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

For $I = 1$ (π, b, ρ, a): $u\overline{d}$, $(u\overline{u} - d\overline{d})/\sqrt{2}$, $d\overline{u}$;
for $I = 0$ (η, η', h, h', ω, ϕ, f, f'): $c_1(u\overline{u} + d\overline{d}) + c_2(s\overline{s})$

$\pi^{\pm}$

$I^G(J^P) = 1^-(0^-)$

Mass $m = 139.56995 \pm 0.00035$ MeV
Mean life $\tau = (2.6033 \pm 0.0005) \times 10^{-8}$ s (S = 1.2)
$c\tau = 7.8045$ m

$\pi^{\pm} \rightarrow \ell^{\pm}\nu\gamma$ form factors [a]

$F_V = 0.017 \pm 0.008$
$F_A = 0.0116 \pm 0.0016$ (S = 1.3)
$R = 0.059^{+0.009}_{-0.008}$

π^- modes are charge conjugates of the modes below.

π^+ DECAY MODES			Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\mu^+\nu_\mu$		[b]	(99.98770 ± 0.00004) %		30
$\mu^+\nu_\mu\gamma$		[c]	(1.24 ± 0.25) $\times 10^{-4}$		30
$e^+\nu_e$		[b]	(1.230 ± 0.004) $\times 10^{-4}$		70
$e^+\nu_e\gamma$		[c]	(1.61 ± 0.23) $\times 10^{-7}$		70
$e^+\nu_e\pi^0$			(1.025 ± 0.034) $\times 10^{-8}$		4
$e^+\nu_e e^+ e^-$			(3.2 ± 0.5) $\times 10^{-9}$		70
$e^+\nu_e\nu\overline{\nu}$			< 5 $\times 10^{-6}$	90%	70
Lepton Family number (LF) or Lepton number (L) violating modes					
$\mu^+\overline{\nu}_e$	L	[d]	< 1.5 $\times 10^{-3}$	90%	30
$\mu^+\nu_e$	LF	[d]	< 8.0 $\times 10^{-3}$	90%	30
$\mu^- e^+ e^+ \nu$	LF		< 1.6 $\times 10^{-6}$	90%	30

π^0

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

Mass $m = 134.9764 \pm 0.0006$ MeV
$m_{\pi^\pm} - m_{\pi^0} = 4.5936 \pm 0.0005$ MeV
Mean life $\tau = (8.4 \pm 0.6) \times 10^{-17}$ s (S = 3.0)
$c\tau = 25.1$ nm

π^0 DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
2γ		(98.798 ± 0.032) %	S=1.1	67
$e^+ e^- \gamma$		(1.198 ± 0.032) %	S=1.1	67
γ positronium		$(1.82 \pm 0.29) \times 10^{-9}$		67
$e^+ e^+ e^- e^-$		$(3.14 \pm 0.30) \times 10^{-5}$		67
$e^+ e^-$		$(7.5 \pm 2.0) \times 10^{-8}$		67
4γ		$< 2 \times 10^{-8}$	CL=90%	67
$\nu \overline{\nu}$	[e]	$< 8.3 \times 10^{-7}$	CL=90%	67
$\nu_e \overline{\nu}_e$		$< 1.7 \times 10^{-6}$	CL=90%	67
$\nu_\mu \overline{\nu}_\mu$		$< 3.1 \times 10^{-6}$	CL=90%	67
$\nu_\tau \overline{\nu}_\tau$		$< 2.1 \times 10^{-6}$	CL=90%	67
Charge conjugation (*C*) or Lepton Family number (*LF*) violating modes				
3γ	*C*	$< 3.1 \times 10^{-8}$	CL=90%	67
$\mu^+ e^- + e^- \mu^+$	*LF*	$< 1.72 \times 10^{-8}$	CL=90%	26

η

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

Mass $m = 547.45 \pm 0.19$ MeV (S = 1.6)
Full width $\Gamma = 1.18 \pm 0.11$ keV [f] (S = 1.8)

C-nonconserving decay parameters [g]

