# LIGHT UNFLAVORED MESONS ($S = C = B = 0$)

NODE=MXXX005

For $I = 1$ ($\pi$, $b$, $\rho$, $a$): $u\overline{d}$, $(u\overline{u}-d\overline{d})/\sqrt{2}$, $d\overline{u}$;
for $I = 0$ ($\eta$, $\eta'$, $h$, $h'$, $\omega$, $\phi$, $f$, $f'$): $c_1(u\overline{u} + d\overline{d}) + c_2(s\overline{s})$

## $f_0(600)$ [a] or $\sigma$

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

NODE=M014

Mass $m$ = (400–1200) MeV
Full width $\Gamma$ = (600–1000) MeV

NODE=M014M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M014W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $f_0(600)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi\pi$ | dominant | – | NODE=M014215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\gamma\gamma$ | seen | – | DESIG=5;OUR EST;→ NOT CHECKED ← |

## $\rho(770)$ [b]

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

NODE=M009

Mass $m$ = 775.49 ± 0.34 MeV
Full width $\Gamma$ = 149.1 ± 0.8 MeV
$\Gamma_{ee}$ = 7.04 ± 0.06 keV

NODE=M009M0;DTYPE=M
NODE=M009W5;DTYPE=G
NODE=M009W4;DTYPE=E

| $\rho(770)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|---|
| $\pi\pi$ | ∼ 100 | % | | 363 | NODE=M009225;DESIG=1;OUR EVAL; → NOT CHECKED ← |
| **$\rho(770)^\pm$ decays** | | | | | NODE=M009;CLUMP=A |
| $\pi^\pm\gamma$ | ( 4.5 ±0.5 ) | $\times 10^{-4}$ | S=2.2 | 375 | DESIG=3 |
| $\pi^\pm\eta$ | < 6 | $\times 10^{-3}$ | CL=84% | 153 | DESIG=5 |
| $\pi^\pm\pi^+\pi^-\pi^0$ | < 2.0 | $\times 10^{-3}$ | CL=84% | 254 | DESIG=21 |
| **$\rho(770)^0$ decays** | | | | | NODE=M009;CLUMP=B |
| $\pi^+\pi^-\gamma$ | ( 9.9 ±1.6 ) | $\times 10^{-3}$ | | 362 | DESIG=60 |
| $\pi^0\gamma$ | ( 6.0 ±0.8 ) | $\times 10^{-4}$ | | 376 | DESIG=40 |
| $\eta\gamma$ | ( 3.00±0.20 ) | $\times 10^{-4}$ | | 194 | DESIG=8 |
| $\pi^0\pi^0\gamma$ | ( 4.5 ±0.8 ) | $\times 10^{-5}$ | | 363 | DESIG=80 |
| $\mu^+\mu^-$ | [c] ( 4.55±0.28 ) | $\times 10^{-5}$ | | 373 | DESIG=6 |
| $e^+e^-$ | [c] ( 4.72±0.05 ) | $\times 10^{-5}$ | | 388 | DESIG=4 |
| $\pi^+\pi^-\pi^0$ | ( $1.01^{+0.54}_{-0.36}\pm0.34$ ) | $\times 10^{-4}$ | | 323 | DESIG=7;OUR EVAL;→ NOT CHECKED ← |
| $\pi^+\pi^-\pi^+\pi^-$ | ( 1.8 ±0.9 ) | $\times 10^{-5}$ | | 251 | DESIG=22 |
| $\pi^+\pi^-\pi^0\pi^0$ | < 4 | $\times 10^{-5}$ | CL=90% | 257 | DESIG=30 |
| $\pi^0e^+e^-$ | < 1.2 | $\times 10^{-5}$ | CL=90% | 376 | DESIG=9 |

## $\omega(782)$

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

NODE=M001

Mass $m$ = 782.65 ± 0.12 MeV (S = 1.9)
Full width $\Gamma$ = 8.49 ± 0.08 MeV
$\Gamma_{ee}$ = 0.60 ± 0.02 keV

NODE=M001M;DTYPE=M
NODE=M001W;DTYPE=G
NODE=M001W7;DTYPE=E;OUR EVAL; → NOT CHECKED ←

| $\omega(782)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\pi^+\pi^-\pi^0$ | (89.2 ±0.7 ) % | | 327 | NODE=M001215;DESIG=1 |
| $\pi^0\gamma$ | ( 8.28±0.28) % | S=2.1 | 380 | DESIG=3 |
| $\pi^+\pi^-$ | ( $1.53^{+0.11}_{-0.13}$) % | S=1.2 | 366 | DESIG=2 |
| neutrals (excluding $\pi^0\gamma$) | ( $8^{+8}_{-5}$ ) $\times 10^{-3}$ | S=1.1 | – | DESIG=13 |
| $\eta\gamma$ | ( 4.6 ±0.4 ) $\times 10^{-4}$ | S=1.1 | 200 | DESIG=6 |
| $\pi^0 e^+ e^-$ | ( 7.7 ±0.6 ) $\times 10^{-4}$ | | 380 | DESIG=14 |
| $\pi^0\mu^+\mu^-$ | ( 9.6 ±2.3 ) $\times 10^{-5}$ | | 349 | DESIG=11 |
| $e^+e^-$ | ( 7.28±0.14) $\times 10^{-5}$ | S=1.3 | 391 | DESIG=7 |
| $\pi^+\pi^-\pi^0\pi^0$ | < 2 % | CL=90% | 262 | DESIG=12 |
| $\pi^+\pi^-\gamma$ | < 3.6 $\times 10^{-3}$ | CL=95% | 366 | DESIG=4 |
| $\pi^+\pi^-\pi^+\pi^-$ | < 1 $\times 10^{-3}$ | CL=90% | 256 | DESIG=15 |
| $\pi^0\pi^0\gamma$ | ( 6.6 ±1.1 ) $\times 10^{-5}$ | | 367 | DESIG=5 |
| $\eta\pi^0\gamma$ | < 3.3 $\times 10^{-5}$ | CL=90% | 162 | DESIG=17 |
| $\mu^+\mu^-$ | ( 9.0 ±3.1 ) $\times 10^{-5}$ | | 377 | DESIG=8 |
| $3\gamma$ | < 1.9 $\times 10^{-4}$ | CL=95% | 391 | DESIG=10 |
| **Charge conjugation ($C$) violating modes** | | | | NODE=M001;CLUMP=A |
| $\eta\pi^0$ $C$ | < 1 $\times 10^{-3}$ | CL=90% | 162 | DESIG=9 |
| $3\pi^0$ $C$ | < 3 $\times 10^{-4}$ | CL=90% | 330 | DESIG=16 |

## $\eta'(958)$

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

NODE=M002

Mass $m = 957.78 \pm 0.06$ MeV — NODE=M002M;DTYPE=M

Full width $\Gamma = 0.204 \pm 0.015$ MeV (S = 1.2) — NODE=M002W;DTYPE=G

$c$ $C$-violating decay parameter = $0.015 \pm 0.018$ — NODE=M002CDP;DTYPE=d

| $\eta'(958)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\pi^+\pi^-\eta$ | (44.6 ±1.4 ) % | S=1.2 | 232 | NODE=M002215;DESIG=1 |
| $\rho^0\gamma$(including non-resonant $\pi^+\pi^-\gamma$) | (29.4 ±0.9 ) % | S=1.1 | 165 | DESIG=9 |
| $\pi^0\pi^0\eta$ | (20.7 ±1.2 ) % | S=1.2 | 239 | DESIG=2 |
| $\omega\gamma$ | ( 3.02±0.31) % | | 159 | DESIG=7 |
| $\gamma\gamma$ | ( 2.10±0.12) % | S=1.2 | 479 | DESIG=6 |
| $3\pi^0$ | ( 1.61±0.23) $\times 10^{-3}$ | S=1.1 | 430 | DESIG=8 |
| $\mu^+\mu^-\gamma$ | ( 1.03±0.26) $\times 10^{-4}$ | | 467 | DESIG=20 |
| $\pi^+\pi^-\mu^+\mu^-$ | < 2.3 $\times 10^{-4}$ | CL=90% | 401 | DESIG=201 |
| $\pi^+\pi^-\pi^0$ | ( $3.7^{+1.1}_{-1.0}$ ) $\times 10^{-3}$ | | 428 | DESIG=121 |
| $\pi^0\rho^0$ | < 4 % | CL=90% | 111 | DESIG=18 |
| $2(\pi^+\pi^-)$ | < 2.5 $\times 10^{-4}$ | CL=90% | 372 | DESIG=131 |
| $\pi^+\pi^-2\pi^0$ | < 2.6 $\times 10^{-3}$ | CL=90% | 376 | DESIG=202 |
| $2(\pi^+\pi^-)$ neutrals | < 1 % | CL=95% | – | DESIG=132 |
| $2(\pi^+\pi^-)\pi^0$ | < 1.9 $\times 10^{-3}$ | CL=90% | 298 | DESIG=141 |
| $2(\pi^+\pi^-)2\pi^0$ | < 1 % | CL=95% | 197 | DESIG=15 |
| $3(\pi^+\pi^-)$ | < 5 $\times 10^{-4}$ | CL=90% | 189 | DESIG=203 |
| $\pi^+\pi^- e^+ e^-$ | ( $2.5^{+1.3}_{-1.0}$ ) $\times 10^{-3}$ | | 458 | DESIG=10 |
| $\gamma e^+ e^-$ | < 9 $\times 10^{-4}$ | CL=90% | 479 | DESIG=28 |
| $\pi^0\gamma\gamma$ | < 8 $\times 10^{-4}$ | CL=90% | 469 | DESIG=24 |
| $4\pi^0$ | < 5 $\times 10^{-4}$ | CL=90% | 380 | DESIG=26 |
| $e^+e^-$ | < 2.1 $\times 10^{-7}$ | CL=90% | 479 | DESIG=150 |
| invisible | < 9 $\times 10^{-4}$ | CL=90% | – | DESIG=200 |

### Charge conjugation ($C$), Parity ($P$), Lepton family number ($LF$) violating modes

NODE=M002;CLUMP=B

| | | | | | | |
|---|---|---|---|---|---|---|
| $\pi^+\pi^-$ | $P,CP$ | $<$ 2.9 | $\times 10^{-3}$ | CL=90% | 458 | DESIG=111 |
| $\pi^0\pi^0$ | $P,CP$ | $<$ 9 | $\times 10^{-4}$ | CL=90% | 459 | DESIG=25 |
| $\pi^0 e^+ e^-$ | $C$ | [$d$] $<$ 1.4 | $\times 10^{-3}$ | CL=90% | 469 | DESIG=16 |
| $\eta e^+ e^-$ | $C$ | [$d$] $<$ 2.4 | $\times 10^{-3}$ | CL=90% | 322 | DESIG=17 |
| $3\gamma$ | $C$ | $<$ 1.0 | $\times 10^{-4}$ | CL=90% | 479 | DESIG=23 |
| $\mu^+\mu^-\pi^0$ | $C$ | [$d$] $<$ 6.0 | $\times 10^{-5}$ | CL=90% | 445 | DESIG=22 |
| $\mu^+\mu^-\eta$ | $C$ | [$d$] $<$ 1.5 | $\times 10^{-5}$ | CL=90% | 273 | DESIG=21 |
| $e\mu$ | $LF$ | $<$ 4.7 | $\times 10^{-4}$ | CL=90% | 473 | DESIG=27 |

## $f_0(980)$ [e]

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

NODE=M003

Mass $m = 980 \pm 10$ MeV
Full width $\Gamma = 40$ to 100 MeV

NODE=M003M1;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M003W1;DTYPE=G;OUR EST; → NOT CHECKED ←

| $f_0(980)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi\pi$ | dominant | 471 | NODE=M003215;DESIG=2;OUR EVAL; → NOT CHECKED ← |
| $K\overline{K}$ | seen | † | DESIG=1;OUR EVAL;→ NOT CHECKED ← |
| $\gamma\gamma$ | seen | 490 | DESIG=5;OUR EVAL;→ NOT CHECKED ← |

## $a_0(980)$ [e]

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

NODE=M036

Mass $m = 980 \pm 20$ MeV
Full width $\Gamma = 50$ to 100 MeV

NODE=M036MX;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M036W1;DTYPE=G;OUR EST; → NOT CHECKED ←

| $a_0(980)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\eta\pi$ | dominant | 319 | NODE=M036215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $K\overline{K}$ | seen | † | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $\gamma\gamma$ | seen | 490 | DESIG=5;OUR EST;→ NOT CHECKED ← |

## $\phi(1020)$

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

NODE=M004

Mass $m = 1019.455 \pm 0.020$ MeV (S = 1.1)
Full width $\Gamma = 4.26 \pm 0.04$ MeV (S = 1.4)

NODE=M004M;DTYPE=M
NODE=M004W;DTYPE=G

| $\phi(1020)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $K^+K^-$ | (48.9 ±0.5 ) % | S=1.1 | 127 | NODE=M004215;DESIG=1 |
| $K^0_L K^0_S$ | (34.2 ±0.4 ) % | S=1.1 | 110 | DESIG=2 |
| $\rho\pi + \pi^+\pi^-\pi^0$ | (15.32 ±0.32 ) % | S=1.1 | – | DESIG=24 |
| $\eta\gamma$ | ( 1.309±0.024) % | S=1.2 | 363 | DESIG=4 |
| $\pi^0\gamma$ | ( 1.27 ±0.06 ) $\times 10^{-3}$ | | 501 | DESIG=7 |
| $\ell^+\ell^-$ | — | | 510 | DESIG=256;OUR EVAL; → NOT CHECKED ← |
| $e^+e^-$ | ( 2.954±0.030) $\times 10^{-4}$ | S=1.1 | 510 | DESIG=5 |
| $\mu^+\mu^-$ | ( 2.87 ±0.19 ) $\times 10^{-4}$ | | 499 | DESIG=6 |
| $\eta e^+e^-$ | ( 1.15 ±0.10 ) $\times 10^{-4}$ | | 363 | DESIG=17 |
| $\pi^+\pi^-$ | ( 7.4 ±1.3 ) $\times 10^{-5}$ | | 490 | DESIG=8 |
| $\omega\pi^0$ | ( 4.7 ±0.5 ) $\times 10^{-5}$ | | 171 | DESIG=25 |
| $\omega\gamma$ | < 5 % | CL=84% | 209 | DESIG=10 |
| $\rho\gamma$ | < 1.2 $\times 10^{-5}$ | CL=90% | 215 | DESIG=12 |
| $\pi^+\pi^-\gamma$ | ( 4.1 ±1.3 ) $\times 10^{-5}$ | | 490 | DESIG=9 |
| $f_0(980)\gamma$ | ( 3.22 ±0.19 ) $\times 10^{-4}$ | S=1.1 | 39 | DESIG=20 |
| $\pi^0\pi^0\gamma$ | ( 1.13 ±0.06 ) $\times 10^{-4}$ | | 492 | DESIG=19 |
| $\pi^+\pi^-\pi^+\pi^-$ | ( 4.0 $^{+2.8}_{-2.2}$ ) $\times 10^{-6}$ | | 410 | DESIG=15 |
| $\pi^+\pi^+\pi^-\pi^-\pi^0$ | < 4.6 $\times 10^{-6}$ | CL=90% | 342 | DESIG=14 |
| $\pi^0 e^+e^-$ | ( 1.12 ±0.28 ) $\times 10^{-5}$ | | 501 | DESIG=21 |
| $\pi^0\eta\gamma$ | ( 8.3 ±0.5 ) $\times 10^{-5}$ | | 346 | DESIG=22 |
| $a_0(980)\gamma$ | ( 7.6 ±0.6 ) $\times 10^{-5}$ | | 39 | DESIG=23 |
| $\eta'(958)\gamma$ | ( 6.25 ±0.21 ) $\times 10^{-5}$ | | 60 | DESIG=194 |
| $\eta\pi^0\pi^0\gamma$ | < 2 $\times 10^{-5}$ | CL=90% | 293 | DESIG=195 |
| $\mu^+\mu^-\gamma$ | ( 1.4 ±0.5 ) $\times 10^{-5}$ | | 499 | DESIG=196 |
| $\rho\gamma\gamma$ | < 1.2 $\times 10^{-4}$ | CL=90% | 215 | DESIG=250 |
| $\eta\pi^+\pi^-$ | < 1.8 $\times 10^{-5}$ | CL=90% | 288 | DESIG=255 |
| $\eta\mu^+\mu^-$ | < 9.4 $\times 10^{-6}$ | CL=90% | 321 | DESIG=26 |

## $h_1(1170)$ $I^G(J^{PC}) = 0^-(1^{+-})$

NODE=M030

Mass $m = 1170 \pm 20$ MeV
Full width $\Gamma = 360 \pm 40$ MeV

NODE=M030M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M030W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $h_1(1170)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\rho\pi$ | seen | 307 | NODE=M030215;DESIG=1;OUR EST; → NOT CHECKED ← |

## $b_1(1235)$ $I^G(J^{PC}) = 1^+(1^{+-})$

NODE=M011

Mass $m = 1229.5 \pm 3.2$ MeV (S = 1.6)
Full width $\Gamma = 142 \pm 9$ MeV (S = 1.2)

NODE=M011M;DTYPE=M
NODE=M011W;DTYPE=G

| $b_1(1235)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\omega\pi$ [$D/S$ amplitude ratio = 0.277 ± 0.027] | dominant | | 348 | NODE=M011215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\pi^\pm\gamma$ | ( 1.6±0.4) $\times 10^{-3}$ | | 607 | DESIG=9 |
| $\eta\rho$ | seen | | † | DESIG=8;OUR EST;→ NOT CHECKED ← |
| $\pi^+\pi^+\pi^-\pi^0$ | < 50 % | 84% | 535 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $(K\overline{K})^\pm\pi^0$ | < 8 % | 90% | 248 | DESIG=71;OUR EST;→ NOT CHECKED ← |
| $K^0_S K^0_L \pi^\pm$ | < 6 % | 90% | 235 | DESIG=73;OUR EST;→ NOT CHECKED ← |
| $K^0_S K^0_S \pi^\pm$ | < 2 % | 90% | 235 | DESIG=72;OUR EST;→ NOT CHECKED ← |
| $\phi\pi$ | < 1.5 % | 84% | 147 | DESIG=5;OUR EST;→ NOT CHECKED ← |

## $a_1(1260)$ [f] $I^G(J^{PC}) = 1^-(1^{++})$

NODE=M010

Mass $m = 1230 \pm 40$ MeV [g]
Full width $\Gamma = 250$ to 600 MeV

NODE=M010M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M010W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $a_1(1260)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $(\rho\pi)_{S-\text{wave}}$ | seen | 353 | NODE=M010215;DESIG=7;OUR EST; → NOT CHECKED ← |
| $(\rho\pi)_{D-\text{wave}}$ | seen | 353 | DESIG=8;OUR EST;→ NOT CHECKED ← |
| $(\rho(1450)\pi)_{S-\text{wave}}$ | seen | † | DESIG=9;OUR EST;→ NOT CHECKED ← |
| $(\rho(1450)\pi)_{D-\text{wave}}$ | seen | † | DESIG=10;OUR EST;→ NOT CHECKED ← |
| $\sigma\pi$ | seen | – | DESIG=16;OUR EST;→ NOT CHECKED ← |
| $f_0(980)\pi$ | not seen | 189 | DESIG=11;OUR EST;→ NOT CHECKED ← |
| $f_0(1370)\pi$ | seen | † | DESIG=12;OUR EST;→ NOT CHECKED ← |
| $f_2(1270)\pi$ | seen | † | DESIG=13;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}^*(892)+$ c.c. | seen | † | DESIG=14;OUR EST;→ NOT CHECKED ← |
| $\pi\gamma$ | seen | 608 | DESIG=4;OUR EST;→ NOT CHECKED ← |

## $f_2(1270)$

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

NODE=M005

Mass $m = 1275.1 \pm 1.2$ MeV (S = 1.1)
Full width $\Gamma = 185.1^{+2.9}_{-2.4}$ MeV (S = 1.5)

NODE=M005M;DTYPE=M
NODE=M005W;DTYPE=G

| $f_2(1270)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\pi\pi$ | $(84.8\ ^{+2.4}_{-1.2})$ % | S=1.2 | 623 | NODE=M005215;DESIG=1 |
| $\pi^+\pi^-2\pi^0$ | $(\ 7.1\ ^{+1.4}_{-2.7})$ % | S=1.3 | 562 | DESIG=3 |
| $K\overline{K}$ | $(\ 4.6\ \pm0.4\ )$ % | S=2.8 | 403 | DESIG=4 |
| $2\pi^+2\pi^-$ | $(\ 2.8\ \pm0.4\ )$ % | S=1.2 | 559 | DESIG=2 |
| $\eta\eta$ | $(\ 4.0\ \pm0.8\ )\times10^{-3}$ | S=2.1 | 326 | DESIG=7 |
| $4\pi^0$ | $(\ 3.0\ \pm1.0\ )\times10^{-3}$ | | 564 | DESIG=9 |
| $\gamma\gamma$ | $(\ 1.64\pm0.19)\times10^{-5}$ | S=1.9 | 638 | DESIG=8 |
| $\eta\pi\pi$ | $<\ 8\ \times10^{-3}$ | CL=95% | 477 | DESIG=6 |
| $K^0K^-\pi^+ +$ c.c. | $<\ 3.4\ \times10^{-3}$ | CL=95% | 293 | DESIG=5 |
| $e^+e^-$ | $<\ 6\ \times10^{-10}$ | CL=90% | 638 | DESIG=10 |

## $f_1(1285)$

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

NODE=M008

Mass $m = 1281.8 \pm 0.6$ MeV (S = 1.6)
Full width $\Gamma = 24.3 \pm 1.1$ MeV (S = 1.4)

NODE=M008M;DTYPE=M
NODE=M008W;DTYPE=G

| $f_1(1285)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $4\pi$ | $(33.1^{+\ 2.1}_{-\ 1.8})$ % | S=1.3 | 568 | NODE=M008215;DESIG=21 |
| $\pi^0\pi^0\pi^+\pi^-$ | $(22.0^{+\ 1.4}_{-\ 1.2})$ % | S=1.3 | 566 | DESIG=22 |
| $2\pi^+2\pi^-$ | $(11.0^{+\ 0.7}_{-\ 0.6})$ % | S=1.3 | 563 | DESIG=20 |
| $\rho^0\pi^+\pi^-$ | $(11.0^{+\ 0.7}_{-\ 0.6})$ % | S=1.3 | 336 | DESIG=191 |
| $\rho^0\rho^0$ | seen | | † | DESIG=23;OUR EST;→ NOT CHECKED ← |
| $4\pi^0$ | $<\ 7\ \times10^{-4}$ | CL=90% | 568 | DESIG=7 |
| $\eta\pi\pi$ | $(52\ \pm16\ )$ % | | 482 | DESIG=3 |
| $a_0(980)\pi$ [ignoring $a_0(980) \to K\overline{K}$] | $(36\ \pm\ 7\ )$ % | | 238 | DESIG=4 |
| $\eta\pi\pi$ [excluding $a_0(980)\pi$] | $(16\ \pm\ 7\ )$ % | | 482 | DESIG=5 |
| $K\overline{K}\pi$ | $(\ 9.0\pm\ 0.4)$ % | S=1.1 | 308 | DESIG=1 |
| $K\overline{K}^*(892)$ | not seen | | † | DESIG=6 |
| $\gamma\rho^0$ | $(\ 5.5\pm\ 1.3)$ % | S=2.8 | 406 | DESIG=13 |
| $\phi\gamma$ | $(\ 7.4\pm\ 2.6)\times10^{-4}$ | | 236 | DESIG=10 |

## $\eta(1295)$

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

NODE=M037

Mass $m = 1294 \pm 4$ MeV (S = 1.6)
Full width $\Gamma = 55 \pm 5$ MeV

NODE=M037M;DTYPE=M
NODE=M037W;DTYPE=G

| $\eta(1295)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) |
|---|---|---|
| $\eta\pi^+\pi^-$ | seen | 487 |
| $a_0(980)\pi$ | seen | 248 |
| $\eta\pi^0\pi^0$ | seen | 490 |
| $\eta(\pi\pi)_{S\text{-wave}}$ | seen | – |

NODE=M037215;DESIG=2;OUR EST; → NOT CHECKED ←
DESIG=1;OUR EST; → NOT CHECKED ←
DESIG=4;OUR EST; → NOT CHECKED ←
DESIG=5;OUR EST; → NOT CHECKED ←

## $\pi(1300)$

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

NODE=M058

Mass $m = 1300 \pm 100$ MeV [g]
Full width $\Gamma = 200$ to 600 MeV

NODE=M058M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M058W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $\pi(1300)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) |
|---|---|---|
| $\rho\pi$ | seen | 404 |
| $\pi(\pi\pi)_{S\text{-wave}}$ | seen | – |

NODE=M058215;DESIG=1;OUR EST; → NOT CHECKED ←
DESIG=3;OUR EST; → NOT CHECKED ←

## $a_2(1320)$

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

NODE=M012

Mass $m = 1318.3 \pm 0.6$ MeV (S = 1.2)
Full width $\Gamma = 107 \pm 5$ MeV [g]

NODE=M012M0;DTYPE=M
NODE=M012W0;DTYPE=G;OUR EST; → NOT CHECKED ←

| $a_2(1320)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) |
|---|---|---|---|
| $3\pi$ | (70.1 ±2.7 ) % | S=1.2 | 624 |
| $\eta\pi$ | (14.5 ±1.2 ) % | | 535 |
| $\omega\pi\pi$ | (10.6 ±3.2 ) % | S=1.3 | 366 |
| $K\overline{K}$ | ( 4.9 ±0.8 ) % | | 437 |
| $\eta'(958)\pi$ | ( 5.3 ±0.9 ) $\times 10^{-3}$ | | 288 |
| $\pi^\pm\gamma$ | ( 2.68±0.31) $\times 10^{-3}$ | | 652 |
| $\gamma\gamma$ | ( 9.4 ±0.7 ) $\times 10^{-6}$ | | 659 |
| $e^+e^-$ | < 6 $\times 10^{-9}$ | CL=90% | 659 |

NODE=M012215;DESIG=1
DESIG=3
DESIG=4
DESIG=2
DESIG=8
DESIG=7
DESIG=9
DESIG=10

## $f_0(1370)$ [e]

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

NODE=M147

Mass $m = 1200$ to 1500 MeV
Full width $\Gamma = 200$ to 500 MeV

NODE=M147M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M147W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $f_0(1370)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) |
|---|---|---|
| $\pi\pi$ | seen | 672 |
| $4\pi$ | seen | 617 |
| $4\pi^0$ | seen | 617 |
| $2\pi^+2\pi^-$ | seen | 612 |
| $\pi^+\pi^-2\pi^0$ | seen | 615 |
| $\rho\rho$ | dominant | † |
| $2(\pi\pi)_{S\text{-wave}}$ | seen | – |
| $\pi(1300)\pi$ | seen | † |
| $a_1(1260)\pi$ | seen | 35 |
| $\eta\eta$ | seen | 411 |
| $K\overline{K}$ | seen | 475 |
| $K\overline{K}n\pi$ | not seen | † |
| $6\pi$ | not seen | 508 |
| $\omega\omega$ | not seen | † |
| $\gamma\gamma$ | seen | 685 |
| $e^+e^-$ | not seen | 685 |

