### $f_4$(2300) WIDTH

**$\overline{p}p \to \pi\pi$ or $\overline{K}K$**

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $\sim$ 200 | [7] MARTIN | 80C | RVUE | |
| $\sim$ 150 | [8] CARTER | 78B | CNTR | 0.7–2.4 $\overline{p}p \to K^-K^+$ |
| $\sim$ 210 | [9] CARTER | 77 | CNTR | 0.7–2.4 $\overline{p}p \to \pi\pi$ |

[7] $I(J^P) = 0(4^+)$ from simultaneous analysis of $p\overline{p} \to \pi^-\pi^+$ and $\pi^0\pi^0$.
[8] $I(J^P) = 0(4^+)$ from Barrelet-zero analysis.
[9] $I(J^P) = 0(4^+)$ from amplitude analysis.

**S-CHANNEL $\overline{p}p$ or $\overline{N}N$**

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $135.0^{+150.0}_{-\ 65.0}$ | [10,11] COUPLAND | 77 | CNTR | 0.7–2.4 $\overline{p}p \to \overline{p}p$ |
| $165\ ^{+\ 18}_{-\ \ 8}$ | [11] ALSPECTOR | 73 | CNTR | $\overline{p}p$ S channel |
| $\sim$ 190 | ABRAMS | 70 | CNTR | S channel $\overline{N}N$ |

[10] From a fit to the total elastic cross section.
[11] Isospins 0 and 1 not separated.

### $f_4$(2300) REFERENCES


| | | | | |
|---|---|---|---|---|
| MARTIN | 80B | NP B176 355 | +Morgan | (LOUC, RHEL) JP |
| MARTIN | 80C | NP B169 216 | +Pennington | (DURH) JP |
| CARTER | 78B | NP B141 467 | | (LOQM) |
| CUTTS | 78B | PR D17 16 | +Good, Grannis, Green, Lee+ | (STON, WISC) |
| DULUDE | 78B | PL 79B 335 | +Lanou, Massimo, Peaslee+ | (BROW, MIT, BARI) JP |
| CARTER | 77 | PL 67B 117 | +Coupland, Eisenhandler, Astbury+ | (LOQM, RHEL) JP |
| COUPLAND | 77 | PL 71B 460 | +Eisenhandler, Gibson, Astbury+ | (LOQM, RHEL) |
| ALSPECTOR | 73 | PRL 30 511 | +Cohen, Cvijanovich+ | (RUTG, UPNJ) |
| ABRAMS | 70 | PR D1 1917 | +Cool, Giacomelli, Kycia, Leontic, Li+ | (BNL) |


#### OTHER RELATED PAPERS


| | | | | |
|---|---|---|---|---|
| FIELDS | 71 | PRL 27 1749 | +Cooper, Rhines, Allison | (ANL, OXF) |
| YOH | 71 | PRL 26 922 | +Barish, Caroll, Lobkowicz+ | (CIT, BNL, ROCH) |
| BRICMAN | 69 | PL 29B 451 | +Ferro-Luzzi, Bizard+ | (CERN, CAEN, SACL) |


## $f_2(2340)$

$I^G(J^{PC}) = 0^+(2^{++})$

See also the mini-review under non-$q\overline{q}$ candidates. (See the index for the page number.)

### $f_2$(2340) MASS

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **2339 ±55** | [1] ETKIN | 88 | MPS | 22 $\pi^- p \to \phi\phi n$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 2392.0±10.0 | BOOTH | 86 | OMEG | 85 $\pi^-$ Be $\to 2\phi$Be |
| 2360.0±20.0 | LINDENBAUM | 84 | RVUE | |

[1] Includes data of ETKIN 85. The percentage of the resonance going into $\phi\phi$ $2^{++}$ $S_2$, $D_2$, and $D_0$ is 37 ± 19, $4^{+12}_{-\ 4}$, and $59^{+21}_{-19}$, respectively.