$\pi^+ \pi^- \pi^0$ Left-right asymmetry $= (0.09 \pm 0.17) \times 10^{-2}$
$\pi^+ \pi^- \pi^0$ Sextant asymmetry $= (0.18 \pm 0.16) \times 10^{-2}$
$\pi^+ \pi^- \pi^0$ Quadrant asymmetry $= (-0.17 \pm 0.17) \times 10^{-2}$
$\pi^+ \pi^- \gamma$ Left-right asymmetry $= (0.9 \pm 0.4) \times 10^{-2}$
$\pi^+ \pi^- \gamma$ β (*D*-wave) $= 0.05 \pm 0.06$ (S = 1.5)

η DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
neutral modes		(71.4 ± 0.6) %	S=1.3	–
2γ	[f]	(39.25 ± 0.31) %	S=1.3	274
$3\pi^0$		(32.1 ± 0.4) %	S=1.2	180
$\pi^0 2\gamma$		$(7.1 \pm 1.4) \times 10^{-4}$		258
other neutral modes		< 2.8 %	CL=90%	–
charged modes		(28.6 ± 0.6) %	S=1.3	–
$\pi^+ \pi^- \pi^0$		(23.2 ± 0.5) %	S=1.3	175

$\pi^+\pi^-\gamma$		(4.78±0.12) %	S=1.2	236
$e^+e^-\gamma$		(4.9 ±1.1) $\times 10^{-3}$		274
$\mu^+\mu^-\gamma$		(3.1 ±0.4) $\times 10^{-4}$		253
e^+e^-		< 3 $\times 10^{-4}$	CL=90%	274
$\mu^+\mu^-$		(5.8 ±0.8) $\times 10^{-6}$		253
$\pi^+\pi^-e^+e^-$		(1.3 $^{+1.2}_{-0.8}$) $\times 10^{-3}$		236
$\pi^+\pi^-2\gamma$		< 2.1 $\times 10^{-3}$		236
$\pi^+\pi^-\pi^0\gamma$		< 6 $\times 10^{-4}$	CL=90%	175
$\pi^0\mu^+\mu^-\gamma$		< 3 $\times 10^{-6}$	CL=90%	211

Charge conjugation (*C*), Parity (*P*), or
Charge conjugation × Parity (*CP*) violating modes

$\pi^+\pi^-$	*P,CP*		< 1.5 $\times 10^{-3}$		236
3γ	*C*		< 5 $\times 10^{-4}$	CL=95%	274
$\pi^0e^+e^-$	*C*	[h]	< 4 $\times 10^{-5}$	CL=90%	258
$\pi^0\mu^+\mu^-$	*C*	[h]	< 5 $\times 10^{-6}$	CL=90%	211

f_0(400–1200) [i] or σ

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

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

Mass m = (400–1200) MeV
Full width Γ = (600–1000) MeV

f_0(400–1200) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	dominant	–
$\gamma\gamma$	seen	–

$\rho(770)$ [j]

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

Mass $m = 768.5 \pm 0.6$ MeV (S = 1.2)
Full width $\Gamma = 150.7 \pm 1.2$ MeV
$\Gamma_{ee} = 6.77 \pm 0.32$ keV

ρ(770) DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi\pi$	~ 100 %		358
$\rho(770)^{\pm}$ decays			
$\pi^{\pm}\gamma$	(4.5 ±0.5) $\times 10^{-4}$	S=2.2	372
$\pi^{\pm}\eta$	< 6 $\times 10^{-3}$	CL=84%	146
$\pi^{\pm}\pi^+\pi^-\pi^0$	< 2.0 $\times 10^{-3}$	CL=84%	249

$\rho(770)^0$ decays

$\pi^+\pi^-\gamma$		$(9.9 \pm 1.6) \times 10^{-3}$		358
$\pi^0\gamma$		$(7.9 \pm 2.0) \times 10^{-4}$		372
$\eta\gamma$		$(3.8 \pm 0.7) \times 10^{-4}$		189
$\mu^+\mu^-$	[k]	$(4.60 \pm 0.28) \times 10^{-5}$		369
e^+e^-	[k]	$(4.48 \pm 0.22) \times 10^{-5}$		384
$\pi^+\pi^-\pi^0$		$< 1.2 \times 10^{-4}$	CL=90%	319
$\pi^+\pi^-\pi^+\pi^-$		$< 2 \times 10^{-4}$	CL=90%	246
$\pi^+\pi^-\pi^0\pi^0$		$< 4 \times 10^{-5}$	CL=90%	252

