CITATION: R.M. Barnett *et al.* Physical Review D54, 1 (1996) and 1997 off-year partial update for the 1998 edition (URL: http://pdg.lbl.gov)

# $a_2(1320)$

$I^G(J^{PC}) = 1^-(2^{++})$

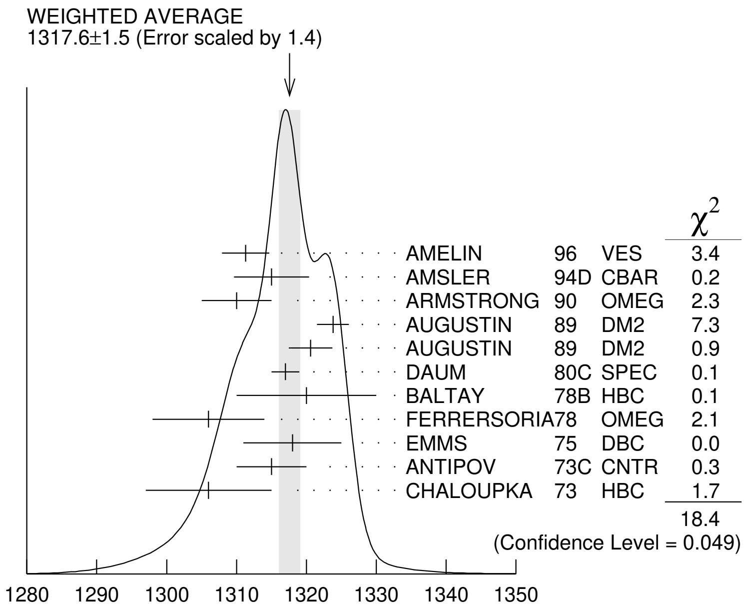
## $a_2(1320)$ MASS

| *VALUE* (MeV) | *DOCUMENT ID* |
|---|---|
| **1318.1±0.7 OUR AVERAGE** | Includes data from the 4 datablocks that follow this one. Error includes scale factor of 1.2. |

### $3\pi$ MODE

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| The data in this block is included in the average printed for a previous datablock. | | | | | |
| **1317.6± 1.5 OUR AVERAGE** | Error includes scale factor of 1.4. See the ideogram below. | | | | |
| 1311.3± 1.6±3.0 | 72400 | AMELIN 96 | VES | | 36 $\pi^- p \rightarrow \pi^+\pi^-\pi^0 n$ |
| 1315 ± 5 ±2 | | [1] AMSLER 94D | CBAR | | 0.0 $\overline{p}p \rightarrow \pi^0\pi^0\eta$ |
| 1310 ± 5 | | ARMSTRONG 90 | OMEG | 0 | 300.0$pp \rightarrow pp\pi^+\pi^-\pi^0$ |
| 1323.8± 2.3 | 4022 | AUGUSTIN 89 | DM2 | ± | $J/\psi \rightarrow \rho^\pm a_2^\mp$ |
| 1320.6± 3.1 | 3562 | AUGUSTIN 89 | DM2 | 0 | $J/\psi \rightarrow \rho^0 a_2^0$ |
| 1317 ± 2 | 25000 | [2] DAUM 80C | SPEC | − | 63,94 $\pi^- p \rightarrow 3\pi p$ |
| 1320 ±10 | 1097 | [2] BALTAY 78B | HBC | +0 | 15 $\pi^+ p \rightarrow p 4\pi$ |
| 1306 ± 8 | | FERRERSORIA 78 | OMEG | − | 9 $\pi^- p \rightarrow p 3\pi$ |
| 1318 ± 7 | 1600 | [2] EMMS 75 | DBC | 0 | 4 $\pi^+ n \rightarrow p(3\pi)^0$ |
| 1315 ± 5 | | [2] ANTIPOV 73C | CNTR | − | 25,40 $\pi^- p \rightarrow p\eta\pi^-$ |
| 1306 ± 9 | 1580 | CHALOUPKA 73 | HBC | − | 3.9 $\pi^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1305 ±14 | | CONDO 93 | SHF | | $\gamma p \rightarrow \eta\pi^+\pi^+\pi^-$ |
| 1310 ± 2 | | [2] EVANGELISTA 81 | OMEG | − | 12 $\pi^- p \rightarrow 3\pi p$ |
| 1343 ±11 | 490 | BALTAY 78B | HBC | 0 | 15 $\pi^+ p \rightarrow \Delta 3\pi$ |
| 1309 ± 5 | 5000 | BINNIE 71 | MMS | − | $\pi^- p$ near $a_2$ threshold |
| 1299 ± 6 | 28000 | BOWEN 71 | MMS | − | 5 $\pi^- p$ |
| 1300 ± 6 | 24000 | BOWEN 71 | MMS | + | 5 $\pi^+ p$ |
| 1309 ± 4 | 17000 | BOWEN 71 | MMS | − | 7 $\pi^- p$ |
| 1306 ± 4 | 941 | ALSTON-... 70 | HBC | + | 7.0 $\pi^+ p \rightarrow 3\pi p$ |

