\[ I(J^P) = \frac{1}{2}(0^-) \]

**D^0 MASS**

The fit includes \( D^\pm, D^0, D^+_s, D^+_s, D^0, D^+_s, D^+_1(2420)^0, D^+_2(2460)^0, \)

and \( D^+_3(2536)^\pm \) mass and mass difference measurements.

Given the recent addition of much more precise measurements, we have omitted all those masses published up through 1990. See any Review before 2015 for those earlier results.

<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>1864.83 ± 0.05</td>
<td>OUR FIT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1864.84 ± 0.05</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1864.845 ± 0.025 ± 0.057</td>
<td>63k</td>
<td>1 TOMARADZE 14</td>
<td></td>
<td>( D^0 \rightarrow K^- 2\pi^+ \pi^- )</td>
</tr>
<tr>
<td>1864.75 ± 0.15 ± 0.11</td>
<td></td>
<td>AAIJ 13</td>
<td>13V LHC</td>
<td>( D^0 \rightarrow K^+ 2K^- \pi^+ )</td>
</tr>
<tr>
<td>1864.841 ± 0.048 ± 0.063</td>
<td>4.3k</td>
<td>3 LEES 13</td>
<td>13S BABR</td>
<td>( e^+ e^- \rightarrow \Upsilon(4S) )</td>
</tr>
<tr>
<td>1865.30 ± 0.33 ± 0.23</td>
<td>0.1k</td>
<td>2 ANASHIN 10</td>
<td>10A KEDR</td>
<td>( e^+ e^- \rightarrow \psi(3770) )</td>
</tr>
<tr>
<td>1864.847 ± 0.150 ± 0.095</td>
<td>0.3k</td>
<td>4 CAVLFIELD 07</td>
<td>07 CLEO</td>
<td>( D^0 \rightarrow K^0_S \phi )</td>
</tr>
</tbody>
</table>

1 Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration. The largest source of error in the TOMARADZE 14 value is from the uncertainties in the \( K^- \) and \( K^0_S \) masses. The systematic error given above is the addition in quadrature of \( ±0.022 ± 0.053 \) MeV, where the second error is from those mass uncertainties.

2 The largest source of error in the LEES 13S value is from the uncertainty of the \( K^+ \) mass. The quoted systematic error is in fact \( ±0.043 + 3 (m_{K^+} - 493.677) \), in MeV.

\[ m_{D^\pm} - m_{D^0} \]

The fit includes \( D^\pm, D^0, D^+_s, D^+_s, D^0, D^+_s, D^+_1(2420)^0, D^+_2(2460)^0, \)

and \( D^+_3(2536)^\pm \) mass and mass difference measurements.

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75 ± 0.08</td>
<td>OUR FIT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.76 ± 0.12 ± 0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AAIJ 13</td>
<td>13V LHC</td>
<td>( D^+ \rightarrow K^+ K^- \pi^+ )</td>
</tr>
</tbody>
</table>

**D^0 MEAN LIFE**

Measurements with an error > 10 \times 10^{-15} \) s have been omitted from the average.

<table>
<thead>
<tr>
<th>VALUE (10^{-15} s)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>409.6 ± 1.1 ± 1.5</td>
<td>210k</td>
<td>LINK 02F</td>
<td></td>
<td>( \gamma ) nucleus, ( \approx 180 ) GeV</td>
</tr>
<tr>
<td>409.7 ± 6.0 ± 4.3</td>
<td>10k</td>
<td>KUSHNIR... 01</td>
<td>SELX</td>
<td>( K^- \pi^+, K^- \pi^+ \pi^+ \pi^- )</td>
</tr>
<tr>
<td>413 ± 3 ± 4</td>
<td>35k</td>
<td>AITALA 99E</td>
<td>E791</td>
<td>( K^- \pi^+ )</td>
</tr>
<tr>
<td>408.5 ± 4.1 ± 3.5</td>
<td>25k</td>
<td>BONVICINI 99</td>
<td>CLE2</td>
<td>( e^+ e^- \approx \Upsilon(4S) )</td>
</tr>
<tr>
<td>413 ± 4 ± 3</td>
<td>16k</td>
<td>FRABETTI 94D</td>
<td>E687</td>
<td>( K^- \pi^+, K^- \pi^+ \pi^+ \pi^- )</td>
</tr>
</tbody>
</table>

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\[ |m_{D_1^0} - m_{D_2^0}| = \frac{\Gamma}{x} \]

The $D^0_1$ and $D^0_2$ are the mass eigenstates of the $D^0$ meson, as described in the note on “$D^0$-$\bar{D}^0$ Mixing,” above. The experiments usually present \( x \equiv \Delta m/\Gamma \). Then \( \Delta m = x \Gamma = \frac{x}{\Gamma}. \)

“OUR EVALUATION” comes from CPV allowing averages provided by the Heavy Flavor Averaging Group, see the note on “$D^0$-$\bar{D}^0$ Mixing.”

\[
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
(10^{10} \ h \ s^{-1}) & & & \\
\hline
0.95^{+0.41}_{-0.44} & & & \\
0.8 \pm 0.7 & \text{OUR AVERAGE} & & \\
\hline
2.10 \pm 1.29 & 1 & AAIJ & 16V & LHCb \ \ pp \ at \ 7 \ TeV \\
3.7 \pm 2.9 & 2 & LEES & 16D & BABR \ e^+e^- , 10.6 \ GeV \\
1.37 \pm 0.46 & 4 & PENG & 14 & BELL \ e^+e^\rightarrow \gamma(nS) \\
0.39 \pm 0.56 & 7 & DEL-AMO-SAI0D & 10D & BABR \ e^+e^- , 10.6 \ GeV \\
\hline
6.4^{+1.4}_{-1.7} & 8 & AAIJ & 13N & LHCb \ \ Repl. by AAIJ 13CE \\
-2^{+7}_{-6} & 9 & AUBERT & 09AN & BABR \ e^+e^- at 10.58 \ GeV \\
1.98 \pm 0.73 & 11 & ZHANG & 07B & BELL \ Repl. by PENG 14 \\
< 7 & 12 & ZHANG & 06 & BELL \ e^+e^- \\
< 11 \ to +22 & 13 & ASNER & 05 & CLEO \ e^+e^- \approx 10 \ GeV \\
< 30 & 14 & BITENC & 05 & BELL \\
< 7 & 15 & LI & 05A & BELL \ See ZHANG 06
\end{array}
\]

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

\[
\begin{array}{cccc}
\text{VALUE} & \text{CL\%} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
(10^{10} \ h \ s^{-1}) & & & \\
\hline
424 \pm 11 & \text{FRABETTI} & 91 & E687 & K^-\pi^+, K^-\pi^+\pi^- \\
417 \pm 18 & \text{ALVAREZ} & 90 & NA14 & K^-\pi^+, K^-\pi^+\pi^- \\
388^{+23}_{-21} & \text{BARLAG} & 90C & ACCM & \pi^- \ Cu \ 230 \ GeV \\
480 \pm 40 \pm 30 & \text{ALBRECHT} & 88I & ARG & e^+e^- \ 10 \ GeV \\
422 \pm 8 \pm 10 & \text{RAAB} & 88 & E691 & Photoproduction \\
420 \pm 50 & \text{BARLAG} & 87B & ACCM & \pi^- \ 200 \ GeV \\
\hline
1 \text{BARLAG 90C estimate systematic error to be negligible.}
\end{array}
\]
1 Model-independent measurement of the charm mixing parameters in the decay $D^0 \to K^0_S \pi^+ \pi^-$ using 1.0 fb$^{-1}$ of LHCb data at $\sqrt{s} = 7$ TeV.

2 Time-dependent amplitude analysis of $D^0 \to \pi^+ \pi^- \pi^0$.

3 Based on 976 fb$^{-1}$ of data collected at $Y(nS)$ resonances. Assumes no $CP$ violation. Reported $x' = 0.09 \pm 0.22 \times 10^{-3}$ and $y' = 4.6 \pm 3.4 \times 10^{-3}$, where $x' = x \cos(\delta) + y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between $D^0 \to K^+ \pi^-$ and $D^0 \to K^+ \pi^-$. This value allows $CP$ violation and is sensitive to the sign of $\Delta m$.

4 The time-dependent Dalitz-plot analysis of $D^0 \to K^0_S \pi^+ \pi^-$ is employed. Decay-time information and interference on the Dalitz plot are used to distinguish doubly Cabibbo-suppressed decays from mixing and to measure the relative phase between $D^0 \to K^+ \pi^-$ and $D^0 \to K^+ \pi^-$. This value allows $CP$ violation and is sensitive to the sign of $\Delta m$.

5 Based on 3 fb$^{-1}$ of data collected at $\sqrt{s} = 7, 8$ TeV. Assumes no $CP$ violation. Reported $x' = 0.08 \pm 0.18 \times 10^{-3}$ and $y' = 4.3 \pm 4.3 \times 10^{-3}$, where $x' = x \cos(\delta) + y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between $D^0 \to K^+ \pi^-$ and $D^0 \to K^+ \pi^-$. This value allows $CP$ violation and is sensitive to the sign of $\Delta m$.

6 Based on 9.6 fb$^{-1}$ of data collected at the Tevatron. Assumes no $CP$ violation. Reported $x' = 0.08 \pm 0.18 \times 10^{-3}$ and $y' = 4.3 \pm 4.3 \times 10^{-3}$, where $x' = x \cos(\delta) + y \sin(\delta)$ and $\delta$ is the strong phase between $D^0 \to K^+ \pi^-$ and $D^0 \to K^+ \pi^-$. This value allows $CP$ violation and is sensitive to the sign of $\Delta m$. 

---

$\frac{m_{D_1^0} - m_{D_2^0}}{x} = \Gamma (10^{10} \ h \ s^{-1})$
\[
\sin(\delta), y' = y \cos(\delta) - x \sin(\delta) \quad \text{and} \quad \delta \text{ is the strong phase between the } D^0 \rightarrow K^+\pi^- \quad \text{and} \quad D^0 \rightarrow K^+\pi^-.
\]

7 DEL-AMO-SANCHEZ 10D uses 540,800±800 $K_S^0\pi^+\pi^-$ and 79,900±300 $K_S^0 K^+K^-$ events in a time-dependent amplitude analysis of the $D^0$ and $\bar{D}^0$ Dalitz plots. No evidence was found for $CP$ violation, and the values here assume no such violation.

8 Based on 1 fb$^{-1}$ of data collected at $\sqrt{s} = 7$ TeV in 2011. Assumes no $CP$ violation. Reported $\chi^2 = (-0.9 \pm 1.3) \times 10^{-4}$ and $y' = (7.2 \pm 2.4) \times 10^{-3}$, where $x' = x \cos(\delta)$ + $y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between the $D^0 \rightarrow K^+\pi^-\bar{\pi}^0$ and $\bar{D}^0 \rightarrow K^+\pi^-\bar{\pi}^0$.

9 The AUBERT 09AN values are inferred from the branching ratio $\Gamma(D^0 \rightarrow K^+\pi^-\pi^0 \text{via } D^0)/\Gamma(D^0 \rightarrow K^-\pi^+\pi^0)$ given near the end of this Listings. Mixing is distinguished from DCS decays using decay-time information. Interference between mixing and DCS is allowed. The phase between $D^0 \rightarrow K^+\pi^-\pi^0$ and $\bar{D}^0 \rightarrow K^+\pi^-\pi^0$ is assumed to be small. The width difference here is $y''$, which is not the same as $y_{CP}$ in the note on $D^0-\bar{D}^0$ mixing.

10 LOWREY 09 uses quantum correlations in $e^+e^- \rightarrow D^0\bar{D}^0$ at the $\psi(3770)$. See below for coherence factors and average relative strong phases for both $D^0 \rightarrow K^-\pi^+\pi^0$ and $\bar{D}^0 \rightarrow K^-\pi^-2\pi^+$. A fit that includes external measurements of charm mixing parameters gets $\Delta m = (2.34 \pm 0.61) \times 10^{10}$ s$^{-1}$.

11 The ASNER 05 and ZHANG 07b values are from the time-dependent Dalitz-plot analysis of $D^0 \rightarrow K_S^0\pi^+\pi^-$. Decay-time information and interference on the Dalitz plot are used to distinguish doubly Cabibbo-suppressed decays from mixing and to measure the relative phase between $D^0 \rightarrow K^+\pi^-\pi^0$ and $\bar{D}^0 \rightarrow K^+\pi^-\pi^0$. This value allows $CP$ violation and is sensitive to the sign of $\Delta m$.

12 The AUBERT 03Z, LI 05A, and ZHANG 06 limits are inferred from the $D^0-\bar{D}^0$ mixing ratio $\Gamma(K^+\pi^- \text{via } D^0)/\Gamma(K^-\pi^+ \text{via } \bar{D}^0)$ given near the end of this Listings. Decay-time information is used to distinguish DCS decays from $D^0-\bar{D}^0$ mixing. The limit allows interference between the DCS and mixing ratios, and also allows $CP$ violation. AUBERT 03Z assumes the strong phase between $D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$ amplitudes is small; if an arbitrary phase is allowed, the limit degrades by 20%. The LI 05A and ZHANG 06 limits are valid for an arbitrary strong phase.

13 This LINK 05H limit is inferred from the $D^0-\bar{D}^0$ mixing ratio $\Gamma(K^+\pi^- \text{via } D^0)/\Gamma(K^-\pi^+ \text{via } \bar{D}^0)$ given near the end of this Listings. Decay-time information is used to distinguish DCS decays from $D^0-\bar{D}^0$ mixing. The limit allows interference between the DCS and mixing ratios, and also allows $CP$ violation. The strong phase between $D^0 \rightarrow K^+\pi^-\pi^0$ and $\bar{D}^0 \rightarrow K^+\pi^-\pi^0$ is assumed to be small. If an arbitrary relative strong phase is allowed, the limit degrades by 25%.

14 This GODANG 00 limit is inferred from the $D^0-\bar{D}^0$ mixing ratio $\Gamma(K^+\pi^- \text{via } D^0)/\Gamma(K^-\pi^+ \text{via } \bar{D}^0)$ given near the end of this Listings. Decay-time information is used to distinguish DCS decays from $D^0-\bar{D}^0$ mixing. The limit allows interference between the DCS and mixing ratios, and also allows $CP$ violation. The strong phase between $D^0 \rightarrow K^+\pi^-\pi^0$ and $\bar{D}^0 \rightarrow K^+\pi^-\pi^0$ is assumed to be small. If an arbitrary relative strong phase is allowed, the limit degrades by a factor of two.

15 AITALA 98 allows interference between the doubly Cabibbo-suppressed and mixing amplitudes, and also allows $CP$ violation in this term, but assumes that $A_D = A_R = 0$. See the note on “$D^0-\bar{D}^0$ Mixing,” above.

16 This limit is inferred from $R_M$ for $f = K^+\pi^-$ and $f = K^+\pi^-\pi^+\pi^-$. See the note on “$D^0-\bar{D}^0$ Mixing,” above. Decay-time information is used to distinguish doubly Cabibbo-suppressed decays from $D^0-\bar{D}^0$ mixing.

17 This limit is inferred from $R_M$ for $f = K^+\ell^-\nu_{\ell}$. See the note on “$D^0-\bar{D}^0$ Mixing,” above.
18 ANJOS 88c assumes that $y = 0$. See the note on “$D^0$-$\bar{D}^0$ Mixing,” above. Without this assumption, the limit degrades by about a factor of two.

\[
\frac{\Gamma(D^0_1 - \Gamma(D^0_2))}{\Gamma} = 2y
\]

The $D^0_1$ and $D^0_2$ are the mass eigenstates of the $D^0$ meson, as described in the note on “$D^0$-$\bar{D}^0$ Mixing,” above.

Due to the strong phase difference between $D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$, we exclude from the average those measurements of $y'$ that are inferred from the $D^0$-$\bar{D}^0$ mixing ratio $\Gamma(K^+\pi^-)$ via $\bar{D}^0$ given near the end of this $D^0$ Listings.

Some early results have been omitted. See our 2006 Review (Journal of Physics G33 1 (2006)).

“OUR EVALUATION” comes from CPV allowing averages provided by the Heavy Flavor Averaging Group, see the note on “$D^0$-$\bar{D}^0$ Mixing.”

<table>
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<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>1.29$^{+0.14}_{-0.18}$ OUR EVALUATION</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.06$^{+0.26}_{-0.26}$ OUR AVERAGE</td>
<td>Error includes scale factor of 1.3. See the ideogram below.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.06 ± 0.92 ± 0.26</td>
<td>0.4 ± 1.8 ± 1.0</td>
<td>2.22 ± 0.44 ± 0.18</td>
<td>−4.0 ± 2.6 ± 1.4</td>
<td>0.60 ± 0.30 $^{+0.10}_{-0.17}$</td>
</tr>
<tr>
<td>1.44 ± 0.36 ± 0.24</td>
<td>0.55 ± 0.63 ± 0.41</td>
<td>1.14 ± 0.40 ± 0.30</td>
<td>0.22 ± 1.22 ± 1.04</td>
<td>-1.0 ± 2.0 $^{+1.4}_{-1.6}$</td>
</tr>
<tr>
<td>1.39 ± 0.50 ± 2.8</td>
<td>6.84 ± 2.78 ± 1.48</td>
<td>+1.6 ± 5.8 ± 2.1</td>
<td>3393</td>
<td>18k</td>
</tr>
</tbody>
</table>

- 0.12$^{+0.10}_{-0.12}$ ± 0.68

- 1.40 ± 4.8 ± 5.4

- 1.70 ± 1.52 ± 12.7 ± 0.3k

- 2.06 ± 0.66 ± 0.38

- 1.94 ± 0.88 ± 0.62 ± 4030 ± 90

- 2.62 ± 0.64 ± 0.50 ± 160k

- 2.32 ± 0.44 ± 0.36

- 0.12$^{+0.10}_{-0.12}$ ± 0.68

- 4.8 ± 5.4

- 1.70 ± 1.52 ± 12.7 ± 0.3k

- 2.06 ± 0.66 ± 0.38

- 1.94 ± 0.88 ± 0.62 ± 4030 ± 90

- 2.62 ± 0.64 ± 0.50 ± 160k

- 2.32 ± 0.44 ± 0.36

- 0.12$^{+0.10}_{-0.12}$ ± 0.68

- 4.8 ± 5.4

- 1.70 ± 1.52 ± 12.7 ± 0.3k

- 2.06 ± 0.66 ± 0.38

- 1.94 ± 0.88 ± 0.62 ± 4030 ± 90

- 2.62 ± 0.64 ± 0.50 ± 160k
1 Model-independent measurement of the charm mixing parameters in the decay $D^0 \to K_S^0 \pi^+ \pi^-$ using 1.0 fb$^{-1}$ of LHCb data at $\sqrt{s} = 7$ TeV.

2 Time-dependent amplitude analysis of $D^0 \to \pi^+ \pi^- \pi^0$.

3 An improved measurement of $D^0 \to D^\ast - D^\ast$ mixing and a search for $CP$ violation in $D^0$ decays to $CP$-even final states $K^+ K^-$ and $\pi^+ \pi^-$ using the final Belle data sample of 976 fb$^{-1}$.

4 ABLIKIM 15D uses quantum correlations in $e^+ e^- \to D^0 \overline{D}^0$ at the $\psi(3770)$.

5 Based on 976 fb$^{-1}$ of data collected at $\gamma(nS)$ resonances. Assumes no $CP$ violation.

Reported $\chi^2 = (0.09 \pm 0.22) \times 10^{-3}$ and $y' = (4.6 \pm 3.4) \times 10^{-3}$, where $x' = x \cos(\delta)$ + $y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between $D^0 \to K^+ \pi^-$ and $\overline{D}^0 \to K^+ \pi^-$. (Confidence Level = 0.098)

6 The time-dependent Dalitz-plot analysis of $D^0 \to K^0_S \pi^+ \pi^-$ is employed. Decay-time information and interference on the Dalitz plot are used to distinguish doubly Cabibbo-suppressed decays from mixing and to measure the relative phase between $D^0 \to K^0_S \pi^+ \pi^-$.
$K^{*+}\pi^-$ and $\bar{D}^0 \rightarrow K^{*+}\pi^-$. This value allows CP violation and is sensitive to the sign of $\Delta m$.

7 Based on 3 fb$^{-1}$ of data collected at $\sqrt{s} = 7.8$ TeV. Assumes no CP violation. Reported $x'^2 = (5.5 \pm 4.9) \times 10^{-4}$ and $y' = (4.8 \pm 1.0) \times 10^{-3}$, where $x' = x \cos(\delta) + y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between the $D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$.

8 Based on 9.6 fb$^{-1}$ of data collected at the Tevatron. Assumes no CP violation. Reported $x'^2 = (0.08 \pm 0.18) \times 10^{-3}$ and $y' = (4.3 \pm 4.3) \times 10^{-3}$, where $x' = x \cos(\delta) + y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between the $D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$.

9 Obtained $y_{CP} = (0.72 \pm 0.18 \pm 0.12)\%$ based on three effective $D^0$ lifetimes measured in $K^+\pi^+$, $K^-\pi^+$, and $\pi^-\pi^+$. We list $2y_{CP} = \Delta \Gamma/\Gamma$.

10 Compared the lifetimes of $D^0$ decay to the CP eigenstate $K^+K^-$ with $D^0$ decay to $\pi^+\pi^-$. The values here assume no CP violation.

11 DEL-AMO-SANchez 100 uses 540,800 $\pm$ 800 $K^0_S\pi^+\pi^-$ and 79,900 $\pm$ 300 $K^0_S K^+K^-$ events in a time-dependent amplitude analyses of the $D^0$ and $\bar{D}^0$ Dalitz plots. No evidence was found for CP violation, and the values here assume no such violation.

12 ZUPANC 09 uses a method based on measuring the mean decay time of $D^0 \rightarrow K^0\pi^+$ $K^+\pi^-$ events for different $K^+\pi^-$ mass intervals.

13 LINK 00, AITALA 99e, and ABE 02i measure the lifetime difference between $D^0 \rightarrow K^-K^+$ (CP even) decays and $D^0 \rightarrow K^-\pi^+$ (CP mixed) decays, or $y_{CP} = [\Gamma(CP+) - \Gamma(CP-)]/\Gamma(CP+) + \Gamma(CP-)$. We list $2y_{CP} = \Delta \Gamma/\Gamma$.

14 CSORNA 02 measures the lifetime difference between $D^0 \rightarrow K^-K^+$ and $\pi^-\pi^+$ (CP even) decays and $D^0 \rightarrow K^-\pi^+$ (CP mixed) decays, or $y_{CP} = [\Gamma(CP+) - \Gamma(CP-)]/\Gamma(CP+) + \Gamma(CP-)$. We list $2y_{CP} = \Delta \Gamma/\Gamma$.

15 Based on 1 fb$^{-1}$ of data collected at $\sqrt{s} = 7$ TeV in 2011. Assumes no CP violation. Reported $x'^2 = (-0.9 \pm 1.3) \times 10^{-4}$ and $y' = (7.2 \pm 2.4) \times 10^{-3}$, where $x' = x \cos(\delta) + y \sin(\delta)$, $y' = y \cos(\delta) - x \sin(\delta)$ and $\delta$ is the strong phase between the $D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$.

16 This combines the $y_{CP} = (\gamma_{KK}/\gamma_{KK})^{-1}$ using untagged $K^-\pi^+$ and $K^-K^+$ events of AUBERT 09a with the disjoint $y_{CP}$ using tagged $K^-\pi^+$, $K^-K^+$, and $\pi^-\pi^+$ events of AUBERT 08u.

17 The AUBERT 09aN values are inferred from the branching ratio $\Gamma(D^0 \rightarrow K^+\pi^-\pi^-)$ via $\Gamma(D^0)$ given near the end of this Listings. Mixing is distinguished from DCS using decays using decay-time information. Interference between mixing and DCS is allowed. The phase between $D^0 \rightarrow K^+\pi^-\pi^0$ and $\bar{D}^0 \rightarrow K^+\pi^-\pi^0$ is assumed to be small. The width difference here is $y''$, which is not the same as $y_{CP}$ in the note on $D^0$-mixing.

18 LOWREY 09 uses quantum correlations in $e^+e^- \rightarrow D^0\bar{D}^0$ at the $\psi(3770)$. See below for coherence factors and average relative strong phases for both $D^0 \rightarrow K^-\pi^+\pi^0$ and $D^0 \rightarrow K^-\pi^-2\pi^+$. A fit that includes external measurements of charm mixing parameters gets $2y = (1.62 \pm 0.32) \times 10^{-2}$.

19 The GODANG 00, AUBERT 03Z, LINK 05H, LI 05A, ZHANG 06, AUBERT 07W, and AALTONEN 08E limits are inferred from the $D^0\bar{D}^0$ mixing ratio $\Gamma(K^+\pi^-)$ (via $\Gamma(D^0)$) given near the end of this Listings. Decay-time information is used to distinguish DCS decays from $D^0\bar{D}^0$ mixing. The limits allow interference between the DCS and mixing ratios, and all except AUBERT 07W and AALTONEN 08E also allow CP violation. The phase between $D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$ is assumed to be small. This is a measurement of $y'$ and is not the same as the $y_{CP}$ of our note above on “$D^0$-$\bar{D}^0$ Mixing.”
20 This value combines the results of AUBERT 08u and AUBERT 03P.
21 STARIC 07 compares the lifetimes of $D^0$ decay to the CP eigenstates $K^+K^-$ and
$\pi^+\pi^-$ with $D^0$ decay to $K^-\pi^+$. 
22 The ASNER 05 and ZHANG 07b values are from the time-dependent Dalitz-plot analysis
of $D^0 \rightarrow KS\pi^+\pi^-$. Decay-time information and interference on the Dalitz plot are
used to distinguish doubly Cabibbo-suppressed decays from mixing and to measure the
relative phase between $D^0 \rightarrow K^{*+}\pi^-$ and $\bar{D}^0 \rightarrow K^{*+}\pi^-$. This limit allows CP
violation.
23 The ranges of AUBERT 03z, LINK 05H, LI 05A, and ZHANG 06 measurements are for
95% confidence level.
24 AUBERT 03P measures $Y \equiv 2 \tau^0 / (\tau^+ + \tau^-) - 1$, where $\tau^0$ is the $D^0 \rightarrow K^+\pi^-$
(and $\bar{D}^0 \rightarrow K^+\pi^-$) lifetime, and $\tau^+$ and $\tau^-$ are the $D^0$ and $\bar{D}^0$ lifetimes to CP-even
states (here $K^-K^+$ and $\pi^+\pi^+$). In the limit of CP conservation, $Y = y \equiv \Delta \Gamma / \Gamma$ (we
list $2y = \Delta \Gamma / \Gamma$). AUBERT 03P also uses $\tau^+ - \tau^-$ to get $\Delta Y = -0.008 \pm 0.006 \pm 0.002$.

\[ |q/p| \]

The mass eigenstates $D^0_1$ and $D^0_2$ are related to the $C = \pm 1$ states by $|D_{1,2}| =
\begin{align*}
|D^0| & > + q |\bar{D}^0| >.
\end{align*}
See the note on “$D^0$-$\bar{D}^0$ Mixing” above.

“OUR EVALUATION” comes from CPV allowing averages provided by the Heavy
Flavor Averaging Group. This would include as-yet-unpublished results, see the note
on “$D^0$-$\bar{D}^0$ Mixing.”

<table>
<thead>
<tr>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.92$^{+0.12}_{-0.09}$ OUR EVALUATION</td>
<td>HFAG fit; see the note on “$D^0$-$\bar{D}^0$ Mixing.”</td>
<td></td>
</tr>
<tr>
<td>0.90$^{+0.16+0.08}_{-0.15-0.06}$</td>
<td>1 PENG 14 BELL $e^+e^- \rightarrow \tau(nS)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 AAIJ 13CE LHCb $pp$ at 7, 8 TeV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• • • We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
</tr>
<tr>
<td>0.86$^{+0.30+0.10}_{-0.29-0.08}$</td>
<td>3 ZHANG 07B BELL Repl. by PENG 14</td>
<td></td>
</tr>
</tbody>
</table>

1 The time-dependent Dalitz-plot analysis of $D^0 \rightarrow KS\pi^+\pi^-$ is employed. Decay-
time information and interference on the Dalitz plot are used to distinguish doubly
Cabibbo-suppressed decays from mixing and to measure the relative phase between $D^0 \rightarrow 
K^{*+}\pi^-$ and $\bar{D}^0 \rightarrow K^{*+}\pi^-$. This value allows CP violation and is sensitive to the
sign of $\Delta m$.
2 Based on 3 fb$^{-1}$ of data collected at $\sqrt{s} = 7, 8$ TeV. Allowing for CP violation, the
direct CP violation in mixing is reported $0.75 < |q/p| < 1.24$ at the 68.3% CL for the
$D^0 \rightarrow K^+\pi^-$ and $\bar{D}^0 \rightarrow K^+\pi^-$. 
3 The phase of $p/q$ is $(-14_{-18}^{+16} \pm 5)^\circ$. The ZHANG 07b value is from the time-dependent
Dalitz-plot analysis of $D^0 \rightarrow KS\pi^+\pi^-$. Decay-time information and interference on the
Dalitz plot are used to distinguish doubly Cabibbo-suppressed decays from mixing and
to measure the relative phase between $D^0 \rightarrow K^{*+}\pi^-$ and $\bar{D}^0 \rightarrow K^{*+}\pi^-$. This
value allows CP violation.
A\gamma

\(A_\gamma\) is the decay-rate asymmetry for \(CP\)-even final states

\[A_\gamma = (\tau^+ - \tau^-) / (\tau^+ + \tau^-).\]

See the note on "\(D^0\) - \(\bar{D}^0\) Mixing" above.

**VALUE (units 10^{-3})** | **EVTS** | **DOCUMENT ID** | **TECN** | **COMMENT**
---|---|---|---|---
-0.125 ± 0.526 | OUR EVALUATION | -0.6 ± 0.4 | OUR AVERAGE
-0.3 ± 2.0 ± 0.7 | 1 | STARIC | 16 | BELL \(e^+ e^- \rightarrow \gamma(nS)\)
-1.34 ± 0.77 + 0.26 − 0.34 | 2 | AAIJ | 15AA LHCb | \(pp\) at 7, 8 TeV
-0.92 ± 1.45 + 0.25 − 0.33 | 3 | AAIJ | 15AA LHCb | \(pp\) at 7, 8 TeV
-0.35 ± 0.62 ± 0.12 | 4 | AAIJ | 14AL LHCb | \(pp\) at 7 TeV
0.33 ± 1.06 ± 0.14 | 5 | AAIJ | 14AL LHCb | \(pp\) at 7 TeV
-1.2 ± 1.2 | 6 | AALTEN | 14Q | CDF \(p\bar{p}, \sqrt{s} = 1.96\) TeV
0.9 ± 2.6 ± 0.6 | 7 | LEES | 13 | BABR \(e^+ e^- \rightarrow \gamma(4S)\)
-5.9 ± 5.9 ± 2.1 | 4 | AAIJ | 12K | LHCb \(pp\) at 7 TeV

---

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

2. Measured using \(D^0 \rightarrow K^+ K^-\) decays, with \(D^0\) from partially reconstructed semileptonic \(B\) hadron decays.

3. Measured using \(D^0 \rightarrow \pi^+ \pi^-\) decays, with \(D^0\) from partially reconstructed semileptonic \(B\) hadron decays.

4. Measured using \(D^{*+} \rightarrow D^0 \pi^+, D^0 \rightarrow K^+ K^-\) decays (and cc).

5. Measured using \(D^{*+} \rightarrow D^0 \pi^+, D^0 \rightarrow \pi^+ \pi^-\) decays (and cc).

6. Combined result from \(D^0 \rightarrow K^+ K^-\) and \(D^0 \rightarrow \pi^+ \pi^-\), with \(D^0\) from \(D^{*+} \rightarrow D^0 \pi^+\) (and cc).

**\(\cos\delta\)**

\(\delta\) is the \(D^0 \rightarrow K^+ \pi^-\) relative strong phase.

**VALUE** | **DOCUMENT ID** | **TECN** | **COMMENT**
---|---|---|---
0.97 ± 0.11 | OUR AVERAGE
1.02 ± 0.11 ± 0.06 | 1 | ABLIKIM | 14C | BES3 \(e^+ e^- \rightarrow D^0 \bar{D}^0, 3.77\) GeV
0.81 ± 0.22 + 0.07 − 0.18 − 0.05 | 2 | ASNER | 12 | CLEO \(e^+ e^- \rightarrow D^0 \bar{D}^0, 3.77\) GeV
1.03 ± 0.31 + 0.06 − 0.17 | 3 | ASNER | 08 | CLEO Repl. by ASNER 12

---

1. Uses quantum correlations in \(e^+ e^- \rightarrow D^0 \bar{D}^0\) at the \(\psi(3770)\) to measure the asymmetry of the branching fraction of \(D^0 \rightarrow K^- \pi^+\) in \(CP\)-odd and \(CP\)-even eigenstates to be \((12.7 ± 1.3 ± 0.7)\%\). A fit that includes external measurements of charm mixing parameters finds the value quoted above.

2. Uses quantum correlations in \(e^+ e^- \rightarrow D^0 \bar{D}^0\) at the \(\psi(3770)\), where decay rates of \(CP\)-tagged \(K\pi\) final states depend on the strong phases between the decays of \(D^0 \rightarrow K^+ \pi^-\) and \(\bar{D}^0 \rightarrow K^- \pi^+\). The measurements obtained \(\sin(\delta) = -0.01 ± 0.41 ± 0.04\) and \(|\delta| = (10^{+28}_{-53} ± 13)°\) as well. A fit that includes external measurements of charm
mixing parameters finds \( \cos(\delta) = 1.15^{+0.19+0.00}_{-0.17-0.08}, \sin(\delta) = 0.56^{+0.32+0.21}_{-0.31-0.20} \), and \(|\delta| = (18^{+11}_{-17})^0\).

3 ASNER 08 uses quantum correlations in \( e^+ e^- \rightarrow D^0\overline{D^0} \) at the \( \psi(3770) \), where decay rates of \( CP \)-tagged \( K \pi \) final states depend on \( \cos \delta \) because of interfering amplitudes. The above measurement implies \(|\delta| < 75^0\) with a confidence level of 95%. A fit that includes external measurements of charm mixing parameters finds \( \cos \delta = 1.10 \pm 0.35 \pm 0.07 \). See also the note on "\( D^0-\overline{D^0} \) Mixing" p. 783 in our 2008 Review (PDG 08).

\[ D^0 \rightarrow K^- \pi^+ \pi^0 \] COHERENCE FACTOR \( R_{K\pi\pi^0} \)

See the note on '\( D^0-\overline{D^0} \) Mixing' for the definition. \( R_{K\pi\pi^0} \) can have any value between 0 and 1. A value near 1 indicates the decay is dominated by a few intermediate states with limited interference.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.82±0.06</td>
<td>1,2 EVANS</td>
<td>16</td>
<td>CLEO e(^+) e(^-) \rightarrow D^0\overline{D^0} ) at ( \psi(3770) )</td>
</tr>
<tr>
<td>0.82±0.07</td>
<td>1 LIBBY</td>
<td>14</td>
<td>CLEO Repl. by EVANS 16</td>
</tr>
<tr>
<td>0.78±0.11</td>
<td>3 LOWREY</td>
<td>09</td>
<td>CLEO Repl. by LIBBY 14</td>
</tr>
</tbody>
</table>

1 Uses quantum correlations in \( e^+ e^- \rightarrow D^0\overline{D^0} \) at the \( \psi(3770) \), where the decay rates of \( CP \)-tagged \( K^- \pi^+ \pi^0 \) final states depend on \( R_{K\pi\pi^0} \) and \( \delta K\pi\pi^0 \).

2 A combined fit with a recent LHCb \( D^0\overline{D^0} \) mixing results in AAIJ 16F is also reported to be 0.81 ± 0.06.

3 LOWREY 09 uses quantum correlations in \( e^+ e^- \rightarrow D^0\overline{D^0} \) at the \( \psi(3770) \), where the decay rates of \( CP \)-tagged \( K^- \pi^+ \pi^0 \) final states depend on \( R_{K\pi\pi^0} \) and \( \delta K\pi\pi^0 \).

A fit that includes external measurements of charm mixing parameters gets \( R_{K\pi\pi^0} = 0.84 \pm 0.07 \).

\[ D^0 \rightarrow K^- \pi^+ \pi^0 \] AVERAGE RELATIVE STRONG PHASE \( \delta K\pi\pi^0 \)

The quoted value of \( \delta \) is based on the same sign \( CP \) phase of \( D^0 \) and \( \overline{D^0} \) convention.

<table>
<thead>
<tr>
<th>VALUE (°)</th>
<th>DOCUMENT ID</th>
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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>199±14</td>
<td>1,2 EVANS</td>
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<td>CLEO e(^+) e(^-) \rightarrow D^0\overline{D^0} ) at ( \psi(3770) )</td>
</tr>
<tr>
<td>164±20</td>
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<td>CLEO Repl. by EVANS 16</td>
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<tr>
<td>239±28</td>
<td>3 LOWREY</td>
<td>09</td>
<td>CLEO Repl. by LIBBY 14</td>
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</table>

1 Uses quantum correlations in \( e^+ e^- \rightarrow D^0\overline{D^0} \) at the \( \psi(3770) \), where the decay rates of \( CP \)-tagged \( K^- \pi^+ \pi^0 \) final states depend on \( R_{K\pi\pi^0} \) and \( \delta K\pi\pi^0 \).

2 A combined fit with a recent LHCb \( D^0\overline{D^0} \) mixing results in AAIJ 16F is also reported to 198±15° degree.

3 LOWREY 09 uses quantum correlations in \( e^+ e^- \rightarrow D^0\overline{D^0} \) at the \( \psi(3770) \), where the decay rates of \( CP \)-tagged \( K^- \pi^+ \pi^0 \) final states depend on \( R_{K\pi\pi^0} \) and \( \delta K\pi\pi^0 \).

A fit that includes external measurements of charm mixing parameters gets \( \delta K\pi\pi^0 = (227^{+14}_{-17})^0 \).
\[ D^0 \rightarrow K^- \pi^- 2\pi^+ \text{ COHERENCE FACTOR } R_{K3\pi} \]

See the note on ‘\(D^0, \overline{D^0}\) Mixing’ for the definition. \(R_{K3\pi}\) can have any value between 0 and 1. A value near 1 indicates the decay is dominated by a few intermediate states with limited interference.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{VALUE} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
0.53^{+0.18}_{-0.21} & 1,2 \text{ EVANS} & 16 \text{ CLEO} & e^+e^- \rightarrow D^0 \overline{D^0} \text{ at } \psi(3770) \\
\hline
0.32^{+0.20}_{-0.28} & 1 \text{ LIBBY} & 14 \text{ CLEO} & \text{Repl. by EVANS 16} \\
\hline
0.36^{+0.24}_{-0.30} & 3 \text{ LOWREY} & 09 \text{ CLEO} & \text{Repl. by LIBBY 14} \\
\hline
\end{array}
\]

1. Uses quantum correlations in \(e^+e^- \rightarrow D^0 \overline{D^0}\) at the \(\psi(3770)\), where the decay rates of \(CP\)-tagged \(K^-\pi^- 2\pi^+\) final states depend on \(R_{K3\pi}\) and \(\delta K3\pi\).

2. A combined fit with a recent LHCb \(D^0 \overline{D^0}\) mixing results in AAIJ 16\(f\) is also reported to be \(0.43^{+0.17}_{-0.13}\).

3. LOWREY 09 uses quantum correlations in \(e^+e^- \rightarrow D^0 \overline{D^0}\) at the \(\psi(3770)\), where the decay rates of \(CP\)-tagged \(K^-\pi^- 2\pi^+\) final states depend on \(R_{K3\pi}\) and \(\delta K3\pi\). A fit that includes external measurements of charm mixing parameters gets \(R_{K3\pi} = 0.33^{+0.26}_{-0.23}\).

\[ D^0 \rightarrow K^- \pi^- 2\pi^+ \text{ AVERAGE RELATIVE STRONG PHASE } \delta K3\pi \]

The quoted value of \(\delta\) is based on the same sign \(CP\) phase of \(D^0\) and \(\overline{D^0}\) convention.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{VALUE(\(^{\circ}\))} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
125^{+22}_{-14} & 1,2 \text{ EVANS} & 16 \text{ CLEO} & e^+e^- \rightarrow D^0 \overline{D^0} \text{ at } \psi(3770) \\
\hline
255^{+21}_{-78} & 1 \text{ LIBBY} & 14 \text{ CLEO} & \text{Repl. by EVANS 16} \\
\hline
118^{+62}_{-53} & 3 \text{ LOWREY} & 09 \text{ CLEO} & \text{Repl. by LIBBY 14} \\
\hline
\end{array}
\]

1. Uses quantum correlations in \(e^+e^- \rightarrow D^0 \overline{D^0}\) at the \(\psi(3770)\), where the decay rates of \(CP\)-tagged \(K^-\pi^- 2\pi^+\) final states depend on \(R_{K3\pi}\) and \(\delta K3\pi\).

2. A combined fit with a recent LHCb \(D^0 \overline{D^0}\) mixing results in AAIJ 16\(f\) is also reported to be \((128^{+28}_{-17})^{\circ}\).

3. LOWREY 09 uses quantum correlations in \(e^+e^- \rightarrow D^0 \overline{D^0}\) at the \(\psi(3770)\), where the decay rates of \(CP\)-tagged \(K^-\pi^- 2\pi^+\) final states depend on \(R_{K3\pi}\) and \(\delta K3\pi\). A fit that includes external measurements of charm mixing parameters gets \(\delta K3\pi = (114^{+26}_{-23})^{\circ}\).

\[ D^0 \rightarrow K^- \pi^- 2\pi^+, R_{K3\pi} \text{ (} y \cos\delta K3\pi \text{ } - \text{ } x \sin\delta K3\pi \text{)} \]

\[
\begin{array}{|c|c|c|c|}
\hline
\text{VALUE(10^{-3} \text{ TeV}^{-1})} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
-3.0\pm0.7 & 42.5k & 1 \text{ AAIJ} & 16\text{f} \text{ LHCb} & pp \text{ at } 7, 8 \text{ TeV} \\
\hline
\end{array}
\]

1. From a time-dependent analysis of \(D\) mixing in \(D^0 \rightarrow K^-\pi^-\pi^+\pi^-\). This result uses external constraints on \(R_M = 1/2 \left( \kappa^2 + \gamma^2 \right)\). Without such constraints, AAIJ 16\(f\) measure \((0.3 \pm 1.8) \times 10^{-3}\), with a large correlation coefficient to \(R_M\).
\( D^0 \rightarrow K_S^0 K^+ \pi^- \) COHERENCE FACTOR \( R_{K_S^0 K^+ \pi^-} \)

<table>
<thead>
<tr>
<th>VALUE ( \pm 0.08 )</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.70</td>
<td>1 INSLER</td>
<td>12</td>
<td>CLEO e(^+)e(^-) \rightarrow D^0 \overline{D^0} \text{ at } 3.77 \text{ GeV}</td>
</tr>
</tbody>
</table>

1 Uses quantum correlations in \( e^+e^- \rightarrow D^0 \overline{D^0} \) at the \( \psi(3770) \), where the signal side \( D^0 \) decays to \( K_S^0 K^+ \pi^- \) and the tag-side \( D^0 \) decays to \( K^+ \pi^- \). 10 additional \( CP \)-even, \( CP \)-odd, and mixed \( CP \) modes involving \( K_S^0 \) or \( K_L^0 \).