NODE=M147215;DESIG=1;OUR EST; → NOT CHECKED ←
DESIG=10;OUR EST; → NOT CHECKED ←
DESIG=4;OUR EST; → NOT CHECKED ←
DESIG=5;OUR EST; → NOT CHECKED ←
DESIG=6;OUR EST; → NOT CHECKED ←
DESIG=14;OUR EST; → NOT CHECKED ←
DESIG=15;OUR EST; → NOT CHECKED ←
DESIG=16;OUR EVAL; → NOT CHECKED ←
DESIG=17;OUR EVAL; → NOT CHECKED ←
DESIG=2;OUR EST; → NOT CHECKED ←
DESIG=11;OUR EST; → NOT CHECKED ←
DESIG=18;OUR EVAL; → NOT CHECKED ←
DESIG=19;OUR EVAL; → NOT CHECKED ←
DESIG=20;OUR EVAL; → NOT CHECKED ←
DESIG=12;OUR EST; → NOT CHECKED ←
DESIG=13;OUR EST; → NOT CHECKED ←

## $\pi_1(1400)$ [h]

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

NODE=M111

Mass $m = 1351 \pm 30$ MeV (S = 2.0)
Full width $\Gamma = 313 \pm 40$ MeV

NODE=M111M;DTYPE=M
NODE=M111W;DTYPE=G

| $\pi_1(1400)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\eta\pi^0$ | seen | 555 | NODE=M111215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\eta\pi^-$ | seen | 554 | DESIG=4;OUR EST;→ NOT CHECKED ← |

## $\eta(1405)$ [i]

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

NODE=M027

Mass $m = 1409.8 \pm 2.5$ MeV [g] (S = 2.2)
Full width $\Gamma = 51.1 \pm 3.4$ MeV [g] (S = 2.0)

NODE=M027MX;DTYPE=M
NODE=M027WX;DTYPE=G

| $\eta(1405)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $K\overline{K}\pi$ | seen | | 425 | NODE=M027215;DESIG=2;OUR EST; → NOT CHECKED ← |
| $\eta\pi\pi$ | seen | | 563 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $a_0(980)\pi$ | seen | | 345 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $\eta(\pi\pi)_S$-wave | seen | | – | DESIG=9;OUR EST;→ NOT CHECKED ← |
| $f_0(980)\eta$ | seen | | † | DESIG=10;OUR EST;→ NOT CHECKED ← |
| $4\pi$ | seen | | 639 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $\rho\rho$ | <58 % | 99.85% | † | DESIG=12 |
| $K^*(892)K$ | seen | | 125 | DESIG=11;OUR EST;→ NOT CHECKED ← |

## $f_1(1420)$ [j]

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

NODE=M006

Mass $m = 1426.4 \pm 0.9$ MeV (S = 1.1)
Full width $\Gamma = 54.9 \pm 2.6$ MeV

NODE=M006M2;DTYPE=M
NODE=M006W;DTYPE=G

| $f_1(1420)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}\pi$ | dominant | 438 | NODE=M006215;DESIG=2;OUR EST; → NOT CHECKED ← |
| $K\overline{K}^*(892)+$ c.c. | dominant | 163 | DESIG=1;OUR EST;→ NOT CHECKED ← |
| $\eta\pi\pi$ | possibly seen | 573 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $\phi\gamma$ | seen | 349 | DESIG=9;OUR EST;→ NOT CHECKED ← |

## $\omega(1420)$ [k]

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

NODE=M125

Mass $m$ (1400–1450) MeV
Full width $\Gamma$ (180–250) MeV

NODE=M125M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M125W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $\omega(1420)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\rho\pi$ | dominant | 486 | NODE=M125215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\omega\pi\pi$ | seen | 444 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $b_1(1235)\pi$ | seen | 125 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $e^+e^-$ | seen | 710 | DESIG=3;OUR EST;→ NOT CHECKED ← |

## $a_0(1450)$ [e]

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

NODE=M149

Mass $m = 1474 \pm 19$ MeV
Full width $\Gamma = 265 \pm 13$ MeV

NODE=M149M;DTYPE=M
NODE=M149W;DTYPE=G

| $a_0(1450)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi\eta$ | seen | 627 | NODE=M149215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\pi\eta'(958)$ | seen | 410 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}$ | seen | 547 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $\omega\pi\pi$ | seen | 484 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $a_0(980)\pi\pi$ | seen | 342 | DESIG=5 |

## $\rho(1450)$ [l]

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

NODE=M105

Mass $m = 1465 \pm 25$ MeV [g]
Full width $\Gamma = 400 \pm 60$ MeV [g]

NODE=M105M0;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M105W0;DTYPE=G;OUR EST; → NOT CHECKED ←

| $\rho(1450)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi\pi$ | seen | 720 | NODE=M105215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $4\pi$ | seen | 669 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $e^+e^-$ | seen | 732 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $\eta\rho$ | possibly seen | 310 | DESIG=3;OUR EVAL;→ NOT CHECKED ← |
| $a_2(1320)\pi$ | not seen | 55 | DESIG=8;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}$ | not seen | 541 | DESIG=7;OUR EVAL;→ NOT CHECKED ← |
| $K\overline{K}^*(892)+$ c.c. | possibly seen | 229 | DESIG=15;OUR EST;→ NOT CHECKED ← |
| $\eta\gamma$ | possibly seen | 630 | DESIG=9;OUR EST;→ NOT CHECKED ← |

## $\eta(1475)$ [i]

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

NODE=M175

Mass $m = 1476 \pm 4$ MeV (S = 1.3)
Full width $\Gamma = 85 \pm 9$ MeV (S = 1.5)

NODE=M175M5;DTYPE=M
NODE=M175W5;DTYPE=G

| $\eta(1475)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}\pi$ | dominant | 477 | NODE=M175215;DESIG=2;OUR EST; → NOT CHECKED ← |
| $K\overline{K}^*(892)+$ c.c. | seen | 245 | DESIG=1;OUR EST;→ NOT CHECKED ← |
| $a_0(980)\pi$ | seen | 396 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $\gamma\gamma$ | seen | 738 | DESIG=7;OUR EST;→ NOT CHECKED ← |

## $f_0(1500)$ [h]

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

NODE=M152

Mass $m = 1505 \pm 6$ MeV (S = 1.3)
Full width $\Gamma = 109 \pm 7$ MeV

NODE=M152M;DTYPE=M
NODE=M152W;DTYPE=G

| $f_0(1500)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\pi\pi$ | (34.9±2.3) % | 1.2 | 741 | NODE=M152215;DESIG=8 |
| $\pi^+\pi^-$ | seen | | 740 | DESIG=9 |
| $2\pi^0$ | seen | | 741 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $4\pi$ | (49.5±3.3) % | 1.2 | 691 | DESIG=7 |
| $4\pi^0$ | seen | | 691 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $2\pi^+2\pi^-$ | seen | | 687 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $\eta\eta$ | ( 5.1±0.9) % | 1.4 | 516 | DESIG=1 |
| $\eta\eta'(958)$ | ( 1.9±0.8) % | 1.7 | † | DESIG=2 |
| $K\overline{K}$ | ( 8.6±1.0) % | 1.1 | 568 | DESIG=4 |
| $\gamma\gamma$ | not seen | | 753 | DESIG=10;OUR EST;→ NOT CHECKED ← |

## $f_2'(1525)$

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

NODE=M013

Mass $m = 1525 \pm 5$ MeV [g]
Full width $\Gamma = 73^{+6}_{-5}$ MeV [g]

NODE=M013MX;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M013WX;DTYPE=G

| $f_2'(1525)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}$ | (88.7 ±2.2 ) % | 581 | NODE=M013215;DESIG=2 |
| $\eta\eta$ | (10.4 ±2.2 ) % | 530 | DESIG=4 |
| $\pi\pi$ | ( 8.2 ±1.5 ) $\times 10^{-3}$ | 750 | DESIG=1 |
| $\gamma\gamma$ | ( 1.11±0.14) $\times 10^{-6}$ | 763 | DESIG=8 |

## $\pi_1(1600)$ [h]

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

NODE=M164

Mass $m = 1662^{+15}_{-11}$ MeV (S = 1.2)

NODE=M164M;DTYPE=M

Full width $\Gamma = 234 \pm 50$ MeV (S = 1.7)

NODE=M164W;DTYPE=G

| $\pi_1(1600)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi\pi\pi$ | not seen | 803 | NODE=M164215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\rho^0\pi^-$ | not seen | 641 | DESIG=2 |
| $f_2(1270)\pi^-$ | not seen | 319 | DESIG=4 |
| $b_1(1235)\pi$ | seen | 357 | DESIG=5 |
| $\eta'(958)\pi^-$ | seen | 543 | DESIG=3 |
| $f_1(1285)\pi$ | seen | 315 | DESIG=6;OUR EST;→ NOT CHECKED ← |

## $\eta_2(1645)$

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

NODE=M154

Mass $m = 1617 \pm 5$ MeV

NODE=M154M;DTYPE=M

Full width $\Gamma = 181 \pm 11$ MeV

NODE=M154W;DTYPE=G

| $\eta_2(1645)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $a_2(1320)\pi$ | seen | 242 | NODE=M154215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $K\overline{K}\pi$ | seen | 580 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $K^*\overline{K}$ | seen | 404 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $\eta\pi^+\pi^-$ | seen | 685 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $a_0(980)\pi$ | seen | 499 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $f_2(1270)\eta$ | not seen | † | DESIG=6;OUR EST;→ NOT CHECKED ← |

## $\omega(1650)$ [m]

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

NODE=M126

Mass $m = 1670 \pm 30$ MeV

NODE=M126M;DTYPE=M;OUR EST; → NOT CHECKED ←

Full width $\Gamma = 315 \pm 35$ MeV

NODE=M126W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $\omega(1650)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\rho\pi$ | seen | 646 | NODE=M126215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\omega\pi\pi$ | seen | 617 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $\omega\eta$ | seen | 500 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $e^+e^-$ | seen | 835 | DESIG=3;OUR EST;→ NOT CHECKED ← |

## $\omega_3(1670)$

$I^G(J^{PC}) = 0^-(3^{--})$

NODE=M045

Mass $m = 1667 \pm 4$ MeV

NODE=M045M;DTYPE=M

Full width $\Gamma = 168 \pm 10$ MeV [g]

NODE=M045W;DTYPE=G

| $\omega_3(1670)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\rho\pi$ | seen | 645 | NODE=M045215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\omega\pi\pi$ | seen | 615 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $b_1(1235)\pi$ | possibly seen | 361 | DESIG=3;OUR EST;→ NOT CHECKED ← |

## $\pi_2(1670)$

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

NODE=M034

Mass $m = 1672.4 \pm 3.2$ MeV [g] (S = 1.4)
Full width $\Gamma = 259 \pm 9$ MeV [g] (S = 1.3)

NODE=M034M;DTYPE=M
NODE=M034W;DTYPE=G

| $\pi_2(1670)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $3\pi$ | (95.8±1.4) % | | 809 | NODE=M034215;DESIG=20 |
| $f_2(1270)\pi$ | (56.3±3.2) % | | 329 | DESIG=8 |
| $\rho\pi$ | (31 ±4 ) % | | 648 | DESIG=2 |
| $\sigma\pi$ | (10.9±3.4) % | | – | DESIG=13 |
| $(\pi\pi)_{S\text{-wave}}$ | ( 8.7±3.4) % | | – | DESIG=11 |
| $K\overline{K}^*(892)+$ c.c. | ( 4.2±1.4) % | | 455 | DESIG=5 |
| $\omega\rho$ | ( 2.7±1.1) % | | 304 | DESIG=14 |
| $\gamma\gamma$ | $< 2.8 \times 10^{-7}$ | 90% | 836 | DESIG=12 |
| $\rho(1450)\pi$ | $< 3.6 \times 10^{-3}$ | 97.7% | 148 | DESIG=15 |
| $b_1(1235)\pi$ | $< 1.9 \times 10^{-3}$ | 97.7% | 366 | DESIG=16 |
| $f_1(1285)\pi$ | possibly seen | | 323 | DESIG=25 |
| $a_2(1320)\pi$ | not seen | | 292 | DESIG=26 |

## $\phi(1680)$

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

NODE=M067

Mass $m = 1680 \pm 20$ MeV [g]
Full width $\Gamma = 150 \pm 50$ MeV [g]

NODE=M067M1;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M067W1;DTYPE=G;OUR EST; → NOT CHECKED ←

| $\phi(1680)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}^*(892)+$ c.c. | dominant | 462 | NODE=M067215;DESIG=4;OUR EST; → NOT CHECKED ← |
| $K^0_S K\pi$ | seen | 621 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}$ | seen | 680 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $e^+e^-$ | seen | 840 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $\omega\pi\pi$ | not seen | 623 | DESIG=1;OUR EST;→ NOT CHECKED ← |

## $\rho_3(1690)$

$I^G(J^{PC}) = 1^+(3^{--})$

NODE=M015

Mass $m = 1688.8 \pm 2.1$ MeV [g]
Full width $\Gamma = 161 \pm 10$ MeV [g] (S = 1.5)

NODE=M015M;DTYPE=M
NODE=M015W;DTYPE=G

| $\rho_3(1690)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $4\pi$ | (71.1 ± 1.9 ) % | | 790 | NODE=M015215;DESIG=2 |
| $\pi^\pm\pi^+\pi^-\pi^0$ | (67 ±22 ) % | | 787 | DESIG=11 |
| $\omega\pi$ | (16 ± 6 ) % | | 655 | DESIG=7 |
| $\pi\pi$ | (23.6 ± 1.3 ) % | | 834 | DESIG=1 |
| $K\overline{K}\pi$ | ( 3.8 ± 1.2 ) % | | 629 | DESIG=3 |
| $K\overline{K}$ | ( 1.58± 0.26) % | 1.2 | 685 | DESIG=4 |
| $\eta\pi^+\pi^-$ | seen | | 727 | DESIG=13 |
| $\rho(770)\eta$ | seen | | 520 | DESIG=14;OUR EST;→ NOT CHECKED ← |
| $\pi\pi\rho$ Excluding $2\rho$ and $a_2(1320)\pi$. | seen | | 633 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $a_2(1320)\pi$ | seen | | 307 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $\rho\rho$ | seen | | 334 | DESIG=8;OUR EST;→ NOT CHECKED ← |

## $\rho(1700)$ [l]

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

NODE=M065

Mass $m = 1720 \pm 20$ MeV [g] ($\eta\rho^0$ and $\pi^+\pi^-$ modes)
Full width $\Gamma = 250 \pm 100$ MeV [g] ($\eta\rho^0$ and $\pi^+\pi^-$ modes)

NODE=M065M0;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M065W0;DTYPE=G;OUR EST; → NOT CHECKED ←

| $\rho(1700)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $2(\pi^+\pi^-)$ | large | 803 | NODE=M065215;DESIG=2;OUR EST; |
| $\rho\pi\pi$ | dominant | 653 | → NOT CHECKED ← |
| $\rho^0\pi^+\pi^-$ | large | 650 | DESIG=12;OUR EST;→ NOT CHECKED ← |
| $\rho^\pm\pi^\mp\pi^0$ | large | 652 | DESIG=1;OUR EST;→ NOT CHECKED ← |
| $a_1(1260)\pi$ | seen | 404 | DESIG=9;OUR EST;→ NOT CHECKED ← |
| $h_1(1170)\pi$ | seen | 447 | DESIG=15;OUR EST;→ NOT CHECKED ← |
| $\pi(1300)\pi$ | seen | 349 | DESIG=16;OUR EST;→ NOT CHECKED ← |
| $\rho\rho$ | seen | 372 | DESIG=17;OUR EST;→ NOT CHECKED ← |
| $\pi^+\pi^-$ | seen | 849 | DESIG=18;OUR EST;→ NOT CHECKED ← |
| $\pi\pi$ | seen | 849 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}^*(892)+$ c.c. | seen | 496 | DESIG=13;OUR EST;→ NOT CHECKED ← |
| $\eta\rho$ | seen | 545 | DESIG=10;OUR EST;→ NOT CHECKED ← |
| $a_2(1320)\pi$ | not seen | 334 | DESIG=11;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}$ | seen | 704 | DESIG=14;OUR EST;→ NOT CHECKED ← |
| $e^+e^-$ | seen | 860 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $\pi^0\omega$ | seen | 674 | DESIG=8;OUR EST;→ NOT CHECKED ← |
| | | | DESIG=6;OUR EST;→ NOT CHECKED ← |

## $f_0(1710)$ [n]

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

NODE=M068

Mass $m = 1720 \pm 6$ MeV (S = 1.6)
Full width $\Gamma = 135 \pm 8$ MeV (S = 1.1)

NODE=M068M;DTYPE=M
NODE=M068W;DTYPE=G

| $f_0(1710)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}$ | seen | 704 | NODE=M068215;DESIG=2;OUR EST; |
| $\eta\eta$ | seen | 663 | → NOT CHECKED ← |
| $\pi\pi$ | seen | 849 | DESIG=1;OUR EST;→ NOT CHECKED ← |
| $\omega\omega$ | seen | 357 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| | | | DESIG=4 |

## $\pi(1800)$

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

NODE=M075

Mass $m = 1816 \pm 14$ MeV (S = 2.3)
Full width $\Gamma = 208 \pm 12$ MeV

NODE=M075M;DTYPE=M
NODE=M075W;DTYPE=G

| $\pi(1800)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi^+\pi^-\pi^-$ | seen | 881 | NODE=M075215;DESIG=10;OUR EST; |
| $f_0(600)\pi^-$ | seen | – | → NOT CHECKED ← |
| $f_0(980)\pi^-$ | seen | 634 | DESIG=11;OUR EST;→ NOT CHECKED ← |
| $f_0(1370)\pi^-$ | seen | 371 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $f_0(1500)\pi^-$ | not seen | 254 | DESIG=1 |
| $\rho\pi^-$ | not seen | 735 | DESIG=12 |
| $\eta\eta\pi^-$ | seen | 664 | DESIG=2 |
| $a_0(980)\eta$ | seen | 477 | DESIG=7;OUR EST;→ NOT CHECKED ← |
| $a_2(1320)\eta$ | not seen | † | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $f_2(1270)\pi$ | not seen | 445 | DESIG=13 |
| $f_0(1370)\pi^-$ | not seen | 371 | DESIG=14 |
| $f_0(1500)\pi^-$ | seen | 254 | DESIG=15 |
| $\eta\eta'(958)\pi^-$ | seen | 380 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $K_0^*(1430)K^-$ | seen | † | DESIG=8;OUR EST;→ NOT CHECKED ← |
| $K^*(892)K^-$ | not seen | 573 | DESIG=4 |
| | | | DESIG=9 |

## $\phi_3(1850)$

$I^G(J^{PC}) = 0^-(3^{--})$

NODE=M054

Mass $m = 1854 \pm 7$ MeV
Full width $\Gamma = 87^{+28}_{-23}$ MeV (S = 1.2)

NODE=M054M;DTYPE=M
NODE=M054W;DTYPE=G

| $\phi_3(1850)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}$ | seen | 785 | NODE=M054215;DESIG=1;OUR EST; |
| $K\overline{K}^*(892)+$ c.c. | seen | 602 | → NOT CHECKED ← DESIG=2;OUR EST;→ NOT CHECKED ← |

## $\pi_2(1880)$

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

NODE=M185

Mass $m = 1895 \pm 16$ MeV
NODE=M185M;DTYPE=M
Full width $\Gamma = 235 \pm 34$ MeV
NODE=M185W;DTYPE=G

## $f_2(1950)$

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

NODE=M135

Mass $m = 1944 \pm 12$ MeV (S = 1.5)
NODE=M135M;DTYPE=M
Full width $\Gamma = 472 \pm 18$ MeV
NODE=M135W;DTYPE=G

| $f_2(1950)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K^*(892)\overline{K}^*(892)$ | seen | 387 | NODE=M135215;DESIG=1 |
| $\pi^+\pi^-$ | seen | 962 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $4\pi$ | seen | 925 | DESIG=7;OUR EST;→ NOT CHECKED ← |
| $\eta\eta$ | seen | 803 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $K\overline{K}$ | seen | 837 | DESIG=8;OUR EST;→ NOT CHECKED ← |
| $\gamma\gamma$ | seen | 972 | DESIG=9;OUR EST;→ NOT CHECKED ← |

## $f_2(2010)$

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

NODE=M106

Mass $m = 2011^{+60}_{-80}$ MeV
NODE=M106M;DTYPE=M
Full width $\Gamma = 202 \pm 60$ MeV
NODE=M106W;DTYPE=G

| $f_2(2010)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\phi\phi$ | seen | † | NODE=M106215;DESIG=1;OUR EST; |
| $K\overline{K}$ | seen | 876 | → NOT CHECKED ← DESIG=2 |

## $a_4(2040)$

$I^G(J^{PC}) = 1^-(4^{++})$

NODE=M017

Mass $m = 2001 \pm 10$ MeV
NODE=M017M;DTYPE=M
Full width $\Gamma = 313 \pm 31$ MeV
NODE=M017W;DTYPE=G

| $a_4(2040)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\overline{K}$ | seen | 870 | NODE=M017215;DESIG=1 |
| $\pi^+\pi^-\pi^0$ | seen | 977 | DESIG=2 |
| $\rho\pi$ | seen | 844 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $f_2(1270)\pi$ | seen | 583 | DESIG=6;OUR EST;→ NOT CHECKED ← |
| $\omega\pi^-\pi^0$ | seen | 822 | DESIG=7;OUR EST;→ NOT CHECKED ← |
| $\omega\rho$ | seen | 628 | DESIG=8 |
| $\eta\pi^0$ | seen | 920 | DESIG=3 |
| $\eta'(958)\pi$ | seen | 764 | DESIG=4;OUR EST;→ NOT CHECKED ← |

## $f_4(2050)$

$I^G(J^{PC}) = 0^+(4^{++})$

NODE=M016

Mass $m = 2018 \pm 11$ MeV (S = 2.1)
NODE=M016M;DTYPE=M
Full width $\Gamma = 237 \pm 18$ MeV (S = 1.9)
NODE=M016W;DTYPE=G

| $f_4(2050)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\omega\omega$ | seen | 637 | NODE=M016215;DESIG=6 |
| $\pi\pi$ | (17.0±1.5) % | 1000 | DESIG=1 |
| $K\overline{K}$ | $(\ 6.8^{+3.4}_{-1.8}) \times 10^{-3}$ | 880 | DESIG=2 |
| $\eta\eta$ | $(\ 2.1\pm0.8) \times 10^{-3}$ | 848 | DESIG=3 |
| $4\pi^0$ | $<$ 1.2 % | 964 | DESIG=5 |
| $a_2(1320)\pi$ | seen | 567 | DESIG=7 |

## $f_2(2300)$ $I^G(J^{PC}) = 0^+(2^{++})$

NODE=M107

Mass $m = 2297 \pm 28$ MeV
NODE=M107M;DTYPE=M

Full width $\Gamma = 149 \pm 40$ MeV
NODE=M107W;DTYPE=G

| $f_2(2300)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\phi\phi$ | seen | 529 | NODE=M107215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $K\overline{K}$ | seen | 1037 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $\gamma\gamma$ | seen | 1149 | DESIG=3;OUR EST;→ NOT CHECKED ← |

## $f_2(2340)$ $I^G(J^{PC}) = 0^+(2^{++})$

NODE=M108

Mass $m = 2339 \pm 60$ MeV
NODE=M108M;DTYPE=M

Full width $\Gamma = 319^{+80}_{-70}$ MeV
NODE=M108W;DTYPE=G

| $f_2(2340)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\phi\phi$ | seen | 573 | NODE=M108215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $\eta\eta$ | seen | 1033 | DESIG=2 |

# STRANGE MESONS ($S = \pm1$, $C = B = 0$)

NODE=MXXX020

$K^+ = u\overline{s}$, $K^0 = d\overline{s}$, $\overline{K}^0 = \overline{d}s$, $K^- = \overline{u}s$, similarly for $K^*$'s

## $K^*(892)$ $I(J^P) = \frac{1}{2}(1^-)$

NODE=M018

$K^*(892)^\pm$ mass $m = 891.66 \pm 0.26$ MeV
NODE=M018M1;DTYPE=M

Mass $m = 895.5 \pm 0.8$ MeV
NODE=M018MCT;DTYPE=M

$K^*(892)^0$ mass $m = 896.00 \pm 0.25$ MeV (S = 1.4)
NODE=M018M2;DTYPE=M

$K^*(892)^\pm$ full width $\Gamma = 50.8 \pm 0.9$ MeV
NODE=M018W1;DTYPE=G

Full width $\Gamma = 46.2 \pm 1.3$ MeV
NODE=M018W5;DTYPE=G

$K^*(892)^0$ full width $\Gamma = 50.3 \pm 0.6$ MeV (S = 1.1)
NODE=M018W2;DTYPE=G

| $K^*(892)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $K\pi$ | ∼ 100 % | | 289 | NODE=M018220;DESIG=1;OUR EVAL; → NOT CHECKED ← |
| $K^0\gamma$ | $(\ 2.31\pm0.20) \times 10^{-3}$ | | 307 | DESIG=4 |
| $K^\pm\gamma$ | $(\ 9.9\ \pm0.9\ ) \times 10^{-4}$ | | 309 | DESIG=3 |
| $K\pi\pi$ | $<$ 7 $\times 10^{-4}$ | 95% | 223 | DESIG=2 |

## $K_1(1270)$ $I(J^P) = \frac{1}{2}(1^+)$

NODE=M028

Mass $m = 1272 \pm 7$ MeV [g]
NODE=M028MX;DTYPE=M

Full width $\Gamma = 90 \pm 20$ MeV [g]
NODE=M028WX;DTYPE=G;OUR EST; → NOT CHECKED ←

| $K_1(1270)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\rho$ | (42 ±6 ) % | 45 | NODE=M028215;DESIG=2 |
| $K_0^*(1430)\pi$ | (28 ±4 ) % | † | DESIG=7 |
| $K^*(892)\pi$ | (16 ±5 ) % | 302 | DESIG=1 |
| $K\omega$ | (11.0±2.0) % | † | DESIG=5 |
| $Kf_0(1370)$ | ( 3.0±2.0) % | † | DESIG=8 |
| $\gamma K^0$ | seen | 539 | DESIG=9;OUR EST;→ NOT CHECKED ← |

## $K_1(1400)$ $I(J^P) = \frac{1}{2}(1^+)$

NODE=M064

Mass $m = 1403 \pm 7$ MeV
NODE=M064M;DTYPE=M

Full width $\Gamma = 174 \pm 13$ MeV (S = 1.6)
NODE=M064W;DTYPE=G

| $K_1(1400)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K^*(892)\pi$ | (94 ±6 ) % | 402 | NODE=M064215;DESIG=1 |
| $K\rho$ | ( 3.0±3.0) % | 292 | DESIG=2 |
| $Kf_0(1370)$ | ( 2.0±2.0) % | † | DESIG=8 |
| $K\omega$ | ( 1.0±1.0) % | 284 | DESIG=5 |
| $K_0^*(1430)\pi$ | not seen | † | DESIG=7;OUR EST;→ NOT CHECKED ← |
| $\gamma K^0$ | seen | 613 | DESIG=9;OUR EST;→ NOT CHECKED ← |

## $K^*(1410)$ $I(J^P) = \frac{1}{2}(1^-)$

NODE=M094

Mass $m = 1414 \pm 15$ MeV (S = 1.3)
NODE=M094M;DTYPE=M

Full width $\Gamma = 232 \pm 21$ MeV (S = 1.1)
NODE=M094W;DTYPE=G

| $K^*(1410)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $K^*(892)\pi$ | > 40 % | 95% | 410 | NODE=M094215;DESIG=2;OUR EST; → NOT CHECKED ← |
| $K\pi$ | ( 6.6±1.3) % | | 612 | DESIG=1 |
| $K\rho$ | < 7 % | 95% | 305 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $\gamma K^0$ | seen | | 619 | DESIG=4;OUR EST;→ NOT CHECKED ← |

