

$a_4(1970)$
was $a_4(2040)$

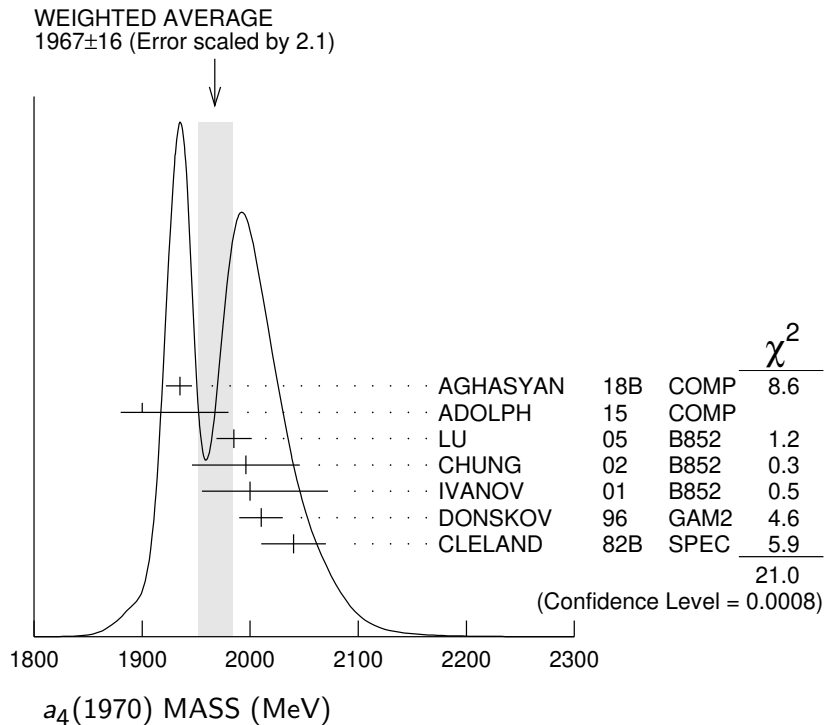
$$I^G(J^{PC}) = 1^-(4^{++})$$

$a_4(1970)$ MASS

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | CHG | COMMENT |
|---------------------------------------|------|---|------|--------|---|
| 1967±16 OUR AVERAGE | | Error includes scale factor of 2.1. See the ideogram below. | | | |
| 1935 ⁺¹¹ ₋₁₃ | 46M | ¹ AGHASYAN | 18B | COMP | 190 $\pi^- p \rightarrow \pi^- \pi^+ \pi^- p$ |
| 1900 ⁺⁸⁰ ₋₂₀ | | ADOLPH | 15 | COMP | 191 $\pi^- p \rightarrow \eta^{(\prime)} \pi^- p$ |
| 1985±10±13 | 145k | LU | 05 | B852 | 18 $\pi^- p \rightarrow \omega \pi^- \pi^0 p$ |
| 1996±25±43 | | CHUNG | 02 | B852 | 18.3 $\pi^- p \rightarrow 3\pi p$ |
| 2000±40 ⁺⁶⁰ ₋₂₀ | | IVANOV | 01 | B852 | 18 $\pi^- p \rightarrow \eta' \pi^- p$ |
| 2010±20 | | ² DONSKOV | 96 | GAM2 0 | 38 $\pi^- p \rightarrow \eta \pi^0 n$ |
| 2040±30 | | ³ CLELAND | 82B | SPEC ± | 50 $\pi p \rightarrow K_S^0 K^\pm p$ |

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

| | | | | | |
|--------------------------------------|------|------------------------|-----|--------|---|
| 1885±13 ⁺⁵⁰ ₋₂ | 420k | ⁴ ALEKSEEV | 10 | COMP | 190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$ |
| 2004± 6 | 80k | ⁵ UMAN | 06 | E835 | 5.2 $\bar{p} p \rightarrow \eta \eta \pi^0$ |
| 2005 ⁺²⁵ ₋₄₅ | | ⁶ ANISOVICH | 01F | SPEC | 2.0 $\bar{p} p \rightarrow 3\pi^0, \pi^0 \eta, \pi^0 \eta'$ |
| 1944± 8±50 | | ⁷ AMELIN | 99 | VES | 37 $\pi^- A \rightarrow \omega \pi^- \pi^0 A^*$ |
| 1903±10 | | ⁸ BALDI | 78 | SPEC - | 10 $\pi^- p \rightarrow p K_S^0 K^-$ |
| 2030±50 | | ⁹ CORDEN | 78C | OMEG 0 | 15 $\pi^- p \rightarrow 3\pi n$ |



