

LIGHT UNFLAVORED MESONS

($S = C = B = 0$)

For $I = 1$ (π, ρ, ω): $u\bar{d}, (u\bar{u}-d\bar{d})/\sqrt{2}, d\bar{u}$;
 for $I = 0$ ($\eta, \eta', h, h', \omega, \phi, f, f'$): $c_1(u\bar{u} + d\bar{d}) + c_2(s\bar{s})$

π^\pm

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

Mass $m = 139.57018 \pm 0.00035$ MeV ($S = 1.2$)

Mean life $\tau = (2.6033 \pm 0.0005) \times 10^{-8}$ s ($S = 1.2$)

$$c\tau = 7.8045 \text{ m}$$

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

$$F_V = 0.017 \pm 0.008$$

$$F_A = 0.0116 \pm 0.0016 \quad (S = 1.3)$$

$$R = 0.059^{+0.009}_{-0.008}$$

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

For decay limits to particles which are not established, see the appropriate Search sections (Massive Neutrino Peak Search Test, A^0 (axion), and Other Light Boson (X^0) Searches, etc.).

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] (2.00 ± 0.25) × 10 ⁻⁴		30
$e^+ \nu_e$	[b] (1.230 ± 0.004) × 10 ⁻⁴		70
$e^+ \nu_e \gamma$	[c] (1.61 ± 0.23) × 10 ⁻⁷		70
$e^+ \nu_e \pi^0$	(1.025 ± 0.034) × 10 ⁻⁸		4
$e^+ \nu_e e^+ e^-$	(3.2 ± 0.5) × 10 ⁻⁹		70
$e^+ \nu_e \nu \bar{\nu}$	< 5	× 10 ⁻⁶ 90%	70

Lepton Family number (LF) or Lepton number (L) violating modes

$\mu^+ \bar{\nu}_e$	L	[d] < 1.5	× 10 ⁻³ 90%	30
$\mu^+ \nu_e$	LF	[d] < 8.0	× 10 ⁻³ 90%	30
$\mu^- e^+ e^+ \nu$	LF	< 1.6	× 10 ⁻⁶ 90%	30



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

Mass $m = 134.9766 \pm 0.0006$ MeV (S = 1.1)
 $m_{\pi^\pm} - m_{\pi^0} = 4.5936 \pm 0.0005$ MeV
 Mean life $\tau = (8.4 \pm 0.6) \times 10^{-17}$ s (S = 3.0)
 $c\tau = 25.1$ nm

For decay limits to particles which are not established, see the appropriate Search sections (A^0 (axion), and Other Light Boson (X^0) Searches, etc.).

π^0 DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	ρ (MeV/c)
2γ	$(98.798 \pm 0.032) \%$	S=1.1	67
$e^+ e^- \gamma$	$(1.198 \pm 0.032) \%$	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
$e^+ e^-$	$(6.2 \pm 0.5) \times 10^{-8}$		67
4γ	< 2	$\times 10^{-8}$ CL=90%	67
$\nu \bar{\nu}$	[e] < 8.3	$\times 10^{-7}$ CL=90%	67
$\nu_e \bar{\nu}_e$	< 1.7	$\times 10^{-6}$ CL=90%	67
$\nu_\mu \bar{\nu}_\mu$	< 3.1	$\times 10^{-6}$ CL=90%	67
$\nu_\tau \bar{\nu}_\tau$	< 2.1	$\times 10^{-6}$ CL=90%	67
$\gamma \nu \bar{\nu}$	< 6	$\times 10^{-4}$ CL=90%	—
Charge conjugation (C) or Lepton Family number (LF) violating modes			
3γ	C < 3.1	$\times 10^{-8}$ CL=90%	67
$\mu^+ e^-$	LF < 3.8	$\times 10^{-10}$ CL=90%	26
$\mu^- e^+$	LF < 3.4	$\times 10^{-9}$ CL=90%	—
$\mu^+ e^- + \mu^- e^+$	LF < 1.72	$\times 10^{-8}$ CL=90%	26



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

Mass $m = 547.30 \pm 0.12$ MeV
 Full width $\Gamma = 1.18 \pm 0.11$ keV [f] (S = 1.8)

C-nonconserving decay parameters

$\pi^+ \pi^- \pi^0$ 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) = -0.02 ± 0.07 (S = 1.3)

