

$a_0(980)$

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

See the related review(s):
 Scalar Mesons below 1 GeV

 $a_0(980)$ T-MATRIX POLE \sqrt{s}

| VALUE (MeV) | DOCUMENT ID | TECN | COMMENT |
|---|---------------------|------|---|
| (960–1030) – i (20–70) OUR ESTIMATE (see Fig. 64.2 in the review) | | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $(989 \pm 5) - i(40 \pm 5)$ | ¹ BUGG | 08A | RVUE $\bar{p}p$ annihilation data |
| $(1117^{+24}_{-320}) - i(12^{+43}_{-12})$ | ² PELAEZ | 04A | RVUE $\pi\pi \rightarrow \pi\pi, \pi K \rightarrow \pi K$ |
| $(982 \pm 3) - i(46 \pm 4)$ | ³ ABELE | 98 | CBAR $0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |
| ¹ T-matrix pole on sheet II. Parameterizes couplings to $\bar{K}K$, $\pi\eta$, and $\pi\eta'$. Uses AM-SLER 94D and ABELE 98. | | | |
| ² Reanalysis of data from LINGLIN 73, ESTABROOKS 78, and ASTON 88 in the unitarized ChPT model. | | | |
| ³ T-matrix pole on sheet II; the pole on sheet III is at $(1006 - i 49)$ MeV. | | | |

 $a_0(980)$ MASS

| VALUE (MeV) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------|------|--|
| 980 \pm 20 OUR ESTIMATE Mass determination very model dependent | | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| $1000.7^{+12.9}_{-0.7}$ | ¹ LU | 20 | RVUE $\gamma\gamma \rightarrow \pi^0\eta, K_S^0 K_S^0$ |
| ¹ T-matrix pole on sheet II. | | | |

 $\eta\pi$ FINAL STATE ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | CHG | COMMENT |
|---|-------|------------------------|------|------|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $1004.1 \pm 1.5 \pm 6.5$ | | ¹ ALBRECHT | 20 | CBAR | $0.9 \bar{p}p \rightarrow \pi^0\pi^0\eta, \pi^0\eta\eta, \pi^0 K^+ K^-$ |
| $982.5 \pm 1.6 \pm 1.1$ | 16.9k | ² AMBROSINO | 09F | KLOE | $1.02 e^+e^- \rightarrow \eta\pi^0\gamma$ |
| 986 ± 4 | | ANISOVICH | 09 | RVUE | $0.0 \bar{p}p, \pi N$ |
| $982.3^{+0.6}_{-0.7} \pm 3.1_{-4.7}$ | | ³ UEHARA | 09A | BELL | $\gamma\gamma \rightarrow \pi^0\eta$ |
| $985 \pm 4 \pm 6$ | 318 | ACHARD | 02B | L3 | $183\text{--}209 e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$ |
| 995^{+52}_{-10} | 36 | ⁴ ACHASOV | 00F | SND | $e^+e^- \rightarrow \eta\pi^0\gamma$ |
| 994^{+33}_{-8} | 36 | ⁵ ACHASOV | 00F | SND | $e^+e^- \rightarrow \eta\pi^0\gamma$ |
| 975 ± 7 | | BARBERIS | 00H | | $450 pp \rightarrow p_f \eta \pi^0 p_s$ |
| 988 ± 8 | | BARBERIS | 00H | | $450 pp \rightarrow \Delta_f^{++} \eta \pi^- p_s$ |
| ~ 1055 | | ⁶ OLLER | 99 | RVUE | $\eta\pi, K\bar{K}$ |
| ~ 1009.2 | | ⁶ OLLER | 99B | RVUE | $\pi\pi \rightarrow \pi\pi, K\bar{K}$ |