$\omega(782)$

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

Mass $m = 781.94 \pm 0.12$ MeV (S = 1.5)
Full width $\Gamma = 8.43 \pm 0.10$ MeV
$\Gamma_{ee} = 0.60 \pm 0.02$ keV

$\omega(782)$ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\pi^+\pi^-\pi^0$		(88.8 ± 0.7) %		327
$\pi^0\gamma$		(8.5 ± 0.5) %		379
$\pi^+\pi^-$		(2.21 ± 0.30) %		365
neutrals (excluding $\pi^0\gamma$)		$(5.3\ ^{+8.7}_{-3.5}) \times 10^{-3}$		–
$\eta\gamma$		$(8.3 \pm 2.1) \times 10^{-4}$		199
$\pi^0 e^+e^-$		$(5.9 \pm 1.9) \times 10^{-4}$		379
$\pi^0\mu^+\mu^-$		$(9.6 \pm 2.3) \times 10^{-5}$		349
e^+e^-		$(7.15 \pm 0.19) \times 10^{-5}$		391
$\pi^+\pi^-\pi^0\pi^0$		< 2 %	90%	261
$\pi^+\pi^-\gamma$		$< 3.6 \times 10^{-3}$	95%	365
$\pi^+\pi^-\pi^+\pi^-$		$< 1 \times 10^{-3}$	90%	256
$\pi^0\pi^0\gamma$		$(7.2 \pm 2.5) \times 10^{-5}$		367
$\mu^+\mu^-$		$< 1.8 \times 10^{-4}$	90%	376
3γ		$< 2 \times 10^{-4}$	90%	391
Charge conjugation (C)				
$\eta\pi^0$	C	$< 1 \times 10^{-3}$	90%	162
$3\pi^0$	C	$< 3 \times 10^{-4}$	90%	329

$\eta'(958)$

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

Mass $m = 957.77 \pm 0.14$ MeV
Full width $\Gamma = 0.201 \pm 0.016$ MeV (S = 1.3)

$\eta'(958)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi^+\pi^-\eta$	(43.7 ± 1.5) %	S=1.1	232
$\rho^0\gamma$	(30.2 ± 1.3) %	S=1.1	169
$\pi^0\pi^0\eta$	(20.8 ± 1.3) %	S=1.2	239
$\omega\gamma$	(3.02 ± 0.30) %		160
$\gamma\gamma$	(2.12 ± 0.13) %	S=1.2	479
$3\pi^0$	$(1.55 \pm 0.26) \times 10^{-3}$		430
$\mu^+\mu^-\gamma$	$(1.04 \pm 0.26) \times 10^{-4}$		467
$\pi^+\pi^-\pi^0$	< 5 %	CL=90%	427
$\pi^0\rho^0$	< 4 %	CL=90%	118
$\pi^+\pi^-$	< 2 %	CL=90%	458
$\pi^0 e^+ e^-$	< 1.3 %	CL=90%	469
$\eta e^+ e^-$	< 1.1 %	CL=90%	322
$\pi^+\pi^+\pi^-\pi^-$	< 1 %	CL=90%	372
$\pi^+\pi^+\pi^-\pi^-$ neutrals	< 1 %	CL=95%	–
$\pi^+\pi^+\pi^-\pi^-\pi^0$	< 1 %	CL=90%	298
6π	< 1 %	CL=90%	189
$\pi^+\pi^- e^+ e^-$	$< 6 \times 10^{-3}$	CL=90%	458
$\pi^0\pi^0$	$< 9 \times 10^{-4}$	CL=90%	459
$\pi^0\gamma\gamma$	$< 8 \times 10^{-4}$	CL=90%	469
$4\pi^0$	$< 5 \times 10^{-4}$	CL=90%	379
3γ	$< 1.0 \times 10^{-4}$	CL=90%	479
$\mu^+\mu^-\pi^0$	$< 6.0 \times 10^{-5}$	CL=90%	445
$\mu^+\mu^-\eta$	$< 1.5 \times 10^{-5}$	CL=90%	274
e^+e^-	$< 2.1 \times 10^{-7}$	CL=90%	479