[1] The systematic error of 2 MeV corresponds to the spread of solutions.
[2] From a fit to $J^P = 2^+ \rho\pi$ partial wave.




$a_2(1320)$ mass, $3\pi$ mode (MeV)

## $K^{\pm} K^0_S$ MODE

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| The data in this block is included in the average printed for a previous datablock. | | | | | |
| **1318.1± 0.7 OUR AVERAGE** | | | | | |
| 1319 ± 5 | 4700 | [3,4] CLELAND 82B | SPEC | + | 50 $\pi^+ p \to K^0_S K^+ p$ |
| 1324 ± 6 | 5200 | [3,4] CLELAND 82B | SPEC | − | 50 $\pi^- p \to K^0_S K^- p$ |
| 1320 ± 2 | 4000 | CHABAUD 80 | SPEC | − | 17 $\pi^- A \to K^0_S K^- A$ |
| 1312 ± 4 | 11000 | CHABAUD 78 | SPEC | − | 9.8 $\pi^- p \to K^- K^0_S p$ |
| 1316 ± 2 | 4730 | CHABAUD 78 | SPEC | − | 18.8 $\pi^- p \to K^- K^0_S p$ |
| 1318 ± 1 | | [3,5] MARTIN 78D | SPEC | − | 10 $\pi^- p \to K^0_S K^- p$ |
| 1320 ± 2 | 2724 | MARGULIE 76 | SPEC | − | 23 $\pi^- p \to K^- K^0_S p$ |
| 1313 ± 4 | 730 | FOLEY 72 | CNTR | − | 20.3 $\pi^- p \to K^- K^0_S p$ |
| 1319 ± 3 | 1500 | [5] GRAYER 71 | ASPK | − | 17.2 $\pi^- p \to K^- K^0_S p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1330 ±11 | 1000 | [3,4] CLELAND 82B | SPEC | + | 30 $\pi^+ p \to K^0_S K^+ p$ |
| 1324 ± 5 | 350 | HYAMS 78 | ASPK | + | 12.7 $\pi^+ p \to K^+ K^0_S p$ |

[3] From a fit to $J^P = 2^+$ partial wave.

[4] Number of events evaluated by us.
[5] Systematic error in mass scale subtracted.

### $\eta\pi$ MODE

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| The data in this block is included in the average printed for a previous datablock. | | | | | | |
| **1319.4±2.1 OUR AVERAGE** | | | | | | |
| 1325.1±5.1 | | AOYAGI | 93 | BKEI | | $\pi^- p \to \eta\pi^- p$ |
| 1317.7±1.4±2.0 | | BELADIDZE | 93 | VES | | $37\pi^- N \to \eta\pi^- N$ |
| 1323 ±8 | 1000 | [6] KEY | 73 | OSPK | − | $6\ \pi^- p \to p\pi^-\eta$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 1324 ±5 | | ARMSTRONG | 93C | SPEC | 0 | $\overline{p}p \to \pi^0\eta\eta \to 6\gamma$ |
| 1336.2±1.7 | 2561 | DELFOSSE | 81 | SPEC | + | $\pi^\pm p \to p\pi^\pm\eta$ |
| 1330.7±2.4 | 1653 | DELFOSSE | 81 | SPEC | − | $\pi^\pm p \to p\pi^\pm\eta$ |
| 1324 ±8 | 6200 | [6,7] CONFORTO | 73 | OSPK | − | $6\ \pi^- p \to p\mathrm{MM}^-$ |

[6] Error includes 5 MeV systematic mass-scale error.
[7] Missing mass with enriched MMS $= \eta\pi^-$, $\eta = 2\gamma$.