| | | | | | |
|----------------------|------|---------------------------|-----|--------|--|
| 993.1 ± 2.1 | | ⁷ TEIGE | 99 | B852 | 18.3 $\pi^- p \rightarrow \eta\pi^+\pi^- n$ |
| 988 ± 6 | | ⁶ ANISOVICH | 98B | RVUE | Compilation |
| 987 | | TORNQVIST | 96 | RVUE | $\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$ |
| 991 | | JANSSEN | 95 | RVUE | $\eta\pi \rightarrow \eta\pi, K\bar{K}, K\pi, \eta\pi$ |
| 984.45 ± 1.23 ± 0.34 | | AMSLER | 94C | CBAR | 0.0 $\bar{p}p \rightarrow \omega\eta\pi^0$ |
| 982 ± 2 | | ⁸ AMSLER | 92 | CBAR | 0.0 $\bar{p}p \rightarrow \eta\eta\pi^0$ |
| 984 ± 4 | 1040 | ⁸ ARMSTRONG | 91B | OMEG ± | 300 $pp \rightarrow pp\eta\pi^+\pi^-$ |
| 976 ± 6 | | ATKINSON | 84E | OMEG ± | 25–55 $\gamma p \rightarrow \eta\pi n$ |
| 986 ± 3 | 500 | ⁹ EVANGELIS... | 81 | OMEG ± | 12 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$ |
| 990 ± 7 | 145 | ⁹ GURTU | 79 | HBC ± | 4.2 $K^- p \rightarrow \Lambda\eta 2\pi$ |
| 980 ± 11 | 47 | CONFORTO | 78 | OSPK – | 4.5 $\pi^- p \rightarrow pX^-$ |
| 978 ± 16 | 50 | CORDEN | 78 | OMEG ± | 12–15 $\pi^- p \rightarrow n\eta 2\pi$ |
| 977 ± 7 | | GRASSLER | 77 | HBC – | 16 $\pi^\mp p \rightarrow p\eta 3\pi$ |
| 989 ± 4 | 70 | WELLS | 75 | HBC – | 3.1–6 $K^- p \rightarrow \Lambda\eta 2\pi$ |
| 972 ± 10 | 150 | DEFOIX | 72 | HBC ± | 0.7 $\bar{p}p \rightarrow 7\pi$ |
| 970 ± 15 | 20 | BARNES | 69C | HBC – | 4–5 $K^- p \rightarrow \Lambda\eta 2\pi$ |
| 980 ± 10 | | CAMPBELL | 69 | DBC ± | 2.7 $\pi^+ d$ |
| 980 ± 10 | 15 | MILLER | 69B | HBC – | 4.5 $K^- N \rightarrow \eta\pi\Lambda$ |
| 980 ± 10 | 30 | AMMAR | 68 | HBC ± | 5.5 $K^- p \rightarrow \Lambda\eta 2\pi$ |

¹ T-matrix pole with 2 poles, 2 channels, pole mass on adjacent sheet $1002.4 \pm 1.4 \pm 6.6$ MeV.

² Using the model of ACHASOV 89 and ACHASOV 03B.

³ From a fit with the S-wave amplitude including two interfering Breit-Wigners plus a background term.

⁴ Using the model of ACHASOV 89. Supersedes ACHASOV 98B.

⁵ Using the model of JAFFE 77. Supersedes ACHASOV 98B.

⁶ T-matrix pole.

⁷ Breit-Wigner fit, average between a_0^\pm and a_0^0 . The fit favors a slightly heavier a_0^\pm .

⁸ From a single Breit-Wigner fit.

⁹ From $f_1(1285)$ decay.

$K\bar{K}$ ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--|------|--------------------------|----------|---|
| • • • | | | | We do not use the following data for averages, fits, limits, etc. • • • |
| 947.7 ⁺ _{–5.0} ± 6.6 | | ¹ AAIJ | 19H LHCB | $pp \rightarrow D^\pm X$ |
| 925 ± 5 ± 8 | 190k | ² AAIJ | 16N LHCB | $D^0 \rightarrow K_S^0 K^\pm \pi^\mp$ |
| ~ 1053 | | ³ OLLER | 99C RVUE | $\pi\pi \rightarrow \pi\pi, K\bar{K}$ |
| 975 ± 15 | | BERTIN | 98B OBLX | 0.0 $\bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp$ |
| 970 ± 10 | 316 | DEBILLY | 80 HBC | 1.2–2 $\bar{p}p \rightarrow f_1(1285)\omega$ |
| 1016 ± 10 | 100 | ⁴ ASTIER | 67 HBC | 0.0 $\bar{p}p$ |
| 1003.3 ± 7.0 | 143 | ^{5,6} ROSENFELD | 65 RVUE | |

¹ From the $D^\pm \rightarrow K^\pm K^+ K^-$ Dalitz plot fit with the Triple-M amplitude in the multi-meson model of AOUDE 18.

