The angular distributions of the decays of the φ and $K^+(892)^0$ in the $\phi\pi^+$ and $K^+\bar{K}^+(892)^0$ modes strongly indicate that the spin is zero. The parity given is that expected of a $c\bar{s}$ ground state.

**$D_s^\pm$ MASS**

The fit includes $D^\pm$, $D^0$, $D_s^\pm$, $D_s^\star\pm$, $D_s^\star0$, $D_1(2420)^0$, $D_2(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements. Measurements of the $D_s^\pm$ mass with an error greater than 10 MeV are omitted from the fit and average. A number of early measurements have been omitted altogether.

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1968.30± 0.11</strong></td>
<td>OUR FIT</td>
<td>Error includes scale factor of 1.1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1969.0 ± 1.4</strong></td>
<td>OUR AVERAGE</td>
<td>Error includes scale factor of 1.5. See the ideogram below.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 ANJOS 88 enters the fit via $m_{D_s^\pm} - m_{D^\pm}$ (see below).

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

1968.3 ± 0.7 ± 0.7 290 ANJOS 88 E691 Photoproduction
1980 ± 15 6 USHIDA 86 EMUL $\nu$ wideband
1973.6 ± 2.6 ± 3.0 163 ALBRECHT 85D ARG $e^+e^- 10$ GeV
1948 ± 28 ± 10 65 AIHARA 84D TPC $e^+e^- 20$ GeV
1975 ± 9 ± 10 49 ALTHOFF 84 TASS $e^+e^- 14–25$ GeV
1975 ± 4 3 BAILEY 84 ACCM hadron$^+$ Be → $\phi\pi^+X$
WEIGHTED AVERAGE
1969.0 ± 1.4 (Error scaled by 1.5)

Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our ‘best’ values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

The fit includes $D^\pm$, $D^0$, $D^+_s$, $D^{*\pm}$, $D^{*0}$, $D^+_s(2420)^0$, $D^+_s(2640)^0$, and $D_s(2536)^\pm$ mass and mass difference measurements.

$D^\pm_s$ MEAN LIFE

Measurements with an error greater than $100 \times 10^{-15}$ s or with fewer than 100 events have been omitted from the Listings.
486.3 ± 15.0$^{+4.9}_{-5.1}$  2167  1 BONVICINI 99  CLE2  $e^+e^- \approx \Upsilon(4S)$
475 ± 20 ± 7  900  FRABETTI 93F  E687  $\gamma$Be, $\phi\pi^+$
500 ± 60 ± 30  104  FRABETTI 90  E687  $\gamma$Be, $\phi\pi^+$
470 ± 40 ± 20  228  RAAB 88  E691  Photoproduction

$^1$ BONVICINI 99 obtains 1.19 ± 0.04 for the ratio of $D_s^+$ to $D^0$ lifetimes.

**WEIGHTED AVERAGE**

500 ± 7 (Error scaled by 1.3)

\[ \chi^2 \]

(Confidence Level = 0.154)

\[
\begin{array}{cccc}
\text{SCALE FACTOR/} & \text{MODE FRACTION (}\Gamma_i/\Gamma) & \text{CONFIDENCE LEVEL} \\
\text{LINK} & \text{05J FOCS} & 1.0 \\
\text{IORI} & \text{01 SELX} & 2.2 \\
\text{AITALA} & \text{99 E791} & 1.3 \\
\text{BONVICINI} & \text{99 CLE2} & 0.8 \\
\text{FRABETTI} & \text{93F E687} & 1.4 \\
\text{FRABETTI} & \text{90 E687} & \\
\text{RAAB} & \text{88 E691} & 6.7 \\
\end{array}
\]

$D_s^\pm$ mean life ($10^{-15}$ s)

**$D_s^+$ DECAY MODES**

Unless otherwise noted, the branching fractions for modes with a resonance in the final state include all the decay modes of the resonance. $D_s^-$ modes are charge conjugates of the modes below.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Fraction ($\Gamma_i/\Gamma$)</th>
<th>Scale factor/Confidence level</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Gamma_1$</td>
<td>$e^+$ semileptonic</td>
<td>[a]  ( 6.5 ± 0.4 ) %</td>
</tr>
<tr>
<td>$\Gamma_2$</td>
<td>$\pi^+$ anything</td>
<td>(119.3 ± 1.4 ) %</td>
</tr>
<tr>
<td>$\Gamma_3$</td>
<td>$\pi^-$ anything</td>
<td>( 43.2 ± 0.9 ) %</td>
</tr>
<tr>
<td>$\Gamma_4$</td>
<td>$\pi^0$ anything</td>
<td>(123 ± 7 ) %</td>
</tr>
<tr>
<td>$\Gamma_5$</td>
<td>$K^-$ anything</td>
<td>( 18.7 ± 0.5 ) %</td>
</tr>
<tr>
<td>$\Gamma_6$</td>
<td>$K^+$ anything</td>
<td>( 28.9 ± 0.7 ) %</td>
</tr>
<tr>
<td>$\Gamma_7$</td>
<td>$K_s^0$ anything</td>
<td>( 19.0 ± 1.1 ) %</td>
</tr>
<tr>
<td>$\Gamma_8$</td>
<td>$\eta$ anything</td>
<td>[b]  ( 29.9 ± 2.8 ) %</td>
</tr>
</tbody>
</table>

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| \( \Gamma \) | \( \omega \) anything | (6.1 ± 1.4) % |
| \( \Gamma \) | \( \eta' \) anything | (11.7 ± 1.8) % |
| \( \Gamma \) | \( f_0(980) \) anything, \( f_0 \rightarrow \pi^+\pi^- \) | < 1.3 % CL=90% |
| \( \Gamma \) | \( \phi \) anything | (15.7 ± 1.0) % |
| \( \Gamma \) | \( K^+ K^- \) anything | (15.8 ± 0.7) % |
| \( \Gamma \) | \( K_S^0 K^+ \) anything | (5.8 ± 0.5) % |
| \( \Gamma \) | \( K_S^0 K^- \) anything | (1.9 ± 0.4) % |
| \( \Gamma \) | \( 2K_S^0 \) anything | (1.70 ± 0.32) % |
| \( \Gamma \) | \( 2K^+ \) anything | < 2.6 \times 10^{-3} CL=90% |
| \( \Gamma \) | \( 2K^- \) anything | < 6 \times 10^{-4} CL=90% |

**Leptonic and semileptonic modes**

| \( \Gamma \) | \( e^+ \nu_e \) | < 8.3 \times 10^{-5} CL=90% |
| \( \Gamma \) | \( \mu^+ \nu_\mu \) | (5.56 ± 0.25) \times 10^{-3} |
| \( \Gamma \) | \( \tau^+ \nu_\tau \) | (5.54 ± 0.24) % |
| \( \Gamma \) | \( K^+ K^- e^+ \nu_e \) | — |
| \( \Gamma \) | \( \phi e^+ \nu_e \) | (2.49 ± 0.14) % |
| \( \Gamma \) | \( \eta e^+ \nu_e + \eta' (958) e^+ \nu_e \) | (3.66 ± 0.37) % |
| \( \Gamma \) | \( \eta e^+ \nu_e \) | (2.67 ± 0.29) % S=1.1 |
| \( \Gamma \) | \( \eta' (958) e^+ \nu_e \) | (9.9 ± 2.3) \times 10^{-3} |
| \( \Gamma \) | \( \omega e^+ \nu_e \) | < 2.0 \times 10^{-3} CL=90% |
| \( \Gamma \) | \( K^0 e^+ \nu_e \) | (3.7 ± 1.0) \times 10^{-3} |
| \( \Gamma \) | \( K^* (892)^0 e^+ \nu_e \) | (1.8 ± 0.7) \times 10^{-3} |
| \( \Gamma \) | \( f_0(980) e^+ \nu_e, f_0 \rightarrow \pi^+\pi^- \) | (2.00 ± 0.32) \times 10^{-3} |

**Hadronic modes with a \( K\bar{K} \) pair**

| \( \Gamma \) | \( K^+ K^0 \) | (1.49 ± 0.06) % |
| \( \Gamma \) | \( K^+ \bar{K}^0 \) | (2.95 ± 0.14) % |
| \( \Gamma \) | \( K^+ K^- \pi^+ \) | (5.39 ± 0.21) % S=1.4 |
| \( \Gamma \) | \( \phi \pi^+ \) | (4.5 ± 0.4) % |
| \( \Gamma \) | \( \phi \pi^+, \phi \rightarrow K^+ K^- \) | (2.24 ± 0.10) % |
| \( \Gamma \) | \( K^+ \bar{K}^*(892)^0, \bar{K}^* \rightarrow \pi^+ \) | (2.58 ± 0.11) % |
| \( \Gamma \) | \( f_0(980) \pi^+, f_0 \rightarrow K^+ K^- \) | (1.14 ± 0.31) % |
| \( \Gamma \) | \( f_0(1370) \pi^+, f_0 \rightarrow K^+ K^- \) | (7 ± 5) \times 10^{-4} |
| \( \Gamma \) | \( f_0(1710) \pi^+, f_0 \rightarrow K^+ K^- \) | (6.6 ± 2.9) \times 10^{-4} |
| \( \Gamma \) | \( K^+ \bar{K}^*_0(1430)^0, \bar{K}^*_0 \rightarrow \pi^+ \) | (1.8 ± 0.4) \times 10^{-3} |
| \( \Gamma \) | \( K^+ K^0 \pi^0 \) | (1.52 ± 0.22) % |
| \( \Gamma \) | \( 2K_S^0 \pi^+ \) | (7.7 ± 0.6) \times 10^{-3} |
| \( \Gamma \) | \( K_S^0 \bar{K}^0 \pi^+ \) | — |
| \( \Gamma \) | \( K^* (892)^+ \bar{K}^0 \) | (5.4 ± 1.2) % |
| \( \Gamma \) | \( K^+ K^- \pi^+ \pi^0 \) | (6.3 ± 0.7) % S=1.1 |
| \( \Gamma \) | \( \phi \rho^+ \) | (8.4 ± 1.9) \times 10^{-2} % |

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\[
\begin{align*}
\Gamma_47 & \quad K^0_S K^- 2\pi^+ (1.66\pm0.11)\% \\
\Gamma_48 & \quad K^*(892)^0 \to K^0 K^- (7.2 \pm 2.6) \% \\
\Gamma_49 & \quad K^+ K^0_S \pi^+ \pi^- (1.03\pm0.10) \% \\
\Gamma_50 & \quad K^+ K^- 2\pi^+ \pi^- (8.6 \pm 1.5) \times 10^{-3} \\
\Gamma_51 & \quad \phi 2\pi^+ \pi^- (1.21\pm0.16) \% \\
\Gamma_52 & \quad K^+ K^- \rho^0 \pi^+ \pi^- non-\phi < 2.6 \times 10^{-4} \quad \text{CL}=90\% \\
\Gamma_53 & \quad \phi \rho^0 \pi^+ (6.5 \pm 1.3) \times 10^{-3} \\
\Gamma_54 & \quad \phi a_1(1260)^+, \phi \to K^+ K^- (7.4 \pm 1.2) \times 10^{-3} \\
\Gamma_55 & \quad K^+ K^- 2\pi^+ \pi^- nonresonant (9 \pm 7) \times 10^{-4} \\
\Gamma_56 & \quad 2K^0_S 2\pi^+ \pi^- (8 \pm 4) \times 10^{-4} \\
\end{align*}
\]

**Hadronic modes without K’s**

\[
\begin{align*}
\Gamma_57 & \quad \pi^+ \pi^0 < 3.4 \times 10^{-4} \quad \text{CL}=90\% \\
\Gamma_58 & \quad 2\pi^+ \pi^- (1.09\pm0.05) \% \quad \text{S}=1.2 \\
\Gamma_59 & \quad \rho^0 \pi^+ (2.0 \pm 1.2) \times 10^{-4} \\
\Gamma_60 & \quad \pi^+ (\pi^+ \pi^-) S-wave [h] (9.0 \pm 0.5) \times 10^{-3} \\
\Gamma_61 & \quad f_0(980) \pi^+, f_0 \to \pi^+ \pi^- \\
\Gamma_62 & \quad f_0(1370) \pi^+ \pi^-, f_0 \to \pi^+ \pi^- \\
\Gamma_63 & \quad f_0(1500) \pi^+ \pi^-, f_0 \to \pi^+ \pi^- \\
\Gamma_64 & \quad f_2(1270) \pi^+ \pi^-, f_2 \to \pi^+ \pi^- (1.09\pm0.20) \times 10^{-3} \\
\Gamma_65 & \quad \rho(1450)^0 \pi^+ \pi^-, \rho^0 \to \pi^+ \pi^- (3.0 \pm 1.9) \times 10^{-4} \\
\Gamma_66 & \quad \pi^+ 2\pi^0 (6.5 \pm 1.3) \times 10^{-3} \\
\Gamma_67 & \quad 2\pi^+ \pi^- \pi^0 \\
\Gamma_68 & \quad \eta \pi^+ [d] (1.69\pm0.10) \% \quad \text{S}=1.2 \\
\Gamma_69 & \quad \omega \pi^+ (2.4 \pm 0.6) \times 10^{-3} \\
\Gamma_70 & \quad 3\pi^+ 2\pi^- (7.9 \pm 0.8) \times 10^{-3} \\
\Gamma_71 & \quad 2\pi^+ \pi^- 2\pi^0 \\
\Gamma_72 & \quad \eta \rho^+ [d] (8.9 \pm 0.8) \% \\
\Gamma_73 & \quad \eta \pi^+ \pi^0 (9.2 \pm 1.2) \% \\
\Gamma_74 & \quad \omega \pi^+ \pi^0 [d] (2.8 \pm 0.7) \% \\
\Gamma_75 & \quad 3\pi^+ 2\pi^- \pi^0 (4.9 \pm 3.2) \% \\
\Gamma_76 & \quad \omega 2\pi^+ \pi^- [d] (1.6 \pm 0.5) \% \\
\Gamma_77 & \quad \eta'(958) \pi^+ [c,d] (3.94\pm0.25) \% \\
\Gamma_78 & \quad 3\pi^+ 2\pi^- 2\pi^0 \\
\Gamma_79 & \quad \omega \eta \pi^+ [d] < 2.13 \% \quad \text{CL}=90\% \\
\Gamma_80 & \quad \eta' (958) \rho^+ [c,d] (12.5 \pm 2.2) \% \\
\Gamma_81 & \quad \eta' (958) \pi^+ \pi^0 (5.6 \pm 0.8) \% \\
\end{align*}
\]

