

# a<sub>0</sub>(1450)

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

See minireview on scalar mesons under f<sub>0</sub>(500).

## a<sub>0</sub>(1450) MASS

| VALUE (MeV)   | EVTS               | DOCUMENT ID            | TECN | COMMENT  |
|---|--------------------|------------------------|------|--|
| <b>1474 ± 19</b>  | <b>OUR AVERAGE</b> |                        |      |  |
| 1480 ± 30   |                    | ABELE                  | 98   | CBAR 0.0 $\bar{p}p \rightarrow K^0 K^\pm \pi^\mp$                                    |
| 1470 ± 25   |                    | <sup>1</sup> AMSLER    | 95D  | CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta \eta, \pi^0 \pi^0 \eta$ |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● |                    |                        |      |  |
| 1515 ± 30   |                    | <sup>2</sup> ANISOVICH | 09   | RVUE 0.0 $\bar{p}p, \pi N$   |
| 1316.8 <sup>+0.7+24.7</sup> <sub>-1.0-4.6</sub>                               |                    | <sup>3</sup> UEHARA    | 09A  | BELL $\gamma\gamma \rightarrow \pi^0 \eta$   |
| 1432 ± 13 ± 25  |                    | <sup>4</sup> BUGG      | 08A  | RVUE $\bar{p}p$  |
| 1477 ± 10   | 80k                | <sup>5</sup> UMAN      | 06   | E835 5.2 $\bar{p}p \rightarrow \eta \eta \pi^0$                                      |
| 1441 <sup>+40</sup> <sub>-15</sub>  | 35280              | <sup>2</sup> BAKER     | 03   | SPEC $\bar{p}p \rightarrow \omega \pi^+ \pi^- \pi^0$                                 |
| 1303 ± 16   |                    | <sup>6</sup> BARGIOTTI | 03   | OBLX $\bar{p}p$  |
| 1296 ± 10   |                    | <sup>7</sup> AMSLER    | 02   | CBAR 0.9 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$                                     |
| 1565 ± 30   |                    | <sup>7</sup> ANISOVICH | 98B  | RVUE Compilation   |
| 1290 ± 10   |                    | <sup>8</sup> BERTIN    | 98B  | OBLX 0.0 $\bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp$                                  |
| 1450 ± 40   |                    | AMSLER                 | 94D  | CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$                                     |
| 1410 ± 25   |                    | ETKIN                  | 82C  | MPS 23 $\pi^- p \rightarrow n 2K_S^0$  |
| ~ 1300  |                    | MARTIN                 | 78   | SPEC 10 $K^\pm p \rightarrow K_S^0 \pi p$  |
| 1255 ± 5  |                    | <sup>9</sup> CASON     | 76   |  |

<sup>1</sup> Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.  
<sup>2</sup> From the pole position.  
<sup>3</sup> May be a different state.  
<sup>4</sup> Using data from AMSLER 94D, ABELE 98, and BAKER 03. Supersedes BUGG 94.  
<sup>5</sup> Statistical error only.  
<sup>6</sup> Coupled channel analysis of  $\pi^+ \pi^- \pi^0$ ,  $K^+ K^- \pi^0$ , and  $K^\pm K_S^0 \pi^\mp$ .  
<sup>7</sup> T-matrix pole.  
<sup>8</sup> Not confirmed by BUGG 08A.  
<sup>9</sup> Isospin 0 not excluded.

## a<sub>0</sub>(1450) WIDTH

| VALUE (MeV)     | EVTS               | DOCUMENT ID          | TECN | COMMENT  |
|-----------------|--------------------|----------------------|------|--|
| <b>265 ± 13</b> | <b>OUR AVERAGE</b> |                      |      |  |
| 265 ± 15        |                    | ABELE                | 98   | CBAR 0.0 $\bar{p}p \rightarrow K^0 K^\pm \pi^\mp$                                    |
| 265 ± 30        |                    | <sup>10</sup> AMSLER | 95D  | CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta \eta, \pi^0 \pi^0 \eta$ |

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

|   |       |              |     |      |   |
|---|-------|--------------|-----|------|---|
| 230 ± 36  |       | 11 ANISOVICH | 09  | RVUE | 0.0 $\bar{p}p$ , $\pi N$                      |
| 65.0 <sup>+</sup> <sub>-</sub> 2.1 <sup>+</sup> <sub>-</sub> 99.1 |       | 12 UEHARA    | 09A | BELL | $\gamma\gamma \rightarrow \pi^0\eta$          |
|   |       | 13 BUGG      | 08A | RVUE | $\bar{p}p$                                    |
| 196 ± 10 ± 10   |       | 14 UMAN      | 06  | E835 | 5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$      |
| 267 ± 11  | 80k   | 11 BAKER     | 03  | SPEC | $\bar{p}p \rightarrow \omega\pi^+\pi^-\pi^0$  |
| 110 ± 14  | 35280 | 15 BARGIOTTI | 03  | OBLX | $\bar{p}p$                                    |
| 92 ± 16   |       | 16 AMSLER    | 02  | CBAR | 0.9 $\bar{p}p \rightarrow \pi^0\pi^0\eta$     |
| 81 ± 21   |       | 16 ANISOVICH | 98B | RVUE | Compilation                                   |
| 292 ± 40  |       | 17 BERTIN    | 98B | OBLX | 0.0 $\bar{p}p \rightarrow K^\pm K_S^0\pi^\mp$ |
| 80 ± 5  |       | AMSLER       | 94D | CBAR | 0.0 $\bar{p}p \rightarrow \pi^0\pi^0\eta$     |
| 270 ± 40  |       | ETKIN        | 82C | MPS  | 23 $\pi^-p \rightarrow n2K_S^0$               |
| 230 ± 30  |       | MARTIN       | 78  | SPEC | 10 $K^\pm p \rightarrow K_S^0\pi p$           |
| ~ 250   |       | 18 CASON     | 76  |      |   |
| 79 ± 10   |       |              |     |      |   |

<sup>10</sup> Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

<sup>11</sup> From the pole position.