## $K_0^*(1430)$ [o] $I(J^P) = \frac{1}{2}(0^+)$

NODE=M019

Mass $m = 1425 \pm 50$ MeV
NODE=M019M;DTYPE=M;OUR EST; → NOT CHECKED ←

Full width $\Gamma = 270 \pm 80$ MeV
NODE=M019W;DTYPE=G;OUR EST; → NOT CHECKED ←

| $K_0^*(1430)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\pi$ | (93±10) % | 619 | NODE=M019215;DESIG=1 |

## $K_2^*(1430)$ $I(J^P) = \frac{1}{2}(2^+)$

NODE=M022

$K_2^*(1430)^\pm$ mass $m = 1425.6 \pm 1.5$ MeV (S = 1.1)
NODE=M022M1;DTYPE=M

$K_2^*(1430)^0$ mass $m = 1432.4 \pm 1.3$ MeV
NODE=M022M4;DTYPE=M

$K_2^*(1430)^\pm$ full width $\Gamma = 98.5 \pm 2.7$ MeV (S = 1.1)
NODE=M022W1;DTYPE=G

$K_2^*(1430)^0$ full width $\Gamma = 109 \pm 5$ MeV (S = 1.9)
NODE=M022W4;DTYPE=G

| $K_2^*(1430)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $K\pi$ | (49.9±1.2) % | | 619 | NODE=M022215;DESIG=1 |
| $K^*(892)\pi$ | (24.7±1.5) % | | 419 | DESIG=2 |
| $K^*(892)\pi\pi$ | (13.4±2.2) % | | 372 | DESIG=6 |
| $K\rho$ | ( 8.7±0.8) % | S=1.2 | 318 | DESIG=3 |
| $K\omega$ | ( 2.9±0.8) % | | 311 | DESIG=4 |
| $K^+\gamma$ | ( 2.4±0.5) $\times 10^{-3}$ | S=1.1 | 627 | DESIG=8 |
| $K\eta$ | ( $1.5^{+3.4}_{-1.0}$) $\times 10^{-3}$ | S=1.3 | 486 | DESIG=5 |
| $K\omega\pi$ | < 7.2 $\times 10^{-4}$ | CL=95% | 100 | DESIG=7 |
| $K^0\gamma$ | < 9 $\times 10^{-4}$ | CL=90% | 626 | DESIG=10;OUR EVAL; → NOT CHECKED ← |

## $K^*(1680)$

$I(J^P) = \frac{1}{2}(1^-)$

NODE=M095

Mass $m = 1717 \pm 27$ MeV (S = 1.4)
Full width $\Gamma = 322 \pm 110$ MeV (S = 4.2)

NODE=M095M;DTYPE=M
NODE=M095W;DTYPE=G

| $K^*(1680)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\pi$ | (38.7±2.5) % | 781 | NODE=M095215;DESIG=1 |
| $K\rho$ | ($31.4^{+5.0}_{-2.1}$) % | 570 | DESIG=3 |
| $K^*(892)\pi$ | ($29.9^{+2.2}_{-5.0}$) % | 618 | DESIG=2 |

## $K_2(1770)$ [p]

$I(J^P) = \frac{1}{2}(2^-)$

NODE=M023

Mass $m = 1773 \pm 8$ MeV
Full width $\Gamma = 186 \pm 14$ MeV

NODE=M023M;DTYPE=M
NODE=M023W;DTYPE=G

| $K_2(1770)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\pi\pi$ | | 794 | NODE=M023215;DESIG=1;OUR EST; → NOT CHECKED ← |
| $K_2^*(1430)\pi$ | dominant | 288 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $K^*(892)\pi$ | seen | 654 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $Kf_2(1270)$ | seen | 55 | DESIG=9;OUR EST;→ NOT CHECKED ← |
| $K\phi$ | seen | 441 | DESIG=10 |
| $K\omega$ | seen | 607 | DESIG=8 |

## $K_3^*(1780)$

$I(J^P) = \frac{1}{2}(3^-)$

NODE=M060

Mass $m = 1776 \pm 7$ MeV (S = 1.1)
Full width $\Gamma = 159 \pm 21$ MeV (S = 1.3)

NODE=M060M;DTYPE=M
NODE=M060W;DTYPE=G

| $K_3^*(1780)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $K\rho$ | (31 ± 9 ) % | | 613 | NODE=M060215;DESIG=3 |
| $K^*(892)\pi$ | (20 ± 5 ) % | | 656 | DESIG=2 |
| $K\pi$ | (18.8± 1.0) % | | 813 | DESIG=1 |
| $K\eta$ | (30 ±13 ) % | | 719 | DESIG=6 |
| $K_2^*(1430)\pi$ | < 16 % | 95% | 291 | DESIG=4 |

## $K_2(1820)$ [q]

$I(J^P) = \frac{1}{2}(2^-)$

NODE=M146

Mass $m = 1816 \pm 13$ MeV
Full width $\Gamma = 276 \pm 35$ MeV

NODE=M146M;DTYPE=M
NODE=M146W;DTYPE=G

| $K_2(1820)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K_2^*(1430)\pi$ | seen | 327 | NODE=M146215;DESIG=1;OUR EVAL; → NOT CHECKED ← |
| $K^*(892)\pi$ | seen | 681 | DESIG=2;OUR EVAL;→ NOT CHECKED ← |
| $Kf_2(1270)$ | seen | 186 | DESIG=3;OUR EVAL;→ NOT CHECKED ← |
| $K\omega$ | seen | 638 | DESIG=6;OUR EVAL;→ NOT CHECKED ← |

## $K_4^*(2045)$

$I(J^P) = \frac{1}{2}(4^+)$

NODE=M035

Mass $m = 2045 \pm 9$ MeV (S = 1.1)
NODE=M035M;DTYPE=M

Full width $\Gamma = 198 \pm 30$ MeV
NODE=M035W;DTYPE=G

| $K_4^*(2045)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $K\pi$ | (9.9±1.2) % | 958 | NODE=M035215;DESIG=1 |
| $K^*(892)\pi\pi$ | (9 ±5 ) % | 802 | DESIG=2 |
| $K^*(892)\pi\pi\pi$ | (7 ±5 ) % | 768 | DESIG=5 |
| $\rho K\pi$ | (5.7±3.2) % | 741 | DESIG=3 |
| $\omega K\pi$ | (5.0±3.0) % | 738 | DESIG=4 |
| $\phi K\pi$ | (2.8±1.4) % | 594 | DESIG=6 |
| $\phi K^*(892)$ | (1.4±0.7) % | 363 | DESIG=7 |

# CHARMED MESONS ($C = \pm 1$)

NODE=MXXX035

$D^+ = c\overline{d}$, $D^0 = c\overline{u}$, $\overline{D}^0 = \overline{c}u$, $D^- = \overline{c}d$, similarly for $D^*$'s

## $D^*(2007)^0$

$I(J^P) = \frac{1}{2}(1^-)$
$I$, $J$, $P$ need confirmation.

NODE=M061

Mass $m = 2006.97 \pm 0.19$ MeV (S = 1.1)
NODE=M061M;DTYPE=M

$m_{D^{*0}} - m_{D^0} = 142.12 \pm 0.07$ MeV
NODE=M061DM;DTYPE=D

Full width $\Gamma < 2.1$ MeV, CL = 90%
NODE=M061W;DTYPE=G

$\overline{D}^*(2007)^0$ modes are charge conjugates of modes below.
NODE=M061220;NODE=M061

| $D^*(2007)^0$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^0\pi^0$ | (61.9±2.9) % | 43 | DESIG=1 |
| $D^0\gamma$ | (38.1±2.9) % | 137 | DESIG=2 |

## $D^*(2010)^\pm$

$I(J^P) = \frac{1}{2}(1^-)$
$I$, $J$, $P$ need confirmation.

NODE=M062

Mass $m = 2010.27 \pm 0.17$ MeV (S = 1.1)
NODE=M062M;DTYPE=M

$m_{D^*(2010)^+} - m_{D^+} = 140.64 \pm 0.10$ MeV (S = 1.1)
NODE=M062MD;DTYPE=D

$m_{D^*(2010)^+} - m_{D^0} = 145.421 \pm 0.010$ MeV (S = 1.1)
NODE=M062DM;DTYPE=D

Full width $\Gamma = 96 \pm 22$ keV
NODE=M062W;DTYPE=G

$D^*(2010)^-$ modes are charge conjugates of the modes below. NODE=M062225;NODE=M062

| $D^*(2010)^\pm$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^0\pi^+$ | (67.7±0.5) % | 39 | DESIG=1 |
| $D^+\pi^0$ | (30.7±0.5) % | 38 | DESIG=3 |
| $D^+\gamma$ | ( 1.6±0.4) % | 136 | DESIG=2 |

## $D_1(2420)^0$

$I(J^P) = \frac{1}{2}(1^+)$
$I$, $J$, $P$ need confirmation. NODE=M097

Mass $m = 2422.3 \pm 1.3$ MeV (S = 1.2) NODE=M097M;DTYPE=M
$m_{D_1^0} - m_{D^{*+}} = 411.7 \pm 0.8$
Full width $\Gamma = 20.4 \pm 1.7$ MeV NODE=M097DM;DTYPE=D
NODE=M097W;DTYPE=G

$\overline{D}_1(2420)^0$ modes are charge conjugates of modes below. NODE=M097215;NODE=M097

| $D_1(2420)^0$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^*(2010)^+\pi^-$ | seen | 355 | DESIG=1 |
| $D^0\pi^+\pi^-$ | seen | 426 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $D^+\pi^-$ | not seen | 474 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $D^{*0}\pi^+\pi^-$ | not seen | 281 | DESIG=7;OUR EST;→ NOT CHECKED ← |

## $D_2^*(2460)^0$

$I(J^P) = \frac{1}{2}(2^+)$ NODE=M119

$J^P = 2^+$ assignment strongly favored.

Mass $m = 2461.1 \pm 1.6$ MeV (S = 1.3) NODE=M119M;DTYPE=M
$m_{D_2^{*0}} - m_{D^+} = 593.9 \pm 0.8$
Full width $\Gamma = 43 \pm 4$ MeV (S = 1.8) NODE=M119DM;DTYPE=D
NODE=M119W;DTYPE=G

$\overline{D}_2^*(2460)^0$ modes are charge conjugates of modes below. NODE=M119215;NODE=M119

| $D_2^*(2460)^0$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^+\pi^-$ | seen | 505 | CLUMP=A;DESIG=1 |
| $D^*(2010)^+\pi^-$ | seen | 389 | DESIG=2 |
| $D^0\pi^+\pi^-$ | not seen | 462 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $D^{*0}\pi^+\pi^-$ | not seen | 324 | DESIG=4;OUR EST;→ NOT CHECKED ← |

## $D_2^*(2460)^\pm$

$I(J^P) = \frac{1}{2}(2^+)$ NODE=M150

$J^P = 2^+$ assignment strongly favored.

Mass $m = 2460.1^{+2.6}_{-3.5}$ MeV (S = 1.5) NODE=M150M;DTYPE=M
$m_{D_2^*(2460)^\pm} - m_{D_2^*(2460)^0} = 2.4 \pm 1.7$ MeV
Full width $\Gamma = 37 \pm 6$ MeV (S = 1.4) NODE=M150DM;DTYPE=D
NODE=M150W;DTYPE=G

$D_2^*(2460)^-$ modes are charge conjugates of modes below. NODE=M150215;NODE=M150

| $D_2^*(2460)^\pm$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^0\pi^+$ | seen | 508 | DESIG=1 |
| $D^{*0}\pi^+$ | seen | 391 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $D^+\pi^+\pi^-$ | not seen | 457 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $D^{*+}\pi^+\pi^-$ | not seen | 320 | DESIG=4;OUR EST;→ NOT CHECKED ← |

# CHARMED, STRANGE MESONS ($C = S = \pm 1$)

NODE=MXXX040

$D_s^+ = c\overline{s}$, $D_s^- = \overline{c}s$, similarly for $D_s^*$'s

## $D_s^{*\pm}$

$I(J^P) = 0(?^?)$

NODE=S074

$J^P$ is natural, width and decay modes consistent with $1^-$.

Mass $m = 2112.3 \pm 0.5$ MeV (S = 1.1)
NODE=S074M;DTYPE=M

$m_{D_s^{*\pm}} - m_{D_s^{\pm}} = 143.8 \pm 0.4$ MeV
NODE=S074DM;DTYPE=D

Full width $\Gamma < 1.9$ MeV, CL = 90%
NODE=S074W;DTYPE=G

$D_s^{*-}$ modes are charge conjugates of the modes below.
NODE=S074215;NODE=S074

| $D_s^{*+}$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D_s^+\gamma$ | (94.2±0.7) % | 139 | DESIG=1 |
| $D_s^+\pi^0$ | ( 5.8±0.7) % | 48 | DESIG=2 |

## $D_{s0}^*(2317)^{\pm}$

$I(J^P) = 0(0^+)$
$J$, $P$ need confirmation.
NODE=M172

$J^P$ is natural, low mass consistent with $0^+$.

Mass $m = 2317.8 \pm 0.6$ MeV (S = 1.1)
NODE=M172M;DTYPE=M

$m_{D_{s0}^*(2317)^{\pm}} - m_{D_s^{\pm}} = 349.3 \pm 0.6$ MeV (S = 1.1)
NODE=M172DM;DTYPE=D

Full width $\Gamma < 3.8$ MeV, CL = 95%
NODE=M172W;DTYPE=G

$D_{s0}^*(2317)^-$ modes are charge conjugates of modes below.
NODE=M172215;NODE=M172

| $D_{s0}^*(2317)^{\pm}$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D_s^+\pi^0$ | seen | 298 | DESIG=1 |
| $D_s^+\pi^0\pi^0$ | not seen | 205 | DESIG=7;OUR EVAL;→ NOT CHECKED ← |

## $D_{s1}(2460)^{\pm}$

$I(J^P) = 0(1^+)$
NODE=M173

Mass $m = 2459.6 \pm 0.6$ MeV (S = 1.1)
NODE=M173M;DTYPE=M

$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{*\pm}} = 347.2 \pm 0.8$ MeV (S = 1.2)
NODE=M173MD;DTYPE=D

$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{\pm}} = 491.1 \pm 0.7$ MeV (S = 1.1)
NODE=M173DM;DTYPE=D

Full width $\Gamma < 3.5$ MeV, CL = 95%
NODE=M173W;DTYPE=G

$D_{s1}(2460)^-$ modes are charge conjugates of the modes below.
NODE=M173215;NODE=M173

| $D_{s1}(2460)^+$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $D_s^{*+}\pi^0$ | (48 ±11 ) % | | 297 | DESIG=1 |
| $D_s^+\gamma$ | (18 ± 4 ) % | | 442 | DESIG=2 |
| $D_s^+\pi^+\pi^-$ | ( 4.3± 1.3) % | S=1.1 | 363 | DESIG=3 |
| $D_s^{*+}\gamma$ | < 8 % | CL=90% | 323 | DESIG=4 |
| $D_{s0}^*(2317)^+\gamma$ | ( $3.7^{+\ 5.0}_{-\ 2.4}$) % | | 138 | DESIG=5 |

## $D_{s1}(2536)^{\pm}$

$I(J^P) = 0(1^+)$
$J$, $P$ need confirmation.
NODE=M121

Mass $m = 2535.35 \pm 0.34 \pm 0.5$ MeV
NODE=M121M;DTYPE=M;OUR EVAL;
→ NOT CHECKED ←

Full width $\Gamma < 2.3$ MeV, CL = 90%
NODE=M121W;DTYPE=G

$D_{s1}(2536)^-$ modes are charge conjugates of the modes below. NODE=M121215;NODE=M121

| $D_{s1}(2536)^+$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^*(2010)^+ K^0$ | seen | 149 | DESIG=1;OUR EST;→ NOT CHECKED ← |
| $D^*(2007)^0 K^+$ | seen | 168 | DESIG=4;OUR EST;→ NOT CHECKED ← |
| $D^+ K^0$ | not seen | 382 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $D^0 K^+$ | not seen | 391 | DESIG=5;OUR EST;→ NOT CHECKED ← |
| $D_s^{*+}\gamma$ | possibly seen | 388 | DESIG=3 |
| $D_s^+\pi^+\pi^-$ | seen | 437 | DESIG=6 |

## $D_{s2}(2573)^\pm$ $I(J^P) = 0(?^?)$ NODE=M148

$J^P$ is natural, width and decay modes consistent with $2^+$.

Mass $m = 2572.6 \pm 0.9$ MeV NODE=M148M;DTYPE=M
Full width $\Gamma = 20 \pm 5$ MeV (S = 1.3) NODE=M148W;DTYPE=G

$D_{s2}(2573)^-$ modes are charge conjugates of the modes below. NODE=M148215;NODE=M148

| $D_{s2}(2573)^+$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $D^0 K^+$ | seen | 435 | DESIG=1 |
| $D^*(2007)^0 K^+$ | not seen | 244 | DESIG=2;OUR EVAL;→ NOT CHECKED ← |

# $c\overline{c}$ MESONS NODE=MXXX025

## $\eta_c(1S)$ $I^G(J^{PC}) = 0^+(0^{-+})$ NODE=M026

Mass $m = 2980.5 \pm 1.2$ MeV (S = 1.7) NODE=M026M;DTYPE=M
Full width $\Gamma = 27.4 \pm 2.9$ MeV (S = 2.0) NODE=M026W;DTYPE=G

| $\eta_c(1S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| **Decays involving hadronic resonances** | | | | NODE=M026215;NODE=M026;CLUMP=A |
| $\eta'(958)\pi\pi$ | $(4.1 \pm 1.7) \%$ | | 1321 | DESIG=24 |
| $\rho\rho$ | $(2.0 \pm 0.7) \%$ | | 1273 | DESIG=19 |
| $K^*(892)^0 K^-\pi^+$ + c.c. | $(2.0 \pm 0.7) \%$ | | 1276 | DESIG=26 |
| $K^*(892)\overline{K}^*(892)$ | $(9.2 \pm 3.4) \times 10^{-3}$ | | 1194 | DESIG=18 |
| $K^{*0}\overline{K}^{*0}\pi^+\pi^-$ | $(1.1 \pm 0.5) \%$ | | 1071 | DESIG=57 |
| $\phi K^+ K^-$ | $(2.9 \pm 1.4) \times 10^{-3}$ | | 1102 | DESIG=28 |
| $\phi\phi$ | $(2.7 \pm 0.9) \times 10^{-3}$ | | 1087 | DESIG=17 |
| $\phi 2(\pi^+\pi^-)$ | $< 3.5 \times 10^{-3}$ | 90% | 1249 | DESIG=58 |
| $a_0(980)\pi$ | $< 2 \%$ | 90% | 1325 | DESIG=21 |
| $a_2(1320)\pi$ | $< 2 \%$ | 90% | 1194 | DESIG=22 |
| $K^*(892)\overline{K}$ + c.c. | $< 1.28 \%$ | 90% | 1308 | DESIG=40 |
| $f_2(1270)\eta$ | $< 1.1 \%$ | 90% | 1143 | DESIG=23 |
| $\omega\omega$ | $< 3.1 \times 10^{-3}$ | 90% | 1268 | DESIG=20 |
| $\omega\phi$ | $< 1.7 \times 10^{-3}$ | 90% | 1183 | DESIG=47 |
| $f_2(1270) f_2(1270)$ | $(7.5\ ^{+3.1}_{-3.4}) \times 10^{-3}$ | | 771 | DESIG=46 |
| $f_2(1270) f_2'(1525)$ | $(7 \pm 4) \times 10^{-3}$ | | 509 | DESIG=59 |

### Decays into stable hadrons

NODE=M026;CLUMP=B

| | | | | | |
|---|---|---|---|---|---|
| $K\overline{K}\pi$ | $(7.0 \pm 1.2)$ % | | | 1379 | DESIG=14 |
| $\eta\pi\pi$ | $(4.9 \pm 1.8)$ % | | | 1427 | DESIG=16 |
| $\pi^+\pi^- K^+ K^-$ | $(1.5 \pm 0.6)$ % | | | 1343 | DESIG=15 |
| $K^+K^-2(\pi^+\pi^-)$ | $(7.0 \pm 2.9) \times 10^{-3}$ | | | 1252 | DESIG=55 |
| $2(K^+K^-)$ | $(1.5 \pm 0.7) \times 10^{-3}$ | | | 1053 | DESIG=27 |
| $2(\pi^+\pi^-)$ | $(1.20 \pm 0.30)$ % | | | 1457 | DESIG=11 |
| $3(\pi^+\pi^-)$ | $(1.5 \pm 0.5)$ % | | | 1405 | DESIG=56 |
| $p\overline{p}$ | $(1.3 \pm 0.4) \times 10^{-3}$ | | | 1158 | DESIG=12 |
| $\Lambda\overline{\Lambda}$ | $(1.04 \pm 0.31) \times 10^{-3}$ | | | 988 | DESIG=45 |
| $K\overline{K}\eta$ | $< 3.1$ | % | 90% | 1263 | DESIG=25 |
| $\pi^+\pi^- p\overline{p}$ | $< 1.2$ | % | 90% | 1025 | DESIG=13 |

### Radiative decays

NODE=M026;CLUMP=C

| | | | | | |
|---|---|---|---|---|---|
| $\gamma\gamma$ | $(2.4\ ^{+1.1}_{-0.9}) \times 10^{-4}$ | | | 1490 | DESIG=31 |

### Charge conjugation ($C$), Parity ($P$), Lepton family number ($LF$) violating modes

NODE=M026;CLUMP=D

| | | | | | | |
|---|---|---|---|---|---|---|
| $\pi^+\pi^-$ | $P,CP$ | $< 6$ | $\times 10^{-4}$ | 90% | 1484 | DESIG=51 |
| $\pi^0\pi^0$ | $P,CP$ | $< 4$ | $\times 10^{-4}$ | 90% | 1484 | DESIG=52 |
| $K^+K^-$ | $P,CP$ | $< 6$ | $\times 10^{-4}$ | 90% | 1406 | DESIG=53 |
| $K^0_S K^0_S$ | $P,CP$ | $< 3.1$ | $\times 10^{-4}$ | 90% | 1405 | DESIG=54 |

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## $J/\psi(1S)$

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

NODE=M070

Mass $m = 3096.916 \pm 0.011$ MeV
NODE=M070M;DTYPE=M

Full width $\Gamma = 93.2 \pm 2.1$ keV
NODE=M070W;DTYPE=G

$\Gamma_{ee} = 5.55 \pm 0.14 \pm 0.02$ keV
NODE=M070W1;DTYPE=E;OUR EVAL; → NOT CHECKED ←

| $J/\psi(1S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| hadrons | $(87.7 \pm 0.5)$ % | | – | NODE=M070215;DESIG=3 |
| virtual $\gamma \rightarrow$ hadrons | $(13.50 \pm 0.30)$ % | | – | DESIG=4 |
| $e^+e^-$ | $(5.94 \pm 0.06)$ % | | 1548 | DESIG=1 |
| $\mu^+\mu^-$ | $(5.93 \pm 0.06)$ % | | 1545 | DESIG=2 |

### Decays involving hadronic resonances

NODE=M070;CLUMP=A

| | | | | |
|---|---|---|---|---|
| $\rho\pi$ | $(1.69 \pm 0.15)$ % | S=2.4 | 1448 | DESIG=20 |
| $\rho^0\pi^0$ | $(5.6 \pm 0.7) \times 10^{-3}$ | | 1448 | DESIG=21 |
| $a_2(1320)\rho$ | $(1.09 \pm 0.22)$ % | | 1123 | DESIG=43 |
| $\omega\pi^+\pi^+\pi^-\pi^-$ | $(8.5 \pm 3.4) \times 10^{-3}$ | | 1392 | DESIG=26 |
| $\omega\pi^+\pi^-\pi^0$ | $(4.0 \pm 0.7) \times 10^{-3}$ | | 1418 | DESIG=211 |
| $\omega\pi^+\pi^-$ | $(8.6 \pm 0.7) \times 10^{-3}$ | S=1.1 | 1435 | DESIG=24 |
| $\omega f_2(1270)$ | $(4.3 \pm 0.6) \times 10^{-3}$ | | 1142 | DESIG=28 |
| $K^*(892)^0\overline{K}^*_2(1430)^0 +$ c.c. | $(6.0 \pm 0.6) \times 10^{-3}$ | | 1012 | DESIG=48 |
| $K^*(892)^0\overline{K}_2(1770)^0 +$ c.c. $\rightarrow$ $K^*(892)^0 K^-\pi^+ +$ c.c. | $(6.9 \pm 0.9) \times 10^{-4}$ | | – | DESIG=235 |
| $\omega K^*(892)\overline{K} +$ c.c. | $(6.1 \pm 0.9) \times 10^{-3}$ | | 1097 | DESIG=102 |
| $K^+\overline{K}^*(892)^- +$ c.c. | $(5.12 \pm 0.30) \times 10^{-3}$ | | 1373 | DESIG=121 |
| $K^+\overline{K}^*(892)^- +$ c.c. $\rightarrow$ $K^+K^-\pi^0$ | $(1.97 \pm 0.20) \times 10^{-3}$ | | – | DESIG=231 |
| $K^+\overline{K}^*(892)^- +$ c.c. $\rightarrow$ $K^0K^\pm\pi^\mp$ | $(3.0 \pm 0.4) \times 10^{-3}$ | | – | DESIG=232 |
| $K^0\overline{K}^*(892)^0 +$ c.c. | $(4.39 \pm 0.31) \times 10^{-3}$ | | 1373 | DESIG=122 |
| $K^0\overline{K}^*(892)^0 +$ c.c. $\rightarrow$ $K^0K^\pm\pi^\mp$ | $(3.2 \pm 0.4) \times 10^{-3}$ | | – | DESIG=233 |
| $K_1(1400)^\pm K^\mp$ | $(3.8 \pm 1.4) \times 10^{-3}$ | | 1170 | DESIG=132 |
| $\overline{K}^*(892)^0 K^+\pi^- +$ c.c. | seen | | 1343 | DESIG=214 |
| $\omega\pi^0\pi^0$ | $(3.4 \pm 0.8) \times 10^{-3}$ | | 1436 | DESIG=140 |
| $b_1(1235)^\pm\pi^\mp$ | [r] $(3.0 \pm 0.5) \times 10^{-3}$ | | 1300 | DESIG=49 |
| $\omega K^\pm K^0_S\pi^\mp$ | [r] $(3.4 \pm 0.5) \times 10^{-3}$ | | 1210 | DESIG=101 |
| $b_1(1235)^0\pi^0$ | $(2.3 \pm 0.6) \times 10^{-3}$ | | 1300 | DESIG=160 |