**Modes with one or three K’s**

\[
\begin{align*}
\Gamma_82 & \quad K^+ \pi^0 (6.3 \pm 2.1) \times 10^{-4} \\
\Gamma_83 & \quad K^0_S \pi^+ (1.21\pm0.06) \times 10^{-3} \\
\Gamma_84 & \quad K^+ \eta [d] (1.76\pm0.35) \times 10^{-3} \\
\Gamma_85 & \quad K^+ \omega [d] < 2.4 \times 10^{-3} \quad \text{CL}=90\% \\
\Gamma_86 & \quad K^+ \eta'(958) [d] (1.8 \pm 0.6) \times 10^{-3} \\
\end{align*}
\]
\(\Gamma_{87} K^+ \pi^+ \pi^-\)  
\(\Gamma_{88} K^+ \rho^0\)  
\(\Gamma_{89} K^+ \rho(1450)^0, \rho^0 \rightarrow \pi^+ \pi^-\)  
\(\Gamma_{90} K^*(892)^0 \pi^+, K^*0 \rightarrow K^+ \pi^-\)  
\(\Gamma_{91} K^*(1410)^0 \pi^+, K^*0 \rightarrow K^+ \pi^-\)  
\(\Gamma_{92} K^*(1430)^0 \pi^+, K^*0 \rightarrow K^+ \pi^-\)  
\(\Gamma_{93} K^+ \pi^+ \pi^-\) nonresonant  
\(\Gamma_{94} K^0 \pi^+ \pi^0\)  
\(\Gamma_{95} K^0_S 2\pi^+ \pi^-\)  
\(\Gamma_{96} K^+ \omega \pi^0\)  
\(\Gamma_{97} K^+ \omega \pi^+ \pi^-\)  
\(\Gamma_{98} K^+ \omega \eta\)  
\(\Gamma_{99} 2K^+ K^-\)  
\(\Gamma_{100} \phi K^+, \phi \rightarrow K^+ K^-\)

**Doubly Cabibbo-suppressed modes**

\(\Gamma_{101} 2K^+ \pi^-\)  
\(\Gamma_{102} K^+ K^*(892)^0, K^*0 \rightarrow K^+ \pi^-\)

**Baryon-antibaryon mode**

\(\Gamma_{103} \rho \bar{\eta}\)

**\(\Delta C = 1\) weak neutral current (CI) modes,**  
**Lepton family number (LF), or**  
**Lepton number (L) violating modes**

\(\Gamma_{104} \pi^+ e^+ e^-\)  
\(\Gamma_{105} \pi^+ \phi, \phi \rightarrow e^+ e^-\)  
\(\Gamma_{106} \pi^+ \mu^+ \mu^-\)  
\(\Gamma_{107} K^+ e^+ e^-\)  
\(\Gamma_{108} K^+ \mu^+ \mu^-\)  
\(\Gamma_{109} K^* (892)^+ \mu^+ \mu^-\)  
\(\Gamma_{110} \pi^+ e^+ \mu^-\)  
\(\Gamma_{111} \pi^+ e^- \mu^+\)  
\(\Gamma_{112} K^+ e^+ \mu^-\)  
\(\Gamma_{113} K^+ e^- \mu^+\)  
\(\Gamma_{114} \pi^- 2e^+\)  
\(\Gamma_{115} \pi^- 2\mu^+\)  
\(\Gamma_{116} \pi^- e^+ \mu^+\)  
\(\Gamma_{117} K^- 2e^+\)  
\(\Gamma_{118} K^- 2\mu^+\)  
\(\Gamma_{119} K^- e^+ \mu^+\)  
\(\Gamma_{120} K^* (892)^- 2\mu^+\)

\(\text{CL}=90\%\)
This is the purely $e^+$ semileptonic branching fraction: the $e^+$ fraction from $\tau^+$ decays has been subtracted off. The sum of our (non-$\tau$) $e^+$ exclusive fractions — an $e^+\nu_e$ with an $\eta$, $\eta'$, $\phi$, $K^0$, $K^{*0}$, or $f_0(980)$ — is $7.0 \pm 0.4\%$.

This fraction includes $\eta$ from $\eta'$ decays.

Two times (to include $\mu$ decays) the $\eta'$ $e^+\nu_e$ branching fraction, plus the $\eta'/\pi^+$, $\eta'/\rho^+$, and $\eta'/K^+$ fractions, is $(18.6 \pm 2.3)\%$, which considerably exceeds the inclusive $\eta'$ fraction of $(11.7 \pm 1.8)\%$. Our best guess is that the $\eta'/\rho^+$ fraction, $(12.5 \pm 2.2)\%$, is too large.

This branching fraction includes all the decay modes of the final-state resonance.

A test for $u\bar{u}$ or $d\bar{d}$ content in the $D_s^+$. Neither Cabibbo-favored nor Cabibbo-suppressed decays can contribute, and $\omega-\phi$ mixing is an unlikely explanation for any fraction above about $2 \times 10^{-4}$.

The branching fraction for this mode may differ from the sum of the submodes that contribute to it, due to interference effects. See the relevant papers.

We decouple the $D_s^+ \to \phi \pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \to \phi \pi^+$, $\phi \to K^+K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \to K^+K^+\pi^-$. That is, the ratio of these two branching fractions is not exactly the $\phi \to K^+K^-$ branching fraction 0.491.

This is the average of a model-independent and a $K$-matrix parametrization of the $\pi^+\pi^-$ $S$-wave and is a sum over several $f_0$ mesons.

This mode is not a useful test for a $\Delta C=1$ weak neutral current because both quarks must change flavor in this decay.

This is not a test for the $\Delta C=1$ weak neutral current, but leads to the $\pi^+\ell^+\ell^-$ final state.
CONSTRINED FIT INFORMATION

An overall fit to 16 branching ratios uses 19 measurements and one constraint to determine 12 parameters. The overall fit has a $\chi^2 = 5.7$ for 8 degrees of freedom.

The following off-diagonal array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the $x_i$ whose labels appear in this array to sum to one.

| $x_{25}$ | 16  |
| $x_{26}$ | 12 2 |
| $x_{31}$ | 0   0 0 |
| $x_{33}$ | 0   0 0 54 |
| $x_{45}$ | 0   0 0 19 45 |
| $x_{47}$ | 0   0 0 38 38 17 |
| $x_{58}$ | 0   0 0 40 69 34 28 |
| $x_{68}$ | 0   0 0 10 -21 -19 1 -20 |
| $x_{69}$ | 0   0 0 1 -2 -2 0 -2 11 |
| $x_{87}$ | 0   0 0 22 19 3 13 11 9 1 |

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$D_s^+$ BRANCHING RATIOS

A number of older, now obsolete results have been omitted. They may be found in earlier editions.

--- Inclusive modes ---

$\Gamma(e^+ \text{ semileptonic}) / \Gamma_{\text{total}}$

This is the purely $e^+$ semileptonic branching fraction: the $e^+$ fraction from $\tau^+$ decays has been subtracted off. The sum of our (non-$\tau$) $e^+$ exclusive fractions — an $e^+ \nu_e$ with an $\eta$, $\eta'$, $\phi$, $K^0$, $K^{*0}$, or $f_0(980)$ — is $6.90 \pm 0.4\%$.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-2}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6.52 \pm 0.39 \pm 0.15$</td>
<td>536 ± 29</td>
<td>1 ASNER</td>
<td>10 CLEO</td>
<td>$e^+ e^- \text{ at 3774 MeV}$</td>
</tr>
</tbody>
</table>

1 Using the $D_s^+$ and $D^0$ lifetimes, ASNER 10 finds that the ratio of the $D_s^+$ and $D^0$ semileptonic widths is $0.828 \pm 0.051 \pm 0.025$.

$\Gamma(\pi^+ \text{ anything}) / \Gamma_{\text{total}}$

Events with two $\pi^+$'s count twice, etc. But $\pi^+$'s from $K_S^0 \rightarrow \pi^+ \pi^-$ are not included.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-2}$)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$119.3 \pm 1.2 \pm 0.7$</td>
<td>DOBBS</td>
<td>09 CLEO</td>
<td>$e^+ e^- \text{ at 4170 MeV}$</td>
</tr>
</tbody>
</table>

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\[ \Gamma (\pi^- \text{anything}) / \Gamma_{\text{total}} \]

Events with two \( \pi^- \)'s count twice, etc. But \( \pi^- \)'s from \( K_S^0 \to \pi^+ \pi^- \) are not included.

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 43.2 \pm 0.9 \pm 0.3 )</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma (\pi^0 \text{anything}) / \Gamma_{\text{total}} \]

Events with two \( \pi^0 \)'s count twice, etc. But \( \pi^0 \)'s from \( K_S^0 \to 2\pi^0 \) are not included.

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 123.4 \pm 3.8 \pm 5.3 )</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma (K^- \text{anything}) / \Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 18.7 \pm 0.5 \pm 0.2 )</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma (K^+ \text{anything}) / \Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 28.9 \pm 0.6 \pm 0.3 )</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma (K_S^0 \text{anything}) / \Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 19.0 \pm 1.0 \pm 0.4 )</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma (\eta \text{anything}) / \Gamma_{\text{total}} \]

This ratio includes \( \eta \) particles from \( \eta' \) decays.

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 29.9 \pm 2.2 \pm 1.7 )</td>
<td>674 ± 91</td>
<td>HUANG 06B</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

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

23.5 \( \pm 3.1 \pm 2.0 \)

\[ \Gamma (\omega \text{anything}) / \Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 6.1 \pm 1.4 \pm 0.3 )</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma (\eta' \text{anything}) / \Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 11.7 \pm 1.7 \pm 0.7 )</td>
<td>68 ± 15</td>
<td>HUANG 06B</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>

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

8.7 \( \pm 1.9 \pm 0.8 \)

\[ \Gamma (f_0(980) \text{anything, } f_0 \to \pi^+ \pi^-) / \Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-2} ))</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;1.3 )</td>
<td>90</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
</tbody>
</table>
\( \Gamma(\phi \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.7 \pm 0.8 \pm 0.6</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
<tr>
<td>16.1 \pm 1.2 \pm 1.1</td>
<td>HUANG 06B</td>
<td>CLEO</td>
<td>See DOBBS 09</td>
</tr>
</tbody>
</table>

\( \Gamma(K^+ K^- \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.8 \pm 0.6 \pm 0.3</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\( \Gamma(K^0 S K^+ \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8 \pm 0.5 \pm 0.1</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\( \Gamma(K^0 S K^- \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9 \pm 0.4 \pm 0.1</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\( \Gamma(2K^0 S \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.7 \pm 0.3 \pm 0.1</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\( \Gamma(K^+ \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.26</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\( \Gamma(K^- \text{ anything})/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.06</td>
<td>DOBBS 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

--- **Leptonic and semileptonic modes** ---

A REVIEW GOES HERE – Check our WWW List of Reviews

\( \Gamma(e^+ \nu_e)/\Gamma_{\text{total}} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.83 \times 10^{-4}</td>
<td>90</td>
<td>1 ZUPANC</td>
<td>BELL</td>
<td>e(^+) e(^-) at (\Upsilon(4S),\Upsilon(5S))</td>
</tr>
<tr>
<td>&lt;2.3 \times 10^{-4}</td>
<td>90</td>
<td>DEL-AMO-SA..10J</td>
<td>BABR</td>
<td>e(^+) e(^-), 10.58 GeV</td>
</tr>
<tr>
<td>&lt;1.2 \times 10^{-4}</td>
<td>90</td>
<td>ALEXANDER 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
<tr>
<td>&lt;1.3 \times 10^{-4}</td>
<td>90</td>
<td>PEDLAR 07A</td>
<td>CLEO</td>
<td>See ALEXANDER 09</td>
</tr>
</tbody>
</table>

1 ZUPANC 13 also gives the limit as < 1.0 \times 10^{-4} at 95\% CL.
$\Gamma(\mu^+\nu_\mu)/\Gamma_{\text{total}}$

See the note on “Decay Constants of Charged Pseudoscalar Mesons” above.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-3}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.31 ± 0.28 ± 0.20</td>
<td>492 ± 26</td>
<td>ZUPANC 13</td>
<td>BELL</td>
<td>$e^+e^- \rightarrow \Upsilon(4S), \Upsilon(5S)$</td>
</tr>
<tr>
<td>6.02 ± 0.38 ± 0.34</td>
<td>275 ± 17</td>
<td>DEL-AMO-SANCHEZ 10j</td>
<td>BABR</td>
<td>$e^+e^-, 10.58 \text{ GeV}$</td>
</tr>
<tr>
<td>5.65 ± 0.45 ± 0.17</td>
<td>235 ± 14</td>
<td>ALEXANDER 09</td>
<td>CLEO</td>
<td>$e^+e^- \rightarrow 4170 \text{ MeV}$</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE (units $10^{-3}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.44 ± 0.76 ± 0.57</td>
<td>169 ± 18</td>
<td>WIDHAML 08</td>
<td>BELL</td>
<td>See ZUPANC 13</td>
</tr>
<tr>
<td>5.94 ± 0.66 ± 0.31</td>
<td>88</td>
<td>PEDLAR 07A</td>
<td>CLEO</td>
<td>See ALEXANDER 09</td>
</tr>
<tr>
<td>6.8 ± 1.1 ± 1.8</td>
<td>553</td>
<td>HEISTER 02l</td>
<td>ALEP</td>
<td>Z decays</td>
</tr>
</tbody>
</table>

1 ZUPANC 13 uses both $\mu^+\nu$ and $\tau^+\nu$ events to get $f_{D_s} = (255.5 \pm 4.2 \pm 5.1) \text{ MeV}$.

2 DEL-AMO-SANCHEZ 10j uses $\mu^+\nu_\mu$ and $\tau^+\nu_\tau$ events together to get $f_{D_s} = (258.6 \pm 6.4 \pm 7.5) \text{ MeV}$.