$f_0(980)$ [i]

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

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

$f_0(980)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\pi\pi$	(78.1 ± 2.4) %		470
$K\overline{K}$	(21.9 ± 2.4) %		–
$\gamma\gamma$	$(1.19 \pm 0.33) \times 10^{-5}$		490
e^+e^-	$< 3 \times 10^{-7}$	90%	490

$a_0(980)$ [i]

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

Mass $m = 983.5 \pm 0.9$ MeV
Full width $\Gamma = 50$ to 100 MeV

$a_0(980)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\pi$	dominant	321
$K\overline{K}$	seen	–
$\gamma\gamma$	seen	492

$\phi(1020)$

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

Mass $m = 1019.413 \pm 0.008$ MeV
Full width $\Gamma = 4.43 \pm 0.05$ MeV
$\Gamma_{ee} = 1.37 \pm 0.05$ keV

$\phi(1020)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
K^+K^-	(49.1 ± 0.6) %	S=1.2	127
$K^0_L K^0_S$	(34.1 ± 0.5) %	S=1.1	110
$\rho\pi$	(12.9 ± 0.7) %		181
$\pi^+\pi^-\pi^0$	(2.7 ± 0.9) %	S=1.1	462
$\eta\gamma$	(1.26 ± 0.06) %	S=1.1	363
$\pi^0\gamma$	$(1.31 \pm 0.13) \times 10^{-3}$		501
e^+e^-	$(3.00 \pm 0.06) \times 10^{-4}$	S=1.1	510
$\mu^+\mu^-$	$(2.48 \pm 0.34) \times 10^{-4}$		499
ηe^+e^-	$(1.3 ^{+0.8}_{-0.6}) \times 10^{-4}$		363
$\pi^+\pi^-$	$(8 ^{+5}_{-4}) \times 10^{-5}$	S=1.5	490
$\omega\gamma$	< 5 %	CL=84%	210
$\rho\gamma$	< 2 %	CL=84%	219
$\pi^+\pi^-\gamma$	$< 7 \times 10^{-3}$	CL=90%	490
$\pi^0\pi^0\gamma$	$< 1 \times 10^{-3}$	CL=90%	492
$\pi^+\pi^-\pi^+\pi^-$	$< 8.7 \times 10^{-4}$	CL=90%	410
$\eta'(958)\gamma$	$< 4.1 \times 10^{-4}$	CL=90%	60
$\pi^+\pi^+\pi^-\pi^-\pi^0$	$< 1.5 \times 10^{-4}$	CL=95%	341
$\pi^0 e^+e^-$	$< 1.2 \times 10^{-4}$	CL=90%	501
$a_0(980)\gamma$	$< 5 \times 10^{-3}$	CL=90%	36

$h_1(1170)$

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

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

$h_1(1170)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	310

$b_1(1235)$

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

Mass $m = 1231 \pm 10$ MeV [l]
Full width $\Gamma = 142 \pm 8$ MeV (S = 1.1)

$b_1(1235)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\omega\pi$	dominant		348
[D/S amplitude ratio = 0.26 ± 0.04]			
$\pi^\pm\gamma$	$(1.6\pm0.4)\times10^{-3}$		608
$\eta\rho$	seen		–
$\pi^+\pi^+\pi^-\pi^0$	<50 %	84%	536
$(K\overline{K})^\pm\pi^0$	<8 %	90%	248
$K_S^0 K_L^0 \pi^\pm$	<6 %	90%	238
$K_S^0 K_S^0 \pi^\pm$	<2 %	90%	238
$\pi\phi$	<1.5 %	84%	146

$a_1(1260)$ [m]