| | | | | | |
|---|---|---|---|---|---|
| $\eta K^{\pm} K_S^0 \pi^{\mp}$ | [r] | $( 2.2 \pm 0.4 ) \times 10^{-3}$ | | 1278 | DESIG=230 |
| $\phi K^*(892) \overline{K}$ + c.c. | | $( 2.18 \pm 0.23) \times 10^{-3}$ | | 969 | DESIG=104 |
| $\omega K \overline{K}$ | | $( 1.6 \pm 0.5 ) \times 10^{-4}$ | | 1268 | DESIG=27 |
| $\omega f_0(1710) \rightarrow \omega K \overline{K}$ | | $( 4.8 \pm 1.1 ) \times 10^{-4}$ | | 878 | DESIG=130 |
| $\phi 2(\pi^+ \pi^-)$ | | $( 1.66 \pm 0.23) \times 10^{-3}$ | | 1318 | DESIG=35 |
| $\Delta(1232)^{++} \overline{p} \pi^-$ | | $( 1.6 \pm 0.5 ) \times 10^{-3}$ | | 1030 | DESIG=70 |
| $\omega \eta$ | | $( 1.74 \pm 0.20) \times 10^{-3}$ | S=1.6 | 1394 | DESIG=30 |
| $\phi K \overline{K}$ | | $( 1.83 \pm 0.24) \times 10^{-3}$ | S=1.5 | 1179 | DESIG=36 |
| $\phi f_0(1710) \rightarrow \phi K \overline{K}$ | | $( 3.6 \pm 0.6 ) \times 10^{-4}$ | | 875 | DESIG=129 |
| $\Delta(1232)^{++} \overline{\Delta}(1232)^{--}$ | | $( 1.10 \pm 0.29) \times 10^{-3}$ | | 938 | DESIG=66 |
| $\Sigma(1385)^- \overline{\Sigma}(1385)^+$ (or c.c.) | [r] | $( 1.03 \pm 0.13) \times 10^{-3}$ | | 697 | DESIG=67 |
| $\phi f_2'(1525)$ | | $( 8 \pm 4 ) \times 10^{-4}$ | S=2.7 | 871 | DESIG=40 |
| $\phi \pi^+ \pi^-$ | | $( 9.4 \pm 0.9 ) \times 10^{-4}$ | S=1.2 | 1365 | DESIG=34 |
| $\phi \pi^0 \pi^0$ | | $( 5.6 \pm 1.6 ) \times 10^{-4}$ | | 1366 | DESIG=76 |
| $\phi K^{\pm} K_S^0 \pi^{\mp}$ | [r] | $( 7.2 \pm 0.8 ) \times 10^{-4}$ | | 1114 | DESIG=103 |
| $\omega f_1(1420)$ | | $( 6.8 \pm 2.4 ) \times 10^{-4}$ | | 1062 | DESIG=105 |
| $\phi \eta$ | | $( 7.5 \pm 0.8 ) \times 10^{-4}$ | S=1.5 | 1320 | DESIG=37 |
| $\Xi^0 \overline{\Xi}^0$ | | $( 1.20 \pm 0.24) \times 10^{-3}$ | | 818 | DESIG=248 |
| $\Xi(1530)^- \overline{\Xi}^+$ | | $( 5.9 \pm 1.5 ) \times 10^{-4}$ | | 600 | DESIG=107 |
| $p K^- \overline{\Sigma}(1385)^0$ | | $( 5.1 \pm 3.2 ) \times 10^{-4}$ | | 646 | DESIG=74 |
| $\omega \pi^0$ | | $( 4.5 \pm 0.5 ) \times 10^{-4}$ | S=1.4 | 1446 | DESIG=32 |
| $\phi \eta'(958)$ | | $( 4.0 \pm 0.7 ) \times 10^{-4}$ | S=2.1 | 1192 | DESIG=38 |
| $\phi f_0(980)$ | | $( 3.2 \pm 0.9 ) \times 10^{-4}$ | S=1.9 | 1182 | DESIG=41 |
| $\phi f_0(980) \rightarrow \phi \pi^+ \pi^-$ | | $( 1.8 \pm 0.4 ) \times 10^{-4}$ | | – | DESIG=236 |
| $\phi f_0(980) \rightarrow \phi \pi^0 \pi^0$ | | $( 1.7 \pm 0.7 ) \times 10^{-4}$ | | – | DESIG=237 |
| $\Xi(1530)^0 \overline{\Xi}^0$ | | $( 3.2 \pm 1.4 ) \times 10^{-4}$ | | 608 | DESIG=108 |
| $\Sigma(1385)^- \overline{\Sigma}^+$ (or c.c.) | [r] | $( 3.1 \pm 0.5 ) \times 10^{-4}$ | | 855 | DESIG=68 |
| $\phi f_1(1285)$ | | $( 2.6 \pm 0.5 ) \times 10^{-4}$ | S=1.1 | 1032 | DESIG=106 |
| $\eta \pi^+ \pi^-$ | | $( 4.0 \pm 1.7 ) \times 10^{-4}$ | | 1487 | DESIG=239 |
| $\rho \eta$ | | $( 1.93 \pm 0.23) \times 10^{-4}$ | | 1396 | DESIG=22 |
| $\omega \eta'(958)$ | | $( 1.82 \pm 0.21) \times 10^{-4}$ | | 1279 | DESIG=31 |
| $\omega f_0(980)$ | | $( 1.4 \pm 0.5 ) \times 10^{-4}$ | | 1271 | DESIG=150 |
| $\rho \eta'(958)$ | | $( 1.05 \pm 0.18) \times 10^{-4}$ | | 1281 | DESIG=23 |
| $a_2(1320)^{\pm} \pi^{\mp}$ | [r] | $< 4.3 \times 10^{-3}$ | CL=90% | 1263 | DESIG=42 |
| $K \overline{K}_2^*(1430)$ + c.c. | | $< 4.0 \times 10^{-3}$ | CL=90% | 1159 | DESIG=45 |
| $K_1(1270)^{\pm} K^{\mp}$ | | $< 3.0 \times 10^{-3}$ | CL=90% | 1231 | DESIG=131 |
| $K_2^*(1430)^0 \overline{K}_2^*(1430)^0$ | | $< 2.9 \times 10^{-3}$ | CL=90% | 604 | DESIG=47 |
| $K^*(892)^0 \overline{K}^*(892)^0$ | | $( 2.3 \pm 0.7 ) \times 10^{-4}$ | | 1266 | DESIG=46 |
| $\phi f_2(1270)$ | | $( 7.2 \pm 1.3 ) \times 10^{-4}$ | | 1036 | DESIG=39 |
| $\phi \eta(1405) \rightarrow \phi \eta \pi \pi$ | | $< 2.5 \times 10^{-4}$ | CL=90% | 946 | DESIG=128 |
| $\omega f_2'(1525)$ | | $< 2.2 \times 10^{-4}$ | CL=90% | 1003 | DESIG=29 |
| $\Sigma(1385)^0 \overline{\Lambda}$ | | $< 2 \times 10^{-4}$ | CL=90% | 912 | DESIG=111 |
| $\Delta(1232)^+ \overline{p}$ | | $< 1 \times 10^{-4}$ | CL=90% | 1100 | DESIG=112 |
| $\Theta(1540) \overline{\Theta}(1540) \rightarrow K_S^0 p K^- \overline{n}$ + c.c. | | $< 1.1 \times 10^{-5}$ | CL=90% | – | DESIG=205 |
| $\Theta(1540) K^- \overline{n} \rightarrow K_S^0 p K^- \overline{n}$ | | $< 2.1 \times 10^{-5}$ | CL=90% | – | DESIG=206 |
| $\Theta(1540) K_S^0 \overline{p} \rightarrow K_S^0 \overline{p} K^+ n$ | | $< 1.6 \times 10^{-5}$ | CL=90% | – | DESIG=207 |
| $\overline{\Theta}(1540) K^+ n \rightarrow K_S^0 \overline{p} K^+ n$ | | $< 5.6 \times 10^{-5}$ | CL=90% | – | DESIG=208 |
| $\overline{\Theta}(1540) K_S^0 p \rightarrow K_S^0 p K^- \overline{n}$ | | $< 1.1 \times 10^{-5}$ | CL=90% | – | DESIG=209 |
| $\Sigma^0 \overline{\Lambda}$ | | $< 9 \times 10^{-5}$ | CL=90% | 1032 | DESIG=110 |
| $\phi \pi^0$ | | $< 6.4 \times 10^{-6}$ | CL=90% | 1377 | DESIG=33 |

## Decays into stable hadrons

NODE=M070;CLUMP=B

| | | | | | |
|---|---|---|---|---|---|
| $2(\pi^+\pi^-)\pi^0$ | | ( 4.1 ±0.5 ) % | S=2.4 | 1496 | DESIG=9 |
| $3(\pi^+\pi^-)\pi^0$ | | ( 2.9 ±0.6 ) % | | 1433 | DESIG=11 |
| $\pi^+\pi^-\pi^0$ | | ( 2.07±0.13) % | S=1.7 | 1533 | DESIG=7 |
| $\pi^+\pi^-\pi^0 K^+K^-$ | | ( 1.79±0.29) % | S=2.2 | 1368 | DESIG=18 |
| $4(\pi^+\pi^-)\pi^0$ | | ( 9.0 ±3.0 ) $\times 10^{-3}$ | | 1345 | DESIG=12 |
| $\pi^+\pi^- K^+K^-$ | | ( 6.6 ±0.5 ) $\times 10^{-3}$ | | 1407 | DESIG=16 |
| $\pi^+\pi^- K^+K^-\eta$ | | ( 1.84±0.28) $\times 10^{-3}$ | | 1221 | DESIG=238 |
| $\pi^0\pi^0 K^+K^-$ | | ( 2.45±0.31) $\times 10^{-3}$ | | 1410 | DESIG=234 |
| $\eta\phi f_0(980) \rightarrow \eta\phi\pi^+\pi^-$ | | ( 3.2 ±1.0 ) $\times 10^{-4}$ | | – | DESIG=229 |
| $K\overline{K}\pi$ | | ( 6.1 ±1.0 ) $\times 10^{-3}$ | | 1442 | DESIG=15 |
| $2(\pi^+\pi^-)$ | | ( 3.55±0.23) $\times 10^{-3}$ | | 1517 | DESIG=8 |
| $3(\pi^+\pi^-)$ | | ( 4.3 ±0.4 ) $\times 10^{-3}$ | | 1466 | DESIG=10 |
| $2(\pi^+\pi^-\pi^0)$ | | ( 1.62±0.21) % | | 1468 | DESIG=210 |
| $2(\pi^+\pi^-)\eta$ | | ( 2.29±0.24) $\times 10^{-3}$ | | 1446 | DESIG=201 |
| $3(\pi^+\pi^-)\eta$ | | ( 7.2 ±1.5 ) $\times 10^{-4}$ | | 1379 | DESIG=202 |
| $p\overline{p}$ | | ( 2.17±0.07) $\times 10^{-3}$ | | 1232 | DESIG=50 |
| $p\overline{p}\pi^0$ | | ( 1.09±0.09) $\times 10^{-3}$ | | 1176 | DESIG=52 |
| $p\overline{p}\pi^+\pi^-$ | | ( 6.0 ±0.5 ) $\times 10^{-3}$ | S=1.3 | 1107 | DESIG=54 |
| $p\overline{p}\pi^+\pi^-\pi^0$ | [s] | ( 2.3 ±0.9 ) $\times 10^{-3}$ | S=1.9 | 1033 | DESIG=55 |
| $p\overline{p}\eta$ | | ( 2.09±0.18) $\times 10^{-3}$ | | 948 | DESIG=56 |
| $p\overline{p}\rho$ | | < 3.1 $\times 10^{-4}$ | CL=90% | 774 | DESIG=57 |
| $p\overline{p}\omega$ | | ( 1.10±0.15) $\times 10^{-3}$ | S=1.3 | 768 | DESIG=58 |
| $p\overline{p}\eta'(958)$ | | ( 9 ±4 ) $\times 10^{-4}$ | S=1.7 | 596 | DESIG=59 |
| $p\overline{p}\phi$ | | ( 4.5 ±1.5 ) $\times 10^{-5}$ | | 527 | DESIG=127 |
| $n\overline{n}$ | | ( 2.2 ±0.4 ) $\times 10^{-3}$ | | 1231 | DESIG=64 |
| $n\overline{n}\pi^+\pi^-$ | | ( 4 ±4 ) $\times 10^{-3}$ | | 1106 | DESIG=65 |
| $\Sigma^+\overline{\Sigma}^-$ | | ( 1.50±0.24) $\times 10^{-3}$ | | 992 | DESIG=247 |
| $\Sigma^0\overline{\Sigma}^0$ | | ( 1.29±0.09) $\times 10^{-3}$ | | 988 | DESIG=63 |
| $2(\pi^+\pi^-)K^+K^-$ | | ( 4.7 ±0.7 ) $\times 10^{-3}$ | S=1.3 | 1320 | DESIG=17 |
| $p\overline{n}\pi^-$ | | ( 2.12±0.09) $\times 10^{-3}$ | | 1174 | DESIG=53 |
| $nN(1440)$ | | seen | | 978 | DESIG=215;OUR EST; → NOT CHECKED ← |
| $nN(1520)$ | | seen | | 924 | DESIG=216;OUR EST; → NOT CHECKED ← |
| $nN(1535)$ | | seen | | 914 | DESIG=217;OUR EST; → NOT CHECKED ← |
| $\Xi^-\overline{\Xi}^+$ | | ( 8.5 ±1.6 ) $\times 10^{-4}$ | S=1.5 | 807 | DESIG=62 |
| $\Lambda\overline{\Lambda}$ | | ( 1.61±0.15) $\times 10^{-3}$ | S=2.0 | 1074 | DESIG=60 |
| $\Lambda\overline{\Sigma}^-\pi^+$ (or c.c.) | [r] | ( 8.3 ±0.7 ) $\times 10^{-4}$ | S=1.2 | 950 | DESIG=71 |
| $pK^-\overline{\Lambda}$ | | ( 8.9 ±1.6 ) $\times 10^{-4}$ | | 876 | DESIG=72 |
| $2(K^+K^-)$ | | ( 7.6 ±0.9 ) $\times 10^{-4}$ | | 1131 | DESIG=19 |
| $pK^-\overline{\Sigma}^0$ | | ( 2.9 ±0.8 ) $\times 10^{-4}$ | | 819 | DESIG=73 |
| $K^+K^-$ | | ( 2.37±0.31) $\times 10^{-4}$ | | 1468 | DESIG=13 |
| $K^0_S K^0_L$ | | ( 1.46±0.26) $\times 10^{-4}$ | S=2.7 | 1466 | DESIG=75 |
| $\Lambda\overline{\Lambda}\eta$ | | ( 2.6 ±0.7 ) $\times 10^{-4}$ | | 672 | DESIG=228 |
| $\Lambda\overline{\Lambda}\pi^0$ | | < 6.4 $\times 10^{-5}$ | CL=90% | 998 | DESIG=109 |
| $\overline{\Lambda}nK^0_S$ + c.c. | | ( 6.5 ±1.1 ) $\times 10^{-4}$ | | 872 | DESIG=225 |
| $\pi^+\pi^-$ | | ( 1.47±0.23) $\times 10^{-4}$ | | 1542 | DESIG=6 |
| $\Lambda\overline{\Sigma}$ + c.c. | | < 1.5 $\times 10^{-4}$ | CL=90% | 1034 | DESIG=61 |
| $K^0_S K^0_S$ | | < 1 $\times 10^{-6}$ | CL=95% | 1466 | DESIG=14 |

## Radiative decays

NODE=M070;CLUMP=C

| | | | | | |
|---|---|---|---|---|---|
| $3\gamma$ | | ( 1.2 ±0.4 ) $\times 10^{-5}$ | | 1548 | DESIG=81 |
| $4\gamma$ | | < 9 $\times 10^{-6}$ | CL=90% | 1548 | DESIG=244 |
| $5\gamma$ | | < 1.5 $\times 10^{-5}$ | CL=90% | 1548 | DESIG=245 |
| $\gamma\eta_c(1S)$ | | ( 1.7 ±0.4 ) % | S=1.7 | 114 | DESIG=85 |
| $\gamma\eta_c(1S) \rightarrow 3\gamma$ | | ( 1.2 $^{+2.7}_{-1.1}$ ) $\times 10^{-6}$ | | – | DESIG=246 |
| $\gamma\pi^+\pi^-2\pi^0$ | | ( 8.3 ±3.1 ) $\times 10^{-3}$ | | 1518 | DESIG=99 |
| $\gamma\eta\pi\pi$ | | ( 6.1 ±1.0 ) $\times 10^{-3}$ | | 1487 | DESIG=96 |
| $\gamma\eta_2(1870) \rightarrow \gamma\eta\pi^+\pi^-$ | | ( 6.2 ±2.4 ) $\times 10^{-4}$ | | – | DESIG=142 |
| $\gamma\eta(1405/1475) \rightarrow \gamma K\overline{K}\pi$ | [i] | ( 2.8 ±0.6 ) $\times 10^{-3}$ | S=1.6 | 1223 | DESIG=89 |
| $\gamma\eta(1405/1475) \rightarrow \gamma\gamma\rho^0$ | | ( 7.8 ±2.0 ) $\times 10^{-5}$ | S=1.8 | 1223 | DESIG=171 |
| $\gamma\eta(1405/1475) \rightarrow \gamma\eta\pi^+\pi^-$ | | ( 3.0 ±0.5 ) $\times 10^{-4}$ | | – | DESIG=170 |
| $\gamma\eta(1405/1475) \rightarrow \gamma\gamma\phi$ | | < 8.2 $\times 10^{-5}$ | CL=95% | – | DESIG=212 |

| | | | | | |
|---|---|---|---|---|---|
| $\gamma\rho\rho$ | $( 4.5 \pm 0.8 ) \times 10^{-3}$ | | 1340 | DESIG=94 | |
| $\gamma\rho\omega$ | $< 5.4 \times 10^{-4}$ | CL=90% | 1338 | DESIG=226 | |
| $\gamma\rho\phi$ | $< 8.8 \times 10^{-5}$ | CL=90% | 1258 | DESIG=227 | |
| $\gamma\eta'(958)$ | $( 4.71 \pm 0.27 ) \times 10^{-3}$ | S=1.1 | 1400 | DESIG=84 | |
| $\gamma 2\pi^+ 2\pi^-$ | $( 2.8 \pm 0.5 ) \times 10^{-3}$ | S=1.9 | 1517 | DESIG=95 | |
| $\gamma f_2(1270) f_2(1270)$ | $( 9.5 \pm 1.7 ) \times 10^{-4}$ | | 879 | DESIG=203 | |
| $\gamma f_2(1270) f_2(1270)$ (non resonant) | $( 8.2 \pm 1.9 ) \times 10^{-4}$ | | – | DESIG=204 | |
| $\gamma K^+ K^- \pi^+ \pi^-$ | $( 2.1 \pm 0.6 ) \times 10^{-3}$ | | 1407 | DESIG=143 | |
| $\gamma f_4(2050)$ | $( 2.7 \pm 0.7 ) \times 10^{-3}$ | | 891 | DESIG=100 | |
| $\gamma\omega\omega$ | $( 1.61 \pm 0.33 ) \times 10^{-3}$ | | 1336 | DESIG=97 | |
| $\gamma\eta(1405/1475) \rightarrow \gamma\rho^0\rho^0$ | $( 1.7 \pm 0.4 ) \times 10^{-3}$ | S=1.3 | 1223 | DESIG=124 | |
| $\gamma f_2(1270)$ | $( 1.43 \pm 0.11 ) \times 10^{-3}$ | | 1286 | DESIG=86 | |
| $\gamma f_0(1710) \rightarrow \gamma K\overline{K}$ | $( 8.5 \, ^{+1.2}_{-0.9} ) \times 10^{-4}$ | S=1.2 | 1075 | DESIG=91 | |
| $\gamma f_0(1710) \rightarrow \gamma\pi\pi$ | $( 4.0 \pm 1.0 ) \times 10^{-4}$ | | – | DESIG=135 | |
| $\gamma f_0(1710) \rightarrow \gamma\omega\omega$ | $( 3.1 \pm 1.0 ) \times 10^{-4}$ | | – | DESIG=221 | |
| $\gamma\eta$ | $( 9.8 \pm 1.0 ) \times 10^{-4}$ | S=1.7 | 1500 | DESIG=83 | |
| $\gamma f_1(1420) \rightarrow \gamma K\overline{K}\pi$ | $( 7.9 \pm 1.3 ) \times 10^{-4}$ | | 1220 | DESIG=175 | |
| $\gamma f_1(1285)$ | $( 6.1 \pm 0.8 ) \times 10^{-4}$ | | 1283 | DESIG=88 | |
| $\gamma f_1(1510) \rightarrow \gamma\eta\pi^+\pi^-$ | $( 4.5 \pm 1.2 ) \times 10^{-4}$ | | – | DESIG=141 | |
| $\gamma f_2'(1525)$ | $( 4.5 \, ^{+0.7}_{-0.4} ) \times 10^{-4}$ | | 1173 | DESIG=87 | |
| $\gamma f_2(1640) \rightarrow \gamma\omega\omega$ | $( 2.8 \pm 1.8 ) \times 10^{-4}$ | | – | DESIG=222 | |
| $\gamma f_2(1910) \rightarrow \gamma\omega\omega$ | $( 2.0 \pm 1.4 ) \times 10^{-4}$ | | – | DESIG=223 | |
| $\gamma f_2(1950) \rightarrow \gamma K^*(892)\overline{K}^*(892)$ | $( 7.0 \pm 2.2 ) \times 10^{-4}$ | | – | DESIG=144 | |
| $\gamma K^*(892)\overline{K}^*(892)$ | $( 4.0 \pm 1.3 ) \times 10^{-3}$ | | 1266 | DESIG=145 | |
| $\gamma\phi\phi$ | $( 4.0 \pm 1.2 ) \times 10^{-4}$ | S=2.1 | 1166 | DESIG=98 | |
| $\gamma p\overline{p}$ | $( 3.8 \pm 1.0 ) \times 10^{-4}$ | | 1232 | DESIG=90 | |
| $\gamma\eta(2225)$ | $( 3.3 \pm 0.5 ) \times 10^{-4}$ | | 749 | DESIG=126 | |
| $\gamma\eta(1760) \rightarrow \gamma\rho^0\rho^0$ | $( 1.3 \pm 0.9 ) \times 10^{-4}$ | | 1048 | DESIG=125 | |
| $\gamma\eta(1760) \rightarrow \gamma\omega\omega$ | $( 1.98 \pm 0.33 ) \times 10^{-3}$ | | – | DESIG=224 | |
| $\gamma X(1835)$ | $( 2.2 \pm 0.6 ) \times 10^{-4}$ | | 1006 | DESIG=213 | |
| $\gamma(K\overline{K}\pi)\ [J^{PC} = 0^{-+}]$ | $( 7 \pm 4 ) \times 10^{-4}$ | S=2.1 | 1442 | DESIG=176 | |
| $\gamma\pi^0$ | $( 3.3 \, ^{+0.6}_{-0.4} ) \times 10^{-5}$ | | 1546 | DESIG=82 | |
| $\gamma p\overline{p}\pi^+\pi^-$ | $< 7.9 \times 10^{-4}$ | CL=90% | 1107 | DESIG=93 | |
| $\gamma\Lambda\overline{\Lambda}$ | $< 1.3 \times 10^{-4}$ | CL=90% | 1074 | DESIG=200 | |
| $\gamma f_J(2220)$ | $> 2.50 \times 10^{-3}$ | CL=99.9% | 745 | DESIG=92 | |
| $\gamma f_J(2220) \rightarrow \gamma\pi\pi$ | $( 8 \pm 4 ) \times 10^{-5}$ | | – | DESIG=136 | |
| $\gamma f_J(2220) \rightarrow \gamma K\overline{K}$ | $( 8.1 \pm 3.0 ) \times 10^{-5}$ | | – | DESIG=137 | |
| $\gamma f_J(2220) \rightarrow \gamma p\overline{p}$ | $( 1.5 \pm 0.8 ) \times 10^{-5}$ | | – | DESIG=138 | |
| $\gamma f_0(1500)$ | $>( 5.7 \pm 0.8 ) \times 10^{-4}$ | | 1183 | DESIG=172;OUR EST; → NOT CHECKED ← | |
| $\gamma e^+ e^-$ | $( 8.8 \pm 1.4 ) \times 10^{-3}$ | | 1548 | DESIG=5 | |
| **Weak decays** | | | | NODE=M070;CLUMP=E | |
| $D^- e^+ \nu_e +$ c.c. | $< 1.2 \times 10^{-5}$ | CL=90% | 984 | DESIG=218 | |
| $\overline{D}^0 e^+ e^- +$ c.c. | $< 1.1 \times 10^{-5}$ | CL=90% | 987 | DESIG=219 | |
| $D_s^- e^+ \nu_e +$ c.c. | $< 3.6 \times 10^{-5}$ | CL=90% | 923 | DESIG=220 | |
| $D^- \pi^+ +$ c.c. | $< 7.5 \times 10^{-5}$ | CL=90% | 977 | DESIG=241 | |
| $\overline{D}^0 K^0 +$ c.c. | $< 1.7 \times 10^{-4}$ | CL=90% | 898 | DESIG=242 | |
| $D_s^- \pi^+ +$ c.c. | $< 1.3 \times 10^{-4}$ | CL=90% | 915 | DESIG=243 | |
| **Charge conjugation ($C$), Parity ($P$), Lepton Family number ($LF$) violating modes** | | | | NODE=M070;CLUMP=D | |
| $\gamma\gamma$ | $C$ $< 5 \times 10^{-6}$ | CL=90% | 1548 | DESIG=80 | |
| $e^\pm\mu^\mp$ | $LF$ $< 1.1 \times 10^{-6}$ | CL=90% | 1547 | DESIG=177 | |
| $e^\pm\tau^\mp$ | $LF$ $< 8.3 \times 10^{-6}$ | CL=90% | 1039 | DESIG=178 | |
| $\mu^\pm\tau^\mp$ | $LF$ $< 2.0 \times 10^{-6}$ | CL=90% | 1035 | DESIG=179 | |

| | | | | | |
|---|---|---|---|---|---|
| **Other decays** | | | | | NODE=M070;CLUMP=F |
| invisible | $<$ 7 | $\times 10^{-4}$ | CL=90% | – | DESIG=240 |