<sup>12</sup> May be a different state.

<sup>13</sup> Using data from AMSLER 94D, ABELE 98, and BAKER 03. Supersedes BUGG 94.

<sup>14</sup> Statistical error only.

<sup>15</sup> Coupled channel analysis of  $\pi^+\pi^-\pi^0$ ,  $K^+K^-\pi^0$ , and  $K^\pm K_S^0\pi^\mp$ .

<sup>16</sup> T-matrix pole.

<sup>17</sup> Not confirmed by BUGG 08A.

<sup>18</sup> Isospin 0 not excluded.

### $a_0(1450)$ DECAY MODES

| Mode                        | Fraction ( $\Gamma_i/\Gamma$ ) |
|-----------------------------|--------------------------------|
| $\Gamma_1$ $\pi\eta$        | seen                           |
| $\Gamma_2$ $\pi\eta'(958)$  | seen                           |
| $\Gamma_3$ $K\bar{K}$       | seen                           |
| $\Gamma_4$ $\omega\pi\pi$   | seen                           |
| $\Gamma_5$ $a_0(980)\pi\pi$ | seen                           |
| $\Gamma_6$ $\gamma\gamma$   | seen                           |

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

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

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

|  |     |                      |     |      |                                      |
|--|-----|----------------------|-----|------|--------------------------------------|
| 432 ± 6 <sup>+</sup> <sub>-</sub> 1073 |     | <sup>19</sup> UEHARA | 09A | BELL | $\gamma\gamma \rightarrow \pi^0\eta$ |
|  | 256 |                      |     |      |                                      |

<sup>19</sup> May be a different state.

## $a_0(1450)$ BRANCHING RATIOS

### $\Gamma(\pi\eta'(958))/\Gamma(\pi\eta)$ $\Gamma_2/\Gamma_1$

| <u>VALUE</u>     | <u>DOCUMENT ID</u>  | <u>TECN</u> | <u>COMMENT</u>                                      |
|------------------|---------------------|-------------|---|
| <b>0.35±0.16</b> | <sup>20</sup> ABELE | 98          | CBAR 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |

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

|           |       |     |   |
|-----------|-------|-----|---|
| 0.43±0.19 | ABELE | 97C | CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta'$ |
|-----------|-------|-----|---|

<sup>20</sup> Using  $\pi^0 \eta$  from AMSLER 94D.

### $\Gamma(K\bar{K})/\Gamma(\pi\eta)$ $\Gamma_3/\Gamma_1$

| <u>VALUE</u>     | <u>DOCUMENT ID</u>  | <u>TECN</u> | <u>COMMENT</u>                                      |
|------------------|---------------------|-------------|---|
| <b>0.88±0.23</b> | <sup>21</sup> ABELE | 98          | CBAR 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$ |

<sup>21</sup> Using  $\pi^0 \eta$  from AMSLER 94D.

### $\Gamma(\omega\pi\pi)/\Gamma(\pi\eta)$ $\Gamma_4/\Gamma_1$

| <u>VALUE</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. • • •

|          |       |                     |    |   |
|----------|-------|---------------------|----|---|
| 10.7±2.3 | 35280 | <sup>22</sup> BAKER | 03 | SPEC $\bar{p}p \rightarrow \omega\pi^+\pi^-\pi^0$ |
|----------|-------|---------------------|----|---|

<sup>22</sup> 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.

### $\Gamma(a_0(980)\pi\pi)/\Gamma_{\text{total}}$ $\Gamma_5/\Gamma$

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

### $\Gamma(a_0(980)\pi\pi)/\Gamma(\pi\eta)$ $\Gamma_5/\Gamma_1$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|------------|----------------|
|--------------|--------------------|-------------|------------|----------------|

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

|       |           |    |      |   |
|-------|-----------|----|------|---|
| ≤ 4.3 | ANISOVICH | 01 | RVUE | 0 $\bar{p}p \rightarrow \eta 2\pi^+ 2\pi^-$ |
|-------|-----------|----|------|---|

### $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_6/\Gamma$

| <u>VALUE</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u> |
|--------------|--------------------|-------------|----------------|
|--------------|--------------------|-------------|----------------|

|             |                      |     |  |
|-------------|----------------------|-----|--|
| <b>seen</b> | <sup>23</sup> UEHARA | 09A | BELL $\gamma\gamma \rightarrow \pi^0 \eta$ |
|-------------|----------------------|-----|--|

<sup>23</sup> May be a different state.

## $a_0(1450)$ REFERENCES

|           |     |                              |                                |                          |
|-----------|-----|------------------------------|--------------------------------|--------------------------|
| 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)                   |
| 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>       |                          |
| BARGIOTTI | 03  | EPJ C26 371                  | M. Bargiotti <i>et al.</i>     | (OBELIX Collab.)         |
| AMSLER    | 02  | EPJ C23 29                   | C. Amsler <i>et al.</i>        |                          |
| 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.) |
| ANISOVICH | 98B | SPU 41 419                   | V.V. Anisovich <i>et al.</i>   |                          |
|           |     | Translated from UFN 168 481. |                                |                          |

|        |     |             |                           |                                |
|--------|-----|-------------|---------------------------|--------------------------------|
| 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 |
| BUGG   | 94  | PR D50 4412 | D.V. Bugg <i>et al.</i>   | (LOQM)                         |
| 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)                    |

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