

a₀(1450)

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

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

a₀(1450) T-MATRIX POLE \sqrt{s}

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

| VALUE (MeV) | DOCUMENT ID | TECN | COMMENT |
|--|------------------------|----------|--|
| (1290–1500) – i (30–140) OUR ESTIMATE | | | |
| (1302.1 ± 1.1 ± 3.9) – i (56.2 ± 0.7 ± 1.7) | ¹ ALBRECHT | 20 RVUE | 0.9 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$, $\pi^0 \eta \eta$, $\pi^0 K^+ K^-$ |
| (1515 ± 30) – i (115 ± 18) | ANISOVICH | 09 RVUE | 0.0 $\bar{p}p$, πN |
| (1432 ± 13 ± 25) – i (98 ± 5 ± 5) | ² BUGG | 08A RVUE | $\bar{p}p$ |
| (1441 ⁺⁴⁰ ₋₁₅) – i (55 ± 7) | ³ BAKER | 03 SPEC | $\bar{p}p \rightarrow \omega \pi^+ \pi^- \pi^0$ |
| (1303 ± 16) – i (46 ± 8) | ⁴ BARGIOTTI | 03 OBLX | $\bar{p}p$ |
| (1296 ± 10) – i (41 ± 11) | AMSLER | 02 CBAR | 0.9 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$ |
| (1565 ± 30) – i (146 ± 20) | ANISOVICH | 98B RVUE | Compilation |
| (1470 ± 25) – i (132 ± 15) | ⁵ AMSLER | 95D CBAR | 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$ |

¹ T-matrix pole, 2 poles, 2 channels ($\pi \eta$, $K \bar{K}$).

² Using data from AMSLER 94D, ABELE 98, and BAKER 03. Supersedes BUGG 94.

³ From the pole position of a fitted Breit-Wigner amplitude.

⁴ Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^0 \pi^\mp$.

⁵ Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

a₀(1450) MASS

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|--------------------|-------------------------------------|----------|--|
| 1439 ± 34 | OUR AVERAGE | Error includes scale factor of 1.8. | | |
| 1480 ± 30 | | ABELE | 98 CBAR | 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |
| 1410 ± 25 | | ETKIN | 82C MPS | 23 $\pi^- p \rightarrow n 2 K_S^0$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | |
| 1458 ± 14 ± 15 | 190k | ¹ AAIJ | 16N LHCB | $D^0 \rightarrow K_S^0 K^\pm \pi^\mp$ |
| 1316.8 ^{+0.7+24.7} _{-1.0-4.6} | | ² UEHARA | 09A BELL | $\gamma \gamma \rightarrow \pi^0 \eta$ |
| 1477 ± 10 | 80k | ³ UMAN | 06 E835 | 5.2 $\bar{p}p \rightarrow \eta \eta \pi^0$ |
| 1290 ± 10 | | ⁴ BERTIN | 98B OBLX | 0.0 $\bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp$ |
| 1450 ± 40 | | AMSLER | 94D CBAR | 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$ |
| ~ 1300 | | MARTIN | 78 SPEC | 10 $K^\pm p \rightarrow K_S^0 \pi p$ |
| 1255 ± 5 | | ⁵ CASON | 76 | |

¹ Using a model with Gaussian constraints to the PDG averaged values.

² May be a different state.

³ Statistical error only.

⁴ Not confirmed by BUGG 08A.

⁵ Isospin 0 not excluded.

$a_0(1450)$ WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | COMMENT |
|--|--------------------|---------------------|------|---|
| 258 ±14 | OUR AVERAGE | | | |
| 265 ±15 | | ABELE | 98 | CBAR 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |
| 230 ±30 | | ETKIN | 82C | MPS 23 $\pi^- p \rightarrow n 2K_S^0$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 282 ±12 ±13 | 190k | ¹ AAIJ | 16N | LHCB $D^0 \rightarrow K_S^0 K^\pm \pi^\mp$ |
| 65.0 ⁺ ₋ 2.1 ⁺ ₋ 99.1 ⁺ ₋ 5.4 ⁻ ₋ 32.6 | | ² UEHARA | 09A | BELL $\gamma\gamma \rightarrow \pi^0 \eta$ |
| 267 ±11 | 80k | ³ UMAN | 06 | E835 5.2 $\bar{p}p \rightarrow \eta \eta \pi^0$ |
| 80 ± 5 | | ⁴ BERTIN | 98B | OBLX 0.0 $\bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp$ |
| 270 ±40 | | AMSLER | 94D | CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$ |
| ~ 250 | | MARTIN | 78 | SPEC 10 $K^\pm p \rightarrow K_S^0 \pi p$ |
| 79 ±10 | | ⁵ CASON | 76 | |

¹ Using a model with Gaussian constraints to the PDG averaged values.

² May be a different state.

³ Statistical error only.

⁴ Not confirmed by BUGG 08A.

⁵ Isospin 0 not excluded.

$a_0(1450)$ DECAY MODES

Branching fractions are given relative to the one **DEFINED AS 1**.

| Mode | Fraction (Γ_i/Γ) |
|-------------------------------|--------------------------------|
| Γ_1 $\pi \eta$ | 0.093 ± 0.020 |
| Γ_2 $\pi \eta'(958)$ | 0.033 ± 0.017 |
| Γ_3 $K \bar{K}$ | 0.082 ± 0.028 |
| Γ_4 $\omega \pi \pi$ | DEFINED AS 1 |
| Γ_5 $a_0(980) \pi \pi$ | seen |
| Γ_6 $\gamma \gamma$ | seen |

$a_0(1450)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

| $\Gamma(\pi \eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ | $\Gamma_1 \Gamma_6/\Gamma$ | | |
|--|----------------------------|------|---------|
| VALUE (eV) | DOCUMENT ID | TECN | COMMENT |

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

| | | | |
|--|---------------------|-----|--|
| 432 ± 6 ⁺ ₋ 1073 ⁺ ₋ 256 | ¹ UEHARA | 09A | BELL $\gamma\gamma \rightarrow \pi^0 \eta$ |
|--|---------------------|-----|--|

¹ May be a different state.

