NODE=M075

# $\pi(1800)$ $\quad I^G(J^{PC}) = 1^-(0^{-+})$

See also minireview under non-$q\overline{q}$ candidates in PDG 06, Journal of Physics, G **33** 1 (2006).

NODE=M075

## $\pi(1800)$ MASS

NODE=M075205

NODE=M075M

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **1816±14 OUR AVERAGE** | | Error includes scale factor of 2.3. See the ideogram below. | | | | |
| 1876±18±16 | 4k | [1] EUGENIO | 08 | B852 | − | 18 $\pi^- p \to \eta\eta\pi^- p$ |
| 1774±18±20 | | [2] CHUNG | 02 | B852 | | 18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$ |
| 1863± 9±10 | | [3] CHUNG | 02 | B852 | | 18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$ |
| 1840±10±10 | 1200 | AMELIN | 96B | VES | − | 37 $\pi^- A \to \eta\eta\pi^- A$ |
| 1775± 7±10 | | [4] AMELIN | 95B | VES | − | 36 $\pi^- A \to \pi^+\pi^-\pi^- A$ |
| 1790±14 | | [5] BERDNIKOV | 94 | VES | − | 37 $\pi^- A \to K^+ K^- \pi^- A$ |
| 1873±33±20 | | BELADIDZE | 92C | VES | − | 36 $\pi^-$ Be $\to \pi^- \eta' \eta$ Be |
| 1814±10±23 | 426 ± 57 | BITYUKOV | 91 | VES | − | 36 $\pi^-$ C $\to \pi^- \eta\eta$ C |
| 1770±30 | 1100 | BELLINI | 82 | SPEC | − | 40 $\pi^-$ A $\to 3\pi$ A |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 1737± 5±15 | | AMELIN | 99 | VES | | 37 $\pi^- A \to \omega\pi^-\pi^0 A^*$ |

OCCUR=2

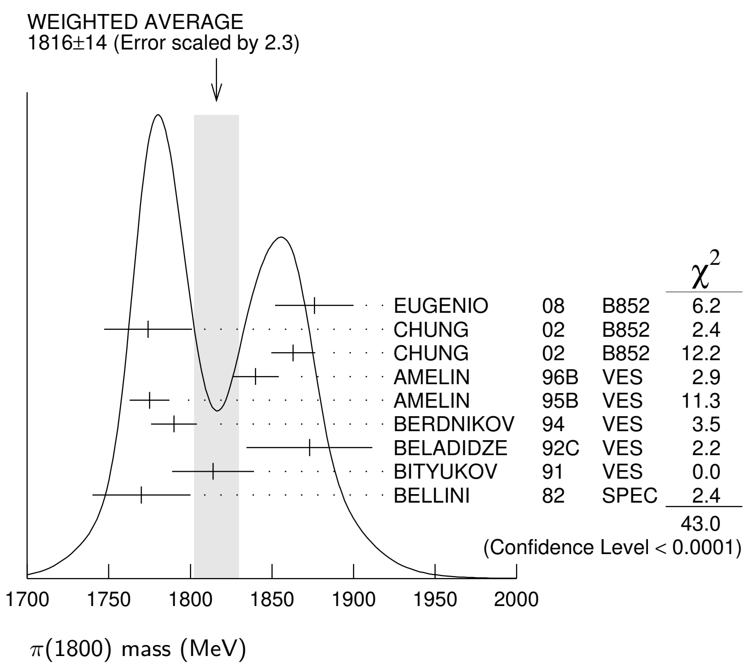
[1] From a single-pole fit. NODE=M075M;LINKAGE=SP

[2] In the $f_0(980)\pi$ wave. NODE=M075M;LINKAGE=C1

[3] In the $f_0(600)\pi$ wave. NODE=M075M;LINKAGE=C2

[4] From a fit to $J^{PC} = 0^{-+}$ $f_0(980)\pi$, $f_0(1370)\pi$ waves. NODE=M075M;LINKAGE=AX

