MPS | $23\ \pi^- p \to n2K^0_S$ |

[1] From partial wave analysis including all possible combinations of $0^{++}$, $2^{++}$, and $4^{++}$ resonances.

[2] Spin 0 favored over spin 2.

[3] In the SU(3) based model with a specific interference pattern of the $f_2(1270)$, $a^0_2(1320)$, and $f'_2(1525)$ mesons incoherently added to the $f_0(1710)$ and non-resonant background.

[4] $J^P = 0^+$, supersedes ARMSTRONG 89D.
[5] Using CLEO-c data but not authored by the CLEO Collaboration.
[6] From a fit to a Breit-Wigner line shape with fixed $\Gamma = 135$ MeV.
[7] Systematic errors not estimated.
[8] Decaying to $f_0(1370)\pi\pi$.
[9] No $J^{PC}$ determination.
[10] No $J^{PC}$ determination, width not determined.
[11] $J^P = 2^+$.
[12] From a fit to the $0^+$ partial wave.
[13] No $J^{PC}$ determination.
[14] ALDE 92D combines all the GAMS-2000 data.
[15] $J^P = 2^+$, superseded by FRENCH 99.
[16] From an analysis ignoring interference with $f'_2(1525)$.
[17] From an analysis including interference with $f'_2(1525)$.
[18] Superseded by ALDE 92D.
[19] Uses MRK3 data. From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.
[20] $J^P = 2^+$ preferred.
[21] From fit neglecting nearby $f'_2(1525)$. Replaced by BLOOM 83.
[22] Superseded by LONGACRE 86.

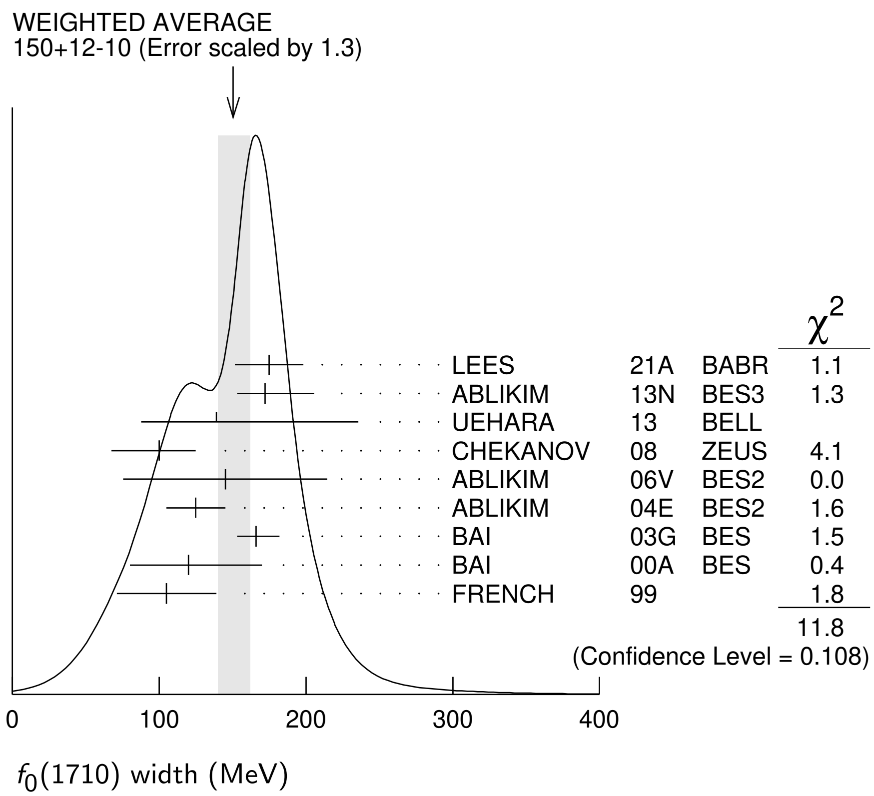



$f_0(1710)$ mass (MeV)