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

Mass $m = 1230 \pm 40$ MeV [l]
Full width $\Gamma \sim 400$ MeV

$a_1(1260)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	dominant	356
$\pi\gamma$	seen	607
$K\overline{K}^*(892)$	possibly seen	–

$f_2(1270)$

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

Mass $m = 1275 \pm 5$ MeV [l]
Full width $\Gamma = 185 \pm 20$ MeV [l]

$f_2(1270)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi\pi$	$(84.7\ ^{+2.6}_{-1.2})\,\%$	S=1.3	622
$\pi^+\pi^- 2\pi^0$	$(\ 7.2\ ^{+1.4}_{-2.9})\,\%$	S=1.3	562
$K\overline{K}$	$(\ 4.6\ \pm0.5\ )\,\%$	S=2.8	403
$2\pi^+ 2\pi^-$	$(\ 2.8\ \pm0.4\ )\,\%$	S=1.2	559
$\eta\eta$	$(\ 4.5\ \pm1.0\ ) \times 10^{-3}$	S=2.4	327
$4\pi^0$	$(\ 3.0\ \pm1.0\ ) \times 10^{-3}$		564
$\gamma\gamma$	$(\ 1.32^{+0.18}_{-0.16}) \times 10^{-5}$		637
$\eta\pi\pi$	$< 8 \times 10^{-3}$	CL=95%	475
$K^0 K^- \pi^+ +$ c.c.	$< 3.4 \times 10^{-3}$	CL=95%	293
$e^+ e^-$	$< 9 \times 10^{-9}$	CL=90%	637

$f_1(1285)$

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

Mass $m = 1282.2 \pm 0.7$ MeV [l] (S = 1.7)
Full width $\Gamma = 24.8 \pm 1.3$ MeV [l] (S = 1.3)

$f_1(1285)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
4π	$(29\ \pm\ 6\ )\,\%$		563
$\pi^0\pi^0\pi^+\pi^-$	$(15\ ^{+\ 9}_{-\ 8})\,\%$	S=1.1	566
$2\pi^+ 2\pi^-$	$(15\ \pm\ 6\ )\,\%$		563
$\rho^0\pi^+\pi^-$	dominates $2\pi^+ 2\pi^-$		340
$4\pi^0$	$< 7 \times 10^{-4}$	CL=90%	568
$\eta\pi\pi$	$(54\ \pm15\ )\,\%$		479
$a_0(980)\pi$ [ignoring $a_0(980) \to K\overline{K}$]	$(44\ \pm\ 7\ )\,\%$	S=1.1	234
$\eta\pi\pi$ [excluding $a_0(980)\pi$]	$(10\ ^{+\ 7}_{-\ 6})\,\%$	S=1.1	–
$K\overline{K}\pi$	$(\ 9.7\pm\ 1.6)\,\%$	S=1.2	308
$K\overline{K}^*(892)$	not seen		–
$\gamma\rho^0$	$(\ 6.6\pm\ 1.3)\,\%$	S=1.5	410
$\phi\gamma$	$(\ 8.0\pm\ 3.1) \times 10^{-4}$		236

$\eta(1295)$

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

Mass $m = 1295 \pm 4$ MeV
Full width $\Gamma = 53 \pm 6$ MeV

$\eta(1295)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\pi^+\pi^-$	seen	488
$a_0(980)\pi$	seen	245

$\pi(1300)$

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

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

$\pi(1300)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	406
$\pi(\pi\pi)_{S\text{-wave}}$	seen	612

$a_2(1320)$

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

Mass $m = 1318.1 \pm 0.7$ MeV (S = 1.2)
Full width $\Gamma = 107 \pm 5$ MeV [l] ($K^\pm K^0_S$ and $\eta\pi$ modes)

$a_2(1320)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\rho\pi$	(70.1 ± 2.7) %	S=1.2	419
$\eta\pi$	(14.5 ± 1.2) %		535
$\omega\pi\pi$	(10.6 ± 3.2) %	S=1.3	362
$K\overline{K}$	(4.9 ± 0.8) %		437
$\eta'(958)\pi$	$(5.7 \pm 1.1) \times 10^{-3}$		287
$\pi^\pm\gamma$	$(2.8 \pm 0.6) \times 10^{-3}$		652
$\gamma\gamma$	$(9.7 \pm 1.0) \times 10^{-6}$		659
$\pi^+\pi^-\pi^-$	< 8 %	CL=90%	621
e^+e^-	$< 2.3 \times 10^{-7}$	CL=90%	659