² Using a two-channel resonance parametrization with couplings fixed to ABELE 98.

³ T-matrix pole.

⁴ ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.

⁵ Note on J^P . Main argument for 0^+ is small Q value. Isotropy of decay distribution in $\bar{p}p$ at rest proves nothing. See discussion by Rosenfeld (Oxford) and Butterworth (Heidelberg).

⁶ Plus systematic errors.

$a_0(980)$ WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | CHG | COMMENT |
|---|------|--|------|------------|--|
| 50 to 100 OUR ESTIMATE | | Width determination very model dependent. Peak width in $\eta\pi$ is about 60 MeV, but decay width can be much larger. | | | |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| $97.2 \pm 1.9 \pm 5.7$ | | ¹ ALBRECHT | 20 | CBAR | $0.9 \bar{p}p \rightarrow \pi^0 \pi^0 \eta,$ $\pi^0 \eta \eta, \pi^0 K^+ K^-$ |
| $73.2 \begin{smallmatrix} +25.4 \\ -5.2 \end{smallmatrix}$ | | ² LU | 20 | RVUE | $\gamma\gamma \rightarrow \pi^0 \eta, K_S^0 K_S^0$ |
| $75.6 \pm 1.6 \begin{smallmatrix} +17.4 \\ -10.0 \end{smallmatrix}$ | | ³ UEHARA | 09A | BELL | $\gamma\gamma \rightarrow \pi^0 \eta$ |
| $50 \pm 13 \pm 4$ | 318 | ACHARD | 02B | L3 | $183\text{--}209 e^+ e^- \rightarrow$ $e^+ e^- \eta \pi^+ \pi^-$ |
| 72 ± 16 | | BARBERIS | 00H | | $450 pp \rightarrow p_f \eta \pi^0 p_s$ |
| 61 ± 19 | | BARBERIS | 00H | | $450 pp \rightarrow$ $\Delta_f^{++} \eta \pi^- p_s$ |
| ~ 42 | | ⁴ OLLER | 99 | RVUE | $\eta\pi, K\bar{K}$ |
| ~ 112 | | ⁴ OLLER | 99B | RVUE | $\pi\pi \rightarrow \eta\pi, K\bar{K}$ |
| 71 ± 7 | | TEIGE | 99 | B852 | $18.3 \pi^- p \rightarrow$ $\eta \pi^+ \pi^- n$ |
| 92 ± 20 | | ⁴ ANISOVICH | 98B | RVUE | Compilation |
| 65 ± 10 | | ⁵ BERTIN | 98B | OBLX \pm | $0.0 \bar{p}p \rightarrow K^\pm K_S \pi^\mp$ |
| ~ 100 | | TORNQVIST | 96 | RVUE | $\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi,$ $\eta\pi$ |
| 202 | | JANSSEN | 95 | RVUE | $\eta\pi \rightarrow \eta\pi, K\bar{K}, K\pi,$ $\eta\pi$ |
| $54.12 \pm 0.34 \pm 0.12$ | | AMSLER | 94C | CBAR | $0.0 \bar{p}p \rightarrow \omega \eta \pi^0$ |
| 54 ± 10 | | ⁶ AMSLER | 92 | CBAR | $0.0 \bar{p}p \rightarrow \eta \eta \pi^0$ |
| 95 ± 14 | 1040 | ⁶ ARMSTRONG | 91B | OMEG \pm | $300 pp \rightarrow$ $pp \eta \pi^+ \pi^-$ |
| 62 ± 15 | 500 | ⁷ EVANGELIS... | 81 | OMEG \pm | $12 \pi^- p \rightarrow$ $\eta \pi^+ \pi^- \pi^- p$ |
| 60 ± 20 | 145 | ⁷ GURTU | 79 | HBC \pm | $4.2 K^- p \rightarrow \Lambda \eta 2\pi$ |
| $60 \begin{smallmatrix} +50 \\ -30 \end{smallmatrix}$ | 47 | CONFORTO | 78 | OSPK $-$ | $4.5 \pi^- p \rightarrow p X^-$ |
| $86.0 \begin{smallmatrix} +60.0 \\ -50.0 \end{smallmatrix}$ | 50 | CORDEN | 78 | OMEG \pm | $12\text{--}15 \pi^- p \rightarrow n \eta 2\pi$ |
| 44 ± 22 | | GRASSLER | 77 | HBC $-$ | $16 \pi^\mp p \rightarrow p \eta 3\pi$ |
| 80 to 300 | | ⁸ FLATTE | 76 | RVUE $-$ | $4.2 K^- p \rightarrow \Lambda \eta 2\pi$ |
| $16.0 \begin{smallmatrix} +25.0 \\ -16.0 \end{smallmatrix}$ | 70 | ⁹ WELLS | 75 | HBC $-$ | $3.1\text{--}6 K^- p \rightarrow \Lambda \eta 2\pi$ |
| 30 ± 5 | 150 | ¹⁰ DEFOIX | 72 | HBC \pm | $0.7 \bar{p}p \rightarrow 7\pi$ |
| 40 ± 15 | | CAMPBELL | 69 | DBC \pm | $2.7 \pi^+ d$ |
| 60 ± 30 | 15 | MILLER | 69B | HBC $-$ | $4.5 K^- N \rightarrow \eta \pi \Lambda$ |
| 80 ± 30 | 30 | AMMAR | 68 | HBC \pm | $5.5 K^- p \rightarrow \Lambda \eta 2\pi$ |

