

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 $m = 139.56995 \pm 0.00035$ 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]

$$F_V = 0.017 \pm 0.008$$

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

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

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) × 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 $m = 134.9764 \pm 0.0006$ 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
$\nu\bar{\nu}$	[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
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

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

$$\text{Mass } m = 547.30 \pm 0.12 \text{ MeV}$$

$$\text{Full width } \Gamma = 1.18 \pm 0.11 \text{ keV } [f] \quad (S = 1.8)$$

C-nonconserving decay parameters

$$\pi^+ \pi^- \pi^0 \quad \text{Left-right asymmetry} = (0.09 \pm 0.17) \times 10^{-2}$$

$$\pi^+ \pi^- \pi^0 \quad \text{Sextant asymmetry} = (0.18 \pm 0.16) \times 10^{-2}$$

$$\pi^+ \pi^- \pi^0 \quad \text{Quadrant asymmetry} = (-0.17 \pm 0.17) \times 10^{-2}$$

$$\pi^+ \pi^- \gamma \quad \text{Left-right asymmetry} = (0.9 \pm 0.4) \times 10^{-2}$$

$$\pi^+ \pi^- \gamma \quad \beta (D\text{-wave}) = 0.05 \pm 0.06 \quad (S = 1.5)$$

Dalitz plot parameter

$$\pi^0 \pi^0 \pi^0 \quad \alpha = -0.039 \pm 0.015$$

η DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Neutral modes			
neutral modes	(71.5 \pm 0.6) %	S=1.4	–
2 γ	[f] (39.21 \pm 0.34) %	S=1.4	274
3 π^0	(32.2 \pm 0.4) %	S=1.3	178
$\pi^0 2\gamma$	(7.1 \pm 1.4) $\times 10^{-4}$		257
other neutral modes	< 2.8 %	CL=90%	–
Charged modes			
charged modes	(28.5 \pm 0.6) %	S=1.4	–
$\pi^+ \pi^- \pi^0$	(23.1 \pm 0.5) %	S=1.4	173
$\pi^+ \pi^- \gamma$	(4.77 \pm 0.13) %	S=1.3	235
$e^+ e^- \gamma$	(4.9 \pm 1.1) $\times 10^{-3}$		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
$\pi^+ \pi^- e^+ e^-$	(1.3 $\begin{smallmatrix} +1.2 \\ -0.8 \end{smallmatrix}$) $\times 10^{-3}$		235
$\pi^+ \pi^- 2\gamma$	< 2.1 $\times 10^{-3}$		235
$\pi^+ \pi^- \pi^0 \gamma$	< 6 $\times 10^{-4}$	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 < 9 $\times 10^{-4}$	CL=90%	235
3 γ	C < 5 $\times 10^{-4}$	CL=95%	274
$\pi^0 e^+ e^-$	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

$f_0(400-1200)$ ^[h]
 or σ

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

 Mass $m = (400-1200)$ MeV

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

$f_0(400-1200)$ 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 $m = 770.0 \pm 0.8$ MeV ($S = 1.8$)

 Full width $\Gamma = 150.7 \pm 1.1$ MeV

 $\Gamma_{ee} = 6.77 \pm 0.32$ 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
$\pi^0\gamma$	$(6.8 \pm 1.7) \times 10^{-4}$		372
$\eta\gamma$	$(2.4^{+0.8}_{-0.9}) \times 10^{-4}$	$S=1.6$	189
$\mu^+\mu^-$	[j] $(4.60 \pm 0.28) \times 10^{-5}$		369
e^+e^-	[j] $(4.49 \pm 0.22) \times 10^{-5}$		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 $\Gamma = 8.41 \pm 0.09$ MeV

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

$\omega(782)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$\pi^+ \pi^- \pi^0$	(88.8 \pm 0.7) %		327
$\pi^0 \gamma$	(8.5 \pm 0.5) %		379
$\pi^+ \pi^-$	(2.21 \pm 0.30) %		365
neutrals (excluding $\pi^0 \gamma$)	(5.3 $^{+8.7}_{-3.5}$) $\times 10^{-3}$		—
$\eta \gamma$	(6.5 \pm 1.0) $\times 10^{-4}$		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
$e^+ e^-$	(7.07 \pm 0.19) $\times 10^{-5}$	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
$\pi^0 \pi^0 \gamma$	(7.2 \pm 2.5) $\times 10^{-5}$		367
$\mu^+ \mu^-$	< 1.8 $\times 10^{-4}$	CL=90%	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 $\Gamma = 0.203 \pm 0.016$ MeV ($S = 1.3$)