## $\chi_{c0}(1P)$

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

NODE=M056

Mass $m = 3414.75 \pm 0.31$ MeV — NODE=M056M;DTYPE=M

Full width $\Gamma = 10.4 \pm 0.7$ MeV — NODE=M056W;DTYPE=G

| $\chi_{c0}(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| **Hadronic decays** | | | | NODE=M056215;NODE=M056;CLUMP=A |
| $2(\pi^+\pi^-)$ | (2.25±0.19) % | | 1679 | DESIG=3 |
| $\rho^0\pi^+\pi^-$ | (8.8 ±2.8 ) × $10^{-3}$ | | 1607 | DESIG=9 |
| $f_0(980)\,f_0(980)$ | (6.9 ±2.2 ) × $10^{-4}$ | | 1398 | DESIG=20 |
| $\pi^+\pi^-\pi^0\pi^0$ | (3.5 ±0.4 ) % | | 1680 | DESIG=61 |
| $\rho^+\pi^-\pi^0$ + c.c. | (3.0 ±0.5 ) % | | 1607 | DESIG=62 |
| $\pi^+\pi^- K^+K^-$ | (1.80±0.15) % | | 1580 | DESIG=5 |
| $K_0^*(1430)^0\overline{K}_0^*(1430)^0 \to \pi^+\pi^- K^+K^-$ | (1.02$^{+0.40}_{-0.29}$) × $10^{-3}$ | | – | DESIG=31 |
| $K_0^*(1430)^0\overline{K}_2^*(1430)^0$ + c.c. $\to \pi^+\pi^- K^+K^-$ | (8.3 $^{+2.0}_{-2.5}$ ) × $10^{-4}$ | | – | DESIG=32 |
| $K_1(1270)^+K^-$ + c.c. $\to \pi^+\pi^- K^+K^-$ | (6.5 ±2.0 ) × $10^{-3}$ | | – | DESIG=33 |
| $K_1(1400)^+K^-$ + c.c. $\to \pi^+\pi^- K^+K^-$ | $<$ 2.8 | × $10^{-3}$ CL=90% | – | DESIG=34 |
| $f_0(980)\,f_0(980)$ | (1.7 $^{+1.1}_{-0.9}$ ) × $10^{-4}$ | | 1398 | DESIG=23 |
| $f_0(980)\,f_0(2200)$ | (8.2 $^{+2.1}_{-2.6}$ ) × $10^{-4}$ | | 595 | DESIG=24 |
| $f_0(1370)\,f_0(1370)$ | $<$ 2.8 | × $10^{-4}$ CL=90% | 1019 | DESIG=25 |
| $f_0(1370)\,f_0(1500)$ | $<$ 1.8 | × $10^{-4}$ CL=90% | 920 | DESIG=26 |
| $f_0(1370)\,f_0(1710)$ | (7.0 $^{+4.0}_{-2.4}$ ) × $10^{-4}$ | | 723 | DESIG=27 |
| $f_0(1500)\,f_0(1370)$ | $<$ 1.4 | × $10^{-4}$ CL=90% | 920 | DESIG=28 |
| $f_0(1500)\,f_0(1500)$ | $<$ 5 | × $10^{-5}$ CL=90% | 805 | DESIG=29 |
| $f_0(1500)\,f_0(1710)$ | $<$ 7 | × $10^{-5}$ CL=90% | 559 | DESIG=30 |
| $K^+K^-\pi^0\pi^0$ | (5.8 ±0.9 ) × $10^{-3}$ | | 1582 | DESIG=63 |
| $K^+\pi^- K^0\pi^0$ + c.c. | (3.1 ±0.7 ) × $10^{-3}$ | | 1581 | DESIG=65 |
| $\rho^+ K^- K^0$ + c.c. | (2.58±0.35) % | | 1458 | DESIG=66 |
| $K^*(892)^- K^+\pi^0 \to K^+\pi^- K^0\pi^0$ + c.c. | (1.25±0.22) % | | – | DESIG=67 |
| $K_S^0 K_S^0\pi^+\pi^-$ | (5.9 ±1.1 ) × $10^{-3}$ | | 1579 | DESIG=41 |
| $K^+K^-\eta\pi^0$ | (4.8 ±1.2 ) × $10^{-3}$ | | 1468 | DESIG=68 |
| $3(\pi^+\pi^-)$ | (1.20±0.18) % | | 1633 | DESIG=4 |
| $K^+\overline{K}^*(892)^0\pi^-$ + c.c. | (7.3 ±1.6 ) × $10^{-3}$ | | 1523 | DESIG=10 |
| $K^*(892)^0\overline{K}^*(892)^0$ | (1.8 ±0.6 ) × $10^{-3}$ | | 1456 | DESIG=21 |
| $\pi\pi$ | (7.2 ±0.6 ) × $10^{-3}$ | | 1702 | DESIG=18 |
| $\pi^0\eta$ | $<$ 1.7 | × $10^{-4}$ | 1661 | DESIG=35 |
| $\pi^0\eta'$ | $<$ 1.0 | × $10^{-3}$ | 1570 | DESIG=36 |
| $\eta\eta$ | (2.2 ±0.4 ) × $10^{-3}$ | | 1617 | DESIG=13 |
| $\eta\eta'$ | $<$ 5 | × $10^{-4}$ CL=90% | 1521 | DESIG=37 |
| $\eta'\eta'$ | (1.7 ±0.4 ) × $10^{-3}$ | | 1413 | DESIG=46 |
| $\omega\omega$ | (2.2 ±0.7 ) × $10^{-3}$ | | 1517 | DESIG=22 |
| $K^+K^-$ | (5.8 ±0.6 ) × $10^{-3}$ | | 1634 | DESIG=2 |
| $K_S^0 K_S^0$ | (2.84±0.28) × $10^{-3}$ | | 1633 | DESIG=15 |
| $\pi^+\pi^-\eta$ | $<$ 2.1 | × $10^{-4}$ CL=90% | 1651 | DESIG=50 |
| $\pi^+\pi^-\eta'$ | $<$ 4 | × $10^{-4}$ CL=90% | 1560 | DESIG=53 |
| $\overline{K}^0 K^+\pi^-$ + c.c. | $<$ 1.0 | × $10^{-4}$ CL=90% | 1610 | DESIG=17 |

| | | | | | |
|---|---|---|---|---|---|
| $K^+K^-\pi^0$ | $< 6$ | $\times 10^{-5}$ | CL=90% | 1611 | DESIG=47 |
| $K^+K^-\eta$ | $< 2.3$ | $\times 10^{-4}$ | CL=90% | 1512 | DESIG=51 |
| $K^+K^-K^0_SK^0_S$ | $(1.5 \pm 0.5) \times 10^{-3}$ | | | 1331 | DESIG=42 |
| $K^+K^-K^+K^-$ | $(2.83 \pm 0.30) \times 10^{-3}$ | | | 1333 | DESIG=14 |
| $K^+K^-\phi$ | $(1.01 \pm 0.26) \times 10^{-3}$ | | | 1381 | DESIG=44 |
| $\phi\phi$ | $(9.3 \pm 1.9) \times 10^{-4}$ | | | 1370 | DESIG=16 |
| $p\overline{p}$ | $(2.39 \pm 0.15) \times 10^{-4}$ | | | 1426 | DESIG=11 |
| $p\overline{p}\pi^0$ | $(5.8 \pm 1.2) \times 10^{-4}$ | | | 1379 | DESIG=48 |
| $p\overline{p}\eta$ | $(3.8 \pm 1.1) \times 10^{-4}$ | | | 1187 | DESIG=52 |
| $\pi^+\pi^-p\overline{p}$ | $(2.1 \pm 0.7) \times 10^{-3}$ | | S=1.4 | 1320 | DESIG=8 |
| $\pi^0\pi^0p\overline{p}$ | $(1.08 \pm 0.29) \times 10^{-3}$ | | | 1324 | DESIG=64 |
| $K^0_SK^0_Sp\overline{p}$ | $< 8.8$ | $\times 10^{-4}$ | CL=90% | 884 | DESIG=40 |
| $p\overline{n}\pi^-$ | $(1.17 \pm 0.32) \times 10^{-3}$ | | | 1376 | DESIG=43 |
| $\Lambda\overline{\Lambda}$ | $(3.4 \pm 0.4) \times 10^{-4}$ | | | 1292 | DESIG=19 |
| $\Lambda\overline{\Lambda}\pi^+\pi^-$ | $< 4.0$ | $\times 10^{-3}$ | CL=90% | 1153 | DESIG=38 |
| $K^+\overline{p}\Lambda$ + c.c. | $(1.05 \pm 0.20) \times 10^{-3}$ | | | 1132 | DESIG=49 |
| $\Sigma^0\overline{\Sigma}^0$ | $(4.3 \pm 0.7) \times 10^{-4}$ | | | 1222 | DESIG=58 |
| $\Sigma^+\overline{\Sigma}^-$ | $(3.2 \pm 0.7) \times 10^{-4}$ | | | 1225 | DESIG=59 |
| $\Xi^0\overline{\Xi}^0$ | $(3.3 \pm 0.8) \times 10^{-4}$ | | | 1089 | DESIG=60 |
| $\Xi^-\overline{\Xi}^+$ | $(5.0 \pm 0.7) \times 10^{-4}$ | | | 1081 | DESIG=39 |
| **Radiative decays** | | | | | NODE=M056;CLUMP=B |
| $\gamma J/\psi(1S)$ | $(1.14 \pm 0.08)$ % | | | 303 | DESIG=6 |
| $\gamma\rho^0$ | $< 9$ | $\times 10^{-6}$ | CL=90% | 1619 | DESIG=55 |
| $\gamma\omega$ | $< 9$ | $\times 10^{-6}$ | CL=90% | 1618 | DESIG=56 |
| $\gamma\phi$ | $< 6$ | $\times 10^{-6}$ | CL=90% | 1555 | DESIG=57 |
| $\gamma\gamma$ | $(2.27 \pm 0.18) \times 10^{-4}$ | | | 1707 | DESIG=7 |

## $\chi_{c1}(1P)$

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

NODE=M055

Mass $m = 3510.66 \pm 0.07$ MeV (S = 1.5)
Full width $\Gamma = 0.86 \pm 0.05$ MeV

NODE=M055M;DTYPE=M
NODE=M055W;DTYPE=G

| $\chi_{c1}(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| **Hadronic decays** | | | | NODE=M055215;NODE=M055;CLUMP=A |
| $3(\pi^+\pi^-)$ | $( 5.8 \pm 1.4) \times 10^{-3}$ | S=1.2 | 1683 | DESIG=6 |
| $2(\pi^+\pi^-)$ | $( 7.6 \pm 2.6) \times 10^{-3}$ | | 1728 | DESIG=5 |
| $\pi^+\pi^-\pi^0\pi^0$ | $( 1.26 \pm 0.17)$ % | | 1729 | DESIG=51 |
| $\rho^+\pi^-\pi^0$ + c.c. | $( 1.53 \pm 0.26)$ % | | 1658 | DESIG=52 |
| $\rho^0\pi^+\pi^-$ | $( 3.9 \pm 3.5) \times 10^{-3}$ | | 1657 | DESIG=9 |
| $\pi^+\pi^-K^+K^-$ | $( 4.5 \pm 1.0) \times 10^{-3}$ | | 1632 | DESIG=7 |
| $K^+K^-\pi^0\pi^0$ | $( 1.18 \pm 0.29) \times 10^{-3}$ | | 1634 | DESIG=53 |
| $K^+\pi^-K^0\pi^0$ + c.c. | $( 1.2 \pm 0.4) \times 10^{-3}$ | | 1632 | DESIG=55 |
| $\rho^+K^-K^0$ + c.c. | $( 9.0 \pm 1.5) \times 10^{-3}$ | | 1514 | DESIG=56 |
| $K^*(892)^0K^0\pi^0 \to K^+\pi^-K^0\pi^0$ + c.c. | $( 5.3 \pm 1.3) \times 10^{-3}$ | | – | DESIG=57 |
| $K^+K^-\eta\pi^0$ | $( 2.5 \pm 0.7) \times 10^{-3}$ | | 1523 | DESIG=58 |
| $\pi^+\pi^-K^0_SK^0_S$ | $( 7.3 \pm 3.1) \times 10^{-4}$ | | 1630 | DESIG=28 |
| $K^+K^-\eta$ | $( 3.3 \pm 1.0) \times 10^{-4}$ | | 1566 | DESIG=42 |
| $K^0K^+\pi^-$ + c.c. | $( 7.3 \pm 0.6) \times 10^{-3}$ | | 1661 | DESIG=17 |
| $K^*(892)^0\overline{K}^0$ + c.c. | $( 1.0 \pm 0.4) \times 10^{-3}$ | | 1602 | DESIG=32 |
| $K^*(892)^+K^-$ + c.c. | $( 1.5 \pm 0.7) \times 10^{-3}$ | | 1602 | DESIG=33 |
| $K^*_J(1430)^0\overline{K}^0$ + c.c. $\to K^0_SK^+\pi^-$ + c.c. | $< 8$ | $\times 10^{-4}$ CL=90% | – | DESIG=34 |
| $K^*_J(1430)^+K^-$ + c.c. $\to K^0_SK^+\pi^-$ + c.c. | $< 2.3$ | $\times 10^{-3}$ CL=90% | – | DESIG=35 |
| $K^+K^-\pi^0$ | $( 1.92 \pm 0.26) \times 10^{-3}$ | | 1662 | DESIG=38 |
| $\eta\pi^+\pi^-$ | $( 5.0 \pm 0.5) \times 10^{-3}$ | | 1701 | DESIG=31 |

| | | | | |
|---|---|---|---|---|
| $a_0(980)^+\pi^- +$ c.c. $\rightarrow \eta\pi^+\pi^-$ | ( 1.9 ±0.7 ) × $10^{-3}$ | | – | DESIG=36 |
| $f_2(1270)\eta$ | ( 2.8 ±0.8 ) × $10^{-3}$ | | 1468 | DESIG=37 |
| $\pi^+\pi^-\eta'$ | ( 2.4 ±0.5 ) × $10^{-3}$ | | 1612 | DESIG=44 |
| $K^+\overline{K}^*(892)^0\pi^- +$ c.c. | ( 3.2 ±2.1 ) × $10^{-3}$ | | 1577 | DESIG=10 |
| $K^*(892)^0\overline{K}^*(892)^0$ | ( 1.5 ±0.4 ) × $10^{-3}$ | | 1512 | DESIG=21 |
| $K^+K^-K^0_SK^0_S$ | < 5 × $10^{-4}$ | CL=90% | 1390 | DESIG=29 |
| $K^+K^-K^+K^-$ | ( 5.6 ±1.2 ) × $10^{-4}$ | | 1393 | DESIG=14 |
| $K^+K^-\phi$ | ( 4.3 ±1.6 ) × $10^{-4}$ | | 1440 | DESIG=30 |
| $p\overline{p}$ | ( 7.4 ±0.4 ) × $10^{-5}$ | | 1484 | DESIG=11 |
| $p\overline{p}\pi^0$ | ( 1.2 ±0.5 ) × $10^{-4}$ | | 1438 | DESIG=39 |
| $p\overline{p}\eta$ | < 1.6 × $10^{-4}$ | CL=90% | 1254 | DESIG=43 |
| $\pi^+\pi^-p\overline{p}$ | ( 5.0 ±1.9 ) × $10^{-4}$ | | 1381 | DESIG=8 |
| $K^0_SK^0_Sp\overline{p}$ | < 4.5 × $10^{-4}$ | CL=90% | 968 | DESIG=25 |
| $\Lambda\overline{\Lambda}$ | ( 1.19±0.19) × $10^{-4}$ | | 1355 | DESIG=19 |
| $\Lambda\overline{\Lambda}\pi^+\pi^-$ | < 1.5 × $10^{-3}$ | CL=90% | 1223 | DESIG=24 |
| $K^+\overline{p}\Lambda$ | ( 3.2 ±1.0 ) × $10^{-4}$ | | 1203 | DESIG=40 |
| $\Sigma^0\overline{\Sigma}^0$ | < 4 × $10^{-5}$ | CL=90% | 1288 | DESIG=48 |
| $\Sigma^+\overline{\Sigma}^-$ | < 6 × $10^{-5}$ | CL=90% | 1291 | DESIG=49 |
| $\Xi^0\overline{\Xi}^0$ | < 6 × $10^{-5}$ | CL=90% | 1163 | DESIG=50 |
| $\Xi^-\overline{\Xi}^+$ | ( 8.4 ±2.3 ) × $10^{-5}$ | | 1155 | DESIG=26 |
| $\pi^+\pi^- + K^+K^-$ | < 2.1 × $10^{-3}$ | | – | DESIG=23 |
| $K^0_SK^0_S$ | < 6 × $10^{-5}$ | CL=90% | 1683 | DESIG=27 |
| **Radiative decays** | | | | NODE=M055;CLUMP=B |
| $\gamma J/\psi(1S)$ | (34.2 ±1.5 ) % | | 389 | DESIG=1 |
| $\gamma\rho^0$ | ( 2.29±0.27) × $10^{-4}$ | | 1670 | DESIG=45 |
| $\gamma\omega$ | ( 7.8 ±1.8 ) × $10^{-5}$ | | 1668 | DESIG=46 |
| $\gamma\phi$ | < 2.5 × $10^{-5}$ | CL=90% | 1607 | DESIG=47 |

## $h_c(1P)$

$I^G(J^{PC}) = ?^?(1^{+-})$ NODE=M144

Mass $m = 3525.67 \pm 0.24$ MeV (S = 1.7) NODE=M144M;DTYPE=M
Full width $\Gamma < 1$ MeV NODE=M144W;DTYPE=G

| $h_c(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $J/\psi(1S)\pi\pi$ | not seen | 313 | NODE=M144215;DESIG=2;OUR EST; → NOT CHECKED ← |
| $\eta_c\gamma$ | seen | 503 | DESIG=4 |

## $\chi_{c2}(1P)$

$I^G(J^{PC}) = 0^+(2^{++})$ NODE=M057

Mass $m = 3556.20 \pm 0.09$ MeV NODE=M057M;DTYPE=M
Full width $\Gamma = 1.98 \pm 0.11$ MeV NODE=M057W;DTYPE=G

| $\chi_{c2}(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| **Hadronic decays** | | | | NODE=M057215;NODE=M057;CLUMP=A |
| $2(\pi^+\pi^-)$ | ( 1.10± 0.11) % | | 1751 | DESIG=3 |
| $\pi^+\pi^-\pi^0\pi^0$ | (200 ±26 ) % | | 1752 | DESIG=50 |
| $\rho^+\pi^-\pi^0$ + c.c. | (239 ±40 ) % | | 1682 | DESIG=51 |
| $K^+K^-\pi^0\pi^0$ | ( 23 ± 5 ) % | | 1658 | DESIG=52 |
| $K^+\pi^-K^0\pi^0$ + c.c. | (151 ±22 ) % | | 1657 | DESIG=54 |
| $\rho^+K^-K^0$ + c.c. | ( 45 ±14 ) % | | 1540 | DESIG=55 |
| $K^*(892)^0K^0\pi^0 \to K^+\pi^-K^0\pi^0$ + c.c. | ( 42 ±10 ) % | | – | DESIG=56 |
| $K^*(892)^+K^-\pi^0 \to K^+\pi^-K^0\pi^0$ + c.c. | ( 41 ±10 ) % | | – | DESIG=57 |
| $K^*(892)^+K^0\pi^- \to K^+\pi^-K^0\pi^0$ + c.c. | ( 32 ± 9 ) % | | – | DESIG=58 |
| $K^+K^-\eta\pi^0$ | ( 14 ± 5 ) % | | 1549 | DESIG=59 |
| $\pi^+\pi^-K^+K^-$ | ( 9.4 ± 1.1 ) $\times 10^{-3}$ | | 1656 | DESIG=5 |
| $K^+\overline{K}^*(892)^0\pi^-$ + c.c. | ( 3.6 ± 1.2 ) $\times 10^{-3}$ | | 1602 | DESIG=10 |
| $K^*(892)^0\overline{K}^*(892)^0$ | ( 2.5 ± 0.5 ) $\times 10^{-3}$ | | 1538 | DESIG=21 |
| $3(\pi^+\pi^-)$ | ( 8.6 ± 1.8 ) $\times 10^{-3}$ | | 1707 | DESIG=4 |
| $\phi\phi$ | ( 1.47± 0.28) $\times 10^{-3}$ | | 1457 | DESIG=16 |
| $\omega\omega$ | ( 1.9 ± 0.6 ) $\times 10^{-3}$ | | 1597 | DESIG=25 |
| $\pi\pi$ | ( 2.10± 0.23) $\times 10^{-3}$ | | 1773 | DESIG=22 |
| $\rho^0\pi^+\pi^-$ | ( 3.9 ± 1.7 ) $\times 10^{-3}$ | | 1681 | DESIG=9 |
| $\pi^+\pi^-\eta$ | ( 5.3 ± 1.4 ) $\times 10^{-4}$ | | 1724 | DESIG=39 |
| $\pi^+\pi^-\eta'$ | ( 5.5 ± 2.0 ) $\times 10^{-4}$ | | 1636 | DESIG=42 |
| $\eta\eta$ | < 5 $\times 10^{-4}$ | 90% | 1692 | DESIG=14 |
| $K^+K^-$ | ( 7.6 ± 1.3 ) $\times 10^{-4}$ | | 1708 | DESIG=2 |
| $K^0_SK^0_S$ | ( 6.2 ± 0.8 ) $\times 10^{-4}$ | | 1707 | DESIG=15 |
| $\overline{K}^0K^+\pi^-$ + c.c. | ( 1.33± 0.20) $\times 10^{-3}$ | | 1685 | DESIG=17 |
| $K^+K^-\pi^0$ | ( 3.3 ± 0.8 ) $\times 10^{-4}$ | | 1686 | DESIG=36 |
| $K^+K^-\eta$ | < 3.5 $\times 10^{-4}$ | 90% | 1592 | DESIG=40 |
| $\eta\eta'$ | < 2.5 $\times 10^{-4}$ | 90% | 1600 | DESIG=34 |
| $\eta'\eta'$ | < 3.3 $\times 10^{-4}$ | 90% | 1498 | DESIG=35 |
| $\pi^+\pi^-K^0_SK^0_S$ | ( 2.4 ± 0.6 ) $\times 10^{-3}$ | | 1655 | DESIG=29 |
| $K^+K^-K^0_SK^0_S$ | < 4 $\times 10^{-4}$ | 90% | 1418 | DESIG=30 |
| $K^+K^-K^+K^-$ | ( 1.77± 0.22) $\times 10^{-3}$ | | 1421 | DESIG=24 |
| $K^+K^-\phi$ | ( 1.55± 0.33) $\times 10^{-3}$ | | 1468 | DESIG=32 |
| $K^0_SK^0_Sp\overline{p}$ | < 7.9 $\times 10^{-4}$ | 90% | 1007 | DESIG=28 |
| $p\overline{p}$ | ( 7.2 ± 0.4 ) $\times 10^{-5}$ | | 1510 | DESIG=11 |
| $p\overline{p}\pi^0$ | ( 4.7 ± 1.0 ) $\times 10^{-4}$ | | 1465 | DESIG=37 |
| $p\overline{p}\eta$ | ( 2.0 ± 0.8 ) $\times 10^{-4}$ | | 1285 | DESIG=41 |
| $\pi^+\pi^-p\overline{p}$ | ( 1.32± 0.34) $\times 10^{-3}$ | | 1410 | DESIG=8 |
| $\pi^0\pi^0p\overline{p}$ | ( 8.6 ± 2.6 ) % | | 1414 | DESIG=53 |
| $p\overline{n}\pi^-$ | ( 1.1 ± 0.4 ) $\times 10^{-3}$ | | 1463 | DESIG=31 |
| $\Lambda\overline{\Lambda}$ | ( 1.87± 0.27) $\times 10^{-4}$ | | 1385 | DESIG=19 |
| $\Lambda\overline{\Lambda}\pi^+\pi^-$ | < 3.5 $\times 10^{-3}$ | 90% | 1255 | DESIG=27 |
| $K^+\overline{p}\Lambda$ + c.c. | ( 9.1 ± 1.8 ) $\times 10^{-4}$ | | 1236 | DESIG=38 |
| $\Sigma^0\overline{\Sigma}^0$ | < 8 $\times 10^{-5}$ | 90% | 1319 | DESIG=47 |
| $\Sigma^+\overline{\Sigma}^-$ | < 7 $\times 10^{-5}$ | 90% | 1322 | DESIG=48 |
| $\Xi^0\overline{\Xi}^0$ | < 1.1 $\times 10^{-4}$ | 90% | 1197 | DESIG=49 |
| $\Xi^-\overline{\Xi}^+$ | ( 1.55± 0.35) $\times 10^{-4}$ | | 1189 | DESIG=26 |
| $J/\psi(1S)\pi^+\pi^-\pi^0$ | < 1.5 % | 90% | 185 | DESIG=12 |

**Radiative decays** NODE=M057;CLUMP=B

| | | | | | |
|---|---|---|---|---|---|
| $\gamma J/\psi(1S)$ | ( 19.4 ± 0.8 ) % | | | 430 | DESIG=6 |
| $\gamma\rho^0$ | < 5 | $\times 10^{-5}$ | 90% | 1694 | DESIG=44 |
| $\gamma\omega$ | < 7 | $\times 10^{-6}$ | 90% | 1692 | DESIG=45 |
| $\gamma\phi$ | < 1.2 | $\times 10^{-5}$ | 90% | 1632 | DESIG=46 |
| $\gamma\gamma$ | ( 2.58± 0.16) | $\times 10^{-4}$ | | 1778 | DESIG=7 |

## $\eta_c(2S)$

$I^G(J^{PC}) = 0^+(0^{-+})$ NODE=M059

Quantum numbers are quark model predictions.

