

$a_1(1260)$

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

THE $a_1(1260)$

Updated March 2002 by S. Eidelman (Novosibirsk).

The main experimental data on the $a_1(1260)$ may be grouped into two classes:

(1) Hadronic Production: This comprises diffractive production with incident π^- (DAUM 80, 81B) and charge-exchange production with low-energy π^- (DANKOWYCH 81, ANDO 92). The 1980's experiments explain the $I^G L J^P = 1^+ S 0^+$ data using a phenomenological amplitude consisting of a rescattered Deck amplitude, plus a direct resonance-production term. They agree on an $a_1(1260)$ mass of about 1270 MeV and a width of 300–380 MeV. ANDO 92 finds rather lower values for the mass (1121 MeV) and width (239 MeV) in a partial-wave analysis based on the isobar model of the $\pi^+\pi^-\pi^0$ system. However, in this analysis, only Breit-Wigner terms were considered. Recently BARBERIS 98B studied central production of the $\pi^+\pi^-\pi^0$ system and observed the $a_1(1260)$ meson with a mass of 1240 MeV and a width of about 400 MeV.

(2) τ Decay: Various experiments reported good data on $\tau \rightarrow a_1(1260)\nu_\tau \rightarrow \rho\pi\nu_\tau$ (RUCKSTUHL 86, SCHMIDKE 86, ALBRECHT 86B, BAND 87, ACKERSTAFF 97R, ABREU 98G, and ASNER 00). They are somewhat inconsistent concerning the $a_1(1260)$ mass, which can, however, be attributed to model-dependent systematic uncertainties (BOWLER 86, ALBRECHT 93C, ACKERSTAFF 97R). They all find a width greater than 400 MeV.

The discrepancies between the hadronic- and τ -decay results have stimulated several reanalyses. BASDEVANT 77,78 used the early diffractive dissociation and τ -decay data, and showed that they could be well reproduced with an a_1 resonance mass of

1180 ± 50 MeV and width of 400 ± 50 MeV. Later, BOWLER 86, TORNQVIST 87, ISGUR 89, and IVANOV 91 studied the process $\tau \rightarrow 3\pi\nu_\tau$. Despite quite different approaches, they all found a good overall description of the τ -decay data with an $a_1(1260)$ mass near 1230 MeV, consistent with the hadronic data. However, their widths remain significantly larger (400–600 MeV) than those extracted from diffractive-hadronic data. This is also the case with the later OPAL experiment (ACKERSTAFF 97R). In the high statistics analysis of ACKERSTAFF 97R, the models of ISGUR 89 and KUHN 90 are used to fit distributions of the 3π invariant mass, as well as the 2π invariant mass projections of the Dalitz plot, and neither model is found to provide a completely satisfactory description of the data. Another recent high statistics analysis of ABREU 98G obtains a good description of the $\tau \rightarrow 3\pi$ data, using the model of FEINDT 90 which includes the a'_1 meson, a radial excitation of the $a_1(1260)$ meson, with a mass of 1700 MeV and a width of 300 MeV. A similar signal has been observed by AMELIN 95B in the D and S waves of the $\rho\pi$ state, as well as by GOUZ 92 in the $f_1(1285)\pi$ state. The existence of such a resonance is also suggested by the very big data sample of ASNER 00, which shows an excess of events at high 3π mass. Their data are better described by the a'_1 contribution, though at a level below that reported by ABREU 98G. Since the statistical significance of the a'_1 contribution is 2–3 standard deviations only, they conclude that more data is needed to establish the a'_1 existence.