\( D^0 \rightarrow K_S^0 K^+ \pi^- \) AVERAGE RELATIVE STRONG PHASE \( \delta_{K_S^0 K^+ \pi^-} \)

The quoted value of \( \delta \) is based on the same sign \( CP \) phase of \( D^0 \) and \( \overline{D^0} \) convention.

<table>
<thead>
<tr>
<th>VALUE ( \pm 15.7 )</th>
<th>DOCUMENT ID</th>
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<td>0.1</td>
<td>1 INSLER</td>
<td>12</td>
<td>CLEO e(^+)e(^-) \rightarrow D^0 \overline{D^0} \text{ at } 3.77 \text{ GeV}</td>
</tr>
</tbody>
</table>

1 Uses quantum correlations in \( e^+e^- \rightarrow D^0 \overline{D^0} \) at the \( \psi(3770) \), where the signal side \( D^0 \) decays to \( K_S^0 K^+ \pi^- \) and the tag-side \( D^0 \) decays to \( K^+ \pi^- \). 10 additional \( CP \)-even, \( CP \)-odd, and mixed \( CP \) modes involving \( K_S^0 \) or \( K_L^0 \).

\( D^0 \rightarrow K^+ K^- \) COHERENCE FACTOR \( R_{K^+ K^-} \)

<table>
<thead>
<tr>
<th>VALUE ( \pm 0.12 )</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.94</td>
<td>1 INSLER</td>
<td>12</td>
<td>CLEO e(^+)e(^-) \rightarrow D^0 \overline{D^0} \text{ at } 3.77 \text{ GeV}</td>
</tr>
</tbody>
</table>

1 Uses quantum correlations in \( e^+e^- \rightarrow D^0 \overline{D^0} \) at the \( \psi(3770) \), where the signal side \( D^0 \) decays to \( K_S^0 K^+ \pi^- \) and the tag-side \( D^0 \) decays to \( K^+ \pi^- \). 10 additional \( CP \)-even, \( CP \)-odd, and mixed \( CP \) modes involving \( K_S^0 \) or \( K_L^0 \).

\( D^0 \rightarrow K^* K^- \) AVERAGE RELATIVE STRONG PHASE \( \delta_{K^* K^-} \)

The quoted value of \( \delta \) is based on the same sign \( CP \) phase of \( D^0 \) and \( \overline{D^0} \) convention.

<table>
<thead>
<tr>
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<th>DOCUMENT ID</th>
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<th>COMMENT</th>
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<tbody>
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<td>16.6</td>
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<td>12</td>
<td>CLEO e(^+)e(^-) \rightarrow D^0 \overline{D^0} \text{ at } 3.77 \text{ GeV}</td>
</tr>
</tbody>
</table>

1 Uses quantum correlations in \( e^+e^- \rightarrow D^0 \overline{D^0} \) at the \( \psi(3770) \), where the signal side \( D^0 \) decays to \( K_S^0 K^+ \pi^- \) and the tag-side \( D^0 \) decays to \( K^+ \pi^- \). 10 additional \( CP \)-even, \( CP \)-odd, and mixed \( CP \) modes involving \( K_S^0 \) or \( K_L^0 \).

\( D^0 \) DECAY MODES

Most decay modes (other than the semileptonic modes) that involve a neutral \( K \) meson are now given as \( K_S^0 \) modes, not as \( K^0 \) modes. Nearly always it is a \( K_S^0 \) that is measured, and interference between Cabibbo-allowed and doubly Cabibbo-suppressed modes can invalidate the assumption that \( 2 \Gamma(K_S^0) = \Gamma(K^0) \).

<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>0-prongs</td>
<td>[a] ( (15 \pm 6) ) %</td>
</tr>
<tr>
<td>( \Gamma_2 )</td>
<td>2-prongs</td>
<td>(70 \pm 6) %</td>
</tr>
<tr>
<td>( \Gamma_3 )</td>
<td>4-prongs</td>
<td>[b] ( (14.5 \pm 0.5) ) %</td>
</tr>
<tr>
<td>( \Gamma_4 )</td>
<td>6-prongs</td>
<td>[c] ( (6.4 \pm 1.3) \times 10^{-4} )</td>
</tr>
</tbody>
</table>

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### Inclusive modes

| Γ_5 | e^+ anything | [d] | (6.49 ± 0.11)% |
| Γ_6 | μ^+ anything | | (6.7 ± 0.6)% |
| Γ_7 | K^- anything | | (54.7 ± 2.8)% S=1.3 |
| Γ_8 | K^0 anything + K^0 anything | | (47 ± 4)% |
| Γ_9 | K^+ anything | | (3.4 ± 0.4)% |
| Γ_10 | K^*(892)^- anything | | (15 ± 9)% |
| Γ_11 | K^*(892)^0 anything | | (9 ± 4)% |
| Γ_12 | K^*(892)^+ anything | | <3.6% CL=90% |
| Γ_13 | K^*(892)^0 anything | | (2.8 ± 1.3)% |
| Γ_14 | η anything | | (9.5 ± 0.9)% |
| Γ_15 | η' anything | | (2.48 ± 0.27)% |
| Γ_16 | φ anything | | (1.05 ± 0.11)% |
| Γ_17 | invisibles | | <9.4 x 10^{-5} CL=90% |

### Semileptonic modes

| Γ_18 | K^- ℓ^+ ν_ℓ | | |
| Γ_19 | K^- e^+ ν_e | | (3.530±0.028)% S=1.1 |
| Γ_20 | K^- μ^+ ν_μ | | (3.31±0.13)% |
| Γ_21 | K^*(892)^- e^+ ν_e | | (2.15±0.16)% |
| Γ_22 | K^*(892)^- μ^+ ν_μ | | (1.86±0.24)% |
| Γ_23 | K^- π^0 e^+ ν_e | | (1.6±1.3) |
| Γ_24 | K^- π^0 e^+ ν_e | | (2.7±0.9)% |
| Γ_25 | K^- π^+ π^- e^+ ν_e | | (2.8±1.4) x 10^{-4} |
| Γ_26 | K^- π^+ π^- e^+ ν_e | | (7.6±4.0) x 10^{-4} |
| Γ_27 | K^- π^+ π^- μ^+ ν_μ | | <1.2 x 10^{-3} CL=90% |
| Γ_28 | (K^*(892)^0 π^-) μ^+ ν_μ | | <1.4 x 10^{-3} CL=90% |
| Γ_29 | π^- e^+ ν_e | | (2.91±0.04) x 10^{-3} S=1.1 |
| Γ_30 | π^- μ^+ ν_μ | | (2.37±0.24) x 10^{-3} |
| Γ_31 | ρ^- e^+ ν_e | | (1.77±0.16) x 10^{-3} |

### Hadronic modes with one K

| Γ_32 | K^- π^+ | | (3.89±0.04)% S=1.1 |
| Γ_33 | K^+ π^- | | (1.385±0.027) x 10^{-4} |
| Γ_34 | K_S^0 π^0 | | (1.19±0.04)% |
| Γ_35 | K_S^0 π^- | | (10.0±0.7) x 10^{-3} |
| Γ_36 | K_S^0 π^+ π^- | | [e] (2.75±0.18)% S=1.1 |
| Γ_37 | K_S^0 ρ^0 | | (6.2±0.6) x 10^{-3} |
| Γ_38 | K_S^0 ω, ω → π^+ π^- | | (2.0±0.6) x 10^{-4} |
| Γ_39 | K_S^0 (π^+ π^-) s-wave | | (3.3±0.7) x 10^{-3} |
\[ \Gamma_{40} \quad K_S^0 f_0(980), \quad f_0(980) \rightarrow \pi^+ \pi^- \quad (1.18 \pm 0.40 \pm 0.23) \times 10^{-3} \]
\[ \Gamma_{41} \quad K_S^0 f_0(1370), \quad f_0 \rightarrow \pi^+ \pi^- \quad (2.7 \pm 0.8 \pm 0.13) \times 10^{-3} \]
\[ \Gamma_{42} \quad K_S^0 f_2(1270), \quad f_2 \rightarrow \pi^+ \pi^- \quad (9 \pm 10 \pm 6) \times 10^{-5} \]
\[ \Gamma_{43} \quad K^*(892)^- \pi^+, \quad K^*(892)^- \rightarrow K_S^0 \pi^- \quad (1.62 \pm 0.14 \pm 0.17) \% \]
\[ \Gamma_{44} \quad K_0^*(1430)^- \pi^+, \quad K_0^- \rightarrow K_S^0 \pi^- \quad (2.63 \pm 0.40 \pm 0.32) \times 10^{-3} \]
\[ \Gamma_{45} \quad K_2^*(1430)^- \pi^+, \quad K_2^- \rightarrow K_S^0 \pi^- \quad (3.3 \pm 1.8 \pm 1.0) \times 10^{-4} \]
\[ \Gamma_{46} \quad K^*(1680)^- \pi^+, \quad K^* \rightarrow K_S^0 \pi^- \quad (4.3 \pm 3.5 \pm 3.5) \times 10^{-4} \]
\[ \Gamma_{47} \quad K^*(892)^+ \pi^-, \quad K^*(892)^+ \rightarrow K_S^0 \pi^+ \quad [f] \quad (1.11 \pm 0.60 \pm 0.33) \times 10^{-4} \]
\[ \Gamma_{48} \quad K_0^*(1430)^+ \pi^-, \quad K_0^+ \rightarrow K_S^0 \pi^+ \quad [f] \quad < 1.4 \times 10^{-5} \quad CL=95\% \]
\[ \Gamma_{49} \quad K_2^*(1430)^+ \pi^-, \quad K_2^+ \rightarrow K_S^0 \pi^+ \quad [f] \quad < 3.3 \times 10^{-5} \quad CL=95\% \]
\[ \Gamma_{50} \quad K_S^0 \pi^+ \pi^- \text{nonresonant} \quad (2.5 \pm 6.0 \pm 1.6) \times 10^{-4} \]
\[ \Gamma_{51} \quad K^- \pi^+ \pi^0 \quad [e] \quad (14.2 \pm 0.5 \pm 0.5) \% \quad S=1.9 \]
\[ \Gamma_{52} \quad K^- \rho^+ \quad (11.1 \pm 0.7 \pm 0.7) \% \]
\[ \Gamma_{53} \quad K^- \rho(1700)^+, \quad \rho^+ \rightarrow \pi^+ \pi^0 \quad (8.1 \pm 1.7 \pm 1.7) \times 10^{-3} \]
\[ \Gamma_{54} \quad K^*(892)^- \pi^+, \quad K^*(892)^- \rightarrow K^- \pi^0 \quad (2.27 \pm 0.40 \pm 0.20) \% \]
\[ \Gamma_{55} \quad K^*(892)^0 \pi^0, \quad K^*(892)^0 \rightarrow K^- \pi^+ \quad (1.93 \pm 0.24 \pm 0.24) \% \]
\[ \Gamma_{56} \quad K_0^*(1430)^- \pi^+, \quad K_0^- \rightarrow K^- \pi^0 \quad (4.7 \pm 2.2 \pm 2.2) \times 10^{-3} \]
\[ \Gamma_{57} \quad K_0^*(1430)^0 \pi^0, \quad K_0^0 \rightarrow K^- \pi^+ \quad (5.8 \pm 5.0 \pm 1.6) \times 10^{-3} \]
\[ \Gamma_{58} \quad K^*(1680)^- \pi^+, \quad K^- \rightarrow K^- \pi^0 \quad (1.8 \pm 0.7 \pm 0.7) \times 10^{-3} \]
\[ \Gamma_{59} \quad K^- \pi^+ \pi^0 \text{nonresonant} \quad (1.14 \pm 0.50 \pm 0.50) \% \]
\[ \Gamma_{60} \quad K_S^0 2\pi^0 \quad (9.1 \pm 1.1 \pm 1.1) \times 10^{-3} \quad S=2.2 \]
\[ \Gamma_{61} \quad K_S^0 (2\pi^0) \text{-S-wave} \quad (2.6 \pm 0.7 \pm 0.7) \times 10^{-3} \]
\[ \Gamma_{62} \quad K^*(892)^0 \pi^0, \quad K^* \rightarrow K_S^0 \pi^0 \quad (7.8 \pm 0.7 \pm 0.7) \times 10^{-3} \]
\[ \Gamma_{63} \quad K^*(1430)^0 \pi^0, \quad K^* \rightarrow K_S^0 \pi^0 \quad (4 \pm 23 \pm 23) \times 10^{-5} \]
\[ \Gamma_{64} \quad K^*(1680)^0 \pi^0, \quad K^* \rightarrow K_S^0 \pi^0 \quad (1.0 \pm 0.4 \pm 0.4) \times 10^{-3} \]
\( \Gamma_{65} \) \( K_S^0 f_2(1270), f_2 \rightarrow 2\pi^0 \) \( (2.3 \pm 1.1) \times 10^{-4} \)

\( \Gamma_{66} \) \( 2K_S^0, \) one \( K_S^0 \rightarrow 2\pi^0 \) \( (3.2 \pm 1.1) \times 10^{-4} \)

\( \Gamma_{67} \) \( K_S^0 2\pi^0 \) nonresonant

\( \Gamma_{68} \) \( K^- 2\pi^+ \pi^- \) \( (e) \) \( (8.11 \pm 0.15) \% \) \( S=1.1 \)

\( \Gamma_{69} \) \( K^- \pi^+ \rho^0 \) total \( (6.77 \pm 0.31) \% \)

\( \Gamma_{70} \) \( K^- \pi^+ \rho^0 \) 3-body \( (5.1 \pm 2.3) \times 10^{-3} \)

\( \Gamma_{71} \) \( K^*(892)^0 \rho^0, \)
\( K^*(892)^0 \rightarrow K^- \pi^+ \)

\( \Gamma_{72} \) \( K^- a_1(1260)^+, \)
\( a_1(1260)^+ \rightarrow 2\pi^+ \pi^- \)

\( \Gamma_{73} \) \( K^*(892)^0 \pi^+ \pi^- \) total, \)
\( K^*(892)^0 \rightarrow K^- \pi^+ \)

\( \Gamma_{74} \) \( K^*(892)^0 \pi^+ \pi^- \) 3-body, \)
\( K^*(892)^0 \rightarrow K^- \pi^+ \)

\( \Gamma_{75} \) \( K_1(1270)^- \pi^+, \)
\( K_1(1270)^- \rightarrow K^- \pi^+ \pi^- \)

\( \Gamma_{76} \) \( K^- 2\pi^+ \pi^- \) nonresonant \( (1.89 \pm 0.26) \% \)

\( \Gamma_{77} \) \( K_S^0 \pi^+ \pi^- \pi^0 \) \( [h] \) \( (5.1 \pm 0.6) \% \)

\( \Gamma_{78} \) \( K_S^0 \eta, \) \( \eta \rightarrow \pi^+ \pi^- \pi^0 \) \( (1.02 \pm 0.09) \times 10^{-3} \)

\( \Gamma_{79} \) \( K_S^0 \omega, \) \( \omega \rightarrow \pi^+ \pi^- \pi^0 \) \( (9.9 \pm 0.5) \times 10^{-3} \)

\( \Gamma_{80} \) \( K^- \pi^+ 2\pi^0 \)

\( \Gamma_{81} \) \( K^- 2\pi^+ \pi^- \pi^0 \) \( (4.2 \pm 0.4) \% \)

\( \Gamma_{82} \) \( K^*(892)^0 \pi^+ \pi^- \pi^0, \)
\( K^*(892)^0 \rightarrow K^- \pi^+ \)

\( \Gamma_{83} \) \( K^- \pi^+ \omega, \) \( \omega \rightarrow \pi^+ \pi^- \pi^0 \)

\( \Gamma_{84} \) \( K^- \pi^+ \omega, \) \( \omega \rightarrow \pi^+ \pi^- \pi^0 \)

\( \Gamma_{85} \) \( K_S^0 \eta \pi^0 \) \( (5.5 \pm 1.1) \times 10^{-3} \)

\( \Gamma_{86} \) \( K_S^0 a_0(980), \) \( a_0 \rightarrow \eta \pi^0 \)

\( \Gamma_{87} \) \( K^*(892)^0 \eta, \) \( K^*(892)^0 \rightarrow K_S^0 \pi^0 \)

\( \Gamma_{88} \) \( K_S^0 2\pi^+ 2\pi^- \)

\( \Gamma_{89} \) \( K_S^0 \rho^0 \pi^+ \pi^-, \) no \( K^*(892)^- \)

\( \Gamma_{90} \) \( K^*(892)^- 2\pi^+ \pi^-, \)
\( K^*(892)^- \rightarrow K_S^0 \pi^-, \) no \( \rho^0 \)

\( \Gamma_{91} \) \( K^*(892)^- \rho^0 \pi^+, \)
\( K^*(892)^- \rightarrow K_S^0 \pi^- \)

\( \Gamma_{92} \) \( K_S^0 2\pi^+ 2\pi^- \) nonresonant \( < 1.2 \times 10^{-3} \) CL=90%

\( \Gamma_{93} \) \( K_S^0 \pi^+ \pi^- 2\pi^0 \) \( (\pi^0) \)

\( \Gamma_{94} \) \( K^- 3\pi^+ 2\pi^- \) \( (2.2 \pm 0.6) \times 10^{-4} \)

Fractions of many of the following modes with resonances have already appeared above as submodes of particular charged-particle modes. (Modes
for which there are only upper limits and $K^*(892)\rho$ submodes only appear below.)

\begin{align*}
\Gamma_{95} & \quad K_S^0 \eta & (4.80 \pm 0.30) \times 10^{-3} \\
\Gamma_{96} & \quad K_S^0 \omega & (1.11 \pm 0.06) \% \\
\Gamma_{97} & \quad K_S^0 \eta' (958) & (9.4 \pm 0.5) \times 10^{-3} \\
\Gamma_{98} & \quad K^- a_1 (1260)^+ & (7.9 \pm 1.1) \% \\
\Gamma_{99} & \quad K^- a_2 (1320)^+ & < 2 \times 10^{-3} \quad \text{CL}=90\% \\
\Gamma_{100} & \quad \overline{K}^*(892)^0 \pi^+ \pi^- \text{ total} & (2.4 \pm 0.5) \% \\
\Gamma_{101} & \quad \overline{K}^*(892)^0 \pi^+ \pi^- \text{ 3-body} & (1.48 \pm 0.34) \% \\
\Gamma_{102} & \quad \overline{K}^*(892)^0 \rho^0 & (1.58 \pm 0.35) \% \\
\Gamma_{103} & \quad \overline{K}^*(892)^0 \rho^0 \text{ S-wave} & (1.7 \pm 0.6) \% \\
\Gamma_{104} & \quad \overline{K}^*(892)^0 \rho^0 \text{ S-wave long.} & < 3 \times 10^{-3} \quad \text{CL}=90\% \\
\Gamma_{105} & \quad \overline{K}^*(892)^0 \rho^0 \text{ P-wave} & < 3 \times 10^{-3} \quad \text{CL}=90\% \\
\Gamma_{106} & \quad \overline{K}^*(892)^0 \rho^0 \text{ D-wave} & (2.1 \pm 0.6) \% \\
\Gamma_{108} & \quad K^- \pi^+ f_0(980) & \\
\Gamma_{109} & \quad \overline{K}^*(892)^0 f_0(980) & \\
\Gamma_{110} & \quad K_1(1270)^- \pi^+ & (1.6 \pm 0.8) \% \\
\Gamma_{111} & \quad K_1(1400)^- \pi^+ & < 1.2 \% \quad \text{CL}=90\% \\
\Gamma_{112} & \quad K^*(1410)^- \pi^+ & \\
\Gamma_{113} & \quad \overline{K}^*(892)^0 \pi^+ \pi^- \pi^0 & (1.9 \pm 0.9) \% \\
\Gamma_{114} & \quad \overline{K}^*(892)^0 \eta & (3.0 \pm 0.6) \% \\
\Gamma_{115} & \quad K^- \pi^+ \omega & (1.1 \pm 0.5) \% \\
\Gamma_{116} & \quad \overline{K}^*(892)^0 \omega & \\
\Gamma_{117} & \quad K^- \pi^+ \eta' (958) & (7.5 \pm 1.9) \times 10^{-3} \\
\Gamma_{118} & \quad \overline{K}^*(892)^0 \eta' (958) & < 1.1 \times 10^{-3} \quad \text{CL}=90\%
\end{align*}

**Hadronic modes with three K’s**

\begin{align*}
\Gamma_{119} & \quad K_S^0 K^+ K^- & (4.35 \pm 0.32) \times 10^{-3} \\
\Gamma_{120} & \quad K_S^0 a_0^0 (980), a_0^0 \rightarrow K^+ K^- & (2.9 \pm 0.4) \times 10^{-3} \\
\Gamma_{121} & \quad K^- a_0^0 (980)^+, a_0^+ \rightarrow K^+ K_S^0 & (5.8 \pm 1.7) \times 10^{-4} \\
\Gamma_{122} & \quad K^+ a_0^0 (980)^-, a_0^- \rightarrow K^- K_S^0 & < 1.1 \times 10^{-4} \quad \text{CL}=95\% \\
\Gamma_{123} & \quad K_S^0 f_0 (980), f_0 \rightarrow K^+ K^- & < 9 \times 10^{-5} \quad \text{CL}=95\% \\
\Gamma_{124} & \quad K_S^0 \phi, \phi \rightarrow K^+ K^- & (2.00 \pm 0.15) \times 10^{-3} \\
\Gamma_{125} & \quad K_S^0 f_0 (1370), f_0 \rightarrow K^+ K^- & (1.7 \pm 1.1) \times 10^{-4} \\
\Gamma_{126} & \quad 3K_S^0 & (7.5 \pm 0.6) \times 10^{-4} \quad \text{S}=1.3 \\
\Gamma_{127} & \quad K^+ 2K^- \pi^+ & (2.22 \pm 0.31) \times 10^{-4} \\
\Gamma_{128} & \quad K^+ K^- \overline{K}^*(892)^0, \overline{K}^*0 \rightarrow K^- \pi^+ & (4.4 \pm 1.7) \times 10^{-5} \\
\Gamma_{129} & \quad K^- \pi^+ \phi, \phi \rightarrow K^+ K^- & (4.0 \pm 1.7) \times 10^{-5} \\
\Gamma_{130} & \quad \phi \overline{K}^*(892)^0, \phi \rightarrow K^+ K^- & (1.06 \pm 0.20) \times 10^{-4} \\
\Gamma_{131} & \quad K^+ 2K^- \pi^+ \text{ nonresonant} & (3.3 \pm 1.5) \times 10^{-5} \\
\Gamma_{132} & \quad 2K_S^0 K^\pm \pi^\mp & (5.8 \pm 1.2) \times 10^{-4}
\end{align*}


\[ \Gamma_{133} \pi^+ \pi^- \]
\[ \Gamma_{134} 2\pi^0 \]
\[ \Gamma_{135} \pi^+ \pi^- \pi^0 \]
\[ \Gamma_{136} \rho^+ \pi^- \]
\[ \Gamma_{137} \rho^0 \pi^0 \]
\[ \Gamma_{138} \rho^- \pi^+ \]
\[ \Gamma_{139} \rho(1450)^+ \pi^- , \rho^+ \rightarrow \pi^+ \pi^0 \]
\[ \Gamma_{140} \rho(1450)^0 \pi^0 , \rho^0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{141} \rho(1450)^- \pi^+ , \rho^- \rightarrow \pi^- \pi^0 \]
\[ \Gamma_{142} \rho(1700)^+ \pi^- , \rho^+ \rightarrow \pi^+ \pi^0 \]
\[ \Gamma_{143} \rho(1700)^0 \pi^0 , \rho^0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{144} \rho(1700)^- \pi^+ , \rho^- \rightarrow \pi^- \pi^0 \]
\[ \Gamma_{145} f_0(980)^0 , f_0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{146} f_0(500)^0 , f_0 \rightarrow \pi^+ \pi^- \]
\[ (\pi^+ \pi^-)_{S\text{-wave}} \]
\[ \Gamma_{147} f_0(1370)^0 , f_0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{148} f_0(1500)^0 , f_0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{149} f_0(1710)^0 , f_0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{150} f_0(1270)^0 , f_2 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{151} f_2(1270)^0 , f_2 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{152} \pi^+ \pi^- \pi^0 \text{ nonresonant} \]
\[ \Gamma_{153} 3\pi^0 \]
\[ \Gamma_{154} 2\pi^+ 2\pi^- \]
\[ \Gamma_{155} a_1(1260)^+ \pi^- , a_1^+ \rightarrow \]
\[ \Gamma_{156} 2\pi^+ \pi^- \text{ total} \]
\[ \Gamma_{157} a_1(1260)^+ \pi^- , a_1^+ \rightarrow \rho^0 \pi^+ \text{ S-wave} \]
\[ \Gamma_{158} a_1(1260)^+ \pi^- , a_1^+ \rightarrow \rho^0 \pi^+ \text{ D-wave} \]
\[ \Gamma_{159} 2\rho^0 \text{ total} \]
\[ \Gamma_{160} 2\rho^0 , \text{ parallel helicities} \]
\[ \Gamma_{161} 2\rho^0 , \text{ perpendicular helicities} \]
\[ \Gamma_{162} 2\rho^0 , \text{ longitudinal helicities} \]
\[ \Gamma_{163} \text{ Resonant} (\pi^+ \pi^-) \pi^+ \pi^- \]
\[ \Gamma_{164} \pi^+ \pi^- \pi^0 \text{ total} \]
\[ \Gamma_{165} f_0(980)^+ \pi^- , f_0 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{166} f_2(1270)^+ \pi^- , f_2 \rightarrow \pi^+ \pi^- \]
\[ \Gamma_{167} \eta \pi^0 [i] \]
\[ \Gamma_{168} \omega \pi^0 [i] \]

\[ (1.407 \pm 0.025) \times 10^{-3} \quad S=1.1 \]
\[ (8.22 \pm 0.25) \times 10^{-4} \]
\[ (1.47 \pm 0.06 \%) \quad S=2.1 \]
\[ (10.0 \pm 0.4) \times 10^{-3} \]
\[ (3.81 \pm 0.23) \times 10^{-3} \]
\[ (5.08 \pm 0.25) \times 10^{-3} \]
\[ (1.6 \pm 2.0) \times 10^{-5} \]
\[ (4.4 \pm 1.9) \times 10^{-5} \]
\[ (2.6 \pm 0.4) \times 10^{-4} \]
\[ (6.0 \pm 1.5) \times 10^{-4} \]
\[ (7.3 \pm 1.7) \times 10^{-4} \]
\[ (4.7 \pm 1.1) \times 10^{-4} \]
\[ (3.7 \pm 0.8) \times 10^{-5} \]
\[ (1.20 \pm 0.21) \times 10^{-4} \]
\[ (5.4 \pm 2.1) \times 10^{-5} \]
\[ (5.7 \pm 1.6) \times 10^{-5} \]
\[ (4.5 \pm 1.6) \times 10^{-5} \]
\[ (1.94 \pm 0.21) \times 10^{-4} \]
\[ (1.2 \pm 0.4) \times 10^{-4} \]
\[ \left< 3.5 \right> \times 10^{-4} \quad \text{CL=90%} \]
\[ (7.45 \pm 0.20) \times 10^{-3} \]
\[ (4.47 \pm 0.31) \times 10^{-3} \]
\[ (3.23 \pm 0.25) \times 10^{-3} \]
\[ (1.9 \pm 0.5) \times 10^{-4} \]
\[ (6.2 \pm 0.7) \times 10^{-4} \]
\[ (1.83 \pm 0.13) \times 10^{-3} \]
\[ (8.2 \pm 3.2) \times 10^{-5} \]
\[ (4.8 \pm 0.6) \times 10^{-4} \]
\[ (1.25 \pm 0.10) \times 10^{-3} \]
\[ (1.49 \pm 0.12) \times 10^{-3} \]
\[ (6.1 \pm 0.9) \times 10^{-4} \]
\[ (1.8 \pm 0.5) \times 10^{-4} \]
\[ (3.7 \pm 0.6) \times 10^{-4} \]
\[ (1.00 \pm 0.09 \%) \]
\[ (6.7 \pm 0.6) \times 10^{-4} \]
\[ (1.17 \pm 0.35) \times 10^{-4} \]
$\Gamma_{170}\ 2\pi^+\pi^-\pi^0$  
$\Gamma_{171}\ \eta\pi^+\pi^-$  
$\Gamma_{172}\ \omega\pi^+\pi^-$  
$\Gamma_{173}\ 3\pi^+3\pi^-$  
$\Gamma_{174}\ \eta'(958)\pi^0$  
$\Gamma_{175}\ \eta'(958)\pi^+\pi^-$  
$\Gamma_{176}\ 2\eta$  
$\Gamma_{177}\ \eta\eta'(958)$

### Hadronic modes with a $K\bar{K}$ pair

<table>
<thead>
<tr>
<th>$\Gamma$</th>
<th>Reaction</th>
<th>Width $W$ (MeV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Gamma_{178}$</td>
<td>$K^+K^-$</td>
<td>$(3.97 \pm 0.07) \times 10^{-3}$</td>
</tr>
<tr>
<td>$\Gamma_{179}$</td>
<td>$2K_S^0$</td>
<td>$(1.70 \pm 0.12) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{180}$</td>
<td>$K_S^0K^-\pi^+$</td>
<td>$(3.3 \pm 0.5) \times 10^{-3}$</td>
</tr>
<tr>
<td>$\Gamma_{181}$</td>
<td>$K^+(892)^0K_S^0$, $K^*0 \rightarrow$</td>
<td>$(8.1 \pm 1.6) \times 10^{-5}$</td>
</tr>
<tr>
<td>$\Gamma_{182}$</td>
<td>$K^*(892)^0K^-, K^{**} \rightarrow$</td>
<td>$(1.86 \pm 0.30) \times 10^{-3}$</td>
</tr>
<tr>
<td>$\Gamma_{183}$</td>
<td>$K^+(1410)^0K_S^0$, $K^*0 \rightarrow$</td>
<td>$(1.2 \pm 1.8) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{184}$</td>
<td>$K^+(1410)^0K^-, K^{**} \rightarrow$</td>
<td>$(3.1 \pm 1.9) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{185}$</td>
<td>$(K^-\pi^+)_{S-wave}K_S^0$</td>
<td>$(5.9 \pm 2.8) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{186}$</td>
<td>$(K_S^0\pi^+)_{S-wave}K^-$</td>
<td>$(3.8 \pm 1.0) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{187}$</td>
<td>$a_0(980)^-\pi^+, a_0^- \rightarrow K_S^0K^-$</td>
<td>$(1.3 \pm 1.4) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{188}$</td>
<td>$a_0(1450)^-\pi^+, a_0^- \rightarrow$</td>
<td>$(2.4 \pm 2.0) \times 10^{-5}$</td>
</tr>
<tr>
<td>$\Gamma_{189}$</td>
<td>$a_2(1320)^-\pi^+, a_2^- \rightarrow$</td>
<td>$(5 \pm 5) \times 10^{-6}$</td>
</tr>
<tr>
<td>$\Gamma_{190}$</td>
<td>$\rho(1450)^-\pi^+, \rho^- \rightarrow K_S^0K^-$</td>
<td>$(4.6 \pm 2.5) \times 10^{-5}$</td>
</tr>
<tr>
<td>$\Gamma_{191}$</td>
<td>$K_S^0K^+\pi^-$</td>
<td>$(2.13 \pm 0.34) \times 10^{-3}$</td>
</tr>
<tr>
<td>$\Gamma_{192}$</td>
<td>$K^+(892)^0K_S^0$, $K^*0 \rightarrow$</td>
<td>$(1.10 \pm 0.21) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{193}$</td>
<td>$K^+(892)^0K^-, K^{**} \rightarrow$</td>
<td>$(6.1 \pm 1.0) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{194}$</td>
<td>$K^+(1410)^0K_S^0$, $K^*0 \rightarrow$</td>
<td>$(5 \pm 8) \times 10^{-5}$</td>
</tr>
<tr>
<td>$\Gamma_{195}$</td>
<td>$K^+(1410)^-K^+, K^{**} \rightarrow$</td>
<td>$(2.5 \pm 2.0) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{196}$</td>
<td>$(K^+\pi^-)_{S-wave}K_S^0$</td>
<td>$(3.6 \pm 1.9) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{197}$</td>
<td>$(K_S^0\pi^-)_{S-wave}K^+$</td>
<td>$(1.3 \pm 0.6) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{198}$</td>
<td>$a_0(980)^+\pi^-, a_0^+ \rightarrow K_S^0K^+$</td>
<td>$(6 \pm 4) \times 10^{-4}$</td>
</tr>
<tr>
<td>$\Gamma_{199}$</td>
<td>$a_0(1450)^+\pi^-, a_0^+ \rightarrow$</td>
<td>$(3.2 \pm 2.5) \times 10^{-5}$</td>
</tr>
</tbody>
</table>
\[\Gamma_{200} \quad \rho(1700)^{\pm} \pi^-, \; \rho^+ \rightarrow K_S^0 K^+ \quad (1.1 \pm 0.6) \times 10^{-5}\]

\[\Gamma_{201} \quad K^+ K^- \pi^0 \quad (3.37 \pm 0.15) \times 10^{-3}\]

\[\Gamma_{202} \quad K^*(892)^{\pm} K^-, \; K^*(892)^+ \rightarrow K^0 \pi^0 \quad (1.50 \pm 0.07) \times 10^{-3}\]

\[\Gamma_{203} \quad K^*(892)^- K^+, \; K^*(892)^- \rightarrow K^- \pi^0 \quad (5.4 \pm 0.4) \times 10^{-4}\]

\[\Gamma_{204} \quad (K^+ \pi^0)_s \text{wave } K^- \quad (2.40 \pm 0.17) \times 10^{-3}\]

\[\Gamma_{205} \quad (K^- \pi^0)_s \text{wave } K^+ \quad (1.3 \pm 0.5) \times 10^{-4}\]

\[\Gamma_{206} \quad f_0(980) \pi^0, \; f_0 \rightarrow K^+ K^- \quad (3.5 \pm 0.6) \times 10^{-4}\]

\[\Gamma_{207} \quad \phi \pi^0, \; \phi \rightarrow K^+ K^- \quad (6.5 \pm 0.4) \times 10^{-4}\]

\[\Gamma_{208} \quad K^+ K^- \pi^0 \text{ nonresonant} \quad < 5.9 \times 10^{-4}\]

\[\Gamma_{209} \quad 2K_S^0 \pi^0 \quad (2.44 \pm 0.11) \times 10^{-3}\]

\[\Gamma_{210} \quad K^+ K^- \pi^+ \pi^- \quad (2.51 \pm 0.33) \times 10^{-4}\]

\[\Gamma_{211} \quad \phi(\pi^+ \pi^-)_s \text{wave}, \; \phi \rightarrow K^+ K^- \quad (9.3 \pm 1.2) \times 10^{-4}\]

\[\Gamma_{212} \quad (\phi \rho^0)_p \text{wave}, \; \phi \rightarrow K^+ K^- \quad (8.3 \pm 2.3) \times 10^{-5}\]

\[\Gamma_{213} \quad (\phi' \rho^0)_D \text{wave}, \; \phi' \rightarrow K^+ K^- \quad (1.49 \pm 0.30) \times 10^{-4}\]

\[\Gamma_{214} \quad (K^0 \rho^0)_s \text{wave}, \; K^0 \rightarrow K^+ \pi^\mp \quad (2.7 \pm 0.5) \times 10^{-4}\]

\[\Gamma_{215} \quad (K^- \pi^+)_p \text{wave}, \; (K^+ \pi^-)_s \text{wave}, \; K^+ \pi^- \rightarrow K^+ \pi^- \quad (1.8 \pm 0.5) \times 10^{-4}\]

\[\Gamma_{216} \quad K_1(1270)^0 K^-, \; K_1^+ \rightarrow K^0 \pi^+ \quad (1.14 \pm 0.26) \times 10^{-4}\]

\[\Gamma_{217} \quad K_1(1270)^0 K^-, \; K_1^+ \rightarrow \rho^0 K^+ \quad (2.2 \pm 1.2) \times 10^{-5}\]

\[\Gamma_{218} \quad K_1(1270)^0 K^+, \; K_1^- \rightarrow \rho^0 K^- \quad (1.46 \pm 0.25) \times 10^{-4}\]

\[\Gamma_{219} \quad K^*(1410)^0 K^- \rightarrow K^0 \pi^+ \quad (1.02 \pm 0.26) \times 10^{-4}\]

\[\Gamma_{220} \quad K^*(1410)^0 K^+ \rightarrow K^0 \pi^- \quad (1.14 \pm 0.25) \times 10^{-4}\]

\[\Gamma_{221} \quad K^0 K^- \rho^0 3\text{-body} \quad (1.14 \pm 0.25) \times 10^{-4}\]

\[\Gamma_{222} \quad f_0(980) \pi^+ \pi^- \rightarrow K^+ K^- \quad (1.50 \pm 0.07) \times 10^{-3}\]

\[\Gamma_{223} \quad K^*(892)^0 K^\mp \pi^\pm 3\text{-body, } K^*0 \rightarrow K^\pm \pi^\mp \quad (2.40 \pm 0.17) \times 10^{-3}\]

\[\Gamma_{224} \quad K^*(892)^0 K^\mp \pi^\pm 3\text{-body, } K^*0 \rightarrow K^\pm \pi^\mp \quad (1.3 \pm 0.5) \times 10^{-4}\]

\[\Gamma_{225} \quad K^*(892)^0 K^*(892)^0, \; K^*0 \rightarrow K^\pm \pi^\mp \quad (5.4 \pm 0.4) \times 10^{-4}\]

\[\Gamma_{226} \quad K_1(1270)^0 K^+, \; K_1^- \rightarrow K^\pm \pi^\mp \quad (6.5 \pm 0.4) \times 10^{-4}\]

\[\Gamma_{227} \quad K_1(1400)^0 K^+, \; K_1^- \rightarrow K^\pm \pi^\mp \quad (2.51 \pm 0.33) \times 10^{-4}\]
\[ \Gamma_{228} \quad 2K^0 \pi^+ \pi^- \quad (1.20 \pm 0.23) \times 10^{-3} \]
\[ \Gamma_{229} \quad K^0_S K^- 2\pi^+ \pi^- \quad < 1.4 \times 10^{-4} \quad \text{CL}=90\% \]
\[ \Gamma_{230} \quad K^+ K^- \pi^+ \pi^- \pi^0 \quad (3.1 \pm 2.0) \times 10^{-3} \]

Other \( K \overline{\Gamma} X \) modes. They include all decay modes of the \( \phi, \eta, \) and \( \omega \).
\[ \Gamma_{231} \quad \phi \pi^0 \quad (1.4 \pm 0.5) \times 10^{-4} \]
\[ \Gamma_{232} \quad \phi \eta \quad < 2.1 \times 10^{-3} \quad \text{CL}=90\% \]
\[ \Gamma_{233} \quad \phi \omega \quad < 2.4 \times 10^{-4} \quad \text{CL}=90\% \]

**Radiative modes**
\[ \Gamma_{234} \quad \rho^0 \gamma \quad (1.76 \pm 0.31) \times 10^{-5} \]
\[ \Gamma_{235} \quad \omega \gamma \quad < 2.4 \times 10^{-4} \quad \text{CL}=90\% \]
\[ \Gamma_{236} \quad \phi \gamma \quad (2.74 \pm 0.19) \times 10^{-5} \]
\[ \Gamma_{237} \quad K^*(892)^0 \gamma \quad (4.1 \pm 0.7) \times 10^{-4} \]

**Doubly Cabibbo suppressed (DC) modes or \( \Delta C = 2 \) forbidden via mixing (C2M) modes**
\[ \Gamma_{238} \quad K^+ \ell^- \pi^0 \text{via} \overline{D}^0 \quad < 2.2 \times 10^{-5} \quad \text{CL}=90\% \]
\[ \Gamma_{239} \quad K^+ \text{or} K^*(892)^+ e^- \pi^0 \text{via} \overline{D}^0 \quad < 6 \times 10^{-5} \quad \text{CL}=90\% \]
\[ \Gamma_{240} \quad K^+ \pi^- \text{ via DCS} \quad (1.48 \pm 0.07) \times 10^{-4} \quad \text{S}=2.8 \]
\[ \Gamma_{241} \quad K^+ \pi^- \text{ via DCS} \quad (1.31 \pm 0.08) \times 10^{-4} \]
\[ \Gamma_{242} \quad K^0_S \pi^+ \pi^- \text{ in} \overline{D}^0 \rightarrow \overline{D}^0 \quad < 1.6 \times 10^{-5} \quad \text{CL}=95\% \]
\[ \Gamma_{243} \quad K^0_S \pi^+ \pi^- \text{ in} \overline{D}^0 \rightarrow \overline{D}^0 \quad < 1.7 \times 10^{-4} \quad \text{CL}=95\% \]
\[ \Gamma_{244} \quad K^*(892)^+ \pi^-, K^{*-} \rightarrow DC \quad (1.11 \pm 0.60) \times 10^{-4} \]
\[ \Gamma_{245} \quad K^+_0 (1430)^+ \pi^-, K^{*-} \rightarrow DC \quad < 1.4 \times 10^{-5} \]
\[ \Gamma_{246} \quad K^+_2 (1430)^+ \pi^-, K^{*-} \rightarrow DC \quad < 3.3 \times 10^{-5} \]
\[ \Gamma_{247} \quad K^+ \pi^- \pi^0 \text{ via} \overline{D}^0 \quad (3.01 \pm 0.15) \times 10^{-4} \]
\[ \Gamma_{248} \quad K^+ \pi^- \pi^0 \text{ via} \overline{D}^0 \quad (7.5 \pm 0.5) \times 10^{-4} \]
\[ \Gamma_{249} \quad K^+ \pi^- 2\pi^- \text{ via DCS} \quad (2.45 \pm 0.07) \times 10^{-4} \]
\[ \Gamma_{250} \quad K^+ \pi^- 2\pi^- \text{ via DCS} \quad (2.61 \pm 0.06) \times 10^{-4} \]
\[ \Gamma_{251} \quad K^+ \pi^- 2\pi^- \text{ via} \overline{D}^0 \quad (7.8 \pm 2.9) \times 10^{-6} \]
\[ \Gamma_{252} \quad K^+ \pi^- \text{ or} K^+ \pi^+ 2\pi^- \text{ via} \overline{D}^0 \quad < 4 \times 10^{-4} \quad \text{CL}=90\% \]

**\( \Delta C = 1 \) weak neutral current (CI) modes,**
**Lepton Family number (LF) violating modes,**
**Lepton (L) or Baryon (B) number violating modes**
\[ \Gamma_{254} \quad \gamma \gamma \quad CI \quad < 8.5 \times 10^{-7} \quad \text{CL}=90\% \]
\[ \Gamma_{255} \quad e^+ e^- \quad CI \quad < 7.9 \times 10^{-8} \quad \text{CL}=90\% \]
\[ \Gamma_{256} \quad \mu^+ \mu^- \quad CI \quad < 6.2 \times 10^{-9} \quad \text{CL}=90\% \]
\[
\begin{array}{lcl}
\Gamma_{257} \pi^0 e^+ e^- & C1 & < 4.5 \times 10^{-5} \text{ CL=90}\% \\
\Gamma_{258} \pi^0 \mu^+ \mu^- & C1 & < 1.8 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{259} \eta e^+ e^- & C1 & < 1.1 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{260} \eta \mu^+ \mu^- & C1 & < 5.3 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{261} \pi^+ \pi^- e^+ e^- & C1 & < 3.73 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{262} \rho^0 e^+ e^- & C1 & < 1.0 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{263} \pi^0 \pi^- \mu^+ \mu^- & C1 & < 5.5 \times 10^{-7} \text{ CL=90}\% \\
\Gamma_{264} \rho^0 \mu^+ \mu^- & C1 & < 2.2 \times 10^{-5} \text{ CL=90}\% \\
\Gamma_{265} \omega e^+ e^- & C1 & < 1.8 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{266} \omega \mu^+ \mu^- & C1 & < 8.3 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{267} K^- K^+ e^+ e^- & C1 & < 3.15 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{268} \phi e^+ e^- & C1 & < 5.2 \times 10^{-5} \text{ CL=90}\% \\
\Gamma_{269} K^- K^+ \mu^+ \mu^- & C1 & < 3.3 \times 10^{-5} \text{ CL=90}\% \\
\Gamma_{270} \phi \mu^+ \mu^- & C1 & < 3.1 \times 10^{-5} \text{ CL=90}\% \\
\Gamma_{271} \overline{\Gamma}_0 e^+ e^- & [j] & < 1.1 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{272} \overline{\Gamma}_0 \mu^+ \mu^- & [j] & < 2.6 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{273} K^- \pi^+ e^+ e^- & C1 & < 3.85 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{274} \overline{\Gamma}^*(892)0 e^+ e^- & [j] & < 4.7 \times 10^{-5} \text{ CL=90}\% \\
\Gamma_{275} K^- \pi^+ \mu^+ \mu^- & C1 & < 3.59 \times 10^{-4} \text{ CL=90}\% \\
\Gamma_{276} K^- \pi^+ \mu^+ \mu^-, 675 < m_{\mu\mu} < 875 \text{ MeV} & & (4.2 \pm 0.4) \times 10^{-6} \\
\end{array}
\]
\[ \Gamma_{298} \quad 2K^- e^+ \mu^+ + \text{c.c.} \quad L < 5.7 \times 10^{-5} \quad \text{CL}=90\% \]

\[ \Gamma_{299} \quad p e^- \quad L,B \quad [l] < 1.0 \times 10^{-5} \quad \text{CL}=90\% \]

\[ \Gamma_{300} \quad \bar{p} e^+ \quad L,B \quad [n] < 1.1 \times 10^{-5} \quad \text{CL}=90\% \]

\[ \Gamma_{301} \quad \text{Unaccounted decay modes} \quad (37.9 \pm 1.3\%) \quad S=1.1 \]

[a] This value is obtained by subtracting the branching fractions for 2-, 4- and 6-prongs from unity.