Mass $m = 3637 \pm 4$ MeV (S = 1.7) NODE=M059M;DTYPE=M
Full width $\Gamma = 14 \pm 7$ MeV NODE=M059W;DTYPE=G

| $\eta_c(2S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| hadrons | not seen | | – | NODE=M059215;DESIG=1 |
| $K\overline{K}\pi$ | (1.9±1.2) % | | 1729 | DESIG=4 |
| $2\pi^+2\pi^-$ | not seen | | 1792 | DESIG=5 |
| $K^+K^-\pi^+\pi^-$ | not seen | | 1700 | DESIG=6 |
| $2K^+2K^-$ | not seen | | 1470 | DESIG=7 |
| $p\overline{p}$ | not seen | | 1558 | DESIG=3 |
| $\gamma\gamma$ | < 5 $\times 10^{-4}$ | 90% | 1819 | DESIG=2 |

## $\psi(2S)$

$I^G(J^{PC}) = 0^-(1^{--})$ NODE=M071

Mass $m = 3686.09 \pm 0.04$ MeV (S = 1.6) NODE=M071M;DTYPE=M
Full width $\Gamma = 317 \pm 9$ keV NODE=M071W;DTYPE=G
$\Gamma_{ee} = 2.38 \pm 0.04$ keV NODE=M071W1;DTYPE=E

| $\psi(2S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| hadrons | (97.85±0.13) % | | – | NODE=M071220;DESIG=3 |
| virtual $\gamma \rightarrow$ hadrons | ( 1.73±0.14) % | S=1.5 | – | DESIG=4 |
| $e^+e^-$ | ( 7.65±0.17) $\times 10^{-3}$ | | 1843 | DESIG=1 |
| $\mu^+\mu^-$ | ( 7.6 ±0.8 ) $\times 10^{-3}$ | | 1840 | DESIG=2 |
| $\tau^+\tau^-$ | ( 3.0 ±0.4 ) $\times 10^{-3}$ | | 490 | DESIG=68 |

**Decays into $J/\psi(1S)$ and anything** NODE=M071;CLUMP=A

| | | | | |
|---|---|---|---|---|
| $J/\psi(1S)$ anything | (58.7 ±0.8 ) % | | – | DESIG=11 |
| $J/\psi(1S)$ neutrals | (24.3 ±0.4 ) % | | – | DESIG=12 |
| $J/\psi(1S)\pi^+\pi^-$ | (33.1 ±0.5 ) % | | 477 | DESIG=13 |
| $J/\psi(1S)\pi^0\pi^0$ | (17.52±0.34) % | | 481 | DESIG=14 |
| $J/\psi(1S)\eta$ | ( 3.24±0.07) % | | 199 | DESIG=15 |
| $J/\psi(1S)\pi^0$ | ( 1.30±0.10) $\times 10^{-3}$ | S=1.4 | 528 | DESIG=18 |

**Hadronic decays** NODE=M071;CLUMP=B

| | | | | |
|---|---|---|---|---|
| $3(\pi^+\pi^-)\pi^0$ | ( 3.5 ±1.6 ) $\times 10^{-3}$ | | 1746 | DESIG=37 |
| $2(\pi^+\pi^-)\pi^0$ | ( 2.9 ±1.0 ) $\times 10^{-3}$ | S=4.6 | 1799 | DESIG=25 |
| $\rho a_2(1320)$ | ( 2.6 ±0.9 ) $\times 10^{-4}$ | | 1500 | DESIG=65 |
| $p\overline{p}$ | ( 2.75±0.12) $\times 10^{-4}$ | | 1586 | DESIG=27 |
| $\Delta^{++}\overline{\Delta}^{--}$ | ( 1.28±0.35) $\times 10^{-4}$ | | 1371 | DESIG=70 |
| $\Lambda\overline{\Lambda}\pi^0$ | < 1.2 $\times 10^{-4}$ | CL=90% | 1412 | DESIG=238 |
| $\Lambda\overline{\Lambda}\eta$ | < 4.9 $\times 10^{-5}$ | CL=90% | 1197 | DESIG=239 |
| $\Lambda\overline{p}K^+$ | ( 1.00±0.14) $\times 10^{-4}$ | | 1327 | DESIG=214 |
| $\Lambda\overline{p}K^+\pi^+\pi^-$ | ( 1.8 ±0.4 ) $\times 10^{-4}$ | | 1167 | DESIG=215 |
| $\Lambda\overline{\Lambda}\pi^+\pi^-$ | ( 2.8 ±0.6 ) $\times 10^{-4}$ | | 1346 | DESIG=213 |
| $\Lambda\overline{\Lambda}$ | ( 2.8 ±0.5 ) $\times 10^{-4}$ | S=2.6 | 1467 | DESIG=28 |
| $\Sigma^+\overline{\Sigma}^-$ | ( 2.6 ±0.8 ) $\times 10^{-4}$ | | 1408 | DESIG=223 |
| $\Sigma^0\overline{\Sigma}^0$ | ( 2.2 ±0.4 ) $\times 10^{-4}$ | S=1.5 | 1405 | DESIG=71 |
| $\Sigma(1385)^+\overline{\Sigma}(1385)^-$ | ( 1.1 ±0.4 ) $\times 10^{-4}$ | | 1218 | DESIG=72 |
| $\Xi^-\overline{\Xi}^+$ | ( 1.8 ±0.6 ) $\times 10^{-4}$ | S=2.8 | 1284 | DESIG=29 |

| | | | | |
|---|---|---|---|---|
| $\Xi^0\overline{\Xi}^0$ | $(\ 2.8\ \pm0.9\ )\times10^{-4}$ | | 1291 | DESIG=224 |
| $\Xi(1530)^0\overline{\Xi}(1530)^0$ | $<\ 8.1\ \times10^{-5}$ | CL=90% | 1025 | DESIG=73 |
| $\Omega^-\overline{\Omega}^+$ | $<\ 7.3\ \times10^{-5}$ | CL=90% | 774 | DESIG=74 |
| $\pi^0 p\overline{p}$ | $(\ 1.33\pm0.17)\times10^{-4}$ | | 1543 | DESIG=35 |
| $\eta p\overline{p}$ | $(\ 6.0\ \pm1.2\ )\times10^{-5}$ | | 1373 | DESIG=200 |
| $\omega p\overline{p}$ | $(\ 6.9\ \pm2.1\ )\times10^{-5}$ | | 1247 | DESIG=77 |
| $\phi p\overline{p}$ | $<\ 2.4\ \times10^{-5}$ | CL=90% | 1109 | DESIG=80 |
| $\pi^+\pi^- p\overline{p}$ | $(\ 6.0\ \pm0.4\ )\times10^{-4}$ | | 1491 | DESIG=31 |
| $p\overline{n}\pi^-$ or c.c. | $(\ 2.48\pm0.17)\times10^{-4}$ | | – | DESIG=227 |
| $p\overline{n}\pi^-\pi^0$ | $(\ 3.2\ \pm0.7\ )\times10^{-4}$ | | 1492 | DESIG=228 |
| $2(\pi^+\pi^-\pi^0)$ | $(\ 4.6\ \pm1.5\ )\times10^{-3}$ | | 1776 | DESIG=221 |
| $\eta\pi^+\pi^-$ | $<\ 1.6\ \times10^{-4}$ | CL=90% | 1791 | DESIG=202 |
| $\eta\pi^+\pi^-\pi^0$ | $(\ 9.5\ \pm1.7\ )\times10^{-4}$ | | 1778 | DESIG=203 |
| $2(\pi^+\pi^-)\eta$ | $(\ 1.2\ \pm0.6\ )\times10^{-3}$ | | 1758 | DESIG=251 |
| $\eta'\pi^+\pi^-\pi^0$ | $(\ 4.5\ \pm2.1\ )\times10^{-4}$ | | 1692 | DESIG=204 |
| $\omega\pi^+\pi^-$ | $(\ 7.3\ \pm1.2\ )\times10^{-4}$ | S=2.1 | 1748 | DESIG=75 |
| $b_1^\pm\pi^\mp$ | $(\ 4.0\ \pm0.6\ )\times10^{-4}$ | S=1.1 | 1635 | DESIG=40 |
| $b_1^0\pi^0$ | $(\ 2.4\ \pm0.6\ )\times10^{-4}$ | | – | DESIG=193 |
| $\omega f_2(1270)$ | $(\ 2.2\ \pm0.4\ )\times10^{-4}$ | | 1515 | DESIG=64 |
| $\pi^+\pi^- K^+K^-$ | $(\ 7.5\ \pm0.9\ )\times10^{-4}$ | S=1.9 | 1726 | DESIG=26 |
| $\rho^0 K^+K^-$ | $(\ 2.2\ \pm0.4\ )\times10^{-4}$ | | 1616 | DESIG=205 |
| $K^*(892)^0\overline{K}_2^*(1430)^0$ | $(\ 1.9\ \pm0.5\ )\times10^{-4}$ | | 1418 | DESIG=66 |
| $K^+K^-\pi^+\pi^-\eta$ | $(\ 1.3\ \pm0.7\ )\times10^{-3}$ | | 1574 | DESIG=252 |
| $K^+K^-2(\pi^+\pi^-)\pi^0$ | $(\ 1.00\pm0.31)\times10^{-3}$ | | 1611 | DESIG=240 |
| $K^+K^-2(\pi^+\pi^-)$ | $(\ 1.8\ \pm0.9\ )\times10^{-3}$ | | 1654 | DESIG=222 |
| $K_1(1270)^\pm K^\mp$ | $(\ 1.00\pm0.28)\times10^{-3}$ | | 1581 | DESIG=41 |
| $K_S^0 K_S^0\pi^+\pi^-$ | $(\ 2.2\ \pm0.4\ )\times10^{-4}$ | | 1724 | DESIG=225 |
| $\rho^0 p\overline{p}$ | $(\ 5.0\ \pm2.2\ )\times10^{-5}$ | | 1251 | DESIG=210 |
| $K^+\overline{K}^*(892)^0\pi^-$ + c.c. | $(\ 6.7\ \pm2.5\ )\times10^{-4}$ | | 1674 | DESIG=34 |
| $2(\pi^+\pi^-)$ | $(\ 2.4\ \pm0.6\ )\times10^{-4}$ | S=2.2 | 1817 | DESIG=24 |
| $\rho^0\pi^+\pi^-$ | $(\ 2.2\ \pm0.6\ )\times10^{-4}$ | S=1.4 | 1750 | DESIG=33 |
| $K^+K^-\pi^+\pi^-\pi^0$ | $(\ 1.26\pm0.09)\times10^{-3}$ | | 1694 | DESIG=206 |
| $\omega f_0(1710)\rightarrow\ \omega K^+K^-$ | $(\ 5.9\ \pm2.2\ )\times10^{-5}$ | | – | DESIG=216 |
| $K^*(892)^0 K^-\pi^+\pi^0$ + c.c. | $(\ 8.6\ \pm2.2\ )\times10^{-4}$ | | – | DESIG=217 |
| $K^*(892)^+ K^-\pi^+\pi^-$ + c.c. | $(\ 9.6\ \pm2.8\ )\times10^{-4}$ | | – | DESIG=218 |
| $K^*(892)^+ K^-\rho^0$ + c.c. | $(\ 7.3\ \pm2.6\ )\times10^{-4}$ | | – | DESIG=219 |
| $K^*(892)^0 K^-\rho^+$ + c.c. | $(\ 6.1\ \pm1.8\ )\times10^{-4}$ | | – | DESIG=220 |
| $\eta K^+K^-$ | $<\ 1.3\ \times10^{-4}$ | CL=90% | 1664 | DESIG=207 |
| $\omega K^+K^-$ | $(\ 1.85\pm0.25)\times10^{-4}$ | S=1.1 | 1614 | DESIG=76 |
| $3(\pi^+\pi^-)$ | $(\ 3.5\ \pm2.0\ )\times10^{-4}$ | S=2.8 | 1774 | DESIG=32 |
| $p\overline{p}\pi^+\pi^-\pi^0$ | $(\ 7.3\ \pm0.7\ )\times10^{-4}$ | | 1435 | DESIG=211 |
| $K^+K^-$ | $(\ 6.3\ \pm0.7\ )\times10^{-5}$ | | 1776 | DESIG=23 |
| $K_S^0 K_L^0$ | $(\ 5.4\ \pm0.5\ )\times10^{-5}$ | | 1775 | DESIG=85 |
| $\pi^+\pi^-\pi^0$ | $(\ 1.68\pm0.26)\times10^{-4}$ | S=1.4 | 1830 | DESIG=36 |
| $\rho(2150)\pi\rightarrow\ \pi^+\pi^-\pi^0$ | $(\ 1.9\ {}^{+1.2}_{-0.4}\ )\times10^{-4}$ | | – | DESIG=201 |
| $\rho(770)\pi\rightarrow\ \pi^+\pi^-\pi^0$ | $(\ 3.2\ \pm1.2\ )\times10^{-5}$ | S=1.8 | – | DESIG=22 |
| $\pi^+\pi^-$ | $(\ 8\ \ \pm5\ \ )\times10^{-5}$ | | 1838 | DESIG=21 |
| $K_1(1400)^\pm K^\mp$ | $<\ 3.1\ \times10^{-4}$ | CL=90% | 1532 | DESIG=42 |
| $K^+K^-\pi^0$ | $<\ 2.96\ \times10^{-5}$ | CL=90% | 1754 | DESIG=38 |
| $K^+\overline{K}^*(892)^-$ + c.c. | $(\ 1.7\ {}^{+0.8}_{-0.7}\ )\times10^{-5}$ | | 1698 | DESIG=39 |
| $K^*(892)^0\overline{K}^0$ + c.c. | $(\ 1.09\pm0.20)\times10^{-4}$ | | 1697 | DESIG=194 |
| $\phi\pi^+\pi^-$ | $(\ 1.17\pm0.29)\times10^{-4}$ | S=1.7 | 1690 | DESIG=78 |
| $\phi f_0(980)\rightarrow\ \pi^+\pi^-$ | $(\ 6.8\ \pm2.4\ )\times10^{-5}$ | S=1.1 | – | DESIG=81 |
| $2(K^+K^-)$ | $(\ 6.0\ \pm1.4\ )\times10^{-5}$ | | 1499 | DESIG=208 |
| $\phi K^+K^-$ | $(\ 7.0\ \pm1.6\ )\times10^{-5}$ | | 1546 | DESIG=79 |
| $2(K^+K^-)\pi^0$ | $(\ 1.10\pm0.28)\times10^{-4}$ | | 1440 | DESIG=209 |

| | | | | |
|---|---|---|---|---|
| $\phi\eta$ | ( 2.8 $^{+1.0}_{-0.8}$ ) $\times 10^{-5}$ | | 1654 | DESIG=89 |
| $\phi\eta'$ | ( 3.1 $\pm$1.6 ) $\times 10^{-5}$ | | 1555 | DESIG=90 |
| $\omega\eta'$ | ( 3.2 $^{+2.5}_{-2.1}$ ) $\times 10^{-5}$ | | 1623 | DESIG=91 |
| $\omega\pi^0$ | ( 2.1 $\pm$0.6 ) $\times 10^{-5}$ | | 1757 | DESIG=92 |
| $\rho\eta'$ | ( 1.9 $^{+1.7}_{-1.2}$ ) $\times 10^{-5}$ | | 1625 | DESIG=93 |
| $\rho\eta$ | ( 2.2 $\pm$0.6 ) $\times 10^{-5}$ | S=1.1 | 1717 | DESIG=94 |
| $\omega\eta$ | $<$ 1.1 $\times 10^{-5}$ | CL=90% | 1715 | DESIG=95 |
| $\phi\pi^0$ | $<$ 4 $\times 10^{-6}$ | CL=90% | 1699 | DESIG=96 |
| $\eta_c\pi^+\pi^-\pi^0$ | $<$ 1.0 $\times 10^{-3}$ | CL=90% | – | DESIG=229 |
| $p\overline{p}K^+K^-$ | ( 2.7 $\pm$0.7 ) $\times 10^{-5}$ | | 1118 | DESIG=212 |
| $\overline{\Lambda}nK^0_S$ + c.c. | ( 8.1 $\pm$1.8 ) $\times 10^{-5}$ | | 1324 | DESIG=237 |
| $\phi f'_2(1525)$ | ( 4.4 $\pm$1.6 ) $\times 10^{-5}$ | | 1321 | DESIG=67 |
| $\Theta(1540)\overline{\Theta}(1540) \rightarrow K^0_S pK^-\overline{n}$ + c.c. | $<$ 8.8 $\times 10^{-6}$ | CL=90% | – | DESIG=195 |
| $\Theta(1540)K^-\overline{n} \rightarrow K^0_S pK^-\overline{n}$ | $<$ 1.0 $\times 10^{-5}$ | CL=90% | – | DESIG=196 |
| $\Theta(1540)K^0_S\overline{p} \rightarrow K^0_S\overline{p}K^+n$ | $<$ 7.0 $\times 10^{-6}$ | CL=90% | – | DESIG=197 |
| $\overline{\Theta}(1540)K^+n \rightarrow K^0_S\overline{p}K^+n$ | $<$ 2.6 $\times 10^{-5}$ | CL=90% | – | DESIG=198 |
| $\overline{\Theta}(1540)K^0_S p \rightarrow K^0_S pK^-\overline{n}$ | $<$ 6.0 $\times 10^{-6}$ | CL=90% | – | DESIG=199 |
| $K^0_S K^0_S$ | $<$ 4.6 $\times 10^{-6}$ | | 1775 | DESIG=86 |

**Radiative decays** NODE=M071;CLUMP=C

| | | | | |
|---|---|---|---|---|
| $\gamma\chi_{c0}(1P)$ | ( 9.42$\pm$0.31) % | | 261 | DESIG=56 |
| $\gamma\chi_{c1}(1P)$ | ( 9.2 $\pm$0.4 ) % | | 171 | DESIG=58 |
| $\gamma\chi_{c2}(1P)$ | ( 8.70$\pm$0.35) % | | 128 | DESIG=59 |
| $\pi^0 h_c \rightarrow \gamma\eta_c(1S)\pi^0$ | ( 4.2 $\pm$0.6 ) $\times 10^{-4}$ | | – | DESIG=253 |
| $\gamma\eta_c(1S)$ | ( 3.4 $\pm$0.5 ) $\times 10^{-3}$ | S=1.3 | 638 | DESIG=61 |
| $\gamma\eta_c(2S)$ | $<$ 2.0 $\times 10^{-3}$ | CL=90% | 48 | DESIG=63 |
| $\gamma\pi^0$ | $<$ 5.4 $\times 10^{-3}$ | CL=95% | 1841 | DESIG=52 |
| $\gamma\eta'(958)$ | ( 1.36$\pm$0.24) $\times 10^{-4}$ | | 1719 | DESIG=54 |
| $\gamma f_2(1270)$ | ( 2.1 $\pm$0.4 ) $\times 10^{-4}$ | | 1622 | DESIG=82 |
| $\gamma f_0(1710) \rightarrow \gamma\pi\pi$ | ( 3.0 $\pm$1.3 ) $\times 10^{-5}$ | | – | DESIG=83 |
| $\gamma f_0(1710) \rightarrow \gamma K\overline{K}$ | ( 6.0 $\pm$1.6 ) $\times 10^{-5}$ | | – | DESIG=84 |
| $\gamma\gamma$ | $<$ 1.4 $\times 10^{-4}$ | CL=90% | 1843 | DESIG=51 |
| $\gamma\eta$ | $<$ 9 $\times 10^{-5}$ | CL=90% | 1802 | DESIG=53 |
| $\gamma\eta\pi^+\pi^-$ | ( 8.7 $\pm$2.1 ) $\times 10^{-4}$ | | 1791 | DESIG=230 |
| $\gamma\eta(1405) \rightarrow \gamma K\overline{K}\pi$ | $<$ 9 $\times 10^{-5}$ | CL=90% | 1569 | DESIG=62 |
| $\gamma\eta(1405) \rightarrow \eta\pi^+\pi^-$ | ( 3.6 $\pm$2.5 ) $\times 10^{-5}$ | | – | DESIG=232 |
| $\gamma\eta(1475) \rightarrow K\overline{K}\pi$ | $<$ 1.4 $\times 10^{-4}$ | CL=90% | – | DESIG=234 |
| $\gamma\eta(1475) \rightarrow \eta\pi^+\pi^-$ | $<$ 8.8 $\times 10^{-5}$ | CL=90% | – | DESIG=235 |
| $\gamma 2(\pi^+\pi^-)$ | ( 4.0 $\pm$0.6 ) $\times 10^{-4}$ | | 1817 | DESIG=241 |
| $\gamma K^{*0}K^+\pi^-$ + c.c. | ( 3.7 $\pm$0.9 ) $\times 10^{-4}$ | | 1674 | DESIG=242 |
| $\gamma K^{*0}\overline{K}^{*0}$ | ( 2.4 $\pm$0.7 ) $\times 10^{-4}$ | | 1613 | DESIG=243 |
| $\gamma K^0_S K^+\pi^-$ + c.c. | ( 2.6 $\pm$0.5 ) $\times 10^{-4}$ | | 1753 | DESIG=244 |
| $\gamma K^+K^-\pi^+\pi^-$ | ( 1.9 $\pm$0.5 ) $\times 10^{-4}$ | | 1726 | DESIG=245 |
| $\gamma p\overline{p}$ | ( 2.9 $\pm$0.6 ) $\times 10^{-5}$ | | 1586 | DESIG=246 |
| $\gamma\pi^+\pi^- p\overline{p}$ | ( 2.8 $\pm$1.4 ) $\times 10^{-5}$ | | 1491 | DESIG=247 |
| $\gamma 2(\pi^+\pi^-)K^+K^-$ | $<$ 2.2 $\times 10^{-4}$ | CL=90% | 1654 | DESIG=248 |
| $\gamma 3(\pi^+\pi^-)$ | $<$ 1.7 $\times 10^{-4}$ | CL=90% | 1774 | DESIG=249 |
| $\gamma K^+K^-K^+K^-$ | $<$ 4 $\times 10^{-5}$ | CL=90% | 1499 | DESIG=250 |

## $\psi(3770)$

$I^G(J^{PC}) = 0^-(1^{--})$ NODE=M053

Mass $m$ = 3772.92 $\pm$ 0.35 MeV (S = 1.1) NODE=M053M;DTYPE=M

Full width $\Gamma$ = 27.3 $\pm$ 1.0 MeV NODE=M053W;DTYPE=G

$\Gamma_{ee}$ = 0.265 $\pm$ 0.018 keV (S = 1.3) NODE=M053W1;DTYPE=E

In addition to the dominant decay mode to $D\overline{D}$, $\psi(3770)$ was found to decay into the final states containing the $J/\psi$ (BAI 05, ADAM 06). ADAMS 06 and HUANG 06A searched for various decay modes with light hadrons and found a statistically significant signal for the decay to $\phi\eta$ only (ADAMS 06).

NODE=M053220;NODE=M053

| $\psi(3770)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $D\overline{D}$ | (85.3 ±3.2 ) % | | 285 | DESIG=2 |
| $D^0\overline{D}^0$ | (48.7 ±3.2 ) % | | 285 | DESIG=5 |
| $D^+D^-$ | (36.1 ±2.8 ) % | | 251 | DESIG=6 |
| $J/\psi\pi^+\pi^-$ | ( 1.93±0.28) $\times 10^{-3}$ | | 560 | DESIG=4 |
| $J/\psi\pi^0\pi^0$ | ( 8.0 ±3.0 ) $\times 10^{-4}$ | | 564 | DESIG=46 |
| $J/\psi\eta$ | ( 9 ±4 ) $\times 10^{-4}$ | | 359 | DESIG=47 |
| $J/\psi\pi^0$ | < 2.8 $\times 10^{-4}$ | CL=90% | 603 | DESIG=48 |
| $\gamma\chi_{c0}$ | ( 7.3 ±0.9 ) $\times 10^{-3}$ | | – | DESIG=49 |
| $\gamma\chi_{c1}$ | ( 2.9 ±0.6 ) $\times 10^{-3}$ | | – | DESIG=50 |
| $\gamma\chi_{c2}$ | < 9 $\times 10^{-4}$ | CL=90% | – | DESIG=51 |
| $e^+e^-$ | ( 9.7 ±0.7 ) $\times 10^{-6}$ | S=1.2 | 1886 | DESIG=1 |
| $K^0_S K^0_L$ | < 1.2 $\times 10^{-5}$ | CL=90% | 1820 | DESIG=3 |
| $2(\pi^+\pi^-)$ | < 1.12 $\times 10^{-3}$ | CL=90% | 1861 | DESIG=21 |
| $2(\pi^+\pi^-)\pi^0$ | < 1.06 $\times 10^{-3}$ | CL=90% | 1843 | DESIG=22 |
| $2(\pi^+\pi^-\pi^0)$ | < 5.85 % | CL=90% | 1821 | DESIG=208 |
| $\omega\pi^+\pi^-$ | < 6.0 $\times 10^{-4}$ | CL=90% | 1794 | DESIG=24 |
| $3(\pi^+\pi^-)$ | < 9.1 $\times 10^{-3}$ | | 1819 | DESIG=52 |
| $3(\pi^+\pi^-)\pi^0$ | < 1.37 % | | 1792 | DESIG=55 |
| $3(\pi^+\pi^-)2\pi^0$ | < 11.74 % | CL=90% | 1759 | DESIG=210 |
| $\eta\pi^+\pi^-$ | < 1.24 $\times 10^{-3}$ | CL=90% | 1836 | DESIG=23 |
| $\pi^+\pi^-2\pi^0$ | < 8.9 $\times 10^{-3}$ | CL=90% | 1862 | DESIG=206 |
| $\rho^0\pi^+\pi^-$ | < 6.9 $\times 10^{-3}$ | CL=90% | 1796 | DESIG=64 |
| $\eta 3\pi$ | < 1.34 $\times 10^{-3}$ | CL=90% | 1824 | DESIG=25 |
| $\eta 2(\pi^+\pi^-)$ | < 2.43 % | | 1804 | DESIG=53 |
| $\eta' 3\pi$ | < 2.44 $\times 10^{-3}$ | CL=90% | 1740 | DESIG=26 |
| $K^+K^-\pi^+\pi^-$ | < 9.0 $\times 10^{-4}$ | CL=90% | 1772 | DESIG=27 |
| $\phi\pi^+\pi^-$ | < 4.1 $\times 10^{-4}$ | CL=90% | 1737 | DESIG=28 |
| $K^+K^-2\pi^0$ | < 4.2 $\times 10^{-3}$ | CL=90% | 1774 | DESIG=207 |
| $\phi\pi^0$ | not seen | | 1746 | DESIG=12;OUR EVAL; → NOT CHECKED ← |
| $\phi\eta$ | ( 3.1 ±0.7 ) $\times 10^{-4}$ | | 1703 | DESIG=8 |
| $4(\pi^+\pi^-)$ | < 1.67 % | CL=90% | 1757 | DESIG=62 |
| $4(\pi^+\pi^-)\pi^0$ | < 3.06 % | CL=90% | 1720 | DESIG=63 |
| $\phi f_0(980)$ | < 4.5 $\times 10^{-4}$ | CL=90% | 1600 | DESIG=29 |
| $K^+K^-\pi^+\pi^-\pi^0$ | < 2.36 $\times 10^{-3}$ | CL=90% | 1741 | DESIG=30 |
| $K^+K^-\rho^0\pi^0$ | < 8 $\times 10^{-4}$ | CL=90% | 1624 | DESIG=67 |
| $K^+K^-\rho^+\pi^-$ | < 1.46 % | CL=90% | 1622 | DESIG=68 |
| $\omega K^+K^-$ | < 3.4 $\times 10^{-4}$ | CL=90% | 1664 | DESIG=32 |
| $\phi\pi^+\pi^-\pi^0$ | < 3.8 $\times 10^{-3}$ | CL=90% | 1722 | DESIG=69 |
| $K^{*0}K^-\pi^+\pi^0$ + c.c. | < 1.62 % | CL=90% | 1693 | DESIG=70 |
| $K^{*+}K^-\pi^+\pi^-$ + c.c. | < 3.23 % | CL=90% | 1692 | DESIG=71 |
| $K^+K^-\pi^+\pi^-2\pi^0$ | < 2.67 % | CL=90% | 1705 | DESIG=209 |
| $K^+K^-2(\pi^+\pi^-)$ | < 1.03 % | CL=90% | 1702 | DESIG=57 |
| $K^+K^-2(\pi^+\pi^-)\pi^0$ | < 3.60 % | CL=90% | 1660 | DESIG=58 |
| $\eta K^+K^-$ | < 4.1 $\times 10^{-4}$ | CL=90% | 1711 | DESIG=31 |
| $\rho^0 K^+K^-$ | < 5.0 $\times 10^{-3}$ | CL=90% | 1665 | DESIG=65 |
| $2(K^+K^-)$ | < 6.0 $\times 10^{-4}$ | CL=90% | 1551 | DESIG=33 |
| $\phi K^+K^-$ | < 7.5 $\times 10^{-4}$ | CL=90% | 1597 | DESIG=34 |
| $2(K^+K^-)\pi^0$ | < 2.9 $\times 10^{-4}$ | CL=90% | 1493 | DESIG=35 |
| $2(K^+K^-)\pi^+\pi^-$ | < 3.2 $\times 10^{-3}$ | CL=90% | 1425 | DESIG=59 |
| $K^0_S K^-\pi^+$ | < 3.2 $\times 10^{-3}$ | CL=90% | 1799 | DESIG=200 |
| $K^0_S K^-\pi^+\pi^0$ | < 1.33 % | CL=90% | 1773 | DESIG=201 |
| $K^0_S K^-2\pi^+\pi^-$ | < 8.7 $\times 10^{-3}$ | CL=90% | 1739 | DESIG=202 |

| | | | | | |
|---|---|---|---|---|---|
| $K^0_S K^- 2\pi^+ \pi^- \pi^0$ | $<$ 4.18 | % | CL=90% | 1703 | DESIG=203 |
| $K^0_S K^- \pi^+ 2(\pi^+ \pi^-)$ | $<$ 1.22 | % | CL=90% | 1658 | DESIG=204 |
| $K^0_S K^- \pi^+ 2\pi^0$ | $<$ 2.65 | % | CL=90% | 1741 | DESIG=205 |
| $K^{*0} K^- \pi^+ +$ c.c. | $<$ 9.7 | $\times 10^{-3}$ | CL=90% | 1721 | DESIG=60 |
| $p\overline{p}\pi^0$ | $<$ 1.2 | $\times 10^{-3}$ | | 1595 | DESIG=54 |
| $p\overline{p}\pi^+ \pi^-$ | $<$ 5.8 | $\times 10^{-4}$ | CL=90% | 1544 | DESIG=36 |
| $\Lambda\overline{\Lambda}$ | $<$ 1.2 | $\times 10^{-4}$ | CL=90% | 1521 | DESIG=42 |
| $p\overline{p}\pi^+ \pi^- \pi^0$ | $<$ 1.85 | $\times 10^{-3}$ | CL=90% | 1490 | DESIG=37 |
| $\omega p\overline{p}$ | $<$ 2.9 | $\times 10^{-4}$ | CL=90% | 1309 | DESIG=39 |
| $\Lambda\overline{\Lambda}\pi^0$ | $<$ 1.2 | $\times 10^{-3}$ | CL=90% | 1468 | DESIG=72 |
| $p\overline{p}2(\pi^+ \pi^-)$ | $<$ 2.6 | $\times 10^{-3}$ | CL=90% | 1425 | DESIG=61 |
| $\eta p\overline{p}$ | $<$ 5.4 | $\times 10^{-4}$ | CL=90% | 1430 | DESIG=38 |
| $\rho^0 p\overline{p}$ | $<$ 1.7 | $\times 10^{-3}$ | CL=90% | 1313 | DESIG=66 |
| $p\overline{p}K^+ K^-$ | $<$ 3.2 | $\times 10^{-4}$ | CL=90% | 1185 | DESIG=40 |
| $\phi p\overline{p}$ | $<$ 1.3 | $\times 10^{-4}$ | CL=90% | 1178 | DESIG=41 |
| $\Lambda\overline{\Lambda}\pi^+ \pi^-$ | $<$ 2.5 | $\times 10^{-4}$ | CL=90% | 1404 | DESIG=43 |
| $\Lambda\overline{p}K^+$ | $<$ 2.8 | $\times 10^{-4}$ | CL=90% | 1387 | DESIG=44 |
| $\Lambda\overline{p}K^+ \pi^+ \pi^-$ | $<$ 6.3 | $\times 10^{-4}$ | CL=90% | 1234 | DESIG=45 |
| $\pi^+ \pi^- \pi^0$ | not seen | | | 1874 | DESIG=9;OUR EVAL;→ NOT CHECKED ← |
| $\rho\pi$ | not seen | | | 1804 | DESIG=10;OUR EVAL; → NOT CHECKED ← |
| $\omega\pi^0$ | not seen | | | 1803 | DESIG=11;OUR EVAL; → NOT CHECKED ← |
| $\rho\eta$ | not seen | | | 1763 | DESIG=13;OUR EVAL; → NOT CHECKED ← |
| $\omega\eta$ | not seen | | | 1762 | DESIG=14;OUR EVAL; → NOT CHECKED ← |
| $\rho\eta'$ | not seen | | | 1674 | DESIG=15;OUR EVAL; → NOT CHECKED ← |
| $\omega\eta'$ | not seen | | | 1672 | DESIG=16;OUR EVAL; → NOT CHECKED ← |
| $\phi\eta'$ | not seen | | | 1606 | DESIG=17;OUR EVAL; → NOT CHECKED ← |
| $K^{*0}\overline{K}^0$ | not seen | | | 1744 | DESIG=18;OUR EVAL; → NOT CHECKED ← |
| $K^{*+} K^-$ | not seen | | | 1745 | DESIG=19;OUR EVAL; → NOT CHECKED ← |
| $b_1\pi$ | not seen | | | 1683 | DESIG=20;OUR EVAL; → NOT CHECKED ← |

## X(3872)

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

NODE=M176

Quantum numbers not established.