ASNER 00 has also performed the analysis of the substructures in the Dalitz plot and found significant contributions of the a_1 decay to $f_0(600)\pi$, $f_0(1370)\pi$, and $f_2(1270)\pi$. The contribution of the $a_1 \rightarrow f_0(600)\pi$ at a similar level has independently been observed in $e^+e^- \rightarrow 4\pi$ annihilation

(AKHMETSHIN 99E), where the $2\pi^+2\pi^-$ final state was shown to be dominated by the $a_1(1260)\pi$ mechanism. Note that existence of the isoscalar contributions to the two-pion state, in addition to the isovector one ($\rho\pi$), will influence the ratio $B(a_1^- \rightarrow \pi^- \pi^+ \pi^-)/B(a_1^- \rightarrow \pi^- \pi^0 \pi^0)$, which should be equal to 1 for the pure $\rho\pi$ state.

BOWLER 88 showed that good fits to both the hadronic and the τ -decay data could be obtained with a width of about 400 MeV. However, applying the same type of analysis to the ANDO 92 data, the low mass and narrow width they obtained with the Breit-Wigner PWA do not change appreciably.

CONDO 93 found no evidence for charge-exchange photoproduction of the $a_1(1260)$ (but found a clear signal of $a_2(1320)$ photoproduction). Similarly, MOLCHANOV 01 found no evidence for Coulomb production of $a_1(1260)$ studying coherent production of three pions (but observed a prominent signal of $a_2(1320)$). They show that it is consistent with either an extremely large $a_1(1260)$ hadronic width, or with a small radiative width to $\pi\gamma$, which could be accommodated if the a_1 mass is somewhat below 1260 MeV.

References

References may be found at the end of the $a_1(1260)$ Listing.

$a_1(1260)$ MASS

| <u>VALUE (MeV)</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |
|---|-------------|----------------------|-------------|------------|---|
| 1230±40 OUR ESTIMATE | | | | | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| 1331±10± 3 | 37k | ¹ ASNER | 00 | CLE2 | 10.6 $e^+ e^- \rightarrow \tau^+ \tau^-, \tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
| 1255± 7± 6 | 5904 | ² ABREU | 98G | DLPH | $e^+ e^-$ |
| 1207± 5± 8 | 5904 | ³ ABREU | 98G | DLPH | $e^+ e^-$ |
| 1196± 4± 5 | 5904 | ^{4,5} ABREU | 98G | DLPH | $e^+ e^-$ |
| 1240±10 | | BARBERIS | 98B | | 450 $p p \rightarrow p_f \pi^+ \pi^- \pi^0 p_s$ |

| | | | | | |
|---------------------------------------|-----------------|------------|-----|--------|--|
| 1262 ± 9 ± 7 | 2, ⁶ | ACKERSTAFF | 97R | OPAL | $E_{\text{cm}}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$ |
| 1210 ± 7 ± 2 | 3, ⁶ | ACKERSTAFF | 97R | OPAL | $E_{\text{cm}}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$ |
| 1211 ± 7 ⁺⁵⁰ ₋₀ | 3 | ALBRECHT | 93C | ARG | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1121 ± 8 | 7 | ANDO | 92 | SPEC | 8 $\pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$ |
| 1242 ± 37 | 8 | IVANOV | 91 | RVUE | $\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1260 ± 14 | 9 | IVANOV | 91 | RVUE | $\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1250 ± 9 | 10 | IVANOV | 91 | RVUE | $\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1208 ± 15 | | ARMSTRONG | 90 | OMEG 0 | 300.0 $pp \rightarrow pp\pi^+ \pi^- \pi^0$ |
| 1220 ± 15 | 11 | ISGUR | 89 | RVUE | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1260 ± 25 | 12 | BOWLER | 88 | RVUE | |
| 1166 ± 18 ± 11 | | BAND | 87 | MAC | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1164 ± 41 ± 23 | | BAND | 87 | MAC | $\tau^+ \rightarrow \pi^+ \pi^0 \pi^0 \nu$ |
| 1250 ± 40 | 11 | TORNQVIST | 87 | RVUE | |
| 1046 ± 11 | | ALBRECHT | 86B | ARG | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1056 ± 20 ± 15 | | RUCKSTUHL | 86 | DLCO | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1194 ± 14 ± 10 | | SCHMIDKE | 86 | MRK2 | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |
| 1255 ± 23 | | BELLINI | 85 | SPEC | 40 $\pi^- A \rightarrow \pi^- \pi^+ \pi^- A$ |
| 1240 ± 80 | 13 | DANKOWY... | 81 | SPEC 0 | 8.45 $\pi^- p \rightarrow n3\pi$ |
| 1280 ± 30 | 13 | DAUM | 81B | CNTR | 63,94 $\pi^- p \rightarrow p3\pi$ |
| 1041 ± 13 | 14 | GAVILLET | 77 | HBC + | 4.2 $K^- p \rightarrow \Sigma 3\pi$ |