[b] This is the sum of our \( K^- 2\pi^+ \pi^- \), \( K^- 2\pi^+ \pi^- \pi^0 \), \( \bar{K}^0 2\pi^+ 2\pi^- \), \( K^+ 2K^- \pi^+ \), \( 2\pi^+ 2\pi^- \), \( 2\pi^+ 2\pi^- \pi^0 \), \( K^+ K^- \pi^+ \pi^- \), and \( K^+ K^- \pi^+ \pi^- \pi^0 \), branching fractions.

[c] This is the sum of our \( K^- 3\pi^+ 2\pi^- \) and \( 3\pi^+ 3\pi^- \) branching fractions.

[d] The branching fractions for the \( K^- e^+ \nu_e \), \( K^* (892) e^+ \nu_e \), \( \pi^- e^+ \nu_e \), and \( \rho^- e^+ \nu_e \) modes add up to \( 6.19 \pm 0.17\% \).

[e] 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.

[f] This is a doubly Cabibbo-suppressed mode.

[g] The two experiments measuring this fraction are in serious disagreement. See the Particle Listings.

[h] Submodes of the \( D^0 \to K_S^0 \pi^+ \pi^- \pi^0 \) mode with a \( K^* \) and/or \( \rho \) were studied by COFFMAN 92B, but with only 140 events. With nothing new for 18 years, we refer to our 2008 edition, Physics Letters B667 1 (2008), for those results.

[i] This branching fraction includes all the decay modes of the resonance in the final state.

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

[k] The value is for the sum of the charge states or particle/antiparticle states indicated.

[l] This limit is for either \( D^0 \) or \( \bar{D}^0 \) to \( p e^- \).

[n] This limit is for either \( D^0 \) or \( \bar{D}^0 \) to \( \bar{p} e^+ \).

---

**CONSTRAINED FIT INFORMATION**

An overall fit to 55 branching ratios uses 114 measurements and one constraint to determine 32 parameters. The overall fit has a \( \chi^2 = 108.1 \) for 83 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients \( \langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j) \), 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.
\(x_19\) & 0 \\
\(x_{20}\) & 20 & 3 \\
\(x_{21}\) & 0 & 0 & 0 \\
\(x_{29}\) & 0 & 1 & 1 & 0 \\
\(x_{30}\) & 3 & 0 & 17 & 0 & 0 \\
\(x_{32}\) & 3 & 16 & 16 & 2 & 4 & 3 \\
\(x_{34}\) & 1 & 5 & 5 & 2 & 1 & 1 & 31 \\
\(x_{36}\) & 0 & 2 & 2 & 15 & 0 & 0 & 11 & 14 \\
\(x_{51}\) & 1 & 4 & 4 & 0 & 1 & 1 & 28 & 8 & 3 \\
\(x_{68}\) & 2 & 9 & 9 & 1 & 2 & 2 & 55 & 17 & 6 & 15 \\
\(x_{77}\) & 0 & 1 & 1 & 6 & 0 & 0 & 4 & 5 & 38 & 1 \\
\(x_{81}\) & 0 & 2 & 2 & 0 & 0 & 0 & 10 & 3 & 1 & 3 \\
\(x_{95}\) & 1 & 3 & 3 & 0 & 1 & 0 & 16 & 5 & 2 & 4 \\
\(x_{96}\) & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 5 & 0 \\
\(x_{97}\) & 1 & 3 & 3 & 3 & 1 & 0 & 18 & 7 & 19 & 5 \\
\(x_{126}\) & 0 & 0 & 0 & 3 & 0 & 0 & 2 & 3 & 20 & 1 \\
\(x_{133}\) & 2 & 9 & 9 & 1 & 2 & 2 & 57 & 17 & 6 & 16 \\
\(x_{134}\) & 0 & 1 & 1 & 0 & 0 & 0 & 9 & 3 & 1 & 2 \\
\(x_{135}\) & 1 & 4 & 4 & 0 & 1 & 1 & 24 & 7 & 3 & 82 \\
\(x_{154}\) & 1 & 6 & 6 & 1 & 1 & 1 & 37 & 11 & 4 & 10 \\
\(x_{168}\) & 0 & 1 & 1 & 0 & 0 & 0 & 7 & 2 & 1 & 2 \\
\(x_{174}\) & 0 & 1 & 1 & 0 & 0 & 0 & 6 & 2 & 1 & 2 \\
\(x_{176}\) & 0 & 1 & 1 & 0 & 0 & 0 & 9 & 3 & 1 & 2 \\
\(x_{177}\) & 0 & 1 & 1 & 0 & 0 & 0 & 4 & 1 & 0 & 1 \\
\(x_{178}\) & 2 & 9 & 9 & 1 & 2 & 2 & 55 & 17 & 6 & 15 \\
\(x_{179}\) & 0 & 1 & 1 & 0 & 0 & 0 & 6 & 2 & 1 & 2 \\
\(x_{180}\) & 0 & 1 & 1 & 5 & 0 & 0 & 5 & 5 & 34 & 1 \\
\(x_{191}\) & 0 & 1 & 1 & 5 & 0 & 0 & 5 & 5 & 34 & 1 \\
\(x_{236}\) & 0 & 2 & 2 & 0 & 1 & 0 & 15 & 4 & 2 & 4 \\
\(x_{240}\) & 1 & 3 & 3 & 0 & 1 & 1 & 21 & 7 & 2 & 6 \\
\(x_{301}\) & -49 & -8 & -25 & -18 & -2 & -6 & -35 & -18 & -40 & -51 \\

\(x_6\) & \(x_{19}\) & \(x_{20}\) & \(x_{21}\) & \(x_{29}\) & \(x_{30}\) & \(x_{32}\) & \(x_{34}\) & \(x_{36}\) & \(x_{51}\)
\[ 2 \]
\[
\begin{array}{ccccccccc}
  x_{77} & x_{81} & x_{85} & x_{96} & x_{97} & x_{126} & x_{133} & x_{134} & x_{135} \\
  10 & 12 & 0 & 0 & 0 & 0 & 10 & 1 & 1
\end{array}
\]

\[ 5 \]
\[
\begin{array}{ccccccccc}
  x_{134} & x_{135} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} \\
  31 & 2 & 6 & 9 & 0 & 0 & 10 & 1 & 1
\end{array}
\]

\[ 13 \]
\[
\begin{array}{ccccccccc}
  x_{135} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} \\
  13 & 1 & 2 & 4 & 0 & 0 & 4 & 1 & 13
\end{array}
\]

\[ 50 \]
\[
\begin{array}{ccccccccc}
  x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} & x_{181} \\
  50 & 2 & 7 & 6 & 0 & 0 & 7 & 1 & 21
\end{array}
\]

\[ 4 \]
\[
\begin{array}{ccccccccc}
  x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} & x_{181} & x_{182} \\
  4 & 0 & 1 & 1 & 0 & 1 & 0 & 0 & 4
\end{array}
\]

\[ 5 \]
\[
\begin{array}{ccccccccc}
  x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} & x_{181} & x_{182} & x_{183} \\
  5 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0
\end{array}
\]

\[ 0 \]
\[
\begin{array}{ccccccccc}
  x_{177} & x_{178} & x_{179} & x_{180} & x_{181} & x_{182} & x_{183} & x_{184} & x_{185} \\
  2 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 2
\end{array}
\]

\[ 30 \]
\[
\begin{array}{ccccccccc}
  x_{178} & x_{179} & x_{180} & x_{181} & x_{182} & x_{183} & x_{184} & x_{185} & x_{186} \\
  30 & 2 & 6 & 9 & 0 & 0 & 10 & 1 & 31
\end{array}
\]

\[ 3 \]
\[
\begin{array}{ccccccccc}
  x_{180} & x_{191} & x_{236} & x_{240} & x_{301} & x_{154} & x_{168} & x_{174} & x_{176} \\
  3 & 13 & 1 & 1 & 2 & 7 & 7 & 7 & 3
\end{array}
\]

\[ 8 \]
\[
\begin{array}{ccccccccc}
  x_{236} & x_{240} & x_{301} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} \\
  8 & 1 & 2 & 2 & 0 & 0 & 3 & 0 & 8
\end{array}
\]

\[ 12 \]
\[
\begin{array}{ccccccccc}
  x_{240} & x_{301} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} \\
  12 & 1 & 2 & 4 & 0 & 4 & 0 & 12 & 2
\end{array}
\]

\[ -30 \]
\[
\begin{array}{ccccccccc}
  x_{301} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} \\
\end{array}
\]

\[ -7 \]
\[
\begin{array}{ccccccccc}
  x_{301} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} \\
  -19 & -3 & -3 & -3 & -5 & -3 & -5 & -2 & -2
\end{array}
\]

\[ -5 \]
\[
\begin{array}{ccccccccc}
  x_{240} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} \\
\end{array}
\]

\[ -5 \]
\[
\begin{array}{ccccccccc}
  x_{236} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} \\
\end{array}
\]

\[ -7 \]
\[
\begin{array}{ccccccccc}
  x_{240} & x_{154} & x_{168} & x_{174} & x_{176} & x_{177} & x_{178} & x_{179} & x_{180} \\
\end{array}
\]
CONSTRANDED FIT INFORMATION

An overall fit to 3 branching ratios uses 3 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 = 0.0$ for 0 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, $x_i = \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the $x_i$ whose labels appear in this array to sum to one.

$$
\begin{array}{|c|c|}
\hline
x_2 & -100 \\
\hline
x_3 & -46 \quad 40 \\
\hline
x_4 & 0 \quad 0 \quad 0 \\
\hline
\end{array}
$$

$\chi^2$ for 0 degrees of freedom.

$\nu_{\mu} \approx 27 \text{ GeV}$ from unity.

---

$\Gamma(0\text{-prongs}) / \Gamma_{\text{total}}$

This value is obtained by subtracting the branching fractions for 2-, 4-, and 6-prongs from unity.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.15 \pm 0.06$ OUR FIT</td>
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</tr>
</tbody>
</table>

$\Gamma(4\text{-prongs}) / \Gamma(2\text{-prongs})$

<table>
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<th>DOCUMENT ID</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
<tr>
<td>$0.207 \pm 0.016 \pm 0.004$</td>
<td>ONENGUT 05 CHRS $\nu_{\mu}$ emulsion, $\bar{\nu}_{\mu} \approx 27 \text{ GeV}$</td>
</tr>
</tbody>
</table>

---

$\Gamma(4\text{-prongs}) / \Gamma_{\text{total}}$

This is the sum of our $K^-2\pi^+\pi^-$, $K^-2\pi^+\pi^-\pi^0$, $\bar{K}^02\pi^+2\pi^-$, $K^+2K^-\pi^+$, $2\pi^+2\pi^-$, $2\pi^+2\pi^-\pi^0$, $K^+K^-\pi^+\pi^-$, and $K^+K^-\pi^+\pi^-\pi^0$ branching fractions.

<table>
<thead>
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<th>DOCUMENT ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.145 \pm 0.005$ OUR FIT</td>
<td></td>
</tr>
<tr>
<td>$0.145 \pm 0.005$</td>
<td>PDG 12</td>
</tr>
</tbody>
</table>

---

$\Gamma(6\text{-prongs}) / \Gamma_{\text{total}}$

This is the sum of our $K^-3\pi^+2\pi^-$ and $3\pi^+3\pi^-$ branching fractions.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-4}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6.4 \pm 1.3$ OUR FIT</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>$6.4 \pm 1.3$</td>
<td>PDG 12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\nu_{\mu} \approx 27 \text{ GeV}$ from unity.

---

12 $\pm 13$ $^9$ $\pm 2$ | ONENGUT 05 CHRS $\nu_{\mu}$ emulsion, $\bar{\nu}_{\mu} \approx 27 \text{ GeV}$

---

D$^0$ BRANCHING RATIOS

Some older now obsolete results have been omitted from these Listings.
### Inclusive modes

\[ \Gamma(e^+ \text{ anything})/\Gamma_{\text{total}} \]  
\[ \Gamma_5/\Gamma \]

The branching fractions for the \( K^- e^+ \nu_e, K^* (892) e^+ \nu_e, \pi^- e^+ \nu_e, \) and \( \rho^- e^+ \nu_e \) modes add up to 6.20 \( \pm 0.17 \) %.

<table>
<thead>
<tr>
<th>VALUE (%</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>6.49( \pm 0.11 ) OUR AVERAGE</td>
<td>6.46( \pm 0.09 \pm 0.11 ) 6584 ( \pm 96 )</td>
<td>1 ASNER 10 CLEO</td>
<td>e(^+)e(^-) at 3774 MeV</td>
<td></td>
</tr>
<tr>
<td>6.3</td>
<td>6.46 ( \pm 0.17 \pm 0.13 ) 2246 ( \pm 57 )</td>
<td>1 ABLIKIM 07G BES2</td>
<td>e(^+)e(^-) ( \approx \psi(3770) )</td>
<td></td>
</tr>
<tr>
<td>6.9</td>
<td>6.9 ± 0.3 ± 0.5</td>
<td>1 ALBRECHT 96c ARG</td>
<td>e(^+)e(^-) ( \approx 10 ) GeV</td>
<td></td>
</tr>
<tr>
<td>6.64</td>
<td>6.64 ( \pm 0.18 \pm 0.29 ) 4609</td>
<td>1 KUBOTA 96b CLE2</td>
<td>e(^+)e(^-) ( \approx T(4S) )</td>
<td></td>
</tr>
</tbody>
</table>

\(^{1}\) Using the \( D^+ \) and \( D^0 \) lifetimes, ASNER 10 finds that the ratio of the \( D^+ \) and \( D^0 \) semileptonic widths is 0.985 \( \pm 0.015 \pm 0.024 \).

\[ \Gamma(\mu^+ \text{ anything})/\Gamma_{\text{total}} \]  
\[ \Gamma_6/\Gamma \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.7( \pm 0.6 ) OUR FIT</td>
<td>6.8 ( \pm 1.5 \pm 0.8 ) 79 ( \pm 10 )</td>
<td>1 ABLIKIM 08L BES2</td>
<td>e(^+)e(^-) ( \approx \psi(3772) )</td>
<td></td>
</tr>
<tr>
<td>6.4( \pm 0.8 ) OUR AVERAGE</td>
<td>6.5 ( \pm 1.2 \pm 0.3 ) 36</td>
<td>1 KAYIS-TOPAK.05 CHRS</td>
<td>( \nu_\mu ) emulsion</td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>6.0 ( \pm 0.7 \pm 1.2 ) 310</td>
<td>1 ALBRECHT 96c ARG</td>
<td>e(^+)e(^-) ( \approx 10 ) GeV</td>
<td></td>
</tr>
</tbody>
</table>

\(^{1}\) ABLIKIM 08L finds the ratio of \( D^+ \rightarrow \mu^+ X \) and \( D^0 \rightarrow \mu^+ X \) branching fractions to be 2.59 \( \pm 0.70 \pm 0.25 \), in accord with the ratio of \( D^+ \) and \( D^0 \) lifetimes, 2.54 \( \pm 0.02 \).

\[ \Gamma(K^- \text{ anything})/\Gamma_{\text{total}} \]  
\[ \Gamma_7/\Gamma \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.547( \pm 0.028 ) OUR AVERAGE</td>
<td>0.578 ( \pm 0.016 \pm 0.032 ) 2098 ( \pm 59 )</td>
<td>1 ABLIKIM 07G BES2</td>
<td>e(^+)e(^-) ( \approx \psi(3770) )</td>
<td></td>
</tr>
<tr>
<td>0.546 ( \pm 0.039 )</td>
<td>1 BARLAG 92c ACCM</td>
<td>e(^-)Cu ( 230 ) GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.609 ( \pm 0.032 \pm 0.052 )</td>
<td>1 COFFMAN 91 MRK3</td>
<td>e(^+)e(^-) ( 3.77 ) GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.42 ( \pm 0.08 )</td>
<td>1 AGUILAR-... 87E HYBR</td>
<td>( \pi, pp ) ( 360, 400 ) GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.55</td>
<td>0.55 ( \pm 0.11 ) 121</td>
<td>1 SCHINDLER 81 MRK2</td>
<td>e(^+)e(^-) ( 3.771 ) GeV</td>
<td></td>
</tr>
<tr>
<td>0.35</td>
<td>0.35 ( \pm 0.10 ) 19</td>
<td>1 VUILLEMIN 78 LGW</td>
<td>e(^+)e(^-) ( 3.772 ) GeV</td>
<td></td>
</tr>
</tbody>
</table>

\(^{1}\) BARLAG 92c computes the branching fraction using topological normalization.
\[ \frac{\Gamma(K^+ \text{ anything})}{\Gamma_{\text{total}}} \]

\[ \frac{\Gamma(K^0 \text{ anything}) + \Gamma(K^0 \text{ anything})}{\Gamma_{\text{total}}} \]

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

\[ \frac{\Gamma(K^0(892)^- \text{ anything})}{\Gamma_{\text{total}}} \]

\[ \frac{\Gamma(K^0(892)^0 \text{ anything})}{\Gamma_{\text{total}}} \]

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[
\Gamma(K^*(892)^+ \text{ anything})/\Gamma_{\text{total}} \quad \Gamma_{12}/\Gamma
\]

<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;0.036</td>
<td>90</td>
<td>ABLIKIM 06u BES2</td>
<td></td>
<td>(e^+ e^- ) at 3773 MeV</td>
</tr>
</tbody>
</table>

\[
\Gamma(K^*(892)^0 \text{ anything})/\Gamma_{\text{total}} \quad \Gamma_{13}/\Gamma
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.028±0.012±0.004</td>
<td>31 ± 12</td>
<td>ABLIKIM 05p BES</td>
<td></td>
<td>(e^+ e^- \approx 3773) MeV</td>
</tr>
</tbody>
</table>

\[
\Gamma(\eta \text{ anything})/\Gamma_{\text{total}} \quad \Gamma_{14}/\Gamma
\]

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>9.5±0.4±0.8</td>
<td>4463 ± 197</td>
<td>HUANG 06b CLEO</td>
<td></td>
<td>(e^+ e^- ) at (\psi(3770))</td>
</tr>
</tbody>
</table>

\[
\Gamma(\eta' \text{ anything})/\Gamma_{\text{total}} \quad \Gamma_{15}/\Gamma
\]

<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>2.48±0.17±0.21</td>
<td>299 ± 21</td>
<td>HUANG 06b CLEO</td>
<td></td>
<td>(e^+ e^- ) at (\psi(3770))</td>
</tr>
</tbody>
</table>

\[
\Gamma(\phi \text{ anything})/\Gamma_{\text{total}} \quad \Gamma_{16}/\Gamma
\]

<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>1.05±0.08±0.07</td>
<td>368 ± 24</td>
<td>HUANG 06b CLEO</td>
<td></td>
<td>(e^+ e^- ) at (\psi(3770))</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EM</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.71±0.76±0.17</td>
<td>9</td>
<td>BAI 00c BES</td>
<td></td>
<td>(e^+ e^- \rightarrow D\bar{D}^<em>, D^</em>\bar{D}^*)</td>
</tr>
</tbody>
</table>

\[
\Gamma(\text{invisibles})/\Gamma_{\text{total}} \quad \Gamma_{17}/\Gamma
\]

<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;9.4 \times 10^{-5}</td>
<td>90</td>
<td>LAI 17 BELL</td>
<td></td>
<td>(e^+ e^- ) at (T(nS), n=4,5)</td>
</tr>
</tbody>
</table>

---

**Semileptonic modes**

\[
\Gamma(K^- \ e^+ \nu_e)/\Gamma_{\text{total}} \quad \Gamma_{19}/\Gamma
\]

<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>3.530±0.028 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.1.</td>
</tr>
<tr>
<td>3.505±0.014±0.033</td>
<td>71k</td>
<td>1 ABLIKIM 15x BES3</td>
<td></td>
<td>2.92 fb(^{-1}), 3.773 GeV</td>
</tr>
<tr>
<td>3.50 ±0.03 ±0.04</td>
<td>14.1k</td>
<td>1 BESSON 09 CLEO</td>
<td></td>
<td>(e^+ e^- ) at (\psi(3770))</td>
</tr>
<tr>
<td>3.45 ±0.10 ±0.19</td>
<td>1.3k</td>
<td>2 WIDHALM 06 BELL</td>
<td></td>
<td>(e^+ e^- \approx \gamma(4S))</td>
</tr>
<tr>
<td>3.82 ±0.40 ±0.27</td>
<td>104</td>
<td>ABLIKIM 04c BES</td>
<td></td>
<td>(e^+ e^-, 3.773) GeV</td>
</tr>
<tr>
<td>3.4 ±0.5 ±0.4</td>
<td>55</td>
<td>ADLER 89 MRK3</td>
<td></td>
<td>(e^+ e^- ) 3.77 GeV</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EM</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.56 ±0.03 ±0.09</td>
<td>3</td>
<td>DOBBS 08 CLEO</td>
<td></td>
<td>See BESSON 09</td>
</tr>
<tr>
<td>3.44 ±0.10 ±0.10</td>
<td>1.3k</td>
<td>COAN 05 CLEO</td>
<td></td>
<td>See DOBBS 08</td>
</tr>
</tbody>
</table>

1 See the form-factor parameters near the end of this \(D^0\) Listing.

2 The \(\pi^- e^+ \nu_e\) and \(K^- e^+ \nu_e\) results of WIDHALM 06 give \(|V_{cd}/V_{cs} f_{\pi}^{(0)} f_{\bar{K}^+}^{(0)}|^2 = 0.042 ± 0.003 \pm 0.003\). 

3 DOBBS 08 establishes \(|V_{cd}/V_{cs} f_{\pi}^{(0)} f_{\bar{K}^+}^{(0)}| = 0.188 ± 0.008 ± 0.002\) from the \(D^+\) and \(D^0\) decays to \(\overline{K} e^+ \nu_e\) and \(\pi e^+ \nu_e\).
<table>
<thead>
<tr>
<th>( \Gamma(K^- e^+ \nu_e) / \Gamma(K^- \pi^+) )</th>
<th>( \Gamma_{19} / \Gamma_{32} )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>0.907 ± 0.011</td>
<td><strong>OUR FIT</strong></td>
</tr>
<tr>
<td>0.930 ± 0.013</td>
<td><strong>OUR AVERAGE</strong></td>
</tr>
<tr>
<td>0.927 ± 0.007 ± 0.012</td>
<td>76k ± 323</td>
</tr>
<tr>
<td>0.978 ± 0.027 ± 0.044</td>
<td>2510</td>
</tr>
<tr>
<td>0.90 ± 0.06 ± 0.06</td>
<td>584</td>
</tr>
<tr>
<td>0.91 ± 0.07 ± 0.11</td>
<td>250</td>
</tr>
</tbody>
</table>

1. The event samples in this AUBERT 07BG result include radiative photons. The \( D^0 \rightarrow K^- e^+ \nu_e \) form factor at \( q^2 = 0 \) is \( f_+(0) = 0.727 \pm 0.007 \pm 0.005 \pm 0.007 \).
2. BEAN 93C uses \( K^- \mu^+ \nu_\mu \) as well as \( K^- e^+ \nu_e \) events and makes a small phase-space adjustment to the number of the \( \mu^+ \) events to use them as \( e^+ \) events. A pole mass of \( 2.00 \pm 0.12 \pm 0.18 \text{ GeV/c}^2 \) is obtained from the \( q^2 \) dependence of the decay rate.
3. CRAWFORD 91B uses \( K^- e^+ \nu_e \) and \( K^- \mu^+ \nu_\mu \) candidates to measure a pole mass of \( 2.1^+0.4^+0.3^+0.2 \pm 0.2 \text{ GeV/c}^2 \) from the \( q^2 \) dependence of the decay rate.
4. ANJOS 89F measures a pole mass of \( 2.1^+0.4^-0.2 \pm 0.2 \text{ GeV/c}^2 \) from the \( q^2 \) dependence of the decay rate.

<table>
<thead>
<tr>
<th>( \Gamma(K^- \mu^+ \nu_\mu) / \Gamma_{\text{total}} )</th>
<th>( \Gamma_{20} / \Gamma )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE</strong> (units ( 10^{-2} ))</td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>3.31 ± 0.13</td>
<td><strong>OUR FIT</strong></td>
</tr>
<tr>
<td>3.45 ± 0.10 ± 0.21</td>
<td>1249 ± 43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( \Gamma(K^- \mu^+ \nu_\mu) / \Gamma(\mu^+ \text{ anything}) )</th>
<th>( \Gamma_{20} / \Gamma_6 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>0.50 ± 0.05</td>
<td><strong>OUR FIT</strong></td>
</tr>
<tr>
<td>0.472 ± 0.051 ± 0.040</td>
<td>232</td>
</tr>
<tr>
<td>• • • We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
</tr>
<tr>
<td>0.32 ± 0.05 ± 0.05</td>
<td>124</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>( \Gamma(K^- \mu^+ \nu_\mu) / \Gamma(K^- \pi^+) )</th>
<th>( \Gamma_{20} / \Gamma_{32} )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>0.851 ± 0.033</td>
<td><strong>OUR FIT</strong></td>
</tr>
<tr>
<td>0.84 ± 0.04</td>
<td><strong>OUR AVERAGE</strong></td>
</tr>
<tr>
<td>0.852 ± 0.034 ± 0.028</td>
<td>1897</td>
</tr>
<tr>
<td>0.82 ± 0.13 ± 0.13</td>
<td>338</td>
</tr>
<tr>
<td>0.79 ± 0.08 ± 0.09</td>
<td>231</td>
</tr>
</tbody>
</table>

1. FRABETTI 95G extracts the ratio of form factors \( f_-(0) / f_+(0) = -1.3^+3.6^-3.4 \pm 0.6 \), and measures a pole mass of \( 1.87^+0.11^+0.07^-0.08^-0.06 \text{ GeV/c}^2 \) from the \( q^2 \) dependence of the decay rate.
2. FRABETTI 93I measures a pole mass of \( 2.1^+0.7^+0.7^-0.3^-0.3 \text{ GeV/c}^2 \) from the \( q^2 \) dependence of the decay rate.
3. CRAWFORD 91B measures a pole mass of \( 2.00 \pm 0.12 \pm 0.18 \text{ GeV/c}^2 \) from the \( q^2 \) dependence of the decay rate.
\( \frac{\Gamma(K^*(892)^- e^+ \nu_e)}{\Gamma_{\text{total}}} \)  \( \Gamma_{21}/\Gamma \)

Both decay modes of the \( K^*(892)^- \) 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>( 2.15 \pm 0.16 ) OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 2.16 \pm 0.15 \pm 0.08 )</td>
<td>219 \pm 16</td>
<td>1 COAN 05 CLEO</td>
<td>( e^+ e^- ) at ( \psi(3770) )</td>
<td></td>
</tr>
</tbody>
</table>

1 COAN 05 uses both \( K^- \pi^0 \) and \( K^0_S \pi^- \) events.

\( \frac{\Gamma(K^*(892)^- e^+ \nu_e)}{\Gamma(K^0_S \pi^+ \pi^-)} \)  \( \Gamma_{21}/\Gamma_{36} \)

Unseen decay modes of the \( K^*(892)^- \) 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>( 0.78 \pm 0.07 ) OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 0.76 \pm 0.12 \pm 0.06 )</td>
<td>152 \pm 17</td>
<td>1 BEAN 93C CLEO</td>
<td>( e^+ e^- \approx \Gamma(4S) )</td>
<td></td>
</tr>
</tbody>
</table>

1 BEAN 93C uses \( K^*^- \mu^+ \nu_\mu \) as well as \( K^*^- e^+ \nu_e \) events and makes a small phase-space adjustment to the number of the \( \mu^+ \) events to use them as \( e^+ \) events.

\( \frac{\Gamma(K^*(892)^- \mu^+ \nu_\mu)}{\Gamma(K^0_S \pi^+ \pi^-)} \)  \( \Gamma_{22}/\Gamma_{36} \)

Unseen decay modes of the \( K^*(892)^- \) 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>( 0.674 \pm 0.068 \pm 0.026 )</td>
<td>175 \pm 17</td>
<td>1 LINK 05B FOCS</td>
<td>( \gamma A, E_\gamma \approx 180 \text{ GeV} )</td>
<td></td>
</tr>
</tbody>
</table>

1 LINK 05B finds that in \( D^0 \to K^0_S \pi^- \mu^+ \nu_\mu \) the \( K^0_S \pi^- \) system is 6\% in S-wave.

\( \frac{\Gamma(K^- \pi^0 e^+ \nu_e)}{\Gamma_{\text{total}}} \)  \( \Gamma_{23}/\Gamma \)

<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>( 0.016 \pm 0.013 \pm 0.005 \pm 0.002 )</td>
<td>4 \pm 0.005 \pm 0.002</td>
<td>1 BAI 91 MRK3</td>
<td>( e^+ e^- \approx 3.77 \text{ GeV} )</td>
<td></td>
</tr>
</tbody>
</table>

1 BAI 91 finds that a fraction \( 0.79 \pm 0.15 \pm 0.09 \pm 0.03 \) of combined \( D^+ \) and \( D^0 \) decays to \( K^- \pi^0 \nu_e \) (24 events) are \( K^*(892)^- e^+ \nu_e \). BAI 91 uses 56 \( K^- \pi^0 \nu_e \) events to measure a pole mass of 1.8 \pm 0.3 \pm 0.2 GeV/c^2 from the \( q^2 \) dependence of the decay rate.

\( \frac{\Gamma(K^0_S \pi^- e^+ \nu_e)}{\Gamma_{\text{total}}} \)  \( \Gamma_{24}/\Gamma \)

<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>( 2.7 \pm 0.9 \pm 0.7 ) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 2.61 \pm 1.04 \pm 0.28 )</td>
<td>9 \pm 3</td>
<td>ABLIKIM 060 BES2</td>
<td>( e^+ e^- ) at 3773 MeV</td>
<td></td>
</tr>
<tr>
<td>( 2.8 \pm 1.7 \pm 0.8 \pm 0.3 )</td>
<td>6 \pm 0.3</td>
<td>1 BAI 91 MRK3</td>
<td>( e^+ e^- \approx 3.77 \text{ GeV} )</td>
<td></td>
</tr>
</tbody>
</table>

1 BAI 91 finds that a fraction \( 0.79 \pm 0.15 \pm 0.09 \pm 0.03 \) of combined \( D^+ \) and \( D^0 \) decays to \( K^- \pi^0 \nu_e \) (24 events) are \( K^*(892)^- e^+ \nu_e \).

\( \frac{\Gamma(K^- \pi^+ \pi^- e^+ \nu_e)}{\Gamma_{\text{total}}} \)  \( \Gamma_{25}/\Gamma \)

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-4} ))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2.8 \pm 1.4 \pm 0.3 )</td>
<td>8</td>
<td>ARTUSO 07A CLEO</td>
<td>( e^+ e^- ) at ( \psi(3770) )</td>
<td></td>
</tr>
</tbody>
</table>
\[ \Gamma(K_1(1270)^- e^+ \nu_e)/\Gamma_{\text{total}} \]

<table>
<thead>
<tr>
<th>VALUE (units (10^{-4}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(7.6^{+4.1}_{-3.0} \pm 0.9)</td>
<td>8</td>
<td>1 ARTUSO 07A</td>
<td>CLEO</td>
<td>e(^+) e(^-) at (\gamma(3770))</td>
</tr>
</tbody>
</table>

1 This ARTUSO 07A result is corrected for all decay modes of the \(K_1(1270)^-\).

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

<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;0.037</td>
<td>90</td>
<td>KODAMA 93B</td>
<td>E653</td>
<td>(\pi^-) emulsion 600 GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma((K^\ast(892)\pi^-) \mu^+ \nu_\mu)/\Gamma(K^- \mu^+ \nu_\mu) \]

<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;0.043</td>
<td>90</td>
<td>KODAMA 93B</td>
<td>E653</td>
<td>(\pi^-) emulsion 600 GeV</td>
</tr>
</tbody>
</table>

1 KODAMA 93B searched in \(K^- \pi^+ \pi^- \mu^+ \nu_\mu\), but the limit includes other \((K^\ast(892)\pi^-)\) charge states.

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

<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>(0.291^{+0.004}_{-0.004}) OUR FIT</td>
<td>Error includes scale factor of 1.1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.293^{+0.004}_{-0.004}) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.295±0.004±0.003</td>
<td>6.3k</td>
<td>1 ABLIKIM 15X</td>
<td>BES3</td>
<td>2.92 fb(^{-1}), 3.773 GeV</td>
</tr>
<tr>
<td>0.288±0.008±0.003</td>
<td>1.3k</td>
<td>1 BESSON 09</td>
<td>CLEO</td>
<td>(e^+ e^-) at (\psi(3770))</td>
</tr>
<tr>
<td>0.279±0.027±0.016</td>
<td>126</td>
<td>2 WIDHAM 06</td>
<td>BELL</td>
<td>(e^+ e^- \approx \gamma(45\mathrm{S}))</td>
</tr>
<tr>
<td>(0.299\pm0.011\pm0.009)</td>
<td>3 DOBBS 08</td>
<td>CLEO</td>
<td>See BESSON 09</td>
<td></td>
</tr>
<tr>
<td>(0.262\pm0.025\pm0.008)</td>
<td>117</td>
<td>COAN 05</td>
<td>CLEO</td>
<td>See DOBBS 08</td>
</tr>
</tbody>
</table>

1 See the form-factor parameters near the end of this \(D^0\) listing.

2 The \(\pi^- e^+ \nu_e\) and \(K^- e^+ \nu_e\) results of WIDHAM 06 give \(\left| V_{cs} V_{cd}^\ast \frac{f_\pi(0)}{f_K^\ast(0)} \right|^2 = 0.042 \pm 0.003\). |

3 DOBBS 08 establishes \(\left| V_{cs} V_{cd}^\ast \frac{f_\pi(0)}{f_K^\ast(0)} \right| = 0.188 \pm 0.008 \pm 0.002\) from the \(D^+\) and \(D^0\) decays to \(K e^+ \nu_e\) and \(\pi e^+ \nu_e\).

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0823^{+0.0014}_{-0.0014}) OUR FIT</td>
<td>Error includes scale factor of 1.1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.085^{+0.007}_{-0.007}) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.082 ±0.006 ±0.005</td>
<td>1 HUANG 05</td>
<td>CLEO</td>
<td>(e^+ e^- \approx \gamma(45\mathrm{S}))</td>
<td></td>
</tr>
<tr>
<td>0.101 ±0.020 ±0.003</td>
<td>91</td>
<td>2 FRABETTI 96B</td>
<td>E687</td>
<td>(\gamma) Be, (E_\gamma \approx 200) GeV</td>
</tr>
<tr>
<td>0.103 ±0.039 ±0.013</td>
<td>87</td>
<td>3 BUTLER 95</td>
<td>CLEO2</td>
<td>&lt;0.156 (90% CL)</td>
</tr>
</tbody>
</table>

1 HUANG 05 uses both \(e\) and \(\mu\) events, and makes a small correction to the \(\mu\) events to make them effectively \(e\) events. This result gives \(\left| V_{cs} V_{cd}^\ast \frac{f_\pi(0)}{f_K^\ast(0)} \right|^2 = 0.038^{+0.006}_{-0.007} \pm 0.003\)
FRABETTI 968 uses both e and μ events, and makes a small correction to the µ events to make them effectively e events. This result gives \( \left| \frac{V_{cd}}{V_{cs}} \frac{f_+^\pi (0)}{f_+^\pi (0)} \right|^2 = 0.050 \pm 0.011 \pm 0.002. \)

3 BUTLER 95 has 87 \( \pm 33 \pi^- e^+ \nu_e \) events. The result gives \( \left| \frac{V_{cd}}{V_{cs}} \frac{f_+^\pi (0)}{f_+^\pi (0)} \right|^2 = 0.052 \pm 0.020 \pm 0.007. \)

\[ \Gamma(\pi^- e^+ \nu_e) / \Gamma(K^- \pi^+) = \Gamma_{29}/\Gamma_{32} \]

<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>7.47 ( \pm 0.13 ) OUR FIT</td>
<td>375k</td>
<td>1 LEES</td>
<td>BABR</td>
<td>347 fb(^{-1} ), 10.58 GeV</td>
</tr>
</tbody>
</table>

1 See the form-factor parameters near the end of the \( D^0 \) Listing.

\[ \Gamma(\pi^- \mu^+ \nu_\mu) / \Gamma_{total} = \Gamma_{30}/\Gamma \]

<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>0.237 ( \pm 0.024 ) OUR FIT</td>
<td>106 ( \pm 13 )</td>
<td>WIDHALM</td>
<td>06 BELL</td>
<td>( e^+ e^- \approx \Upsilon(4S) )</td>
</tr>
</tbody>
</table>

1 \( \text{LINK} \) 05 finds the form-factor ratio \( |f_0^\pi (0)/f_0^K (0)| \) to be \( 0.85 \pm 0.04 \pm 0.04 \pm 0.01. \)

\[ \Gamma(\rho^- e^+ \nu_e) / \Gamma_{total} = \Gamma_{31}/\Gamma \]

<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>1.77 ( \pm 0.12 ) ( \pm 0.10 )</td>
<td>305 ( \pm 21 )</td>
<td>1,2 DOBBS</td>
<td>13 CLEO</td>
<td>( e^+ e^- ) at ( \psi(3770) )</td>
</tr>
</tbody>
</table>

1 DOBBS 13 finds \( \Gamma(D^0 \to \rho^- e^+ \nu_e) / 2 \Gamma(D^+ \to \rho^0 e^+ \nu_e) = 1.03 \pm 0.09^{+0.08}_{-0.02}; \) isospin invariance predicts the ratio is 1.0.