Mass $m = 3871.9 \pm 0.7$ MeV (S = 2.3)
NODE=M176M;DTYPE=M

$m_{X(3872)} - m_{J/\psi} = 775 \pm 4$ MeV
NODE=M176DM;DTYPE=D

$m_{X(3872)} - m_{\psi(2S)}$
NODE=M176DM2;DTYPE=D

Full width $\Gamma = 3.0^{+2.1}_{-1.7}$ MeV
NODE=M176W;DTYPE=G

| X(3872) DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\pi^+ \pi^- J/\psi(1S)$ | seen | 650 | NODE=M176215;DESIG=2;OUR EVAL; → NOT CHECKED ← |
| $\rho^0 J/\psi(1S)$ | seen | † | DESIG=10;OUR EVAL; → NOT CHECKED ← |
| $D^0\overline{D}^0$ | not seen | 520 | DESIG=6;OUR EVAL;→ NOT CHECKED ← |
| $D^+ D^-$ | not seen | 502 | DESIG=7;OUR EVAL;→ NOT CHECKED ← |
| $D^0\overline{D}^0\pi^0$ | seen | 118 | DESIG=8;OUR EVAL;→ NOT CHECKED ← |

## X(3945)

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

NODE=M159

Observed in $\omega J/\psi$, thus $C = +$

Mass $m = 3916 \pm 6$ MeV (S = 1.6)
NODE=M159M;DTYPE=M

Full width $\Gamma = 40^{+18}_{-13}$ MeV (S = 1.5)
NODE=M159W;DTYPE=G

| $X(3945)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $\omega J/\psi$ | seen | 216 | NODE=M159215;DESIG=1;OUR EST; → NOT CHECKED ← |

## $\psi(4040)$ [t]

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

NODE=M072

Mass $m = 4039 \pm 1$ MeV
NODE=M072M;DTYPE=M;OUR EST; → NOT CHECKED ←
Full width $\Gamma = 80 \pm 10$ MeV
NODE=M072W;DTYPE=G;OUR EST; → NOT CHECKED ←
$\Gamma_{ee} = 0.86 \pm 0.07$ keV
NODE=M072W5;DTYPE=E;OUR EST; → NOT CHECKED ←

| $\psi(4040)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $e^+e^-$ | $(1.07\pm0.16)\times10^{-5}$ | | 2019 | NODE=M072215;DESIG=5 |
| $D^0\overline{D}^0$ | seen | | 775 | DESIG=1;OUR EST;→ NOT CHECKED ← |
| $D^*(2007)^0\overline{D}^0$ + c.c. | seen | | 575 | DESIG=2;OUR EST;→ NOT CHECKED ← |
| $D^*(2007)^0\overline{D}^*(2007)^0$ | seen | | 225 | DESIG=3;OUR EST;→ NOT CHECKED ← |
| $J/\psi\pi^+\pi^-$ | $< 4 \times 10^{-3}$ | 90% | 794 | DESIG=7 |
| $J/\psi\pi^0\pi^0$ | $< 2 \times 10^{-3}$ | 90% | 797 | DESIG=8 |
| $J/\psi\eta$ | $< 7 \times 10^{-3}$ | 90% | 675 | DESIG=9 |
| $J/\psi\pi^0$ | $< 2 \times 10^{-3}$ | 90% | 823 | DESIG=10 |
| $J/\psi\pi^+\pi^-\pi^0$ | $< 2 \times 10^{-3}$ | 90% | 746 | DESIG=11 |
| $\chi_{c1}\gamma$ | $< 1.1$ % | 90% | 494 | DESIG=12 |
| $\chi_{c2}\gamma$ | $< 1.7$ % | 90% | 454 | DESIG=13 |
| $\chi_{c1}\pi^+\pi^-\pi^0$ | $< 1.1$ % | 90% | 306 | DESIG=14 |
| $\chi_{c2}\pi^+\pi^-\pi^0$ | $< 3.2$ % | 90% | 233 | DESIG=15 |
| $\phi\pi^+\pi^-$ | $< 3 \times 10^{-3}$ | 90% | 1880 | DESIG=16 |

## $\psi(4160)$ [t]

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

NODE=M025

Mass $m = 4153 \pm 3$ MeV
NODE=M025M;DTYPE=M;OUR EST; → NOT CHECKED ←
Full width $\Gamma = 103 \pm 8$ MeV
NODE=M025W;DTYPE=G;OUR EST; → NOT CHECKED ←
$\Gamma_{ee} = 0.83 \pm 0.07$ keV
NODE=M025W1;DTYPE=E;OUR EST; → NOT CHECKED ←

| $\psi(4160)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $e^+e^-$ | $(8.1\pm0.9)\times10^{-6}$ | | 2076 | NODE=M025215;DESIG=1 |
| $J/\psi\pi^+\pi^-$ | $< 3 \times 10^{-3}$ | 90% | 888 | DESIG=2 |
| $J/\psi\pi^0\pi^0$ | $< 3 \times 10^{-3}$ | 90% | 891 | DESIG=3 |
| $J/\psi K^+K^-$ | $< 2 \times 10^{-3}$ | 90% | 324 | DESIG=4 |
| $J/\psi\eta$ | $< 8 \times 10^{-3}$ | 90% | 786 | DESIG=5 |
| $J/\psi\pi^0$ | $< 1 \times 10^{-3}$ | 90% | 914 | DESIG=6 |
| $J/\psi\eta'$ | $< 5 \times 10^{-3}$ | 90% | 385 | DESIG=7 |
| $J/\psi\pi^+\pi^-\pi^0$ | $< 1 \times 10^{-3}$ | 90% | 847 | DESIG=8 |
| $\psi(2S)\pi^+\pi^-$ | $< 4 \times 10^{-3}$ | 90% | 353 | DESIG=9 |
| $\chi_{c1}\gamma$ | $< 7 \times 10^{-3}$ | 90% | 593 | DESIG=10 |
| $\chi_{c2}\gamma$ | $< 1.3$ % | 90% | 554 | DESIG=11 |
| $\chi_{c1}\pi^+\pi^-\pi^0$ | $< 2 \times 10^{-3}$ | 90% | 452 | DESIG=12 |
| $\chi_{c2}\pi^+\pi^-\pi^0$ | $< 8 \times 10^{-3}$ | 90% | 398 | DESIG=13 |
| $\phi\pi^+\pi^-$ | $< 2 \times 10^{-3}$ | 90% | 1941 | DESIG=14 |

## $X(4260)$

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

NODE=M074

Mass $m = 4263^{+8}_{-9}$ MeV (S = 1.1)
NODE=M074M;DTYPE=M
Full width $\Gamma = 95 \pm 14$ MeV
NODE=M074W;DTYPE=G

| $X(4260)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $J/\psi\pi^+\pi^-$ | seen | 976 | NODE=M074215;DESIG=2;OUR EVAL; → NOT CHECKED ← |
| $J/\psi\pi^0\pi^0$ | [$u$] seen | 978 | DESIG=4;OUR EVAL;→ NOT CHECKED ← |
| $J/\psi K^+K^-$ | [$u$] seen | 530 | DESIG=5;OUR EVAL;→ NOT CHECKED ← |
| $J/\psi\eta$ | [$u$] not seen | 886 | DESIG=6;OUR EVAL;→ NOT CHECKED ← |
| $J/\psi\pi^0$ | [$u$] not seen | 999 | DESIG=7;OUR EVAL;→ NOT CHECKED ← |
| $J/\psi\eta'$ | [$u$] not seen | 569 | DESIG=8;OUR EVAL;→ NOT CHECKED ← |
| $J/\psi\pi^+\pi^-\pi^0$ | [$u$] not seen | 939 | DESIG=9;OUR EVAL;→ NOT CHECKED ← |
| $J/\psi\eta\eta$ | [$u$] not seen | 339 | DESIG=10;OUR EVAL; → NOT CHECKED ← |
| $\psi(2S)\pi^+\pi^-$ | [$u$] not seen | 470 | DESIG=11;OUR EVAL; → NOT CHECKED ← |
| $\psi(2S)\eta$ | [$u$] not seen | 167 | DESIG=12;OUR EVAL; → NOT CHECKED ← |
| $\chi_{c0}\omega$ | [$u$] not seen | 284 | DESIG=13;OUR EVAL; → NOT CHECKED ← |
| $\chi_{c1}\gamma$ | [$u$] not seen | 686 | DESIG=14;OUR EVAL; → NOT CHECKED ← |
| $\chi_{c2}\gamma$ | [$u$] not seen | 648 | DESIG=15;OUR EVAL; → NOT CHECKED ← |
| $\chi_{c1}\pi^+\pi^-\pi^0$ | [$u$] not seen | 571 | DESIG=16;OUR EVAL; → NOT CHECKED ← |
| $\chi_{c2}\pi^+\pi^-\pi^0$ | [$u$] not seen | 524 | DESIG=17;OUR EVAL; → NOT CHECKED ← |
| $\phi\pi^+\pi^-$ | [$u$] not seen | 1999 | DESIG=18;OUR EVAL; → NOT CHECKED ← |
| $D\overline{D}$ | not seen | 1032 | DESIG=19;OUR EVAL; → NOT CHECKED ← |

## $\psi(4415)$ [$t$]

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

NODE=M073

Mass $m = 4421 \pm 4$ MeV
Full width $\Gamma = 62 \pm 20$ MeV
$\Gamma_{ee} = 0.58 \pm 0.07$ keV

NODE=M073M;DTYPE=M;OUR EST; → NOT CHECKED ←
NODE=M073W;DTYPE=G;OUR EST; → NOT CHECKED ←
NODE=M073W1;DTYPE=E;OUR EST; → NOT CHECKED ←

| $\psi(4415)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| hadrons | dominant | | – | NODE=M073215;DESIG=2 |
| $(D^0D^-\pi^+)_{non-res}$ | $<$ 2.3 % | 90% | – | DESIG=4 |
| $D\overline{D}_2^*(2460) \rightarrow D^0D^-\pi^+$ | (10 ±4 ) % | | – | DESIG=5 |
| $e^+e^-$ | ( 9.4±3.2) $\times 10^{-6}$ | | 2210 | DESIG=1 |

# $b\overline{b}$ MESONS

NODE=MXXX030

## $\Upsilon(1S)$

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

NODE=M049

Mass $m = 9460.30 \pm 0.26$ MeV (S = 3.3)
Full width $\Gamma = 54.02 \pm 1.25$ keV
$\Gamma_{ee} = 1.340 \pm 0.018$ keV

NODE=M049M;DTYPE=M
NODE=M049W;DTYPE=G;OUR EVAL; → NOT CHECKED ←
NODE=M049W2;DTYPE=E;OUR EVAL; → NOT CHECKED ←

| $\Upsilon(1S)$ DECAY MODES | | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|---|
| $\tau^+\tau^-$ | | $(2.60\pm0.10)$ % | | 4384 | NODE=M049215;DESIG=3 |
| $e^+e^-$ | | $(2.38\pm0.11)$ % | | 4730 | DESIG=2 |
| $\mu^+\mu^-$ | | $(2.48\pm0.05)$ % | | 4729 | DESIG=1 |
| **Hadronic decays** | | | | | NODE=M049;CLUMP=A |
| $\eta'(958)$ anything | | $(2.94\pm0.24)$ % | | – | DESIG=73 |
| $J/\psi(1S)$ anything | | $(6.5\ \pm0.7\ )\times10^{-4}$ | | 4223 | DESIG=12 |
| $\chi_{c0}$ anything | | $<5\times10^{-3}$ | 90% | – | DESIG=5 |
| $\chi_{c1}$ anything | | $(2.3\ \pm0.7\ )\times10^{-4}$ | | – | DESIG=6 |
| $\chi_{c2}$ anything | | $(3.4\ \pm1.0\ )\times10^{-4}$ | | – | DESIG=7 |
| $\psi(2S)$ anything | | $(2.7\ \pm0.9\ )\times10^{-4}$ | | – | DESIG=8 |
| $\rho\pi$ | | $<2\times10^{-4}$ | 90% | 4697 | DESIG=11 |
| $\pi^+\pi^-$ | | $<5\times10^{-4}$ | 90% | 4728 | DESIG=23 |
| $K^+K^-$ | | $<5\times10^{-4}$ | 90% | 4704 | DESIG=24 |
| $p\overline{p}$ | | $<5\times10^{-4}$ | 90% | 4636 | DESIG=25 |
| $\pi^0\pi^+\pi^-$ | | $<1.84\times10^{-5}$ | 90% | 4725 | DESIG=72 |
| $\overline{d}$ anything | | $(2.86\pm0.28)\times10^{-5}$ | | – | DESIG=107 |
| **Radiative decays** | | | | | NODE=M049;CLUMP=B |
| $\gamma\pi^+\pi^-$ | | $(6.3\ \pm1.8\ )\times10^{-5}$ | | 4728 | DESIG=70 |
| $\gamma\pi^0\pi^0$ | | $(1.7\ \pm0.7\ )\times10^{-5}$ | | 4728 | DESIG=71 |
| $\gamma\pi^0\eta$ | | $<2.4\times10^{-6}$ | 90% | 4713 | DESIG=111 |
| $\gamma K^+K^-$ | [v] | $(1.14\pm0.13)\times10^{-5}$ | | 4704 | DESIG=102 |
| $\gamma p\overline{p}$ | [w] | $<6\times10^{-6}$ | 90% | 4636 | DESIG=103 |
| $\gamma 2h^+2h^-$ | | $(7.0\ \pm1.5\ )\times10^{-4}$ | | 4720 | DESIG=20 |
| $\gamma 3h^+3h^-$ | | $(5.4\ \pm2.0\ )\times10^{-4}$ | | 4703 | DESIG=21 |
| $\gamma 4h^+4h^-$ | | $(7.4\ \pm3.5\ )\times10^{-4}$ | | 4679 | DESIG=22 |
| $\gamma\pi^+\pi^-K^+K^-$ | | $(2.9\ \pm0.9\ )\times10^{-4}$ | | 4686 | DESIG=14 |
| $\gamma 2\pi^+2\pi^-$ | | $(2.5\ \pm0.9\ )\times10^{-4}$ | | 4720 | DESIG=13 |
| $\gamma 3\pi^+3\pi^-$ | | $(2.5\ \pm1.2\ )\times10^{-4}$ | | 4703 | DESIG=17 |
| $\gamma 2\pi^+2\pi^-K^+K^-$ | | $(2.4\ \pm1.2\ )\times10^{-4}$ | | 4658 | DESIG=18 |
| $\gamma\pi^+\pi^-p\overline{p}$ | | $(1.5\ \pm0.6\ )\times10^{-4}$ | | 4604 | DESIG=15 |
| $\gamma 2\pi^+2\pi^-p\overline{p}$ | | $(4\ \ \pm6\ \ )\times10^{-5}$ | | 4563 | DESIG=19 |
| $\gamma 2K^+2K^-$ | | $(2.0\ \pm2.0\ )\times10^{-5}$ | | 4601 | DESIG=16 |
| $\gamma\eta'(958)$ | | $<1.9\times10^{-6}$ | 90% | 4682 | DESIG=55 |
| $\gamma\eta$ | | $<1.0\times10^{-6}$ | 90% | 4714 | DESIG=54 |
| $\gamma f_0(980)$ | | $<3\times10^{-5}$ | 90% | 4679 | DESIG=105 |
| $\gamma f_2'(1525)$ | | $(3.7\ ^{+1.2}_{-1.1}\ )\times10^{-5}$ | | 4607 | DESIG=52 |
| $\gamma f_2(1270)$ | | $(1.01\pm0.09)\times10^{-4}$ | | 4644 | DESIG=51 |
| $\gamma\eta(1405)$ | | $<8.2\times10^{-5}$ | 90% | 4625 | DESIG=65 |
| $\gamma f_0(1500)$ | | $<1.5\times10^{-5}$ | 90% | 4610 | DESIG=108 |
| $\gamma f_0(1710)$ | | $<2.6\times10^{-4}$ | 90% | 4574 | DESIG=53 |
| $\gamma f_0(1710)\to\gamma K^+K^-$ | | $<7\times10^{-6}$ | 90% | – | DESIG=112 |
| $\gamma f_0(1710)\to\gamma\pi^0\pi^0$ | | $<1.4\times10^{-6}$ | 90% | – | DESIG=109 |
| $\gamma f_0(1710)\to\gamma\eta\eta$ | | $<1.8\times10^{-6}$ | 90% | – | DESIG=110 |
| $\gamma f_4(2050)$ | | $<5.3\times10^{-5}$ | 90% | 4515 | DESIG=104 |
| $\gamma f_0(2200)\to\gamma K^+K^-$ | | $<2\times10^{-4}$ | 90% | 4475 | DESIG=69 |
| $\gamma f_J(2220)\to\gamma K^+K^-$ | | $<8\times10^{-7}$ | 90% | 4469 | DESIG=60 |
| $\gamma f_J(2220)\to\gamma\pi^+\pi^-$ | | $<6\times10^{-7}$ | 90% | – | DESIG=61 |
| $\gamma f_J(2220)\to\gamma p\overline{p}$ | | $<1.1\times10^{-6}$ | 90% | – | DESIG=62 |
| $\gamma\eta(2225)\to\gamma\phi\phi$ | | $<3\times10^{-3}$ | 90% | 4469 | DESIG=68 |
| $\gamma X$ | [x] | $<3\times10^{-5}$ | 90% | – | DESIG=66 |
| $\gamma X\overline{X}$ | [y] | $<1\times10^{-3}$ | 90% | – | DESIG=67 |
| $\gamma X\to\gamma+\geq4$ prongs | [z] | $<1.78\times10^{-4}$ | 95% | – | DESIG=113 |
| **Lepton Flavor ($LF$) violating or Invisible decays** | | | | | NODE=M049;CLUMP=C |
| $\mu^\pm\tau^\mp$ | $LF$ | $<6.0\times10^{-6}$ | 95% | 4563 | DESIG=116 |
| invisible | | $<2.5\times10^{-3}$ | 90% | – | DESIG=106 |

## $\chi_{b0}(1P)$ [aa]

$I^G(J^{PC}) = 0^+(0^{++})$
$J$ needs confirmation.

NODE=M076

Mass $m = 9859.44 \pm 0.42 \pm 0.31$ MeV

NODE=M076M;DTYPE=M;OUR EVAL;
→ NOT CHECKED ←

| $\chi_{b0}(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\gamma\Upsilon(1S)$ | $< 6$ % | 90% | 391 | NODE=M076215;DESIG=1 |
| $D^0X$ | $< 10.4$ % | 90% | – | DESIG=2 |
| $\pi^+\pi^-K^+K^-\pi^0$ | $< 1.6 \times 10^{-4}$ | 90% | 4875 | DESIG=3 |
| $2\pi^+\pi^-K^-K^0_S$ | $< 5 \times 10^{-5}$ | 90% | 4875 | DESIG=4 |
| $2\pi^+\pi^-K^-K^0_S2\pi^0$ | $< 5 \times 10^{-4}$ | 90% | 4846 | DESIG=5 |
| $2\pi^+2\pi^-2\pi^0$ | $< 2.1 \times 10^{-4}$ | 90% | 4905 | DESIG=6 |
| $2\pi^+2\pi^-K^+K^-$ | $(1.1\pm0.6) \times 10^{-4}$ | | 4861 | DESIG=7 |
| $2\pi^+2\pi^-K^+K^-\pi^0$ | $< 2.7 \times 10^{-4}$ | 90% | 4846 | DESIG=8 |
| $2\pi^+2\pi^-K^+K^-2\pi^0$ | $< 5 \times 10^{-4}$ | 90% | 4828 | DESIG=9 |
| $3\pi^+2\pi^-K^-K^0_S\pi^0$ | $< 1.6 \times 10^{-4}$ | 90% | 4827 | DESIG=10 |
| $3\pi^+3\pi^-$ | $< 8 \times 10^{-5}$ | 90% | 4904 | DESIG=11 |
| $3\pi^+3\pi^-2\pi^0$ | $< 6 \times 10^{-4}$ | 90% | 4881 | DESIG=12 |
| $3\pi^+3\pi^-K^+K^-$ | $(2.4\pm1.2) \times 10^{-4}$ | | 4827 | DESIG=13 |
| $3\pi^+3\pi^-K^+K^-\pi^0$ | $< 1.0 \times 10^{-3}$ | 90% | 4808 | DESIG=14 |
| $4\pi^+4\pi^-$ | $< 8 \times 10^{-5}$ | 90% | 4880 | DESIG=15 |
| $4\pi^+4\pi^-2\pi^0$ | $< 2.1 \times 10^{-3}$ | 90% | 4850 | DESIG=16 |

## $\chi_{b1}(1P)$ [aa]

$I^G(J^{PC}) = 0^+(1^{++})$
$J$ needs confirmation.