[5] From a fit to $J^{PC} = 0^{-+}$ $K_0^*(1430)K^-$ and $f_0(980)\pi^-$ waves. NODE=M075M;LINKAGE=A




$\pi(1800)$ mass (MeV)

## $\pi(1800)$ WIDTH

NODE=M075210

NODE=M075W

| *VALUE* (MeV) | *EVTS* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| **208±12 OUR AVERAGE** | | | | | | |
| 221±26±38 | 4k | [6] EUGENIO | 08 | B852 | − | 18 $\pi^- p \to \eta\eta\pi^- p$ |
| 223±48±50 | | [7] CHUNG | 02 | B852 | | 18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$ |
| 191±21±20 | | [8] CHUNG | 02 | B852 | | 18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$ |
| 210±30±30 | 1200 | AMELIN | 96B | VES | − | 37 $\pi^- A \to \eta\eta\pi^- A$ |
| 190±15±15 | | [9] AMELIN | 95B | VES | − | 36 $\pi^- A \to \pi^+\pi^-\pi^- A$ |

OCCUR=2

| | | | | | | |
|---|---|---|---|---|---|---|
| $210 \pm 70$ | | [10] BERDNIKOV | 94 | VES | − | 37 $\pi^- A \rightarrow K^+ K^- \pi^- A$ |
| $225 \pm 35 \pm 20$ | | BELADIDZE | 92C | VES | − | 36 $\pi^-$ Be $\rightarrow \pi^- \eta' \eta$ Be |
| $205 \pm 18 \pm 32$ | $426 \pm 57$ | BITYUKOV | 91 | VES | − | 36 $\pi^-$ C $\rightarrow \pi^- \eta \eta$ C |
| $310 \pm 50$ | 1100 | BELLINI | 82 | SPEC | − | 40 $\pi^-$ A $\rightarrow 3\pi$ A |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $259 \pm 19 \pm 6$ | | AMELIN | 99 | VES | | 37 $\pi^- A \rightarrow \omega \pi^- \pi^0 A^*$ |

[6] From a single-pole fit. NODE=M075W;LINKAGE=SP

[7] In the $f_0(980)\pi$ wave. NODE=M075W;LINKAGE=C1

[8] In the $f_0(600)\pi$ wave. NODE=M075W;LINKAGE=C2

[9] From a fit to $J^{PC} = 0^{-+}$ $f_0(980)\pi$, $f_0(1370)\pi$ waves. NODE=M075W;LINKAGE=AX

[10] From a fit to $J^{PC} = 0^{-+}$ $K_0^*(1430) K^-$ and $f_0(980)\pi^-$ waves. NODE=M075W;LINKAGE=A

## $\pi(1800)$ DECAY MODES

NODE=M075215;NODE=M075

| | Mode | Fraction ($\Gamma_i/\Gamma$) | |
|---|---|---|---|
| $\Gamma_1$ | $\pi^+ \pi^- \pi^-$ | seen | DESIG=10;OUR EST;→ NOT CHECKED ← |
| $\Gamma_2$ | $f_0(600)\pi^-$ | seen | DESIG=11;OUR EST;→ NOT CHECKED ← |
| $\Gamma_3$ | $f_0(980)\pi^-$ | seen | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $\Gamma_4$ | $f_0(1370)\pi^-$ | seen | DESIG=1 |
| $\Gamma_5$ | $f_0(1500)\pi^-$ | not seen | DESIG=12 |
| $\Gamma_6$ | $\rho\pi^-$ | not seen | DESIG=2 |
| $\Gamma_7$ | $\eta\eta\pi^-$ | seen | DESIG=7;OUR EST;→ NOT CHECKED ← |
| $\Gamma_8$ | $a_0(980)\eta$ | seen | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $\Gamma_9$ | $a_2(1320)\eta$ | not seen | DESIG=13 |
| $\Gamma_{10}$ | $f_2(1270)\pi$ | not seen | DESIG=14 |
| $\Gamma_{11}$ | $f_0(1370)\pi^-$ | not seen | DESIG=15 |
| $\Gamma_{12}$ | $f_0(1500)\pi^-$ | seen | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $\Gamma_{13}$ | $\eta\eta'(958)\pi^-$ | seen | DESIG=8;OUR EST;→ NOT CHECKED ← |
| $\Gamma_{14}$ | $K_0^*(1430) K^-$ | seen | DESIG=4 |
| $\Gamma_{15}$ | $K^*(892) K^-$ | not seen | DESIG=9 |