¹ From a fit to the 3π mass spectrum including the $K\bar{K}^*(892)$ threshold.

² Uses the model of KUHN 90.

³ Uses the model of ISGUR 89.

⁴ Includes the effect of a possible a_1' state.

⁵ Uses the model of FEINDT 90.

⁶ Supersedes AKERS 95P.

⁷ Average and spread of values using 2 variants of the model of BOWLER 75.

⁸ Reanalysis of RUCKSTUHL 86.

⁹ Reanalysis of SCHMIDKE 86.

¹⁰ Reanalysis of ALBRECHT 86B.

¹¹ From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.

¹² From a combined reanalysis of ALBRECHT 86B and DAUM 81B.

¹³ Uses the model of BOWLER 75.

¹⁴ Produced in K^- backward scattering.

$a_1(1260)$ WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | CHG | COMMENT |
|---|------|------------------------------|------|--------|--|
| 250 to 600 OUR ESTIMATE | | | | | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| 814 ± 36 ± 13 | 37k | ¹⁵ ASNER | 00 | CLE2 | 10.6 $e^+e^- \rightarrow \tau^+\tau^-, \tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$ |
| 450 ± 50 | 22k | ¹⁶ AKHMETSHIN 99E | CMD2 | | 1.05–1.38 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$ |
| 570 ± 10 | | ¹⁷ BONDAR | 99 | RVUE | $e^+e^- \rightarrow 4\pi, \tau \rightarrow 3\pi\nu_\tau$ |
| 587 ± 27 ± 21 | 5904 | ¹⁸ ABREU | 98G | DLPH | e^+e^- |
| 478 ± 3 ± 15 | 5904 | ¹⁹ ABREU | 98G | DLPH | e^+e^- |
| 425 ± 14 ± 8 | 5904 | ^{20,21} ABREU | 98G | DLPH | e^+e^- |
| 400 ± 35 | | BARBERIS | 98B | | 450 $pp \rightarrow p_f \pi^+\pi^-\pi^0 p_s$ |
| 621 ± 32 ± 58 | | ^{18,22} ACKERSTAFF | 97R | OPAL | $E_{cm}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$ |
| 457 ± 15 ± 17 | | ^{19,22} ACKERSTAFF | 97R | OPAL | $E_{cm}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$ |
| 446 ± 21 ⁺¹⁴⁰ / ₀ | | ¹⁹ ALBRECHT | 93C | ARG | $\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 239 ± 11 | | ANDO | 92 | SPEC | 8 $\pi^-p \rightarrow \pi^+\pi^-\pi^0 n$ |
| 266 ± 13 ± 4 | | ²³ ANDO | 92 | SPEC | 8 $\pi^-p \rightarrow \pi^+\pi^-\pi^0 n$ |
| 465 ⁺²²⁸ / ₋₁₄₃ | | ²⁴ IVANOV | 91 | RVUE | $\tau \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 298 ⁺⁴⁰ / ₋₃₄ | | ²⁵ IVANOV | 91 | RVUE | $\tau \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 488 ± 32 | | ²⁶ IVANOV | 91 | RVUE | $\tau \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 430 ± 50 | | ARMSTRONG | 90 | OMEG 0 | 300.0 $pp \rightarrow pp\pi^+\pi^-\pi^0$ |
| 420 ± 40 | | ²⁷ ISGUR | 89 | RVUE | $\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 396 ± 43 | | ²⁸ BOWLER | 88 | RVUE | |
| 405 ± 75 ± 25 | | BAND | 87 | MAC | $\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 419 ± 108 ± 57 | | BAND | 87 | MAC | $\tau^+ \rightarrow \pi^+\pi^0\pi^0\nu$ |
| 521 ± 27 | | ALBRECHT | 86B | ARG | $\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 476 ⁺¹³² / ₋₁₂₀ ± 54 | | RUCKSTUHL | 86 | DLCO | $\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 462 ± 56 ± 30 | | SCHMIDKE | 86 | MRK2 | $\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$ |
| 292 ± 40 | | BELLINI | 85 | SPEC | 40 $\pi^-A \rightarrow \pi^-\pi^+\pi^-A$ |
| 380 ± 100 | | ²⁹ DANKOWY... | 81 | SPEC 0 | 8.45 $\pi^-p \rightarrow n3\pi$ |
| 300 ± 50 | | ²⁹ DAUM | 81B | CNTR | 63,94 $\pi^-p \rightarrow p3\pi$ |
| 230 ± 50 | | ³⁰ GAVILLET | 77 | HBC + | 4.2 $K^-p \rightarrow \Sigma 3\pi$ |