### $\eta'\pi$ MODE

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| The data in this block is included in the average printed for a previous datablock. | | | | |
| **1327.0±10.7** | BELADIDZE | 93 | VES | $37\pi^- N \to \eta'\pi^- N$ |

## $a_2(1320)$ WIDTH

### $3\pi$ MODE

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **105.5± 1.8 OUR AVERAGE** | | | | | | |
| 103.0± 6.0±3.3 | 72400 | AMELIN | 96 | VES | | $36\ \pi^- p \to \pi^+\pi^-\pi^0 n$ |
| 112 ± 3 ±2 | | [8] AMSLER | 94D | CBAR | | $0.0\ \overline{p}p \to \pi^0\pi^0\eta$ |
| 120 ±10 | | ARMSTRONG | 90 | OMEG | 0 | $300.0 pp \to pp\pi^+\pi^-\pi^0$ |
| 107.0± 9.7 | 4022 | AUGUSTIN | 89 | DM2 | ± | $J/\psi \to \rho^\pm a_2^\mp$ |
| 118.5±12.5 | 3562 | AUGUSTIN | 89 | DM2 | 0 | $J/\psi \to \rho^0 a_2^0$ |
| 97 ± 5 | | [9] EVANGELISTA | 81 | OMEG | − | $12\ \pi^- p \to 3\pi p$ |
| 96 ± 9 | 25000 | [9] DAUM | 80C | SPEC | − | $63,94\ \pi^- p \to 3\pi p$ |
| 110 ±15 | 1097 | [9] BALTAY | 78B | HBC | +0 | $15\ \pi^+ p \to p4\pi$ |
| 112 ±18 | 1600 | [9] EMMS | 75 | DBC | 0 | $4\ \pi^+ n \to p(3\pi)^0$ |
| 122 ±14 | 1200 | [9,10] WAGNER | 75 | HBC | 0 | $7\ \pi^+ p \to \Delta^{++}(3\pi)^0$ |
| 115 ±15 | | [9] ANTIPOV | 73C | CNTR | − | $25,40\ \pi^- p \to p\eta\pi^-$ |
| 99 ±15 | 1580 | CHALOUPKA | 73 | HBC | − | $3.9\ \pi^- p$ |
| 105 ± 5 | 28000 | BOWEN | 71 | MMS | − | $5\ \pi^- p$ |
| 99 ± 5 | 24000 | BOWEN | 71 | MMS | + | $5\ \pi^+ p$ |
| 103 ± 5 | 17000 | BOWEN | 71 | MMS | − | $7\ \pi^- p$ |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 120 ±40 | | CONDO | 93 | SHF | | $\gamma p \rightarrow \eta \pi^+ \pi^+ \pi^-$ |
| 115 ±14 | 490 | BALTAY | 78B | HBC | 0 | 15 $\pi^+ p \rightarrow \Delta 3\pi$ |
| 72 ±16 | 5000 | BINNIE | 71 | MMS | − | $\pi^- p$ near $a_2$ threshold |
| 79 ±12 | 941 | ALSTON-... | 70 | HBC | + | 7.0 $\pi^+ p \rightarrow 3\pi p$ |

[8] The systematic error of 2 MeV corresponds to the spread of solutions.
[9] From a fit to $J^P = 2^+$ $\rho\pi$ partial wave.
[10] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

## $K^\pm K^0_S$ AND $\eta\pi$ MODES

| *VALUE* (MeV) | *DOCUMENT ID* |
|---|---|
| **107 ±5 OUR ESTIMATE** | |
| **109.8±2.0 OUR AVERAGE** | Includes data from the 2 datablocks that follow this one. |