### $f_2$(2340) WIDTH

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **$319\ ^{+\ 81}_{-\ 69}$** | [2] ETKIN | 88 | MPS | 22 $\pi^- p \to \phi\phi n$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 198.0± 50.0 | BOOTH | 86 | OMEG | 85 $\pi^-$ Be $\to 2\phi$Be |
| $150.0^{+150.0}_{-\ 50.0}$ | LINDENBAUM | 84 | RVUE | |

[2] Includes data of ETKIN 85.

### $f_2$(2340) DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $\phi\phi$ | seen |

### $f_2$(2340) REFERENCES


| | | | | |
|---|---|---|---|---|
| ETKIN | 88 | PL B201 568 | +Foley, Lindenbaum+ | (BNL, CUNY) |
| BOOTH | 86 | NP B273 677 | +Carroll, Donald, Edwards+ | (LIVP, GLAS, CERN) |
| ETKIN | 85 | PL 165B 217 | +Foley, Longacre, Lindenbaum+ | (BNL, CUNY) |
| LINDENBAUM | 84 | CNPP 13 285 | | (CUNY) |


#### OTHER RELATED PAPERS


| | | | | |
|---|---|---|---|---|
| ARMSTRONG | 89B | PL B221 221 | +Benayoun+ | (CERN, CDEF, BIRM, BARI, ATHU, CURIN+) |
| GREEN | 86 | PRL 56 1639 | +Lai+ | (FNAL, ARIZ, FSU, NDAM, TUFTS, VAND+) |
| BOOTH | 84 | NP B242 51 | +Ballance, Carroll, Donald+ | (LIVP, GLAS, CERN) |


## $\rho_5(2350)$

$I^G(J^{PC}) = 1^+(5^{--})$

OMITTED FROM SUMMARY TABLE

This entry was previously called $U_1(2400)$. Contains results only from formation experiments. For production experiments see the $\overline{N}N$(1100–3600) entry. See also $\rho(2150)$, $f_2(2150)$, $\rho_3(2250)$, $f_4(2300)$.

### $\rho_5$(2350) MASS

**$\overline{p}p \to \pi\pi$ or $\overline{K}K$**

| VALUE (MeV) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $\sim$ 2300 | [1] MARTIN | 80B | RVUE | | |
| $\sim$ 2250 | [1] MARTIN | 80C | RVUE | | |
| $\sim$ 2500 | [2] CARTER | 78B | CNTR | 0 | 0.7–2.4 $\overline{p}p \to K^-K^+$ |
| $\sim$ 2480 | [3] CARTER | 77 | CNTR | 0 | 0.7–2.4 $\overline{p}p \to \pi\pi$ |

[1] $I(J^P) = 1(5^-)$ from simultaneous analysis of $p\overline{p} \to \pi^-\pi^+$ and $\pi^0\pi^0$.
[2] $I = 0(1)$; $J^P = 5^-$ from Barrelet-zero analysis.
[3] $I(J^P) = 1(5^-)$ from amplitude analysis.

**S-CHANNEL $\overline{N}N$**

| VALUE (MeV) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $\sim$ 2380 | [4] CUTTS | 78B | CNTR | | 0.97–3 $\overline{p}p \to \overline{N}N$ |
| 2345.0±15.0 | [4,5] COUPLAND | 77 | CNTR | 0 | 0.7–2.4 $\overline{p}p \to \overline{p}p$ |
| 2359 ± 2 | [4,6] ALSPECTOR | 73 | CNTR | | $\overline{p}p$ S channel |
| 2350 ±10 | [7] ABRAMS | 70 | CNTR | | S channel $\overline{N}N$ |
| 2360.0±25.0 | [8] OH | 70B | HDBC | $-$0 | $\overline{p}(pn)$, $K^*K2\pi$ |

[4] Isospins 0 and 1 not separated.
[5] From a fit to the total elastic cross section.
[6] Referred to as $U$ or $U$ region by ALSPECTOR 73.
[7] For $I = 1$ $\overline{N}N$.
[8] No evidence for this bump seen in the $\overline{p}p$ data of CHAPMAN 71B. Narrow state not confirmed by OH 73 with more data.