Dalitz plot parameter

$$\pi^0 \pi^0 \pi^0 \quad \alpha = -0.031 \pm 0.004 \quad (S = 1.1)$$

η DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Neutral modes			
neutral modes	(72.0 \pm 0.5) %	S=1.3	–
2γ	[f] (39.43 \pm 0.26) %	S=1.2	274
$3\pi^0$	(32.51 \pm 0.29) %	S=1.2	178
$\pi^0 2\gamma$	(7.2 \pm 1.4) $\times 10^{-4}$		257
other neutral modes	< 2.8 %	CL=90%	–
Charged modes			
charged modes	(28.0 \pm 0.5) %	S=1.3	–
$\pi^+ \pi^- \pi^0$	(22.6 \pm 0.4) %	S=1.3	173
$\pi^+ \pi^- \gamma$	(4.68 \pm 0.11) %	S=1.2	235
$e^+ e^- \gamma$	(6.0 \pm 0.8) $\times 10^{-3}$	S=1.4	274
$\mu^+ \mu^- \gamma$	(3.1 \pm 0.4) $\times 10^{-4}$		252
$e^+ e^-$	< 7.7 $\times 10^{-5}$	CL=90%	274
$\mu^+ \mu^-$	(5.8 \pm 0.8) $\times 10^{-6}$		252
$e^+ e^- e^+ e^-$	< 6.9 $\times 10^{-5}$	CL=90%	274
$\pi^+ \pi^- e^+ e^-$	(4.0 $^{+14.0}_{-2.7}$) $\times 10^{-4}$	S=5.8	235
$\pi^+ \pi^- 2\gamma$	< 2.0 $\times 10^{-3}$		235
$\pi^+ \pi^- \pi^0 \gamma$	< 5 $\times 10^{-4}$	CL=90%	173
$\pi^0 \mu^+ \mu^- \gamma$	< 3 $\times 10^{-6}$	CL=90%	210
Charge conjugation (C), Parity (P), Charge conjugation \times Parity (CP), or Lepton Family number (LF) violating modes			
$\pi^+ \pi^-$	P, CP < 3.3	$\times 10^{-4}$	CL=90% 235
$\pi^0 \pi^0$	P, CP < 4.3	$\times 10^{-4}$	CL=90% 238
3γ	C < 5	$\times 10^{-4}$	CL=95% 274
$4\pi^0$	P, CP < 6.9	$\times 10^{-7}$	CL=90% 39
$\pi^0 e^+ e^-$	C [g] < 4	$\times 10^{-5}$	CL=90% 257
$\pi^0 \mu^+ \mu^-$	C [g] < 5	$\times 10^{-6}$	CL=90% 210
$\mu^+ e^- + \mu^- e^+$	LF < 6	$\times 10^{-6}$	CL=90% 263

$f_0(600)$ [h]
or σ

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

Mass $m = (400\text{--}1200)$ MeV

Full width $\Gamma = (600\text{--}1000)$ MeV

$f_0(600)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	dominant	—
$\gamma\gamma$	seen	—

$\rho(770)$ [i]

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

Mass $m = 771.1 \pm 0.9$ MeV ($S = 2.6$)

Full width $\Gamma = 149.2 \pm 0.7$ MeV ($S = 1.1$)

$\Gamma_{ee} = 6.85 \pm 0.11$ keV

$\rho(770)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi\pi$	~ 100	%	358
$\rho(770)^\pm$ decays			
$\pi^\pm\gamma$	$(4.5 \pm 0.5) \times 10^{-4}$	$S=2.2$	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
$\pi^0\pi^0\gamma$	$(4.8^{+3.4}_{-1.9}) \times 10^{-5}$		—
$\mu^+\mu^-$	[i] $(4.60 \pm 0.28) \times 10^{-5}$		369
e^+e^-	[i] $(4.54 \pm 0.10) \times 10^{-5}$	$S=1.1$	384
$\pi^+\pi^-\pi^0$	$< 1.2 \times 10^{-4}$	CL=90%	319
$\pi^+\pi^-\pi^+\pi^-$	$(1.8 \pm 0.9) \times 10^{-5}$		246
$\pi^+\pi^-\pi^0\pi^0$	$< 4 \times 10^{-5}$	CL=90%	252

$\omega(782)$

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

Mass $m = 782.57 \pm 0.12$ MeV (S = 1.8)