## $\pi(1800)$ BRANCHING RATIOS

NODE=M075220

### $\Gamma(f_0(980)\pi^-)/\Gamma(f_0(600)\pi^-)$ $\Gamma_3/\Gamma_2$

NODE=M075R11
NODE=M075R11

| *VALUE* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **0.44±0.08±0.38** | [11] CHUNG | 02 | B852 | 18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$ |

### $\Gamma(f_0(980)\pi^-)/\Gamma(f_0(1370)\pi^-)$ $\Gamma_3/\Gamma_4$

NODE=M075R5
NODE=M075R5

| *VALUE* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $1.7 \pm 1.3$ | [12] AMELIN | 95B | VES | − | 36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$ |

### $\Gamma(f_0(1370)\pi^-)/\Gamma_{total}$ $\Gamma_4/\Gamma$

NODE=M075R1
NODE=M075R1

| *VALUE* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| **seen** | BELLINI | 82 | SPEC | − | 40 $\pi^-$ A $\rightarrow 3\pi$ A |

### $\Gamma(f_0(1500)\pi^-)/\Gamma_{total}$ $\Gamma_5/\Gamma$

NODE=M075R12
NODE=M075R12

| *VALUE* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **not seen** | CHUNG | 02 | B852 | 18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$ |

### $\Gamma(\rho\pi^-)/\Gamma_{total}$ $\Gamma_6/\Gamma$

NODE=M075R2
NODE=M075R2

| *VALUE* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|
| **not seen** | BELLINI | 82 | SPEC | − | 40 $\pi^-$ A $\rightarrow 3\pi$ A |

### $\Gamma(\rho\pi^-)/\Gamma(f_0(980)\pi^-)$ $\Gamma_6/\Gamma_3$

NODE=M075R6
NODE=M075R6

| *VALUE* | *CL%* | *DOCUMENT ID* | | *TECN* | *CHG* | *COMMENT* |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $<0.25$ | | CHUNG | 02 | B852 | | 18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$ |
| $<0.14$ | 90 | AMELIN | 95B | VES | − | 36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$ |

### $\Gamma(\eta\eta\pi^-)/\Gamma(\pi^+\pi^-\pi^-)$ — $\Gamma_7/\Gamma_1$

NODE=M075R8
NODE=M075R8

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $0.5\pm0.1$ | 1200 | [12] AMELIN | 96B | VES | $-$ | $37\ \pi^- A \to \eta\eta\pi^- A$ |

### $\Gamma(a_2(1320)\eta)/\Gamma_{total}$ — $\Gamma_9/\Gamma$

NODE=M075R13
NODE=M075R13

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **not seen** | EUGENIO | 08 | B852 | $18\ \pi^- p \to \eta\eta\pi^- p$ |

### $\Gamma(f_2(1270)\pi)/\Gamma_{total}$ — $\Gamma_{10}/\Gamma$

NODE=M075R14
NODE=M075R14

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **not seen** | EUGENIO | 08 | B852 | $18\ \pi^- p \to \eta\eta\pi^- p$ |

### $\Gamma(f_0(1370)\pi^-)/\Gamma_{total}$ — $\Gamma_{11}/\Gamma$

NODE=M075R15
NODE=M075R15

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **not seen** | EUGENIO | 08 | B852 | $18\ \pi^- p \to \eta\eta\pi^- p$ |