3 WIDHAML 08 gets $f_{D_s} = (275 \pm 16 \pm 12) \text{ MeV}$ from the branching fraction.

4 PEDLAR 07A also fits $\mu^+\nu_\mu$ and $\tau^+\nu_\tau$ events together and gets an effective $\mu^+\nu_\mu$ branching fraction of $(6.38 \pm 0.59 \pm 0.33) \times 10^{-3}$.

5 This HEISTER 02l result is not actually an independent measurement of the absolute $\mu^+\nu_\mu$ branching fraction, but is in fact based on the $\phi\pi^+$ branching fraction of $3.6 \pm 0.9\%$, so it cannot be included in our overall fit. HEISTER 02l combines its $D^+ \rightarrow \pi^+\pi^0$ and $\mu^+\nu_\mu$ branching fractions to get $f_{D_s} = (285 \pm 19 \pm 40) \text{ MeV}$.

$\Gamma(\mu^+\nu_\mu)/\Gamma(\phi\pi^+)$

See the note on “Decay Constants of Charged Pseudoscalar Mesons” above.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-3}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.143 ± 0.018 ± 0.006</td>
<td>489 ± 55</td>
<td>AUBERT 07v</td>
<td>BABR</td>
<td>$e^+e^- \approx \Upsilon(4S)$</td>
</tr>
<tr>
<td>0.23 ± 0.06 ± 0.04</td>
<td>18</td>
<td>ALEXANDROV 00</td>
<td>BEAT</td>
<td>$\pi^- \text{ nucleus}, 350 \text{ GeV}$</td>
</tr>
<tr>
<td>0.173 ± 0.023 ± 0.035</td>
<td>182</td>
<td>CHADHA 98</td>
<td>CLE2</td>
<td>$e^+e^- \approx \Upsilon(4S)$</td>
</tr>
<tr>
<td>0.245 ± 0.052 ± 0.074</td>
<td>39</td>
<td>ACOSTA 94</td>
<td>CLE2</td>
<td>See CHADHA 98</td>
</tr>
</tbody>
</table>

1 AUBERT 07v gets $f_{D_s} = (283 \pm 17 \pm 16) \text{ MeV}$, using $\Gamma(D^+_s \rightarrow \phi\pi^+)/\Gamma(\text{total}) = (4.71 \pm 0.46\%)$.

2 ALEXANDROV 00 uses $f^2_D/f^2_{D_s} = 0.82 \pm 0.09$ from a lattice-gauge-theory calculation to get the relative numbers of $D^+ \rightarrow \mu^+\nu_\mu$ and $D^+_s \rightarrow \mu^+\nu_\mu$ events. The present result leads to $f_{D_s} = (323 \pm 44 \pm 36) \text{ MeV}$.

3 CHADHA 98 obtains $f_{D_s} = (280 \pm 19 \pm 28 \pm 34) \text{ MeV}$ from this measurement, using $\Gamma(D^+_s \rightarrow \phi\pi^+)/\Gamma(\text{total}) = 0.036 \pm 0.009$.

4 ACOSTA 94 obtains $f_{D_s} = (344 \pm 37 \pm 52 \pm 42) \text{ MeV}$ from this measurement, using $\Gamma(D^+_s \rightarrow \phi\pi^+)/\Gamma(\text{total}) = 0.037 \pm 0.009$. 
\[ \frac{\Gamma(\tau^+ \nu_\tau)}{\Gamma_{\text{total}}} \]

See the note on “Decay Constants of Charged Pseudoscalar Mesons” above.

\[ \frac{\Gamma_{21}}{\Gamma_{20}} \]

\[ \frac{\Gamma(\pi^+ + \nu_\pi)}{\Gamma(K^+ + K^- + \pi^+)} \]

\[ \frac{\Gamma_{22}}{\Gamma_{33}} \]

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
\textbf{VALUE (units $10^{-2}$)} & \textbf{EVTS} & \textbf{DOCUMENT ID} & \textbf{TECN} & \textbf{COMMENT} \\
\hline
5.54 & 0.24 & OUR AVERAGE & & \\
\hline
5.70 & 0.21 & +0.31 & 2.2k & 1 ZUPANC 13 BELL $e^+ e^- \text{ at } \gamma(4S), \gamma(5S)$ \\
\hline
5.00 & 0.35 & +0.49 & 748 & 2 DEL-AMO-SA..10j BABR $e^- \pi^+ \nu_\tau, \mu^- \pi^- \nu_\mu$ \\
\hline
6.42 & 0.81 & +0.18 & 126 & 3 ALEXANDER 09 CLEO $\tau^+ \rightarrow \pi^+ \nu_\tau$ \\
\hline
5.52 & 0.57 & +0.21 & 155 & 3 NAIK 09A CLEO $\tau^+ \rightarrow \rho^+ \tau_\tau$ \\
\hline
5.30 & 0.47 & +0.22 & 181 & 3 ONYISI 09 CLEO $\tau^+ \rightarrow e^+ \nu_\tau \pi^+$ \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
\textbf{VALUE (units $10^{-2}$)} & \textbf{EVTS} & \textbf{DOCUMENT ID} & \textbf{TECN} & \textbf{COMMENT} \\
\hline
6.17 & 0.71 & +0.34 & 102 & 4 ECKLUND 08 CLEO See ONYISI 09 \\
\hline
8.0 & +1.3 & ±0.4 & 47 & 4 PEDLAR 07A CLEO See ALEXANDER 09 \\
\hline
5.79 & 0.77 & ±1.84 & 881 & 5 HEISTER 02I ALEP Z decays \\
\hline
7.0 & ±2.1 & ±2.0 & 22 & 6 ABBIENDI 01L OPAL $D_s^+ \rightarrow \gamma D_s^+$ from Z’s \\
\hline
7.4 & ±2.8 & ±2.4 & 16 & 7 ACCIARRI 97F L3 $D_s^+ \rightarrow \gamma D_s^+$ from Z’s \\
\hline
\end{tabular}
\end{table}

1 ZUPANC 13 uses both $\mu^+ \nu$ and $\tau^+ \nu$ events to get $f_{D_s} = (255.5 \pm 4.2 \pm 5.1) \text{ MeV}$. \\
2 DEL-AMO-SANCHEZ 10j uses $\mu^+ \nu_\mu$ and $\tau^+ \nu_\tau$ events together to get $f_{D_s} = (258.6 \pm 6.4 \pm 7.5) \text{ MeV}$. \\
3 ALEXANDER 09, NAIK 09A, and ONYISI 09 use different $\tau$ decay modes and are independent. The three papers combined give $f_{D_s} = (259.7 \pm 7.8 \pm 3.4) \text{ MeV}$. \\
4 ECKLUND 08 and PEDLAR 07A are independent: ECKLUND 08 uses $\tau^+ \rightarrow e^+ \nu_\tau \pi^+$ events, PEDLAR 07A uses $\tau^+ \rightarrow \pi^+ \nu_\tau$ events. \\
5 HEISTER 02I combines its $D_s^+ \rightarrow \tau^+ \nu_\tau$ and $\mu^+ \nu_\mu$ branching fractions to get $f_{D_s} = (285 \pm 19 \pm 40) \text{ MeV}$. \\
6 This ABBIENDI 01L value gives a decay constant $f_{D_s}$ of $(286 \pm 44 \pm 41) \text{ MeV}$. \\
7 The second ACCIARRI 97F error here combines in quadrature systematic (0.016) and normalization (0.018) errors. The branching fraction gives $f_{D_s} = (309 \pm 58 \pm 33 \pm 38) \text{ MeV}$. \\

\[ \frac{\Gamma(\tau^+ \nu_\tau)}{\Gamma(\mu^+ \nu_\mu)} \]

\[ \frac{\Gamma_{21}}{\Gamma_{20}} \]

\[ \frac{\Gamma(\pi^+ + \nu_\pi)}{\Gamma(K^+ + K^- + \pi^+)} \]

\[ \frac{\Gamma_{22}}{\Gamma_{33}} \]

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
\textbf{VALUE (units $10^{-2}$)} & \textbf{EVTS} & \textbf{DOCUMENT ID} & \textbf{TECN} & \textbf{COMMENT} \\
\hline
10.73 & 0.69 & +0.56 & 2.2k/492 & 1 ZUPANC 13 BELL $e^+ e^- \text{ at } \gamma(4S), \gamma(5S)$ \\
\hline
11.0 & ±1.4 & ±0.6 & 102 & 2 ECKLUND 08 CLEO See ONYISI 09 \\
\hline
\end{tabular}
\end{table}

1 This ZUPANC 13 ratio is not independent of the separate $\tau \nu$ and $\mu \nu$ fractions listed above. \\
2 This ECKLUND 08 value also uses results from PEDLAR 07A, and it is not independent of other results in these Listings. Combined with earlier CLEO results, the decay constant $f_{D_s}$ is $274 \pm 10 \pm 5 \text{ MeV}$. \\
3 This AUBERT 08AN ratio is only for the $K^+ K^-$ mass in the range 1.01-to-1.03 GeV in the numerator and 1.0095-to-1.0295 GeV in the denominator.
\[ \Gamma(\phi e^+ \nu_e)/\Gamma_{\text{total}} \]

See the end of the Listings for measurements of \( D_s^+ \rightarrow \phi e^+ \nu_e \) form factors.
Unseen decay modes of the \( \phi \) are included.

\[ \Gamma_{23}/\Gamma \]

\[ \Gamma(\phi e^+ \nu_e)/\Gamma(\phi \pi^+) \]

As noted in the comment column, most of these measurements use \( \phi \mu^+ \nu_\mu \) events in addition to or instead of \( \phi e^+ \nu_e \) events.

\[ \Gamma_{23}/\Gamma_{34} \]

\[ \Gamma(\eta e^+ \nu_e)/\Gamma_{\text{total}} \]

Unseen decay modes of the \( \eta \) are included.

\[ \Gamma_{25}/\Gamma \]

\[ \Gamma(\eta e^+ \nu_e)/\Gamma(\phi e^+ \nu_e) \]

Unseen decay modes of the \( \eta \) and the \( \phi \) are included.

\[ \Gamma_{25}/\Gamma_{23} \]

\[ \Gamma(\eta'(958) e^+ \nu_e)/\Gamma_{\text{total}} \]

Unseen decay modes of the \( \eta'(958) \) are included.

\[ \Gamma_{26}/\Gamma \]

\[ \Gamma(\eta'(958) e^+ \nu_e)/\Gamma(\phi e^+ \nu_e) \]

Unseen decay modes of the resonances are included.
\[ \frac{\Gamma(\eta e^+ \nu_e) + \Gamma(\eta/(958) e^+ \nu_e)}{\Gamma(\phi e^+ \nu_e)} \quad \Gamma_{24}/\Gamma_{23} = (\Gamma_{25} + \Gamma_{26})/\Gamma_{23} \]

Unseen decay modes of the resonances are included.

\begin{tabular}{|c|c|c|c|}
\hline
VALUE & DOCUMENT ID & TECN & COMMENT \\
\hline
\hline
\end{tabular}

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

1.67±0.17±0.17 1 BRANDENBURG 95 1 CLEO e^+ e^- ≈ \gamma(4S)

1 This BRANDENBURG 95 data is redundant with data in previous blocks.

\[ \Gamma(\omega e^+ \nu_e)/\Gamma_{\text{total}} \quad \Gamma_{27}/\Gamma \]

A test for \( u\bar{u} \) or \( d\bar{d} \) content in the \( D^+ \). Neither Cabibbo-favored nor Cabibbo-suppressed decays can contribute, and \( \omega - \phi \) mixing is an unlikely explanation for any fraction above about \( 2 \times 10^{-4} \).