Full width $\Gamma = 8.44 \pm 0.09$ MeV

$\Gamma_{ee} = 0.60 \pm 0.02$ keV

$\omega(782)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi^+\pi^-\pi^0$	(89.1 \pm 0.7) %	S=1.1	327
$\pi^0\gamma$	(8.7 \pm 0.4) %		379
$\pi^+\pi^-$	(1.70 \pm 0.28) %	S=1.5	365
neutrals (excluding $\pi^0\gamma$)	(4.1 $^{+8.2}_{-2.8}$) $\times 10^{-3}$		—
$\eta\gamma$	(6.5 \pm 1.1) $\times 10^{-4}$		199
$\pi^0e^+e^-$	(5.9 \pm 1.9) $\times 10^{-4}$		379
$\pi^0\mu^+\mu^-$	(9.6 \pm 2.3) $\times 10^{-5}$		349
e^+e^-	(6.95 \pm 0.15) $\times 10^{-5}$	S=1.1	391
$\pi^+\pi^-\pi^0\pi^0$	< 2 %	CL=90%	261
$\pi^+\pi^-\gamma$	< 3.6 $\times 10^{-3}$	CL=95%	365
$\pi^+\pi^-\pi^+\pi^-$	< 1 $\times 10^{-3}$	CL=90%	256
$\pi^0\pi^0\gamma$	(7.8 \pm 3.4) $\times 10^{-5}$		367
$\mu^+\mu^-$	(9.0 \pm 3.1) $\times 10^{-5}$		376
3γ	< 1.9 $\times 10^{-4}$	CL=95%	391
Charge conjugation (C) violating modes			
$\eta\pi^0$	C < 1 $\times 10^{-3}$	CL=90%	162
$3\pi^0$	C < 3 $\times 10^{-4}$	CL=90%	329

$\eta'(958)$

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

Mass $m = 957.78 \pm 0.14$ MeV

Full width $\Gamma = 0.202 \pm 0.016$ MeV (S = 1.3)

$\eta'(958)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi^+\pi^-\eta$	(44.3 \pm 1.5) %	S=1.2	232
$\rho^0\gamma$ (including non-resonant $\pi^+\pi^-\gamma$)	(29.5 \pm 1.0) %	S=1.2	169
$\pi^0\pi^0\eta$	(20.9 \pm 1.2) %	S=1.2	239
$\omega\gamma$	(3.03 \pm 0.31) %		160
$\gamma\gamma$	(2.12 \pm 0.14) %	S=1.3	479
$3\pi^0$	(1.56 \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

$\pi^+ \pi^+ \pi^- \pi^-$	< 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
$\gamma e^+ e^-$	< 9	$\times 10^{-4}$	CL=90%	—
$\pi^0 \gamma \gamma$	< 8	$\times 10^{-4}$	CL=90%	469
$4\pi^0$	< 5	$\times 10^{-4}$	CL=90%	379
$e^+ e^-$	< 2.1	$\times 10^{-7}$	CL=90%	479

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

$\pi^+ \pi^-$	<i>P, CP</i>	< 2	%	CL=90%	458
$\pi^0 \pi^0$	<i>P, CP</i>	< 9	$\times 10^{-4}$	CL=90%	459
$\pi^0 e^+ e^-$	<i>C</i>	[<i>g</i>] < 1.4	$\times 10^{-3}$	CL=90%	469
$\eta e^+ e^-$	<i>C</i>	[<i>g</i>] < 2.4	$\times 10^{-3}$	CL=90%	322
3γ	<i>C</i>	< 1.0	$\times 10^{-4}$	CL=90%	479
$\mu^+ \mu^- \pi^0$	<i>C</i>	[<i>g</i>] < 6.0	$\times 10^{-5}$	CL=90%	445
$\mu^+ \mu^- \eta$	<i>C</i>	[<i>g</i>] < 1.5	$\times 10^{-5}$	CL=90%	274
$e\mu$	<i>LF</i>	< 4.7	$\times 10^{-4}$	CL=90%	—

$f_0(980)$ [*k*]

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

Mass $m = 980 \pm 10$ MeV

Full width $\Gamma = 40$ to 100 MeV

$f_0(980)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi \pi$	dominant	470
$K \bar{K}$	seen	—

$a_0(980)$ [*k*]

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

Mass $m = 984.7 \pm 1.2$ MeV ($S = 1.5$)

Full width $\Gamma = 50$ to 100 MeV

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

$\phi(1020)$

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

Mass $m = 1019.456 \pm 0.020$ MeV (S = 1.1)