2 See the \( D^+ \) Listings for \( D \to \rho^+ e^+ \nu_e \) form factors.

\[ \Gamma(K^- \pi^+) / \Gamma_{total} = \Gamma_{32}/\Gamma \]

<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>3.89 ( \pm 0.04 ) OUR FIT</td>
<td>3.93 ( \pm 0.05 ) OUR AVERAGE</td>
<td>Error includes scale factor of 1.1.</td>
<td>CLEO</td>
<td>All CLEO-c runs</td>
</tr>
<tr>
<td>3.934 ( \pm 0.021 ) ( \pm 0.061 )</td>
<td>3.90 ( \pm 0.09 ) ( \pm 0.12 )</td>
<td>BONVICINI</td>
<td>14 CLEO</td>
<td>( e^+ e^- ) at ( \Upsilon(4S) )</td>
</tr>
<tr>
<td>4.007 ( \pm 0.037 ) ( \pm 0.072 )</td>
<td>3.82 ( \pm 0.07 ) ( \pm 0.12 )</td>
<td>AUBERT</td>
<td>08 L</td>
<td>BABR</td>
</tr>
<tr>
<td>3.90 ( \pm 0.09 ) ( \pm 0.12 )</td>
<td>3.41 ( \pm 0.12 ) ( \pm 0.28 )</td>
<td>2 BARATE</td>
<td>97 C</td>
<td>ALEP</td>
</tr>
<tr>
<td>3.62 ( \pm 0.34 ) ( \pm 0.44 )</td>
<td>2 ALBRECHT</td>
<td>94 F</td>
<td>ARG</td>
<td>( e^+ e^- \approx \Upsilon(4S) )</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Value</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.891 ± 0.035 ± 0.069</td>
<td>DOBBS 07</td>
<td>CLEO</td>
<td>See BONVICINI 14</td>
</tr>
<tr>
<td>3.91 ± 0.08 ± 0.09</td>
<td>HE 05</td>
<td>CLEO</td>
<td>See DOBBS 07</td>
</tr>
<tr>
<td>3.81 ± 0.15 ± 0.16</td>
<td>ARTUSO 98</td>
<td>CLE2</td>
<td>$e^+ e^- \to \Upsilon(4S)$</td>
</tr>
<tr>
<td>3.69 ± 0.11 ± 0.16</td>
<td>COAN 98</td>
<td>CLE2</td>
<td>See ARTUSO 98</td>
</tr>
<tr>
<td>4.5 ± 0.6 ± 0.4</td>
<td>ALBRECHT 94</td>
<td>ARG</td>
<td>$e^+ e^- \to \Upsilon(4S)$</td>
</tr>
<tr>
<td>3.95 ± 0.08 ± 0.17</td>
<td>AKERIB 93</td>
<td>CLE2</td>
<td>See ARTUSO 98</td>
</tr>
<tr>
<td>4.5 ± 0.8 ± 0.5</td>
<td>ABACHI 88</td>
<td>HRS</td>
<td>$e^+ e^- \to 29$ GeV</td>
</tr>
<tr>
<td>4.2 ± 0.4 ± 0.4</td>
<td>ADLER 88C</td>
<td>MRK3</td>
<td>$e^+ e^- 3.77$ GeV</td>
</tr>
<tr>
<td>4.1 ± 0.6</td>
<td>SCHINDLER 81</td>
<td>MRK2</td>
<td>$e^+ e^- 3.771$ GeV</td>
</tr>
<tr>
<td>4.3 ± 1.0</td>
<td>PERUZZI 77</td>
<td>LGW</td>
<td>$e^+ e^- 3.77$ GeV</td>
</tr>
</tbody>
</table>

1 This combines the CLEO results of ARTUSO 98, COAN 98, and AKERIB 93.
2 ABACHI 88, DECAMP 91J, AKERIB 93, ALBRECHT 94f, and BARATE 97c use $D^*(2010)^+ \to D^0 \pi^+$ decays. The $\pi^+$ is both slow and of low $p_T$ with respect to the event thrust axis or nearest jet ($\approx D^{**}$ direction). The excess number of such $\pi^+$'s over background gives the number of $D^*(2010)^+ \to D^0 \pi^+$ events, and the fraction with $D^0 \to K^- \pi^+$ gives the $D^0 \to K^- \pi^+$ branching fraction.
3 DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.
4 ARTUSO 98, following ALBRECHT 94, uses $D^0$ mesons from $\overline{B}^0 \to D^{*+}(2010)^+ \chi \ell^+ \nu_\ell$ decays. Our average uses the CLEO average of this value with the values of COAN 98 and AKERIB 93.
5 COAN 98 assumes that $\Gamma(B \to D X \ell^+ \nu)/\Gamma(B \to X \ell^+ \nu) = 1.0 - 3 |V_{ub}/V_{cb}|^2 - 0.010 \pm 0.005$, the last term accounting for $\overline{B} \to D^{*+} K X \ell^+ \nu$. COAN 98 is included in the CLEO average in ARTUSO 98.
6 ALBRECHT 94 uses $D^0$ mesons from $\overline{B}^0 \to D^{*+} \ell^- \nu_\ell$ decays. This is a different set of events than those used by ALBRECHT 94f.
7 This AKERIB 93 value includes radiative corrections; without them, the value is $0.0391 \pm 0.0008 \pm 0.0017$. AKERIB 93 is included in the CLEO average in ARTUSO 98.
8 SCHINDLER 81 (MARK-2) measures $\sigma(e^+ e^- \to \psi(3770)) \times$ branching fraction to be $0.24 \pm 0.02$ nb. We use the MARK-3 (ADLER 88c) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.
9 PERUZZI 77 (MARK-1) measures $\sigma(e^+ e^- \to \psi(3770)) \times$ branching fraction to be $0.25 \pm 0.05$ nb. We use the MARK-3 (ADLER 88c) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

<table>
<thead>
<tr>
<th>Value (units 10^{-3})</th>
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<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.56 ± 0.06</td>
<td>KO 14</td>
<td>BELL</td>
<td>$e^+ e^- \to \Upsilon(nS)$</td>
</tr>
<tr>
<td>3.568 ± 0.066</td>
<td>AAJ 13CE</td>
<td>LHCb</td>
<td>$p\bar{p}$ at 7, 8 TeV</td>
</tr>
<tr>
<td>3.51 ± 0.35</td>
<td>AALTONEN 13AE</td>
<td>CDF</td>
<td>$p\bar{p}$ at 1.96 TeV</td>
</tr>
</tbody>
</table>

1 Based on 976 fb^{-1} of data collected at $\Upsilon(nS)$ resonances. Assumes no CP violation.
2 Based on 3 fb^{-1} of data collected at $\sqrt{s} = 7$, 8 TeV. Assumes no CP violation.
3 Based on 9.6 fb^{-1} of data collected at the Tevatron. Assumes no CP violation.
4 Based on 1 fb^{-1} of data collected at $\sqrt{s} = 7$ TeV in 2011. Assumes no CP violation.
\[ \Gamma(K^0_L\pi^0)/\Gamma_{total} \]

<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>1.240 ± 0.017 ± 0.056</td>
<td>614</td>
<td>HE 08 CLEO</td>
<td>See MENDEZ 10</td>
<td></td>
</tr>
</tbody>
</table>

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

<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>0.68 ± 0.12 ± 0.11</td>
<td>119</td>
<td>ANJOS 92b E691</td>
<td>γBe 80–240 GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<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>30.4 ± 0.9 OUR FIT</td>
<td>30.4 ± 0.3 ± 0.9</td>
<td>20k MENDEZ 10</td>
<td>CLEO e^+e^- at 3774 MeV</td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K^0_S\pi^0)/34 \Gamma_34/36 \]

<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>0.432 ± 0.028 OUR FIT</td>
<td>0.44 ± 0.02 ± 0.05</td>
<td>1942 ± 64</td>
<td>PROCARIO 93b CLE2 e^+e^- 10.36–10.7 GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<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>0.998 ± 0.049 ± 0.048</td>
<td>1116</td>
<td>1 HE 08 CLEO</td>
<td>e^+e^- at ψ(3770)</td>
<td></td>
</tr>
</tbody>
</table>

1 The difference of HE 08 D^0 \to K^0_S\pi^0 and K^0_L\pi^0 branching fractions over the sum is 0.108 ± 0.025 ± 0.024. This is consistent with U-spin symmetry and the Cabibbo angle.

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

<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>2.52 ± 0.20 ± 0.25</td>
<td>284  ± 22</td>
<td>1 ALBRECHT 94f ARG e^+e^- ≈ Υ(4S)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 ± 0.3 ± 0.5</td>
<td>ADLER 87 MRK3 e^+e^- 3.77 GeV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.6 ± 0.8</td>
<td>32 ± 8</td>
<td>2 SCHINDLER 81 MRK2 e^+e^- 3.771 GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0 ± 1.2</td>
<td>28   ± 3</td>
<td>3 PERUZZI 77 LGW e^+e^- 3.77 GeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 See the footnote on the ALBRECHT 94f measurement of \( \Gamma(K^-\pi^+)/\Gamma_{total} \) for the method used.
2 SCHINDLER 81 (MARK-2) measures \( \sigma(e^+e^- \to \psi(3770)) \times \) branching fraction to be 0.30 ± 0.08 nb. We use the MARK-3 (ADLER 88c) value of \( \sigma = 5.8 \pm 0.5 \pm 0.6 \) nb.
3 PERUZZI 77 (MARK-1) measures \( \sigma(e^+e^- \to \psi(3770)) \times \) branching fraction to be 0.46 ± 0.12 nb. We use the MARK-3 (ADLER 88c) value of \( \sigma = 5.8 \pm 0.5 \pm 0.6 \) nb.
\[
\frac{\Gamma(K_S^0 \pi^+ \pi^-)/\Gamma(K^- \pi^+)}{\Gamma_36/\Gamma_32}
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.71 ± 0.05 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.1.</td>
</tr>
<tr>
<td>0.81 ± 0.05 ± 0.08</td>
<td>856 ± 35</td>
<td>FRABETTI 94</td>
<td>E687</td>
<td>γ Be (E_\gamma = 220) GeV</td>
</tr>
<tr>
<td>0.85 ± 0.40</td>
<td>35</td>
<td>AVERY 80</td>
<td>SPEC</td>
<td>γ (N \rightarrow D^{*+})</td>
</tr>
<tr>
<td>1.4 ± 0.5</td>
<td>116</td>
<td>PICCOLO 77</td>
<td>MRK1</td>
<td>(e^+ e^- 4.03, 4.41) GeV</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K_S^0 \rho^0)/\Gamma(K_S^0 \pi^+ \pi^-)}{\Gamma_37/\Gamma_36}
\]

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>0.224 ± 0.017</td>
<td>0.023</td>
<td>AUBERT 08</td>
<td>BABR</td>
</tr>
<tr>
<td>0.210 ± 0.016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.264 ± 0.009 ± 0.010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.267 ± 0.011 ± 0.009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.350 ± 0.028 ± 0.067</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.227 ± 0.032 ± 0.009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.215 ± 0.051 ± 0.037</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.20 ± 0.06 ± 0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.12 ± 0.01 ± 0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASNER 04A</td>
<td></td>
<td></td>
<td>CLEO</td>
</tr>
<tr>
<td>FRABETTI 94G</td>
<td></td>
<td></td>
<td>E687</td>
</tr>
<tr>
<td>ALBRECHT 93D</td>
<td></td>
<td></td>
<td>ARG</td>
</tr>
<tr>
<td>ANJOS 93</td>
<td></td>
<td></td>
<td>E691</td>
</tr>
<tr>
<td>FRABETTI 92B</td>
<td></td>
<td></td>
<td>E687</td>
</tr>
<tr>
<td>ADLER 87</td>
<td></td>
<td></td>
<td>MRK3</td>
</tr>
</tbody>
</table>

1 The error on this AUBERT 08Al value includes both statistical and systematic uncertainties; the latter dominates.

\[
\frac{\Gamma(K_S^0 \omega, \omega \rightarrow \pi^+ \pi^-)/\Gamma(K_S^0 \pi^+ \pi^-)}{\Gamma_38/\Gamma_36}
\]

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>0.0073 ± 0.0020</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.009 ± 0.010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0072 ± 0.0018</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0081 ± 0.0019</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASNER 04A</td>
<td></td>
<td></td>
<td>CLEO</td>
</tr>
<tr>
<td>AUBERT 08</td>
<td></td>
<td></td>
<td>BABR</td>
</tr>
<tr>
<td>MURAMATU 02</td>
<td></td>
<td></td>
<td>CLE2</td>
</tr>
</tbody>
</table>

1 The error on this AUBERT 08Al value includes both statistical and systematic uncertainties; the latter dominates.

\[
\frac{\Gamma(K_S^0 (\pi^+ \pi^-) S-wave)/\Gamma(K_S^0 \pi^+ \pi^-)}{\Gamma_39/\Gamma_36}
\]

This is the “fit fraction” from the Dalitz-plot analysis. The \((\pi^+ \pi^-) S-wave\) includes what in isobar models are the \(f_0(980)\) and \(f_0(1370)\); see the following two data blocks.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.119 ± 0.026</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUBERT 08</td>
<td></td>
<td></td>
<td>BABR</td>
</tr>
</tbody>
</table>

1 The error on this AUBERT 08Al value includes both statistical and systematic uncertainties; the latter dominates.
\[ \Gamma(K^0_S f_2(980), f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma(K^0_S \pi^+ \pi^-) \quad \Gamma_{40}/\Gamma_{36} \]

Fit fraction from the Dalitz plot analyses.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.043 ± 0.005 +0.012</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
<tr>
<td>0.042 ± 0.005 +0.011</td>
<td>ASNER 04A</td>
<td>CLEO</td>
<td>See MURAMATSU 02</td>
</tr>
<tr>
<td>0.068 ± 0.016 ± 0.018</td>
<td>FRABETTI 94G</td>
<td>E687</td>
<td>Dalitz fit, 597 evts</td>
</tr>
<tr>
<td>0.046 ± 0.018 ± 0.006</td>
<td>ALBRECHT 93D</td>
<td>ARG</td>
<td>Dalitz fit, 440 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^0_S f_0(1370), f_0 \rightarrow \pi^+ \pi^-)/\Gamma(K^0_S \pi^+ \pi^-) \quad \Gamma_{41}/\Gamma_{36} \]

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>0.099 ± 0.011 +0.028</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
<tr>
<td>0.098 ± 0.014 +0.026</td>
<td>ASNER 04A</td>
<td>CLEO</td>
<td>See MURAMATSU 02</td>
</tr>
<tr>
<td>0.077 ± 0.022 ± 0.031</td>
<td>FRABETTI 94G</td>
<td>E687</td>
<td>Dalitz fit, 597 evts</td>
</tr>
<tr>
<td>0.082 ± 0.028 ± 0.013</td>
<td>ALBRECHT 93D</td>
<td>ARG</td>
<td>Dalitz fit, 440 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^0_S f_2(1270), f_2 \rightarrow \pi^+ \pi^-)/\Gamma(K^0_S \pi^+ \pi^-) \quad \Gamma_{42}/\Gamma_{36} \]

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>0.0032 +0.0035</td>
<td>OUR AVERAGE</td>
<td>1 AUBERT 08AL BABR</td>
<td>Dalitz fit, ≅ 487 k evts</td>
</tr>
<tr>
<td>0.0027 ± 0.0015 +0.0037</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
<tr>
<td>0.0036 ± 0.0022 +0.0032</td>
<td>ASNER 04A</td>
<td>CLEO</td>
<td>See MURAMATSU 02</td>
</tr>
<tr>
<td>0.037 ± 0.014 ± 0.017</td>
<td>FRABETTI 94G</td>
<td>E687</td>
<td>Dalitz fit, 597 evts</td>
</tr>
<tr>
<td>0.050 ± 0.021 ± 0.008</td>
<td>ALBRECHT 93D</td>
<td>ARG</td>
<td>Dalitz fit, 440 evts</td>
</tr>
</tbody>
</table>

\[ 1 \text{ The error on this AUBERT 08AL value includes both statistical and systematic uncertainties; the latter dominates.} \]

\[ \Gamma(K^*(892)^- \pi^+, K^*(892)^- \rightarrow K^0_S \pi^-)/\Gamma(K^0_S \pi^+ \pi^-) \quad \Gamma_{43}/\Gamma_{36} \]

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>0.588 ± 0.034</td>
<td>OUR AVERAGE</td>
<td>1 AUBERT 08AL BABR</td>
<td>Dalitz fit, ≅ 487 k evts</td>
</tr>
<tr>
<td>0.557 ± 0.028</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
<tr>
<td>0.657 ± 0.013 ± 0.018</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
<tr>
<td>0.663 ± 0.013 ± 0.024</td>
<td>ASNER 04A</td>
<td>CLEO</td>
<td>See MURAMATSU 02</td>
</tr>
<tr>
<td>0.625 ± 0.036 ± 0.026</td>
<td>FRABETTI 94G</td>
<td>E687</td>
<td>Dalitz fit, 597 evts</td>
</tr>
<tr>
<td>0.718 ± 0.042 ± 0.030</td>
<td>ALBRECHT 93D</td>
<td>ARG</td>
<td>Dalitz fit, 440 evts</td>
</tr>
<tr>
<td>0.480 ± 0.097</td>
<td>ANJOS 93</td>
<td>E691</td>
<td>γ Be 90–260 GeV</td>
</tr>
<tr>
<td>0.56 ± 0.04 ± 0.05</td>
<td>ADLER 87</td>
<td>MRK3</td>
<td>e+ e− 3.77 GeV</td>
</tr>
</tbody>
</table>

HTTP://PDG.LBL.GOV  Page 36  Created: 5/30/2017 17:22
The error on this AUBERT 08AL value includes both statistical and systematic uncertainties; the latter dominates.

$$\Gamma(K^*_0(1430)^-\pi^+, K^*_0 \to K^0_S\pi^-)/\Gamma(K^0_S\pi^+\pi^-) \quad \Gamma_{44}/\Gamma_{36}$$

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>0.095$^{+0.014}_{-0.010}$ OUR AVERAGE</td>
<td>1 AUBERT 08AL BABR</td>
<td>Dalitz fit, $\approx 487$ k evts</td>
<td></td>
</tr>
<tr>
<td>0.102±0.015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.073±0.007$^{+0.031}_{-0.011}$</td>
<td>MURAMATSU 02 CLE2</td>
<td>Dalitz fit, 5299 evts</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.072±0.007$^{+0.014}_{-0.013}$</td>
<td>ASNER 04A CLEO</td>
<td>See MURAMATSU 02</td>
<td></td>
</tr>
<tr>
<td>0.109±0.027±0.029</td>
<td>FRABETTI 94G E687</td>
<td>Dalitz fit, 597 evts</td>
<td></td>
</tr>
<tr>
<td>0.129±0.034±0.021</td>
<td>ALBRECHT 93D ARG</td>
<td>Dalitz fit, 440 evts</td>
<td></td>
</tr>
</tbody>
</table>

The error on this AUBERT 08AL value includes both statistical and systematic uncertainties; the latter dominates.

$$\Gamma(K^*_2(1430)^-\pi^+, K^*_2 \to K^0_S\pi^-)/\Gamma(K^0_S\pi^+\pi^-) \quad \Gamma_{45}/\Gamma_{36}$$

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>0.0120$^{+0.0070}_{-0.0035}$ OUR AVERAGE</td>
<td>1 AUBERT 08AL BABR</td>
<td>Dalitz fit, $\approx 487$ k evts</td>
<td></td>
</tr>
<tr>
<td>0.022 ±0.016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.002 ±0.030$^{+0.007}_{-0.003}$</td>
<td>MURAMATSU 02 CLE2</td>
<td>Dalitz fit, 5299 evts</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.011 ±0.002$^{+0.005}_{-0.003}$</td>
<td>ASNER 04A CLEO</td>
<td>See MURAMATSU 02</td>
<td></td>
</tr>
</tbody>
</table>

The error on this AUBERT 08AL value includes both statistical and systematic uncertainties; the latter dominates.

$$\Gamma(K^*(1680)^-\pi^+, K^- \to K^0_S\pi^-)/\Gamma(K^0_S\pi^+\pi^-) \quad \Gamma_{46}/\Gamma_{36}$$

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>0.016±0.013 OUR AVERAGE</td>
<td>1 AUBERT 08AL BABR</td>
<td>Dalitz fit, $\approx 487$ k evts</td>
<td></td>
</tr>
<tr>
<td>0.007±0.019</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.022±0.004$^{+0.018}_{-0.015}$</td>
<td>MURAMATSU 02 CLE2</td>
<td>Dalitz fit, 5299 evts</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.023±0.005$^{+0.007}_{-0.014}$</td>
<td>ASNER 04A CLEO</td>
<td>See MURAMATSU 02</td>
<td></td>
</tr>
</tbody>
</table>

The error on this AUBERT 08AL value includes both statistical and systematic uncertainties; the latter dominates.
\[
\Gamma(K^{*}(892)^{+}\pi^{-}, K^{*}(892)^{+} \rightarrow K_{S}^{0}\pi^{+}) / \Gamma(K_{S}^{0}\pi^{+}\pi^{-}) \quad \Gamma_{47}/\Gamma_{36}
\]
This is the “fit fraction” from the Dalitz-plot analysis. This is a doubly Cabibbo-suppressed mode.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-3})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0^{+2.0}_{-1.2} OUR AVERAGE</td>
<td>4.6 \pm 2.3</td>
<td>08Al BABR</td>
<td>Dalitz fit, ( \approx 487 ) kevts</td>
</tr>
<tr>
<td>3.4 \pm 1.3^{+4.1}_{-0.4}</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
</tbody>
</table>

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

\[
\Gamma(K_{S}^{0}(1430)^{+}\pi^{-}, K_{S}^{0}^{+} \rightarrow K_{S}^{0}\pi^{+}) / \Gamma(K_{S}^{0}\pi^{+}\pi^{-}) \quad \Gamma_{48}/\Gamma_{36}
\]
This is the “fit fraction” from the Dalitz-plot analysis. This is a doubly Cabibbo-suppressed mode.

<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;5 \times 10^{-4}</td>
<td>95</td>
<td>AUBERT 08Al BABR</td>
<td>Dalitz fit, ( \approx 487 ) kevts</td>
<td></td>
</tr>
</tbody>
</table>

\[
\Gamma(K_{S}^{0}(1430)^{+}\pi^{-}, K_{S}^{0}^{+} \rightarrow K_{S}^{0}\pi^{+}) / \Gamma(K_{S}^{0}\pi^{+}\pi^{-}) \quad \Gamma_{49}/\Gamma_{36}
\]
This is the “fit fraction” from the Dalitz-plot analysis. This is a doubly Cabibbo-suppressed mode.

<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;1.2 \times 10^{-3}</td>
<td>95</td>
<td>AUBERT 08Al BABR</td>
<td>Dalitz fit, ( \approx 487 ) kevts</td>
<td></td>
</tr>
</tbody>
</table>

\[
\Gamma(K_{S}^{0}\pi^{+}\pi^{-} \text{ nonresonant}) / \Gamma(K_{S}^{0}\pi^{+}\pi^{-}) \quad \Gamma_{50}/\Gamma_{36}
\]
This is the “fit fraction” from the Dalitz-plot analysis. Neither FRABETTI 94G nor ALBRECHT 93D (quoted in many of the earlier submodes of \( K_{S}^{0}\pi^{+}\pi^{-} \)) sees evidence for a nonresonant component.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.009^{+0.004}_{-0.004}</td>
<td>MURAMATSU 02</td>
<td>CLE2</td>
<td>Dalitz fit, 5299 evts</td>
</tr>
</tbody>
</table>

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

\[
\Gamma(K^{-}\pi^{+}\pi^{0}) / \Gamma_{\text{total}} \quad \Gamma_{51}/\Gamma
\]

<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>14.57 \pm 0.12 \pm 0.38</td>
<td>1</td>
<td>DOBBS 07</td>
<td>CLEO</td>
<td>See BONVICINI 14</td>
</tr>
<tr>
<td>14.9 \pm 0.3 \pm 0.5</td>
<td>1</td>
<td>HE 05</td>
<td>CLEO</td>
<td>See DOBBS 07</td>
</tr>
<tr>
<td>13.3 \pm 1.2 \pm 1.3</td>
<td>931</td>
<td>ADLER 88C</td>
<td>MKR3</td>
<td>( e^{+} e^{-} ) 3.77 GeV</td>
</tr>
<tr>
<td>11.7 \pm 4.3</td>
<td>37</td>
<td>SCHINDLER 81</td>
<td>MKR2</td>
<td>( e^{+} e^{-} ) 3.771 GeV</td>
</tr>
</tbody>
</table>

\(^{1}\) DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

\(^{2}\) SCHINDLER 81 (MARK-2) measures \( \sigma(e^{+} e^{-} \rightarrow \psi(3770)) \times \text{branching fraction} \) to be 0.68 \pm 0.23 nb. We use the MARK-3 (ADLER 88C) value of \( \sigma = 5.8 \pm 0.5 \pm 0.6 \) nb.

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update.
\[ \frac{\Gamma(K^- \pi^+ \pi^0)}{\Gamma(K^- \pi^+)} \]

\[ \frac{\Gamma_51}{\Gamma_32} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.65 (\pm 0.13) OUR FIT</td>
<td></td>
<td></td>
<td>Error includes scale factor of 2.1.</td>
</tr>
<tr>
<td>3.76 (\pm 0.10) OUR AVERAGE</td>
<td></td>
<td></td>
<td>See the ideogram below.</td>
</tr>
<tr>
<td>3.802 (\pm 0.022 \pm 0.073)</td>
<td>BONVICINI</td>
<td>14 CLEO</td>
<td>All CLEO-c runs</td>
</tr>
<tr>
<td>3.81 (\pm 0.07 \pm 0.26) 10k</td>
<td>BARISH</td>
<td>96 CLEO</td>
<td>(e^+ e^- \approx 7(45))</td>
</tr>
<tr>
<td>3.04 (\pm 0.16 \pm 0.34) 931</td>
<td>ALBRECHT</td>
<td>92P ARG</td>
<td>(e^+ e^- \approx 10 \text{ GeV})</td>
</tr>
<tr>
<td>2.8 (\pm 0.14 \pm 0.52) 1050</td>
<td>KINOSHITA</td>
<td>91 CLEO</td>
<td>(e^+ e^- \sim 10.7 \text{ GeV})</td>
</tr>
</tbody>
</table>

1 This value is calculated from numbers in Table 1 of ALBRECHT 92p.

WEIGHTED AVERAGE
3.76\(\pm 0.10\) (Error scaled by 1.4)

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.

\[ \frac{\Gamma(K^- \rho^+)}{\Gamma(K^- \pi^+ \pi^0)} \]

\[ \frac{\Gamma_52}{\Gamma_51} \]

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>0.78 (\pm 0.04) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.788 (\pm 0.019 \pm 0.048)</td>
<td>KOPP</td>
<td>01 CLE2</td>
<td>Dalitz fit, (\approx 7,000) evts</td>
</tr>
<tr>
<td>0.765 (\pm 0.041 \pm 0.054)</td>
<td>FRABETTI</td>
<td>94G E687</td>
<td>Dalitz fit, 530 evts</td>
</tr>
<tr>
<td>\bullet \bullet \bullet \ We do not use the following data for averages, fits, limits, etc. \bullet \bullet \bullet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.647 (\pm 0.039 \pm 0.150)</td>
<td>ANJOS</td>
<td>93 E691</td>
<td>(\gamma)Be 90–260 GeV</td>
</tr>
<tr>
<td>0.81 (\pm 0.03 \pm 0.06)</td>
<td>ADLER</td>
<td>87 MRK3</td>
<td>(e^+ e^- \sim 3.77 \text{ GeV})</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(K^- \rho(1700)^+ \rightarrow \pi^+ \pi^0)}{\Gamma(K^- \pi^+ \pi^0)} \]

\[ \frac{\Gamma_53}{\Gamma_51} \]

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>0.057 (\pm 0.008 \pm 0.009)</td>
<td>KOPP</td>
<td>01 CLE2</td>
<td>Dalitz fit, (\approx 7,000) evts</td>
</tr>
</tbody>
</table>
\[ \Gamma(K^{*}(892)^{-}\pi^{+}, K^{*}(892)^{0} \rightarrow K^{-}\pi^{0})/\Gamma(K^{-}\pi^{+}\pi^{0}) \] \[ \Gamma_{54}/\Gamma_{51} \]

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>0.160^{+0.025}_{-0.013}</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.161^{+0.007}_{-0.011}</td>
<td>KOPP</td>
<td>01</td>
<td>CLE2 Dalitz fit, \approx 7,000 evts</td>
</tr>
<tr>
<td>0.148^{+0.028}_{-0.049}</td>
<td>FRABETTI</td>
<td>94G</td>
<td>E687 Dalitz fit, 530 evts</td>
</tr>
<tr>
<td>0.084^{+0.011}_{-0.012}</td>
<td>ANJOS</td>
<td>93</td>
<td>E691 \gamma Be 90–260 GeV</td>
</tr>
<tr>
<td>0.12^{+0.02}_{-0.03}</td>
<td>ADLER</td>
<td>87</td>
<td>MRK3 ( e^{+} e^{-} 3.77 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^{*}(892)^{0}\pi^{0}, K^{*}(892)^{0} \rightarrow K^{-}\pi^{+})/\Gamma(K^{-}\pi^{+}\pi^{0}) \] \[ \Gamma_{55}/\Gamma_{51} \]

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>0.135^{+0.016}_{-0.018}</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.127^{+0.009}_{-0.016}</td>
<td>KOPP</td>
<td>01</td>
<td>CLE2 Dalitz fit, \approx 7,000 evts</td>
</tr>
<tr>
<td>0.165^{+0.031}_{-0.015}</td>
<td>FRABETTI</td>
<td>94G</td>
<td>E687 Dalitz fit, 530 evts</td>
</tr>
<tr>
<td>0.142^{+0.018}_{-0.024}</td>
<td>ANJOS</td>
<td>93</td>
<td>E691 \gamma Be 90–260 GeV</td>
</tr>
<tr>
<td>0.13^{+0.02}_{-0.03}</td>
<td>ADLER</td>
<td>87</td>
<td>MRK3 ( e^{+} e^{-} 3.77 ) GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(K_{0}(1430)^{-}\pi^{+}, K_{0}^{*-} \rightarrow K^{-}\pi^{0})/\Gamma(K^{-}\pi^{+}\pi^{0}) \] \[ \Gamma_{56}/\Gamma_{51} \]

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>0.033^{+0.006}_{-0.014}</td>
<td>KOPP</td>
<td>01</td>
<td>CLE2 Dalitz fit, \approx 7,000 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(R_{0}(1430)^{0}\pi^{0}, R_{0}^{*-} \rightarrow K^{-}\pi^{+})/\Gamma(K^{-}\pi^{+}\pi^{0}) \] \[ \Gamma_{57}/\Gamma_{51} \]

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>0.041^{+0.006}_{-0.032}</td>
<td>KOPP</td>
<td>01</td>
<td>CLE2 Dalitz fit, \approx 7,000 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^{*}(1680)^{-}\pi^{+}, K^{*-} \rightarrow K^{-}\pi^{0})/\Gamma(K^{-}\pi^{+}\pi^{0}) \] \[ \Gamma_{58}/\Gamma_{51} \]

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>0.013^{+0.003}_{-0.004}</td>
<td>KOPP</td>
<td>01</td>
<td>CLE2 Dalitz fit, \approx 7,000 evts</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^{-}\pi^{+}\pi^{0} \text{nonresonant})/\Gamma(K^{-}\pi^{+}\pi^{0}) \] \[ \Gamma_{59}/\Gamma_{51} \]

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>0.080^{+0.040}_{-0.014}</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.075^{+0.009}_{-0.011}</td>
<td>KOPP</td>
<td>01</td>
<td>CLE2 Dalitz fit, \approx 7,000 evts</td>
</tr>
<tr>
<td>0.101^{+0.033}_{-0.040}</td>
<td>FRABETTI</td>
<td>94G</td>
<td>E687 Dalitz fit, 530 evts</td>
</tr>
<tr>
<td>0.036^{+0.004}_{-0.018}</td>
<td>ANJOS</td>
<td>93</td>
<td>E691 \gamma Be 90–260 GeV</td>
</tr>
<tr>
<td>0.09^{+0.02}_{-0.04}</td>
<td>ADLER</td>
<td>87</td>
<td>MRK3 ( e^{+} e^{-} 3.77 ) GeV</td>
</tr>
<tr>
<td>0.51^{+0.22}_{-0.17}</td>
<td>SUMMERS</td>
<td>84</td>
<td>E691 Photoproduction</td>
</tr>
</tbody>
</table>
\[
\frac{\Gamma(K^0_S 2\pi^0)}{\Gamma_{\text{total}}}
\]
\[
\frac{\Gamma_60}{\Gamma}
\]

<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>9.1 ± 1.1 OUR AVERAGE</td>
<td>1259</td>
<td>LOWREY 11</td>
<td>CLEO</td>
<td>Error includes scale factor of 2.2.</td>
</tr>
<tr>
<td>10.58 ± 0.38 ± 0.73</td>
<td>1259</td>
<td>LOWREY 11</td>
<td>CLEO</td>
<td>e^+ e^- \approx 3.77 \text{ GeV}</td>
</tr>
<tr>
<td>8.34 ± 0.45 ± 0.42</td>
<td>1259</td>
<td>ASNER 08</td>
<td>CLEO</td>
<td>e^+ e^- \rightarrow D^0 \bar{D}^0, 3.77 \text{ GeV}</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^0_S 2\pi^0) - S\text{-wave}}{\Gamma(K^0_S 2\pi^0)}
\]
\[
\frac{\Gamma_{61}}{\Gamma_{60}}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.9 ± 6.3 ± 3.1</td>
<td>LOWREY 11</td>
<td>CLEO</td>
<td>Dalitz analysis, 1259 evts</td>
</tr>
<tr>
<td>65.6 ± 5.3 ± 2.5</td>
<td>LOWREY 11</td>
<td>CLEO</td>
<td>Dalitz analysis, 1259 evts</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^*(892)^0 \pi^0, K^*0 \rightarrow K^0_S \pi^0)}{\Gamma(K^0_S 2\pi^0)}
\]
\[
\frac{\Gamma_{62}}{\Gamma_{34}}
\]

\[
\frac{\Gamma(K^*(1430)^0 \pi^0, K^*0 \rightarrow K^0_S \pi^0)}{\Gamma(K^0_S 2\pi^0)}
\]
\[
\frac{\Gamma_{63}}{\Gamma_{60}}
\]

\[
\frac{\Gamma(K^0_S f_2(1270), f_2 \rightarrow 2\pi^0)}{\Gamma(K^0_S 2\pi^0)}
\]
\[
\frac{\Gamma_{65}}{\Gamma_{60}}
\]

\[
\frac{\Gamma(2K^0_S, \text{ one } K^0_S \rightarrow 2\pi^0)}{\Gamma(K^0_S 2\pi^0)}
\]
\[
\frac{\Gamma_{66}}{\Gamma_{60}}
\]

\[
\frac{\Gamma(K^0_S 2\pi^0 \text{ nonresonant})}{\Gamma(K^0_S \pi^0)}
\]
\[
\frac{\Gamma_{67}}{\Gamma_{34}}
\]

\[
\frac{\Gamma(K^- 2\pi^+ \pi^-)}{\Gamma_{\text{total}}}
\]
\[
\frac{\Gamma_{68}}{\Gamma}
\]

<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>8.30 ± 0.07 ± 0.20</td>
<td>15</td>
<td>DOBBS 07</td>
<td>CLEO</td>
<td>See BONVICINI 14</td>
</tr>
<tr>
<td>8.3 ± 0.2 ± 0.3</td>
<td>15</td>
<td>HE 05</td>
<td>CLEO</td>
<td>See DOBBS 07</td>
</tr>
<tr>
<td>7.9 ± 1.5 ± 0.9</td>
<td>15</td>
<td>ALBRECHT 94</td>
<td>ARG</td>
<td>e^+ e^- \approx \Gamma(4S)</td>
</tr>
<tr>
<td>6.80 ± 0.27 ± 0.57</td>
<td>14k</td>
<td>ALBRECHT 94</td>
<td>ARG</td>
<td>e^+ e^- \approx \Gamma(4S)</td>
</tr>
<tr>
<td>9.1 ± 0.8 ± 0.8</td>
<td>992</td>
<td>ADLER 88c</td>
<td>MRK3</td>
<td>e^+ e^- \approx 3.77 \text{ GeV}</td>
</tr>
<tr>
<td>11.7 ± 2.5</td>
<td>185</td>
<td>SCHINDLER 81</td>
<td>MRK2</td>
<td>e^+ e^- \approx 3.771 \text{ GeV}</td>
</tr>
<tr>
<td>6.2 ± 1.9</td>
<td>44</td>
<td>PERUZZI 77</td>
<td>LGW</td>
<td>e^+ e^- \approx 3.77 \text{ GeV}</td>
</tr>
</tbody>
</table>

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
1 DOBBS 07 and HE 05 use single- and double-tagged events in an overall fit. DOBBS 07 supersedes HE 05.

2 ALBRECHT 94 uses $D^0$ mesons from $B^0 \to D^{*+} \ell^− \overline{\nu}_\ell$ decays. This is a different set of events than used by ALBRECHT 94F.

3 See the footnote on the ALBRECHT 94F measurement of $\Gamma(K^−π^+)/Γ_{total}$ for the method used.

4 SCHINDLER 81 (MARK-2) measures $\sigma(e^+e^−\to\psi(3770)) \times$ branching fraction to be $0.68 \pm 0.11$ nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

5 PERUZZI 77 (MARK-1) measures $\sigma(e^+e^−\to\psi(3770)) \times$ branching fraction to be $0.36 \pm 0.10$ nb. We use the MARK-3 (ADLER 88C) value of $\sigma = 5.8 \pm 0.5 \pm 0.6$ nb.

### $\Gamma(K^−2π^+π^−)/\Gamma(K^−π^+)$

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.083 ± 0.031</td>
<td>2.087 ± 0.032</td>
<td>OUR FIT</td>
<td>OUR AVERAGE</td>
<td></td>
</tr>
<tr>
<td>2.106 ± 0.013 ± 0.032</td>
<td>BONVICINI</td>
<td>14</td>
<td>CLEO</td>
<td>All CLEO-c runs</td>
</tr>
<tr>
<td>1.94 ± 0.07 ± 0.09</td>
<td>JUN</td>
<td>00</td>
<td>SELX</td>
<td>$\Sigma^−$ nucleus, 600 GeV</td>
</tr>
<tr>
<td>1.7 ± 0.2 ± 0.2</td>
<td>1745</td>
<td>ANJOS</td>
<td>92C</td>
<td>E691</td>
</tr>
<tr>
<td>1.90 ± 0.25 ± 0.20</td>
<td>337</td>
<td>ALVAREZ</td>
<td>91B</td>
<td>CLEO</td>
</tr>
<tr>
<td>2.12 ± 0.16 ± 0.09</td>
<td>BORTOLETTO88</td>
<td>CLEO</td>
<td>$e^+e^− 10.55$ GeV</td>
<td></td>
</tr>
<tr>
<td>2.17 ± 0.28 ± 0.23</td>
<td>ALBRECHT</td>
<td>85F</td>
<td>ARG</td>
<td>$e^+e^− 10$ GeV</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 ± 0.9</td>
<td>48</td>
<td>BAILEY</td>
<td>86</td>
<td>ACCM</td>
</tr>
<tr>
<td>2.0 ± 1.0</td>
<td>10</td>
<td>BAILEY</td>
<td>83B</td>
<td>SPEC</td>
</tr>
<tr>
<td>2.2 ± 0.8</td>
<td>214</td>
<td>PICCOLO</td>
<td>77</td>
<td>MRK1</td>
</tr>
</tbody>
</table>

### $\Gamma(K^−π^+\rho^0_{\text{total}})/\Gamma(K^−2π^+π^−)$

This includes $K^−a_1(1260)^+, \overline{\Lambda}^+(892)0\rho^0$, etc. The next entry gives the specifically 3-body fraction. We rely on the MARK III and E691 full amplitude analyses of the $K^−π^+π^+π^−$ channel for values of the resonant substructure.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.835 ± 0.035</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.80 ± 0.03 ± 0.05</td>
<td>ANJOS</td>
<td>92C</td>
<td>E691</td>
</tr>
<tr>
<td>0.855 ± 0.032 ± 0.030</td>
<td>COFFMAN</td>
<td>92B</td>
<td>MRK3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.98 ± 0.12 ± 0.10</td>
<td>ALVAREZ</td>
<td>91B</td>
<td>NA14</td>
</tr>
</tbody>
</table>

### $\Gamma(K^−π^+\rho^0_{3\text{-body}})/\Gamma(K^−2π^+π^−)$

We rely on the MARK III and E691 full amplitude analyses of the $K^−π^+π^+π^−$ channel for values of the resonant substructure.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.063 ± 0.028</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.05 ± 0.03 ± 0.02</td>
<td>ANJOS</td>
<td>92C</td>
<td>E691</td>
</tr>
<tr>
<td>0.084 ± 0.022 ± 0.04</td>
<td>COFFMAN</td>
<td>92B</td>
<td>MRK3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
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<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.77 ± 0.06 ± 0.06</td>
<td>1 ALVAREZ</td>
<td>91B</td>
<td>NA14</td>
</tr>
<tr>
<td>0.85 ± 0.11 ± 0.22</td>
<td>180</td>
<td>PICCOLO</td>
<td>77</td>
</tr>
</tbody>
</table>

1 This value is for $\rho^0 (K^−π^+)$-nonresonant. ALVAREZ 91B cannot determine what fraction of this is $K^−a_1(1260)^+$.
Unseen decay modes of the $K^*(892)^0$ are included. We rely on the MARK III and E691 full amplitude analyses of the $K^- \pi^+ \pi^+ \pi^-$ channel for values of the resonant substructure.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.195 \pm 0.03 \pm 0.03$</td>
<td></td>
<td>ANJOS 92c</td>
<td>E691</td>
<td>$1745 K^- 2\pi^+ \pi^-$ evts</td>
</tr>
<tr>
<td>$\pm 0.09 \pm 0.09$</td>
<td>ALVAREZ 91b</td>
<td>NA14</td>
<td>Photoproduction</td>
<td></td>
</tr>
<tr>
<td>$0.75 \pm 0.3$</td>
<td>BAILEY 83b</td>
<td>SPEC</td>
<td>$\pi^0 \rightarrow D^0$</td>
<td></td>
</tr>
<tr>
<td>$0.15 \pm 0.16 \pm 0.15$</td>
<td>PICCOLO 77</td>
<td>MRK1</td>
<td>$e^+ e^- 4.03, 4.41$ GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.213 \pm 0.024 \pm 0.075$</td>
<td>COFFMAN 92b</td>
<td>MRK3</td>
<td>$1281 \pm 45 K^- 2\pi^+ \pi^-$ evts</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.375 \pm 0.045 \pm 0.06$</td>
<td>ANJOS 92c</td>
<td>E691</td>
<td>$1745 K^- 2\pi^+ \pi^-$ evts</td>
</tr>
</tbody>
</table>

Unseen decay modes of the $K^*(892)^0$ 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>$&lt;0.003$</td>
<td>90</td>
<td>COFFMAN 92b</td>
<td>MRK3</td>
<td>$1281 \pm 45 K^- 2\pi^+ \pi^-$ evts</td>
</tr>
</tbody>
</table>

Unseen decay modes of the $K^*(892)^0$ 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>$&lt;0.003$</td>
<td>90</td>
<td>COFFMAN 92b</td>
<td>MRK3</td>
<td>$1.3k K^- 2\pi^+ \pi^- $ evts</td>
</tr>
<tr>
<td>$&lt;0.009$</td>
<td>90</td>
<td>ANJOS 92c</td>
<td>E691</td>
<td>$1745 K^- 2\pi^+ \pi^- $ evts</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.255 \pm 0.045 \pm 0.06$</td>
<td>ANJOS 92c</td>
<td>E691</td>
<td>$1745 K^- 2\pi^+ \pi^- $ evts</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt;0.111$</td>
<td>90</td>
<td>ANJOS 92c</td>
<td>E691</td>
</tr>
</tbody>
</table>

We do not use the following data for averages, fits, limits, etc. • • •
\( \Gamma(K^- a_1(1260)^+)/(K^- \pi^+ \pi^-) \quad \Gamma_{98}/\Gamma_{68} \)

Unseen decay modes of the \( a_1(1260)^+ \) are included, assuming that the \( a_1(1260)^+ \) decays entirely to \( \rho \pi \) [or at least to \( (\pi \pi)^{I=1} \pi \)].

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.97 ± 0.14</td>
<td></td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.94 ± 0.13 ± 0.20</td>
<td></td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
<tr>
<td>0.984 ± 0.048 ± 0.16</td>
<td></td>
<td>COFFMAN</td>
<td>92b</td>
<td>MRK3 1281 ± 45 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K^- a_2(1320)^+)/\Gamma_{\text{total}} \quad \Gamma_{99}/\Gamma \)

Unseen decay modes of the \( a_2(1320)^+ \) 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;0.002</td>
<td></td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
<tr>
<td>• • •</td>
<td></td>
<td>We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;0.006</td>
<td></td>
<td>COFFMAN</td>
<td>92b</td>
<td>MRK3 1281 ± 45 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K_1(1270)^- \pi^+)/\Gamma(K^- \pi^+ \pi^-) \quad \Gamma_{110}/\Gamma_{68} \)

Unseen decay modes of the \( K_1(1270)^- \) are included. The MARK3 and E691 experiments disagree considerably here.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.194 ± 0.056 ± 0.088</td>
<td></td>
<td>COFFMAN</td>
<td>92b</td>
<td>MRK3 1281 ± 45 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
<tr>
<td>• • •</td>
<td></td>
<td>We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;0.013</td>
<td></td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K_1(1400)^- \pi^+)/\Gamma_{\text{total}} \quad \Gamma_{111}/\Gamma \)

<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;0.012</td>
<td></td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K^*(1410)^- \pi^+)/\Gamma_{\text{total}} \quad \Gamma_{112}/\Gamma \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• • •</td>
<td></td>
<td>We do not use the following data for averages, fits, limits, etc. • • •</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;0.012</td>
<td></td>
<td>COFFMAN</td>
<td>92b</td>
<td>MRK3 1281 ± 45 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K^*(892)^0 \pi^+ \pi^- \text{total})/\Gamma(K^- \pi^+ \pi^-) \quad \Gamma_{100}/\Gamma_{68} \)

This includes \( K^*(892)^0 \rho^0 \), etc. The next entry gives the specifically 3-body fraction. Unseen decay modes of the \( K^*(892)^0 \) are included.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.30 ± 0.06 ± 0.03</td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K^*(892)^0 \pi^+ \pi^- \text{3-body})/\Gamma(K^- \pi^+ \pi^-) \quad \Gamma_{101}/\Gamma_{68} \)

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

<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</td>
<td>OUR AVERAGE</td>
<td>ANJOS</td>
<td>92c</td>
</tr>
<tr>
<td>0.165 ± 0.03 ± 0.045</td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
<tr>
<td>0.210 ± 0.027 ± 0.06</td>
<td>COFFMAN</td>
<td>92b</td>
<td>MRK3 1281 ± 45 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>

\( \Gamma(K^- \pi^+ \pi^- \text{nonresonant})/\Gamma(K^- \pi^+ \pi^-) \quad \Gamma_{76}/\Gamma_{68} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.23 ± 0.02 ± 0.03</td>
<td>ANJOS</td>
<td>92c</td>
<td>E691 1745 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
<tr>
<td>0.242 ± 0.025 ± 0.06</td>
<td>COFFMAN</td>
<td>92b</td>
<td>MRK3 1281 ± 45 ( K^- \pi^+ \pi^- ) evts</td>
</tr>
</tbody>
</table>
\[ \Gamma(K_0 S^\pi + \pi^- \pi^0)/\Gamma_{\text{total}} \]

**\( \Gamma_{77}/\Gamma \)**

<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>5.1 ± 0.6 OUR FIT</td>
<td></td>
<td>COFFMAN 92b MRK3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2 ± 1.1 ± 1.2</td>
<td>140</td>
<td>BARLAG 92c ACCM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

6.7 ± 1.6

1 BARLAG 92c computes the branching fraction using topological normalization.

<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>1.85 ± 0.20 OUR FIT</td>
<td></td>
<td>ALBRECHT 92p ARG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.86 ± 0.23 OUR AVERAGE</td>
<td></td>
<td>ANJOS 92c E691</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.85 ± 0.26 ± 0.30</td>
<td>158</td>
<td>KINOSHITA 91 CLEO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- This value is calculated from numbers in Table 1 of ALBRECHT 92p.