¹ T-matrix pole with 2 poles, 2 channels, pole width on adjacent sheet $127.0 \pm 2.3 \pm 6.7$ MeV.

- 2 T-matrix pole on sheet II.
 3 From a fit with the S-wave amplitude including two interfering Breit-Wigners plus a background term.
 4 T-matrix pole.
 5 The $\eta\pi$ width.
 6 From a single Breit-Wigner fit.
 7 From $f_1(1285)$ decay.
 8 Using a two-channel resonance parametrization of GAY 76B data.
 9 Weak evidence only for $a_0(980)^+$ production.
 10 This number has very little meaning. Error is much too small. Vlada

$K\bar{K}$ ONLY

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | CHG | COMMENT |
|---|------|------------------------|------|------|---------------------------------------|
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| ~ 48 | | ¹ OLLER | 99C | RVUE | $\pi\pi \rightarrow \pi\pi, K\bar{K}$ |
| ~ 25 | 100 | ² ASTIER | 67 | HBC | ± |
| 57±13 | 143 | ³ ROSENFELD | 65 | RVUE | ± |
| ¹ T-matrix pole. ² ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65. ³ Plus systematic errors. | | | | | |

$a_0(980)$ DECAY MODES

| Mode | Fraction (Γ_i/Γ) |
|---------------------------|--------------------------------|
| Γ_1 $\eta\pi$ | seen |
| Γ_2 $K\bar{K}$ | seen |
| Γ_3 $\eta'\pi$ | seen |
| Γ_4 $\rho\pi$ | not seen |
| Γ_5 $\gamma\gamma$ | seen |
| Γ_6 e^+e^- | |

$a_0(980)$ PARTIAL WIDTHS

| VALUE (keV) | DOCUMENT ID | TECN | Γ_5 |
|--|---------------------|------|------------|
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 0.30±0.10 | ¹ AMSLER | 98 | RVUE |
| ¹ Using $\Gamma_{\gamma\gamma}B(a_0(980) \rightarrow \eta\pi) = 0.24 \pm 0.08$ keV. | | | |

$a_0(980)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

| $\Gamma(\eta\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ | VALUE (keV) | EVTS | DOCUMENT ID | TECN | COMMENT | $\Gamma_1\Gamma_5/\Gamma$ |
|---|--------------------|--------|---------------------|------|---------|--------------------------------------|
| 0.21 | +0.08 | | | | | |
| | -0.04 | | | | | |
| | OUR AVERAGE | | | | | |
| 0.128 | +0.003 | +0.502 | ¹ UEHARA | 09A | BELL | $\gamma\gamma \rightarrow \pi^0\eta$ |
| | -0.002 | -0.043 | | | | |
| 0.28 | ±0.04 | ±0.10 | OEST | 90 | JADE | $e^+e^- \rightarrow e^+e^-\pi^0\eta$ |
| 0.19 | ±0.07 | +0.10 | ANTREASYAN | 86 | CBAL | $e^+e^- \rightarrow e^+e^-\pi^0\eta$ |
| | | -0.07 | | | | |