## $K^\pm K^0_S$ MODE

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| The data in this block is included in the average printed for a previous datablock. | | | | | | |
| **109.8± 2.4 OUR AVERAGE** | | | | | | |
| 112 ±20 | 4700 | [11,12] CLELAND | 82B | SPEC | + | 50 $\pi^+ p \rightarrow K^0_S K^+ p$ |
| 120 ±25 | 5200 | [11,12] CLELAND | 82B | SPEC | − | 50 $\pi^- p \rightarrow K^0_S K^- p$ |
| 106 ± 4 | 4000 | CHABAUD | 80 | SPEC | − | 17 $\pi^-$ A $\rightarrow K^0_S K^-$ A |
| 126 ±11 | 11000 | CHABAUD | 78 | SPEC | − | 9.8 $\pi^- p \rightarrow K^- K^0_S p$ |
| 101 ± 8 | 4730 | CHABAUD | 78 | SPEC | − | 18.8 $\pi^- p \rightarrow K^- K^0_S p$ |
| 113 ± 4 | | [11,13] MARTIN | 78D | SPEC | − | 10 $\pi^- p \rightarrow K^0_S K^- p$ |
| 105 ± 8 | 2724 | [13] MARGULIE | 76 | SPEC | − | 23 $\pi^- p \rightarrow K^- K^0_S p$ |
| 113 ±19 | 730 | FOLEY | 72 | CNTR | − | 20.3 $\pi^- p \rightarrow K^- K^0_S p$ |
| 123 ±13 | 1500 | [13] GRAYER | 71 | ASPK | − | 17.2 $\pi^- p \rightarrow K^- K^0_S p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 121 ±51 | 1000 | [11,12] CLELAND | 82B | SPEC | + | 30 $\pi^+ p \rightarrow K^0_S K^+ p$ |
| 110 ±18 | 350 | HYAMS | 78 | ASPK | + | 12.7 $\pi^+ p \rightarrow K^+ K^0_S p$ |

[11] From a fit to $J^P = 2^+$ partial wave.
[12] Number of events evaluated by us.
[13] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

### $\eta\pi$ MODE

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| The data in this block is included in the average printed for a previous datablock. | | | | | | |
| **110.0± 3.5 OUR AVERAGE** | | | | | | |
| 103 ± 6 ±3 | | BELADIDZE | 93 | VES | | $37\pi^- N \to \eta\pi^- N$ |
| 112.2± 5.7 | 2561 | DELFOSSE | 81 | SPEC | + | $\pi^{\pm} p \to p\pi^{\pm}\eta$ |
| 116.6± 7.7 | 1653 | DELFOSSE | 81 | SPEC | − | $\pi^{\pm} p \to p\pi^{\pm}\eta$ |
| 108 ± 9 | 1000 | KEY | 73 | OSPK | − | $6\ \pi^- p \to p\pi^-\eta$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 118 ±10 | | ARMSTRONG | 93C | SPEC | 0 | $\overline{p}p \to \pi^0\eta\eta \to 6\gamma$ |
| 104 ± 9 | 6200 | [14] CONFORTO | 73 | OSPK | − | $6\ \pi^- p \to p\text{MM}^-$ |

[14] Model dependent.

### $\eta'\pi$ MODE

| *VALUE* (MeV) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **106±32** | BELADIDZE | 93 | VES | $37\pi^- N \to \eta'\pi^- N$ |

## $a_2(1320)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level |
|---|---|---|---|
| $\Gamma_1$ | $\rho\pi$ | $(70.1\pm2.7)$ % | S=1.2 |
| $\Gamma_2$ | $\eta\pi$ | $(14.5\pm1.2)$ % | |
| $\Gamma_3$ | $\omega\pi\pi$ | $(10.6\pm3.2)$ % | S=1.3 |
| $\Gamma_4$ | $K\overline{K}$ | $(4.9\pm0.8)$ % | |
| $\Gamma_5$ | $\eta'(958)\pi$ | $(5.7\pm1.1)\times10^{-3}$ | |
| $\Gamma_6$ | $\pi^{\pm}\gamma$ | $(2.8\pm0.6)\times10^{-3}$ | |
| $\Gamma_7$ | $\gamma\gamma$ | $(9.5\pm0.8)\times10^{-6}$ | |
| $\Gamma_8$ | $\pi^+\pi^-\pi^-$ | $<8$ % | CL=90% |
| $\Gamma_9$ | $e^+e^-$ | $<2.3\times10^{-7}$ | CL=90% |

## CONSTRAINED FIT INFORMATION

An overall fit to 5 branching ratios uses 18 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 =$ 9.3 for 15 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\left\langle\delta x_i\delta x_j\right\rangle/(\delta x_i\cdot\delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. The fit constrains the $x_i$ whose labels appear in this array to sum to one.

| | | | |
|---|---|---|---|
| $x_2$ | 10 | | |
| $x_3$ | −89 | −46 | |
| $x_4$ | −1 | −2 | −24 |
| | $x_1$ | $x_2$ | $x_3$ |