NODE=M077

Mass $m = 9892.78 \pm 0.26 \pm 0.31$ MeV

NODE=M077M;DTYPE=M;OUR EVAL;
→ NOT CHECKED ←

| $\chi_{b1}(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\gamma\Upsilon(1S)$ | $(35 \pm 8)$ % | | 423 | NODE=M077215;DESIG=1 |
| $D^0X$ | $(12.6\pm2.2)$ % | | – | DESIG=2 |
| $\pi^+\pi^-K^+K^-\pi^0$ | $(2.0\pm0.6) \times 10^{-4}$ | | 4892 | DESIG=3 |
| $2\pi^+\pi^-K^-K^0_S$ | $(1.3\pm0.5) \times 10^{-4}$ | | 4892 | DESIG=4 |
| $2\pi^+\pi^-K^-K^0_S2\pi^0$ | $< 6 \times 10^{-4}$ | 90% | 4863 | DESIG=5 |
| $2\pi^+2\pi^-2\pi^0$ | $(8.0\pm2.5) \times 10^{-4}$ | | 4921 | DESIG=6 |
| $2\pi^+2\pi^-K^+K^-$ | $(1.5\pm0.5) \times 10^{-4}$ | | 4878 | DESIG=7 |
| $2\pi^+2\pi^-K^+K^-\pi^0$ | $(3.5\pm1.2) \times 10^{-4}$ | | 4863 | DESIG=8 |
| $2\pi^+2\pi^-K^+K^-2\pi^0$ | $(8.6\pm3.2) \times 10^{-4}$ | | 4845 | DESIG=9 |
| $3\pi^+2\pi^-K^-K^0_S\pi^0$ | $(9.3\pm3.3) \times 10^{-4}$ | | 4844 | DESIG=10 |
| $3\pi^+3\pi^-$ | $(1.9\pm0.6) \times 10^{-4}$ | | 4921 | DESIG=11 |
| $3\pi^+3\pi^-2\pi^0$ | $(1.7\pm0.5) \times 10^{-3}$ | | 4898 | DESIG=12 |
| $3\pi^+3\pi^-K^+K^-$ | $(2.6\pm0.8) \times 10^{-4}$ | | 4844 | DESIG=13 |
| $3\pi^+3\pi^-K^+K^-\pi^0$ | $(7.5\pm2.6) \times 10^{-4}$ | | 4825 | DESIG=14 |
| $4\pi^+4\pi^-$ | $(2.6\pm0.9) \times 10^{-4}$ | | 4897 | DESIG=15 |
| $4\pi^+4\pi^-2\pi^0$ | $(1.4\pm0.6) \times 10^{-3}$ | | 4867 | DESIG=16 |

## $\chi_{b2}(1P)$ [aa]

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

NODE=M078

Mass $m = 9912.21 \pm 0.26 \pm 0.31$ MeV

NODE=M078M;DTYPE=M;OUR EVAL;
→ NOT CHECKED ←

| $\chi_{b2}(1P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\gamma\,\Upsilon(1S)$ | (22 ±4 ) % | | 442 | NODE=M078215;DESIG=1 |
| $D^0 X$ | < 7.9 % | 90% | – | DESIG=2 |
| $\pi^+\pi^- K^+ K^-\pi^0$ | ( 8 ±5 ) $\times 10^{-5}$ | | 4902 | DESIG=3 |
| $2\pi^+\pi^- K^- K^0_S$ | < 1.0 $\times 10^{-4}$ | 90% | 4901 | DESIG=4 |
| $2\pi^+\pi^- K^- K^0_S 2\pi^0$ | ( 5.3±2.4) $\times 10^{-4}$ | | 4873 | DESIG=5 |
| $2\pi^+ 2\pi^- 2\pi^0$ | ( 3.5±1.4) $\times 10^{-4}$ | | 4931 | DESIG=6 |
| $2\pi^+ 2\pi^- K^+ K^-$ | ( 1.1±0.4) $\times 10^{-4}$ | | 4888 | DESIG=7 |
| $2\pi^+ 2\pi^- K^+ K^-\pi^0$ | ( 2.1±0.9) $\times 10^{-4}$ | | 4872 | DESIG=8 |
| $2\pi^+ 2\pi^- K^+ K^- 2\pi^0$ | ( 3.9±1.8) $\times 10^{-4}$ | | 4855 | DESIG=9 |
| $3\pi^+ 2\pi^- K^- K^0_S\pi^0$ | < 5 $\times 10^{-4}$ | 90% | 4854 | DESIG=10 |
| $3\pi^+ 3\pi^-$ | ( 7.0±3.1) $\times 10^{-5}$ | | 4931 | DESIG=11 |
| $3\pi^+ 3\pi^- 2\pi^0$ | ( 1.0±0.4) $\times 10^{-3}$ | | 4908 | DESIG=12 |
| $3\pi^+ 3\pi^- K^+ K^-$ | < 8 $\times 10^{-5}$ | 90% | 4854 | DESIG=13 |
| $3\pi^+ 3\pi^- K^+ K^-\pi^0$ | ( 3.6±1.5) $\times 10^{-4}$ | | 4835 | DESIG=14 |
| $4\pi^+ 4\pi^-$ | ( 8 ±4 ) $\times 10^{-5}$ | | 4907 | DESIG=15 |
| $4\pi^+ 4\pi^- 2\pi^0$ | ( 1.8±0.7) $\times 10^{-3}$ | | 4877 | DESIG=16 |

## $\Upsilon(2S)$

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

NODE=M052

Mass $m = 10.02326 \pm 0.00031$ GeV

NODE=M052M;DTYPE=M

Full width $\Gamma = 31.98 \pm 2.63$ keV

NODE=M052W;DTYPE=G;OUR EVAL; → NOT CHECKED ←

$\Gamma_{ee} = 0.612 \pm 0.011$ keV

NODE=M052W2;DTYPE=E;OUR EVAL; → NOT CHECKED ←

| $\Upsilon(2S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\Upsilon(1S)\pi^+\pi^-$ | (18.1 ± 0.4 ) % | | 475 | NODE=M052215;DESIG=4 |
| $\Upsilon(1S)\pi^0\pi^0$ | ( 8.6 ± 0.4 ) % | | 480 | DESIG=5 |
| $\tau^+\tau^-$ | ( 2.00± 0.21) % | | 4686 | DESIG=3 |
| $\mu^+\mu^-$ | ( 1.93± 0.17) % | S=2.2 | 5011 | DESIG=1 |
| $e^+e^-$ | ( 1.91± 0.16) % | | 5012 | DESIG=2 |
| $\Upsilon(1S)\pi^0$ | < 1.8 $\times 10^{-4}$ | CL=90% | 531 | DESIG=10 |
| $\Upsilon(1S)\eta$ | ( 2.1 $^{+\ 0.8}_{-\ 0.7}$ ) $\times 10^{-4}$ | | 126 | DESIG=6 |
| $J/\psi(1S)$ anything | < 6 $\times 10^{-3}$ | CL=90% | 4533 | DESIG=20 |
| $\overline{d}$ anything | ( 3.4 ± 0.6 ) $\times 10^{-5}$ | | – | DESIG=16 |
| hadrons | (94 ±11 ) % | | – | DESIG=101 |
| **Radiative decays** | | | | NODE=M052;CLUMP=A |
| $\gamma\chi_{b1}(1P)$ | ( 6.9 ± 0.4 ) % | | 130 | DESIG=8 |
| $\gamma\chi_{b2}(1P)$ | ( 7.15± 0.35) % | | 110 | DESIG=7 |
| $\gamma\chi_{b0}(1P)$ | ( 3.8 ± 0.4 ) % | | 162 | DESIG=9 |
| $\gamma f_0(1710)$ | < 5.9 $\times 10^{-4}$ | CL=90% | 4864 | DESIG=13 |
| $\gamma f'_2(1525)$ | < 5.3 $\times 10^{-4}$ | CL=90% | 4896 | DESIG=12 |
| $\gamma f_2(1270)$ | < 2.41 $\times 10^{-4}$ | CL=90% | 4931 | DESIG=11 |
| $\gamma\eta_b(1S)$ | < 5.1 $\times 10^{-4}$ | CL=90% | 614 | DESIG=102 |
| $\gamma X \rightarrow\ \gamma + \geq 4$ prongs | [bb] < 1.95 $\times 10^{-4}$ | CL=95% | – | DESIG=103 |
| **Lepton Flavor (*LF*) violating decays** | | | | NODE=M052;CLUMP=B |
| $\mu^\pm\tau^\mp$ | *LF* < 1.44 $\times 10^{-5}$ | CL=95% | 4854 | DESIG=104 |

## $\chi_{b0}(2P)$ [aa]

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

*J* needs confirmation.

NODE=M079

Mass $m = 10.2325 \pm 0.0004 \pm 0.0005$ GeV

NODE=M079M;DTYPE=M;OUR EVAL; → NOT CHECKED ←

| $\chi_{b0}(2P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\gamma\,\Upsilon(2S)$ | (4.6±2.1) % | | 207 | NODE=M079215;DESIG=2 |
| $\gamma\,\Upsilon(1S)$ | (9 ±6 ) $\times 10^{-3}$ | | 743 | DESIG=1 |
| $D^0 X$ | < 8.2 % | 90% | – | DESIG=3 |
| $\pi^+\pi^- K^+ K^- \pi^0$ | < 3.4 $\times 10^{-5}$ | 90% | 5064 | DESIG=4 |
| $2\pi^+\pi^- K^- K^0_S$ | < 5 $\times 10^{-5}$ | 90% | 5063 | DESIG=5 |
| $2\pi^+\pi^- K^- K^0_S 2\pi^0$ | < 2.2 $\times 10^{-4}$ | 90% | 5036 | DESIG=6 |
| $2\pi^+ 2\pi^- 2\pi^0$ | < 2.4 $\times 10^{-4}$ | 90% | 5092 | DESIG=7 |
| $2\pi^+ 2\pi^- K^+ K^-$ | < 1.5 $\times 10^{-4}$ | 90% | 5050 | DESIG=8 |
| $2\pi^+ 2\pi^- K^+ K^- \pi^0$ | < 2.2 $\times 10^{-4}$ | 90% | 5035 | DESIG=9 |
| $2\pi^+ 2\pi^- K^+ K^- 2\pi^0$ | < 1.1 $\times 10^{-3}$ | 90% | 5019 | DESIG=10 |
| $3\pi^+ 2\pi^- K^- K^0_S \pi^0$ | < 7 $\times 10^{-4}$ | 90% | 5018 | DESIG=11 |
| $3\pi^+ 3\pi^-$ | < 7 $\times 10^{-5}$ | 90% | 5091 | DESIG=12 |
| $3\pi^+ 3\pi^- 2\pi^0$ | < 1.2 $\times 10^{-3}$ | 90% | 5070 | DESIG=13 |
| $3\pi^+ 3\pi^- K^+ K^-$ | < 1.5 $\times 10^{-4}$ | 90% | 5017 | DESIG=14 |
| $3\pi^+ 3\pi^- K^+ K^- \pi^0$ | < 7 $\times 10^{-4}$ | 90% | 4999 | DESIG=15 |
| $4\pi^+ 4\pi^-$ | < 1.7 $\times 10^{-4}$ | 90% | 5069 | DESIG=16 |
| $4\pi^+ 4\pi^- 2\pi^0$ | < 6 $\times 10^{-4}$ | 90% | 5039 | DESIG=17 |

## $\chi_{b1}(2P)$ [aa]

$I^G(J^{PC}) = 0^+(1^{++})$
$J$ needs confirmation. NODE=M080

Mass $m = 10.25546 \pm 0.00022 \pm 0.00050$ GeV NODE=M080M;DTYPE=M;OUR EVAL;
$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)} = 23.5 \pm 1.0$ MeV → NOT CHECKED ← NODE=M080M2;DTYPE=D

| $\chi_{b1}(2P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\omega\,\Upsilon(1S)$ | ( $1.63^{+0.40}_{-0.34}$ ) % | | 135 | NODE=M080215;DESIG=3 |
| $\gamma\,\Upsilon(2S)$ | (21 ±4 ) % | 1.5 | 230 | DESIG=2 |
| $\gamma\,\Upsilon(1S)$ | ( 8.5 ±1.3 ) % | 1.3 | 764 | DESIG=1 |
| $\pi\pi\,\chi_{b1}(1P)$ | ( 8.6 ±3.1 ) $\times 10^{-3}$ | | 238 | DESIG=4 |
| $D^0 X$ | ( 8.8 ±1.7 ) % | | – | DESIG=5 |
| $\pi^+\pi^- K^+ K^- \pi^0$ | ( 3.1 ±1.0 ) $\times 10^{-4}$ | | 5075 | DESIG=6 |
| $2\pi^+\pi^- K^- K^0_S$ | ( 1.1 ±0.5 ) $\times 10^{-4}$ | | 5075 | DESIG=7 |
| $2\pi^+\pi^- K^- K^0_S 2\pi^0$ | ( 7.7 ±3.2 ) $\times 10^{-4}$ | | 5047 | DESIG=8 |
| $2\pi^+ 2\pi^- 2\pi^0$ | ( 5.9 ±2.0 ) $\times 10^{-4}$ | | 5104 | DESIG=9 |
| $2\pi^+ 2\pi^- K^+ K^-$ | (10 ±4 ) $\times 10^{-5}$ | | 5062 | DESIG=10 |
| $2\pi^+ 2\pi^- K^+ K^- \pi^0$ | ( 5.5 ±1.8 ) $\times 10^{-4}$ | | 5047 | DESIG=11 |
| $2\pi^+ 2\pi^- K^+ K^- 2\pi^0$ | (10 ±4 ) $\times 10^{-4}$ | | 5030 | DESIG=12 |
| $3\pi^+ 2\pi^- K^- K^0_S \pi^0$ | ( 6.7 ±2.6 ) $\times 10^{-4}$ | | 5029 | DESIG=13 |
| $3\pi^+ 3\pi^-$ | ( 1.2 ±0.4 ) $\times 10^{-4}$ | | 5103 | DESIG=14 |
| $3\pi^+ 3\pi^- 2\pi^0$ | ( 1.2 ±0.4 ) $\times 10^{-3}$ | | 5081 | DESIG=15 |
| $3\pi^+ 3\pi^- K^+ K^-$ | ( 2.0 ±0.8 ) $\times 10^{-4}$ | | 5029 | DESIG=16 |
| $3\pi^+ 3\pi^- K^+ K^- \pi^0$ | ( 6.1 ±2.2 ) $\times 10^{-4}$ | | 5011 | DESIG=17 |
| $4\pi^+ 4\pi^-$ | ( 1.7 ±0.6 ) $\times 10^{-4}$ | | 5080 | DESIG=18 |
| $4\pi^+ 4\pi^- 2\pi^0$ | ( 1.9 ±0.7 ) $\times 10^{-3}$ | | 5051 | DESIG=19 |

## $\chi_{b2}(2P)$ [aa]

$I^G(J^{PC}) = 0^+(2^{++})$
$J$ needs confirmation. NODE=M081

Mass $m = 10.26865 \pm 0.00022 \pm 0.00050$ GeV NODE=M081M;DTYPE=M;OUR EVAL;
$m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)} = 13.5 \pm 0.6$ MeV → NOT CHECKED ← NODE=M081M2;DTYPE=D

| $\chi_{b2}(2P)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\omega\,\Upsilon(1S)$ | $(\ 1.10^{+0.34}_{-0.30})$ % | | 194 | NODE=M081215;DESIG=3 |
| $\gamma\,\Upsilon(2S)$ | (16.2 ±2.4 ) % | | 242 | DESIG=2 |
| $\gamma\,\Upsilon(1S)$ | ( 7.1 ±1.0 ) % | | 777 | DESIG=1 |
| $\pi\pi\,\chi_{b2}(1P)$ | ( 6.0 ±2.1 ) $\times 10^{-3}$ | | 229 | DESIG=4 |
| $D^0 X$ | < 2.4 % | 90% | – | DESIG=5 |
| $\pi^+\pi^- K^+ K^-\pi^0$ | < 1.1 $\times 10^{-4}$ | 90% | 5082 | DESIG=6 |
| $2\pi^+\pi^- K^- K^0_S$ | < 9 $\times 10^{-5}$ | 90% | 5082 | DESIG=7 |
| $2\pi^+\pi^- K^- K^0_S 2\pi^0$ | < 7 $\times 10^{-4}$ | 90% | 5054 | DESIG=8 |
| $2\pi^+ 2\pi^- 2\pi^0$ | ( 3.9 ±1.6 ) $\times 10^{-4}$ | | 5110 | DESIG=9 |
| $2\pi^+ 2\pi^- K^+ K^-$ | ( 9 ±4 ) $\times 10^{-5}$ | | 5068 | DESIG=10 |
| $2\pi^+ 2\pi^- K^+ K^-\pi^0$ | ( 2.4 ±1.1 ) $\times 10^{-4}$ | | 5054 | DESIG=11 |
| $2\pi^+ 2\pi^- K^+ K^- 2\pi^0$ | ( 4.7 ±2.3 ) $\times 10^{-4}$ | | 5037 | DESIG=12 |
| $3\pi^+ 2\pi^- K^- K^0_S\pi^0$ | < 4 $\times 10^{-4}$ | 90% | 5036 | DESIG=13 |
| $3\pi^+ 3\pi^-$ | ( 9 ±4 ) $\times 10^{-5}$ | | 5110 | DESIG=14 |
| $3\pi^+ 3\pi^- 2\pi^0$ | ( 1.2 ±0.4 ) $\times 10^{-3}$ | | 5088 | DESIG=15 |
| $3\pi^+ 3\pi^- K^+ K^-$ | ( 1.4 ±0.7 ) $\times 10^{-4}$ | | 5036 | DESIG=16 |
| $3\pi^+ 3\pi^- K^+ K^-\pi^0$ | ( 4.2 ±1.7 ) $\times 10^{-4}$ | | 5017 | DESIG=17 |
| $4\pi^+ 4\pi^-$ | ( 9 ±5 ) $\times 10^{-5}$ | | 5087 | DESIG=18 |
| $4\pi^+ 4\pi^- 2\pi^0$ | ( 1.3 ±0.5 ) $\times 10^{-3}$ | | 5058 | DESIG=19 |

## $\Upsilon(3S)$

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

NODE=M048

Mass $m = 10.3552 \pm 0.0005$ GeV
NODE=M048M;DTYPE=M

Full width $\Gamma = 20.32 \pm 1.85$ keV
NODE=M048W;DTYPE=G;OUR EVAL;→ NOT CHECKED ←

$\Gamma_{ee} = 0.443 \pm 0.008$ keV
NODE=M048W2;DTYPE=E;OUR EVAL;→ NOT CHECKED ←

| $\Upsilon(3S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $\Upsilon(2S)$ anything | (10.6 ±0.8 ) % | | 296 | NODE=M048215;DESIG=8 |
| $\Upsilon(2S)\pi^+\pi^-$ | ( 2.45±0.23) % | S=1.1 | 177 | DESIG=4 |
| $\Upsilon(2S)\pi^0\pi^0$ | ( 1.85±0.14) % | | 190 | DESIG=10 |
| $\Upsilon(2S)\gamma\gamma$ | ( 5.0 ±0.7 ) % | | 327 | DESIG=12 |
| $\Upsilon(2S)\pi^0$ | < 5.1 $\times 10^{-4}$ | CL=90% | 298 | DESIG=107 |
| $\Upsilon(1S)\pi^+\pi^-$ | ( 4.40±0.10) % | | 813 | DESIG=3 |
| $\Upsilon(1S)\pi^0\pi^0$ | ( 2.20±0.13) % | | 816 | DESIG=11 |
| $\Upsilon(1S)\eta$ | < 1.8 $\times 10^{-4}$ | CL=90% | 677 | DESIG=9 |
| $\Upsilon(1S)\pi^0$ | < 7 $\times 10^{-5}$ | CL=90% | 846 | DESIG=106 |
| $\tau^+\tau^-$ | ( 2.29±0.30) % | | 4863 | DESIG=16 |
| $\mu^+\mu^-$ | ( 2.18±0.21) % | S=2.1 | 5177 | DESIG=1 |
| $e^+e^-$ | seen | | 5178 | DESIG=2;OUR EVAL;→ NOT CHECKED ← |
| **Radiative decays** | | | | NODE=M048;CLUMP=B |
| $\gamma\,\chi_{b2}(2P)$ | (13.1 ±1.6 ) % | S=3.4 | 86 | DESIG=5 |
| $\gamma\,\chi_{b1}(2P)$ | (12.6 ±1.2 ) % | S=2.4 | 99 | DESIG=6 |
| $\gamma\,\chi_{b0}(2P)$ | ( 5.9 ±0.6 ) % | S=1.4 | 122 | DESIG=7 |
| $\gamma\,\chi_{b2}(1P)$ | < 1.9 % | CL=90% | 434 | DESIG=103 |
| $\gamma\,\chi_{b1}(1P)$ | < 1.7 $\times 10^{-3}$ | CL=90% | 452 | DESIG=104 |
| $\gamma\,\chi_{b0}(1P)$ | ( 3.0 ±1.1 ) $\times 10^{-3}$ | | 484 | DESIG=13 |
| $\gamma\,\eta_b(2S)$ | < 6.2 $\times 10^{-4}$ | CL=90% | – | DESIG=14 |
| $\gamma\,\eta_b(1S)$ | ( 4.8 ±1.3 ) $\times 10^{-4}$ | | 921 | DESIG=15 |
| $\gamma X \rightarrow\ \gamma+\geq 4$ prongs | [cc] < 2.2 $\times 10^{-4}$ | CL=95% | – | DESIG=102 |
| **Lepton Flavor (LF) violating decays** | | | | NODE=M048;CLUMP=C |
| $\mu^\pm\tau^\mp$ | LF < 2.03 $\times 10^{-5}$ | CL=95% | 5025 | DESIG=105 |

## $\Upsilon(4S)$ or $\Upsilon(10580)$

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

NODE=M047

Mass $m = 10.5794 \pm 0.0012$ GeV
NODE=M047M;DTYPE=M

Full width $\Gamma = 20.5 \pm 2.5$ MeV
NODE=M047W;DTYPE=G

$\Gamma_{ee} = 0.272 \pm 0.029$ keV (S = 1.5)
NODE=M047W1;DTYPE=E

| $\Upsilon(4S)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $B\overline{B}$ | $> 96$ % | 95% | 328 | NODE=M047215;DESIG=8;OUR EST; → NOT CHECKED ← |
| $B^+B^-$ | (51.6 ±0.6 ) % | | 334 | DESIG=10 |
| $D_s^+$ anything + c.c. | (18.2 ±2.5 ) % | | – | DESIG=12 |
| $B^0\overline{B}^0$ | (48.4 ±0.6 ) % | | 328 | DESIG=11 |
| $J/\psi K_S^0 (J/\psi,\ \eta_c) K_S^0$ | $< 4 \times 10^{-7}$ | 90% | – | DESIG=15 |
| non-$B\overline{B}$ | $< 4$ % | 95% | – | DESIG=6 |
| $e^+e^-$ | $(1.57 \pm 0.08) \times 10^{-5}$ | | 5290 | DESIG=1 |
| $\rho^+\rho^-$ | $< 5.7 \times 10^{-6}$ | 90% | 5233 | DESIG=16 |
| $J/\psi(1S)$ anything | $< 1.9 \times 10^{-4}$ | 95% | – | DESIG=2 |
| $D^{*+}$ anything + c.c. | $< 7.4$ % | 90% | 5099 | DESIG=3 |
| $\phi$ anything | ( 7.1 ±0.6 ) % | | 5240 | DESIG=4 |
| $\phi\eta$ | $< 2.5 \times 10^{-6}$ | 90% | 5226 | DESIG=13 |
| $\Upsilon(1S)$ anything | $< 4 \times 10^{-3}$ | 90% | 1053 | DESIG=5 |
| $\Upsilon(1S)\pi^+\pi^-$ | $(8.2 \pm 0.6) \times 10^{-5}$ | | 1026 | DESIG=7 |
| $\Upsilon(1S)\eta$ | $(1.96 \pm 0.11) \times 10^{-4}$ | | 924 | DESIG=17 |
| $\Upsilon(2S)\pi^+\pi^-$ | $(8.7 \pm 1.1) \times 10^{-5}$ | | 468 | DESIG=9 |
| $\overline{d}$ anything | $< 1.3 \times 10^{-5}$ | 90% | – | DESIG=14 |

## $\Upsilon(10860)$ $I^G(J^{PC}) = 0^-(1^{--})$

NODE=M092

Mass $m = 10.865 \pm 0.008$ GeV (S = 1.1) NODE=M092M;DTYPE=M

Full width $\Gamma = 110 \pm 13$ MeV NODE=M092W;DTYPE=G

$\Gamma_{ee} = 0.31 \pm 0.07$ keV (S = 1.3) NODE=M092W1;DTYPE=E

| $\Upsilon(10860)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | Confidence level | $p$ (MeV/$c$) | |
|---|---|---|---|---|
| $e^+e^-$ | $(2.8 \pm 0.7) \times 10^{-6}$ | | 5432 | NODE=M092215;DESIG=1 |
| $B\overline{B}X$ | ( 59 ±14 ) % | | – | DESIG=9 |
| $B\overline{B}$ | $< 13.8$ % | 90% | 1280 | DESIG=2 |
| $B\overline{B}^* +$ c.c. | ( 14 ± 6 ) % | | – | DESIG=3 |
| $B^*\overline{B}^*$ | ( 44 ±11 ) % | | – | DESIG=4 |
| $B\overline{B}^{(*)}\pi$ | $< 19.7$ % | 90% | – | DESIG=10 |
| $B\overline{B}\pi\pi$ | $< 8.9$ % | 90% | 442 | DESIG=11 |
| $B_s^{(*)}\overline{B}_s^{(*)}(X)$ | ( 19.3 ± 2.9 ) % | | – | DESIG=15 |
| $\Upsilon(1S)\pi^+\pi^-$ | $(5.3 \pm 0.6) \times 10^{-3}$ | | 1288 | DESIG=17 |
| $\Upsilon(2S)\pi^+\pi^-$ | $(7.8 \pm 1.3) \times 10^{-3}$ | | 763 | DESIG=18 |
| $\Upsilon(3S)\pi^+\pi^-$ | $(4.8 \pm^{1.9}_{1.7}) \times 10^{-3}$ | | 416 | DESIG=19 |
| $\Upsilon(1S)K^+K^-$ | $(6.1 \pm 1.8) \times 10^{-4}$ | | 933 | DESIG=20 |

**Inclusive Decays.** NODE=M092;CLUMP=I

These decay modes are submodes of one or more of the decay modes above. NODE=M092

| | | | | |
|---|---|---|---|---|
| $\phi$ anything | ( 13.8 $\pm^{2.4}_{1.7}$ ) % | | – | DESIG=12 |
| $D^0$ anything + c.c. | (108 ± 8 ) % | | – | DESIG=13 |
| $D_s$ anything + c.c. | ( 46 ± 6 ) % | | – | DESIG=6 |
| $J/\psi$ anything | ( 2.06± 0.21) % | | – | DESIG=14 |

## $\Upsilon(11020)$ $I^G(J^{PC}) = 0^-(1^{--})$

NODE=M093

Mass $m = 11.019 \pm 0.008$ GeV NODE=M093M;DTYPE=M

Full width $\Gamma = 79 \pm 16$ MeV NODE=M093W;DTYPE=G

$\Gamma_{ee} = 0.130 \pm 0.030$ keV NODE=M093W1;DTYPE=E

| $\Upsilon(11020)$ DECAY MODES | Fraction ($\Gamma_i/\Gamma$) | $p$ (MeV/$c$) | |
|---|---|---|---|
| $e^+e^-$ | $(1.6 \pm 0.5) \times 10^{-6}$ | 5510 | NODE=M093215;DESIG=1 |

NOTES

[a] See the "Note on scalar mesons" in the $f_0(1370)$ Particle Listings . The interpretation of this entry as a particle is controversial. LINKAGE=NS2

[b] See the "Note on $\rho(770)$" in the $\rho(770)$ Particle Listings . LINKAGE=NRH

[c] The $\omega\rho$ interference is then due to $\omega\rho$ mixing only, and is expected to be small. If $e\mu$ universality holds, $\Gamma(\rho^0 \rightarrow \mu^+\mu^-) = \Gamma(\rho^0 \rightarrow e^+e^-) \times 0.99785$. LINKAGE=MD2

[d] $C$ parity forbids this to occur as a single-photon process. LINKAGE=CS

[e] See the "Note on scalar mesons" in the $f_0(1370)$ Particle Listings . LINKAGE=NSM

[f] See the "Note on $a_1(1260)$" in the $a_1(1260)$ Particle Listings in PDG 06, Journal of Physics, G **33** 1 (2006). LINKAGE=NA1

[g] This is only an educated guess; the error given is larger than the error on the average of the published values. See the Particle Listings for details. LINKAGE=MS

[h] See the "Note on non-$q\overline{q}$ mesons" in the Particle Listings in PDG 06, Journal of Physics, G **33** 1 (2006). LINKAGE=NQQ

[i] See the "Note on the $\eta(1405)$" in the $\eta(1405)$ Particle Listings. LINKAGE=MG

[j] See the "Note on the $f_1(1420)$" in the $\eta(1405)$ Particle Listings. LINKAGE=MDA

[k] See also the $\omega(1650)$ Particle Listings. LINKAGE=MDE

[l] See the "Note on the $\rho(1450)$ and the $\rho(1700)$" in the $\rho(1700)$ Particle Listings. LINKAGE=MDC

[m] See also the $\omega(1420)$ Particle Listings. LINKAGE=MDF

[n] See the "Note on $f_0(1710)$" in the $f_0(1710)$ Particle Listings in 2004 edition of *Review of Particle Physics*. LINKAGE=NFJ

[o] See the "Note on $f_0(1370)$" in the $f_0(1370)$ Particle Listings and in the 1994 edition. LINKAGE=NF0

[p] See the note in the $L(1770)$ Particle Listings in Reviews of Modern Physics **56** S1 (1984), p. S200. See also the "Note on $K_2(1770)$ and the $K_2(1820)$" in the $K_2(1770)$ Particle Listings . LINKAGE=MDB

[q] See the "Note on $K_2(1770)$ and the $K_2(1820)$" in the $K_2(1770)$ Particle Listings . LINKAGE=MBD

[r] The value is for the sum of the charge states or particle/antiparticle states indicated. LINKAGE=SG

[s] Includes $p\overline{p}\pi^+\pi^-\gamma$ and excludes $p\overline{p}\eta$, $p\overline{p}\omega$, $p\overline{p}\eta'$. LINKAGE=MF

[t] $J^{PC}$ known by production in $e^+e^-$ via single photon annihilation. $I^G$ is not known; interpretation of this state as a single resonance is unclear because of the expectation of substantial threshold effects in this energy region. LINKAGE=MPD

[u] See COAN 06 for details. LINKAGE=COA

[v] $2m_\tau < \mathrm{M}(\tau^+\tau^-) < 7500$ MeV. LINKAGE=E49

[w] $2 < m_{K^+K^-} < 3$ GeV. LINKAGE=G49

[x] $X$ = pseudoscalar with $m < 7.2$ GeV LINKAGE=A49

[y] $X\overline{X}$ = vectors with $m < 3.1$ GeV LINKAGE=B49

[z] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C49

[aa] Spectroscopic labeling for these states is theoretical, pending experimental information. LINKAGE=MJ

[bb] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C52

[cc] 1.5 GeV $< m_X <$ 5.0 GeV LINKAGE=C48