- ¹ Statistical error negligible.
- ² From a simultaneous fit to the G_+ and G_0 wave intensities.
- ³ From an amplitude analysis.
- ⁴ Superseded by AGHASYAN 2018B.
- ⁵ Statistical error only.
- ⁶ From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.
- ⁷ May be a different state.
- ⁸ From a fit to the Y_8^0 moment. Limited by phase space.
- ⁹ $J^P = 4^+$ is favored, though $J^P = 2^+$ cannot be excluded.

$a_4(1970)$ WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | CHG | COMMENT |
|---|------|------------------------|------|--------|---|
| 324⁺₋ 15₁₈ OUR AVERAGE | | | | | |
| 333 ⁺ ₋ 16 ₂₁ | 46M | ¹ AGHASYAN | 18B | COMP | 190 $\pi^- p \rightarrow \pi^- \pi^+ \pi^- p$ |
| 300 ⁺ ₋ 80 ₁₀₀ | | ADOLPH | 15 | COMP | 191 $\pi^- p \rightarrow \eta^{(\prime)} \pi^- p$ |
| 231 ± 30 ± 46 | 145k | LU | 05 | B852 | 18 $\pi^- p \rightarrow \omega \pi^- \pi^0 p$ |
| 298 ± 81 ± 85 | | CHUNG | 02 | B852 | 18.3 $\pi^- p \rightarrow 3\pi p$ |
| 350 ± 100 ⁺ ₋ 70 ₅₀ | | IVANOV | 01 | B852 | 18 $\pi^- p \rightarrow \eta' \pi^- p$ |
| 370 ± 80 | | ² DONSKOV | 96 | GAM2 0 | 38 $\pi^- p \rightarrow \eta \pi^0 n$ |
| 380 ± 150 | | ³ CLELAND | 82B | SPEC ± | 50 $\pi p \rightarrow K_S^0 K^\pm p$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | | | |
| 294 ± 25 ⁺ ₋ 46 ₁₉ | 420k | ⁴ ALEKSEEV | 10 | COMP | 190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$ |
| 401 ± 16 | 80k | ⁵ UMAN | 06 | E835 | 5.2 $\bar{p} p \rightarrow \eta \eta \pi^0$ |
| 180 ± 30 | | ⁶ ANISOVICH | 01F | SPEC | 2.0 $\bar{p} p \rightarrow 3\pi^0, \pi^0 \eta, \pi^0 \eta'$ |
| 324 ± 26 ± 75 | | ⁷ AMELIN | 99 | VES | 37 $\pi^- A \rightarrow \omega \pi^- \pi^0 A^*$ |
| 166 ± 43 | | ⁸ BALDI | 78 | SPEC - | 10 $\pi^- p \rightarrow p K_S^0 K^-$ |
| 510 ± 200 | | ⁹ CORDEN | 78C | OMEG 0 | 15 $\pi^- p \rightarrow 3\pi n$ |

- ¹ Statistical error negligible.
- ² From a simultaneous fit to the G_+ and G_0 wave intensities.
- ³ From an amplitude analysis.
- ⁴ Superseded by AGHASYAN 2018B.
- ⁵ Statistical error only.
- ⁶ From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.
- ⁷ May be a different state.
- ⁸ From a fit to the Y_8^0 moment. Limited by phase space.
- ⁹ $J^P = 4^+$ is favored, though $J^P = 2^+$ cannot be excluded.