Full width $\Gamma = 4.26 \pm 0.05$ MeV (S = 1.7)

$\phi(1020)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	ρ (MeV/c)
$K^+ K^-$	(49.2 $^{+0.6}_{-0.7}$) %	S=1.2	127
$K_L^0 K_S^0$	(33.7 ± 0.5) %	S=1.2	110
$\rho\pi + \pi^+\pi^-\pi^0$	(15.5 ± 0.5) %	S=1.3	—
$\eta\gamma$	(1.299 ± 0.026) %	S=1.2	363
$\pi^0\gamma$	(1.24 ± 0.10) $\times 10^{-3}$		501
e^+e^-	(2.96 ± 0.04) $\times 10^{-4}$	S=1.2	510
$\mu^+\mu^-$	(2.87 $^{+0.18}_{-0.22}$) $\times 10^{-4}$		499
ηe^+e^-	(1.15 ± 0.10) $\times 10^{-4}$		363
$\pi^+\pi^-$	(7.3 ± 1.3) $\times 10^{-5}$		490
$\omega\pi^0$	(5.2 $^{+1.3}_{-1.1}$) $\times 10^{-5}$		—
$\omega\gamma$	< 5 %	CL=84%	210
$\rho\gamma$	< 1.2 $\times 10^{-5}$	CL=90%	219
$\pi^+\pi^-\gamma$	(4.1 ± 1.3) $\times 10^{-5}$		490
$f_0(980)\gamma$	(3.3 $^{+0.8}_{-0.5}$) $\times 10^{-4}$		39
$\pi^0\pi^0\gamma$	(1.08 ± 0.19) $\times 10^{-4}$		492
$\pi^+\pi^-\pi^+\pi^-$	(4.0 $^{+2.8}_{-2.2}$) $\times 10^{-6}$		410
$\pi^+\pi^+\pi^-\pi^-\pi^0$	< 4.6 $\times 10^{-6}$	CL=90%	341
$\pi^0 e^+ e^-$	(1.2 ± 0.4) $\times 10^{-5}$		501
$\pi^0\eta\gamma$	(8.9 ± 1.4) $\times 10^{-5}$		346
$a_0(980)\gamma$	(8.8 ± 1.7) $\times 10^{-4}$		36
$\eta'(958)\gamma$	(6.7 $^{+1.5}_{-1.4}$) $\times 10^{-5}$		—
$\eta\pi^0\pi^0\gamma$	< 2 $\times 10^{-5}$	CL=90%	—
$\mu^+\mu^-\gamma$	(1.4 ± 0.5) $\times 10^{-5}$		—
$\rho\gamma\gamma$	< 5 $\times 10^{-4}$	CL=90%	—
$\eta\pi^+\pi^-$	< 1.8 $\times 10^{-5}$	CL=90%	—
$\eta\mu^+\mu^-$	< 9.4 $\times 10^{-6}$	CL=90%	—

$h_1(1170)$

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

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 $m = 1229.5 \pm 3.2$ MeV ($S = 1.6$)

Full width $\Gamma = 142 \pm 9$ MeV ($S = 1.2$)

$b_1(1235)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\omega\pi$	dominant		348
[D/S amplitude ratio = 0.29 ± 0.04]			
$\pi^\pm\gamma$	$(1.6 \pm 0.4) \times 10^{-3}$		608
$\eta\rho$	seen		—
$\pi^+\pi^+\pi^-\pi^0$	< 50 %	84%	536
$(K\bar{K})^\pm\pi^0$	< 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
$\phi\pi$	< 1.5 %	84%	146

$a_1(1260)$ [1]

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

Mass $m = 1230 \pm 40$ MeV [m]

Full width $\Gamma = 250$ to 600 MeV

$a_1(1260)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$(\rho\pi)_{S\text{-wave}}$	seen	—
$(\rho\pi)_{D\text{-wave}}$	seen	—
$(\rho(1450)\pi)_{S\text{-wave}}$	seen	—
$(\rho(1450)\pi)_{D\text{-wave}}$	seen	—
$\sigma\pi$	seen	—
$f_0(980)\pi$	not seen	—
$f_0(1370)\pi$	seen	—
$f_2(1270)\pi$	seen	—
$K\bar{K}^*(892)+c.c.$	seen	—
$\pi\gamma$	seen	607

$f_2(1270)$

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

Mass $m = 1275.4 \pm 1.2$ MeV

Full width $\Gamma = 185.1^{+3.4}_{-2.6}$ MeV (S = 1.5)