\begin{tabular}{|c|c|c|c|}
\hline
VALUE (\%) & CL\% & DOCUMENT ID & TECN & COMMENT \\
\hline
<0.20 & 90 & MARTIN 11 & CLEO & e^+ e^- at 4170 MeV \\
\hline
\end{tabular}

\[ \Gamma(K^0 e^+ \nu_e)/\Gamma_{\text{total}} \quad \Gamma_{28}/\Gamma \]

\begin{tabular}{|c|c|c|c|}
\hline
VALUE (units \( 10^{-2} \)) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
0.37±0.10±0.02 & 14 & YELTON 09 & CLEO & e^+ e^- at 4170 MeV \\
\hline
\end{tabular}

\[ \Gamma(K^*(892)^0 e^+ \nu_e)/\Gamma_{\text{total}} \quad \Gamma_{29}/\Gamma \]

Unseen decay modes of the \( K^*(892)^0 \) are included.

\begin{tabular}{|c|c|c|c|}
\hline
VALUE (units \( 10^{-2} \)) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
0.18±0.07±0.01 & 7.5 & YELTON 09 & CLEO & e^+ e^- at 4170 MeV \\
\hline
\end{tabular}

\[ \Gamma(f_0(980) e^+ \nu_e, f_0 \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}} \quad \Gamma_{30}/\Gamma \]

\begin{tabular}{|c|c|c|c|}
\hline
VALUE (units \( 10^{-2} \)) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
0.20±0.03±0.01 & 44 ± 7 & ECKLUND 09 & CLEO & e^+ e^- at 4170 MeV \\
\hline
\end{tabular}

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

0.13±0.04±0.01 13 YELTON 09 CLEO See ECKLUND 09

--- Hadronic modes with a \( K\bar{K} \) pair. ---

\[ \Gamma(K^+ K^0 \bar{\nu} \bar{\nu}_e)/\Gamma_{\text{total}} \quad \Gamma_{31}/\Gamma \]

\begin{tabular}{|c|c|c|c|}
\hline
VALUE (units \( 10^{-2} \)) & DOCUMENT ID & TECN & COMMENT \\
\hline
1.49±0.06 OUR FIT & & & \\
1.52±0.05±0.03 & ONYISI 13 & CLEO & e^+ e^- at 4.17 GeV \\
\hline
\end{tabular}

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

1.49±0.07±0.05 1 ALEXANDER 08 CLEO See ONYISI 13

1 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

\[ \Gamma(K^+ \bar{\nu} \bar{\nu}_e)/\Gamma_{\text{total}} \quad \Gamma_{32}/\Gamma \]

\begin{tabular}{|c|c|c|c|}
\hline
VALUE (units \( 10^{-2} \)) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
2.95±0.11±0.09 & 2.0k & ZUPANC 13 & BELL & e^+ e^- at \gamma(4S), \gamma(5S) \\
\hline
\end{tabular}

1 ZUPANC 13 finds the \( \bar{\nu} \bar{\nu}_e \) from its missing-mass squared, not from \( K^0 S \rightarrow \pi^+ \pi^- \).

The DCS (\( D^+ \rightarrow K^+ K^0 \)) contribution to this fraction is estimated to be an order of magnitude below the statistical uncertainty.
The results here are model-independent. For earlier, model-dependent results, see our PDG 06 edition. We decouple the $D_s^+ \to \phi \pi^+$ branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the $D_s^+ \to \phi \pi^+$, $\phi \to K^+ K^-$ branching fraction obtained from the Dalitz-plot analysis of $D_s^+ \to K^+ K^- \pi^+$. That is, the ratio of these two branching fractions is not exactly the $\phi \to K^+ K^-$ branching fraction 0.491.

\[
\Gamma(K^+ K^- \pi^+)/\Gamma_{\text{total}} \quad \Gamma_{33}/\Gamma
\]

<table>
<thead>
<tr>
<th>VALUE (units $10^{-2}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.39±0.21 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.38±0.23 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.55±0.14±0.13</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e$^+ e^-$ at 4.17 GeV</td>
<td></td>
</tr>
<tr>
<td>5.06±0.15±0.21</td>
<td>ZUPANC 13</td>
<td>BELL</td>
<td>e$^+ e^-$ at $\Upsilon(4S), \Upsilon(5S)$</td>
<td></td>
</tr>
<tr>
<td>● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.50±0.23±0.16</td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
<td></td>
</tr>
</tbody>
</table>

1 ALEXANDER 08 uses single- and double-tagged events in an overall fit. The correlation matrix for the branching fractions is used in the fit.

\[
\Gamma(\phi \pi^+)/\Gamma_{\text{total}} \quad \Gamma_{34}/\Gamma
\]

<table>
<thead>
<tr>
<th>VALUE (units $10^{-2}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 ±0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.62±0.36±0.51</td>
<td>AUBERT 06N</td>
<td>BABR</td>
<td>e$^+ e^-$ at $\Upsilon(4S)$</td>
<td></td>
</tr>
<tr>
<td>4.81±0.52±0.38</td>
<td>AUBERT 05V</td>
<td>BABR</td>
<td>e$^+ e^-$ at $\Upsilon(4S)$</td>
<td></td>
</tr>
<tr>
<td>3.59±0.77±0.48</td>
<td>ARTUSO 96</td>
<td>CLEO</td>
<td>e$^+ e^-$ at $\Upsilon(4S)$</td>
<td></td>
</tr>
<tr>
<td>● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.9   $^{+5.1}<em>{-1.9}$  $^{+1.8}</em>{-1.1}$</td>
<td>BAI 95C</td>
<td>BES</td>
<td>e$^+ e^-$ at 4.03 GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 This AUBERT 06N measurement uses $B^0 \to D_s^{(*)-} D^{(*)+}$ and $B^- \to D_s^{(*)-} D^{(*)0}$ decays, including some from other papers. However, the result is independent of AUBERT 05V.

2 AUBERT 05V uses the ratio of $B^0 \to D^{*-+} D_s^{*-}$ events seen in two different ways, in both of which the $D^{*-} \to B^0 \pi^-$ decay is fully reconstructed: (1) The $D_s^{*-} \to D_s^{*-} \gamma$, $D_s^{*-} \to \phi \pi^+$ decay is fully reconstructed. (2) The number of events in the $D_s^{*-}$ peak in the missing mass spectrum against the $D^{*-} \gamma$ is measured.

3 ARTUSO 96 uses partially reconstructed $B^0 \to D^{*-+} D_s^{*-}$ decays to get a model-independent value for $\Gamma(D_s^{*-} \to \phi \pi^+)/\Gamma(D^0 \to K^- \pi^+)$ of 0.92 ± 0.20 ± 0.11.

4 BAI 95C uses $e^+ e^- \to D_s^{+} D_s^{-}$ events in which one or both of the $D_s^{\pm}$ are observed to obtain the first model-independent measurement of the $D_s^{+} \to \phi \pi^+$ branching fraction, without assumptions about $\sigma(D_s^{\pm})$. However, with only two “doubly-tagged” events, the statistical error is very large.
\[ \Gamma(\phi \pi^+, \phi \to K^+ K^-) / \Gamma(K^+ K^- \pi^+) \]  
\[ \Gamma_{35}/\Gamma_{33} \]

This is the “fit fraction” from the Dalitz-plot analysis. We decouple the \( D_s^+ \to \phi \pi^+ \) branching fraction obtained from mass projections (and used to get some of the other branching fractions) from the \( D_s^+ \to \phi \pi^+, \phi \to K^+ K^- \) branching fraction obtained from the Dalitz-plot analysis of \( D_s^+ \to K^+ K^- \pi^+ \). That is, the ratio of these two branching fractions is not exactly the \( \phi \to K^+ K^- \) branching fraction 0.491.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.6 ± 0.8</td>
<td>DEL-AMO-SA...11G</td>
<td>BABR</td>
<td>Dalitz fit, 96k ± 369 evts</td>
</tr>
<tr>
<td>41.4 ± 0.8 ± 0.5</td>
<td>MITCHELL</td>
<td>09A</td>
<td>CLEO</td>
</tr>
<tr>
<td>42.2 ± 1.6 ± 0.3</td>
<td>FRABETTI</td>
<td>95B</td>
<td>E687</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ K^*(892)^0, \bar{K}^{*0} \to K^- \pi^+) / \Gamma(K^+ K^- \pi^+) \]  
\[ \Gamma_{36}/\Gamma_{33} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>47.8 ± 0.6</td>
<td>DEL-AMO-SA...11G</td>
<td>BABR</td>
<td>Dalitz fit, 96k ± 369 evts</td>
</tr>
<tr>
<td>47.9 ± 0.5 ± 0.5</td>
<td>MITCHELL</td>
<td>09A</td>
<td>CLEO</td>
</tr>
<tr>
<td>47.4 ± 1.5 ± 0.4</td>
<td>FRABETTI</td>
<td>95B</td>
<td>E687</td>
</tr>
</tbody>
</table>

\[ \Gamma(f_0(980)\pi^+, f_0 \to K^+ K^-) / \Gamma(K^+ K^- \pi^+) \]  
\[ \Gamma_{37}/\Gamma_{33} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 ± 6</td>
<td>DEL-AMO-SA...11G</td>
<td>BABR</td>
<td>Dalitz fit, 96k ± 369 evts</td>
</tr>
<tr>
<td>16.4 ± 0.7 ± 2.0</td>
<td>MITCHELL</td>
<td>09A</td>
<td>CLEO</td>
</tr>
<tr>
<td>28.2 ± 1.9 ± 1.8</td>
<td>FRABETTI</td>
<td>95B</td>
<td>E687</td>
</tr>
</tbody>
</table>

\[ \Gamma(f_0(1370)\pi^+, f_0 \to K^+ K^-) / \Gamma(K^+ K^- \pi^+) \]  
\[ \Gamma_{38}/\Gamma_{33} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3 ± 0.8</td>
<td>DEL-AMO-SA...11G</td>
<td>BABR</td>
<td>Dalitz fit, 96k ± 369 evts</td>
</tr>
<tr>
<td>1.1 ± 0.1 ± 0.2</td>
<td>MITCHELL</td>
<td>09A</td>
<td>CLEO</td>
</tr>
</tbody>
</table>

\[ \Gamma(f_0(1710)\pi^+, f_0 \to K^+ K^-) / \Gamma(K^+ K^- \pi^+) \]  
\[ \Gamma_{39}/\Gamma_{33} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 ± 0.5</td>
<td>DEL-AMO-SA...11G</td>
<td>BABR</td>
<td>Dalitz fit, 96k ± 369 evts</td>
</tr>
<tr>
<td>3.4 ± 0.5 ± 0.3</td>
<td>MITCHELL</td>
<td>09A</td>
<td>CLEO</td>
</tr>
<tr>
<td>3.4 ± 2.3 ± 3.5</td>
<td>FRABETTI</td>
<td>95B</td>
<td>E687</td>
</tr>
</tbody>
</table>
\[ \Gamma(K^+K_0^*(1430)^0, K_0^* \rightarrow K^-\pi^+)/\Gamma(K^+K^-\pi^+) \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4±0.7</td>
<td>OUR AVERAGE</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Error includes scale factor of 1.2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4±0.3±1.0</td>
<td>DEL-AMO-SA...11G BABR</td>
<td></td>
<td>Dalitz fit, 96k±369 evts</td>
</tr>
<tr>
<td>3.9±0.5±0.5</td>
<td>MITCHELL 09A CLEO</td>
<td></td>
<td>Dalitz fit, 12k evts</td>
</tr>
<tr>
<td></td>
<td>We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.3±3.2±3.2</td>
<td>FRAEBETTI 95B E687</td>
<td></td>
<td>Dalitz fit, 701 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+K_0^*\pi^0)/\Gamma_{total} \]

\[ \Gamma(K^+(892)^+\bar{K}^0)/\Gamma(\phi\pi^+) \]

Unseen decay modes of the resonances are included.

\[ \Gamma(K^+K^-\pi^-\pi^0)/\Gamma_{total} \]

\[ \Gamma(\phi^+)/\Gamma(\phi\pi^+) \]

\[ \Gamma(K^0_2^-2\pi^+)/\Gamma_{total} \]

Unseen decay modes of the resonances are included.