## $f_0(1710)$ Breit-Wigner WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **$150^{+12}_{-10}$ OUR AVERAGE** | | | | | Error includes scale factor of 1.3. See the ideogram below. |
| $175 \pm 23 \pm 4$ | | LEES | 21A | BABR | $\eta_c(1S) \to \eta' K^+ K^-$ |
| $172 \pm 10 ^{+32}_{-16}$ | 5.5k | [1] ABLIKIM | 13N | BES3 | $e^+ e^- \to J/\psi \to \gamma\eta\eta$ |
| $139 ^{+11}_{-12} {}^{+96}_{-50}$ | | [2] UEHARA | 13 | BELL | $\gamma\gamma \to K^0_S K^0_S$ |
| $100 \pm 24 ^{+7}_{-22}$ | 4k | [3] CHEKANOV | 08 | ZEUS | $e p \to K^0_S K^0_S X$ |
| $145 \pm 8 \pm 69$ | | ABLIKIM | 06V | BES2 | $e^+ e^- \to J/\psi \to \gamma\pi^+\pi^-$ |
| $125 \pm 20$ | | ABLIKIM | 04E | BES2 | $J/\psi \to \omega K^+ K^-$ |
| $166 ^{+5}_{-8} {}^{+15}_{-10}$ | | BAI | 03G | BES | $J/\psi \to \gamma K \overline{K}$ |
| $120 ^{+50}_{-40}$ | | BAI | 00A | BES | $J/\psi \to \gamma(\pi^+\pi^-\pi^+\pi^-)$ |
| $105 \pm 34$ | | [4] FRENCH | 99 | | $300\ p p \to p_f (K^+ K^-) p_s$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $148 ^{+40}_{-30}$ | | AMSLER | 06 | CBAR | $1.64\ \overline{p} p \to K^+ K^- \pi^0$ |
| $188 \pm 13$ | 80k | [5] UMAN | 06 | E835 | $5.2\ \overline{p} p \to \eta\eta\pi^0$ |
| $250 \pm 30$ | | VLADIMIRSK... | 06 | SPEC | $40\ \pi^- p \to K^0_S K^0_S n$ |
| $260 \pm 50$ | | BINON | 05 | GAMS | $33\ \pi^- p \to \eta\eta n$ |
| $102 \pm 26$ | | TIKHOMIROV | 03 | SPEC | $40.0\ \pi^- C \to K^0_S K^0_S K^0_L X$ |
| $267 \pm 44$ | 3651 | [6] NICHITIU | 02 | OBLX | $0\ \overline{p} p \to K^+ K^- \pi^+ \pi^- \pi^0$ |
| $100 \pm 25$ | | BARBERIS | 99 | OMEG | $450\ p p \to p_s p_f K^+ K^-$ |
| $160 \pm 30$ | | BARBERIS | 99B | OMEG | $450\ p p \to p_s p_f \pi^+ \pi^-$ |
| $30 \pm 7$ | 57 | [7] BARKOV | 98 | | $\pi^- p \to K^0_S K^0_S n$ |
| $103 \pm 18 ^{+30}_{-11}$ | | [8] BAI | 96C | BES | $J/\psi \to \gamma K^+ K^-$ |
| $85 \pm 24 ^{+22}_{-19}$ | | BAI | 96C | BES | $J/\psi \to \gamma K^+ K^-$ |
| $56 \pm 19$ | | BALOSHIN | 95 | SPEC | $40\ \pi^- C \to K^0_S K^0_S X$ |
| $160 \pm 40$ | | [9] BUGG | 95 | MRK3 | $J/\psi \to \gamma\pi^+\pi^-\pi^+\pi^-$ |
| $160 ^{+60}_{-20}$ | | [8] BUGG | 95 | MRK3 | $J/\psi \to \gamma\pi^+\pi^-\pi^+\pi^-$ |
| $264 \pm 25$ | | [10] ARMSTRONG | 93C | E760 | $\overline{p} p \to \pi^0 \eta\eta \to 6\gamma$ |
| 200 to 300 | | BREAKSTONE | 93 | SFM | $p p \to p p \pi^+\pi^-\pi^+\pi^-$ |
| $< 80$ 90% CL | | [11] ALDE | 92D | GAM2 | $38\ \pi^- p \to \eta\eta N^*$ |
| $181 \pm 30$ | | [12] ARMSTRONG | 89D | OMEG | $300\ p p \to p p K^+ K^-$ |
| $104 \pm 30$ | | [12] ARMSTRONG | 89D | OMEG | $300\ p p \to p p K^0_S K^0_S$ |
| $166.4 \pm 33.2$ | | [10] AUGUSTIN | 88 | DM2 | $J/\psi \to \gamma K^+ K^-,\ K^0_S K^0_S$ |
| $30 \pm 20$ | | [8] BOLONKIN | 88 | SPEC | $40\ \pi^- p \to K^0_S K^0_S n$ |
| $350 \pm 150$ | | BOLONKIN | 88 | SPEC | $40\ \pi^- p \to K^0_S K^0_S n$ |
| $148 \pm 17$ | | [13] FALVARD | 88 | DM2 | $J/\psi \to \phi K^+ K^-,\ K^0_S K^0_S$ |