$f_2(1270)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi\pi$	(84.7 $^{+2.4}_{-1.3}$) %	S=1.3	622
$\pi^+\pi^-2\pi^0$	(7.1 $^{+1.5}_{-2.6}$) %	S=1.3	562
$K\bar{K}$	(4.6 ± 0.5) %	S=2.8	403
$2\pi^+2\pi^-$	(2.8 ± 0.4) %	S=1.2	559
$\eta\eta$	(4.5 ± 1.0) $\times 10^{-3}$	S=2.4	327
$4\pi^0$	(3.0 ± 1.0) $\times 10^{-3}$		564
$\gamma\gamma$	(1.41 ± 0.13) $\times 10^{-5}$		637
$\eta\pi\pi$	< 8 $\times 10^{-3}$	CL=95%	475
$K^0K^-\pi^+$ + c.c.	< 3.4 $\times 10^{-3}$	CL=95%	293
e^+e^-	< 6 $\times 10^{-10}$	CL=90%	637

$f_1(1285)$

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

Mass $m = 1281.9 \pm 0.6$ MeV (S = 1.6)

Full width $\Gamma = 24.0 \pm 1.2$ MeV (S = 1.4)

$f_1(1285)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
4π	(33.1 $^{+2.1}_{-1.8}$) %	S=1.3	563
$\pi^0\pi^0\pi^+\pi^-$	(22.0 $^{+1.4}_{-1.2}$) %	S=1.3	566
$2\pi^+2\pi^-$	(11.0 $^{+0.7}_{-0.6}$) %	S=1.3	563
$\rho^0\pi^+\pi^-$	(11.0 $^{+0.7}_{-0.6}$) %	S=1.3	340
$\rho^0\rho^0$	seen		—
$4\pi^0$	< 7 $\times 10^{-4}$	CL=90%	568
$\eta\pi\pi$	(52 ± 16) %		479
$a_0(980)\pi$ [ignoring $a_0(980) \rightarrow K\bar{K}$]	(36 ± 7) %		234
$\eta\pi\pi$ [excluding $a_0(980)\pi$]	(16 ± 7) %		—
$K\bar{K}\pi$	(9.0 ± 0.4) %	S=1.1	308
$K\bar{K}^*(892)$	not seen		—
$\gamma\rho^0$	(5.5 ± 1.3) %	S=2.8	410
$\phi\gamma$	(7.4 ± 2.6) $\times 10^{-4}$		236

$\eta(1295)$

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

Mass $m = 1293 \pm 5$ MeV ($S = 1.9$)

Full width $\Gamma = 55 \pm 5$ MeV

$\eta(1295)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\pi^+\pi^-$	seen	488
$a_0(980)\pi$	seen	245
$\eta\pi^0\pi^0$	seen	—
$\eta(\pi\pi)_{S\text{-wave}}$	seen	—

$\pi(1300)$

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

Mass $m = 1300 \pm 100$ MeV [m]

Full width $\Gamma = 200$ to 600 MeV

$\pi(1300)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	406

$a_2(1320)$

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

Mass $m = 1318.0 \pm 0.6$ MeV ($S = 1.1$)

Full width $\Gamma = 107 \pm 5$ MeV [m]

$a_2(1320)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\rho\pi$	(70.1 \pm 2.7) %	S=1.2	419
$\eta\pi$	(14.5 \pm 1.2) %		535
$\omega\pi\pi$	(10.6 \pm 3.2) %	S=1.3	362
$K\bar{K}$	(4.9 \pm 0.8) %		437
$\eta'(958)\pi$	(5.3 \pm 0.9) $\times 10^{-3}$		287
$\pi^\pm\gamma$	(2.68 \pm 0.31) $\times 10^{-3}$		652
$\gamma\gamma$	(9.4 \pm 0.7) $\times 10^{-6}$		659
$\pi^+\pi^-\pi^-$	< 8 %	CL=90%	621
e^+e^-	< 6 $\times 10^{-9}$	CL=90%	659

$f_0(1370)$ [k]

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

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

$f_0(1370)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\pi$	seen	—
4π	seen	—
$4\pi^0$	seen	—
$2\pi^+2\pi^-$	seen	—
$\pi^+\pi^-2\pi^0$	seen	—
$\rho\rho$	dominant	—
$2(\pi\pi)_{S\text{-wave}}$	seen	—
$\eta\eta$	seen	—
$K\bar{K}$	seen	—
$\gamma\gamma$	seen	—
e^+e^-	not seen	—