### $\rho_5$(2350) WIDTH

**$\overline{p}p \to \pi\pi$ or $\overline{K}K$**

| VALUE (MeV) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $\sim$ 250 | [9] MARTIN | 80B | RVUE | | |
| $\sim$ 300 | [9] MARTIN | 80C | RVUE | | |
| $\sim$ 150 | [10] CARTER | 78B | CNTR | 0 | 0.7–2.4 $\overline{p}p \to K^-K^+$ |
| $\sim$ 210 | [11] CARTER | 77 | CNTR | 0 | 0.7–2.4 $\overline{p}p \to \pi\pi$ |

[9] $I(J^P) = 1(5^-)$ from simultaneous analysis of $p\overline{p} \to \pi^-\pi^+$ and $\pi^0\pi^0$.
[10] $I = 0(1)$; $J^P = 5^-$ from Barrelet-zero analysis.
[11] $I(J^P) = 1(5^-)$ from amplitude analysis.

**S-CHANNEL $\overline{N}N$**

| VALUE (MeV) | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $135.0^{+150.0}_{-\ 65.0}$ | [12,13] COUPLAND | 77 | CNTR | 0 | 0.7–2.4 $\overline{p}p \to \overline{p}p$ |
| $165\ ^{+\ 18}_{-\ \ 8}$ | [13] ALSPECTOR | 73 | CNTR | | $\overline{p}p$ S channel |
| $<$ 60.0 | [14] OH | 70B | HDBC | $-$0 | $\overline{p}(pn)$, $K^*K2\pi$ |
| $\sim$ 140 | ABRAMS | 67C | CNTR | | S channel $\overline{p}N$ |

[12] From a fit to the total elastic cross section.
[13] Isospins 0 and 1 not separated.
[14] No evidence for this bump seen in the $\overline{p}p$ data of CHAPMAN 71B. Narrow state not confirmed by OH 73 with more data.

### $\rho_5$(2350) REFERENCES


| | | | | |
|---|---|---|---|---|
| MARTIN | 80B | NP B176 355 | +Morgan | (LOUC, RHEL) JP |
| MARTIN | 80C | NP B169 216 | +Pennington | (DURH) JP |
| CARTER | 78B | NP B141 467 | | (LOQM) |
| CUTTS | 78B | PR D17 16 | +Good, Grannis, Green, Lee+ | (STON, WISC) |
| CARTER | 77 | PL 67B 117 | +Coupland, Eisenhandler, Astbury+ | (LOQM, RHEL) JP |
| COUPLAND | 77 | PL 71B 460 | +Eisenhandler, Gibson, Astbury+ | (LOQM, RHEL) |
| ALSPECTOR | 73 | PRL 30 511 | +Cohen, Cvijanovich+ | (RUTG, UPNJ) |
| OH | 73 | NP B51 57 | +Eastman, MingMa, Parker, Smith+ | (MSU) |
| CHAPMAN | 71B | PR D4 1275 | +Green, Lys, Murphy, Ring+ | (MICH) |
| ABRAMS | 70 | PR D1 1917 | +Cool, Giacomelli, Kycia, Leontic, Li+ | (BNL) |
| OH | 70B | PRL 24 1257 | +Parker, Eastman, Smith, Sprafka, Ma | (MSU) |
| ABRAMS | 67C | PRL 18 1209 | +Cool, Giacomelli, Kycia, Leontic, Li+ | (BNL) |


#### OTHER RELATED PAPERS


| | | | | |
|---|---|---|---|---|
| CASO | 70 | LNC 3 707 | +Conte, Tomasini+ | (GENO, HAMB, MILA, SACL) |
| BRICMAN | 69 | PL 29B 451 | +Ferro-Luzzi, Bizard+ | (CERN, CAEN, SACL) |