## $a_2(1320)$ PARTIAL WIDTHS

### $\Gamma(\pi^\pm\gamma)$ — $\Gamma_6$

| VALUE (keV) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **295± 60** | CIHANGIR | 82 | SPEC | + | 200 $\pi^+$A |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 461±110 | [14] MAY | 77 | SPEC | ± | 9.7 $\gamma$A |

### $\Gamma(\gamma\gamma)$ — $\Gamma_7$

| VALUE (keV) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **1.01±0.08 OUR AVERAGE** | | | | | | |
| 0.96±0.03±0.13 | | ALBRECHT | 97B | ARG | | $e^+e^- \to \pi^+\pi^-\pi^0$ |
| 1.26±0.26±0.18 | 36 | BARU | 90 | MD1 | | $e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$ |
| 1.00±0.07±0.15 | 415 | BEHREND | 90C | CELL | 0 | $e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$ |
| 1.03±0.13±0.21 | | BUTLER | 90 | MRK2 | | $e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$ |
| 1.01±0.14±0.22 | 85 | OEST | 90 | JADE | | $e^+e^- \to e^+e^-\pi^0\eta$ |
| 0.90±0.27±0.15 | 56 | [15] ALTHOFF | 86 | TASS | 0 | $e^+e^- \to e^+e^-3\pi$ |
| 1.14±0.20±0.26 | | [16] ANTREASYAN | 86 | CBAL | 0 | $e^+e^- \to e^+e^-\pi^0\eta$ |
| 1.06±0.18±0.19 | | BERGER | 84C | PLUT | 0 | $e^+e^- \to e^+e^-3\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $0.81\pm0.19^{+0.42}_{-0.11}$ | 35 | [15] BEHREND | 83B | CELL | 0 | $e^+e^- \to e^+e^-3\pi$ |
| 0.84±0.07±0.15 | | [15] FRAZER | 83 | JADE | 0 | $e^+e^- \to e^+e^-3\pi$ |
| 0.77±0.18±0.27 | 22 | [16] EDWARDS | 82F | CBAL | 0 | $e^+e^- \to e^+e^-\pi^0\eta$ |

[15] From $\rho\pi$ decay mode.
[16] From $\eta\pi^0$ decay mode.

### $\Gamma(e^+e^-)$ — $\Gamma_9$

| VALUE (eV) | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **<25** | 90 | VOROBYEV | 88 | ND | $e^+e^- \to \pi^0\eta$ |

## $a_2(1320)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

### $\Gamma(K\overline{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ — $\Gamma_4\Gamma_7/\Gamma$

| VALUE (keV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.126±0.007±0.028** | [17] ALBRECHT | 90G | ARG | $e^+e^- \to e^+e^-K^+K^-$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.081±0.006±0.027 | [18] ALBRECHT | 90G | ARG | $e^+e^- \to e^+e^-K^+K^-$ |

[17] Using an incoherent background.
[18] Using a coherent background.

# $a_2(1320)$ BRANCHING RATIOS

## $\Gamma(K\overline{K})/\Gamma(\rho\pi)$ — $\Gamma_4/\Gamma_1$

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.070±0.012 OUR FIT** | | | | | | |
| **0.078±0.017** | | CHABAUD | 78 | RVUE | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 0.056±0.014 | 50 | [19] CHALOUPKA | 73 | HBC | − | 3.9 $\pi^- p$ |
| 0.097±0.018 | 113 | [19] ALSTON-... | 71 | HBC | + | 7.0 $\pi^+ p$ |
| 0.06 ±0.03 | | [19] ABRAMOVI... | 70B | HBC | − | 3.93 $\pi^- p$ |
| 0.054±0.022 | | [19] CHUNG | 68 | HBC | − | 3.2 $\pi^- p$ |

[19] Included in CHABAUD 78 review.

## $\Gamma(\eta\pi)/[\Gamma(\rho\pi)+\Gamma(\eta\pi)+\Gamma(K\overline{K})]$ — $\Gamma_2/(\Gamma_1+\Gamma_2+\Gamma_4)$

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.162±0.012 OUR FIT** | | | | | | |
| **0.140±0.028 OUR AVERAGE** | | | | | | |
| 0.13 ±0.04 | | ESPIGAT | 72 | HBC | ± | 0.0 $\overline{p}p$ |
| 0.15 ±0.04 | 34 | BARNHAM | 71 | HBC | + | 3.7 $\pi^+ p$ |