$f_0(1370)$ [i] was $f_0(1300)$

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

Mass m = 1200 to 1500 MeV
Full width Γ = 300 to 500 MeV

In two-particle decay modes the $\pi\pi$ decay is dominant. We include here the resonance observed in 4π under the same entry as the one decaying to 2 pseudoscalars. See also the minireview under non-$q\overline{q}$ candidates.

$f_0(1370)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	seen	–
4π	seen	–
$2\pi^+ 2\pi^-$	seen	–
$\pi^+ \pi^- 2\pi^0$	seen	–
$\eta\eta$	seen	–
$K\overline{K}$	seen	–
$\gamma\gamma$	seen	–
$e^+ e^-$	not seen	–

$f_1(1420)$ [n]

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

Mass m = 1426.8 ± 2.3 MeV (S = 1.3)
Full width Γ = 53 ± 5 MeV

$f_1(1420)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}\pi$	dominant	439
$\eta\pi\pi$	possibly seen	571

$\omega(1420)$ [o]

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

Mass m = 1419 ± 31 MeV
Full width Γ = 174 ± 60 MeV

$\omega(1420)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	dominant	488

$\eta(1440)$ [p]

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

Mass $m = 1415 \pm 10$ MeV [l]
Full width $\Gamma = 60 \pm 20$ MeV [l]

$\eta(1440)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}\pi$	seen	429
$\eta\pi\pi$	seen	564
$a_0(980)\pi$	seen	347
4π	seen	637

$\rho(1450)$ [q]

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

Mass $m = 1465 \pm 25$ MeV [l]
Full width $\Gamma = 310 \pm 60$ MeV [l]

$\rho(1450)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\pi\pi$	seen		719
4π	seen		665
e^+e^-	seen		732
$\eta\rho$	<4 %		317
$\omega\pi$	<2.0 %	95%	512
$\phi\pi$	<1 %		358
$K\overline{K}$	$<1.6 \times 10^{-3}$	95%	541

$f_0(1500)$ [r]
was $f_0(1525)$ and $f_0(1590)$

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

Mass $m = 1503 \pm 11$ MeV
Full width $\Gamma = 120 \pm 19$ MeV

$f_0(1500)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\eta'(958)$	seen	–
$\eta\eta$	seen	515
$4\pi^0$	seen	690
$\pi^0\pi^0$	seen	739
$2\pi^+2\pi^-$	seen	686

$f_1(1510)$

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

Mass $m = 1512 \pm 4$ MeV
Full width $\Gamma = 35 \pm 15$ MeV

$f_1(1510)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}^*(892)+$ c.c.	seen	292

$f'_2(1525)$

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

Mass $m = 1525 \pm 5$ MeV [l]
Full width $\Gamma = 76 \pm 10$ MeV [l]

$f'_2(1525)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	(88.8 ± 3.1) %	581
$\eta\eta$	(10.3 ± 3.1) %	531
$\pi\pi$	$(8.2 \pm 1.5) \times 10^{-3}$	750
$\gamma\gamma$	$(1.32 \pm 0.21) \times 10^{-6}$	763

$\omega(1600)$ [s]

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

Mass $m = 1649 \pm 24$ MeV (S = 2.3)
Full width $\Gamma = 220 \pm 35$ MeV (S = 1.6)

$\omega(1600)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	637
$\omega\pi\pi$	seen	601
e^+e^-	seen	824

$\omega_3(1670)$

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

Mass $m = 1667 \pm 4$ MeV
Full width $\Gamma = 168 \pm 10$ MeV [l]

$\omega_3(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	647
$\omega\pi\pi$	seen	614
$b_1(1235)\pi$	possibly seen	359