$a_4(1970)$ DECAY MODES

| Mode | Fraction (Γ_i/Γ) |
|-------------------------------|--------------------------------|
| Γ_1 $K\bar{K}$ | seen |
| Γ_2 $\pi^+\pi^-\pi^0$ | seen |
| Γ_3 $\rho\pi$ | seen |
| Γ_4 $f_2(1270)\pi$ | seen |
| Γ_5 $\omega\pi^-\pi^0$ | seen |
| Γ_6 $\omega\rho$ | seen |
| Γ_7 $\eta\pi$ | seen |
| Γ_8 $\eta'(958)\pi$ | seen |

 $a_4(1970)$ BRANCHING RATIOS

$\Gamma(K\bar{K})/\Gamma_{\text{total}}$ Γ_1/Γ

| VALUE | DOCUMENT ID | TECN | CHG | COMMENT |
|-------------|-------------|------|------|--|
| seen | BALDI | 78 | SPEC | \pm $10 \pi^- p \rightarrow K_S^0 K^- p$ |

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_2/Γ

| VALUE | DOCUMENT ID | TECN | CHG | COMMENT |
|-------------|-------------|------|------|-----------------------------------|
| seen | CORDEN | 78c | OMEG | 0 $15 \pi^- p \rightarrow 3\pi n$ |

$\Gamma(\rho\pi)/\Gamma(f_2(1270)\pi)$ Γ_3/Γ_4

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

$1.7^{+0.9}_{-0.8}$ OUR AVERAGE Error includes scale factor of 3.7.

$2.9^{+0.6}_{-0.4}$ 46M ¹ AGHASYAN 18B COMP 190 $\pi^- p \rightarrow \pi^- \pi^+ \pi^- p$

$1.1 \pm 0.2 \pm 0.2$ CHUNG 02 B852 $18.3 \pi^- p \rightarrow 3\pi p$

¹Statistical error negligible.

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

| VALUE | DOCUMENT ID | TECN | CHG | COMMENT |
|-------------|-------------|------|------|--|
| seen | DONSKOV | 96 | GAM2 | 0 $38 \pi^- p \rightarrow \eta\pi^0 n$ |

$\Gamma(\eta'(958)\pi)/\Gamma(\eta\pi)$ Γ_8/Γ_7

| VALUE | DOCUMENT ID | TECN | COMMENT |
|-----------------------------------|-------------|------|---|
| 0.23 ± 0.07 | ADOLPH | 15 | COMP 191 $\pi^- p \rightarrow \eta^{(\prime)}\pi^- p$ |

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

| VALUE | EVTS | DOCUMENT ID | TECN | COMMENT |
|-------------|------|-------------|------|--|
| seen | 145k | LU | 05 | B852 $18 \pi^- p \rightarrow \omega\pi^-\pi^0 p$ |

a_4 (1970) REFERENCES

| | | | | |
|-----------|-----|------------------------------|------------------------------|------------------------|
| AGHASYAN | 18B | PR D98 092003 | M. Aghasyan <i>et al.</i> | (COMPASS Collab.) |
| ADOLPH | 15 | PL B740 303 | M. Adolph <i>et al.</i> | (COMPASS Collab.) |
| ALEKSEEV | 10 | PRL 104 241803 | M.G. Alekseev <i>et al.</i> | (COMPASS Collab.) |
| UMAN | 06 | PR D73 052009 | I. Uman <i>et al.</i> | (FNAL E835) |
| LU | 05 | PRL 94 032002 | M. Lu <i>et al.</i> | (BNL E852 Collab.) |
| CHUNG | 02 | PR D65 072001 | S.U. Chung <i>et al.</i> | (BNL E852 Collab.) |
| ANISOVICH | 01F | PL B517 261 | A.V. Anisovich <i>et al.</i> | |
| IVANOV | 01 | PRL 86 3977 | E.I. Ivanov <i>et al.</i> | (BNL E852 Collab.) |
| AMELIN | 99 | PAN 62 445 | D.V. Amelin <i>et al.</i> | (VES Collab.) |
| | | Translated from YAF 62 487. | | |
| ANISOVICH | 99C | PL B452 173 | A.V. Anisovich <i>et al.</i> | |
| ANISOVICH | 99E | PL B452 187 | A.V. Anisovich <i>et al.</i> | |
| DONSKOV | 96 | PAN 59 982 | S.V. Donskov <i>et al.</i> | (GAMS Collab.) IGJPC |
| | | Translated from YAF 59 1027. | | |
| CLELAND | 82B | NP B208 228 | W.E. Cleland <i>et al.</i> | (DURH, GEVA, LAUS+) |
| BALDI | 78 | PL 74B 413 | R. Baldi <i>et al.</i> | (GEVA) JP |
| CORDEN | 78C | NP B136 77 | M.J. Corden <i>et al.</i> | (BIRM, RHEL, TELA+) JP |