### $\Gamma(f_0(1500)\pi^-)/\Gamma(a_0(980)\eta)$ — $\Gamma_{12}/\Gamma_8$

NODE=M075R7
NODE=M075R7

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $0.48\ \pm0.17$ | 4k | [12,13] EUGENIO | 08 | B852 | $-$ | $18\ \pi^- p \to \eta\eta\pi^- p$ |
| $0.030^{+0.014}_{-0.011}$ | | [12] ANISOVICH | 01B | SPEC | 0 | $0.6–1.94\ p\overline{p} \to \eta\eta\pi^0\pi^0$ |
| $0.08\ \pm0.03$ | 1200 | [12,14] AMELIN | 96B | VES | $-$ | $37\ \pi^- A \to \eta\eta\pi^- A$ |

### $\Gamma(\eta\eta'(958)\pi^-)/\Gamma(\eta\eta\pi^-)$ — $\Gamma_{13}/\Gamma_7$

NODE=M075R10
NODE=M075R10

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $0.29\pm0.07$ | | [12] BELADIDZE | 92C | VES | $-$ | $36\ \pi^-$ Be $\to \pi^-\eta'\eta$ Be |
| $0.3\ \pm0.1$ | $426\pm57$ | [12] BITYUKOV | 91 | VES | $-$ | $36\ \pi^-$ C $\to \pi^-\eta\eta$ C |

### $\Gamma(K_0^*(1430)K^-)/\Gamma_{total}$ — $\Gamma_{14}/\Gamma$

NODE=M075R4
NODE=M075R4

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **seen** | BERDNIKOV | 94 | VES | $-$ | $37\ \pi^- A \to K^+K^-\pi^- A$ |

### $\Gamma(K^*(892)K^-)/\Gamma_{total}$ — $\Gamma_{15}/\Gamma$

NODE=M075R9
NODE=M075R9

| VALUE | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| **not seen** | BERDNIKOV | 94 | VES | $-$ | $37\ \pi^- A \to K^+K^-\pi^- A$ |

[11] Assuming that $f_0(980)$ decays only to $\pi\pi$. NODE=M075R;LINKAGE=CK
[12] Systematic errors not estimated. NODE=M075R5;LINKAGE=NS
[13] From a single-pole fit. NODE=M075R7;LINKAGE=SP
[14] Assuming that $f_0(1500)$ decays only to $\eta\eta$ and $a_0(980)$ decays only to $\eta\pi$. NODE=M075R7;LINKAGE=A

## $\pi(1800)$ REFERENCES

NODE=M075


| | | | | | |
|---|---|---|---|---|---|
| EUGENIO | 08 | PL B660 466 | P. Eugenio *et al.* | (BNL E852 Collab.) | REFID=52160 |
| PDG | 06 | JPG 33 1 | W.-M. Yao *et al.* | (PDG Collab.) | REFID=51004 |
| CHUNG | 02 | PR D65 072001 | S.U. Chung *et al.* | (BNL E852 Collab.) | REFID=48837 |
| ANISOVICH | 01B | PL B500 222 | A.V. Anisovich *et al.* | | REFID=48318 |
| AMELIN | 99 | PAN 62 445 Translated from YAF 62 487. | D.V. Amelin *et al.* | (VES Collab.) | REFID=46910 |
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| AMELIN | 95B | PL B356 595 | D.V. Amelin *et al.* | (SERP, TBIL) | REFID=44433 |
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| BELADIDZE | 92C | SJNP 55 1535 Translated from YAF 55 2748. | G.M. Beladidze, S.I. Bityukov, G.V. Borisov | (SERP+) | REFID=43175 |
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## OTHER RELATED PAPERS


| | | | | | |
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| EBERT | 05 | MPL A20 1887 | D. Ebert, R.N. Faustov, V.O. Galkin | | REFID=50792 |
| ZAIMIDOROGA | 99 | PAN 30 1 Translated from SJPN 30 5. | O.A. Zaimidoroga | | REFID=46907 |
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