¹ From a fit with the S-wave amplitude including two interfering Breit-Wigners plus a background term.

| $\Gamma(\eta\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ | | | | | $\Gamma_1\Gamma_6/\Gamma$ |
|---|-----|-------------|------|--------------------------------|---------------------------|
| VALUE (eV) | CL% | DOCUMENT ID | TECN | COMMENT | |
| <1.5 | 90 | VOROBYEV 88 | ND | $e^+e^- \rightarrow \pi^0\eta$ | |

 $a_0(980)$ BRANCHING RATIOS

| $\Gamma(K\bar{K})/\Gamma(\eta\pi)$ | | | | | Γ_2/Γ_1 |
|------------------------------------|-------------|------|-----|---------|---------------------|
| VALUE | DOCUMENT ID | TECN | CHG | COMMENT | |

0.177 ± 0.024 OUR AVERAGE Error includes scale factor of 1.2.

| | | | | |
|---------------------|-----------------------|-----|------|--|
| 0.23 ± 0.05 | ¹ ABELE | 98 | CBAR | 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |
| 0.166 ± 0.01 ± 0.02 | ² BARBERIS | 98c | OMEG | 450 $pp \rightarrow p_f f_1(1285) p_S$ |

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

| | | | | |
|-----------------------|------------------------|-----|--------|--|
| 0.138 ± 0.001 ± 0.035 | ³ ALBRECHT | 20 | CBAR | 0.9 $\bar{p}p \rightarrow \pi^0\pi^0\eta,$ $\pi^0\eta\eta, \pi^0K^+K^-$ |
| 1.20 ± 0.15 | ⁴ ANISOVICH | 09 | RVUE | 0.0 $\bar{p}p, \pi N$ |
| 1.05 ± 0.07 ± 0.05 | ⁵ BUGG | 08A | RVUE 0 | $\bar{p}p \rightarrow \pi^0\pi^0\eta$ |
| 0.57 ± 0.16 | ⁶ BARGIOTTI | 03 | OBLX | $\bar{p}p$ |
| ~ 0.60 | OLLER | 99B | RVUE | $\pi\pi \rightarrow \eta\pi, K\bar{K}$ |
| 0.7 ± 0.3 | ² CORDEN | 78 | OMEG | 12–15 $\pi^-p \rightarrow n\eta 2\pi$ |
| 0.25 ± 0.08 | ² DEFOIX | 72 | HBC ± | 0.7 $\bar{p} \rightarrow 7\pi$ |

¹ Using $\pi^0\pi^0\eta$ from AMSLER 94D.² From the decay of $f_1(1285)$.³ Residues from T-matrix pole with 2 poles, 2 channels. Solution on adjacent sheet 0.149 ± 0.001 ± 0.039.⁴ This is a ratio of couplings.⁵ A ratio of couplings, using AMSLER 94D and ABELE 98. Supersedes BUGG 94.⁶ Coupled channel analysis of $\pi^+\pi^-\pi^0, K^+K^-\pi^0,$ and $K^\pm K_S^0 \pi^\mp$.

| $\Gamma(\eta'\pi)/\Gamma_{\text{total}}$ | | | | | Γ_3/Γ |
|--|------|-------------|------|---------|-------------------|
| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT | |

| | | | | | |
|-------------|------|-------------------|-----|------|--------------------------------|
| seen | 116k | ¹ CHEN | 20A | BELL | $D^0 \rightarrow K^-\pi^+\eta$ |
|-------------|------|-------------------|-----|------|--------------------------------|

¹ From an amplitude analysis of the $D^0 \rightarrow K^-\pi^+\eta$ decay in a three-channel Flatte model with a 10.1 σ significance. Earlier observed by ABLIKIM 17K in the $\chi_{c1} \rightarrow \eta\pi^+\pi^-$ decay with a 8.9 σ significance.

| $\Gamma(\rho\pi)/\Gamma(\eta\pi)$ | | | | | Γ_4/Γ_1 |
|-----------------------------------|-----|-------------|------|-----|---------------------|
| VALUE | CL% | DOCUMENT ID | TECN | CHG | COMMENT |