## $\Gamma(\eta\pi)/\Gamma(\rho\pi)$ — $\Gamma_2/\Gamma_1$

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.207±0.018 OUR FIT** | | | | | | |
| **0.213±0.020 OUR AVERAGE** | | | | | | |
| 0.18 ±0.05 | | FORINO | 76 | HBC | | 11 $\pi^- p$ |
| 0.22 ±0.05 | 52 | ANTIPOV | 73 | CNTR | − | 40 $\pi^- p$ |
| 0.211±0.044 | 149 | CHALOUPKA | 73 | HBC | − | 3.9 $\pi^- p$ |
| 0.246±0.042 | 167 | ALSTON-... | 71 | HBC | + | 7.0 $\pi^+ p$ |
| 0.25 ±0.09 | 15 | BOECKMANN | 70 | HBC | + | 5.0 $\pi^+ p$ |
| 0.23 ±0.08 | 22 | ASCOLI | 68 | HBC | − | 5 $\pi^- p$ |
| 0.12 ±0.08 | | CHUNG | 68 | HBC | − | 3.2 $\pi^- p$ |
| 0.22 ±0.09 | | CONTE | 67 | HBC | − | 11.0 $\pi^- p$ |

## $\Gamma(\eta'(958)\pi)/\Gamma_{\text{total}}$ — $\Gamma_5/\Gamma$

| VALUE | CL% | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <0.006 | 95 | ALDE | 92B | GAM2 | | 38,100 $\pi^- p \to \eta' \pi^0 n$ |
| <0.02 | 97 | BARNHAM | 71 | HBC | + | 3.7 $\pi^+ p$ |
| 0.004±0.004 | | BOESEBECK | 68 | HBC | + | 8 $\pi^+ p$ |

## $\Gamma(\eta'(958)\pi)/\Gamma(\rho\pi)$ — $\Gamma_5/\Gamma_1$

| VALUE | CL% | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <0.011 | 90 | EISENSTEIN | 73 | HBC | − | 5 $\pi^- p$ |
| <0.04 | | ALSTON-... | 71 | HBC | + | 7.0 $\pi^+ p$ |
| $0.04\ ^{+0.03}_{-0.04}$ | | BOECKMANN | 70 | HBC | 0 | 5.0 $\pi^+ p$ |

### $\Gamma(K\overline{K})/\left[\Gamma(\rho\pi)+\Gamma(\eta\pi)+\Gamma(K\overline{K})\right]$ — $\Gamma_4/(\Gamma_1+\Gamma_2+\Gamma_4)$

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.054±0.009 OUR FIT** | | | | | | |
| **0.048±0.012 OUR AVERAGE** | | | | | | |
| 0.05 ±0.02 | | TOET | 73 | HBC | + | 5 $\pi^+ p$ |
| 0.09 ±0.04 | | TOET | 73 | HBC | 0 | 5 $\pi^+ p$ |
| 0.03 ±0.02 | 8 | DAMERI | 72 | HBC | − | 11 $\pi^- p$ |
| 0.06 ±0.03 | 17 | BARNHAM | 71 | HBC | + | 3.7 $\pi^+ p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 0.020±0.004 | | [20] ESPIGAT | 72 | HBC | ± | 0.0 $\overline{p} p$ |

[20] Not averaged because of discrepancy between masses from $K\overline{K}$ and $\rho\pi$ modes.

### $\Gamma(\pi^+\pi^-\pi^-)/\Gamma(\rho\pi)$ — $\Gamma_8/\Gamma_1$

| VALUE | CL% | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **<0.12** | 90 | ABRAMOVI... | 70B | HBC | − | 3.93 $\pi^- p$ |