$\pi_2(1670)$

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

Mass $m = 1670 \pm 20$ MeV [l]
Full width $\Gamma = 258 \pm 18$ MeV [l] (S = 1.7)
$\Gamma_{ee} = 1.35 \pm 0.26$ keV

$\pi_2(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
3π	(95.8 ± 1.4) %	806
$f_2(1270)\pi$	(56.2 ± 3.2) %	325
$\rho\pi$	(31 ± 4) %	649
$f_0(1370)\pi$	(8.7 ± 3.4) %	–
$K\overline{K}^*(892)+$ c.c.	(4.2 ± 1.4) %	453
$\gamma\gamma$	$(5.2\pm1.1)\times10^{-6}$	835

$\phi(1680)$

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

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

$\phi(1680)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}^*(892)+$ c.c.	dominant	463
$K^0_S K\pi$	seen	620
$K\overline{K}$	seen	681
e^+e^-	seen	840
$\omega\pi\pi$	not seen	622

$\rho_3(1690)$

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

J^P from the 2π and $K\overline{K}$ modes.
Mass $m = 1691 \pm 5$ MeV [l]
Full width $\Gamma = 160 \pm 10$ MeV [l] (S = 1.5)

$\rho_3(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	p (MeV/c)
4π	(71.1 ± 1.9) %		788
$\pi^\pm\pi^+\pi^-\pi^0$	(67 ± 22) %		788
$\pi\pi$	(23.6 ± 1.3) %		834
$\omega\pi$	(16 ± 6) %		656
$K\overline{K}\pi$	(3.8 ± 1.2) %		628
$K\overline{K}$	(1.58 ± 0.26) %	1.2	686
$\eta\pi^+\pi^-$	seen		728

$\rho(1700)$ [q]

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

Mass $m = 1700 \pm 20$ MeV [l] ($\eta\rho^0$ and $\pi^+\pi^-$ modes)
Full width $\Gamma = 235 \pm 50$ MeV [l] ($\eta\rho^0$ and $\pi^+\pi^-$ modes)

$\rho(1700)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi\pi$	dominant	640
$\rho^0\pi^+\pi^-$	large	640
$\rho^\pm\pi^\mp\pi^0$	large	642
$2(\pi^+\pi^-)$	large	792
$\pi^+\pi^-$	seen	838
$K\overline{K}^*(892)+$ c.c.	seen	479
$\eta\rho$	seen	533
$K\overline{K}$	seen	692
e^+e^-	seen	850

$f_J(1710)$ [t]

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

Mass $m = 1697 \pm 4$ MeV (S = 1.4)
Full width $\Gamma = 175 \pm 9$ MeV (S = 1.7)

$f_J(1710)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	seen	690
$\eta\eta$	seen	648
$\pi\pi$	seen	837

$\phi_3(1850)$

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

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

$\phi_3(1850)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\overline{K}$	seen	785
$K\overline{K}^*(892)+$ c.c.	seen	602

$f_2(2010)$

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

Seen by one group only.

Mass $m = 2011^{+60}_{-80}$ MeV

Full width $\Gamma = 202 \pm 60$ MeV

$f_2(2010)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\phi\phi$	seen	–

$f_4(2050)$

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

Mass $m = 2044 \pm 11$ MeV (S = 1.4)

Full width $\Gamma = 208 \pm 13$ MeV (S = 1.2)

$f_4(2050)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\omega\omega$	(26 ± 6) %	658
$\pi\pi$	(17.0 ± 1.5) %	1012
$K\overline{K}$	$(6.8^{+3.4}_{-1.8}) \times 10^{-3}$	895
$\eta\eta$	$(2.1 \pm 0.8) \times 10^{-3}$	863
$4\pi^0$	< 1.2 %	977

$f_2(2300)$

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

Mass $m = 2297 \pm 28$ MeV

Full width $\Gamma = 149 \pm 40$ MeV

$f_2(2300)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\phi\phi$	seen	529

$f_2(2340)$

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

Mass $m = 2339 \pm 60$ MeV

Full width $\Gamma = 319^{+80}_{-70}$ MeV

$f_2(2340)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\phi\phi$	seen	573