 $\rho\pi$ forbidden.

| | | | | | |
|-------|----|--------------------|----|-------|---|
| <0.25 | 70 | ¹ AMMAR | 70 | HBC ± | 4.1,5.5 $K^-p \rightarrow \Lambda\eta 2\pi$ |
|-------|----|--------------------|----|-------|---|

¹ Not clear if they really observed the $a_0(980)$ 3 standard deviations. **$a_0(980)$ REFERENCES**

| | | | | |
|----------|-----|----------------|---------------------------|--------------------------|
| ALBRECHT | 20 | EPJ C80 453 | M. Albrecht <i>et al.</i> | (Crystal Barrel Collab.) |
| CHEN | 20A | PR D102 012002 | Y.Q. Chen <i>et al.</i> | (BELLE Collab.) |
| LU | 20 | EPJ C80 436 | J. Lu, B. Moussallam | |
| AAIJ | 19H | JHEP 1904 063 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AOUDE | 18 | PR D98 056021 | R.T. Aoude <i>et al.</i> | |
| ABLIKIM | 17K | PR D95 032002 | M. Ablikim <i>et al.</i> | (BESIII Collab.) |

| | | | | |
|------------------|-----|---|--------------------------------|---------------------------|
| AAIJ | 16N | PR D93 052018 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| AMBROSINO | 09F | PL B681 5 | F. Ambrosino <i>et al.</i> | (KLOE Collab.) |
| ANISOVICH | 09 | IJMP A24 2481 | V.V. Anisovich, A.V. Sarantsev | |
| UEHARA | 09A | PR D80 032001 | S. Uehara <i>et al.</i> | (BELLE Collab.) |
| BUGG | 08A | PR D78 074023 | D.V. Bugg | (LOQM) |
| PELAEZ | 04A | MPL A19 2879 | J.R. Pelaez | (MADU) |
| ACHASOV | 03B | PR D68 014006 | N.N. Achasov, A.V. Kiselev | |
| BARGIOTTI | 03 | EPJ C26 371 | M. Bargiotti <i>et al.</i> | (OBELIX Collab.) |
| ACHARD | 02B | PL B526 269 | P. Achard <i>et al.</i> | (L3 Collab.) |
| ACHASOV | 00F | PL B479 53 | M.N. Achasov <i>et al.</i> | (Novosibirsk SND Collab.) |
| BARBERIS | 00H | PL B488 225 | D. Barberis <i>et al.</i> | (WA 102 Collab.) |
| OLLER | 99 | PR D60 099906 (erratum) | J.A. Oller <i>et al.</i> | |
| OLLER | 99B | NP A652 407 (erratum) | J.A. Oller, E. Oset | |
| OLLER | 99C | PR D60 074023 | J.A. Oller, E. Oset | |
| TEIGE | 99 | PR D59 012001 | S. Teige <i>et al.</i> | (BNL E852 Collab.) |
| ABELE | 98 | PR D57 3860 | A. Abele <i>et al.</i> | (Crystal Barrel Collab.) |
| ACHASOV | 98B | PL B438 441 | M.N. Achasov <i>et al.</i> | (Novosibirsk SND Collab.) |
| AMSLER | 98 | RMP 70 1293 | C. AMSler | |
| ANISOVICH | 98B | SPU 41 419 | V.V. Anisovich <i>et al.</i> | |
| BARBERIS | 98C | Translated from UFN 168 481. PL B440 225 | D. Barberis <i>et al.</i> | (WA 102 Collab.) |
| BERTIN | 98B | PL B434 180 | A. Bertin <i>et al.</i> | (OBELIX Collab.) |
| TORNQVIST | 96 | PRL 76 1575 | N.A. Tornqvist, M. Roos | (HELS) |
| JANSEN | 95 | PR D52 2690 | G. Janssen <i>et al.</i> | (STON, ADLD, JULI) |