| | | | | | |
|---|---|---|---|---|---|
| 184 | $\pm$ 6 | [14] FALVARD | 88 | DM2 | $J/\psi \to \phi K^+ K^-$, $K^0_S K^0_S$ |
| 136 | $\pm$ 28 | [10] AUGUSTIN | 87 | DM2 | $J/\psi \to \gamma \pi^+ \pi^-$ |
| 130 | $\pm$ 20 | [8] BALTRUSAIT... | 87 | MRK3 | $J/\psi \to \gamma K^+ K^-$ |
| 122 | $^{+74}_{-15}$ | [15] LONGACRE | 86 | RVUE | $22\ \pi^- p \to n 2K^0_S$ |
| 57 | $\pm$ 38 | [16] WILLIAMS | 84 | MPSF | $200\ \pi^- N \to 2K^0_S X$ |
| 160 | $\pm$ 80 | BLOOM | 83 | CBAL | $J/\psi \to \gamma 2\eta$ |
| 200 | $\pm$100 | BURKE | 82 | MRK2 | $J/\psi \to \gamma 2\rho$ |
| 220 | $^{+100}_{-70}$ | [17,18] EDWARDS | 82D | CBAL | $J/\psi \to \gamma 2\eta$ |
| 200 | $^{+156}_{-9}$ | [19] ETKIN | 82B | MPS | $23\ \pi^- p \to n 2K^0_S$ |




[1] From partial wave analysis including all possible combinations of $0^{++}$, $2^{++}$, and $4^{++}$ resonances.
[2] Spin 0 favored over spin 2.
[3] In the SU(3) based model with a specific interference pattern of the $f_2(1270)$, $a^0_2(1320)$, and $f'_2(1525)$ mesons incoherently added to the $f_0(1710)$ and non-resonant background.
[4] $J^P = 0^+$, supersedes ARMSTRONG 89D.
[5] Systematic errors not estimated.
[6] Decaying to $f_0(1370)\pi\pi$.
[7] No $J^{PC}$ determination.
[8] $J^P = 2^+$.
[9] From a fit to the $0^+$ partial wave.
[10] No $J^{PC}$ determination.
[11] ALDE 92D combines all the GAMS-2000 data.
[12] $J^P = 2^+$, ($0^+$ excluded).
[13] From an analysis ignoring interference with $f'_2(1525)$.

[14] From an analysis including interference with $f'_2(1525)$.
[15] Uses MRK3 data. From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.
[16] No $J^{PC}$ determination.
[17] $J^P = 2^+$ preferred.
[18] From fit neglecting nearby $f'_2(1525)$. Replaced by BLOOM 83.
[19] From an amplitude analysis of the $K^0_S K^0_S$ system, superseded by LONGACRE 86.

## $f_0(1710)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $K\overline{K}$ | seen |
| $\Gamma_2$ | $\eta\eta$ | seen |
| $\Gamma_3$ | $\eta\eta'$ | not seen |
| $\Gamma_4$ | $\pi\pi$ | seen |
| $\Gamma_5$ | $\gamma\gamma$ | seen |
| $\Gamma_6$ | $\omega\omega$ | seen |

## $f_0(1710)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

### $\Gamma(K\overline{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_1\Gamma_5/\Gamma$

| VALUE (eV) | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| $\mathbf{12^{+3}_{-2}{}^{+227}_{-8}}$ | | UEHARA | 13 | BELL | $\gamma\gamma \to K^0_S K^0_S$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| <480 | 95 | ALBRECHT | 90G | ARG | $\gamma\gamma \to K^+ K^-$ |
| <110 | 95 | [1] BEHREND | 89C | CELL | $\gamma\gamma \to K^0_S K^0_S$ |
| <280 | 95 | [1] ALTHOFF | 85B | TASS | $\gamma\gamma \to K\overline{K}\pi$ |

[1] Assuming helicity 2.

### $\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_4\Gamma_5/\Gamma$

| VALUE (keV) | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **<0.82** | 95 | [1] BARATE | 00E | ALEP | $\gamma\gamma \to \pi^+\pi^-$ |

[1] Assuming spin 0.