<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>4.42 ± 0.15 ± 0.28</td>
<td>2864</td>
<td>MENDEZ 10 CLEO</td>
<td></td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

\[ \Gamma(K_0 S^\eta)/\Gamma_{\text{total}} \]

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

<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>0.32 ± 0.04 ± 0.03</td>
<td>225</td>
<td>PROCARIO 93b CLE2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K_0 S^\eta)/[\Gamma(K^- + + \Gamma(K^+ \pi^-))] \]

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>0.14 ± 0.02 ± 0.02</td>
<td>80</td>
<td>PROCARIO 93b CLE2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update

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

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.11 ± 0.06 OUR FIT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.12 ± 0.04 ± 0.05</td>
<td>ASNER 08 CLEO</td>
<td>e(^+) e(^-) \rightarrow D^0 \bar{D}^0, 3.77 GeV</td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K_S^0\omega)/\Gamma(K^− π^+) \]

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50 ± 0.18 ± 0.10</td>
<td>ALBRECHT 89D ARG</td>
<td>e(^+) e(^-) \sim 10 GeV</td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K_S^0\omega)/\Gamma(K^0_S π^+ π^-) \]

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.402 ± 0.033 OUR FIT</td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.1.</td>
</tr>
<tr>
<td>0.33 ± 0.09 OUR AVERAGE</td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.1.</td>
</tr>
<tr>
<td>0.29 ± 0.08 ± 0.05</td>
<td>16 ALBRECHT 92P ARG</td>
<td>e(^+) e(^-) \approx 10 GeV</td>
<td></td>
</tr>
<tr>
<td>0.54 ± 0.14 ± 0.16</td>
<td>40 KINOSHITA 91 CLEO</td>
<td>e(^+) e(^-) \sim 10.7 GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 This value is calculated from numbers in Table 1 of ALBRECHT 92P.

\[ \Gamma(K_S^0\omega)/\Gamma(K^0_S π^+ π^- π^0) \]

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.217 ± 0.026 OUR FIT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.220 ± 0.048 ± 0.0116</td>
<td>COFFMAN 92B MRK3</td>
<td>1281 ± 45 K(^-) 2π(^+) π(^-) \text{ evts}</td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K_S^0\eta(958))/\left[\Gamma(K^− π^+) + \Gamma(K^+ π^-)\right] \]

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>23.9 ± 1.3 OUR FIT</td>
<td>1321 ± 42 MENDEZ 10 CLEO</td>
<td>e(^+) e(^-) \text{ at } 3774 \text{ MeV}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(K_S^0\eta(958))/\Gamma(K_S^0 π^+ π^-) \]

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.340 ± 0.025 OUR FIT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.32 ± 0.04 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.31 ± 0.02 ± 0.04</td>
<td>594 PROCARIO 93B CLE2</td>
<td>( \eta' \rightarrow \eta π^+ π^- ), ( ρ^0 \gamma )</td>
<td></td>
</tr>
<tr>
<td>0.37 ± 0.13 ± 0.06</td>
<td>18 1 ALBRECHT 92P ARG</td>
<td>e(^+) e(^-) \approx 10 GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 This value is calculated from numbers in Table 1 of ALBRECHT 92P.

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.177 ± 0.029</td>
<td>1 BARLAG 92C ACCM</td>
<td>( π^- \ Cu ) 230 GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.149 ± 0.037 ± 0.030</td>
<td>2 ADLER 88C MRK3</td>
<td>( e^+ e^- ) 3.77 GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.209 ± 0.074 −0.043</td>
<td>9 1 AGUILAR... 87F HYBR</td>
<td>( π p, pp ) 360, 400 GeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HTTP://PDG.LBL.GOV Page 46 Created: 5/30/2017 17:22
AGUILAR-BENITEZ 87f and BARLAG 92c compute the branching fraction using topological normalization. They do not distinguish the presence of a third $\pi^0$, and thus are not included in the average.

2 ADLER 88c uses an absolute normalization method finding this decay channel opposite a detected $D^0 \rightarrow K^+ \pi^-$ in pure $D\bar{D}$ events.

\[
\Gamma(K^- 2\pi^+ \pi^- \pi^0) / \Gamma(K^- \pi^+) \quad \Gamma_{81}/\Gamma_{32}
\]

\[
\begin{array}{c|c|c|c|c}
\text{VALUE} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
1.09 \pm 0.10 & \text{OUR FIT} & & & \\
0.98 \pm 0.11 & 225 & 1 \text{ ALBRECHT} 92p & \text{ARG} & e^+ e^- \approx 10 \text{ GeV} \\
\end{array}
\]

1 This value is calculated from numbers in Table 1 of ALBRECHT 92p.

\[
\Gamma(K^- 2\pi^+ \pi^- \pi^-) / \Gamma(K^- 2\pi^+ \pi^-) \quad \Gamma_{81}/\Gamma_{68}
\]

\[
\begin{array}{c|c|c|c|c}
\text{VALUE} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
0.52 \pm 0.05 & \text{OUR FIT} & & & \\
0.56 \pm 0.07 & \text{OUR AVERAGE} & & & \\
0.55 \pm 0.07 & 167 & \text{KINOSHITA} 91 & \text{CLEO} & e^+ e^- \sim 10.7 \text{ GeV} \\
0.57 \pm 0.06 & 180 & \text{ANJOS} 90d & \text{E691} & \text{Photoproduction} \\
\end{array}
\]

\[
\Gamma(K^*(892)^0 \pi^+ \pi^- \pi^0) / \Gamma(K^- 2\pi^+ \pi^- \pi^-) \quad \Gamma_{113}/\Gamma_{81}
\]

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

\[
\begin{array}{c|c|c|c|c}
\text{VALUE} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
0.45 \pm 0.15 & 46 & \text{KINOSHITA} 91 & \text{CLEO} & e^+ e^- \sim 10.7 \text{ GeV} \\
\end{array}
\]

\[
\Gamma(K^*(892)^0 \eta) / \Gamma(K^- \pi^+) \quad \Gamma_{114}/\Gamma_{32}
\]

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

\[
\begin{array}{c|c|c|c|c}
\text{VALUE} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
0.58 \pm 0.19 & 214 & \text{PROCARIO} 93b & \text{CLEO} & \Gamma_{K^*(892)^0 \eta} \rightarrow K^- \pi^+ / \gamma \gamma \\
\end{array}
\]

\[
\Gamma(K_S^0 \eta \pi^0) / \Gamma(K_S^0 \pi^0) \quad \Gamma_{85}/\Gamma_{34}
\]

\[
\begin{array}{c|c|c|c|c}
\text{VALUE} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
0.46 \pm 0.07 & 155 & 04 & \text{CLEO} & e^+ e^- \approx 10 \text{ GeV} \\
\end{array}
\]

1 The $\eta$ here is detected in its $\gamma \gamma$ mode, but other $\eta$ modes are included in the value given.

\[
\Gamma(K_S^0 a_0(980), a_0 \rightarrow \eta \pi^0) / \Gamma(K_S^0 \eta \pi^0) \quad \Gamma_{86}/\Gamma_{85}
\]

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

\[
\begin{array}{c|c|c|c|c}
\text{VALUE} & \text{EVTS} & \text{DOCUMENT ID} & \text{TECN} & \text{COMMENT} \\
\hline
1.19 \pm 0.09 & 04 & \text{CLEO} & \text{Dalitz fit, 155 evts} \\
\end{array}
\]

1 In addition to $K_S^0 a_0(980)$ and $K^*(892)^0 \eta$ modes, RUBIN 04 finds a fit fraction of $0.246 \pm 0.092 \pm 0.091$ for other, undetermined modes.
\( \Gamma(K^0(892)^0 \eta, K^0(892)^0 \to K^0_S \pi^0) / \Gamma(K^0_S \eta \pi^0) \)  \( \Gamma_{87}/\Gamma_{85} \)

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.293 \pm 0.062 \pm 0.035)</td>
<td>RUBIN 04</td>
<td>CLEO</td>
<td>Dalitz fit, 155 evts</td>
</tr>
</tbody>
</table>

1 See the note on RUBIN 04 in the preceding data block.

\( \Gamma(K^- \pi^+ \omega) / \Gamma(K^- \pi^+) \)  \( \Gamma_{115}/\Gamma_{32} \)

Unseen decay modes of the \( \omega \) 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>(0.78 \pm 0.12 \pm 0.10)</td>
<td>99</td>
<td>ALBRECHT 92P</td>
<td>ARG</td>
<td>( e^+ e^- \approx 10 ) GeV</td>
</tr>
</tbody>
</table>

1 This value is calculated from numbers in Table 1 of ALBRECHT 92P.

\( \Gamma(K^0(892)^0 \omega) / \Gamma(K^- \pi^+) \)  \( \Gamma_{116}/\Gamma_{32} \)

Unseen decay modes of the \( K^0(892)^0 \) and \( \omega \) 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>(0.28 \pm 0.11 \pm 0.04)</td>
<td>17</td>
<td>ALBRECHT 92P</td>
<td>ARG</td>
<td>( e^+ e^- \approx 10 ) GeV</td>
</tr>
</tbody>
</table>

1 This value is calculated from numbers in Table 1 of ALBRECHT 92P.

\( \Gamma(K^- \pi^+ \eta'(958)) / \Gamma(K^- 2\pi^+ \pi^-) \)  \( \Gamma_{117}/\Gamma_{68} \)

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>(0.093 \pm 0.014 \pm 0.019)</td>
<td>286</td>
<td>PROCARIO 93b</td>
<td>CLE2</td>
<td>( \eta' \to \eta \pi^+ \pi^- , \rho^0 \gamma )</td>
</tr>
</tbody>
</table>

\( \Gamma(K^0(892)^0 \eta'(958)) / \Gamma(K^- \pi^+ \eta'(958)) \)  \( \Gamma_{118}/\Gamma_{117} \)

Unseen decay modes of the \( K^0(892)^0 \) 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;0.15)</td>
<td>90</td>
<td>PROCARIO 93b</td>
<td>CLE2</td>
<td></td>
</tr>
</tbody>
</table>

\( \Gamma(K^0_S 2\pi^+ 2\pi^-) / \Gamma(K^0_S \pi^+ \pi^-) \)  \( \Gamma_{88}/\Gamma_{36} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.095 \pm 0.005 \pm 0.007)</td>
<td>1283 ± 57</td>
<td>LINK 04D FOCKS</td>
<td></td>
<td>( \gamma A, \overline{E}_\gamma \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.07 \pm 0.02 \pm 0.01)</td>
<td>11</td>
<td>ALBRECHT 92P</td>
<td>ARG</td>
<td>( e^+ e^- \approx 10 ) GeV</td>
</tr>
<tr>
<td>(0.149 \pm 0.026)</td>
<td>56</td>
<td>AMMAR 91 CLEO</td>
<td></td>
<td>( e^+ e^- \approx 10.5 ) GeV</td>
</tr>
<tr>
<td>(0.18 \pm 0.07 \pm 0.04)</td>
<td>6</td>
<td>ANJOS 90D E691</td>
<td></td>
<td>Photoproduction</td>
</tr>
</tbody>
</table>

1 This value is calculated from numbers in Table 1 of ALBRECHT 92P.

\( \Gamma(K^0_S \rho^0 \pi^+ \pi^- , no K^*(892)^-) / \Gamma(K^0_S 2\pi^+ 2\pi^-) \)  \( \Gamma_{89}/\Gamma_{88} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.40 \pm 0.24 \pm 0.07)</td>
<td>LINK 04D FOCKS</td>
<td></td>
<td>( \gamma A, \overline{E}_\gamma \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\( \Gamma(K^*(892)^- 2\pi^+ \pi^- , K^*(892)^- \to K^0_S \pi^-, no \rho^0) / \Gamma(K^0_S 2\pi^+ 2\pi^-) \)  \( \Gamma_{90}/\Gamma_{88} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.17 \pm 0.28 \pm 0.02)</td>
<td>LINK 04D FOCKS</td>
<td></td>
<td>( \gamma A, \overline{E}_\gamma \approx 180 ) GeV</td>
</tr>
</tbody>
</table>

\( \Gamma(K^*(892)^- \rho^0 \pi^+, K^*(892)^- \to K^0_S \pi^-) / \Gamma(K^0_S 2\pi^+ 2\pi^-) \)  \( \Gamma_{91}/\Gamma_{88} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.60 \pm 0.21 \pm 0.09)</td>
<td>LINK 04D FOCKS</td>
<td></td>
<td>( \gamma A, \overline{E}_\gamma \approx 180 ) GeV</td>
</tr>
</tbody>
</table>
$\Gamma(K_2^0 2\pi^+ 2\pi^- / \Gamma(K_S^0 2\pi^+ 2\pi^-) \quad \Gamma_{92}/\Gamma_{88}$

<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;0.46</td>
<td>90</td>
<td>LINK</td>
<td>04D</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

$\Gamma(K^- 3\pi^+ 2\pi^- )/ \Gamma(K^- 2\pi^+ \pi^-) \quad \Gamma_{94}/\Gamma_{68}$

<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>2.70 ± 0.58 ± 0.38</td>
<td>48 ± 10</td>
<td>LINK</td>
<td>04B</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

### Hadronic modes with three $K$'s

$\Gamma(K_2^0 K^+ K^-)/ \Gamma(K_S^0 \pi^+ \pi^-) \quad \Gamma_{119}/\Gamma_{36}$

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.158 ± 0.001 ± 0.005</td>
<td>AUBERT,B</td>
<td>05J</td>
<td>BABR</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20 ± 0.05 ± 0.04</td>
<td>FRABETTI</td>
<td>92B</td>
<td>E687</td>
</tr>
<tr>
<td>0.170 ± 0.022</td>
<td>AMMAR</td>
<td>91</td>
<td>CLEO</td>
</tr>
<tr>
<td>0.24 ± 0.08</td>
<td>BEBEK</td>
<td>86</td>
<td>CLEO</td>
</tr>
<tr>
<td>0.185 ± 0.055</td>
<td>ALBRECHT</td>
<td>85B</td>
<td>ARG</td>
</tr>
</tbody>
</table>

$\Gamma(K_2^0 a_0(980)^0, a_0^0 \to K^+ K^-)/ \Gamma(K_S^0 K^+ K^-) \quad \Gamma_{120}/\Gamma_{119}$

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.664 ± 0.016 ± 0.070</td>
<td>AUBERT,B</td>
<td>05J</td>
<td>BABR</td>
</tr>
</tbody>
</table>

Dalitz fit, 12540 ± 112 evts

$\Gamma(K^- a_0(980)^+, a_0^+ \to K^+ K_S^0)/ \Gamma(K_S^0 K^+ K^-) \quad \Gamma_{121}/\Gamma_{119}$

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.134 ± 0.011 ± 0.037</td>
<td>AUBERT,B</td>
<td>05J</td>
<td>BABR</td>
</tr>
</tbody>
</table>

Dalitz fit, 12540 ± 112 evts

$\Gamma(K^+ a_0(980)^-, a_0^- \to K^- K_S^0)/ \Gamma(K_S^0 K^+ K^-) \quad \Gamma_{122}/\Gamma_{119}$

This is a doubly Cabibbo-suppressed mode.

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.025</td>
<td>95</td>
<td>AUBERT,B</td>
<td>05J</td>
</tr>
</tbody>
</table>

Dalitz fit, 12540 ± 112 evts

$\Gamma(K_S^0 f_0(980), f_0 \to K^+ K^-)/ \Gamma(K_S^0 K^+ K^-) \quad \Gamma_{123}/\Gamma_{119}$

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.021</td>
<td>95</td>
<td>AUBERT,B</td>
<td>05J</td>
</tr>
</tbody>
</table>

Dalitz fit, 12540 ± 112 evts

$\Gamma(K_S^0 \phi, \phi \to K^+ K^-)/ \Gamma(K_S^0 K^+ K^-) \quad \Gamma_{124}/\Gamma_{119}$

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.459 ± 0.007 ± 0.007</td>
<td>AUBERT,B</td>
<td>05J</td>
<td>BABR</td>
</tr>
</tbody>
</table>

Dalitz fit, 12540 ± 112 evts

$\Gamma(K_S^0 f_0(1370), f_0 \to K^+ K^-)/ \Gamma(K_S^0 K^+ K^-) \quad \Gamma_{125}/\Gamma_{119}$

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

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.038 ± 0.007 ± 0.023</td>
<td>1 AUBERT,B</td>
<td>05J</td>
<td>BABR</td>
</tr>
</tbody>
</table>

1 AUBERT,B 05J calls the mode $K_S^0 f_0(1400)$, but insofar as it is seen here at all, it is certainly the same as $f_0(1370)$.
\(\Gamma(3K^0_S)/\Gamma_{\text{total}}\)  

<table>
<thead>
<tr>
<th>Value (units (10^{-4}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5 ± 0.6 OUR FIT</td>
<td>597</td>
<td>ABLIKIM 17A</td>
<td>BES3</td>
<td>e(^+) e(^-) → (\psi(3770))</td>
</tr>
</tbody>
</table>

\(\Gamma(3K^0_S)/\Gamma(K^0_S\pi^+\pi^-)\)

<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>2.74 ± 0.25 OUR FIT</td>
<td>170  ± 26</td>
<td>05A FOCS</td>
<td>γBe, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
<tr>
<td>3.58 ± 0.54 ± 0.52</td>
<td>61</td>
<td>ASNER 96B</td>
<td>CLE2</td>
<td>(e^+ e^- \sim \Upsilon(4S))</td>
</tr>
<tr>
<td>2.78 ± 0.38 ± 0.48</td>
<td>10   ± 3</td>
<td>FRABETTI 94J</td>
<td>E687</td>
<td>(\gamma, \vec{E}\gamma \approx 220 \text{ GeV})</td>
</tr>
<tr>
<td>3.2 ± 1.0</td>
<td>22</td>
<td>AMMAR 91</td>
<td>CLEO</td>
<td>(e^+ e^- \approx 10.5 \text{ GeV})</td>
</tr>
<tr>
<td>3.4 ± 1.4 ± 1.0</td>
<td>5</td>
<td>ALBRECHT 90c</td>
<td>ARG</td>
<td>(e^+ e^- \approx 10 \text{ GeV})</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Value (units (10^{-4}))</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0027 ± 0.0004 OUR AVERAGE</td>
<td>143</td>
<td>LINK 03G FOCS</td>
<td>γ A, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
<tr>
<td>0.00257 ± 0.00034 ± 0.00024</td>
<td>18</td>
<td>AITALA 01D</td>
<td>E791</td>
<td>(\pi^-, \gamma, \vec{E}\gamma \approx 500 \text{ GeV})</td>
</tr>
<tr>
<td>0.0028 ± 0.0007 ± 0.0001</td>
<td>20</td>
<td>FRABETTI 95C</td>
<td>E687</td>
<td>γ Be, (\vec{E}\gamma) ≈ 200 GeV</td>
</tr>
</tbody>
</table>

\(\Gamma(\phi R^*(892)^0, \phi \rightarrow K^+ K^-, R^*0 \rightarrow K^- \pi^+)/\Gamma(K^+ 2K^- \pi^+)\)

<table>
<thead>
<tr>
<th>Value</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.48 ± 0.06 ± 0.01</td>
<td>LINK 03G FOCS</td>
<td>γ A, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
</tbody>
</table>

\(\Gamma(K^- \pi^+ \phi, \phi \rightarrow K^+ K^-)/\Gamma(K^+ 2K^- \pi^+)\)

<table>
<thead>
<tr>
<th>Value</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.18 ± 0.06 ± 0.04</td>
<td>LINK 03G FOCS</td>
<td>γ A, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
</tbody>
</table>

\(\Gamma(K^+ K^- R^*(892)^0, R^*0 \rightarrow K^- \pi^+)/\Gamma(K^+ 2K^- \pi^+)\)

<table>
<thead>
<tr>
<th>Value</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20 ± 0.07 ± 0.02</td>
<td>LINK 03G FOCS</td>
<td>γ A, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Value</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.15 ± 0.06 ± 0.02</td>
<td>LINK 03G FOCS</td>
<td>γ A, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
</tbody>
</table>

\(\Gamma(2K^0_S K^\pm \pi^+)/\Gamma(K^0_S \pi^+ \pi^-)\)

<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>2.12 ± 0.38 ± 0.20</td>
<td>57 ± 10</td>
<td>05A FOCS</td>
<td>γ Be, (\vec{E}\gamma) ≈ 180 GeV</td>
<td></td>
</tr>
</tbody>
</table>
## Pionic modes

### $\Gamma(\pi^+\pi^-)/\Gamma(K^-\pi^+)$

<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>3.62 ±0.05 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.59 ±0.06 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.594±0.054±0.040</td>
<td>7334 ±97</td>
<td>ACOSTA 05C CDF $p\pi, \sqrt{s} = 1.96$ TeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.53 ±0.12 ±0.06</td>
<td>3453</td>
<td>LINK 03 FOCS $\gamma A, E_\gamma \approx 180$ GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.51 ±0.16 ±0.17</td>
<td>710</td>
<td>CSORNA 02 CLEO $e^+e^- \approx \Upsilon(4S)$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0 ±0.2 ±0.3</td>
<td>2043</td>
<td>AITALA 98C E791 $\pi^- A, 500$ GeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

| 3.62 ±0.10 ±0.08        | 2085 ±54 | RUBIN 06 CLEO See MENDEZ 10 |
| 3.4 ±0.7 ±0.1           | 76 ±15   | ABLIKIM 05F BES $e^+e^- \approx \psi(3770)$ |
| 4.3 ±0.7 ±0.3           | 177    | FRABETTI 94C E687 $\gamma$Be $E_\gamma = 220$ GeV |
| 3.48 ±0.30 ±0.23        | 227    | SELEN 93 CLEO $e^+e^- \approx \Upsilon(4S)$ |
| 5.5 ±0.8 ±0.5           | 120    | ANJOS 91D E691 Photoproduction |
| 5.0 ±0.7 ±0.5           | 110    | ALEXANDER 90 CLEO $e^+e^- 10.5$–11 GeV |

### $\Gamma_133/\Gamma_32$

<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>3.60±0.05 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.70±0.06±0.09</td>
<td>6210 ±93</td>
<td>MENDEZ 10 CLEO $e^+e^-$ at 3774 MeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### $\Gamma(2\pi^0)/\Gamma_{total}$

<table>
<thead>
<tr>
<th>VALUE (units $10^{-4}$)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.22±0.25 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.29±0.30 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.24±0.21±0.30</td>
<td>6k</td>
<td>ABLIKIM 15F BES3 $e^+e^- \approx 3.773$ GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.4 ±0.1 ±0.5</td>
<td>26k</td>
<td>LEES 12I BABR $e^+e^- \approx 10.58$ GeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### $\Gamma_134/\Gamma_32$

<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>2.05±0.13±0.16</td>
<td>499 ±32</td>
<td>RUBIN 06 CLEO See MENDEZ 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 ±0.4 ±0.4</td>
<td>40</td>
<td>SELEN 93 CLEO $e^+e^- \rightarrow \Upsilon(4S)$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### $\Gamma_{134}/(\Gamma_32+\Gamma_{240})$

<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>2.11±0.07 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.06±0.07±0.010</td>
<td>1567 ±54</td>
<td>MENDEZ 10 CLEO $e^+e^-$ at 3774 MeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### $\Gamma_135/\Gamma_32$

<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>37.7±1.6 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.4±0.5±1.2</td>
<td>11k±164</td>
<td>RUBIN 06 CLEO $e^+e^-$ at $\psi(3770)$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[ \Gamma (\pi^+ \pi^- \pi^0) / \Gamma (K^- \pi^+ \pi^0) \]

\[ \Gamma_{135} / \Gamma_{51} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
10.32±0.25 OUR FIT | EVTS | | Error includes scale factor of 2.3.
10.41±0.23 OUR AVERAGE | | | Error includes scale factor of 2.0.

10.12±0.04±0.18 123k±490 | ARINSTEIN 08 BELL | | \( e^+ e^- \approx \Upsilon (4S) \)
10.59±0.06±0.13 60k±343 | AUBERT, B 06X BABR | | \( e^+ e^- \approx \Upsilon (4S) \)

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

\[ \Gamma_{136} / \Gamma_{135} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
68.1±0.6 OUR AVERAGE | AUBERT 07BJ BABR | | Dalitz fit, 45k events

67.8±0.0±0.6 | | | \( e^+ e^- \approx 10 \text{ GeV} \)
76.3±1.9±2.5 | CRONIN-HEN..05 CLEO | | \( e^+ e^- \approx 10 \text{ GeV} \)

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

\[ \Gamma_{138} / \Gamma_{135} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
34.6±0.8±0.3 | AUBERT 07BJ BABR | | Dalitz fit, 45k events
34.5±2.4±1.3 | CRONIN-HEN..05 CLEO | | \( e^+ e^- \approx 10 \text{ GeV} \)

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

\[ \Gamma_{139} / \Gamma_{135} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
0.11±0.07±0.12 | AUBERT 07BJ BABR | | Dalitz fit, 45k events

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

\[ \Gamma_{140} / \Gamma_{135} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
0.30±0.11±0.07 | AUBERT 07BJ BABR | | Dalitz fit, 45k events

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

\[ \Gamma_{141} / \Gamma_{135} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
1.79±0.22±0.12 | AUBERT 07BJ BABR | | Dalitz fit, 45k events

\[ \Gamma (\rho(1700)^+ \pi^- , \rho^+ \rightarrow \pi^+ \pi^0) / \Gamma (\pi^+ \pi^- \pi^0) \]

\[ \Gamma_{142} / \Gamma_{135} \]

**VALUE (units 10^{-2})** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
4.1±0.7±0.7 | AUBERT 07BJ BABR | | Dalitz fit, 45k events
<table>
<thead>
<tr>
<th>$\Gamma(\rho(1700)^0 \pi^0, \rho^0 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{143}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>DOCUMENT ID</strong></td>
</tr>
<tr>
<td>$5.0 \pm 0.6 \pm 1.0$</td>
<td>AUBERT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(\rho(1700)^- \pi^+, \rho^- \to \pi^- \pi^0)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{144}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>DOCUMENT ID</strong></td>
</tr>
<tr>
<td>$3.2 \pm 0.4 \pm 0.6$</td>
<td>AUBERT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(f_0(980)^0, f_0 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{145}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>CL%</strong></td>
</tr>
<tr>
<td>$0.25 \pm 0.04 \pm 0.04$</td>
<td></td>
</tr>
</tbody>
</table>

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

$<0.026$ 95 1 CRONIN-HENNESSY05 CLEO $e^+ e^- \approx 10$ GeV

1 The CRONIN-HENNESSY05 fit here includes, in addition to the three $\rho \pi$ charged states, only the $f_0(980)\pi^0$ mode. See also the next entries for limits obtained in the same way for the $f_0(500)\pi^0$ mode and for an $S$-wave $\pi^+ \pi^-$ parametrized using a $K$-matrix. Our $\rho \pi$ branching ratios, given above, use the fit with the $K$-matrix $S$ wave.

<table>
<thead>
<tr>
<th>$\Gamma(f_0(500)^0, f_0 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{146}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>CL%</strong></td>
</tr>
<tr>
<td>$0.82 \pm 0.10 \pm 0.10$</td>
<td></td>
</tr>
</tbody>
</table>

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

$<0.21$ 95 1 CRONIN-HENNESSY05 CLEO $e^+ e^- \approx 10$ GeV

1 See the note on CRONIN-HENNESSY05 in the proceeding data block.

<table>
<thead>
<tr>
<th>$\Gamma((\pi^+ \pi^-)S$-wave $\pi^0)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{147}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>CL%</strong></td>
</tr>
<tr>
<td>$&lt;0.019$</td>
<td></td>
</tr>
</tbody>
</table>

1 See the note on CRONIN-HENNESSY05 two data blocks up.

<table>
<thead>
<tr>
<th>$\Gamma(f_0(1370)^0, f_0 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{148}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>DOCUMENT ID</strong></td>
</tr>
<tr>
<td>$0.37 \pm 0.11 \pm 0.09$</td>
<td>AUBERT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(f_0(1500)^0, f_0 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{149}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>DOCUMENT ID</strong></td>
</tr>
<tr>
<td>$0.39 \pm 0.08 \pm 0.07$</td>
<td>AUBERT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(f_0(1710)^0, f_0 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{150}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>DOCUMENT ID</strong></td>
</tr>
<tr>
<td>$0.31 \pm 0.07 \pm 0.08$</td>
<td>AUBERT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(f_2(1270)^0, f_2 \to \pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$</th>
<th>$\Gamma_{151}/\Gamma_{135}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10$^{-2}$)</strong></td>
<td><strong>DOCUMENT ID</strong></td>
</tr>
<tr>
<td>$1.32 \pm 0.08 \pm 0.10$</td>
<td>AUBERT</td>
</tr>
</tbody>
</table>
\[ \frac{\Gamma(\pi^+\pi^-\pi^0\text{nonresonant})}{\Gamma(\pi^+\pi^-\pi^0)} \]

\[ \frac{\Gamma_{\text{152}}}{\Gamma_{\text{135}}} \]

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.84 ± 0.21 ± 0.12</td>
<td>AUBERT 07BJ</td>
<td>BABR</td>
<td>Dalitz fit, 45k events</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(3\pi^0)}{\Gamma_{\text{total}}} \]

\[ \frac{\Gamma_{\text{153}}}{\Gamma} \]

<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;3.5 \times 10^{-4}</td>
<td>90</td>
<td>RUBIN 06</td>
<td>CLEO</td>
<td>e^+e^- at \psi(3770)</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(2\pi^+2\pi^-)}{\Gamma(K^-\pi^+)} \]

\[ \frac{\Gamma_{\text{154}}}{\Gamma_{\text{32}}} \]

<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>19.1 ± 0.5 OUR FIT</td>
<td>7331 ± 130</td>
<td>RUBIN 06</td>
<td>CLEO</td>
<td>e^+e^- at \psi(3770)</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(2\pi^+2\pi^-)}{\Gamma(K^-2\pi^+\pi^-)} \]

\[ \frac{\Gamma_{\text{154}}}{\Gamma_{\text{68}}} \]

<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>9.19 ± 0.22 OUR FIT</td>
<td>6360 ± 115</td>
<td>LINK 07A</td>
<td>FOCS</td>
<td>\gamma Be, \overline{\gamma} \approx 180 GeV</td>
</tr>
<tr>
<td>9.20 ± 0.26 OUR AVERAGE</td>
<td>7.9 ± 1.8 ± 0.5</td>
<td>ABLIKIM 05F</td>
<td>BES</td>
<td>e^+e^- \approx \psi(3770)</td>
</tr>
<tr>
<td>10.2 ± 1.3</td>
<td>814</td>
<td>FRA Betti 95C</td>
<td>E687</td>
<td>\gamma Be, \overline{\gamma} \approx 200 GeV</td>
</tr>
<tr>
<td>9.6 ± 1.8 ± 0.7</td>
<td>345</td>
<td>AMMAR 91</td>
<td>CLEO</td>
<td>e^+e^- \approx 10.5 GeV</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(a_1(1260)^+\pi^-)}{\Gamma(2\pi^+2\pi^-)} \]

\[ \frac{\Gamma_{\text{155}}}{\Gamma_{\text{154}}} \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>60.0 ± 3.0 ± 2.4</td>
<td>LINK 07A</td>
<td>FOCS</td>
<td>4-body fit, \approx 5.7k evts</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(a_1(1260)^+\pi^-)}{\Gamma(2\pi^+2\pi^-)} \]

\[ \frac{\Gamma_{\text{156}}}{\Gamma_{\text{154}}} \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.3 ± 2.5 ± 1.9</td>
<td>LINK 07A</td>
<td>FOCS</td>
<td>4-body fit, \approx 5.7k evts</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(a_1(1260)^+\pi^-)}{\Gamma(2\pi^+2\pi^-)} \]

\[ \frac{\Gamma_{\text{157}}}{\Gamma_{\text{154}}} \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 ± 0.5 ± 0.4</td>
<td>LINK 07A</td>
<td>FOCS</td>
<td>4-body fit, \approx 5.7k evts</td>
</tr>
</tbody>
</table>

\[ \frac{\Gamma(a_1(1260)^+\pi^-)}{\Gamma(2\pi^+2\pi^-)} \]

\[ \frac{\Gamma_{\text{158}}}{\Gamma_{\text{154}}} \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (units 10^{-2})</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3 ± 0.7 ± 0.6</td>
<td>LINK 07A</td>
<td>FOCS</td>
<td>4-body fit, \approx 5.7k evts</td>
</tr>
</tbody>
</table>
\[ \Gamma(2\rho^0\text{total})/\Gamma(2\pi^+2\pi^-) \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$24.5 \pm 1.3 \pm 1.0$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(2\rho^0, \text{parallel helicities})/\Gamma(2\pi^+2\pi^-) \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.1 \pm 0.3 \pm 0.3$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(2\rho^0, \text{perpendicular helicities})/\Gamma(2\pi^+2\pi^-) \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6.4 \pm 0.6 \pm 0.5$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(2\rho^0, \text{longitudinal helicities})/\Gamma(2\pi^+2\pi^-) \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$16.8 \pm 1.0 \pm 0.8$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(\text{Resonant } (\pi^+\pi^-)\pi^+\pi^- \text{ 3-body total})/\Gamma(2\pi^+2\pi^-) \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20.0 \pm 1.2 \pm 1.0$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

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

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8.2 \pm 0.9 \pm 0.7$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ \Gamma(f_0(980)\pi^+\pi^-, f_0 \rightarrow \pi^+\pi^-)/\Gamma(2\pi^+2\pi^-) \]

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.4 \pm 0.5 \pm 0.4$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

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

This is the fit fraction from the coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4.9 \pm 0.6 \pm 0.5$</td>
<td>LINK</td>
<td>07A</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-2}$</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25.8 \pm 1.5 \pm 1.8$</td>
<td>2724 ± 166</td>
<td>RUBIN</td>
<td>06</td>
<td>CLEO</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>VALUE $\times 10^{-4}$</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6.7 \pm 0.6$ OUR FIT</td>
<td></td>
<td>ABLIKIM</td>
<td>16D</td>
<td>BES3</td>
</tr>
</tbody>
</table>

6.5 ± 0.9 ± 0.4

We do not use the following data for averages, fits, limits, etc. 6.5 ± 0.9 ± 0.4

6.4 ± 1.0 ± 0.4

ARTUSO 08 CLEO See MENDEZ 10

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[
\frac{\Gamma(\eta^0 \pi^0)}{\Gamma(K^- \pi^+)} \quad \Gamma_{168}/\Gamma_{32}
\]

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>1.47 ± 0.34 ± 0.11</td>
<td>62 ± 14</td>
<td>RUBIN 06 CLEO</td>
<td>See ARTUSO 08</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(\eta^0 \pi^0)/\left[\Gamma(K^- \pi^+) + \Gamma(K^+ \pi^-)\right]}{\Gamma_{168}/(\Gamma_{32} + \Gamma_{240})} \quad \Gamma_{168}/(\Gamma_{32} + \Gamma_{240})
\]

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>1.71 ± 0.15 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.74 ± 0.15 ± 0.11</td>
<td>481 ± 40</td>
<td>MENDEZ 10 CLEO</td>
<td>$e^+ e^- \text{ at } 3774 \text{ MeV}$</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(\omega \pi^0)}{\Gamma_{\text{total}}} \quad \Gamma_{169}/\Gamma
\]

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

<table>
<thead>
<tr>
<th>VALUE (units $10^{-4}$)</th>
<th>CL%</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.17 ± 0.34 ± 0.07</td>
<td>45</td>
<td>ABLIKIM 16D BES3</td>
<td>$e^+ e^-, 3773 \text{ MeV}$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(2\pi^+ 2\pi^- \pi^0)}{\Gamma(K^- \pi^+)} \quad \Gamma_{170}/\Gamma_{32}
\]

Unseen decay modes of the $\pi$ 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>10.7 ± 1.2 ± 0.5</td>
<td>1614 ± 171</td>
<td>RUBIN 06 CLEO</td>
<td>$e^+ e^- \text{ at } \psi(3770)$</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(\eta^+ \pi^- \pi^-)}{\Gamma_{\text{total}}} \quad \Gamma_{171}/\Gamma
\]

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

<table>
<thead>
<tr>
<th>VALUE (units $10^{-4}$)</th>
<th>CL%</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.9 ± 1.3 ± 0.9</td>
<td>257 ± 32</td>
<td>ARTUSO 08 CLEO</td>
<td>$e^+ e^- \text{ at } \psi(3770)$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(\omega \pi^+ \pi^-)}{\Gamma(K^- \pi^+)} \quad \Gamma_{172}/\Gamma_{32}
\]

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>4.1 ± 1.2 ± 0.4</td>
<td>472 ± 132</td>
<td>RUBIN 06 CLEO</td>
<td>$e^+ e^- \text{ at } \psi(3770)$</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(3\pi^+ 3\pi^-)}{\Gamma(K^- 2\pi^+ \pi^-)} \quad \Gamma_{173}/\Gamma_{68}
\]

<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>5.23 ± 0.59 ± 1.35</td>
<td>149 ± 17</td>
<td>LINK 04B FOC5</td>
<td>$\gamma A, E_\gamma \approx 180 \text{ GeV}$</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(3\pi^+ 3\pi^-)}{\Gamma(K^- 3\pi^+ 2\pi^-)} \quad \Gamma_{173}/\Gamma_{94}
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.93 ± 0.47 ± 0.48</td>
<td>1 LINK 04B FOC5</td>
<td>$\gamma A, E_\gamma \approx 180 \text{ GeV}$</td>
<td></td>
</tr>
</tbody>
</table>

\footnote{1 This LINK 04B result is not independent of other results in these Listings.}
<table>
<thead>
<tr>
<th>$\Gamma(\eta'(958)^0)/\Gamma_{\text{total}}$</th>
<th>$\Gamma_{174}/\Gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-6})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$8.1 \pm 1.5 \pm 0.6$</td>
<td>50 $\pm$ 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(\eta'(958)^0)/[\Gamma(K^- \pi^+) + \Gamma(K^+ \pi^-)]$</th>
<th>$\Gamma_{174}/(\Gamma_{32}+\Gamma_{240})$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-2})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>$2.3 \pm 0.4$ OUR FIT</td>
<td>-</td>
</tr>
<tr>
<td>$2.3 \pm 0.3 \pm 0.2$</td>
<td>159 $\pm$ 19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(\eta'(958)^{\pi^+ \pi^-})/\Gamma_{\text{total}}$</th>
<th>$\Gamma_{175}/\Gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-6})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$4.5 \pm 1.6 \pm 0.5$</td>
<td>21 $\pm$ 8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(2\eta)/\Gamma_{\text{total}}$</th>
<th>$\Gamma_{176}/\Gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-4})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$16.7 \pm 1.4 \pm 1.3$</td>
<td>255 $\pm$ 22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(2\eta)/[\Gamma(K^- \pi^+) + \Gamma(K^+ \pi^-)]$</th>
<th>$\Gamma_{176}/(\Gamma_{32}+\Gamma_{240})$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-2})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>$4.3 \pm 0.5$ OUR FIT</td>
<td>-</td>
</tr>
<tr>
<td>$4.3 \pm 0.3 \pm 0.4$</td>
<td>430 $\pm$ 29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(\eta \eta'(958))/(\Gamma_{\text{total}}$</th>
<th>$\Gamma_{177}/\Gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-6})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$12.6 \pm 2.5 \pm 1.1$</td>
<td>46 $\pm$ 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(\eta \eta'(958))/[\Gamma(K^- \pi^+) + \Gamma(K^+ \pi^-)]$</th>
<th>$\Gamma_{177}/(\Gamma_{32}+\Gamma_{240})$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-2})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>$2.7 \pm 0.7$ OUR FIT</td>
<td>-</td>
</tr>
<tr>
<td>$2.7 \pm 0.6 \pm 0.3$</td>
<td>66 $\pm$ 15</td>
</tr>
</tbody>
</table>

--- Hadronic modes with a $K\bar{K}$ pair ---

<table>
<thead>
<tr>
<th>$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$</th>
<th>$\Gamma_{178}/\Gamma$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-3})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>$3.97 \pm 0.07$ OUR FIT</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$4.08 \pm 0.08 \pm 0.09$</td>
<td>4746 $\pm$ 74</td>
</tr>
</tbody>
</table>

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update.
\[ \frac{\Gamma(K^+K^-)/\Gamma(K^-\pi^+)}{\Gamma_{178}/\Gamma_{32}} \]

**VALUES**

- **OUR FIT**
  - Error includes scale factor of 1.7.
  - 0.1021 ± 0.0015
- **OUR AVERAGE**
  - Error includes scale factor of 1.4.
  - 0.1010 ± 0.0016

See the ideogram below.