¹⁵ From a fit to the 3π mass spectrum including the $K\bar{K}^*(892)$ threshold.

¹⁶ Using the $a_1(1260)$ mass of 1230 MeV.

¹⁷ From AKHMETSHIN 99E and ASNER 00 data using the $a_1(1260)$ mass of 1230 MeV.

¹⁸ Uses the model of KUHN 90.

¹⁹ Uses the model of ISGUR 89.

²⁰ Includes the effect of a possible a_1' state.

- 21 Uses the model of FEINDT 90.
 22 Supersedes AKERS 95P.
 23 Average and spread of values using 2 variants of the model of BOWLER 75.
 24 Reanalysis of RUCKSTUHL 86.
 25 Reanalysis of SCHMIDKE 86.
 26 Reanalysis of ALBRECHT 86B.
 27 From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
 28 From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
 29 Uses the model of BOWLER 75.
 30 Produced in K^- backward scattering.

$a_1(1260)$ DECAY MODES

| | Mode | Fraction (Γ_i/Γ) |
|---------------|-----------------------------------|--------------------------------|
| Γ_1 | $\pi^+ \pi^- \pi^0$ | |
| Γ_2 | $\pi^0 \pi^0 \pi^0$ | |
| Γ_3 | $(\rho\pi)_{S\text{-wave}}$ | seen |
| Γ_4 | $(\rho\pi)_{D\text{-wave}}$ | seen |
| Γ_5 | $(\rho(1450)\pi)_{S\text{-wave}}$ | seen |
| Γ_6 | $(\rho(1450)\pi)_{D\text{-wave}}$ | seen |
| Γ_7 | $\sigma\pi$ | seen |
| Γ_8 | $f_0(980)\pi$ | not seen |
| Γ_9 | $f_0(1370)\pi$ | seen |
| Γ_{10} | $f_2(1270)\pi$ | seen |
| Γ_{11} | $K \bar{K}^*(892) + \text{c.c.}$ | seen |
| Γ_{12} | $\pi\gamma$ | seen |

$a_1(1260)$ PARTIAL WIDTHS

| $\Gamma(\pi\gamma)$ | | | | Γ_{12} |
|---------------------------------|-------------|----------|----------------------------------|---------------|
| VALUE (keV) | DOCUMENT ID | TECN | COMMENT | |
| 640 ± 246 | ZIELINSKI | 84C SPEC | 200 $\pi^+ Z \rightarrow Z 3\pi$ | |

D-wave/S-wave AMPLITUDE RATIO IN DECAY OF $a_1(1260) \rightarrow \rho\pi$

| VALUE | DOCUMENT ID | TECN | COMMENT |
|--|---------------------------------|------|---|
| -0.107 ± 0.016 OUR AVERAGE | | | |
| $-0.10 \pm 0.02 \pm 0.02$ | ^{31,32} ACKERSTAFF 97R | OPAL | $E_{\text{cm}}^{ee} = 88\text{--}94$, $\tau \rightarrow$ |
| -0.11 ± 0.02 | ³¹ ALBRECHT 93C | ARG | $\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$ |

³¹ Uses the model of ISGUR 89.