### $\Gamma(\pi^\pm\gamma)/\Gamma_{\text{total}}$ — $\Gamma_6/\Gamma$

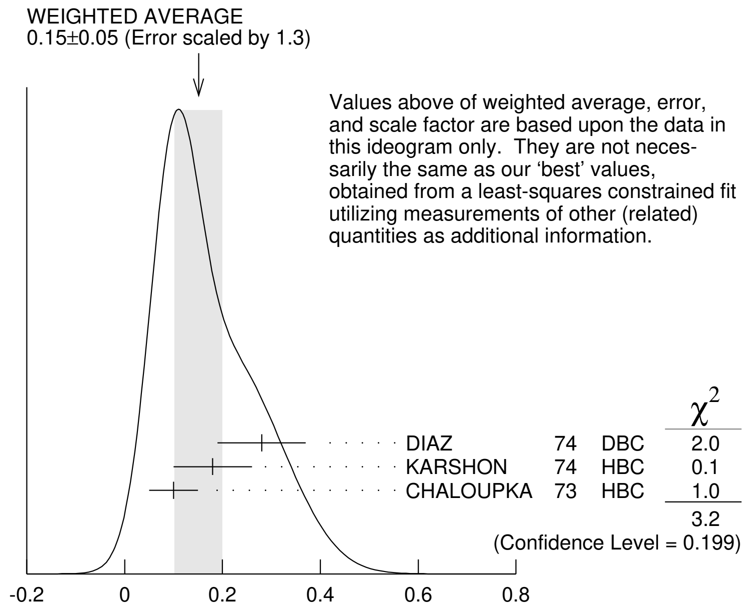
| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $0.005^{+0.005}_{-0.003}$ | [21] EISENBERG | 72 | HBC | 4.3,5.25,7.5 $\gamma p$ |

[21] Pion-exchange model used in this estimation.

### $\Gamma(\omega\pi\pi)/\Gamma(\rho\pi)$ — $\Gamma_3/\Gamma_1$

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.15±0.05 OUR FIT** Error includes scale factor of 1.3. | | | | | | |
| **0.15±0.05 OUR AVERAGE** Error includes scale factor of 1.3. See the ideogram below. | | | | | | |
| 0.28±0.09 | 60 | DIAZ | 74 | DBC | 0 | 6 $\pi^+ n$ |
| 0.18±0.08 | | [22] KARSHON | 74 | HBC | | Avg. of above two |
| 0.10±0.05 | 279 | CHALOUPKA | 73 | HBC | − | 3.9 $\pi^- p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 0.29±0.08 | 140 | [22] KARSHON | 74 | HBC | 0 | 4.9 $\pi^+ p$ |
| 0.10±0.04 | 60 | [22] KARSHON | 74 | HBC | + | 4.9 $\pi^+ p$ |
| 0.19±0.08 | | DEFOIX | 73 | HBC | 0 | 0.7 $\overline{p} p$ |

[22] KARSHON 74 suggest an additional $I=0$ state strongly coupled to $\omega\pi\pi$ which could explain discrepancies in branching ratios and masses. We use a central value and a systematic spread.




$\Gamma(\omega\pi\pi)/\Gamma(\rho\pi)$

## $\Gamma(\eta'(958)\pi)/\Gamma(\eta\pi)$ $\Gamma_5/\Gamma_2$

| *VALUE* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **0.040±0.007 OUR AVERAGE** | | | | |
| $0.047\pm0.010\pm0.004$ | [23] BELADIDZE | 93 | VES | $37\pi^- N \rightarrow a_2^- N$ |
| $0.034\pm0.008\pm0.005$ | BELADIDZE | 92 | VES | $36\pi^- C \rightarrow a_2^- C$ |

[23] Using $B(\eta' \rightarrow \pi^+\pi^-\eta) = 0.441$, $B(\eta \rightarrow \gamma\gamma) = 0.389$ and $B(\eta \rightarrow \pi^+\pi^-\pi^0) = 0.236$.

## $a_2(1320)$ REFERENCES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| ALBRECHT | 97B | ZPHY C74 469 | +Hamacher, Hofmann+ | (ARGUS Collab.) |
| AMELIN | 96 | ZPHY C70 71 | +Berdnikov, Bityukov+ | (SERP, TBIL) |
| AMSLER | 94D | PL B333 277 | +Anisovich, Spanier+ | (Crystal Barrel Collab.) |
| AOYAGI | 93 | PL B314 246 | +Fukui, Hasegawa+ | (BKEI Collab.) |
| ARMSTRONG | 93C | PL B307 394 | +Bettoni+ | (FNAL, FERR, GENO, UCI, NWES+) |
| BELADIDZE | 93 | PL 313 276 | +Berdnikov, Bityukov+ | (VES Collab.) |
| CONDO | 93 | PR D48 3045 | +Handler, Bugg+ | (SLAC Hybrid Collab.) |
| ALDE | 92B | ZPHY C54 549 | +Binon+ | (SERP, BELG, LANL, LAPP, PISA, KEK) |
| BELADIDZE | 92 | ZPHY C54 235 | +Bityukov, Borisov+ | (VES Collab.) |
| ALBRECHT | 90G | ZPHY C48 183 | +Ehrlichmann, Harder+ | (ARGUS Collab.) |
| ARMSTRONG | 90 | ZPHY C48 213 | +Benayoun, Beusch | (WA76 Collab.) |
| BARU | 90 | ZPHY C48 581 | +Blinov, Blinov+ | (MD-1 Collab.) |
| BEHREND | 90C | ZPHY C46 583 | +Criegee+ | (CELLO Collab.) |
| BUTLER | 90 | PR D42 1368 | +Boyer+ | (Mark II Collab.) |
| OEST | 90 | ZPHY C47 343 | +Olsson+ | (JADE Collab.) |
| AUGUSTIN | 89 | NP B320 1 | +Cosme | (DM2 Collab.) |
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| | | Translated from YAF 48 436. | | |