| AMSLER | 94C | PL B327 425 | C. AMSler <i>et al.</i> | (Crystal Barrel Collab.) |
| AMSLER | 94D | PL B333 277 | C. AMSler <i>et al.</i> | (Crystal Barrel Collab.) |
| BUGG | 94 | PR D50 4412 | D.V. Bugg <i>et al.</i> | (LOQM) |
| AMSLER | 92 | PL B291 347 | C. AMSler <i>et al.</i> | (Crystal Barrel Collab.) |
| ARMSTRONG | 91B | ZPHY C52 389 | T.A. Armstrong <i>et al.</i> | (ATHU, BARI, BIRM+) |
| OEST | 90 | ZPHY C47 343 | T. Oest <i>et al.</i> | (JADE Collab.) |
| ACHASOV | 89 | NP B315 465 | N.N. Achasov, V.N. Ivanchenko | |
| ASTON | 88 | NP B296 493 | D. Aston <i>et al.</i> | (SLAC, NAGO, CINC, INUS) |
| VOROBYEV | 88 | SJNP 48 273 | P.V. Vorobiev <i>et al.</i> | (NOVO) |
| ANTREASYAN | 86 | Translated from YAF 48 436. PR D33 1847 | D. Antreasyan <i>et al.</i> | (Crystal Ball Collab.) |
| ATKINSON | 84E | PL 138B 459 | M. Atkinson <i>et al.</i> | (BONN, CERN, GLAS+) |
| EVANGELIS... | 81 | NP B178 197 | C. Evangelista <i>et al.</i> | (BARI, BONN, CERN+) |
| DEBILLY | 80 | NP B176 1 | L. de Billy <i>et al.</i> | (CURIN, LAUS, NEUC+) |
| GURTU | 79 | NP B151 181 | A. Gurtu <i>et al.</i> | (CERN, ZEEM, NIJM, OXF) |
| CONFORTO | 78 | LNC 23 419 | B. Conforto <i>et al.</i> | (RHEL, TINTO, CHIC+) |
| CORDEN | 78 | NP B144 253 | M.J. Corden <i>et al.</i> | (BIRM, RHEL, TELA+) |
| ESTABROOKS | 78 | NP B133 490 | P.G. Estabrooks <i>et al.</i> | (MCGI, CARL, DURH+) |
| GRASSLER | 77 | NP B121 189 | H. Grassler <i>et al.</i> | (AACH3, BERL, BONN+) |
| JAFFE | 77 | PR D15 267,281 | R. Jaffe | (MIT) |
| FLATTE | 76 | PL 63B 224 | S.M. Flatte | (CERN) |
| GAY | 76B | PL 63B 220 | J.B. Gay <i>et al.</i> | (CERN, AMST, NIJM) JP |
| WELLS | 75 | NP B101 333 | J. Wells <i>et al.</i> | (OXF) |
| LINGLIN | 73 | NP B55 408 | D. Linglin | (CERN) |
| DEFOIX | 72 | NP B44 125 | C. Defoix <i>et al.</i> | (CDEF, CERN) |
| AMMAR | 70 | PR D2 430 | R. Ammar <i>et al.</i> | (KANS, NWES, ANL, WISC) |
| BARNES | 69C | PRL 23 610 | V.E. Barnes <i>et al.</i> | (BNL, SYRA) |
| CAMPBELL | 69 | PRL 22 1204 | J.H. Campbell <i>et al.</i> | (PURD) |
| MILLER | 69B | PL 29B 255 | D.H. Miller <i>et al.</i> | (PURD) |
| Also | | PR 188 2011 | W.L. Yen <i>et al.</i> | (PURD) |
| AMMAR | 68 | PRL 21 1832 | R. Ammar <i>et al.</i> | (NWES, ANL) |
| ASTIER | 67 | PL 25B 294 | A. Astier <i>et al.</i> | (CDEF, CERN, IRAD) |
| Includes data of | | BARLOW 67, CONFORTO 67, and ARMENTEROS 65. | | |
| BARLOW | 67 | NC 50A 701 | J. Barlow <i>et al.</i> | (CERN, CDEF, IRAD, LIVP) |
| CONFORTO | 67 | NP B3 469 | G. Conforto <i>et al.</i> | (CERN, CDEF, IPNP+) |
| ARMENTEROS | 65 | PL 17 344 | R. Armenteros <i>et al.</i> | (CERN, CDEF) |
| ROSENFELD | 65 | Oxford Conf. 58 | A.H. Rosenfeld | (LRL) |