³² Supersedes AKERS 95P.

$a_1(1260)$ BRANCHING RATIOS

$\Gamma((\rho\pi)_{S\text{-wave}})/\Gamma_{\text{total}}$ Γ_3/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|-------|-----|---------------------|---------|---|
| 60.19 | 37k | ³⁴ ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|-------|-----|---------------------|---------|---|

$\Gamma((\rho\pi)_{D\text{-wave}})/\Gamma_{\text{total}}$ Γ_4/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|--------------------------|-----|---------------------|---------|---|
| $1.30 \pm 0.60 \pm 0.22$ | 37k | ³⁴ ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|--------------------------|-----|---------------------|---------|---|

$\Gamma((\rho(1450)\pi)_{S\text{-wave}})/\Gamma_{\text{total}}$ Γ_5/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|--------------------------|-----|------------------------|---------|---|
| $0.56 \pm 0.84 \pm 0.32$ | 37k | ^{34,35} ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|--------------------------|-----|------------------------|---------|---|

$\Gamma((\rho(1450)\pi)_{D\text{-wave}})/\Gamma_{\text{total}}$ Γ_6/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|--------------------------|-----|------------------------|---------|---|
| $2.04 \pm 1.20 \pm 0.28$ | 37k | ^{34,35} ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|--------------------------|-----|------------------------|---------|---|

$\Gamma(\sigma\pi)/\Gamma_{\text{total}}$ Γ_7/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|---------------------------|-----|------------------------|---------|---|
| $18.76 \pm 4.29 \pm 1.48$ | 37k | ^{34,36} ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|---------------------------|-----|------------------------|---------|---|

$\Gamma(f_0(980)\pi)/\Gamma_{\text{total}}$ Γ_8/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|----------|-----|-------|---------|---|
| not seen | 37k | ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|----------|-----|-------|---------|---|

$\Gamma(f_0(1370)\pi)/\Gamma_{\text{total}}$ Γ_9/Γ

| <u>VALUE (units 10^{-2})</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|---|-------------|--------------------|-------------|----------------|
|---|-------------|--------------------|-------------|----------------|

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

| | | | | |
|--------------------------|-----|------------------------|---------|---|
| $7.40 \pm 2.71 \pm 1.26$ | 37k | ^{34,37} ASNER | 00 CLE2 | $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ |
|--------------------------|-----|------------------------|---------|---|

$\Gamma(f_2(1270)\pi)/\Gamma_{\text{total}}$ Γ_{10}/Γ

| VALUE (units 10^{-2}) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------|-------------|------|---------|
|--------------------------|------|-------------|------|---------|

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

| | | | | |
|----------------|-----|------------------------|---------|--|
| 1.19±0.49±0.17 | 37k | ^{34,38} ASNER | 00 CLE2 | 10.6 $e^+e^- \rightarrow \tau^+\tau^-$, $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$ |
|----------------|-----|------------------------|---------|--|

$\Gamma(K\bar{K}^*(892)+c.c.)/\Gamma_{\text{total}}$ Γ_{11}/Γ

| VALUE (units 10^{-2}) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--------------------------|------|-------------|------|---------|
|--------------------------|------|-------------|------|---------|

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

| | | | | |
|-------------|-----|---------------------|---------|--|
| 3.3±0.5±0.1 | 37k | ³⁹ ASNER | 00 CLE2 | 10.6 $e^+e^- \rightarrow \tau^+\tau^-$, $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$ |
|-------------|-----|---------------------|---------|--|