| | | | | | |
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| ALTHOFF | 86 | ZPHY C31 537 | +Boch, Foster, Bernardi+ | (TASSO Collab.) | |
| ANTREASYAN | 86 | PR D33 1847 | +Aschman, Besset, Bienlein+ | (Crystal Ball Collab.) | |
| BERGER | 84C | PL 149B 427 | +Klovning, Burger+ | (PLUTO Collab.) | |
| BEHREND | 83B | PL 125B 518 | +D'Agostini+ | (CELLO Collab.) | |
| FRAZER | 83 | Aachen Conf. | | (UCSD) | |
| CIHANGIR | 82 | PL 117B 123 | +Berg, Biel, Chandlee+ | (FNAL, MINN, ROCH) | |
| CLELAND | 82B | NP B208 228 | +Delfosse, Dorsaz, Gloor | (DURH, GEVA, LAUS, PITT) | |
| EDWARDS | 82F | PL 110B 82 | +Partridge, Peck+ | (CIT, HARV, PRIN, STAN, SLAC) | |
| DELFOSSE | 81 | NP B183 349 | +Guisan, Martin, Muhlemann, Weill+ | (GEVA, LAUS) | |
| EVANGELISTA | 81 | NP B178 197 | + | (BARI, BONN, CERN, DARE, LIVP+) | |
| CHABAUD | 80 | NP B175 189 | +Hyams, Papadopoulou+ | (CERN, MPIM, AMST) | |
| DAUM | 80C | PL 89B 276 | +Hertzberger+ | (AMST, CERN, CRAC, MPIM, OXF+) | JP |
| BALTAY | 78B | PR D17 62 | +Cautis, Cohen, Csorna+ | (COLU, BING) | |
| CHABAUD | 78 | NP B145 349 | +Hyams, Jones, Weilhammer, Blum+ | (CERN, MPIM) | |
| FERRERSORIA | 78 | PL 74B 287 | +Treille+ | (ORSAY, CERN, CDEF, EPOL) | |
| HYAMS | 78 | NP B146 303 | +Jones, Weilhammer, Blum+ | (CERN, MPIM, ATEN) | |
| MARTIN | 78D | PL 74B 417 | +Ozmutlu, Baldi, Bohringer, Dorsaz+ | (DURH, GEVA) | JP |
| MAY | 77 | PR D16 1983 | +Abramson, Andrews, Busnello+ | (ROCH, CORN) | |
| FORINO | 76 | NC 35A 465 | +Gessaroli+ | (BGNA, FIRZ, GENO, MILA, OXF, PAVI) | |
| MARGULIE | 76 | PR D14 667 | +Kramer, Foley, Love, Lindenbaum+ | (BNL, CUNY) | |
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| DIAZ | 74 | PRL 32 260 | +Dibianca, Fickinger, Anderson+ | (CASE, CMU) | |
| KARSHON | 74 | PRL 32 852 | +Mikenberg, Pitluck, Eisenberg, Ronat+ | (REHO) | |
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| CHALOUPKA | 73 | PL 44B 211 | +Dobrzynski, Ferrando, Losty+ | (CERN) | |
| CONFORTO | 73 | PL 45B 154 | +Mobley, Key+ | (EFI, FNAL, TNTO, WISC) | |
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| EISENSTEIN | 73 | PR D7 278 | +Schultz, Ascoli, Ioffredo+ | (ILL) | |
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| TOET | 73 | NP B63 248 | +Thuan, Major+ | (NIJM, BONN, DURH, TORI) | |
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| BARNHAM | 71 | PRL 26 1494 | +Abrams, Butler, Coyne, Goldhaber, Hall+ | (LBL) | |
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