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\[ \Gamma(K^+ K_S^0 \pi^+ \pi^-)/\Gamma_{total} \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.03 ( \pm ) 0.06 ( \pm ) 0.08</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ K_S^0 \pi^+ \pi^-)/\Gamma(K_S^0 K^- 2\pi^+) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.586 ( \pm ) 0.052 ( \pm ) 0.043</td>
<td>476</td>
<td>LINK 01c FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
<tr>
<td>0.150 ( \pm ) 0.019 ( \pm ) 0.025</td>
<td>240</td>
<td>LINK 03d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
<tr>
<td>0.188 ( \pm ) 0.036 ( \pm ) 0.040</td>
<td>75</td>
<td>FRABETTI 97c E687</td>
<td>( \gamma Be, E_{\gamma} \approx 200 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ K^- 2\pi^+ \pi^-)/\Gamma(K^+ K^- \pi^+) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.160 ( \pm ) 0.027 OUR AVERAGE</td>
<td>136</td>
<td>LINK 03d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
<tr>
<td>0.249 ( \pm ) 0.024 ( \pm ) 0.021</td>
<td>40</td>
<td>FRABETTI 97c E687</td>
<td>( \gamma Be, E_{\gamma} \approx 200 ) GeV</td>
</tr>
<tr>
<td>0.28 ( \pm ) 0.06 ( \pm ) 0.01</td>
<td>21</td>
<td>FRABETTI 92 E687</td>
<td>( \gamma Be )</td>
</tr>
<tr>
<td>0.58 ( \pm ) 0.21 ( \pm ) 0.10</td>
<td>19</td>
<td>ANJOS 88 E691</td>
<td>Photoproduction</td>
</tr>
<tr>
<td>0.42 ( \pm ) 0.13 ( \pm ) 0.07</td>
<td>62</td>
<td>ALBRECHT 85d ARG</td>
<td>( e^+ e^- ) 10 GeV</td>
</tr>
<tr>
<td>1.11 ( \pm ) 0.37 ( \pm ) 0.28</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ K^- \rho^0 \pi^+ \text{non-}\phi)/\Gamma(K^+ K^- 2\pi^+ \pi^-) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;0.03 )</td>
<td>90</td>
<td>LINK 03d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\phi \rho^0 \pi^+ \phi \rightarrow K^+ K^-)/\Gamma(K^+ K^- 2\pi^+ \pi^-) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75 ( \pm ) 0.06 ( \pm ) 0.04</td>
<td></td>
<td>LINK 03d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\phi a_1(1260)^+ \phi \rightarrow K^+ K^-, a_1^+ \rightarrow \rho^0 \pi^+)/\Gamma(K^+ K^- \pi^+) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.137 ( \pm ) 0.019 ( \pm ) 0.011</td>
<td></td>
<td>LINK 03d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ K^- 2\pi^+ \pi^- \text{nonresonant})/\Gamma(K^+ K^- 2\pi^+ \pi^-) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10 ( \pm ) 0.06 ( \pm ) 0.05</td>
<td></td>
<td>LINK 03d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(2K_S^0 2\pi^+ \pi^-)/\Gamma(K_S^0 K^- 2\pi^+) \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.051 ( \pm ) 0.015 ( \pm ) 0.015</td>
<td>37 ( \pm ) 10</td>
<td>LINK 04d FOCS</td>
<td>( \gamma A, E_{\gamma} \approx 180 ) GeV</td>
<td></td>
</tr>
</tbody>
</table>
### Pionic modes

\[ \Gamma(\pi^+\pi^0)/\Gamma(K^+K^0_S) \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.3</td>
<td></td>
<td></td>
<td>e^+ e^- at 4170 MeV</td>
</tr>
</tbody>
</table>

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

\[ \Gamma(2\pi^+\pi^-)/\Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.09±0.05 OUR FIT</td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.2.</td>
</tr>
<tr>
<td>1.11±0.04±0.04</td>
<td>ONYISI</td>
<td>CLEO</td>
<td>e^+ e^- at 4.17 GeV</td>
</tr>
</tbody>
</table>

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

\[ \Gamma(2\pi^+\pi^-)/\Gamma(K^+K^-\pi^+) \]

<table>
<thead>
<tr>
<th>VALUE (EVTS)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.201±0.007 OUR FIT</td>
<td></td>
<td></td>
<td>Dalitz fit, \approx 10.5k evts</td>
</tr>
<tr>
<td>0.199±0.004±0.009</td>
<td>AUBERT 090</td>
<td>BABR</td>
<td>e^+ e^- \approx 10.6 GeV</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE (EVTS)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.265±0.041±0.031</td>
<td>FRABETTI 97D</td>
<td>E687</td>
<td>\gamma Be \approx 200 GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\rho^0\pi^+)/\Gamma(2\pi^+\pi^-) \]

<table>
<thead>
<tr>
<th>VALUE (CL%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.018±0.005±0.010</td>
<td>AUBERT 090</td>
<td>BABR</td>
<td>Dalitz fit, \approx 10.5k evts</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE (CL%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.058±0.023±0.037</td>
<td>AITALA 01A</td>
<td>E791</td>
<td>Dalitz fit, 848 evts</td>
</tr>
<tr>
<td>&lt;0.073</td>
<td>FRABETTI 97D</td>
<td>E687</td>
<td>\gamma Be \approx 200 GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\pi^+(\pi^+\pi^-)_S\text{-wave})/\Gamma(2\pi^+\pi^-) \]

This is the “fit fraction” from the Dalitz-plot analysis. See also KLEMPF 08, which uses 568 \( D_s^+ \rightarrow 3\pi \) decays (over 280 background events) from FNAL E791 to study various parametrizations of the decay amplitudes. The emphasis there is more on S-wave \( \pi\pi \) decay products — 20 different solutions are given — than on \( D_s^+ \) fit fractions.

<table>
<thead>
<tr>
<th>VALUE (CL%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.833±0.020 OUR AVERAGE</td>
<td>1 AUBERT 090</td>
<td>BABR</td>
<td>Dalitz fit, \approx 10.5k evts</td>
</tr>
<tr>
<td>0.830±0.009±0.019</td>
<td>2 LINK 04</td>
<td>FOCS</td>
<td>Dalitz fit, 1475±50 evts</td>
</tr>
<tr>
<td>0.8704±0.0560±0.0438</td>
<td></td>
<td></td>
<td>Dalitz fit, 1475±50 evts</td>
</tr>
</tbody>
</table>

1 AUBERT 090 gives the amplitude and phase of the \( \pi^+\pi^- \) S-wave in 29 \( \pi^+\pi^- \) invariant-mass bins.

2 LINK 04 borrows a K-matrix parametrization from ANISOVICH 03 of the full \( \pi\pi \) S-wave isoscalar scattering amplitude to describe the \( \pi^+\pi^- \) S-wave component of the \( \pi^+\pi^- \) state. The fit fraction given above is a sum over five \( f_0(980) \), \( f_0(1300) \), \( f_0(1200-1600) \), \( f_0(1500) \), and \( f_0(1750) \). See LINK 04 for details and discussion.
\[ \Gamma(f_0(980)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-) \]

This is the “fit fraction” from the Dalitz-plot analysis. See above for the full \(\pi^+ (\pi^+\pi^-)S\)-wave fit fraction.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.565±0.043±0.047</td>
<td>AITALA</td>
<td>01A</td>
<td>E791</td>
</tr>
<tr>
<td>1.074±0.140±0.043</td>
<td>FRABETTI</td>
<td>97D</td>
<td>E687</td>
</tr>
</tbody>
</table>

\[ \Gamma(f_0(1370)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-) \]

This is the “fit fraction” from the Dalitz-plot analysis. See above for the full \(\pi^+ (\pi^+\pi^-)S\)-wave fit fraction.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.324±0.077±0.017</td>
<td>AITALA</td>
<td>01A</td>
<td>E791</td>
</tr>
</tbody>
</table>

\[ \Gamma(f_0(1500)\pi^+, f_0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-) \]

This is the “fit fraction” from the Dalitz-plot analysis. See above for the full \(\pi^+ (\pi^+\pi^-)S\)-wave fit fraction.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.274±0.114±0.019</td>
<td>FRABETTI</td>
<td>97D</td>
<td>E687</td>
</tr>
</tbody>
</table>

1 FRABETTI 97D calls this mode \(S(1475)\pi^+\) but finds the mass and width of this \(S(1475)\) to be in excellent agreement with those of the \(f_0(1500)\).

\[ \Gamma(f_2(1270)\pi^+, f_2 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-) \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.101±0.018</td>
<td>OUR AVERAGE</td>
<td>0.101±0.015±0.011</td>
<td>AUBERT</td>
</tr>
<tr>
<td>0.0974±0.0449±0.0294</td>
<td>LINK</td>
<td>04</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(\rho(1450)^0\pi^+, \rho^0 \to \pi^+\pi^-)/\Gamma(2\pi^+\pi^-) \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.027±0.018</td>
<td>OUR AVERAGE</td>
<td>0.023±0.008±0.017</td>
<td>AUBERT</td>
</tr>
<tr>
<td>0.0656±0.0343±0.0440</td>
<td>LINK</td>
<td>04</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(\pi^+ 2\pi^0)/\Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.65±0.13±0.03</td>
<td>72 ± 16</td>
<td>NAIK</td>
<td>09A</td>
<td>CLEO</td>
</tr>
</tbody>
</table>

Citation: K.A. Olive et al. (Particle Data Group), Chin. Phys. C38, 090001 (2014) (URL: http://pdg.lbl.gov)
\[
\Gamma(2\pi^+ \pi^- \pi^0)/\Gamma(\phi \pi^+) \quad \Gamma_{67}/\Gamma_{34}
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>* * * We do not use the following data for averages, fits, limits, etc. * * *</td>
<td>90</td>
<td>ANJOS</td>
<td>89E</td>
<td>E691 Photoproduction</td>
</tr>
</tbody>
</table>

\[\Gamma(\eta \pi^+)/\Gamma_{\text{total}} \quad \Gamma_{68}/\Gamma\]

Unseen decay modes of the \(\eta\) are included.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1.69 \pm 0.10 \text{ OUR FIT}) Error includes scale factor of 1.2.</td>
<td>1.67 \pm 0.08 \pm 0.06</td>
<td>ONYISI</td>
<td>13</td>
<td>CLEO (e^+ e^-) at 4.17 GeV</td>
</tr>
<tr>
<td>(1.82 \pm 0.14 \pm 0.07 ) 0.8k</td>
<td>ZUPANC</td>
<td>13</td>
<td>BELL (e^+ e^-) at (\Upsilon(4S), \Upsilon(5S))</td>
<td></td>
</tr>
<tr>
<td>* * * We do not use the following data for averages, fits, limits, etc. * * *</td>
<td>1.58 \pm 0.11 \pm 0.18</td>
<td>(1) ALEXANDER</td>
<td>08</td>
<td>CLEO See ONYISI 13</td>
</tr>
</tbody>
</table>

\[\Gamma(\eta \pi^+)/\Gamma(K^+ K^0_S) \quad \Gamma_{68}/\Gamma_{31}\]

Unseen decay modes of the \(\eta\) are included.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1.14 \pm 0.07 \text{ OUR FIT}) Error includes scale factor of 1.2.</td>
<td>(1.236 \pm 0.043 \pm 0.063)</td>
<td>MENDEZ</td>
<td>10</td>
<td>CLEO See ONYISI 13</td>
</tr>
</tbody>
</table>

\[\Gamma(\eta \pi^+)/\Gamma(\phi \pi^+) \quad \Gamma_{68}/\Gamma_{34}\]

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>* * * We do not use the following data for averages, fits, limits, etc. * * *</td>
<td>0.48 \pm 0.03 \pm 0.04</td>
<td>920</td>
<td>JESSOP</td>
<td>98 CLE2 (e^+ e^- \approx \Upsilon(4S))</td>
</tr>
<tr>
<td>0.54 \pm 0.09 \pm 0.06</td>
<td>165</td>
<td>ALEXANDER</td>
<td>92</td>
<td>CLE2 See JESSOP 98</td>
</tr>
</tbody>
</table>

\[\Gamma(\omega \pi^+)/\Gamma_{\text{total}} \quad \Gamma_{69}/\Gamma\]

Unseen decay modes of the \(\omega\) are included.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.24 \pm 0.06 \text{ OUR FIT})</td>
<td>(6 \pm 2.4)</td>
<td>GE</td>
<td>09A</td>
<td>CLEO (e^+ e^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[\Gamma(\omega \pi^+)/\Gamma(\eta \pi^+) \quad \Gamma_{69}/\Gamma_{68}\]

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.14 \pm 0.04 \text{ OUR FIT})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.16 \pm 0.04 \pm 0.03)</td>
<td>BALEST</td>
<td>97</td>
<td>CLE2 (e^+ e^- \approx \Upsilon(4S))</td>
</tr>
</tbody>
</table>

\[\Gamma(3\pi^+ 2\pi^-)/\Gamma(K^+ K^- \pi^+) \quad \Gamma_{70}/\Gamma_{33}\]

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.146 \pm 0.014 \text{ OUR AVERAGE})</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.145 \pm 0.011 \pm 0.010)</td>
<td>671</td>
<td>LINK</td>
<td>03D</td>
<td>FOCS (\gamma A, E_{\gamma} \approx 180 \text{ GeV})</td>
</tr>
<tr>
<td>(0.158 \pm 0.042 \pm 0.031)</td>
<td>37</td>
<td>FRABETTI</td>
<td>97C</td>
<td>E687 (\gamma \text{Be}, E_{\gamma} \approx 200 \text{ GeV})</td>
</tr>
</tbody>
</table>
Unseen decay modes of the $\eta$ are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.9±0.6±0.5</td>
<td>328±22</td>
<td>NAIK 09A</td>
<td>CLEO</td>
<td>$\eta \rightarrow 2\gamma$</td>
</tr>
</tbody>
</table>

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• • • We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.98±0.20±0.39</td>
<td>447</td>
<td>JESSOP 98</td>
<td>CLEO</td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
<tr>
<td>2.86±0.38±0.36</td>
<td>217</td>
<td>AVERY 92</td>
<td>CLEO</td>
<td>See JESSOP 98</td>
</tr>
</tbody>
</table>