$\Gamma(\sigma\pi)/\Gamma((\rho\pi)_{S\text{-wave}})$ Γ_7/Γ_3

| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
|-------|------|-------------|------|---------|
|-------|------|-------------|------|---------|

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

| | | | | |
|-------|-----|----------------|------|---|
| ~ 0.3 | 28k | AKHMETSHIN 99E | CMD2 | 1.05–1.38 $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$ |
|-------|-----|----------------|------|---|

| | | | | |
|-------------|--|------------------------|---------|--|
| 0.003±0.003 | | ³³ LONGACRE | 82 RVUE | |
|-------------|--|------------------------|---------|--|

³³ Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from GAVILLET 77, DAUM 80, and DANKOWYCH 81.

$\Gamma(\pi^0\pi^0\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_2/Γ_1

| VALUE | CL% | DOCUMENT ID | COMMENT |
|-------|-----|-------------|---------|
|-------|-----|-------------|---------|

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

| | | | |
|--------|----|------------------------|--|
| <0.008 | 90 | ⁴⁰ BARBERIS | 01 450 $p\bar{p} \rightarrow p_f 3\pi^0 p_s$ |
|--------|----|------------------------|--|

³⁴ From a fit to the Dalitz plot.

³⁵ Assuming for $\rho(1450)$ mass and width of 1370 and 386 MeV respectively.

³⁶ Assuming for σ mass and width of 860 and 880 MeV respectively.

³⁷ Assuming for $f_0(1370)$ mass and width of 1186 and 350 MeV respectively.

³⁸ Assuming for $f_2(1270)$ mass and width of 1275 and 185 MeV respectively.

³⁹ From a fit to the 3π mass spectrum including the $K\bar{K}^*(892)$ threshold.

⁴⁰ Inconsistent with observations of $\sigma\pi$, $f_0(1370)\pi$, and $f_2(1270)\pi$ decay modes.

$a_1(1260)$ REFERENCES

| | | | | |
|------------|-----|---------------|--|-----------------------------|
| BARBERIS | 01 | PL B507 14 | D. Barberis <i>et al.</i> | |
| ASNER | 00 | PR D61 012002 | D.M. Asner <i>et al.</i> | (CLEO Collab.) |
| AKHMETSHIN | 99E | PL B466 392 | R.R. Akhmetshin <i>et al.</i> | (Novosibirsk CMD-2 Collab.) |
| BONDAR | 99 | PL B466 403 | A.E. Bondar <i>et al.</i> | (Novosibirsk CMD-2 Collab.) |
| ABREU | 98G | PL B426 411 | P. Abreu <i>et al.</i> | (DELPHI Collab.) |
| BARBERIS | 98B | PL B422 399 | D. Barberis <i>et al.</i> | (WA 102 Collab.) |
| ACKERSTAFF | 97R | ZPHY C75 593 | K. Ackerstaff <i>et al.</i> | (OPAL Collab.) |
| AKERS | 95P | ZPHY C67 45 | R. Akers <i>et al.</i> | (OPAL Collab.) |
| ALBRECHT | 93C | ZPHY C58 61 | H. Albrecht <i>et al.</i> | (ARGUS Collab.) |
| ANDO | 92 | PL B291 496 | A. Ando <i>et al.</i> | (KEK, KYOT, NIRS, SAGA+) |
| IVANOV | 91 | ZPHY C49 563 | Y.P. Ivanov, A.A. Osipov, M.K. Volkov | (JINR) |
| ARMSTRONG | 90 | ZPHY C48 213 | T.A. Armstrong, M. Benayoun, W. Beusch | |
| FEINDT | 90 | ZPHY C48 681 | M. Feindt | (HAMB) |
| KUHN | 90 | ZPHY C48 445 | J.H. Kuhn <i>et al.</i> | (MPIM) |
| ISGUR | 89 | PR D39 1357 | N. Isgur, C. Morningstar, C. Reader | (TNTO) |

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|------------|-----|---------------------------------------|------------------------------|------------------------------|
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