- 0.122 ± 0.011 ± 0.004 242 ± 20 ABLIKIM 05F BES \(e^+e^- \approx \psi(3770)\)
- 0.0992 ± 0.0011 ± 0.0012 16k ± 200 ACOSTA 05C CDF \(p\bar{p}, \sqrt{s}=1.96\text{ TeV}\)
- 0.0993 ± 0.0014 ± 0.0014 11k LINK 03 FOCS \(\gamma\text{ nucleus, } E_\gamma \approx 180\text{ GeV}\)
- 0.1040 ± 0.0033 ± 0.0027 1900 CSORNA 02 CLE2 \(e^+e^- \approx T(4S)\)
- 0.109 ± 0.003 ± 0.003 3317 AITALA 98C E791 \(\pi^-\text{ nucleus, } 500\text{ GeV}\)
- 0.116 ± 0.007 ± 0.007 1102 ASNER 96B CLE2 \(e^+e^- \approx T(4S)\)
- 0.109 ± 0.007 ± 0.009 581 FRABETTI 94c E687 \(\gamma\text{Be } E_\gamma=220\text{ GeV}\)
- 0.107 ± 0.010 ± 0.009 193 ANJOS 91D E691 Photoproduction
- 0.117 ± 0.010 ± 0.007 249 ALEXANDER 90 CLEO \(e^+e^- \approx 10.5-11\text{ GeV}\)

- We do not use the following data for averages, fits, limits, etc.
- 0.107 ± 0.029 ± 0.015 103 ADAMOVICH 92 OMEG \(\pi^-\text{ 340 GeV}\)
- 0.138 ± 0.027 ± 0.010 155 FRABETTI 92 E687 \(\gamma\text{Be}\)
- 0.16 ± 0.05 34 ALVAREZ 91B NA14 Photoproduction
- 0.10 ± 0.02 ± 0.01 131 ALBRECHT 90C ARG \(e^+e^- \approx 10\text{ GeV}\)
- 0.122 ± 0.018 ± 0.012 118 BALTRUSAITIS85e MRK3 \(e^+e^- \approx 3.77\text{ GeV}\)
- 0.113 ± 0.030 ABRAMS 79D MRK2 \(e^+e^- \approx 3.77\text{ GeV}\)

**WEIGHTED AVERAGE**

0.1010 ± 0.0016 (Error scaled by 1.4)

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.

\[ \chi^2 = 8.3 \]

(Confidence Level = 0.081)

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[
\frac{\Gamma(K^+K^-)}{[\Gamma(K^-\pi^+) + \Gamma(K^+\pi^-)]} \quad \frac{\Gamma_{178}}{(\Gamma_{32} + \Gamma_{240})}
\]

<table>
<thead>
<tr>
<th>\text{VALUE} (units 10^{-2})</th>
<th>\text{EVTS}</th>
<th>\text{DOCUMENT ID}</th>
<th>\text{TECN}</th>
<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.18 ± 0.15 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.7.</td>
</tr>
<tr>
<td>10.41 ± 0.11 OUR FIT</td>
<td></td>
<td></td>
<td>CLEO</td>
<td>(e^+e^-) at 3774 MeV</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^+K^-)}{\Gamma(\pi^+\pi^-)} \quad \frac{\Gamma_{178}}{\Gamma_{133}}
\]

The unused results here are redundant with \(\Gamma(K^+K^-)/\Gamma(K^-\pi^+)\) and \(\Gamma(\pi^+\pi^-)/\Gamma(K^-\pi^+)\) measurements by the same experiments.

<table>
<thead>
<tr>
<th>\text{VALUE}</th>
<th>\text{EVTS}</th>
<th>\text{DOCUMENT ID}</th>
<th>\text{TECN}</th>
<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.760 ± 0.040 ± 0.034</td>
<td>7334</td>
<td>CDF 05c</td>
<td></td>
<td>(\rho\gamma), (\sqrt{s}=1.96\ TeV)</td>
</tr>
<tr>
<td>2.86 ± 0.21 ± 0.06</td>
<td></td>
<td>LINK 03</td>
<td>FOCS</td>
<td>(\gamma) nucleus, (E_{\gamma} \approx 180\ GeV)</td>
</tr>
<tr>
<td>2.96 ± 0.16 ± 0.15</td>
<td>710</td>
<td>CSORNA 02</td>
<td>CLE2</td>
<td>(e^+e^- \approx \Upsilon(4S))</td>
</tr>
<tr>
<td>2.75 ± 0.15 ± 0.16</td>
<td></td>
<td>AITALA 98c</td>
<td>E791</td>
<td>(\pi^-) nucleus, (500\ GeV)</td>
</tr>
<tr>
<td>2.53 ± 0.16 ± 0.19</td>
<td></td>
<td>FRABETTI 94c</td>
<td>E687</td>
<td>(\gamma) (\Upsilon) (\Upsilon \approx 220\ GeV)</td>
</tr>
<tr>
<td>2.23 ± 0.16 ± 0.46</td>
<td></td>
<td>ADAMOVIK 92</td>
<td>OMEG</td>
<td>(\pi^-) (340\ GeV)</td>
</tr>
<tr>
<td>1.95 ± 0.33 ± 0.22</td>
<td></td>
<td>ANJOS 91d</td>
<td>E691</td>
<td>Photoproduction</td>
</tr>
<tr>
<td>2.5 ± 0.7</td>
<td></td>
<td>ALBRECHT 90c</td>
<td>ARG</td>
<td>(e^+e^- \approx 10\ GeV)</td>
</tr>
<tr>
<td>2.35 ± 0.37 ± 0.28</td>
<td></td>
<td>ALEXANDER 90</td>
<td>CLEO</td>
<td>(e^+e^-) (10.5-11\ GeV)</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(2K_S^0)}{\Gamma_{\text{total}}} \quad \frac{\Gamma_{179}}{\Gamma}
\]

<table>
<thead>
<tr>
<th>\text{VALUE} (units 10^{-4})</th>
<th>\text{EVTS}</th>
<th>\text{DOCUMENT ID}</th>
<th>\text{TECN}</th>
<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.70 ± 0.12 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.67 ± 0.11 ± 0.11</td>
<td>576</td>
<td>ABLIKIM 17A</td>
<td>BES3</td>
<td>(e^+e^- \rightarrow \psi(3770))</td>
</tr>
<tr>
<td>1.46 ± 0.32 ± 0.09</td>
<td>68 ± 15</td>
<td>BONVICINI 08</td>
<td>CLEO</td>
<td>See MENDEZ 10</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(2K_S^0)}{[\Gamma(K^-\pi^+) + \Gamma(K^+\pi^-)]} \quad \frac{\Gamma_{179}}{(\Gamma_{32} + \Gamma_{240})}
\]

<table>
<thead>
<tr>
<th>\text{VALUE} (units 10^{-2})</th>
<th>\text{EVTS}</th>
<th>\text{DOCUMENT ID}</th>
<th>\text{TECN}</th>
<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.436 ± 0.030 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.41 ± 0.04 ± 0.02</td>
<td>215 ± 23</td>
<td>MENDEZ 10</td>
<td>CLEO</td>
<td>(e^+e^-) at 3774 MeV</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(2K_S^0)}{\Gamma(K_S^0\pi^+\pi^-)} \quad \frac{\Gamma_{179}}{\Gamma_{36}}
\]

This is the same as \(\Gamma(K^0\bar{K}^0) / \Gamma(K^0\pi^+\pi^-)\) because \(D^0 \rightarrow K_S^0\bar{K}_L^0\) is forbidden by \(CP\) conservation.

<table>
<thead>
<tr>
<th>\text{VALUE}</th>
<th>\text{EVTS}</th>
<th>\text{DOCUMENT ID}</th>
<th>\text{TECN}</th>
<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0062 ± 0.0006 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0120 ± 0.0022 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0144 ± 0.0032 ± 0.0016</td>
<td>79 ± 17</td>
<td>LINK 05A FOCS</td>
<td></td>
<td>(\gamma) (\Upsilon) (\Upsilon \approx 180\ GeV)</td>
</tr>
<tr>
<td>0.0101 ± 0.0022 ± 0.0016</td>
<td>26</td>
<td>ASNER 96b</td>
<td>CLE2</td>
<td>(e^+e^- \approx \Upsilon(4S))</td>
</tr>
<tr>
<td>0.039 ± 0.013 ± 0.013</td>
<td>20 ± 7</td>
<td>FRABETTI 94j</td>
<td>E687</td>
<td>(\gamma) (\Upsilon) (\Upsilon \approx 220\ GeV)</td>
</tr>
<tr>
<td>0.021 ± 0.011 ± 0.008</td>
<td>5</td>
<td>ALEXANDER 90</td>
<td>CLEO</td>
<td>(e^+e^-) (10.5-11\ GeV)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>\text{VALUE} (units 10^{-2})</th>
<th>\text{EVTS}</th>
<th>\text{DOCUMENT ID}</th>
<th>\text{TECN}</th>
<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.18 ± 0.15 OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.41 ± 0.11 OUR FIT</td>
<td></td>
<td></td>
<td>CLEO</td>
<td></td>
</tr>
<tr>
<td>2.760 ± 0.040 ± 0.034</td>
<td>7334</td>
<td>CDF 05c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.86 ± 0.21 ± 0.06</td>
<td></td>
<td>LINK 03</td>
<td>FOCS</td>
<td></td>
</tr>
<tr>
<td>2.96 ± 0.16 ± 0.15</td>
<td>710</td>
<td>CSORNA 02</td>
<td>CLE2</td>
<td></td>
</tr>
<tr>
<td>2.75 ± 0.15 ± 0.16</td>
<td></td>
<td>AITALA 98c</td>
<td>E791</td>
<td></td>
</tr>
<tr>
<td>2.53 ± 0.16 ± 0.19</td>
<td></td>
<td>FRABETTI 94c</td>
<td>E687</td>
<td></td>
</tr>
<tr>
<td>2.23 ± 0.16 ± 0.46</td>
<td></td>
<td>ADAMOVIK 92</td>
<td>OMEG</td>
<td></td>
</tr>
<tr>
<td>1.95 ± 0.33 ± 0.22</td>
<td></td>
<td>ANJOS 91d</td>
<td>E691</td>
<td></td>
</tr>
<tr>
<td>2.5 ± 0.7</td>
<td></td>
<td>ALBRECHT 90c</td>
<td>ARG</td>
<td></td>
</tr>
<tr>
<td>2.35 ± 0.37 ± 0.28</td>
<td></td>
<td>ALEXANDER 90</td>
<td>CLEO</td>
<td></td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^+K^-)}{\Gamma(\pi^+\pi^-)} \quad \frac{\Gamma_{178}}{\Gamma_{133}}
\]

The unused results here are redundant with \(\Gamma(K^+K^-)/\Gamma(K^-\pi^+)\) and \(\Gamma(\pi^+\pi^-)/\Gamma(K^-\pi^+)\) measurements by the same experiments.

<table>
<thead>
<tr>
<th>\text{VALUE}</th>
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<th>\text{COMMENT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.760 ± 0.040 ± 0.034</td>
<td>7334</td>
<td>CDF 05c</td>
<td></td>
<td></td>
</tr>
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<td>LINK 03</td>
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<td></td>
</tr>
<tr>
<td>2.96 ± 0.16 ± 0.15</td>
<td>710</td>
<td>CSORNA 02</td>
<td>CLE2</td>
<td></td>
</tr>
<tr>
<td>2.75 ± 0.15 ± 0.16</td>
<td></td>
<td>AITALA 98c</td>
<td>E791</td>
<td></td>
</tr>
<tr>
<td>2.53 ± 0.16 ± 0.19</td>
<td></td>
<td>FRABETTI 94c</td>
<td>E687</td>
<td></td>
</tr>
<tr>
<td>2.23 ± 0.16 ± 0.46</td>
<td></td>
<td>ADAMOVIK 92</td>
<td>OMEG</td>
<td></td>
</tr>
<tr>
<td>1.95 ± 0.33 ± 0.22</td>
<td></td>
<td>ANJOS 91d</td>
<td>E691</td>
<td></td>
</tr>
<tr>
<td>2.5 ± 0.7</td>
<td></td>
<td>ALBRECHT 90c</td>
<td>ARG</td>
<td></td>
</tr>
<tr>
<td>2.35 ± 0.37 ± 0.28</td>
<td></td>
<td>ALEXANDER 90</td>
<td>CLEO</td>
<td></td>
</tr>
</tbody>
</table>
\[
\Gamma(K_S^0 K^- \pi^+)/\Gamma(K^- \pi^-) \quad \Gamma_{180}/\Gamma_{32}
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.084±0.013</td>
<td>OUR FIT</td>
<td>1</td>
<td>AMJOS 91 E691 γBe 80–240 GeV</td>
</tr>
<tr>
<td>0.08±0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The factor 100 at the top of column 2 of Table I of AMJOS 91 should be omitted.

\[
\Gamma(K_S^0 K^- \pi^+)/\Gamma(K_S^0 \pi^+ \pi^-) \quad \Gamma_{180}/\Gamma_{36}
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.118±0.017</td>
<td>OUR FIT</td>
<td>1</td>
<td>AMJOS 91 CLEO e^+ e^- \approx 10.5 GeV</td>
</tr>
<tr>
<td>0.119±0.021</td>
<td>OUR AVERAGE</td>
<td></td>
<td>e^+ e^- \approx 10 GeV</td>
</tr>
<tr>
<td>0.108±0.019</td>
<td>61</td>
<td>AMMARR 91 CLEO</td>
<td></td>
</tr>
<tr>
<td>0.16±0.03±0.02</td>
<td>39</td>
<td>ALBRECHT 90C ARG</td>
<td></td>
</tr>
</tbody>
</table>

\[
\Gamma(K^*(892)^0 K_S^0, K^*0 \rightarrow K^- \pi^+)/\Gamma(K_S^0 K^- \pi^+) \quad \Gamma_{181}/\Gamma_{180}
\]

Fit fraction from Dalitz plot analyses. The fraction for the \(K_S^0\) mass between 792 and 992 MeV is 0.370±0.003±0.012.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.47±0.15±0.23</td>
<td>113k</td>
<td>1 AAIJ 16N LHC</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty.

\[
\Gamma(K^*(892)^+ K^-, K^{*-} \rightarrow K_S^0 \pi^+)/\Gamma(K^*_S K^- \pi^+) \quad \Gamma_{182}/\Gamma_{180}
\]

Fit fraction from Dalitz plot analyses.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>56.9±0.6±1.1</td>
<td>113k</td>
<td>1 AAIJ 16N LHC</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty.

\[
\Gamma(K^*(1410)^0 K_S^0, K^*0 \rightarrow K^- \pi^+)/\Gamma(K_S^0 K^- \pi^+) \quad \Gamma_{183}/\Gamma_{180}
\]

Fit fraction from Dalitz plot analyses.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8±0.5±5.6</td>
<td>113k</td>
<td>1 AAIJ 16N LHC</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty (which in this case dominates).

\[
\Gamma(K^*(1410)^+ K^-, K^{*-} \rightarrow K_S^0 \pi^+)/\Gamma(K^*_S K^- \pi^+) \quad \Gamma_{184}/\Gamma_{180}
\]

Fit fraction from Dalitz plot analyses.

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.6±1.1±5.4</td>
<td>113k</td>
<td>1 AAIJ 16N LHC</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty (which in this case dominates).

\[
\Gamma((K^- \pi^+)_{S\text{-wave}} K_S^0) /\Gamma(K_S^0 K^- \pi^+) \quad \Gamma_{185}/\Gamma_{180}
\]

Fit fraction from Dalitz plot analyses.

<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±2±8</td>
<td>113k</td>
<td>1 AAIJ 16N LHC</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty (which in this case dominates).
\[ \frac{\Gamma\left( (K_S^0 \pi^+)_{S\text{-wave}} K^- \right)}{\Gamma\left( (K_S^0 K^- \pi^+) \right)} \quad \Gamma_{186}/\Gamma_{180} \]

Fit fraction from Dalitz plot analyses.

<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 1.0 \pm 2.3)</td>
<td>113k</td>
<td>1 AAIJ</td>
<td>16N</td>
<td>LHCB Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty.

\[ \frac{\Gamma\left( a_0(980)^- \pi^+, a_0^- \rightarrow K_S^0 K^- \right)}{\Gamma\left( (K_S^0 K^- \pi^+) \right)} \quad \Gamma_{187}/\Gamma_{180} \]

Fit fraction from Dalitz plot analyses.

| VALUE (units \(10^{-2}\)) | EVTS | DOCUMENT ID | TECN | COMMENT | |
|-----------------------------|------|-------------|------|---------|
| \(4.0 \pm 0.7 \pm 4.1\)    | 113k | 1 AAIJ      | 16N  | LHCB Dalitz plot fit |

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty (which in this case dominates).

\[ \frac{\Gamma\left( a_0(1450)^- \pi^+, a_0^0 \rightarrow K_S^0 K^- \right)}{\Gamma\left( (K_S^0 K^- \pi^+) \right)} \quad \Gamma_{188}/\Gamma_{180} \]

Fit fraction from Dalitz plot analyses.

| VALUE (units \(10^{-2}\)) | EVTS | DOCUMENT ID | TECN | COMMENT | |
|-----------------------------|------|-------------|------|---------|
| \(0.74 \pm 0.15 \pm 0.57\) | 113k | 1 AAIJ      | 16N  | LHCB Dalitz plot fit |

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty (which in this case dominates).

\[ \frac{\Gamma\left( a_2(1320)^- \pi^+, a_2^- \rightarrow K_S^0 K^- \right)}{\Gamma\left( (K_S^0 K^- \pi^+) \right)} \quad \Gamma_{189}/\Gamma_{180} \]

Fit fraction from Dalitz plot analyses.

| VALUE (units \(10^{-2}\)) | EVTS | DOCUMENT ID | TECN | COMMENT | |
|-----------------------------|------|-------------|------|---------|
| \(0.15 \pm 0.06 \pm 0.14\) | 113k | 1 AAIJ      | 16N  | LHCB Dalitz plot fit |

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty.

\[ \frac{\Gamma\left( \rho(1450)^- \pi^+, \rho^- \rightarrow K_S^0 K^- \right)}{\Gamma\left( (K_S^0 K^- \pi^+) \right)} \quad \Gamma_{190}/\Gamma_{180} \]

Fit fraction from Dalitz plot analyses.

| VALUE (units \(10^{-2}\)) | EVTS | DOCUMENT ID | TECN | COMMENT | |
|-----------------------------|------|-------------|------|---------|
| \(1.4 \pm 0.2 \pm 0.7\)    | 113k | 1 AAIJ      | 16N  | LHCB Dalitz plot fit |

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty.

\[ \frac{\Gamma\left( K_S^0 K^+ \pi^- \right)}{\Gamma\left( K^- \pi^+ \right)} \quad \Gamma_{191}/\Gamma_{32} \]

<table>
<thead>
<tr>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.05 \pm 0.025)</td>
<td>1 ANJOS 91</td>
<td>E691 (\gamma)Be 80–240 GeV</td>
</tr>
</tbody>
</table>

1 The factor 100 at the top of column 2 of Table I of ANJOS 91 should be omitted.

\[ \frac{\Gamma\left( K_S^0 K^+ \pi^- \right)}{\Gamma\left( K_S^0 \pi^+ \pi^- \right)} \quad \Gamma_{191}/\Gamma_{36} \]

<table>
<thead>
<tr>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.098 \pm 0.020)</td>
<td>55 AMMAR 91</td>
<td>CLEO (e^+ e^- \approx 10.5) GeV</td>
</tr>
</tbody>
</table>

---

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[
\frac{\Gamma(K^0 S K^+\pi^-)}{\Gamma(K^0 S K^-\pi^+)} \quad \Gamma_{191}/\Gamma_{180}
\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.654±0.007</td>
<td>OUR FIT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.654±0.007</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.655±0.004±0.006</td>
<td>76k,113k</td>
<td>AAIJ</td>
<td>16N</td>
<td>pp at 7, 8 TeV</td>
</tr>
<tr>
<td>0.592±0.044±0.018</td>
<td>INSLER</td>
<td>CLEO</td>
<td></td>
<td>e^+ e^- → D^{0}\overline{D}^{0} at 3.77 GeV</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^+(892)^0 K^0_S, K^+ \rightarrow K^+\pi^-)}{\Gamma(K^0_S K^+\pi^-)} \quad \Gamma_{192}/\Gamma_{191}
\]

Fit fraction from Dalitz plot analyses.

<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>5.17±0.21±0.47</td>
<td>76k</td>
<td>AAIJ</td>
<td>16N</td>
<td>Dalitz fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty.

\[
\frac{\Gamma(K^+(892)^0 K^0_S, K^+ \rightarrow K^0_S K^+\pi^-) - \Gamma(K^0_S K^+\pi^-)}{\Gamma(K^0_S K^+\pi^-)} \quad \Gamma_{193}/\Gamma_{191}
\]

Fit fraction from Dalitz plot analyses.

<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>28.8±0.4±1.5</td>
<td>76k</td>
<td>AAIJ</td>
<td>16N</td>
<td>Dalitz fit</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty.

\[
\frac{\Gamma(K^+(1410)^0 K^0_S, K^+ \rightarrow K^+\pi^+)}{\Gamma(K^0_S K^+\pi^-)} \quad \Gamma_{194}/\Gamma_{191}
\]

Fit fraction from Dalitz plot analyses.

<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>2.2±0.6±3.7</td>
<td>76k</td>
<td>AAIJ</td>
<td>16N</td>
<td>Dalitz plot</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty (which in this case dominates).

\[
\frac{\Gamma(K^+(1410)^0 K^0_S, K^+ \rightarrow K^0_S K^+\pi^-) - \Gamma(K^0_S K^+\pi^-)}{\Gamma(K^0_S K^+\pi^-)} \quad \Gamma_{195}/\Gamma_{191}
\]

Fit fraction from Dalitz plot analyses.

<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>11.9±1.5±9.1</td>
<td>76k</td>
<td>AAIJ</td>
<td>16N</td>
<td>Dalitz plot</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty (which in this case dominates).

\[
\frac{\Gamma((K^+\pi^-)_{SWAVE} K^0_S)}{\Gamma(K^0_S K^+\pi^-)} \quad \Gamma_{196}/\Gamma_{191}
\]

Fit fraction from Dalitz plot analyses.

<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>17±2±8</td>
<td>76k</td>
<td>AAIJ</td>
<td>16N</td>
<td>Dalitz plot</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty.

\[
\frac{\Gamma((K^0_S\pi^-)_{SWAVE} K^+)}{\Gamma(K^0_S K^+\pi^-)} \quad \Gamma_{197}/\Gamma_{191}
\]

Fit fraction from Dalitz plot analyses.

<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>6.3±0.9±2.3</td>
<td>76k</td>
<td>AAIJ</td>
<td>16N</td>
<td>Dalitz plot</td>
</tr>
</tbody>
</table>

1 AAIJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrization, and the difference as a systematic uncertainty.
\( \Gamma(a_0(980)^+ \pi^-, a_0^+ \rightarrow K_S^0 K^+)/\Gamma(K_S^0 K^+ \pi^-) \) \( \Gamma_{198}/\Gamma_{191} \)

Fit fraction from Dalitz plot analyses.

<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>26±2±18</td>
<td>76k</td>
<td>AAJ 16N</td>
<td>LHCB</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty (which in this case dominates).

\( \Gamma(a_0(1450)^+ \pi^-, a_0^+ \rightarrow K_S^0 K^+)/\Gamma(K_S^0 K^+ \pi^-) \) \( \Gamma_{199}/\Gamma_{191} \)

Fit fraction from Dalitz plot analyses.

<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>1.5±0.3±1.1</td>
<td>76k</td>
<td>AAJ 16N</td>
<td>LHCB</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty (which in this case dominates).

\( \Gamma(\rho(1700)^+ \pi^-, \rho^+ \rightarrow K_S^0 K^+)/\Gamma(K_S^0 K^+ \pi^-) \) \( \Gamma_{200}/\Gamma_{191} \)

Fit fraction from Dalitz plot analyses.

<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>0.53±0.11±0.23</td>
<td>76k</td>
<td>AAJ 16N</td>
<td>LHCB</td>
<td>Dalitz plot fit</td>
</tr>
</tbody>
</table>

1 AAJ 16N gives results for two S-wave parameterisations. We take the values from the model with LASS parametrisation, and the difference as a systematic uncertainty.

\( \Gamma(K^+(892)^0 K_S^0, K^0 \rightarrow K^+ \pi^-)/\Gamma(K^+(892)^0 K_S^0, K^0 \rightarrow K^- \pi^+) \) \( \Gamma_{192}/\Gamma_{181} \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.356±0.034±0.007</td>
<td>1 Insl 12</td>
<td>CLEO</td>
<td>e^+ e^- \rightarrow D^0 \overline{D}^0, 3.77 GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<0.010                     | 90   | AMMAR 91 | CLEO | e^+ e^- \approx 10.5 GeV |

1 Uses quantum correlations in e^+ e^- \rightarrow D^0 \overline{D}^0 at the \( \psi(3770) \), where the signal side \( D \) decays to \( K_S^0 K \pi \) and the tag-side \( D \) decays to \( K \pi, K \pi\pi\pi, K \pi \pi \), and 10 additional \( CP \)-even, \( CP \)-odd, and mixed \( CP \) modes involving \( K_S^0 \) or \( K_S^0 \).

\( \Gamma(K^+ K^- \pi^0)/\Gamma(K^- \pi^+ \pi^-) \) \( \Gamma_{201}/\Gamma_{51} \)

<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>2.37±0.03±0.04</td>
<td>11k±122</td>
<td>AUBERT 06x BABR</td>
<td>e^+ e^- \approx \gamma(4S)</td>
<td></td>
</tr>
</tbody>
</table>

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

0.95±0.26                  | 151  | ASNER 96b CLE2 | e^+ e^- \approx \gamma(4S) |

\( \Gamma(K^+(892)^+ K^-, K^+(892)^+ \rightarrow K^+ \pi^-)/\Gamma(K^+ K^- \pi^0) \) \( \Gamma_{202}/\Gamma_{201} \)

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

<table>
<thead>
<tr>
<th>VALUE (units (10^{-2}))</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.4±0.8±0.6</td>
<td>AUBERT 07t BABR</td>
<td>Dalitz fit ll, 11k evts</td>
<td></td>
</tr>
</tbody>
</table>

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

46.1±3.1                   | 1 CAWLFIELD 06A CLEO | Dalitz fit, 627 ± 30 evts |

1 The error on this CAWLFIELD 06A result is statistical only.
\[
\frac{\Gamma(K^*(892)^- K^+, \, K^*(892)^- \rightarrow K^- \pi^0)}{\Gamma(K^+ K^- \pi^0)} \quad \frac{\Gamma_{203}}{\Gamma_{201}}
\]

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

\[
\frac{\Gamma((K^+ \pi^0)_{S-wave} K^-)}{\Gamma(K^+ K^- \pi^0)} \quad \frac{\Gamma_{204}}{\Gamma_{201}}
\]

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

\[
\frac{\Gamma((K^- \pi^0)_{S-wave} K^+)}{\Gamma(K^+ K^- \pi^0)} \quad \frac{\Gamma_{205}}{\Gamma_{201}}
\]

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

\[
\frac{\Gamma(f_0(980) \pi^0, \, f_0 \rightarrow K^+ K^-)}{\Gamma(K^+ K^- \pi^0)} \quad \frac{\Gamma_{206}}{\Gamma_{201}}
\]

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

\[
\frac{\Gamma(\phi^0, \, \phi \rightarrow K^+ K^-)}{\Gamma(K^+ K^- \pi^0)} \quad \frac{\Gamma_{207}}{\Gamma_{201}}
\]

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

\[
\frac{\Gamma(K^+ K^- \pi^0_{nonresonant})}{\Gamma(K^+ K^- \pi^0)} \quad \frac{\Gamma_{208}}{\Gamma_{201}}
\]

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

\[
\frac{\Gamma(2K^0 S \pi^0)}{\Gamma_{total}} \quad \frac{\Gamma_{209}}{\Gamma}
\]

The error is statistical only. CAWLFIELD 06A also fits the Dalitz plot replacing this flat nonresonant background with broad $S$-wave $\kappa^\pm \rightarrow K^\pm \pi^0$ resonances. There is no significant improvement in the fit, and $K^*\pm K^\mp$ and $\phi \pi^0$ results are not much changed.

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[\frac{\Gamma(\phi\pi^{0})/\Gamma(K^{+}K^{-})}{\Gamma(\phi\eta)/\Gamma(K^{+}K^{-})} = \frac{\Gamma_{231}}{\Gamma_{178}}\]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.194 ± 0.006 ± 0.009</td>
<td>1254</td>
<td>TAJIMA 04</td>
<td>BELL</td>
<td>(e^{+}e^{-}) at (\Upsilon(4S))</td>
</tr>
</tbody>
</table>

\[\frac{\Gamma(\phi\eta)/\Gamma(K^{+}K^{-})}{\Gamma(\phi\omega)/\Gamma_{\text{total}}} = \frac{\Gamma_{232}}{\Gamma_{178}}\]

<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>3.59 ± 1.14 ± 0.18</td>
<td>31</td>
<td>TAJIMA 04</td>
<td>BELL</td>
<td>(e^{+}e^{-}) at (\Upsilon(4S))</td>
</tr>
</tbody>
</table>

\[\frac{\Gamma(\phi\omega)/\Gamma_{\text{total}}}{\Gamma(\phi\pi^{+}\pi^{-})/\Gamma(K^{+}2\pi^{+}\pi^{-})} = \frac{\Gamma_{233}}{\Gamma_{210}}\]

<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>3.00 ± 0.13 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.95 ± 0.11 ± 0.08</td>
<td>2669 ± 101</td>
<td>1 LINK 05G FOC5</td>
<td>γBe, (\overline{\epsilon}\gamma \approx 180) GeV</td>
<td></td>
</tr>
<tr>
<td>3.13 ± 0.37 ± 0.36</td>
<td>136 ± 15</td>
<td>AITALA 98D E781</td>
<td>π− nucleus, 500 GeV</td>
<td></td>
</tr>
<tr>
<td>3.5 ± 0.4 ± 0.2</td>
<td>244 ± 26</td>
<td>FRABETTI 95C E687</td>
<td>γBe, (\overline{\epsilon}\gamma \approx 200) GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<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;0.0021</td>
<td>90</td>
<td>ALBRECHT 94I</td>
<td>ARG</td>
<td>(e^{+}e^{-} \approx 10) GeV</td>
</tr>
</tbody>
</table>

\[\frac{\Gamma(\phi\pi^{+}\pi^{-})_{S-\text{wave}}, \phi^{0} \rightarrow K^{+}K^{-}}{\Gamma(K^{+}K^{-}\pi^{+}\pi^{-})} = \frac{\Gamma_{211}}{\Gamma_{210}}\]

This is the fraction from a coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3 ± 1.0 ± 0.8</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

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

\[\frac{\Gamma((\phi^{0})_{S-\text{wave}}, \phi^{0} \rightarrow K^{+}K^{-})}{\Gamma(K^{+}K^{-}\pi^{+}\pi^{-})} = \frac{\Gamma_{212}}{\Gamma_{210}}\]

This is the fraction from a coherent amplitude analysis.

<table>
<thead>
<tr>
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<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>38.3 ± 2.5 ± 3.8</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

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

\[\frac{\Gamma((\phi^{0})_{D-\text{wave}}, \phi^{0} \rightarrow K^{+}K^{-})}{\Gamma(K^{+}K^{-}\pi^{+}\pi^{-})} = \frac{\Gamma_{213}}{\Gamma_{210}}\]

<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 ± 0.6</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[\frac{\Gamma((K^{*0}\overline{K}^{*0})_{S-\text{wave}}, K^{*0} \rightarrow K^{\pm}\pi^{\mp})}{\Gamma(K^{+}K^{-}\pi^{+}\pi^{-})} = \frac{\Gamma_{214}}{\Gamma_{210}}\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 ± 0.8 ± 0.9</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 Update
\[
\frac{\Gamma((K^+\pi^+)_{p-wave}, (K^+\pi^-)_{s-wave})}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{215}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.9±1.2±1.7</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K_1(1270)^+K^-, K_1^+ \rightarrow K^0\pi^+)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{216}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3±0.8±1.9</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K_1(1270)^+K^-, K_1^+ \rightarrow \rho^0K^+)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{217}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7±0.7±0.8</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K_1(1270)^-K^+, K_1^- \rightarrow \bar{K}^0\pi^-)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{218}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9±0.3±0.4</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K_1(1270)^-K^+, K_1^- \rightarrow \rho^0K^-)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{219}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0±0.8±0.6</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^*(1410)^+K^-, K^{**} \rightarrow K^0\pi^+)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{220}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2±0.7±0.8</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^*(1410)^-K^+, K^{**} \rightarrow \bar{K}^0\pi^-)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{221}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7±0.7±0.7</td>
<td>ARTUSO 12</td>
<td>CLEO</td>
<td>Fitting 2959 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^+K^-\rho^03\text{-body})}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{222}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</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>LINK 05G</td>
<td>FOCS</td>
<td>Fits 1279 ± 48 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(f_0(980)^+\pi^-f_0 \rightarrow K^+K^-)}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{223}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</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>LINK 05G</td>
<td>FOCS</td>
<td>Fits 1279 ± 48 evts.</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(K^*(892)^0K^{\mp3\text{-body}}, K^*^{0} \rightarrow K^{\pm\pi^\mp})}{\Gamma(K^+K^-\pi^+\pi^-)} \quad \Gamma_{224}/\Gamma_{210}
\]

<table>
<thead>
<tr>
<th>VALUE (%)</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>LINK 05G</td>
<td>FOCS</td>
<td>Fits 1279 ± 48 evts.</td>
</tr>
</tbody>
</table>
\[ \Gamma(K^*(892)^0K^*(892)^0, \, K^{*0} \rightarrow K^{\pm} \pi^\mp)/\Gamma(K^+K^-\pi^+\pi^-) \quad \Gamma_{225}/\Gamma_{210} \]

This is the fraction from a coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</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>
</tr>
<tr>
<td>3 ± 2 ± 1</td>
<td>LINK</td>
<td>05G</td>
<td>FOCS 1 Fits 1279 ± 48 evts.</td>
</tr>
</tbody>
</table>

\[ \Gamma(K_1(1270)^\pm K^{\mp}, \, K_1^{\pm} \rightarrow K^{\pm} \pi^+\pi^-)/\Gamma(K^+K^-\pi^+\pi^-) \quad \Gamma_{226}/\Gamma_{210} \]

This is the fraction from a coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</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>
</tr>
<tr>
<td>33 ± 6 ± 4</td>
<td>1 LINK</td>
<td>05G</td>
<td>FOCS 1 This LINK 05G value includes ( K_1(1270)^\pm \rightarrow \rho^0K^{\pm}, \rightarrow K_0^0(1430)^0\pi^\pm, ) and ( K^*(892)^0\pi^\pm. )</td>
</tr>
</tbody>
</table>

\[ \Gamma(K_1(1400)^\pm K^{\mp}, \, K_1^{\pm} \rightarrow K^{\pm} \pi^+\pi^-)/\Gamma(K^+K^-\pi^+\pi^-) \quad \Gamma_{227}/\Gamma_{210} \]

This is the fraction from a coherent amplitude analysis.

<table>
<thead>
<tr>
<th>VALUE (%)</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>
</tr>
<tr>
<td>22 ± 3 ± 4</td>
<td>LINK</td>
<td>05G</td>
<td>FOCS 1 Fits 1279 ± 48 evts.</td>
</tr>
</tbody>
</table>

\[ \Gamma(2K_0^0\pi^+\pi^-)/\Gamma(K_0^0\pi^+\pi^-) \quad \Gamma_{228}/\Gamma_{36} \]

<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>4.3 ± 0.8 OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.16 ± 0.70 ± 0.42</td>
<td>113</td>
<td>LINK</td>
<td>05A</td>
<td>FOCS γ Be, ( E_\gamma \approx 180 \text{ GeV} )</td>
</tr>
<tr>
<td>6.2 ± 2.0 ± 1.6</td>
<td>25</td>
<td>ALBRECHT</td>
<td>94i</td>
<td>ARG ( e^+e^- \approx 10 \text{ GeV} )</td>
</tr>
</tbody>
</table>

\[ \Gamma(K_0^0K^-2\pi^+\pi^-)/\Gamma(K_0^02\pi^+2\pi^-) \quad \Gamma_{229}/\Gamma_{88} \]

<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;0.054</td>
<td>90</td>
<td>LINK</td>
<td>04D</td>
<td>FOCS γ A, ( E_\gamma \approx 180 \text{ GeV} )</td>
</tr>
</tbody>
</table>

\[ \Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{230}/\Gamma \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0031 ± 0.0020</td>
<td>1 BARLAG</td>
<td>92C</td>
<td>ACCM ( \pi^- \text{ Cu 230 GeV} )</td>
</tr>
</tbody>
</table>

\[ \Gamma(\rho^0\gamma) / \Gamma(\pi^+\pi^-) \quad \Gamma_{234}/\Gamma_{133} \]

<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>1.25 ± 0.21 ± 0.05</td>
<td>500</td>
<td>NANUT</td>
<td>17</td>
<td>BELL ( e^+e^- \text{ at } \gamma(nS), , n=2,3,4,5 )</td>
</tr>
</tbody>
</table>

\[ \Gamma(\omega\gamma) / \Gamma_{\text{total}} \quad \Gamma_{235}/\Gamma \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.4 \times 10^{-4}</td>
<td>90</td>
<td>ASNER</td>
<td>98</td>
</tr>
</tbody>
</table>

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update

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<table>
<thead>
<tr>
<th>$\Gamma(\phi\gamma)/\Gamma(K^+ K^-)$</th>
<th>$\Gamma_{236}/\Gamma_{178}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-3})</strong></td>
<td><strong>EVTS</strong></td>
</tr>
<tr>
<td>6.9 ± 0.5 OUR FIT</td>
<td>6.88 ± 0.47 ± 0.21</td>
</tr>
<tr>
<td>$\ldots$</td>
<td>$\ldots$</td>
</tr>
<tr>
<td>6.31 ± 1.70 ± 0.30</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$\Gamma(K^+ \ell^- \nu_\ell)/(\Gamma(K^- \ell^+ \nu_\ell))$</th>
<th>$\Gamma_{238}/\Gamma_{18}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE (units 10^{-5})</strong></td>
<td><strong>CL%</strong></td>
</tr>
<tr>
<td>6.1 ± 0.4 ± 0.21</td>
<td>90</td>
</tr>
<tr>
<td>$\ldots$</td>
<td>$\ldots$</td>
</tr>
<tr>
<td>4.5 ± 0.5 ± 0.21</td>
<td>2</td>
</tr>
</tbody>
</table>

1 The BITENC 08 right-sign sample includes about 15% of $D^0 \to K^- \pi^0 \ell^+ \nu_\ell$ and other decays.

2 AITALA 96c uses $D^{*+} \to D^0 \pi^+$ (and charge conjugate) decays to identify the charm at production and $D^0 \to K^- \ell^+ \nu_\ell$ (and charge conjugate) decays to identify the charm at decay.

<table>
<thead>
<tr>
<th>$\Gamma(K^+ \text{ or } K^* (892)^+ \ell^- \nu_\ell \text{ via } D^0)/(\Gamma(K^- \ell^+ \nu_\ell))$</th>
<th>$\Gamma_{239}/(\Gamma_{19}+\Gamma_{21})$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALUE</strong></td>
<td><strong>CL%</strong></td>
</tr>
<tr>
<td>&lt; 0.001</td>
<td>90</td>
</tr>
<tr>
<td>$\ldots$</td>
<td>$\ldots$</td>
</tr>
<tr>
<td>$-0.0013 &lt; R &lt; +0.0012$</td>
<td>90</td>
</tr>
<tr>
<td>&lt; 0.0078</td>
<td>90</td>
</tr>
<tr>
<td>&lt; 0.0042</td>
<td>90</td>
</tr>
</tbody>
</table>

HTTP://PDG.LBL.GOV Page 68 Created: 5/30/2017 17:22
$\Gamma(K^+\pi^-)/\Gamma(K^-\pi^+)$ 

This is $R$, the time-integrated wrong-sign rate compared to the right-sign rate. See the note on "$D^0$-$\bar{D}^0$ Mixing," near the start of the $D^0$ Listings.

The experiments here use the charge of the pion in $D^*(2010)^{\pm} \rightarrow (D^0 or \bar{D}^0) \pi^\pm$ decay to tell whether a $D^0$ or a $\bar{D}^0$ was born. The $D^0 \rightarrow K^+\pi^-$ decay can occur directly by doubly Cabibbo-suppressed (DCS) decay, or indirectly by $D^0 \rightarrow \bar{D}^0$ mixing followed by $\bar{D}^0 \rightarrow K^+\pi^-$ decay. Some of the experiments can use the decay-time information to disentangle the two mechanisms. Here, we list the experimental branching ratio, which if there is no mixing is the DCS ratio. See the next data block for values of the DCS ratio $R_D$, and the following data block for limits on the mixing ratio $R_M$. See the section on $CP$-violating asymmetries near the end of this $D^0$ Listing for values of $A_D$, and the note on "$D^0$-$\bar{D}^0$ Mixing" for limits on $x'$ and $y'$.

Some early limits have been omitted from this Listing; see our 1998 edition (The European Physical Journal C3 1 (1998)) and our 2006 edition (Journal of Physics G33 1 (2006)).

<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>$3.79\pm0.18$ OUR FIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$3.79\pm0.18$ OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.15 $\pm$ 0.10</td>
<td>12.7 $\pm$ 0.3k</td>
<td>1 AALTONEN 08E</td>
<td>CDF</td>
<td>$p\bar{p}$, $\sqrt{s} = 1.96$ TeV</td>
</tr>
<tr>
<td>3.53 $\pm$ 0.08 $\pm$ 0.04</td>
<td>4030 $\pm$ 90</td>
<td>2 AUBERT 07W</td>
<td>BABR</td>
<td>$e^+e^- \approx 10.6$ GeV</td>
</tr>
<tr>
<td>3.77 $\pm$ 0.08 $\pm$ 0.05</td>
<td>4024 $\pm$ 88</td>
<td>1 ZHANG 06</td>
<td>BELL</td>
<td>$e^+e^-$</td>
</tr>
<tr>
<td>4.05 $\pm$ 0.21 $\pm$ 0.11</td>
<td>2.0 $\pm$ 0.1k</td>
<td>3 ABULENCIA 06X</td>
<td>CDF</td>
<td>See AALTONEN 08E</td>
</tr>
<tr>
<td>3.81 $\pm$ 0.17 $+0.08$ $-0.16$</td>
<td>845 $\pm$ 40</td>
<td>2 LI 05A</td>
<td>BELL</td>
<td>See ZHANG 06</td>
</tr>
<tr>
<td>4.29 $+0.63$ $-0.61$ $+0.27$</td>
<td>234</td>
<td>4 LINK 05H</td>
<td>FOCS</td>
<td>$\gamma$ nucleus</td>
</tr>
<tr>
<td>3.57 $\pm$ 0.22 $\pm$ 0.27</td>
<td>149</td>
<td>5 AUBERT 03Z</td>
<td>BABR</td>
<td>See AUBERT 07W</td>
</tr>
<tr>
<td>4.04 $\pm$ 0.85 $\pm$ 0.25</td>
<td>45</td>
<td>1 GODANG 00</td>
<td>CLE2</td>
<td>$e^+e^-$</td>
</tr>
<tr>
<td>3.32 $+0.63$ $-0.65$ $+0.40$</td>
<td>34</td>
<td>2 AITALA 98</td>
<td>E791</td>
<td>$\pi^-$ nucle., 500 GeV</td>
</tr>
</tbody>
</table>

1 GODANG 00, ZHANG 06, and AALTONEN 08E allow $CP$ violation. 
2 AITALA 98, LI 05A, and AUBERT 07W assume no $CP$ violation. 
3 This ABULENCIA 06X result assumes no mixing. 
4 This LINK 05H result assumes no mixing but allows $CP$ violation. If neither mixing nor $CP$ violation is allowed, $R = (4.29 \pm 0.63 \pm 0.28) \times 10^{-3}$. 
5 This AUBERT 03Z result allows $CP$ violation. If $CP$ violation is not allowed, $R = 0.00359 \pm 0.00020 \pm 0.00027$. 
6 This LINK 01 result assumes no mixing or $CP$ violation.
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.

\[ \Gamma(K^+ \pi^-) / \Gamma(K^- \pi^+) \text{ (units } 10^{-3}) \]

\[ \frac{\Gamma_{241}}{\Gamma_{32}} \]

This is \( R_D \), the doubly Cabibbo-suppressed ratio when mixing is allowed.