$f_1(1420)$ [n]

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

Mass $m = 1426.3 \pm 1.1$ MeV ($S = 1.3$)
 Full width $\Gamma = 55.5 \pm 2.9$ MeV

$f_1(1420)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\bar{K}\pi$	dominant	439
$K\bar{K}^*(892) + \text{c.c.}$	dominant	155
$\eta\pi\pi$	possibly seen	571
$\phi\gamma$	seen	—

$\omega(1420)$ [o]

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

Mass $m = 1419 \pm 31$ MeV
 Full width $\Gamma = 174 \pm 60$ MeV

$\omega(1420)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	dominant	488
$\omega\pi\pi$	possibly seen	—
$b_1(1235)\pi$	seen	—

$\eta(1440)$ [ρ]

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

Mass $m = 1400 - 1470$ MeV [m]

Full width $\Gamma = 50 - 80$ MeV [m]

$\eta(1440)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\bar{K}\pi$	seen	—
$K\bar{K}^*(892)+$ c.c.	seen	—
$\eta\pi\pi$	seen	—
$a_0(980)\pi$	seen	—
$\eta(\pi\pi)$ S-wave	seen	—
$f_0(980)\eta$	seen	—
4π	seen	—

$a_0(1450)$

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

Mass $m = 1474 \pm 19$ MeV

Full width $\Gamma = 265 \pm 13$ MeV

$a_0(1450)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi\eta$	seen	613
$\pi\eta'(958)$	seen	392
$K\bar{K}$	seen	530

$\rho(1450)$ [q]

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

Mass $m = 1465 \pm 25$ MeV [m]

Full width $\Gamma = 310 \pm 60$ MeV [m]

$\rho(1450)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\pi\pi$	seen		719
4π	seen		665
$\omega\pi$	<2.0 %	95%	512
e^+e^-	seen		732
$\eta\rho$	<4 %		317
$a_2(1320)\pi$	not seen		—
$\phi\pi$	<1 %		358
$K\bar{K}$	< 1.6×10^{-3}	95%	541
$\eta\gamma$	possibly seen		—

$f_0(1500)$ [*r*]

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

Mass $m = 1507 \pm 5$ MeV ($S = 1.2$)

Full width $\Gamma = 109 \pm 7$ MeV

$f_0(1500)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\eta\eta'(958)$	seen	—
$\eta\eta$	seen	513
4π	seen	—
$4\pi^0$	seen	690
$2\pi^+2\pi^-$	seen	686
$\pi\pi$	seen	—
$\pi^+\pi^-$	seen	737
$2\pi^0$	seen	738
$K\bar{K}$	seen	563
$\gamma\gamma$	not seen	—

$f'_2(1525)$

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

Mass $m = 1525 \pm 5$ MeV [*m*]

Full width $\Gamma = 76 \pm 10$ MeV [*m*]

$f'_2(1525)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\bar{K}$	(88.8 \pm 3.1) %	581
$\eta\eta$	(10.3 \pm 3.1) %	531
$\pi\pi$	(8.2 \pm 1.5) $\times 10^{-3}$	750
$\gamma\gamma$	(1.23 \pm 0.17) $\times 10^{-6}$	763

$\omega(1650)$ [*s*]
was $\omega(1600)$

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

Mass $m = 1649 \pm 24$ MeV ($S = 2.3$)

Full width $\Gamma = 220 \pm 35$ MeV ($S = 1.6$)

$\omega(1650)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\rho\pi$	seen	637
$\omega\pi\pi$	seen	601
$\omega\eta$	seen	—
e^+e^-	seen	824

$\omega_3(1670)$

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

Mass $m = 1667 \pm 4$ MeV

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

$\omega_3(1670)$ 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

$\pi_2(1670)$

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

Mass $m = 1670 \pm 20$ MeV [*m*]

Full width $\Gamma = 259 \pm 10$ MeV [*m*] ($S = 1.4$)