Unseen decay modes of the $\omega$ are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.78±0.65±0.25</td>
<td>34±7.9</td>
<td>GE 09A</td>
<td>CLEO</td>
<td>$e^+ e^- \text{ at 4170 MeV}$</td>
</tr>
</tbody>
</table>

Unseen decay modes of the $\omega$ are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.049±0.033</td>
<td>29±8.2</td>
<td>GE 09A</td>
<td>CLEO</td>
<td>$\pi^- \text{ 230 GeV}$</td>
</tr>
</tbody>
</table>

Unseen decay modes of the $\omega$ are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.58±0.45±0.09</td>
<td>29±8.2</td>
<td>GE 09A</td>
<td>CLEO</td>
<td>$e^+ e^- \text{ at 4170 MeV}$</td>
</tr>
</tbody>
</table>

Unseen decay modes of the $\eta'(958)$ are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.94±0.15±0.20</td>
<td>13</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>$e^+ e^- \text{ at 4.17 GeV}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• • • We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.77±0.25±0.30</td>
<td>1</td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
</tbody>
</table>

1 ALEXANDER 08 uses single- and double-tagged events in an overall fit.

Unseen decay modes of the $\eta'(958)$ are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• • • We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.65±0.088±0.139</td>
<td>1436±47</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
</tbody>
</table>
Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.03±0.06±0.07</td>
<td>537</td>
<td>JESSOP 98</td>
<td>CLE2</td>
<td>e⁺e⁻ ≈ Ζ(4S)</td>
</tr>
<tr>
<td>1.20±0.15±0.11</td>
<td>281</td>
<td>ALEXANDER 92</td>
<td>CLE2</td>
<td>See JESSOP 98</td>
</tr>
<tr>
<td>2.5 ± 1.0 ± 1.5</td>
<td>22</td>
<td>ALVAREZ 91</td>
<td>NA14</td>
<td>Photoproduction</td>
</tr>
<tr>
<td>2.5 ± 0.5 ± 0.3</td>
<td>215</td>
<td>ALBRECHT 90D</td>
<td>ARG</td>
<td>e⁺e⁻ ≈ 10.4 GeV</td>
</tr>
</tbody>
</table>

Unseen decay modes of the ω and η are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.13 × 10⁻²</td>
<td>90</td>
<td>GE 09A</td>
<td>CLEO</td>
<td>e⁺e⁻ at 4170 MeV</td>
</tr>
</tbody>
</table>

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.78±0.28±0.30</td>
<td>137</td>
<td>JESSOP 98</td>
<td>CLE2</td>
<td>e⁺e⁻ ≈ Ζ(4S)</td>
</tr>
<tr>
<td>3.44±0.62±0.44</td>
<td>68</td>
<td>AVERY 92</td>
<td>CLE2</td>
<td>See JESSOP 98</td>
</tr>
</tbody>
</table>

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.6±0.5±0.6</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e⁺e⁻ at 4.17 GeV</td>
</tr>
</tbody>
</table>

--- Modes with one or three K’s ---

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2±1.4±0.2</td>
<td>202 ± 70</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>e⁺e⁻ at 4170 MeV</td>
</tr>
<tr>
<td>5.5±1.3±0.7</td>
<td>141 ± 34</td>
<td>ADAMS 07A</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

Unseen decay modes of the resonances are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.5 ± 0.7 ± 0.2</td>
<td>393 ± 33</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>e⁺e⁻ at 4170 MeV</td>
</tr>
<tr>
<td>8.03±0.24±0.19</td>
<td>17.6k±481</td>
<td>WON 09</td>
<td>BELL</td>
<td>e⁺e⁻ at Ζ(4S)</td>
</tr>
<tr>
<td>10.4 ± 2.4 ± 1.4</td>
<td>113 ± 26</td>
<td>LINK 08</td>
<td>FOCS</td>
<td>γA, Ε, γ ≈ 180 GeV</td>
</tr>
<tr>
<td>8.2 ± 0.9 ± 0.2</td>
<td>206 ± 22</td>
<td>ADAMS 07A</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

Unseen decay modes of the η are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.8±2.2±0.6</td>
<td>222 ± 41</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>e⁺e⁻ at 4170 MeV</td>
</tr>
</tbody>
</table>
\( \Gamma(K^+ \eta)/\Gamma(\eta\pi^+) \) \( \Gamma_{84}/\Gamma_{68} \)

\begin{tabular}{llll}

VALUE (units 10^{-2}) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
\multirow{2}{*}{\( \cdot \cdot \cdot \)} We do not use the following data for averages, fits, limits, etc.
8.9\( \pm \)1.5\( \pm \)0.4 & 113 \( \pm \)18 & ADAMS 07A CLEO & See MENDEZ 10 \\
\end{tabular}

\( \Gamma(K^+\omega)/\Gamma_{\text{total}} \)

Unseen decay modes of the \( \omega \) are included.

\begin{tabular}{llll}

VALUE (units 10^{-2}) & CL\% & DOCUMENT ID & TECN & COMMENT \\
\hline
<0.24 & 90 & GE 09A CLEO & e^+e^- at 4170 MeV \\
\end{tabular}

\( \Gamma(K^+\eta'(958))/\Gamma(K^+K_S^0) \) \( \Gamma_{86}/\Gamma_{31} \)

Unseen decay modes of the \( \eta'(958) \) are included.

\begin{tabular}{llll}

VALUE (units 10^{-2}) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
11.8\( \pm \)3.6\( \pm \)0.7 & 56 \( \pm \)17 & MENDEZ 10 CLEO & e^+e^- at 4170 MeV \\
\end{tabular}

\( \Gamma(K^+\eta'(958))/\Gamma(\eta'(958)\pi^+) \) \( \Gamma_{86}/\Gamma_{77} \)

\begin{tabular}{llll}

VALUE (units 10^{-2}) & EVTS & DOCUMENT ID & TECN & COMMENT \\
\hline
\multirow{2}{*}{\( \cdot \cdot \cdot \)} We do not use the following data for averages, fits, limits, etc.
4.2\( \pm \)1.3\( \pm \)0.3 & 28 \( \pm \)9 & ADAMS 07A CLEO & See MENDEZ 10 \\
\end{tabular}

\( \Gamma(K^+\pi^+\pi^-)/\Gamma_{\text{total}} \) \( \Gamma_{87}/\Gamma_{88} \)

\begin{tabular}{llll}

VALUE (units 10^{-2}) & DOCUMENT ID & TECN & COMMENT \\
\hline
0.65 \( \pm \)0.04 OUR FIT & & & \\
0.654\( \pm \)0.033\( \pm \)0.025 & ONYISI 13 CLEO & e^+e^- at 4.17 GeV \\
\cdot \cdot \cdot We do not use the following data for averages, fits, limits, etc. \cdot \cdot \cdot \\
0.69 \( \pm \)0.05 \( \pm \)0.03 & 1 ALEXANDER 08 CLEO & See ONYISI 13 \\
\end{tabular}

\( \Gamma(K^+\rho^0)/\Gamma(K^+\pi^+\pi^-) \) \( \Gamma_{88}/\Gamma_{87} \)

This is the “fit fraction” from the Dalitz-plot analysis.

\begin{tabular}{llll}

VALUE & DOCUMENT ID & TECN & COMMENT \\
\hline
0.3883\( \pm \)0.0531\( \pm \)0.0261 & LINK 04F FOCS & Dalitz fit, 567 evts \\
\end{tabular}

\( \Gamma(K^+(1450)^0, \rho^0 \rightarrow \pi^+\pi^-)/\Gamma(K^+\pi^+\pi^-) \) \( \Gamma_{89}/\Gamma_{87} \)

This is the “fit fraction” from the Dalitz-plot analysis.

\begin{tabular}{llll}

VALUE & DOCUMENT ID & TECN & COMMENT \\
\hline
0.1062\( \pm \)0.0351\( \pm \)0.0104 & LINK 04F FOCS & Dalitz fit, 567 evts \\
\end{tabular}

\( \Gamma(K^*(892)^0, K^*0 \rightarrow K^+\pi^-)/\Gamma(K^+\pi^+\pi^-) \) \( \Gamma_{90}/\Gamma_{87} \)

This is the “fit fraction” from the Dalitz-plot analysis.

\begin{tabular}{llll}

VALUE & DOCUMENT ID & TECN & COMMENT \\
\hline
0.2164\( \pm \)0.0321\( \pm \)0.0114 & LINK 04F FOCS & Dalitz fit, 567 evts \\
\end{tabular}
\[ \Gamma(K^*(1410)^0 \pi^+, K^*0 \to K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-) \quad \Gamma_{91/\Gamma_{87}} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1882 ± 0.0403 ± 0.0122</td>
<td>LINK</td>
<td>04F FOCS</td>
<td>Dalitz fit, 567 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^*(1430)^0 \pi^+, K^*0 \to K^+ \pi^-)/\Gamma(K^+ \pi^+ \pi^-) \quad \Gamma_{92/\Gamma_{87}} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0765 ± 0.0500 ± 0.0170</td>
<td>LINK</td>
<td>04F FOCS</td>
<td>Dalitz fit, 567 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ \pi^+ \pi^- \text{ nonresonant})/\Gamma(K^+ \pi^+ \pi^-) \quad \Gamma_{93/\Gamma_{87}} \]

This is the “fit fraction” from the Dalitz-plot analysis.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1588 ± 0.0492 ± 0.0153</td>
<td>LINK</td>
<td>04F FOCS</td>
<td>Dalitz fit, 567 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^0 \pi^+ \pi^0)/\Gamma_{\text{total}} \quad \Gamma_{94/\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00 ± 0.18 ± 0.04</td>
<td>44 ± 8</td>
<td>NAIK</td>
<td>09A CLEO</td>
<td>e^+ e^- at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^0_S 2\pi^+ \pi^-)/\Gamma(K^0_S K^- 2\pi^+) \quad \Gamma_{95/\Gamma_{47}} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.18 ± 0.04 ± 0.05</td>
<td>LINK</td>
<td>08 FOCS</td>
<td>γ A, ( E_\gamma \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ \omega \pi^0)/\Gamma_{\text{total}} \quad \Gamma_{96/\Gamma} \]

Unseen decay modes of the \( \omega \) are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.82</td>
<td>90</td>
<td>GE</td>
<td>09A CLEO</td>
<td>e^+ e^- at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ \omega \pi^+ \pi^-)/\Gamma_{\text{total}} \quad \Gamma_{97/\Gamma} \]

Unseen decay modes of the \( \omega \) are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.54</td>
<td>90</td>
<td>GE</td>
<td>09A CLEO</td>
<td>e^+ e^- at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+ \omega \eta)/\Gamma_{\text{total}} \quad \Gamma_{98/\Gamma} \]

Unseen decay modes of the \( \omega \) and \( \eta \) are included.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.79</td>
<td>90</td>
<td>GE</td>
<td>09A CLEO</td>
<td>e^+ e^- at 4170 MeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(2K^+ K^-)/\Gamma(K^+ K^- \pi^+) \quad \Gamma_{99/\Gamma_{33}} \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-3})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 ± 0.3 ± 0.2</td>
<td>748 ± 60</td>
<td>DEL-AMO-SA..11G BABR</td>
<td>e^+ e^- \approx \Upsilon(4S)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*** We do not use the following data for averages, fits, limits, etc. ***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUE</th>
<th></th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.95 ± 2.12 ± 2.24 ± 2.31</td>
<td>31</td>
<td>LINK</td>
<td>02I FOCS</td>
<td>γ A, ( \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\phi K^+, \phi \to K^+ K^-)/\Gamma(2K^+ K^-) \quad \Gamma_{100/\Gamma_{99}} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.41 ± 0.08 ± 0.03</td>
<td>DEL-AMO-SA..11G BABR</td>
<td>e^+ e^- \approx \Upsilon(4S)</td>
<td></td>
</tr>
</tbody>
</table>
Doubly Cabibbo-suppressed modes

$$\Gamma(2K^+ \pi^-)/\Gamma(K^+ K^- \pi^+)$$  \hspace{1cm} \Gamma_{101}/\Gamma_{33}

<table>
<thead>
<tr>
<th>VALUE (units $10^{-3}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.33 ± 0.23 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 ± 0.3 ± 0.2</td>
<td>356 ± 52</td>
<td>DEL-AMO-SA..11g BABR</td>
<td>e$^+e^-$ ≈ $\Upsilon$(45)</td>
<td></td>
</tr>
<tr>
<td>2.29 ± 0.28±0.12</td>
<td>281 ± 34</td>
<td>KO 09 BELL</td>
<td>e$^+e^-$ at $\Upsilon$(45)</td>
<td></td>
</tr>
<tr>
<td>5.2 ± 1.7 ± 1.1</td>
<td>27 ± 9</td>
<td>LINK 05k FOCS</td>
<td>&lt;0.78%, CL = 90%</td>
<td></td>
</tr>
</tbody>
</table>

$$\Gamma(p K^0, K^0 \rightarrow K^+ \pi^-)/\Gamma(2K^+ \pi^-)$$  \hspace{1cm} \Gamma_{102}/\Gamma_{101}

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.47 ± 0.22 ± 0.15</td>
<td>DEL-AMO-SA..11g BABR</td>
<td>e$^+e^-$ ≈ $\Upsilon$(45)</td>
<td></td>
</tr>
</tbody>
</table>