**3.37 ± 0.21 OUR AVERAGE** Error includes scale factor of 1.8. See the ideogram below.

<table>
<thead>
<tr>
<th>VALUE (units ( 10^{-3} ))</th>
<th>CL%</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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<tbody>
<tr>
<td>3.04 ± 0.55</td>
<td>AALTONEN 08E CDF</td>
<td>p\bar{p}, \sqrt{s} = 1.96 TeV</td>
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<tr>
<td>3.03± 0.16±0.10</td>
<td>1 AUBERT 07W BABR</td>
<td>( e^+e^- \approx 10.6 \text{ GeV} )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.64 ± 0.17</td>
<td>2 ZHANG 06 BELL</td>
<td>( e^+e^- )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.17± 1.47±0.76</td>
<td>3 LINK 05H FOCS ( \gamma ) nucleus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8 ± 1.2 ±0.4</td>
<td>4 GODANG 00 CLE2</td>
<td>( e^+e^- )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

| 2.87 ± 0.37                 | LI 05A BELL | See ZHANG 06 |
| 2.3 < \( R_D < 5.2 \)      | 5 AUBERT 03Z BABR | See AUBERT 07W |
| 9.0 +12.0 ±10.9 ±4.4        | 6 AITALA 98 E791 \( \pi^- \) nucl., 500 GeV |

1 This AUBERT 07W result is the same whether or not \( CP \) violation is allowed.
2 This ZHANG 06 assumes no \( CP \) violation.
3 This LINK 05H result allows \( CP \) violation. Allowing mixing but not \( CP \) violation, \( R_D = (3.81^{+1.67}_{-1.63} \pm 0.92) \times 10^{-3}. \)
4 This GODANG 00 result allows \( CP \) violation.
5 This AUBERT 03Z result allows \( CP \) violation. If only mixing is allowed, the 95% confidence level interval is \( (2.4 < R_D < 4.9) \times 10^{-3}. \)
6 This AITALA 98 result assumes no \( CP \) violation.
\[ \frac{\Gamma(K^+ \pi^- \text{ via DCS})}{\Gamma(K^- \pi^+)} \] (units $10^{-3}$)

\[ \frac{\Gamma_242}{\Gamma_32} \]

This is $R_M$ in the note on "$D^0$-$\bar{D}^0$ Mixing" near the start of the $D^0$ Listings. The experiments here (1) use the charge of the pion in $D^*(2010)^\pm \rightarrow (D^0$ or $\bar{D}^0)^\pi^\pm$ decay to tell whether a $D^0$ or a $\bar{D}^0$ was born; and (2) use the decay-time distribution to disentangle doubly Cabibbo-suppressed decay and mixing. For the limits on $|m_1 - m_2|$ and $(\Gamma_1 - \Gamma_2)/\Gamma$ that come from the best mixing limit, see near the beginning of these $D^0$ Listings.

<table>
<thead>
<tr>
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<td>&lt;0.00040</td>
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<td>06</td>
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<td>&lt;0.00046</td>
<td>95</td>
<td>2 LI</td>
<td>05A</td>
<td>BELL See ZHANG 06</td>
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<tr>
<td>&lt;0.00063</td>
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<td>3 LINK</td>
<td>05H</td>
<td>FOCS $\gamma$ nucleus</td>
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<td>&lt;0.0013</td>
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<td>03Z</td>
<td>BABR $e^+ e^-$, 10.6 GeV</td>
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<tr>
<td>&lt;0.00041</td>
<td>95</td>
<td>5 GODANG</td>
<td>00</td>
<td>CLE2 $e^+ e^-$</td>
</tr>
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<td>&lt;0.0092</td>
<td>95</td>
<td>6 BARATE</td>
<td>98W</td>
<td>ALEP $e^+ e^-$ at $Z^0$</td>
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<tr>
<td>&lt;0.005</td>
<td>90</td>
<td>7 ANJOS</td>
<td>88C</td>
<td>E691 Photoproduction</td>
</tr>
</tbody>
</table>

1 This ZHANG 06 result allows CP violation, but the result does not change if CP violation is not allowed.
2 This LI 05A result allows CP violation. The limit becomes $< 0.00042$ (95% CL) if CP violation is not allowed.
3 LINK 05H obtains the same result whether or not CP violation is allowed.
4 This AUBERT 03Z result allows CP violation and assumes that the strong phase between $D^0 \rightarrow K^+ \pi^-$ and $\bar{D}^0 \rightarrow K^- \pi^-$ is small, and limits only $D^0 \rightarrow \bar{D}^0$ transitions via off-shell intermediate states. The limit on transitions via on-shell intermediate states is 0.0016.
5 This GODANG 00 result allows CP violation and assumes that the strong phase between 
\( D^0 \rightarrow K^+ \pi^- \) and \( \bar{D}^0 \rightarrow K^+ \pi^- \) is small, and limits only \( D^0 \rightarrow \bar{D}^0 \) transitions via 
off-shell intermediate states. The limit on transitions via on-shell intermediate states is 
0.0017.

6 This BARATE 98W result assumes no interference between the DCS and mixing amplitudes 
\( (\gamma' = 0 \text{ in the note on } \text{“} D^0, \bar{D}^0 \text{ Mixing” near the start of the } D^0 \text{ Listings}. \) When 
interference is allowed, the limit degrades to 0.036 (95%CL).

7 This ANJOS 88C result assumes no interference between the DCS and mixing amplitudes 
\( (\gamma' = 0 \text{ in the note on } \text{“} D^0, \bar{D}^0 \text{ Mixing” near the start of the } D^0 \text{ Listings}. \) When 
interference is allowed, the limit degrades to 0.019.

\[
\frac{\Gamma(K^0_S \pi^+ \pi^- \text{ in } D^0 \rightarrow \bar{D}^0)/\Gamma(K^0_S \pi^+ \pi^-)}{\Gamma_{243}/\Gamma_{36}}
\]

This is \( R_M \) in the note on “\( D^0, \bar{D}^0 \) Mixing” near the start of the \( D^0 \) Listings. The 
experiments here (1) use the charge of the pion in \( D^*(2010)^{\pm} \rightarrow (D^0 \text{ or } \bar{D}^0)^{\pi^\pm} \) 
decay to tell whether a \( D^0 \) or a \( \bar{D}^0 \) was born; and (2) use the decay-time distribution 
to disentangle doubly Cabibbo-suppressed decay and mixing. For the limits on \( |m_1 - m_2| \) 
and \( (\Gamma_1 - \Gamma_2)/\Gamma \) that come from the best mixing limit, see near the beginning of 
these \( D^0 \) Listings.

\[
\frac{\Gamma(K^+ \pi^- \pi^0)/\Gamma(K^- \pi^+ \pi^0)}{\Gamma_{247}/\Gamma_{51}}
\]

The experiments here use the charge of the pion in \( D^*(2010)^{\pm} \rightarrow (D^0 \text{ or } \bar{D}^0)^{\pi^\pm} \) 
decay to tell whether a \( D^0 \) or a \( \bar{D}^0 \) was born. The \( D^0 \rightarrow D^0 \) decay can 
occur directly by doubly Cabibbo-suppressed (DCS) decay, or indirectly by \( D^0 \rightarrow \bar{D}^0 \) 
mixing followed by \( \bar{D}^0 \rightarrow D^0 \) decay.

\[
\frac{\Gamma(K^+ \pi^- \pi^0 \text{ via } \bar{D}^0)/\Gamma(K^- \pi^+ \pi^0)}{\Gamma_{248}/\Gamma_{51}}
\]

This is \( R_M \) in the note on “\( D^0, \bar{D}^0 \) Mixing” near the start of the \( D^0 \) Listings. The 
experiments here (1) use the charge of the pion in \( D^*(2010)^{\pm} \rightarrow (D^0 \text{ or } \bar{D}^0)^{\pi^\pm} \) 
decay to tell whether a \( D^0 \) or a \( \bar{D}^0 \) was born; and (2) use the decay-time distribution 
to disentangle doubly Cabibbo-suppressed decay and mixing. For the limits on \( |m_1 - m_2| \) 
and \( (\Gamma_1 - \Gamma_2)/\Gamma \) that come from the best mixing limit, see near the beginning of 
these \( D^0 \) Listings.
• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.54 95 1 AUBERT,B 06N BABR $e^+e^-$ at 10.58 GeV

1 This AUBERT,B 06N limit assumes no CP violation. The measured value corresponding to the limit is $(2.3^{+1.8}_{-1.4} \pm 0.4) \times 10^{-4}$. If CP violation is allowed, this becomes $(1.0^{+2.2}_{-0.7} \pm 0.3) \times 10^{-4}$.

$\Gamma(K^+\pi^+2\pi^-\text{via DCS})/\Gamma(K^-2\pi^+\pi^-)$

$\Gamma_{249}/\Gamma_{68}$

<table>
<thead>
<tr>
<th>VALUE (units 10^{-3})</th>
<th>CL%</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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<tbody>
<tr>
<td>3.03 ±0.07 OUR AVERAGE</td>
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<tr>
<td>3.025±0.077</td>
<td>42k,11M</td>
<td>1 AAIJ 16f LHCb</td>
<td>$pp$ at 7, 8 TeV</td>
<td></td>
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<tr>
<td>3.03 ±0.13</td>
<td></td>
<td>2 EVANS 16 CLEO</td>
<td>$e^+e^-\rightarrow D^0\bar{D}^0$ at $\psi(3770)$</td>
<td></td>
</tr>
</tbody>
</table>

1 This result uses external input on the mixing parameters x, y. Without this input, the result is $(3.215 \pm 0.136) \times 10^{-3}$.

2 A combined fit with a recent LHCb $D^0\bar{D}^0$ mixing results in AAIJ 16f is also reported to be $(3.01 \pm 0.07) \times 10^{-3}$.

$\Gamma(K^+\pi^+2\pi^-)/\Gamma(K^-2\pi^+\pi^-)$

$\Gamma_{250}/\Gamma_{68}$

The experiments here use the charge of the pion in $D^*(2010)^{\pm}\rightarrow (D^0$ or $\bar{D}^0)^{\pi^{\pm}}$ decay to tell whether a $D^0$ or a $\bar{D}^0$ was born. The $D^0\rightarrow K^+\pi^-\pi^+\pi^-$ decay can occur directly by doubly Cabibbo-suppressed (DCS) decay, or indirectly by $D^0\rightarrow \bar{D}^0$ mixing followed by $\bar{D}^0\rightarrow K^+\pi^-\pi^+\pi^-$ decay. Some of the experiments can use the decay-time information to disentangle the two mechanisms. Here, we list the experimental branching ratio, which if there is no mixing is the DCS ratio; in the next data block we give the limits on the mixing ratio.

Some early limits have been omitted from this Listing; see our 1998 edition (EPJ C 31).

$\Gamma(K^+\pi^+2\pi^-)$

<table>
<thead>
<tr>
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<td>42k,11M</td>
<td>1 AAIJ 16f LHCb</td>
<td>$pp$ at 7, 8 TeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.24±0.08±0.07</td>
<td>3.3k</td>
<td>2 WHITE 13 BELL</td>
<td>$e^+e^-\approx \Upsilon(4S)$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4 ±1.3 -1.2 ± 0.4</td>
<td>54</td>
<td>2 DYTMAN 01 CLEO</td>
<td>$e^+e^-\approx \Upsilon(4S)$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5 ±3.6 -3.4 ±0.3</td>
<td>3 AITALA 98</td>
<td>E791</td>
<td>$\pi^-$ nucl., 500 GeV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<18 90 2 TIAN 05 BELL | See WHITE 13 |
| 3.20±0.18+0.18 -0.13 | 1.7k | 2 AMMAR 91 CLEO | $e^+e^-\approx 10.5$ GeV |
| <18 90 | 4 ANJOS 88C | E691 | Photoproduction |

1 AAIJ 16f result comes from time-dependent analysis that uses external input on the mixing parameters x, y. Without this input, the result is $(3.29 \pm 0.08) \times 10^{-3}$.

2 AMMAR 91 cannot and DYTMAN 01, TIAN 05 do not distinguish between doubly Cabibbo-suppressed decay and $D^0\bar{D}^0$ mixing.

HTTP://PDG.LBL.GOV
This AITALA 98 result assumes no $D^0\overline{D}^0$ mixing ($R_M$ in the note on "$D^0\overline{D}^0$ Mixing"). It becomes $-0.0026^{+0.0117}_{-0.0106}$ $\pm 0.0035$ when mixing is allowed and decay-time information is used to distinguish doubly Cabibbo-suppressed decays from mixing.

ANJOS 88c uses decay-time information to distinguish doubly Cabibbo-suppressed (DCS) decays from $D^0\overline{D}^0$ mixing. However, the result assumes no interference between the DCS and mixing amplitudes ($y' = 0$ in the note on "$D^0\overline{D}^0$ Mixing" near the start of the $D^0$ Listings). When interference is allowed, the limit degrades to 0.033.

$$\Gamma(K^+\pi^+2\pi^-/\Gamma(K^-2\pi^+\pi^-)) / \Gamma_0$$

This is a $D^0\overline{D}^0$ mixing limit. The experiments here (1) use the charge of the pion in $D^*(2010)^+ \to (D^0$ or $\overline{D}^0)\pi^+$ decay to tell whether a $D^0$ or a $\overline{D}^0$ was born; and (2) use the decay-time distribution to disentangle doubly Cabibbo-suppressed decay and mixing. For the limits on $|m_D^1 - m_D^2|$ and $(\Gamma D_0 - \Gamma D_2)/\Gamma D^0$ that come from the best mixing limit, see near the beginning of these $D^0$ Listings.

### Table 1

<table>
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<td>9.6 $\pm$ 3.6</td>
<td></td>
<td>1 AAIJ</td>
<td>16f</td>
<td>LHCB $pp$ at 7, 8 TeV</td>
</tr>
</tbody>
</table>

1. We do not use the following data for averages, fits, limits, etc. $\cdots$

2. AAIJ 16f result comes from an unconstrained decay-time dependent fit to the wrong-sign to right-sign decay rates ratio as $(x^2 + y^2)/2$.

3. ANJOS 88c uses decay-time information to distinguish doubly Cabibbo-suppressed (DCS) decays from $D^0\overline{D}^0$ mixing. However, the result assumes no interference between the DCS and mixing amplitudes ($y' = 0$ in the note on "$D^0\overline{D}^0$ Mixing" near the start of the $D^0$ Listings). When interference is allowed, the limit degrades to 0.007.

$$\Gamma(K^+-+-2\pi^-/\Gamma(K^-2\pi^+\pi^-)) / \Gamma_0$$

This is a $D^0\overline{D}^0$ mixing limit. The limits on $|m_D^1 - m_D^2|$ and $(\Gamma D_0 - \Gamma D_2)/\Gamma D^0$ that come from the best mixing limit, see near the beginning of these $D^0$ Listings.

### Table 2

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<td>1 AITALA 98</td>
<td>E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
</tr>
<tr>
<td>&lt;0.0037</td>
<td>90</td>
<td>2 ANJOS 88c</td>
<td>E691</td>
<td>Photoproduction</td>
</tr>
</tbody>
</table>

1. AITALA 98 uses decay-time information to distinguish doubly Cabibbo-suppressed decays from $D^0\overline{D}^0$ mixing. The fit allows interference between the two amplitudes, and also allows CP violation in this term. The central value obtained is $0.0039^{+0.0036}_{-0.0032} \pm 0.0016$. When interference is disallowed, the result becomes $0.0021 \pm 0.0009 \pm 0.0002$.

2. This combines results of ANJOS 88c on $K^+\pi^-$ and $K^+\pi^-\pi^+\pi^-$ (via $D^0$) reported in the data block above (see footnotes there). It assumes no interference.

$$\Gamma(\mu^-\text{anything via } D^0) / \Gamma(\mu^+\text{anything})$$

This is a $D^0\overline{D}^0$ mixing limit. See the somewhat better limits above.

### Table 3

<table>
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<td>LOUIS 86</td>
<td>SPEC</td>
<td>$\pi^-W$ 225 GeV</td>
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<td>&lt;0.012</td>
<td>90</td>
<td>BENVENUTI 85</td>
<td>CNTR</td>
<td>$\mu$ C, 200 GeV</td>
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<tr>
<td>&lt;0.044</td>
<td>90</td>
<td>BODEK 82</td>
<td>SPEC</td>
<td>$\pi^-, pFe \to D^0$</td>
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Rare or forbidden modes

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

$D^0 \rightarrow \gamma\gamma$ is a flavor-changing neutral-current decay, forbidden in the Standard Model at the tree level.

<table>
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<tr>
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<td>90</td>
<td>NISAR</td>
<td>16</td>
<td>BELL $e^+e^-$ at $\Upsilon(4S), \Upsilon(5S)$</td>
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<tr>
<td>$&lt; 3.8 \times 10^{-6}$</td>
<td>90</td>
<td>ABLIKIM</td>
<td>15F</td>
<td>BES3 $e^+e^-$ at 3.773 GeV</td>
</tr>
<tr>
<td>$&lt; 2.2 \times 10^{-6}$</td>
<td>90</td>
<td>LEES</td>
<td>12L</td>
<td>BABR $e^+e^- \approx 10.58$ GeV</td>
</tr>
<tr>
<td>$&lt; 29 \times 10^{-6}$</td>
<td>90</td>
<td>COAN</td>
<td>03</td>
<td>CLE2 $e^+e^- \approx \Upsilon(4S)$</td>
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</table>

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

A test for the $\Delta C = 1$ weak neutral current. Allowed by first-order weak interaction combined with electromagnetic interaction.

<table>
<thead>
<tr>
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<td>$&lt; 1.7 \times 10^{-7}$</td>
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<td>LEES</td>
<td>12Q</td>
<td>BABR $e^+e^- \approx 10.58$ GeV</td>
</tr>
<tr>
<td>$&lt; 1.2 \times 10^{-6}$</td>
<td>90</td>
<td>AUBERT,B</td>
<td>04Y</td>
<td>BABR $e^+e^- \approx \Upsilon(4S)$</td>
</tr>
<tr>
<td>$&lt; 8.19 \times 10^{-6}$</td>
<td>90</td>
<td>PRIPSTEIN</td>
<td>00</td>
<td>E789 $p$ nucleus, 800 GeV</td>
</tr>
<tr>
<td>$&lt; 6.2 \times 10^{-6}$</td>
<td>90</td>
<td>AITALA</td>
<td>99C</td>
<td>E791 $\pi^- N$ 500 GeV</td>
</tr>
<tr>
<td>$&lt; 1.3 \times 10^{-5}$</td>
<td>90</td>
<td>FREYBERGER</td>
<td>96</td>
<td>CLE2 $e^+e^- \approx \Upsilon(4S)$</td>
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<td>$&lt; 1.3 \times 10^{-4}$</td>
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<td>ADLER</td>
<td>88</td>
<td>MRK3 $e^+e^- \approx 3.77$ GeV</td>
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<tr>
<td>$&lt; 1.7 \times 10^{-4}$</td>
<td>90</td>
<td>ALBRECHT</td>
<td>88G</td>
<td>ARG $e^+e^- \approx 10$ GeV</td>
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<tr>
<td>$&lt; 2.2 \times 10^{-4}$</td>
<td>90</td>
<td>HAAS</td>
<td>88</td>
<td>CLEO $e^+e^- \approx 10$ GeV</td>
</tr>
</tbody>
</table>

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

A test for the $\Delta C = 1$ weak neutral current. Allowed by first-order weak interaction combined with electromagnetic interaction.

<table>
<thead>
<tr>
<th>VALUE</th>
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<td>AAIJ</td>
<td>13AI</td>
<td>LHCB $pp$ at 7 TeV</td>
</tr>
<tr>
<td>$0.6-8.1 \times 10^{-7}$</td>
<td>90</td>
<td>LEES</td>
<td>12Q</td>
<td>BABR $e^+e^- \approx 10.58$ GeV</td>
</tr>
<tr>
<td>$&lt; 2.1 \times 10^{-7}$</td>
<td>90</td>
<td>AALTONEN</td>
<td>10X</td>
<td>CDF $p\overline{p}, \sqrt{s} = 1.96$ TeV</td>
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<td>$&lt; 1.4 \times 10^{-7}$</td>
<td>90</td>
<td>PETRIC</td>
<td>10</td>
<td>BELL $e^+e^- \approx \Upsilon(4S)$</td>
</tr>
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<td>$&lt; 2.0 \times 10^{-6}$</td>
<td>90</td>
<td>ABT</td>
<td>04</td>
<td>HERB $pA$, 920 GeV</td>
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<tr>
<td>$&lt; 1.3 \times 10^{-6}$</td>
<td>90</td>
<td>AUBERT,B</td>
<td>04Y</td>
<td>BABR $e^+e^- \approx \Upsilon(4S)$</td>
</tr>
<tr>
<td>$&lt; 2.5 \times 10^{-6}$</td>
<td>90</td>
<td>ACOSTA</td>
<td>03F</td>
<td>CDF See AALTONEN 10X</td>
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<td>$&lt; 1.56 \times 10^{-5}$</td>
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<td>PRIPSTEIN</td>
<td>00</td>
<td>E789 $p$ nucleus, 800 GeV</td>
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<tr>
<td>$&lt; 5.2 \times 10^{-6}$</td>
<td>90</td>
<td>AITALA</td>
<td>99G</td>
<td>E791 $\pi^- N$ 500 GeV</td>
</tr>
<tr>
<td>$&lt; 4.1 \times 10^{-6}$</td>
<td>90</td>
<td>ADAMOVICH</td>
<td>97</td>
<td>BEAT $\pi^- Cu$, 350 GeV</td>
</tr>
<tr>
<td>$&lt; 4.2 \times 10^{-6}$</td>
<td>90</td>
<td>ALEXOPOU...</td>
<td>96</td>
<td>E771 $p, Si$, 800 GeV</td>
</tr>
<tr>
<td>$&lt; 3.4 \times 10^{-5}$</td>
<td>90</td>
<td>FREYBERGER</td>
<td>96</td>
<td>CLE2 $e^+e^- \approx \Upsilon(4S)$</td>
</tr>
<tr>
<td>$&lt; 7.6 \times 10^{-6}$</td>
<td>90</td>
<td>ADAMOVICH</td>
<td>95</td>
<td>BEAT See ADAMOVICH 97</td>
</tr>
<tr>
<td>$&lt; 4.4 \times 10^{-5}$</td>
<td>90</td>
<td>KODAMA</td>
<td>95</td>
<td>E653 $\pi^-$ emulsion 600 GeV</td>
</tr>
<tr>
<td>$&lt; 3.1 \times 10^{-5}$</td>
<td>90</td>
<td>MISHRA</td>
<td>94</td>
<td>E789 $\pm 4.1 \pm 4.8$ events</td>
</tr>
<tr>
<td>$&lt; 7.0 \times 10^{-5}$</td>
<td>90</td>
<td>ALBRECHT</td>
<td>88G</td>
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<tr>
<td>$&lt; 1.1 \times 10^{-5}$</td>
<td>90</td>
<td>LOUIS</td>
<td>86</td>
<td>SPEC $\pi^- W$ 225 GeV</td>
</tr>
<tr>
<td>$&lt; 3.4 \times 10^{-4}$</td>
<td>90</td>
<td>AUBERT</td>
<td>85</td>
<td>EMC Deep inelast. $\mu^- N$</td>
</tr>
</tbody>
</table>
1 LEES 12q gives a 2-sided range.

2 Here MISHRA 94 uses "the statistical approach advocated by the PDG." For an alternate approach, giving a limit of $9 \times 10^{-6}$ at 90% confidence level, see the paper.

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

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

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</thead>
<tbody>
<tr>
<td>$&lt;4.5 \times 10^{-5}$</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
</tbody>
</table>

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

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</tr>
</thead>
<tbody>
<tr>
<td>$&lt;1.8 \times 10^{-4}$</td>
<td>90</td>
<td>KODAMA 95</td>
<td>E653</td>
<td>$\pi^-$ emulsion 600 GeV</td>
</tr>
</tbody>
</table>

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<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
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\[ \Gamma(\eta e^+ e^-)/\Gamma_{\text{total}} \]

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<td>$&lt;1.1 \times 10^{-4}$</td>
<td>90</td>
<td>FREYBERGER 96</td>
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\[ \Gamma(\eta \mu^+ \mu^-)/\Gamma_{\text{total}} \]

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</thead>
<tbody>
<tr>
<td>$&lt;5.3 \times 10^{-4}$</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
</tbody>
</table>

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

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

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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt;3.73 \times 10^{-4}$</td>
<td>90</td>
<td>AITALA 01c</td>
<td>E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\rho^0 e^+ e^-)/\Gamma_{\text{total}} \]

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

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</tr>
</thead>
<tbody>
<tr>
<td>$&lt;1.0 \times 10^{-4}$</td>
<td>90</td>
<td>1 FREYBERGER 96</td>
<td>CLE2</td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
</tbody>
</table>

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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt;1.24 \times 10^{-4}$</td>
<td>90</td>
<td>AITALA 01c</td>
<td>E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
</tr>
<tr>
<td>$&lt;4.5 \times 10^{-4}$</td>
<td>90</td>
<td>HAAS 88</td>
<td>CLEO</td>
<td>$e^+ e^- 10$ GeV</td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $<1.8 \times 10^{-4}$ using a photon pole amplitude model.
\[ \Gamma(\pi^+ \pi^- \mu^+ \mu^-)/\Gamma_{\text{total}} \]

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

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</tr>
</thead>
<tbody>
<tr>
<td>$&lt;5.5 \times 10^{-7}$</td>
<td>90</td>
<td>1 AAIJ 14B</td>
<td>LHCb</td>
<td>$\rho \rho$ at 7 TeV</td>
</tr>
<tr>
<td>$&lt;3.0 \times 10^{-5}$</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 AAIJ 14B measures this branching-fraction limit relative to the $\pi^+ \pi^- \phi, \phi \rightarrow \mu^+ \mu^-$ fraction. The above limit excludes the resonant $\phi, \omega$, and $\rho$ regions, and then fills those gaps with a phase-space model.

\[ \Gamma(\rho^0 \mu^+ \mu^-)/\Gamma_{\text{total}} \]

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

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</tr>
</thead>
<tbody>
<tr>
<td>$&lt;2.2 \times 10^{-5}$</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
</tr>
<tr>
<td>$&lt;4.9 \times 10^{-4}$</td>
<td>90</td>
<td>1 FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
<tr>
<td>$&lt;2.3 \times 10^{-4}$</td>
<td>90</td>
<td>KODAMA 95 E653</td>
<td>$\pi^-$ emulsion 600 GeV</td>
<td></td>
</tr>
<tr>
<td>$&lt;8.1 \times 10^{-4}$</td>
<td>90</td>
<td>HAAS 88 CLEO</td>
<td>$e^+ e^- \approx 10$ GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 4.5 \times 10^{-4}$ using a photon pole amplitude model.

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

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

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</thead>
<tbody>
<tr>
<td>$&lt;1.8 \times 10^{-4}$</td>
<td>90</td>
<td>1 FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 2.7 \times 10^{-4}$ using a photon pole amplitude model.

\[ \Gamma(\omega \mu^+ \mu^-)/\Gamma_{\text{total}} \]

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

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</thead>
<tbody>
<tr>
<td>$&lt;8.3 \times 10^{-4}$</td>
<td>90</td>
<td>1 FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 6.5 \times 10^{-4}$ using a photon pole amplitude model.

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

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

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>$&lt;3.15 \times 10^{-4}$</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
</tr>
</tbody>
</table>
\[ \Gamma(\phi e^+ e^-)/\Gamma_{\text{total}} \]

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

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</thead>
<tbody>
<tr>
<td>$&lt;5.2 \times 10^{-5}$</td>
<td>90</td>
<td>1 FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
<tr>
<td>$&lt;5.9 \times 10^{-5}$</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $<7.6 \times 10^{-5}$ using a photon pole amplitude model.

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

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

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<tbody>
<tr>
<td>$&lt;3.3 \times 10^{-5}$</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
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\[ \Gamma(\phi \mu^+ \mu^-)/\Gamma_{\text{total}} \]

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

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<tbody>
<tr>
<td>$&lt;3.1 \times 10^{-5}$</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
</tr>
<tr>
<td>$&lt;4.1 \times 10^{-4}$</td>
<td>90</td>
<td>1 FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $<2.4 \times 10^{-4}$ using a photon pole amplitude model.

\[ \Gamma(\phi e^+ e^-)/\Gamma_{\text{total}} \]

Not a useful test for $\Delta C = 1$ weak neutral current because both quarks must change flavor.

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<tbody>
<tr>
<td>$&lt;1.1 \times 10^{-4}$</td>
<td>90</td>
<td>FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
<tr>
<td>$&lt;1.7 \times 10^{-3}$</td>
<td>90</td>
<td>ADLER 89c MRK3</td>
<td>$e^+ e^- \approx 3.77$ GeV</td>
<td></td>
</tr>
</tbody>
</table>

\[ \Gamma(\phi \mu^+ \mu^-)/\Gamma_{\text{total}} \]

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</thead>
<tbody>
<tr>
<td>$&lt;2.6 \times 10^{-4}$</td>
<td>90</td>
<td>KODAMA 95 E653</td>
<td>$\pi^-$ emulsion 600 GeV</td>
<td></td>
</tr>
<tr>
<td>$&lt;6.7 \times 10^{-4}$</td>
<td>90</td>
<td>FREYBERGER 96 CLE2</td>
<td>$e^+ e^- \approx \Upsilon(4S)$</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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<tbody>
<tr>
<td>$&lt;3.85 \times 10^{-4}$</td>
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<td>AITALA 01c E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
<td></td>
</tr>
</tbody>
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\[
\frac{\Gamma(K^+(892)^0 e^+ e^-)}{\Gamma_{\text{total}}}
\]
Not a useful test for $\Delta C = 1$ weak neutral current because both quarks must change flavor.

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<td>AITALA 01c</td>
<td>E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
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<tr>
<td>$&lt;1.4 \times 10^{-4}$</td>
<td>90</td>
<td>1 FREYBERGER 96 CLE2</td>
<td></td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 2.0 \times 10^{-4}$ using a photon pole amplitude model.

\[
\frac{\Gamma(K^- \pi^+ \mu^+ \mu^- - 675 < m_{\mu\mu} < 875 \text{ MeV})}{\Gamma_{\text{total}}}
\]

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

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<tbody>
<tr>
<td>$&lt;3.59 \times 10^{-4}$</td>
<td>90</td>
<td>AITALA 01c</td>
<td>E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
</tr>
</tbody>
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\[
\frac{\Gamma(K^+(892)^0 \mu^+ \mu^-)}{\Gamma_{\text{total}}}
\]
Not a useful test for $\Delta C = 1$ weak neutral current because both quarks must change flavor.

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<td>E791</td>
<td>$\pi^-$ nucleus, 500 GeV</td>
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</thead>
<tbody>
<tr>
<td>$&lt;1.18 \times 10^{-3}$</td>
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<td>1 FREYBERGER 96 CLE2</td>
<td></td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to $< 1.0 \times 10^{-3}$ using a photon pole amplitude model.

\[
\frac{\Gamma(\pi^+ \pi^- \pi^0 \mu^+ \mu^-)}{\Gamma_{\text{total}}}
\]
A test for the $\Delta C = 1$ weak neutral current. Allowed by higher-order electroweak interactions.

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</thead>
<tbody>
<tr>
<td>$&lt;8.1 \times 10^{-4}$</td>
<td>90</td>
<td>KODAMA 95</td>
<td>E653</td>
<td>$\pi^-$ emulsion 600 GeV</td>
</tr>
</tbody>
</table>

\[
\frac{\Gamma(\mu^\pm e^\mp)}{\Gamma_{\text{total}}}
\]
A test of lepton family number conservation.

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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt;1.3 \times 10^{-8}$</td>
<td>90</td>
<td>AAIJ 16h</td>
<td>LHCb</td>
<td>$pp$ at 7, 8 GeV</td>
</tr>
</tbody>
</table>

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

$< 3.3 \times 10^{-7}$ | 90 | LEES 12q | BABR | $e^+ e^- \approx 10.58 \text{ GeV}$ |

$< 2.6 \times 10^{-7}$ | 90 | PETRIC 10 | BELL | $e^+ e^- \approx \gamma(4S)$ |

$< 8.1 \times 10^{-7}$ | 90 | AUBERT.B 04Y | BABR | $e^+ e^- \approx \gamma(4S)$ |

$< 1.72 \times 10^{-5}$ | 90 | PRIPSTEIN 00 | E789 | $p$ nucleus, 800 GeV |

$< 8.1 \times 10^{-6}$ | 90 | AITALA 99g | E791 | $\pi^- N$ 500 GeV |

$< 1.9 \times 10^{-5}$ | 90 | 1 FREYBERGER 96 CLE2 | | $e^+ e^- \approx \gamma(4S)$ |
\[ \Gamma(\pi^0 e^\pm \mu^\mp)/\Gamma_{\text{total}} \]
A test of lepton family number conservation. The value is for the sum of the two charge states.

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<tbody>
<tr>
<td>&lt;8.6 \times 10^{-5}</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>e^+ e^- \approx \gamma(4S)</td>
</tr>
</tbody>
</table>

\[ \Gamma(\eta e^\pm \mu^\mp)/\Gamma_{\text{total}} \]
A test of lepton family number conservation. The value is for the sum of the two charge states.

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<tbody>
<tr>
<td>&lt;1.0 \times 10^{-4}</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>e^+ e^- \approx \gamma(4S)</td>
</tr>
</tbody>
</table>

\[ \Gamma(\pi^+ \pi^- e^\pm \mu^\mp)/\Gamma_{\text{total}} \]
A test of lepton family-number conservation. The value is for the sum of the two charge states.

<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;1.5 \times 10^{-5}</td>
<td>90</td>
<td>AITALA 01c</td>
<td>E791</td>
<td>\pi^- nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

\[ \Gamma(\rho^0 e^\pm \mu^\mp)/\Gamma_{\text{total}} \]
A test of lepton family number conservation. The value is for the sum of the two charge states.

<table>
<thead>
<tr>
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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4.9 \times 10^{-5}</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>e^+ e^- \approx \gamma(4S)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE</th>
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<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6.6 \times 10^{-5}</td>
<td>90</td>
<td>AITALA 01c</td>
<td>E791</td>
<td>\pi^- nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to <5.0 \times 10^{-5} using a photon pole amplitude model.

\[ \Gamma(\omega e^\pm \mu^\mp)/\Gamma_{\text{total}} \]
A test of lepton family number conservation. The value is for the sum of the two charge states.

<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;1.2 \times 10^{-4}</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>e^+ e^- \approx \gamma(4S)</td>
</tr>
</tbody>
</table>

1 This FREYBERGER 96 limit is obtained using a phase-space model. The same limit is obtained using a photon pole amplitude model.

\[ \Gamma(K^- K^+ e^\pm \mu^\mp)/\Gamma_{\text{total}} \]
A test of lepton family-number conservation. The value is for the sum of the two charge states.

<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;1.8 \times 10^{-4}</td>
<td>90</td>
<td>AITALA 01c</td>
<td>E791</td>
<td>\pi^- nucleus, 500 GeV</td>
</tr>
</tbody>
</table>
\( \Gamma(\phi e^\pm \mu^\mp)/\Gamma_{\text{total}} \)

A test of lepton family number conservation. The value is for the sum of the two charge states.

<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;3.4 \times 10^{-5})</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>(e^+ e^- \approx \Upsilon(4S))</td>
</tr>
</tbody>
</table>

\footnote{We do not use the following data for averages, fits, limits, etc.}  
\footnote{This FREYBERGER 96 limit is obtained using a phase-space model. The limit changes to \(<3.3 \times 10^{-5}\) using a photon pole amplitude model.}

\( \Gamma(\bar{K}^0 e^\pm \mu^\mp)/\Gamma_{\text{total}} \)

A test of lepton family number conservation. The value is for the sum of the two charge states.

<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;1.0 \times 10^{-4})</td>
<td>90</td>
<td>FREYBERGER 96</td>
<td>CLE2</td>
<td>(e^+ e^- \approx \Upsilon(4S))</td>
</tr>
</tbody>
</table>

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

A test of lepton family-number conservation. The value is for the sum of the two charge states.

<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;5.53 \times 10^{-4})</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td></td>
<td>(\pi^-) nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

\( \Gamma(\bar{K}^*(892)\pi^0 e^\pm \mu^\mp)/\Gamma_{\text{total}} \)

A test of lepton family number conservation. The value is for the sum of the two charge states.

<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;8.3 \times 10^{-5})</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td></td>
<td>(\pi^-) nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

\footnote{We do not use the following data for averages, fits, limits, etc.}  
\footnote{This FREYBERGER 96 limit is obtained using a phase-space model. The same limit is obtained using a photon pole amplitude model.}

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

A test of lepton-number conservation. The value is for the sum of the two charge states.

<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;1.12 \times 10^{-4})</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td></td>
<td>(\pi^-) nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

\( \Gamma(2\pi^- 2\mu^+ + \text{c.c.})/\Gamma_{\text{total}} \)

A test of lepton-number conservation. The value is for the sum of the two charge states.

<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;2.9 \times 10^{-5})</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td></td>
<td>(\pi^-) nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

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

A test of lepton-number conservation. The value is for the sum of the two charge states.

<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;2.06 \times 10^{-4})</td>
<td>90</td>
<td>AITALA 01c E791</td>
<td></td>
<td>(\pi^-) nucleus, 500 GeV</td>
</tr>
</tbody>
</table>

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(K^- \pi^- 2\mu^+ + \text{c.c.})}{\Gamma_{\text{total}}} < 3.9 \times 10^{-4}
\]

A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(2\pi^- e^+ + \text{c.c.})}{\Gamma_{\text{total}}} < 1.52 \times 10^{-4}
\]

A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(2\pi^- \mu^+ + \text{c.c.})}{\Gamma_{\text{total}}} < 9.4 \times 10^{-5}
\]

A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(\pi^- \pi^- e^+ \mu^+ + \text{c.c.})}{\Gamma_{\text{total}}} < 7.9 \times 10^{-5}
\]

A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(K^- \pi^- e^+ \mu^+ + \text{c.c.})}{\Gamma_{\text{total}}} < 2.18 \times 10^{-4}
\]

A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(2\pi^- \mu^- \mu^+ + \text{c.c.})}{\Gamma_{\text{total}}} < 5.7 \times 10^{-5}
\]

A test of lepton-number conservation. The value is for the sum of the two charge states.

\[
\frac{\Gamma(p e^-)}{\Gamma_{\text{total}}} < 1.0 \times 10^{-5}
\]

This RUBIN 09 limit is for either \( D^0 \rightarrow p e^- \) or \( \bar{D}^0 \rightarrow \bar{p} e^- \) decay.

\[
\frac{\Gamma(\bar{p} e^+)}{\Gamma_{\text{total}}} < 1.1 \times 10^{-5}
\]

This RUBIN 09 limit is for either \( D^0 \rightarrow \bar{p} e^+ \) or \( \bar{D}^0 \rightarrow p e^- \) decay.
**D^0 CP-VIOLATING DECAY-RATE ASYMMETRIES**

This is the difference between D^0 and \(\overline{D}^0\) partial widths for the decay to state \(f\), divided by the sum of the widths:

\[
A_{CP}(f) = \left[ \Gamma(D^0 \rightarrow f) - \Gamma(\overline{D}^0 \rightarrow \overline{f}) \right] / \left[ \Gamma(D^0 \rightarrow f) + \Gamma(\overline{D}^0 \rightarrow \overline{f}) \right].
\]

### \(A_{CP}(K^+ K^-)\) in \(D^0, \overline{D}^0 \rightarrow K^+ K^-\)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-0.07\pm0.11) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-0.04\pm0.12\pm0.10)</td>
<td>456k</td>
<td>AAIJ 17M</td>
<td>LHC</td>
<td>pp 7, 8 TeV</td>
</tr>
<tr>
<td>(-0.24\pm0.22\pm0.09)</td>
<td>476k</td>
<td>1 AALTONEN 12B</td>
<td>CDF</td>
<td>p(\overline{p}), (\sqrt{s}=1.96) TeV</td>
</tr>
<tr>
<td>(0.00\pm0.34\pm0.13)</td>
<td>129k</td>
<td>2 AUBERT 08M</td>
<td>BABR</td>
<td>e^+e^- (\approx) 10.6 GeV</td>
</tr>
<tr>
<td>(-0.43\pm0.30\pm0.11)</td>
<td>120k</td>
<td>3 STARIC 08</td>
<td>BELL</td>
<td>e^+e^- (\approx) (\Upsilon(4S))</td>
</tr>
<tr>
<td>(+2.0\pm1.2\pm0.6)</td>
<td>4 ACOSTA 05C</td>
<td>CDF</td>
<td>p(\overline{p}), (\sqrt{s}=1.96) TeV</td>
<td></td>
</tr>
<tr>
<td>(0.0\pm2.2\pm0.8)</td>
<td>3023</td>
<td>4 CSORNA 02</td>
<td>CLE2</td>
<td>e^+e^- (\approx) (\Upsilon(4S))</td>
</tr>
<tr>
<td>(-0.1\pm2.2\pm1.5)</td>
<td>3330</td>
<td>4 LINK 00B</td>
<td>FOCS</td>
<td></td>
</tr>
</tbody>
</table>
| \(-1.0\pm4.9\pm1.2\) | 609 | 4 AITALA 98C | E791 | -0.093 \(<A_{CP}(<+0.073 (90\% CL)

---

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

\(-0.06\pm0.15\pm0.10\) 1.8M 1 AAIJ 14AK LHC | See AAIJ 17M

1 See also “\(D^0\) CP-violating asymmetry differences” at the end of the \(CP\)-violating asymmetries.
2 AUBERT 08M uses corrected numbers of events directly, not ratios with \(K^\pm\pi^\pm\) events.
3 STARIC 08 uses \(D^0 \rightarrow K^-\pi^+\) and \(\overline{D}^0 \rightarrow K^+\pi^-\) decays to correct for detector-induced asymmetries.
4 AITALA 98C, LINK 00B, CSORNA 02, and ACOSTA 05C measure \(N(D^0 \rightarrow K^+K^-)\) for \(K^+K^\pm\pi^\pm\), the ratio of numbers of events observed, and similarly for the \(\overline{D}^0\).