$\pi_2(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
3π	$(95.8 \pm 1.4) \%$		806
$f_2(1270)\pi$	$(56.2 \pm 3.2) \%$		325
$\rho\pi$	$(31 \pm 4) \%$		649
$\sigma\pi$	$(13 \pm 6) \%$		—
$f_0(1370)\pi$	$(8.7 \pm 3.4) \%$		—
$K\bar{K}^*(892) + \text{c.c.}$	$(4.2 \pm 1.4) \%$		453
$\omega\rho$	$(2.7 \pm 1.1) \%$		—
$\rho(1450)\pi$	$< 3.6 \times 10^{-3}$	97.7%	—
$b_1(1235)\pi$	$< 1.9 \times 10^{-3}$	97.7%	—

$\phi(1680)$

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

Mass $m = 1680 \pm 20$ MeV [*m*]

Full width $\Gamma = 150 \pm 50$ MeV [*m*]

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

$\rho_3(1690)$

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

Mass $m = 1691 \pm 5$ MeV [m]

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

$\rho_3(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor	ρ (MeV/c)
4π	(71.1 \pm 1.9) %		788
$\pi^\pm \pi^+ \pi^- \pi^0$	(67 \pm 22) %		788
$\omega \pi$	(16 \pm 6) %		656
$\pi \pi$	(23.6 \pm 1.3) %		834
$K \bar{K} \pi$	(3.8 \pm 1.2) %		628
$K \bar{K}$	(1.58 \pm 0.26) %	1.2	686
$\eta \pi^+ \pi^-$	seen		728
$\rho(770)\eta$	seen		—

$\rho(1700)$ [q]

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

Mass $m = 1700 \pm 20$ MeV [m] ($\eta \rho^0$ and $\pi^+ \pi^-$ modes)

Full width $\Gamma = 240 \pm 60$ MeV [m] ($\eta \rho^0$ and $\pi^+ \pi^-$ modes)

$\rho(1700)$ DECAY MODES	Fraction (Γ_i/Γ)	ρ (MeV/c)
$2(\pi^+ \pi^-)$	large	792
$\rho \pi \pi$	dominant	640
$\rho^0 \pi^+ \pi^-$	large	640
$\rho^\pm \pi^\mp \pi^0$	large	642
$\pi^+ \pi^-$	seen	838
$\pi \pi$	seen	839
$K \bar{K}^*(892) + \text{c.c.}$	seen	479
$\eta \rho$	seen	533
$a_2(1320)\pi$	not seen	—
$K \bar{K}$	seen	692
$e^+ e^-$	seen	850
$\pi^0 \omega$	seen	662

$f_0(1710)$ [t]

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

Mass $m = 1713 \pm 6$ MeV

Full width $\Gamma = 125 \pm 10$ MeV

$f_0(1710)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\bar{K}$	seen	690
$\eta\eta$	seen	648
$\pi\pi$	seen	837

$\pi(1800)$

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

Mass $m = 1801 \pm 13$ MeV ($S = 1.9$)

Full width $\Gamma = 210 \pm 15$ MeV

$\pi(1800)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\pi^+\pi^-\pi^-$	seen	—
$f_0(980)\pi^-$	seen	623
$f_0(1370)\pi^-$	seen	—
$\rho\pi^-$	not seen	728
$\eta\eta\pi^-$	seen	—
$a_0(980)\eta$	seen	459
$f_0(1500)\pi^-$	seen	240
$\eta\eta'(958)\pi^-$	seen	—
$K_0^*(1430)K^-$	seen	—
$K^*(892)K^-$	not seen	560

$\phi_3(1850)$

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

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)
$K\bar{K}$	seen	785
$K\bar{K}^*(892) + \text{c.c.}$	seen	602

$f_2(2010)$

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

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	–

$a_4(2040)$

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

Mass $m = 2011 \pm 13$ MeV

Full width $\Gamma = 360 \pm 40$ MeV

$a_4(2040)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\bar{K}$	seen	892
$\pi^+\pi^-\pi^0$	seen	–
$\eta\pi^0$	seen	941
$\eta'(958)\pi$	seen	–

$f_4(2050)$

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

Mass $m = 2025 \pm 8$ MeV ($S = 1.7$)

Full width $\Gamma = 194 \pm 13$ MeV ($S = 2.2$)

$f_4(2050)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\omega\omega$	not seen	658
$\pi\pi$	$(17.0 \pm 1.5)\%$	1012
$K\bar{K}$	$(6.8^{+3.4}_{-1.8}) \times 10^{-3}$	895
$\eta\eta$	$(2.1 \pm 0.8) \times 10^{-3}$	863
$4\pi^0$	$< 1.2\%$	977
$a_2(1320)\pi$	seen	–

$f_2(2300)$

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

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