Baryon-antibaryon mode

$$\Gamma(p \eta)/\Gamma_{\text{total}}$$  \hspace{1cm} \Gamma_{103}/\Gamma

This is the only baryonic mode allowed kinematically.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-3}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.30 ± 0.36±0.12</td>
<td>13.0 ± 3.6</td>
<td>ATHAR 08 CLEO</td>
<td>e$^+e^-$, $E_{\text{cm}}$ ≈ 4170 MeV</td>
<td></td>
</tr>
</tbody>
</table>

Rare or forbidden modes

$$\Gamma(p^+ e^+ e^-)/\Gamma_{\text{total}}$$  \hspace{1cm} \Gamma_{104}/\Gamma

This mode is not a useful test for a $\Delta C$=1 weak neutral current because both quarks must change flavor in this decay.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;13 $\times 10^{-6}$</td>
<td>90</td>
<td>LEES 11G BABR</td>
<td>e$^+e^-$ ≈ $\Upsilon$(45)</td>
<td></td>
</tr>
<tr>
<td>&lt; 2.2 $\times 10^{-5}$</td>
<td>90</td>
<td>RUBIN 10 CLEO</td>
<td>e$^+e^-$ at 4170 MeV</td>
<td></td>
</tr>
<tr>
<td>&lt; 27 $\times 10^{-5}$</td>
<td>90</td>
<td>AITALA 99G E791</td>
<td>$\pi^-N$ 500 GeV</td>
<td></td>
</tr>
</tbody>
</table>

$^1$This RUBIN 10 limit is for the $e^+e^-$ mass in the continuum away from the $\phi(1020)$. See the next data block.

$$\Gamma(p^+ \phi, \phi \rightarrow e^+ e^-)/\Gamma_{\text{total}}$$  \hspace{1cm} \Gamma_{105}/\Gamma

This is not a test for the $\Delta C = 1$ weak neutral current, but leads to the $p^+ e^+ e^-$ final state.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6.8±1) $\times 10^{-6}$</td>
<td>3</td>
<td>RUBIN 10 CLEO</td>
<td>e$^+e^-$ at 4170 MeV</td>
<td></td>
</tr>
</tbody>
</table>

$$\Gamma(p^+ \mu^+ \mu^-)/\Gamma_{\text{total}}$$  \hspace{1cm} \Gamma_{106}/\Gamma

This mode is not a useful test for a $\Delta C$=1 weak neutral current because both quarks must change flavor in this decay.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4.1 $\times 10^{-7}$</td>
<td>90</td>
<td>AAIJ 13AF LHCb</td>
<td>$pp$ at 7 TeV</td>
<td></td>
</tr>
<tr>
<td>&lt;4.3 $\times 10^{-5}$</td>
<td>90</td>
<td>LEES 11G BABR</td>
<td>e$^+e^-$ ≈ $\Upsilon$(45)</td>
<td></td>
</tr>
<tr>
<td>&lt;2.6 $\times 10^{-5}$</td>
<td>90</td>
<td>LINK 03F FOCS</td>
<td>$\gamma A, \bar{E}_\gamma$≈ 180 GeV</td>
<td></td>
</tr>
<tr>
<td>&lt;1.4 $\times 10^{-4}$</td>
<td>90</td>
<td>AITALA 99G E791</td>
<td>$\pi^-N$ 500 GeV</td>
<td></td>
</tr>
<tr>
<td>&lt;4.3 $\times 10^{-4}$</td>
<td>90</td>
<td>KODAMA 95 E653</td>
<td>$\pi^-$ emulsion 600 GeV</td>
<td></td>
</tr>
</tbody>
</table>
\( \Gamma(K^+ e^+ e^-)/\Gamma_{\text{total}} \)

A test for the \( \Delta C=1 \) weak neutral current. Allowed by higher-order electroweak interactions.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;3.7 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
<tr>
<td>(&lt;5.2 \times 10^{-5})</td>
<td>90</td>
<td>RUBIN</td>
<td>10</td>
<td>CLEO ( e^+ e^- ) at 4170 MeV</td>
</tr>
<tr>
<td>(&lt;1.6 \times 10^{-3})</td>
<td>90</td>
<td>AITALA</td>
<td>99G</td>
<td>E791 ( \pi^- N 500 \text{ GeV} )</td>
</tr>
</tbody>
</table>

\( \Gamma(K^+ \mu^+ \mu^-)/\Gamma_{\text{total}} \)

A test for the \( \Delta C=1 \) weak neutral current. Allowed by higher-order electroweak interactions.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;21 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
<tr>
<td>(&lt;3.6 \times 10^{-5})</td>
<td>90</td>
<td>LINK</td>
<td>03F</td>
<td>FOCS ( \gamma, \mathcal{E}_\gamma \approx 180 \text{ GeV} )</td>
</tr>
<tr>
<td>(&lt;1.4 \times 10^{-4})</td>
<td>90</td>
<td>AITALA</td>
<td>99G</td>
<td>E791 ( \pi^- N 500 \text{ GeV} )</td>
</tr>
<tr>
<td>(&lt;5.9 \times 10^{-4})</td>
<td>90</td>
<td>KODAMA</td>
<td>95</td>
<td>E653 ( \pi^- \text{ emulsion 600 GeV} )</td>
</tr>
</tbody>
</table>

\( \Gamma(K^+(892)^+ \mu^+ \mu^-)/\Gamma_{\text{total}} \)

A test for the \( \Delta C=1 \) weak neutral current. Allowed by higher-order electroweak interactions.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;1.4 \times 10^{-3})</td>
<td>90</td>
<td>KODAMA</td>
<td>95</td>
<td>E653 ( \pi^- \text{ emulsion 600 GeV} )</td>
</tr>
</tbody>
</table>

\( \Gamma(\pi^+ e^+ e^-)/\Gamma_{\text{total}} \)

A test of lepton-family-number conservation.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;12 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
</tbody>
</table>

\( \Gamma(\pi^+ e^- \mu^+)/\Gamma_{\text{total}} \)

A test of lepton-family-number conservation.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;20 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
</tbody>
</table>

\( \Gamma(K^+ e^+ \mu^-)/\Gamma_{\text{total}} \)

A test of lepton-family-number conservation.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;14 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
</tbody>
</table>

\( \Gamma(K^+ e^- \mu^+)/\Gamma_{\text{total}} \)

A test of lepton-family-number conservation.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;9.7 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
</tbody>
</table>

\( \Gamma(\pi^- 2e^+)/\Gamma_{\text{total}} \)

A test of lepton-number conservation.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(&lt;4.1 \times 10^{-6})</td>
<td>90</td>
<td>LEES</td>
<td>11G</td>
<td>BABR ( e^+ e^- \approx \gamma(4S) )</td>
</tr>
<tr>
<td>(&lt;1.8 \times 10^{-5})</td>
<td>90</td>
<td>RUBIN</td>
<td>10</td>
<td>CLEO ( e^+ e^- ) at 4170 MeV</td>
</tr>
<tr>
<td>(&lt;69 \times 10^{-5})</td>
<td>90</td>
<td>AITALA</td>
<td>99G</td>
<td>E791 ( \pi^- N 500 \text{ GeV} )</td>
</tr>
</tbody>
</table>

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\begin{align*}
\Gamma(\pi^- 2\mu^+)/\Gamma_{\text{total}} &\quad \text{A test of lepton-number conservation.} \\
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
<1.2 \times 10^{-7} & 90 & \text{AAIJ} & 13AF & \text{LHC} \ p p \ at \ 7 \, \text{TeV} \\
<1.4 \times 10^{-5} & 90 & \text{LEES} & 11G & \text{BABR} \ e^+ e^- \approx \gamma(4S) \\
<2.9 \times 10^{-5} & 90 & \text{LINK} & 03F & \text{FOCS} \ \gamma, E_\gamma \approx 180 \, \text{GeV} \\
<8.2 \times 10^{-5} & 90 & \text{AITALA} & 99G & \text{E791} \ \pi^- N \ 500 \, \text{GeV} \\
<4.3 \times 10^{-4} & 90 & \text{KODAMA} & 95 & \text{E653} \ \pi^- \ emulsion \ 600 \, \text{GeV}
\end{array}
\end{align*}

\begin{align*}
\Gamma(\pi^- e^+ \mu^+)/\Gamma_{\text{total}} &\quad \text{A test of lepton-number conservation.} \\
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
<8.4 \times 10^{-6} & 90 & \text{LEES} & 11G & \text{BABR} \ e^+ e^- \approx \gamma(4S) \\
<7.3 \times 10^{-4} & 90 & \text{AITALA} & 99G & \text{E791} \ \pi^- N \ 500 \, \text{GeV}
\end{array}
\end{align*}

\begin{align*}
\Gamma(K^- 2e^+)/\Gamma_{\text{total}} &\quad \text{A test of lepton-number conservation.} \\
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
<5.2 \times 10^{-6} & 90 & \text{LEES} & 11G & \text{BABR} \ e^+ e^- \approx \gamma(4S) \\
<1.7 \times 10^{-5} & 90 & \text{RUBIN} & 10 & \text{CLEO} \ \pi^+ e^- \ at \ 4170 \, \text{MeV} \\
<63 \times 10^{-5} & 90 & \text{AITALA} & 99G & \text{E791} \ \pi^- N \ 500 \, \text{GeV}
\end{array}
\end{align*}

\begin{align*}
\Gamma(K^- 2\mu^+)/\Gamma_{\text{total}} &\quad \text{A test of lepton-number conservation.} \\
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
<1.3 \times 10^{-5} & 90 & \text{LEES} & 11G & \text{BABR} \ e^+ e^- \approx \gamma(4S) \\
<1.3 \times 10^{-5} & 90 & \text{LINK} & 03F & \text{FOCS} \ \gamma, E_\gamma \approx 180 \, \text{GeV} \\
<1.8 \times 10^{-4} & 90 & \text{AITALA} & 99G & \text{E791} \ \pi^- N \ 500 \, \text{GeV} \\
<5.9 \times 10^{-4} & 90 & \text{KODAMA} & 95 & \text{E653} \ \pi^- \ emulsion \ 600 \, \text{GeV}
\end{array}
\end{align*}

\begin{align*}
\Gamma(K^- e^+ \mu^+)/\Gamma_{\text{total}} &\quad \text{A test of lepton-number conservation.} \\
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
<6.1 \times 10^{-6} & 90 & \text{LEES} & 11G & \text{BABR} \ e^+ e^- \approx \gamma(4S) \\
<6.8 \times 10^{-4} & 90 & \text{AITALA} & 99G & \text{E791} \ \pi^- N \ 500 \, \text{GeV}
\end{array}
\end{align*}

\begin{align*}
\Gamma(K^*(892)^- 2\mu^+)/\Gamma_{\text{total}} &\quad \text{A test of lepton-number conservation.} \\
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
<1.4 \times 10^{-3} & 90 & \text{KODAMA} & 95 & \text{E653} \ \pi^- \ emulsion \ 600 \, \text{GeV}
\end{array}
\end{align*}
\[D_s^+ - D_s^- \text{ CP-VIOLATING DECAY-RATEASYMMETRIES}\]

This is the difference of the \(D_s^+\) and \(D_s^-\) partial widths divided by the sum of the widths.

\[A_{CP}(\mu^\pm \nu) \text{ in } D_s^+ \rightarrow \mu^+ \nu, D_s^- \rightarrow \mu^- \nu\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.8\pm 0.1</td>
<td>ALEXANDER 09</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4170 MeV</td>
</tr>
</tbody>
</table>

\[A_{CP}(K^\pm K_S^0) \text{ in } D_s^\pm \rightarrow K^\pm K_S^0\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.08\pm 0.26 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0.05 \pm 0.23 \pm 0.24</td>
<td>LEES 13E</td>
<td>BABR</td>
<td>e(^+) e(^-) at (\gamma(4S))</td>
</tr>
<tr>
<td>2.6 \pm 1.5 \pm 0.6</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4.17 GeV</td>
</tr>
<tr>
<td>0.12 \pm 0.36 \pm 0.22</td>
<td>KO 10</td>
<td>BELL</td>
<td>e(^+) e(^-) \approx (\gamma(4S))</td>
</tr>
</tbody>
</table>

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

4.7 \pm 1.8 \pm 0.9 4.0k MENDEZ 10 CLEO See ONYISI 13

4.9 \pm 2.1 \pm 0.9 ALEXANDER 08 CLEO See MENDEZ 10

\* \* \* LEES 13E finds that after subtracting the contribution due to \(K^0 - \bar{K}^0\) mixing, the \(CP\) asymmetry is \((+0.28 \pm 0.23 \pm 0.24)\)%.

\[A_{CP}(K^+ K^- \pi^\pm) \text{ in } D_s^\pm \rightarrow K^+ K^- \pi^\pm\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.5 \pm 0.8 \pm 0.4</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4.17 GeV</td>
</tr>
</tbody>
</table>

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

0.3 \pm 1.1 \pm 0.8 ALEXANDER 08 CLEO See ONYISI 13

\[A_{CP}(K^\pm K_S^0 \pi^0) \text{ in } D_s^\pm \rightarrow K^\pm K_S^0 \pi^0\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.6 \pm 6.0 \pm 1.1</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4.17 GeV</td>
</tr>
</tbody>
</table>

\[A_{CP}(2K_S^0 \pi^\pm) \text{ in } D_s^\pm \rightarrow 2K_S^0 \pi^\pm\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 \pm 5.2 \pm 0.6</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4.17 GeV</td>
</tr>
</tbody>
</table>

\[A_{CP}(K^+ K^- \pi^+ \pi^0) \text{ in } D_s^\pm \rightarrow K^+ K^- \pi^+ \pi^0\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 \pm 2.7 \pm 1.2</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4.17 GeV</td>
</tr>
</tbody>
</table>