## $f_0(1710)$ BRANCHING RATIOS

### $\Gamma(K\overline{K})/\Gamma_{\text{total}}$ — $\Gamma_1/\Gamma$

| VALUE | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| seen | 1004 | [1] DOBBS | 15 | | $J/\psi \to \gamma K^+ K^-$ |
| seen | 349 | [1] DOBBS | 15 | | $\psi(2S) \to \gamma K^+ K^-$ |
| $0.36\pm0.12$ | | ALBALADEJO | 08 | RVUE | |
| $0.38^{+0.09}_{-0.19}$ | | [2] LONGACRE | 86 | MPS | $22\ \pi^- p \to n 2K^0_S$ |

[1] Using CLEO-c data but not authored by the CLEO Collaboration.
[2] From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.

## $\Gamma(\eta\eta)/\Gamma_{total}$ $\Gamma_2/\Gamma$

| VALUE | DOCUMENT ID | | TECN |
|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $0.22\pm0.12$ | ALBALADEJO | 08 | RVUE |
| $0.18^{+0.03}_{-0.13}$ | [1] LONGACRE | 86 | RVUE |

[1] From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.

## $\Gamma(\eta\eta)/\Gamma(K\overline{K})$ $\Gamma_2/\Gamma_1$

| VALUE | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **0.48±0.15** | | BARBERIS | 00E | | 450 $pp \to p_f \eta\eta p_s$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $0.46^{+0.70}_{-0.38}$ | | [1] ANISOVICH | 02D | SPEC | Combined fit |
| <0.02 | 90 | [2] PROKOSHKIN | 91 | GA24 | 300 $\pi^- p \to \pi^- p\eta\eta$ |

[1] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K} n$) data.
[2] Combining results of GAM4 with those of ARMSTRONG 89D.

## $\Gamma(\pi\pi)/\Gamma_{total}$ $\Gamma_4/\Gamma$

| VALUE | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| seen | 381 | [1] DOBBS | 15 | | $J/\psi \to \gamma\pi^+\pi^-$ |
| seen | 237 | [1] DOBBS | 15 | | $\psi(2S) \to \gamma\pi^+\pi^-$ |
| not seen | | AMSLER | 02 | CBAR | 0.9 $\overline{p}p \to \pi^0\eta\eta$, $\pi^0\pi^0\pi^0$ |
| $0.039^{+0.002}_{-0.024}$ | | [2] LONGACRE | 86 | RVUE | |

[1] Using CLEO-c data but not authored by the CLEO Collaboration.
[2] From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.

## $\Gamma(\pi\pi)/\Gamma(K\overline{K})$ $\Gamma_4/\Gamma_1$

| VALUE | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **0.23±0.05 OUR AVERAGE** | | Error includes scale factor of 1.2. | | | |
| $0.64\pm0.27\pm0.18$ | | LEES | 18A | BABR | $\Upsilon(1S) \to \gamma\pi^+\pi^-$, $\gamma K^+K^-$ |
| $0.41^{+0.11}_{-0.17}$ | | ABLIKIM | 06V | BES2 | $e^+e^- \to J/\psi \to \gamma\pi^+\pi^-$ |
| $0.2\pm0.024\pm0.036$ | | BARBERIS | 99D | OMEG | 450 $pp \to K^+K^-$, $\pi^+\pi^-$ |
| $0.39\pm0.14$ | | ARMSTRONG | 91 | OMEG | 300 $pp \to pp\pi\pi$, $ppK\overline{K}$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $0.32\pm0.14$ | | ALBALADEJO | 08 | RVUE | |
| < 0.11 | 95 | [1] ABLIKIM | 04E | BES2 | $J/\psi \to \omega K^+K^-$ |
| $5.8^{+9.1}_{-5.5}$ | | [2] ANISOVICH | 02D | SPEC | Combined fit |

[1] Using data from ABLIKIM 04A.
[2] From a combined K-matrix analysis of Crystal Barrel (0. $p\overline{p} \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \to \pi^0\pi^0 n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \to K\overline{K} n$) data.

### $\Gamma(\eta\eta')/\Gamma(\pi\pi)$ $\Gamma_3/\Gamma_4$

| VALUE | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **<2.87 × 10^−3** | 90 | [1] ABLIKIM | 22AS | BES3 | $J/\psi(1S) \to \gamma\eta\eta'$ |

[1] From a Breit-Wigner fit involving 9 resonances and a resonating exotic $\eta_1(1855) \to \eta\eta'$ P-wave.

### $\Gamma(\omega\omega)/\Gamma_{total}$ $\Gamma_6/\Gamma$

| VALUE | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **seen** | 180 | ABLIKIM | 06H | BES | $J/\psi \to \gamma\omega\omega$ |

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