$a_0(1450)$ BRANCHING RATIOS **$\Gamma(\pi\eta'(958))/\Gamma(\pi\eta)$ Γ_2/Γ_1**

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------------|-----------------------|-------------|--|
| 0.35 ± 0.16 | ¹ ABELE 98 | CBAR | $0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |
| 0.43 ± 0.19 | ABELE 97C | CBAR | $0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \eta'$ |

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

¹ Using $\pi^0 \eta$ from AMSLER 94D.

 $\Gamma(K\bar{K})/\Gamma(\pi\eta)$ Γ_3/Γ_1

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|-----------------------------------|--------------------------|-------------|--|
| 0.88 ± 0.23 | ¹ ABELE 98 | CBAR | $0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |
| $1.887 \pm 0.041 \pm 0.97$ | ² ALBRECHT 20 | RVUE | $0.9 \bar{p}p \rightarrow \pi^0 \pi^0 \eta,$ $\pi^0 \eta \eta, \pi^0 K^+ K^-$ |

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

¹ Using $\pi^0 \eta$ from AMSLER 94D.

² Residues from T-matrix pole, 2 poles, 2 channels ($\pi\eta, K\bar{K}$).

 $\Gamma(\omega\pi\pi)/\Gamma(\pi\eta)$ Γ_4/Γ_1

| <u>VALUE</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|----------------------------------|-------------|-----------------------|-------------|---|
| 10.7 ± 2.3 | 35280 | ¹ BAKER 03 | SPEC | $\bar{p}p \rightarrow \omega \pi^+ \pi^- \pi^0$ |

¹ Using results on $\bar{p}p \rightarrow a_0(1450)^0 \pi^0, a_0(1450) \rightarrow \eta \pi^0$ from ABELE 96C and assuming the $\omega\rho$ mechanism for the $\omega\pi\pi$ state.

 $\Gamma(a_0(980)\pi\pi)/\Gamma_{\text{total}}$ Γ_5/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
| seen | BUGG 08A | RVUE | $\bar{p}p$ |

 $\Gamma(a_0(980)\pi\pi)/\Gamma(\pi\eta)$ Γ_5/Γ_1

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|------------|---|
| ≤ 4.3 | ANISOVICH 01 | RVUE 0 | | $\bar{p}p \rightarrow \eta 2\pi^+ 2\pi^-$ |

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

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ Γ_6/Γ

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|-------------------------|-------------|---------------------------------------|
| seen | ¹ UEHARA 09A | BELL | $\gamma\gamma \rightarrow \pi^0 \eta$ |

¹ May be a different state.

 $a_0(1450)$ REFERENCES

| | | | |
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| ALBRECHT 20 | EPJ C80 453 | M. Albrecht <i>et al.</i> | (Crystal Barrel Collab.) |
| AAIJ 16N | PR D93 052018 | R. Aaij <i>et al.</i> | (LHCb Collab.) |
| ANISOVICH 09 | IJMP A24 2481 | V.V. Anisovich, A.V. Sarantsev | (PNPI) |
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| BUGG 08A | PR D78 074023 | D.V. Bugg | (LOQM) |
| UMAN 06 | PR D73 052009 | I. Uman <i>et al.</i> | (FNAL E835) |
| BAKER 03 | PL B563 140 | C.A. Baker <i>et al.</i> | |
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| AMSLER 02 | EPJ C23 29 | C. Amsler <i>et al.</i> | (Crystal Barrel Collab.) |
| ANISOVICH 01 | NP A690 567 | A.V. Anisovich <i>et al.</i> | |
| ABELE 98 | PR D57 3860 | A. Abele <i>et al.</i> | (Crystal Barrel Collab.) |
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Translated from UFN 168 481.

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| BERTIN | 98B | PL B434 180 | A. Bertin <i>et al.</i> | (OBELIX Collab.) |
| ABELE | 97C | PL B404 179 | A. Abele <i>et al.</i> | (Crystal Barrel Collab.) |
| ABELE | 96C | NP A609 562 | A. Abele <i>et al.</i> | (Crystal Barrel Collab.) |
| AMSLER | 95B | PL B342 433 | C. Amsler <i>et al.</i> | (Crystal Barrel Collab.) |
| AMSLER | 95C | PL B353 571 | C. Amsler <i>et al.</i> | (Crystal Barrel Collab.) |
| AMSLER | 95D | PL B355 425 | C. Amsler <i>et al.</i> | (Crystal Barrel Collab.) |
| AMSLER | 94D | PL B333 277 | C. Amsler <i>et al.</i> | (Crystal Barrel Collab.) IGJPC |
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| ETKIN | 82C | PR D25 2446 | A. Etkin <i>et al.</i> | (BNL, CUNY, TUFTS, VAND) |
| MARTIN | 78 | NP B134 392 | A.D. Martin <i>et al.</i> | (DURH, GEVA) |
| CASON | 76 | PRL 36 1485 | N.M. Cason <i>et al.</i> | (NDAM, ANL) |
