# $a_1(1640)$

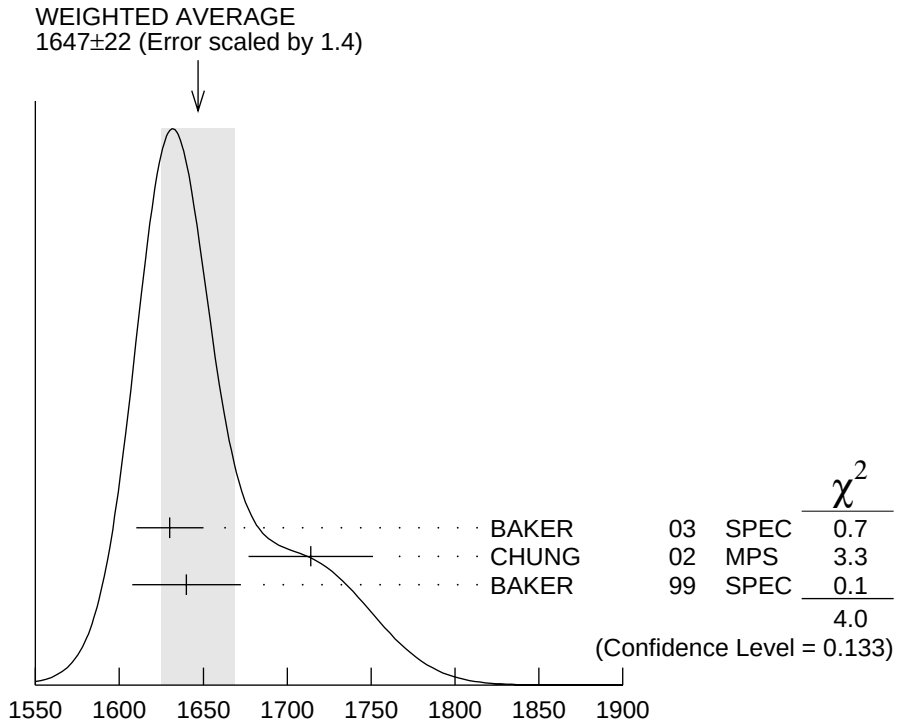
$I^G(J^{PC}) = 1^-(1^{++})$

OMITTED FROM SUMMARY TABLE

Seen in the amplitude analysis of the $3\pi^0$ system produced in $\overline{p}p \to 4\pi^0$. Possibly seen in the study of the hadronic structure in decay $\tau \to 3\pi\nu_\tau$ (ABREU 98G and ASNER 00). Needs confirmation. See the Note under $a_1(1260)$.

## $a_1(1640)$ MASS

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| **1647±22 OUR AVERAGE** | Error includes scale factor of 1.4. See the ideogram below. | | | | |
| 1630±20 | 35280 | [1] BAKER | 03 | SPEC | $\overline{p}p \to \omega\pi^+\pi^-\pi^0$ |
| 1714± 9±36 | | CHUNG | 02 | MPS | 18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$ |
| 1640±12±30 | | BAKER | 99 | SPEC | 1.94 $\overline{p}p \to 4\pi^0$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1670±90 | | BELLINI | 85 | SPEC | 40 $\pi^- A \to \pi^-\pi^+\pi^- A$ |




$a_1(1640)$ mass

[1] Using the $a_1(1260)$ mass and width results of BOWLER 88.

## $a_1(1640)$ WIDTH

| VALUE (MeV) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **254± 27 OUR AVERAGE** Error includes scale factor of 1.1. | | | | | |
| 225± 30 | 35280 | [2] BAKER | 03 | SPEC | $\overline{p}p \rightarrow \omega\pi^+\pi^-\pi^0$ |
| 308± 37±62 | | CHUNG | 02 | MPS | 18.3 $\pi^- p \rightarrow \pi^+\pi^-\pi^- p$ |
| 300± 22±40 | | BAKER | 99 | SPEC | 1.94 $\overline{p}p \rightarrow 4\pi^0$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 300±100 | | BELLINI | 85 | SPEC | 40 $\pi^- A \rightarrow \pi^-\pi^+\pi^- A$ |

[2] Using the $a_1(1260)$ mass and width results of BOWLER 88.

## $a_1(1640)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $\pi\pi\pi$ | seen |
| $\Gamma_2$ | $f_2(1270)\pi$ | seen |
| $\Gamma_3$ | $\sigma\pi$ | seen |
| $\Gamma_4$ | $\rho\pi$ $S-wave$ | seen |
| $\Gamma_5$ | $\rho\pi$ $D-wave$ | seen |
| $\Gamma_6$ | $\omega\pi\pi$ | seen |
| $\Gamma_7$ | $f_1(1285)\pi$ | seen |

## $a_1(1640)$ BRANCHING RATIOS

### $\Gamma(f_2(1270)\pi)/\Gamma(\sigma\pi)$ $\Gamma_2/\Gamma_3$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.24±0.07 | BAKER | 99 | SPEC | 1.94 $\overline{p}p \rightarrow 4\pi^0$ |

### $\Gamma(\rho\pi_{D-wave})/\Gamma_{total}$ $\Gamma_5/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| seen | CHUNG | 02 | MPS | 18.3 $\pi^- p \rightarrow \pi^+\pi^-\pi^- p$ |
| seen | AMELIN | 95B | VES | 36 $\pi^- A \rightarrow \pi^+\pi^-\pi^- A$ |

### $\Gamma(\omega\pi\pi)/\Gamma_{total}$ $\Gamma_6/\Gamma$

| VALUE | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| seen | 35280 | [3] BAKER | 03 | SPEC | $\overline{p}p \rightarrow \omega\pi^+\pi^-\pi^0$ |

**$\Gamma(f_1(1285)\pi)/\Gamma_{total}$** **$\Gamma_7/\Gamma$**

| VALUE | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| seen | LEE 94 | MPS2 | 18 $\pi^- p \rightarrow K^+ \overline{K}^0 \pi^- \pi^- p$ |

[3] Assuming the $\omega\rho$ mechanism for the $\omega\pi\pi$ state.

## $a_1(1640)$ REFERENCES


| | | | | |
|---|---|---|---|---|
| BAKER | 03 | PL B563 140 | C.A. Baker *et al.* | |
| CHUNG | 02 | PR D65 072001 | S.U. Chung *et al.* | |
| ASNER | 00 | PR D61 012002 | D.M. Asner *et al.* | (CLEO Collab.) |
| BAKER | 99 | PL B449 114 | C.A. Baker *et al.* | |
| ABREU | 98G | PL B426 411 | P. Abreu *et al.* | (DELPHI Collab.) |
| AMELIN | 95B | PL B356 595 | D.V. Amelin *et al.* | (SERP, TBIL) |
| LEE | 94 | PL B323 227 | J.H. Lee *et al.* | (BNL, IND, KYUN, MASD+) |
| BOWLER | 88 | PL B209 99 | M.G. Bowler | (OXF) |
| BELLINI | 85 | SJNP 41 781 | D. Bellini *et al.* | |
| | | Translated from YAF 41 1223. | | |


## OTHER RELATED PAPERS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|---|---|---|---|---|
| BARNES | 97 | PR D55 4157 | T. Barnes *et al.* | (ORNL, RAL, MCHS) |
| GOUZ | 92 | Dallas HEP 92, p. 572 | Yu.P. Gouz *et al.* | (VES Collab.) |
| | | Proceedings XXVI Int. Conf. on High Energy Physics | | |