### \(A_{CP}(K^0_S K^0_S)\) in \(D^0, \overline{D}^0 \rightarrow K^0_S K^0_S\)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-5 \pm 5) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-2.9\pm5.2\pm2.2)</td>
<td>630</td>
<td>AAIJ 15AT</td>
<td>LHC</td>
<td>pp at 7, 8 TeV</td>
</tr>
<tr>
<td>(-23 \pm 19)</td>
<td>65</td>
<td>BONVICINI 01</td>
<td>CLE2</td>
<td>e^+e^- (\approx) 10.6 GeV</td>
</tr>
</tbody>
</table>

### \(A_{CP}(\pi^+\pi^-)\) in \(D^0, \overline{D}^0 \rightarrow \pi^+\pi^-\)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.13\pm0.14) OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-0.07\pm0.14\pm0.11)</td>
<td>215k</td>
<td>1 AAIJ 17M</td>
<td>LHC</td>
<td>pp 7, 8 TeV</td>
</tr>
<tr>
<td>(-0.22\pm0.24\pm0.11)</td>
<td>63.7k</td>
<td>2 AALTONEN 12B</td>
<td>CDF</td>
<td>p(\overline{p}), (\sqrt{s}=1.96) TeV</td>
</tr>
<tr>
<td>(-0.24\pm0.52\pm0.22)</td>
<td>51k</td>
<td>3 AUBERT 08M</td>
<td>BABR</td>
<td>e^+e^- (\approx) 10.6 GeV</td>
</tr>
<tr>
<td>(0.43\pm0.52\pm0.12)</td>
<td>1.0 \pm 1.3 \pm 0.6</td>
<td>4 STARIC 08</td>
<td>BELL</td>
<td>e^+e^- (\approx) (\Upsilon(4S))</td>
</tr>
<tr>
<td>(1.9 \pm 3.2 \pm 0.8)</td>
<td>1136</td>
<td>5 ACOSTA 05C</td>
<td>CDF</td>
<td>p(\overline{p}), (\sqrt{s}=1.96) TeV</td>
</tr>
<tr>
<td>(4.8 \pm 3.9 \pm 2.5)</td>
<td>1177</td>
<td>5 CSORNA 02</td>
<td>CLE2</td>
<td>e^+e^- (\approx) (\Upsilon(4S))</td>
</tr>
<tr>
<td>(-4.9 \pm 7.8 \pm 3.0)</td>
<td>343</td>
<td>5 LINK 00B</td>
<td>FOCS</td>
<td></td>
</tr>
</tbody>
</table>
| \(-4.9 \pm 7.8 \pm 3.0\) | 343 | 5 AITALA 98C | E791 | -0.186 \(<A_{CP}(<+0.088 (90\% CL)

---

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

\(-0.20\pm0.19\pm0.10\) 774k 2 6 AAIJ 14AK LHC | See AAIJ 17M

---

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
1 AAIJ 17M value combines $\Delta A_{CP}(\pi \pi, KK)$ from AAIJ 16D, $A_{CP}(KK)$ from AAIJ 17M, and $A_{CP}(\pi \pi)$ from AAIJ 14AK.
2 See also “$D^0$ CP-violating asymmetry differences” at the end of the CP-violating asymmetries.
3 AUBERT 08M uses corrected numbers of events directly, not ratios with $K^+\pi^\pm$ events.
4 STARIC 08 uses $D^0 \to K^-\pi^+$ and $\overline{D}^0 \to K^+\pi^-$ decays to correct for detector-induced asymmetries.
5 AITALA 98C, LINK 00B, CSORNA 02, and ACOSTA 05c measure $N(D^0 \to \pi^+\pi^-)/N(\overline{D}^0 \to K^-\pi^+)$, the ratio of numbers of events observed, and similarly for the $\overline{D}^0$.
6 AAIJ 14AK uses $A_{CP}(\pi \pi, KK)$ and $A_{CP}(KK)$ reported in the same paper.

$A_{CP}(\pi^0 \pi^0)$ in $D^0, \overline{D}^0 \to \pi^0 \pi^0$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.0 \pm 0.6$ OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$-0.03 \pm 0.64 \pm 0.10$</td>
<td>34k</td>
<td>NISAR</td>
<td>14 BELL</td>
<td>$e^+ e^- \text{ at/near } \gamma$'s</td>
</tr>
<tr>
<td>$0.1 \pm 4.8$</td>
<td>810</td>
<td>BONVICINI</td>
<td>01 CLE2</td>
<td>$e^+ e^- \approx 10.6 \text{ GeV}$</td>
</tr>
</tbody>
</table>

$A_{CP}(\rho\gamma)$ in $D^0, \overline{D}^0 \to \rho\gamma$

<table>
<thead>
<tr>
<th>VALUE (units 10$^{-2}$)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5.6 \pm 15.2 \pm 0.6$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$-9.4 \pm 6.6 \pm 0.1$</td>
<td>NANUT</td>
<td>17 BELL</td>
<td>$e^+ e^- \text{ at } \gamma(nS), n=2,3,4,5$</td>
</tr>
</tbody>
</table>

$A_{CP}(\phi\gamma)$ in $D^0, \overline{D}^0 \to \phi\gamma$

<table>
<thead>
<tr>
<th>VALUE (units 10$^{-2}$)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-9.4 \pm 6.6 \pm 0.1$</td>
<td>NANUT</td>
<td>17 BELL</td>
<td>$e^+ e^- \text{ at } \gamma(nS), n=2,3,4,5$</td>
</tr>
</tbody>
</table>

$A_{CP}(K^{*}(892)^0 \gamma)$ in $D^0, \overline{D}^0 \to K^{*}(892)^0 \gamma$

<table>
<thead>
<tr>
<th>VALUE (units 10$^{-2}$)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-0.3 \pm 2.0 \pm 0.0$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$A_{CP}(\pi^+ \pi^- \pi^0)$ in $D^0, \overline{D}^0 \to \pi^+ \pi^- \pi^0$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.3 \pm 0.4$ OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0.43 \pm 1.30$</td>
<td>$123k \pm 490$</td>
<td>ARINSTEN</td>
<td>08 BELL</td>
<td>$e^+ e^- \approx \gamma(4S)$</td>
</tr>
<tr>
<td>$0.31 \pm 0.41 \pm 0.17$</td>
<td>$80 \pm .3k$</td>
<td>1 AUBERT</td>
<td>08AO BABR</td>
<td>$e^+ e^- \approx 10.6 \text{ GeV}$</td>
</tr>
<tr>
<td>$1 \pm 9 \pm 7$</td>
<td>5</td>
<td>CRONIN-HEN.05</td>
<td>CLEO</td>
<td>$e^+ e^- \approx 10 \text{ GeV}$</td>
</tr>
</tbody>
</table>

$A_{CP}(\rho(770)^+ \pi^- \to \pi^+ \pi^- \pi^0)$ in $D^0 \to \rho^+ \pi^-, \overline{D}^0 \to \rho^\prime \pi^+$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+1.2 \pm 0.8 \pm 0.3$</td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, –Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

$A_{CP}(\rho(770)^0 \pi^0 \to \pi^+ \pi^- \pi^0)$ in $D^0, \overline{D}^0 \to \rho^0 \pi^0$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-3.1 \pm 2.7 \pm 1.2$</td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, –Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

$A_{CP}(\rho(770)^- \pi^+ \to \pi^+ \pi^- \pi^0)$ in $D^0 \to \rho^- \pi^+, \overline{D}^0 \to \rho^\prime \pi^-$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-1.0 \pm 1.6 \pm 0.7$</td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, –Col.5/2×Col.2</td>
</tr>
<tr>
<td>$A_{CP}(\rho(1450)^+ \pi^- \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0 \rightarrow \rho(1450)^+ \pi^-, \bar{D}^0 \rightarrow \text{c.c.}$</td>
<td>VALUE (%)</td>
<td>DOCUMENT ID</td>
<td>TECN</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>----------</td>
<td>--------------</td>
<td>------</td>
</tr>
<tr>
<td>$0 \pm 50 \pm 50$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(\rho(1450)^0 \pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow \rho(1450)^0 \pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-17 \pm 33 \pm 17$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(\rho(1450)^- \pi^+ \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0 \rightarrow \rho(1450)^- \pi^+, \bar{D}^0 \rightarrow \text{c.c.}$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+6 \pm 8 \pm 3$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(\rho(1700)^+ \pi^- \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0 \rightarrow \rho(1700)^+ \pi^-, \bar{D}^0 \rightarrow \text{c.c.}$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-5 \pm 13 \pm 5$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(\rho(1700)^0 \pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow \rho(1700)^0 \pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+13 \pm 8 \pm 3$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(\rho(1700)^- \pi^+ \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0 \rightarrow \rho(1700)^- \pi^+, \bar{D}^0 \rightarrow \text{c.c.}$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+8 \pm 10 \pm 5$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(f_0(980)\pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow f_0(980)\pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 \pm 25 \pm 25$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(f_0(1370)\pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow f_0(1370)\pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+25 \pm 13 \pm 13$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(f_0(1500)\pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow f_0(1500)\pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 \pm 13 \pm 13$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(f_0(1710)\pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow f_0(1710)\pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 \pm 17 \pm 17$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(f_2(1270)\pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow f_2(1270)\pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-4 \pm 4 \pm 4$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$A_{CP}(\sigma(400)\pi^0 \rightarrow \pi^+ \pi^- \pi^0)$ in $D^0, \bar{D}^0 \rightarrow \sigma(400)\pi^0$</th>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+6 \pm 6 \pm 6$</td>
<td></td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
</tr>
</tbody>
</table>
**A\textsubscript{CP}(\text{nonresonant } \pi^+ \pi^- \pi^0) in \ D^0, \ D^{0*} \rightarrow \text{nonresonant } \pi^+ \pi^- \pi^0**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−13±19±13</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}(2\pi^+ 2\pi^-) in \ D^0, \ D^{0*} \rightarrow 2\pi^+ 2\pi^-**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>no evidence</td>
<td>1 AAIJ 13BR LHCb</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 AAIJ 13BR searched for CP violation in binned phase space. No evidence was found.

**A\textsubscript{CP}(K^+ K^- \pi^0) in \ D^0, \ D^{0*} \rightarrow K^+ K^- \pi^0**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−1.00±1.67±0.25</td>
<td>11 ± 0.11k AUBERT 08AO BABR</td>
<td>e^+ e^- ≈ 10.6 GeV</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}(K^*(892)^+ K^- \rightarrow K^+ K^- \pi^0) in \ D^0 \rightarrow K^*(892)^+ K^-, \ D^{0*} \rightarrow c.c.**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−0.9±1.2±0.4</td>
<td>1 AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

1 AUBERT 08AO report their result using a different sign convention.

**A\textsubscript{CP}(K^*(1410)^+ K^- \rightarrow K^+ K^- \pi^0) in \ D^0 \rightarrow K^*(1410)^+ K^-, \ D^{0*} \rightarrow c.c.**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−21±23±8</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}((K^+ \pi^0)_{S-wave} K^- \rightarrow K^+ K^- \pi^0) in \ D^0 \rightarrow (K^+ \pi^0)_{S} K^-, \ D^{0*} \rightarrow c.c.**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+7±15±3</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}(\phi(1020) \pi^0 \rightarrow K^+ K^- \pi^0) in \ D^0, \ D^{0*} \rightarrow \phi(1020) \pi^0**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1.1±2.1±0.5</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}(f_0(980) \pi^0 \rightarrow K^+ K^- \pi^0) in \ D^0, \ D^{0*} \rightarrow f_0(980) \pi^0**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−3±19±1</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}(a_0(980)^0 \pi^0 \rightarrow K^+ K^- \pi^0) in \ D^0, \ D^{0*} \rightarrow a_0(980)^0 \pi^0**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−5±16±2</td>
<td>1 AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

1 This AUBERT 08AO value is obtained when the a_0(980)^0 replaces the f_0(980) in the fit.

**A\textsubscript{CP}(f_2(1525) \pi^0 \rightarrow K^+ K^- \pi^0) in \ D^0, \ D^{0*} \rightarrow f_2(1525) \pi^0**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0±50±150</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>

**A\textsubscript{CP}(K^*(892)^- K^+ \rightarrow K^+ K^- \pi^0) in \ D^0 \rightarrow K^*(892)^- K^+, \ D^{0*} \rightarrow c.c.**

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>−5±4±1</td>
<td>AUBERT 08AO BABR</td>
<td>Table 1, −Col.5/2×Col.2</td>
<td></td>
</tr>
</tbody>
</table>
\( A_{CP}(K^*(1410)^- K^+ \rightarrow K^+ K^- \pi^0) \) in \( D^0 \rightarrow K^*(1410)^- K^+, \bar{D}^0 \rightarrow \text{c.c.} \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-17 \pm 28 \pm 7)</td>
<td>AUBERT 08A0 BABR</td>
<td>Table 1, ( -\text{Col.5/2} \times \text{Col.2} )</td>
<td></td>
</tr>
</tbody>
</table>

\( A_{CP}((K^- \pi^0)_S\text{-wave} K^+ \rightarrow K^+ K^- \pi^0) \) in \( D^0 \rightarrow (K^- \pi^0)_S K^+, \bar{D}^0 \rightarrow \text{c.c.} \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-7 \pm 40 \pm 8)</td>
<td>AUBERT 08A0 BABR</td>
<td>Table 1, ( -\text{Col.5/2} \times \text{Col.2} )</td>
<td></td>
</tr>
</tbody>
</table>

\( A_{CP}(K^0_S \pi^0) \) in \( D^0, \bar{D}^0 \rightarrow K^0_S \pi^0 \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-0.20 \pm 0.17 \text{ OUR AVERAGE})</td>
<td>467k 1 NISAR 14 BELL</td>
<td>( e^+ e^- \text{ at}/\text{near } \gamma')'s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1 \pm 1.3</td>
<td>9099 BONVICINI 01 CLE2</td>
<td>( e^+ e^- \approx 10.6 \text{ GeV} )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \cdot \cdot \cdot \) We do not use the following data for averages, fits, limits, etc. \( \cdot \cdot \cdot \)

\( \cdot \cdot \cdot \) After subtracting CPV in \( K^0 \rightarrow \pi^0 \) mixing, NISAR 14 gets \( A_{CP} = (+0.12 \pm 0.16 \pm 0.07\)\%.

\( A_{CP}(K^0_S \eta) \) in \( D^0, \bar{D}^0 \rightarrow K^0_S \eta \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.54 \pm 0.51 \pm 0.16</td>
<td>46k KO 11 BELL</td>
<td>( e^+ e^- \approx \gamma(4S) )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( A_{CP}(K^0_S \eta') \) in \( D^0, \bar{D}^0 \rightarrow K^0_S \eta' \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.98 \pm 0.67 \pm 0.14</td>
<td>27k KO 11 BELL</td>
<td>( e^+ e^- \approx \gamma(4S) )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( A_{CP}(K^0_S \phi) \) in \( D^0, \bar{D}^0 \rightarrow K^0_S \phi \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-2.8 \pm 9.4)</td>
<td>95 BARTLELT 95 CLE2</td>
<td>(-18.2 &lt; A_{CP} &lt; +12.6% ) (90%CL)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( A_{CP}(K^\mp \pi^\pm) \) in \( D^0 \rightarrow K^- \pi^+, \bar{D}^0 \rightarrow K^+ \pi^- \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 \pm 0.3 \pm 0.6</td>
<td>150k MENDEZ 10 CLEO</td>
<td>All CLEO-c runs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \cdot \cdot \cdot \) We do not use the following data for averages, fits, limits, etc. \( \cdot \cdot \cdot \)

\( A_{CP}(K^\pm \pi^\mp) \) in \( D^0 \rightarrow K^+ \pi^-, \bar{D}^0 \rightarrow K^- \pi^+ \)

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 \pm 1.6 \text{ OUR AVERAGE})</td>
<td>1 AAIJ 13CE LHCb</td>
<td>( pp ) at 7, 8 TeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-0.7 \pm 1.9)</td>
<td>40k AUBERT 07W BABR 2 HANG 06 BELL</td>
<td>( e^+ e^- \approx 10.6 \text{ GeV})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2.1 \pm 5.2 \pm 1.5</td>
<td>40k ZHANG 06 BELL</td>
<td>( e^+ e^- \approx 10.6 \text{ GeV})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2.3 \pm 4.7</td>
<td>05H FOCS ( \gamma ) nucleus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+18 \pm 14 \pm 4</td>
<td>4 AUBERT 03Z BABR</td>
<td>( e^+ e^- ), 10.6 GeV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+9.5 \pm 6.1 \pm 8.3</td>
<td>5 GODANG 00 CLE2</td>
<td>( e^+ e^- )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \cdot \cdot \cdot \) We do not use the following data for averages, fits, limits, etc. \( \cdot \cdot \cdot \)

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\( \cdot \cdot \cdot \) We do not use the following data for averages, fits, limits, etc. \( \cdot \cdot \cdot \)

\( \cdot \cdot \cdot \) We do not use the following data for averages, fits, limits, etc. \( \cdot \cdot \cdot \)
1 Based on 3 fb\(^{-1}\) of data collected at \(\sqrt{s} = 7, 8\) TeV. Allowing for CP violation, the direct CP-violation in mixing is reported for the \(D^0 \rightarrow K^+\pi^-\) and \(\overline{D}^0 \rightarrow K^+\pi^-\).
2 This ZHANG 06 result allows mixing.
3 This LINK 05H result assumes no mixing. If mixing is allowed, it becomes \(0.13^{+0.33}_{-0.25} \pm 0.10\).
4 This AUBERT 03Z limit assumes no mixing. If mixing is allowed, the 95% confidence-level interval is \((-2.8 < A_{D} < 4.9) \times 10^{-3}\).
5 This GODANG 00 result assumes no \(D^0, \overline{D}^0\) mixing and becomes \(-0.43 < A_{CP} < +0.34\) at 95% CL. If mixing is allowed \(A_{CP} = -0.01^{+0.16}_{-0.17} \pm 0.01\).
6 This LI 05A result allows mixing.

\[A_{CP}(K^-\pi^+) \text{ in } D_{CP}(\pm 1) \rightarrow K^\mp\pi^\pm\]

\[A_{CP}(K^-\pi^+) = \frac{|B(D_{CP}(-) \rightarrow K^-\pi^+ + c.c.) - B(D_{CP}(+) \rightarrow K^-\pi^+ + c.c.)|}{\text{Sum}}\]

<table>
<thead>
<tr>
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<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.7 \pm 1.3 \pm 0.7</td>
<td>ABLIKIM 14c BES3</td>
<td>e^+ e^- \rightarrow D^0 D^0, 3.77 GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 ABLIKIM 14c uses quantum correlations in \(e^+ e^- \rightarrow D^0 D^0\) at the \(\psi(3770)\) to measure the asymmetry of the branching fraction of \(D^0 \rightarrow K^-\pi^+\) in CP-odd and CP-even eigenstates. It then extracts the strong-phase difference \(\delta_{K\pi}\).

\[A_{CP}(K^\mp\pi^\pm 0) \text{ in } D^0 \rightarrow K^-\pi^+\pi^0, \overline{D}^0 \rightarrow K^+\pi^-\pi^0\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 \pm 0.5 OUR AVERAGE</td>
<td>BONVICINI 14 CLEO</td>
<td>All CLEO-c runs</td>
<td></td>
</tr>
<tr>
<td>-3.1 \pm 8.6</td>
<td>KOPP 01 CLEO2</td>
<td>(e^+ e^- \approx 10.6) GeV</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 \pm 0.4 \pm 0.8</td>
<td>DOBBS 07 CLEO</td>
<td>See BONVICINI 14</td>
<td></td>
</tr>
</tbody>
</table>

1 KOPP 01 fits separately the \(D^0\) and \(\overline{D}^0\) Dalitz plots and then calculates the integrated difference of normalized densities divided by the integrated sum.

\[A_{CP}(K^\pm\pi^\mp\pi^0) \text{ in } D^0 \rightarrow K^+\pi^-\pi^0, \overline{D}^0 \rightarrow K^-\pi^+\pi^0\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 \pm 5 OUR AVERAGE</td>
<td>1978 \pm 104 TIAN 05 CLEO</td>
<td>(e^+ e^- \approx \Gamma(4S))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0.6 \pm 5.3</td>
<td>38 BRANDENB... 01 CLEO2</td>
<td>(e^+ e^- \approx \Gamma(4S))</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[A_{CP}(K^0_S\pi^+\pi^-) \text{ in } D^0, \overline{D}^0 \rightarrow K^0_S\pi^+\pi^-\]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.1 \pm 0.8 OUR AVERAGE</td>
<td>350k</td>
<td>AALTONEN 12AD CDF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0.05 \pm 0.57 \pm 0.54</td>
<td>4854</td>
<td>ASNER 04A CLEO</td>
<td>(e^+ e^- \approx 10) GeV</td>
<td></td>
</tr>
</tbody>
</table>

1 This is the overall result of AALTONEN 12AD. Following are the 15 CP fit-fraction asymmetries from the amplitude analysis of the \(D^0\) and \(\overline{D}^0\) - \(K^0_S\pi^+\pi^-\) Dalitz plots.
2 This is the overall result of ASNER 04A; CP-violating limits are also given below for each of the 10 resonant submodes found in an amplitude analysis of the \(D^0\) and \(\overline{D}^0\) - \(K^0_S\pi^+\pi^-\) Dalitz plots.
A$_{CP}(K^*(892)^\mp \pi^\pm \rightarrow K_S^0 \pi^+ \pi^-)$ in $D^0 \rightarrow K^0 \pi^+$, $D^0 \rightarrow K^{*+} \pi^-$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+0.36 \pm 0.33 \pm 0.40$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$+2.5 \pm 1.9 \pm 3.3 \pm 0.8$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>

This is a doubly Cabibbo-suppressed mode.

A$_{CP}(K^*(892)^\pm \pi^\mp \rightarrow K_S^0 \pi^\pm \pi^-)$ in $D^0 \rightarrow K^{*\pm} \pi^\mp$, $D^0 \rightarrow K^{*-} \pi^+$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$+1.0 \pm 5.7 \pm 2.1$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$-21 \pm 42 \pm 28$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>

A$_{CP}(K_S^0 \rho^0 \rightarrow K_S^0 \pi^+ \pi^-)$ in $D^0 \rightarrow K^0 \rho^0$, $D^0 \rightarrow K^0 \rho^0$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-0.05 \pm 0.50 \pm 0.08$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$+3.1 \pm 3.8 \pm 2.7 \pm 2.2$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>

A$_{CP}(K_S^0 \omega \rightarrow K_S^0 \pi^+ \pi^-)$ in $D^0 \rightarrow K^0 \omega$, $D^0 \rightarrow K^0 \omega$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-12.6 \pm 6.0 \pm 2.6$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$-26 \pm 24 \pm 22 \pm 4$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>

A$_{CP}(K_S^0 f_0(980) \rightarrow K_S^0 \pi^+ \pi^-)$ in $D^0 \rightarrow K^0 f_0(980)$, $D^0 \rightarrow K^0 f_0(980)$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-0.4 \pm 2.2 \pm 1.6$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$-4.7 \pm 11.0 \pm 24.9 \pm 8.8$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>

A$_{CP}(K_S^0 f_2(1270) \rightarrow K_S^0 \pi^+ \pi^-)$ in $D^0 \rightarrow K^0 f_2(1270)$, $D^0 \rightarrow K^0 f_2(1270)$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-4.0 \pm 3.4 \pm 3.0$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$+34 \pm 51 \pm 33 \pm 79$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>

A$_{CP}(K_S^0 f_0(1370) \rightarrow K_S^0 \pi^+ \pi^-)$ in $D^0 \rightarrow K^0 f_0(1370)$, $D^0 \rightarrow K^0 f_0(1370)$

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-0.5 \pm 4.6 \pm 7.7$</td>
<td>AALTONEN 12AD CDF</td>
<td>Dalitz fit, $\sim 350k$ evts</td>
<td></td>
</tr>
<tr>
<td>$+18 \pm 10 \pm 13 \pm 22$</td>
<td>ASNER 04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
<td></td>
</tr>
</tbody>
</table>
\[ A_{CP}(K_S^0\rho^0(1450)) \text{ in } D^0 \rightarrow \bar{\rho}^0(1450), \bar{D}^0 \rightarrow K^0\rho^0(1450) \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-4.1\pm5.2\pm8.1)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^0 f_0(600)) \text{ in } D^0 \rightarrow \bar{\rho}^0(600), \bar{D}^0 \rightarrow K^0 f_0(600) \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-2.7\pm2.7\pm3.6)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*(1410)^\mp \pi^\pm) \text{ in } D^0 \rightarrow K^*(1410)^-\pi^+, \bar{D}^0 \rightarrow K^*(1410)^+\pi^- \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-2.3\pm5.7\pm6.4)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K_0^*(1430)^\mp \pi^\pm \rightarrow K_0^0\pi^+\pi^-) \text{ in } D^0 \rightarrow K_0^*(1430)^-\pi^+, \bar{D}^0 \rightarrow \text{c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4.0\pm2.4\pm3.8)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K_0^*(1430)^\pm \pi^\mp) \text{ in } D^0 \rightarrow K_0^*(1430)^+\pi^-, \bar{D}^0 \rightarrow K_0^*(1430)^-\pi^+ \]

This is a doubly Cabibbo-suppressed mode.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+12\pm11\pm10)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K_2^*(1430)^\mp \pi^\pm \rightarrow K_2^0\pi^+\pi^-) \text{ in } D^0 \rightarrow K_2^*(1430)^-\pi^+, \bar{D}^0 \rightarrow \text{c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+2.9\pm4.0\pm4.1)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K_2^*(1430)^\pm \pi^\mp) \text{ in } D^0 \rightarrow K_2^*(1430)^+\pi^-, \bar{D}^0 \rightarrow K_2^*(1430)^-\pi^+ \]

This is a doubly Cabibbo-suppressed mode.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-10\pm14\pm29)</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>Dalitz fit, \sim 350k evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*(1680)^\mp \pi^\pm \rightarrow K_0^0\pi^+\pi^-) \text{ in } D^0 \rightarrow K^*(1680)^-\pi^+, \bar{D}^0 \rightarrow \text{c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-36\pm19\pm10\pm35)</td>
<td>ASNER</td>
<td>04A CLEO</td>
<td>Dalitz fit, 4854 evts</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^-\pi^+\pi^+\pi^-) \text{ in } D^0 \rightarrow K^-\pi^+\pi^+\pi^-, \bar{D}^0 \rightarrow K^+\pi^-\pi^-\pi^+ \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.2\pm0.3\pm0.4)</td>
<td>BONVICINI</td>
<td>14 CLEO</td>
<td>All CLEO-c runs</td>
</tr>
</tbody>
</table>

\[ \pm 0.7\pm0.5\pm0.9 \] | DOBBS | 07 CLEO | See BONVICINI 14 |

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update
\[ A_{CP}(K^0 \pi^0 \pi^\pm \pi^\mp) \text{ in } D^0 \to K^+ \pi^- \pi^\mp \pi^\mp, \overline{D}^0 \to K^- \pi^+ \pi^\mp \pi^\mp \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.8 ± 4.4</td>
<td>1721 ± 75</td>
<td>TIAN</td>
<td>BELL</td>
<td>[ \gamma(45) \text{ e}^+ \text{e}^- \approx \gamma(45) ]</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^+ K^- \pi^\mp \pi^\mp) \text{ in } D^0, \overline{D}^0 \to K^+ K^- \pi^\mp \pi^\mp \]

See also AAIJ 13BR for a search for CP violation in \[ D^0 \to K^+ K^- \pi^\mp \pi^\mp \text{ in binned phase space. No evidence of CP violation was found.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8.2 ± 5.6 ± 4.7</td>
<td>828 ± 46</td>
<td>LINK</td>
<td>FOCS</td>
<td>[ \gamma \text{ A, } \overline{E}_\gamma \approx 180 \text{ GeV} ]</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*_1(1270)^+ K^- \to K^0 \pi^0 \pi^- \pi^-) \text{ in } D^0 \to K^*_1(1270)^+ K^-, \overline{D}^0 \to \text{ c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.7 ± 10.4</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*_1(1270)^- K^+ \to \overline{K}^0 \pi^- K^+) \text{ in } D^0 \to K^*_1(1270)^- K^+, \overline{D}^0 \to \text{ c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10.0 ± 31.5</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*_1(1270)^+ K^- \to \rho^0 K^+ K^-) \text{ in } D^0 \to K^*_1(1270)^+ K^-, \overline{D}^0 \to \text{ c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6.5 ± 16.9</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*_1(1270)^- K^+ \to \rho^0 K^- K^+) \text{ in } D^0 \to K^*_1(1270)^- K^+, \overline{D}^0 \to \text{ c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+9.6 ± 12.9</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*(1410)^+ K^- \to K^0 \pi^+ K^-) \text{ in } D^0 \to K^*(1410)^+ K^-, \overline{D}^0 \to \text{ c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20.0 ± 16.8</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^*(1410)^- K^+ \to \overline{K}^0 \pi^- K^+) \text{ in } D^0 \to K^*(1410)^- K^+, \overline{D}^0 \to \text{ c.c.} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.1 ± 13.7</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(K^0 \overline{K}^0 \text{ S-wave}) \text{ in } D^0, \overline{D}^0 \to K^0 \overline{K}^0 \text{ S-wave} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+9.5 ± 13.5</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(\phi \rho^0 \text{ S-wave}) \text{ in } D^0, \overline{D}^0 \to \phi \rho^0 \text{ S-wave} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.7 ± 5.3</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(\phi \rho^0 \text{ D-wave}) \text{ in } D^0, \overline{D}^0 \to \phi \rho^0 \text{ D-wave} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-37.1 ± 19.0</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>

\[ A_{CP}(\phi (\pi^+ \pi^-) \text{s-wave}) \text{ in } D^0, \overline{D}^0 \to \phi (\pi^+ \pi^-) \text{s-wave} \]

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8.6 ± 10.4</td>
<td>ARTUSO</td>
<td>CLEO</td>
<td>Amplitude fit, 2959 evts.</td>
</tr>
</tbody>
</table>
\[ \Delta A_{CP} = A_{CP}(K^+ K^-) - A_{CP}(\pi^+ \pi^-) \]

\( CP \) violation in these modes can come from the decay amplitudes (direct) and/or from mixing or interference of mixing and decay (indirect). The difference \( \Delta A_{CP} \) is primarily sensitive to the direct component, and only retains a second-order dependence on the indirect component for measurements where the mean decay time of the \( K^+ K^- \) and \( \pi^+ \pi^- \) samples are not identical. The results below are averaged assuming the indirect component can be neglected.

<table>
<thead>
<tr>
<th>VALUE (%)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-0.12 \pm 0.13) OUR ( \overline{\text{AVG}} )</td>
<td>Error includes scale factor of 1.8. See the ideogram below.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-0.10 \pm 0.08 \pm 0.03)</td>
<td>6.5M,2.2M</td>
<td>AAIJ</td>
<td>16D LHCb Time-integrated</td>
</tr>
<tr>
<td>(0.14 \pm 0.16 \pm 0.08)</td>
<td>2.2M,0.8M</td>
<td>AAIJ</td>
<td>14AK LHCb Time-integrated</td>
</tr>
<tr>
<td>(-0.62 \pm 0.21 \pm 0.10)</td>
<td></td>
<td>AALTONEN</td>
<td>12O CDF Time-integrated</td>
</tr>
<tr>
<td>(0.24 \pm 0.62 \pm 0.26)</td>
<td>(1) AUBERT</td>
<td>08M BABR Time-integrated</td>
<td></td>
</tr>
<tr>
<td>(-0.86 \pm 0.60 \pm 0.07)</td>
<td>120k</td>
<td>STARIC</td>
<td>08 BELL Time-integrated</td>
</tr>
<tr>
<td>(0.49 \pm 0.30 \pm 0.14)</td>
<td>0.56M,0.22M</td>
<td>AAIJ</td>
<td>13AD LHCb See AAIJ 14AK</td>
</tr>
<tr>
<td>(-0.82 \pm 0.21 \pm 0.11)</td>
<td>1.4M,0.4M</td>
<td>AAIJ</td>
<td>12G LHCb See AAIJ 16D</td>
</tr>
<tr>
<td>(-0.46 \pm 0.31 \pm 0.12)</td>
<td></td>
<td>AALTONEN</td>
<td>12B CDF See AALTONEN 12O</td>
</tr>
</tbody>
</table>
Calculated from the AUBERT 08 values of $A_{CP}(K^+K^-)$ and $A_{CP}(\pi^+\pi^-)$. The systematic error here combines the systematic errors in quadrature, and therefore somewhat over-estimates it.

\[
\Delta A_{CP} = A_{CP}(K^+K^-) - A_{CP}(\pi^+\pi^-) \, (\%)
\]

**$D^0 \chi^2$ TESTS OF CP-VIOLATION (CPV)**

We list model-independent searches for local CP violation in phase-space distributions of multi-body decays.

Most of these searches divide phase space (Dalitz plot for 3-body decays, five-dimensional equivalent for 4-body decays) into bins, and perform a $\chi^2$ test comparing normalised yields $N_i$, $\overline{N}_i$ in CP-conjugate bin pairs $i$: $\chi^2 = \sum_i (N_i - \alpha \overline{N}_i)/\sigma(N_i - \alpha \overline{N}_i)$. The factor $\alpha = (\Sigma_i N_i)/\Sigma_i \overline{N}_i$ removes the dependence on phase-space-integrated rate asymmetries. The result is used to obtain the probability (p-value) to obtain the measured $\chi^2$ or larger under the assumption of CP conservation [AUBERT 08AO, BEDIAGA 09]. Alternative methods obtain p-values from other test variables based on unbinned analyses [WILLIAMS 11, AAIJ 14C]. Results can be combined using Fisher's method [MOSTELLER 48].

<table>
<thead>
<tr>
<th>Local CPV in $D^0$, $\overline{D}^0 \rightarrow \pi^+\pi^-\pi^0$</th>
<th>p-value (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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<tr>
<td><strong>4.9 OUR EVALUATION</strong></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2.6</td>
<td>566k</td>
<td>1</td>
<td>AAIJ</td>
<td>15A</td>
<td>LHCGB</td>
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<tr>
<td>32.8</td>
<td>82k</td>
<td>AUBERT</td>
<td>08A0 BABR</td>
<td>$\chi^2$</td>
<td></td>
</tr>
</tbody>
</table>

1 Unusually, AAIJ 15A assigns an uncertainty on the p value of ±0.5%. This results from limited test statistics.
Local CPV in $D^0$, $\bar{D}^0 \rightarrow \pi^+\pi^-\pi^+\pi^-$

<table>
<thead>
<tr>
<th>p-value (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>41</td>
<td>330k</td>
<td>AAIJ</td>
<td>13BR LHC</td>
<td>$\chi^2$</td>
</tr>
</tbody>
</table>

Local CPV in $D^0$, $\bar{D}^0 \rightarrow K^0_S\pi^+\pi^-$

<table>
<thead>
<tr>
<th>p-value (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
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<th>COMMENT</th>
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<tbody>
<tr>
<td>96</td>
<td>350k</td>
<td>AALTONEN</td>
<td>12AD CDF</td>
<td>$\chi^2$</td>
</tr>
</tbody>
</table>

Local CPV in $D^0$, $\bar{D}^0 \rightarrow K^+K^-\pi^0$

<table>
<thead>
<tr>
<th>p-value (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.6</td>
<td>11k</td>
<td>AUBERT</td>
<td>08AO BABR</td>
<td>$\chi^2$</td>
</tr>
</tbody>
</table>

Local CPV in $D^0$, $\bar{D}^0 \rightarrow K^+K^-\pi^+\pi^-$

<table>
<thead>
<tr>
<th>p-value (%)</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>57k</td>
<td>AAIJ</td>
<td>13BR LHC</td>
<td>$\chi^2$</td>
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</table>

**CP Violating Asymmetries of P-odd (T-odd) Moments**

The CP-sensitive $P$-odd ($T$-odd) correlation in $D^0$, $\bar{D}^0 \rightarrow K^+K^-\pi^+\pi^-$ decays. $D^0$ and $\bar{D}^0$ are distinguished by the charge of the parent $D^*$: $D^{*+} \rightarrow D^0\pi^+$ and $D^{*-} \rightarrow \bar{D}^0\pi^-$. 

$A_{T\text{viol}}(K^+K^-\pi^+\pi^-)$ in $D^0$, $\bar{D}^0 \rightarrow K^+K^-\pi^+\pi^-$

$C_T \equiv \bar{p}_{K^+} \cdot (\bar{p}_{\pi^+} \times \bar{p}_{\pi^-})$ is a parity-odd correlation of the $K^+$, $\pi^+$, and $\pi^-$ momenta (evaluated in the $D^0$ rest frame) for the $D^0$. $\overline{C}_T \equiv \bar{p}_{K^-} \cdot (\bar{p}_{\pi^-} \times \bar{p}_{\pi^+})$ is the corresponding quantity for the $\bar{D}^0$. Then

$A_T \equiv \frac{\Gamma(C_T > 0) - \Gamma(C_T < 0)}{\Gamma(C_T > 0) + \Gamma(C_T < 0)}$, and

$\overline{A}_T \equiv \frac{\Gamma(\overline{C}_T > 0) - \Gamma(\overline{C}_T < 0)}{\Gamma(\overline{C}_T > 0) + \Gamma(\overline{C}_T < 0)}$, and

$A_{T\text{viol}} \equiv \frac{1}{2}(A_T - \overline{A}_T)$. $C_T$ and $\overline{C}_T$ are commonly referred to as $T$-odd moments, because they are odd under $T$ reversal. However, the $T$-conjugate process $K^+K^-\pi^+\pi^- \rightarrow D^0$ is not accessible, while the $P$-conjugate process is.

**VALUE (units 10^{-3})**

<table>
<thead>
<tr>
<th>1.7± 2.7 OUR AVERAGE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8 ± 2.9 ± 0.4</td>
<td>171k</td>
<td>AAIJ</td>
<td>14BC LHC</td>
<td>$B \rightarrow D^0\mu^-X$</td>
</tr>
<tr>
<td>1.0 ± 5.1 ± 4.4</td>
<td>47k</td>
<td>DEL-AMO-SA..10</td>
<td>BABR</td>
<td>$e^+e^- \approx 10.6$ GeV</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>10 ± 57 ± 37</td>
<td>0.8k</td>
<td>LINK</td>
<td>05E FOCS</td>
<td>$\gamma\nu, E_{\gamma} \approx 180$ GeV</td>
</tr>
</tbody>
</table>

**$D^0$ CPT-violating decay-rate asymmetries**

$A_{CPT}(K^\mp\pi^\pm)$ in $D^0 \rightarrow K^-\pi^+, \bar{D}^0 \rightarrow K^+\pi^-$

$A_{CPT}(t)$ is defined in terms of the time-dependent decay probabilities $P(D^0 \rightarrow K^-\pi^+)$ and $\overline{P}(\bar{D}^0 \rightarrow K^+\pi^-)$ by $A_{CPT}(t) = (\overline{P} - P)/(\overline{P} + P)$. For small mixing parameters $\chi \equiv \Delta m/\Gamma$ and $\gamma \equiv \Delta \Gamma/2\Gamma$ (as is the case), and times $t$, $A_{CPT}(t)$ reduces to $\{ y Re \xi - x Im \xi \} \Gamma t$, where $\xi$ is the CPT-violating parameter.

The following is actually $y Re \xi - x Im \xi$.

<table>
<thead>
<tr>
<th>VALUE (units $10^{-3}$)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0083±0.0065±0.0041</td>
<td>LINK</td>
<td>03B</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

HTTP://PDG.LBL.GOV  Page 94  Created: 5/30/2017 17:22
\[ D^0 \rightarrow K^*(892)^- \ell^+ \nu_\ell \] FORM FACTORS

\[ r_V \equiv V(0)/A_1(0) \text{ in } D^0 \rightarrow K^*(892)^- \ell^+ \nu_\ell \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.71 ± 0.68 ± 0.34</td>
<td>LINK</td>
<td>05B</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ r_2 \equiv A_2(0)/A_1(0) \text{ in } D^0 \rightarrow K^*(892)^- \ell^+ \nu_\ell \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.91 ± 0.37 ± 0.10</td>
<td>LINK</td>
<td>05B</td>
<td>FOCS</td>
</tr>
</tbody>
</table>

\[ D^0 \rightarrow K^-/\pi^- \ell^+ \nu_\ell \] FORM FACTORS

\[ f_+(0) \text{ in } D^0 \rightarrow K^- \ell^+ \nu_\ell \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.736 ± 0.004</td>
<td>OUR AVERAGE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ f_+(0)|V_{cd}| \text{ in } D^0 \rightarrow K^- \ell^+ \nu_\ell \]

1 The 3-parameter fit yields 0.7195 ± 0.0035 ± 0.0041.

\[ r_1 \equiv a_1/a_0 \text{ in } D^0 \rightarrow K^- \ell^+ \nu_\ell \]

\[ r_2 \equiv a_2/a_0 \text{ in } D^0 \rightarrow K^- \ell^+ \nu_\ell \]

\[ f_+(0) \text{ in } D^0 \rightarrow \pi^- \ell^+ \nu_\ell \]

\[ f_+(0)|V_{cd}| \text{ in } D^0 \rightarrow \pi^- \ell^+ \nu_\ell \]

Error includes scale factor of 1.5. See the ideogram below.

1 The 2-parameter fit yields \(-2.23 \pm 0.09 \pm 0.06\).
1 The 3-parameter fit yields $0.1420 \pm 0.0024 \pm 0.0010$.

2 LEES 15F reports a value $0.1374 \pm 0.0038 \pm 0.0022 \pm 0.0009$, where the last uncertainty is due to the uncertainties of the $D^0 \to K^-\pi^+$ branching fraction.

**WEIGHTED AVERAGE**

$0.1436\pm0.0026$ (Error scaled by 1.5)

$\chi^2 = 4.6$ (Confidence Level = 0.099)

$$f_+(0)\left|V_{cd}\right|$$ in $D^0 \to \pi^-\ell^+\nu_\ell$

\[ r_1 \equiv \frac{a_1}{a_0} \text{ in } D^0 \to \pi^-\ell^+\nu_\ell \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-1.97\pm0.28$ OUR AVERAGE</td>
<td></td>
<td></td>
<td></td>
<td>Error includes scale factor of 1.4. See the ideogram below.</td>
</tr>
<tr>
<td>$-1.84\pm0.22\pm0.07$</td>
<td>6.3k</td>
<td>ABLIKIM 15X BES3</td>
<td></td>
<td>$\ell=e$, 3-parameter fit</td>
</tr>
<tr>
<td>$-1.31\pm0.70\pm0.43$</td>
<td>5.3k</td>
<td>LEES 15F BABR</td>
<td></td>
<td>$\ell=e$, 3-parameter fit</td>
</tr>
<tr>
<td>$-2.80\pm0.49\pm0.04$</td>
<td></td>
<td>BESSON 09 CLEO</td>
<td></td>
<td>$\ell=e$, 3-parameter fit</td>
</tr>
</tbody>
</table>

1 The 2-parameter fit yields $-2.04 \pm 0.08 \pm 0.03$. 
WEIGHTED AVERAGE
-1.97±0.28 (Error scaled by 1.4)

\( r_1 \equiv a_1 / a_0 \) in \( D^0 \to \pi^- \ell^+ \nu_\ell \)

\( r_2 \equiv a_1 / a_0 \) in \( D^0 \to \pi^- \ell^+ \nu_\ell \)

\( \chi^2 \)

<table>
<thead>
<tr>
<th>VALUE</th>
<th>EVTS</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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</thead>
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<tr>
<td>-0.2±2.2</td>
<td>6.3k</td>
<td>ABLIKIM 15X BES3</td>
<td>0.3</td>
<td>Error includes scale factor of 1.7. See the ideogram below.</td>
</tr>
<tr>
<td>-1.4±1.5</td>
<td>6.3k</td>
<td>ABLIKIM 15X BES3</td>
<td>0.3</td>
<td>( \ell = e ), 3-parameter fit</td>
</tr>
<tr>
<td>-4.2±4.0</td>
<td>5.3k</td>
<td>LEES 15F BABR</td>
<td>0.6</td>
<td>( \ell = e ), 3-parameter fit</td>
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<tr>
<td>6±3</td>
<td>5.3k</td>
<td>BES3</td>
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<tr>
<td>6±3</td>
<td>5.3k</td>
<td>BES3</td>
<td>0.6</td>
<td></td>
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WEIGHTED AVERAGE
-0.2±2.2 (Error scaled by 1.7)
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