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

-5.9 \pm 4.2 \pm 1.2 ALEXANDER 08 CLEO See ONYISI 13

\[A_{CP}(K^\pm K_S^0 \pi^+ \pi^-) \text{ in } D_s^\pm \rightarrow K^\pm K_S^0 \pi^+ \pi^-\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5.7 \pm 5.3 \pm 0.9</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>e(^+) e(^-) at 4.17 GeV</td>
</tr>
</tbody>
</table>
\( A_{CP}(K_S^0 K^{\mp} 2\pi^\pm) \) in \( D_s^+ \rightarrow K_S^0 K^{\mp} 2\pi^\pm \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1±2.7±0.9</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
<tr>
<td>( \cdot \cdot \cdot ) We do not use the following data for averages, fits, limits, etc. ( \cdot \cdot \cdot )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7±3.6±1.1</td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
</tbody>
</table>

\( A_{CP}(\pi^+ \pi^- \pi^\pm) \) in \( D_s^\pm \rightarrow \pi^+ \pi^- \pi^\pm \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7±3.0±0.6</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
<tr>
<td>( \cdot \cdot \cdot ) We do not use the following data for averages, fits, limits, etc. ( \cdot \cdot \cdot )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0±4.6±0.7</td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
</tbody>
</table>

\( A_{CP}(\pi^\pm \eta) \) in \( D_s^- \rightarrow \pi^\pm \eta \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 1.1\pm3.0\pm0.8 )</td>
<td></td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
<tr>
<td>( \cdot \cdot \cdot ) We do not use the following data for averages, fits, limits, etc. ( \cdot \cdot \cdot )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( -4.6\pm2.9\pm0.3 )</td>
<td>2.5k</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
<tr>
<td>( -8.2\pm5.2\pm0.8 )</td>
<td>1.4k</td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

\( A_{CP}(\pi^\pm \eta') \) in \( D_s^- \rightarrow \pi^\pm \eta' \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( -2.2\pm2.2\pm0.6 )</td>
<td></td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
<tr>
<td>( \cdot \cdot \cdot ) We do not use the following data for averages, fits, limits, etc. ( \cdot \cdot \cdot )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( -6.1\pm3.0\pm0.3 )</td>
<td>1.4k</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
<tr>
<td>( -5.5\pm3.7\pm1.2 )</td>
<td></td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

\( A_{CP}(\eta \pi^\pm \pi^0) \) in \( D_s^- \rightarrow \eta \pi^\pm \pi^0 \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( -0.5\pm3.9\pm2.0 )</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
</tbody>
</table>

\( A_{CP}(\eta' \pi^\pm \pi^0) \) in \( D_s^- \rightarrow \eta' \pi^\pm \pi^0 \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( -0.4\pm7.4\pm1.9 )</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4.17 GeV</td>
</tr>
</tbody>
</table>

\( A_{CP}(K^\pm \pi^0) \) in \( D_s^- \rightarrow K^\pm \pi^0 \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( -26.6\pm23.8\pm0.9 )</td>
<td>202 ± 70</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>( e^+ e^- ) at 4170 MeV</td>
</tr>
<tr>
<td>( \cdot \cdot \cdot ) We do not use the following data for averages, fits, limits, etc. ( \cdot \cdot \cdot )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 ± 29</td>
<td>ADAMS 07A</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
<td></td>
</tr>
</tbody>
</table>
**$A_{CP}(K^0_S\pi^\pm)$ in $D^\pm_s \rightarrow K^0_S\pi^\pm$**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 ± 1.0</td>
<td>LEES 13E</td>
<td>BABR</td>
<td>e^+ e^- at $\Upsilon$(4S)</td>
<td></td>
</tr>
<tr>
<td>0.61 ± 0.83 ± 0.14</td>
<td>25.6k</td>
<td>AAIJ 13W</td>
<td>LHCB</td>
<td>$pp$ at 7 TeV</td>
</tr>
<tr>
<td>0.6 ± 2.0 ± 0.3</td>
<td>14k</td>
<td>1 LEES 13E</td>
<td>BELL</td>
<td>$e^+ e^- \approx \Upsilon$(4S)</td>
</tr>
<tr>
<td>5.45 ± 2.50 ± 0.33</td>
<td>KO 10</td>
<td>LEES 13E</td>
<td>BELL</td>
<td>$e^+ e^- \approx \Upsilon$(4S)</td>
</tr>
<tr>
<td>16.3 ± 7.3 ± 0.3</td>
<td>393 ± 33</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>$e^+ e^- \rightarrow 4170$ MeV</td>
</tr>
</tbody>
</table>

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

1 LEES 13E finds that after subtracting the contribution due to $K^0 - \bar{K}^0$ mixing, the CP asymmetry is $(+0.3 \pm 2.0 \pm 0.3)\%$.

**$A_{CP}(K^\pm \pi^+ \pi^-)$ in $D^\pm_s \rightarrow K^\pm \pi^+ \pi^-$**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 ± 4.8 ± 0.6</td>
<td>ONYISI 13</td>
<td>CLEO</td>
<td>$e^+ e^- \rightarrow 4170$ MeV</td>
</tr>
<tr>
<td>11.2 ± 7.0 ± 0.9</td>
<td>ALEXANDER 08</td>
<td>CLEO</td>
<td>See ONYISI 13</td>
</tr>
</tbody>
</table>

**$A_{CP}(K^\pm \eta)$ in $D^\pm_s \rightarrow K^\pm \eta$**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.3 ± 15.2 ± 0.9</td>
<td>222 ± 41</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>$e^+ e^- \rightarrow 4170$ MeV</td>
</tr>
<tr>
<td>−20 ± 18</td>
<td>ADAMS 07A</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
<td></td>
</tr>
</tbody>
</table>

We do not use the following data for averages, fits, limits, etc.
\( A_{CP}(K^\pm \eta'(958)) \) in \( D_s^\pm \rightarrow K^\pm \eta'(958) \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0 ± 18.9 ± 0.9</td>
<td>56 ± 17</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>( e^+e^- ) at 4170 MeV</td>
</tr>
<tr>
<td>−17 ± 37</td>
<td></td>
<td>ADAMS 07A</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

\( D_s^- - D_s^- \) T-VIOLATING DECAY-RATE ASYMMETRIES

\( A_{T_{viol}}(K_s^0 K^\pm \pi^\pm \pi^-) \) in \( D_s^\pm \rightarrow K_s^0 K^\pm \pi^\pm \pi^- \)

\( C_T \equiv \bar{p}_{K^+} \cdot (\bar{p}_{\pi^+} \times \bar{p}_{\pi^-}) \) is a parity-odd correlation of the \( K^+, \pi^+, \) and \( \pi^- \) momenta for the \( D_s^+ \). \( \mathcal{C}_T \equiv \bar{p}_{K^-} \cdot (\bar{p}_{\pi^-} \times \bar{p}_{\pi^+}) \) is the corresponding quantity for the \( D_s^- \). Then

\[
A_T \equiv \left[ (C_T > 0) - (C_T < 0) \right] / \left[ (C_T > 0) + (C_T < 0) \right],
\]

\[
\mathcal{A}_T \equiv \left[ (\mathcal{C}_T > 0) - (\mathcal{C}_T < 0) \right] / \left[ (\mathcal{C}_T > 0) + (\mathcal{C}_T < 0) \right],
\]

and

\[
A_{T_{viol}} \equiv \frac{1}{2} \left( A_T - \mathcal{A}_T \right).
\]

C\( _T \) and \( \mathcal{C}_T \) are commonly referred to as \( T \)-odd moments, because they are odd under \( T \) reversal. However, the \( T \)-conjugate process \( K_s^0 K^\pm \pi^\pm \pi^- \rightarrow D_s^\pm \) is not accessible, while the \( P \)-conjugate process is.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-3})</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−13.6 ± 7.7 ± 3.4</td>
<td>29.8 ± 0.3k</td>
<td>LEES 11E</td>
<td>BABR</td>
<td>( e^+e^- \approx \Upsilon(4S) )</td>
</tr>
<tr>
<td>−36 ± 67 ± 23</td>
<td>508 ± 34</td>
<td>LINK 05E</td>
<td>FOCS</td>
<td>( \gamma A, \mathcal{E}_\gamma \approx 180 \text{ GeV} )</td>
</tr>
</tbody>
</table>

\( D_s^+ \rightarrow \phi \ell^+ \nu_\ell \) FORM FACTORS

\( r_2 \equiv A_2(0)/A_1(0) \) in \( D_s^+ \rightarrow \phi \ell^+ \nu_\ell \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.84 ± 0.11</td>
<td>OUR AVERAGE</td>
<td>Error includes scale factor of 2.4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.816 ± 0.036 ± 0.030</td>
<td>25 ± 0.5k</td>
<td>AUBERT 08AN</td>
<td>BABR</td>
<td>( \phi e^+ \nu_e )</td>
</tr>
<tr>
<td>0.713 ± 0.202 ± 0.284</td>
<td>793</td>
<td>LINK 04C</td>
<td>FOCS</td>
<td>( \phi \mu^+ \nu_\mu )</td>
</tr>
<tr>
<td>1.57 ± 0.25 ± 0.19</td>
<td>271</td>
<td>AITALA 99D</td>
<td>E791</td>
<td>( \phi e^+ \nu_e, \phi \mu^+ \nu_\mu )</td>
</tr>
<tr>
<td>1.4 ± 0.5 ± 0.3</td>
<td>308</td>
<td>AVERY 94B</td>
<td>CLE2</td>
<td>( \phi e^+ \nu_e )</td>
</tr>
<tr>
<td>1.1 ± 0.8 ± 0.1</td>
<td>90</td>
<td>FRABETTI 94F</td>
<td>E687</td>
<td>( \phi \mu^+ \nu_\mu )</td>
</tr>
<tr>
<td>2.1 ± 0.6 ± 0.2</td>
<td>19</td>
<td>KODAMA 93</td>
<td>E653</td>
<td>( \phi \mu^+ \nu_\mu )</td>
</tr>
</tbody>
</table>

To compare with previous measurements, this AUBERT 08AN value is from a fit that fixes the pole masses at \( m_A = 2.5 \text{ GeV}/c^2 \) and \( m_V = 2.1 \text{ GeV}/c^2 \). A simultaneous fit to \( r_2, r_v \) (a significant s-wave contribution) and \( m_A \), gives \( r_2 = 0.763 \pm 0.071 \pm 0.065 \).

\( r_v \equiv V(0)/A_1(0) \) in \( D_s^+ \rightarrow \phi \ell^+ \nu_\ell \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.80 ± 0.08</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.807 ± 0.046 ± 0.065</td>
<td>25 ± 0.5k</td>
<td>AUBERT 08AN</td>
<td>BABR</td>
<td>( \phi e^+ \nu_e )</td>
</tr>
<tr>
<td>1.549 ± 0.250 ± 0.148</td>
<td>793</td>
<td>LINK 04C</td>
<td>FOCS</td>
<td>( \phi \mu^+ \nu_\mu )</td>
</tr>
<tr>
<td>2.27 ± 0.35 ± 0.22</td>
<td>271</td>
<td>AITALA 99D</td>
<td>E791</td>
<td>( \phi e^+ \nu_e, \phi \mu^+ \nu_\mu )</td>
</tr>
<tr>
<td>Value</td>
<td>EVTS</td>
<td>Document ID</td>
<td>TECN</td>
<td>Comment</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>-------------</td>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>0.9 ±0.6 ±0.3</td>
<td>308</td>
<td>AVERY 94B</td>
<td>CLE2</td>
<td>φe⁺νe</td>
</tr>
<tr>
<td>1.8 ±0.9 ±0.2</td>
<td>90</td>
<td>FRABETTI 94F</td>
<td>E687</td>
<td>φµ⁺νµ</td>
</tr>
<tr>
<td>2.3 ±1.1 ±0.9</td>
<td>19</td>
<td>KODAMA 93</td>
<td>E653</td>
<td>φµ⁺νµ</td>
</tr>
</tbody>
</table>

1 To compare with previous measurements, this AUBERT 08AN value is from a fit that fixes the pole masses at \( m_A = 2.5 \text{ GeV}/c^2 \) and \( m_V = 2.1 \text{ GeV}/c^2 \). A simultaneous fit to \( r_ν \), \( r_ν \) (a significant s-wave contribution) and \( m_A \), gives \( r_ν = 1.849 ± 0.060 ± 0.095 \).

\[ \Gamma_L/\Gamma_T \text{ in } D_s^{±} \rightarrow φ ℓ^+ν_ℓ \]

<table>
<thead>
<tr>
<th>Value</th>
<th>EVTS</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.72±0.18</td>
<td>OUR AVERAGE</td>
<td>0.72±0.18</td>
<td>OUR AVERAGE</td>
<td>0.72±0.18</td>
</tr>
</tbody>
</table>

1 FRABETTI 94F and KODAMA 93 evaluate \( \Gamma_L/\Gamma_T \) for a lepton mass of zero.

### \( D_s^{±} \) References

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
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