$\eta'(958)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	ρ (MeV/c)
$\pi^+ \pi^- \eta$	(43.8 \pm 1.5) %	S=1.1	232
$\rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$)	(30.2 \pm 1.3) %	S=1.1	169
$\pi^0 \pi^0 \eta$	(20.7 \pm 1.3) %	S=1.2	239
$\omega \gamma$	(3.01 \pm 0.30) %		160
$\gamma \gamma$	(2.11 \pm 0.13) %	S=1.2	479
$3\pi^0$	(1.54 \pm 0.26) $\times 10^{-3}$		430
$\mu^+ \mu^- \gamma$	(1.03 \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
$\pi^0 \gamma \gamma$	< 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) or Parity (P) violating modes			
$\pi^+ \pi^-$	P, CP < 2 %	CL=90%	458
$\pi^0 \pi^0$	P, CP < 9 $\times 10^{-4}$	CL=90%	459
$\pi^0 e^+ e^-$	C [g] < 1.3 %	CL=90%	469
$\eta e^+ e^-$	C [g] < 1.1 %	CL=90%	322
3γ	C < 1.0 $\times 10^{-4}$	CL=90%	479
$\mu^+ \mu^- \pi^0$	C [g] < 6.0 $\times 10^{-5}$	CL=90%	445
$\mu^+ \mu^- \eta$	C [g] < 1.5 $\times 10^{-5}$	CL=90%	274

$f_0(980)$ [k]

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

 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)
$\pi\pi$	dominant		470
$K\bar{K}$	seen		—
$\gamma\gamma$	$(1.19 \pm 0.33) \times 10^{-5}$		490
e^+e^-	$< 3 \times 10^{-7}$	90%	490

 $a_0(980)$ [k]

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

 Mass $m = 983.4 \pm 0.9$ MeV

 Full width $\Gamma = 50$ to 100 MeV

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

$\phi(1020)$

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

Mass $m = 1019.413 \pm 0.008$ MeVFull width $\Gamma = 4.43 \pm 0.05$ MeV

$\phi(1020)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
$K^+ K^-$	(49.1 \pm 0.8) %	S=1.3	127
$K_L^0 K_S^0$	(34.1 \pm 0.6) %	S=1.2	110
$\rho\pi + \pi^+\pi^-\pi^0$	(15.5 \pm 0.7) %	S=1.5	–
$\eta\gamma$	(1.26 \pm 0.06) %	S=1.1	363
$\pi^0\gamma$	(1.31 \pm 0.13) $\times 10^{-3}$		501
$e^+ e^-$	(2.99 \pm 0.08) $\times 10^{-4}$	S=1.2	510
$\mu^+ \mu^-$	(2.5 \pm 0.4) $\times 10^{-4}$		499
$\eta e^+ e^-$	(1.3 $\begin{smallmatrix} +0.8 \\ -0.6 \end{smallmatrix}$) $\times 10^{-4}$		363
$\pi^+ \pi^-$	(8 $\begin{smallmatrix} +5 \\ -4 \end{smallmatrix}$) $\times 10^{-5}$	S=1.5	490
$\omega\gamma$	< 5 %	CL=84%	210
$\rho\gamma$	< 7 $\times 10^{-4}$	CL=90%	219
$\pi^+ \pi^- \gamma$	< 3 $\times 10^{-5}$	CL=90%	490
$f_0(980)\gamma$	< 1 $\times 10^{-4}$	CL=90%	39
$\pi^0\pi^0\gamma$	< 1 $\times 10^{-3}$	CL=90%	492
$\pi^+ \pi^- \pi^+ \pi^-$	< 8.7 $\times 10^{-4}$	CL=90%	410
$\pi^+ \pi^+ \pi^- \pi^- \pi^0$	< 1.5 $\times 10^{-4}$	CL=95%	341
$\pi^0 e^+ e^-$	< 1.2 $\times 10^{-4}$	CL=90%	501
$\pi^0 \eta\gamma$	< 2.5 $\times 10^{-3}$	CL=90%	346
$a_0(980)\gamma$	< 5 $\times 10^{-3}$	CL=90%	36
$\eta'(958)\gamma$	(1.2 $\begin{smallmatrix} +0.7 \\ -0.5 \end{smallmatrix}$) $\times 10^{-4}$		–
$\mu^+ \mu^- \gamma$	(2.3 \pm 1.0) $\times 10^{-5}$		–

 $h_1(1170)$

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

Mass $m = 1170 \pm 20$ MeVFull 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)
$\rho\pi$	dominant	356
[D/S amplitude ratio = -0.100 ± 0.028]		
$\pi\gamma$	seen	607
$\pi(\pi\pi)_{S\text{-wave}}$	possibly seen	575

$f_2(1270)$

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

 Mass $m = 1275.0 \pm 1.2$ MeV

 Full width $\Gamma = 185.5^{+3.8}_{-2.7}$ MeV (S = 1.5)

$f_2(1270)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	ρ (MeV/c)
$\pi\pi$	(84.6 $^{+2.5}_{-1.3}$) %	S=1.3	622
$\pi^+\pi^-2\pi^0$	(7.2 $^{+1.5}_{-2.7}$) %	S=1.3	562
$K\bar{K}$	(4.6 ± 0.4) %	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
$\gamma\gamma$	(1.32 $^{+0.17}_{-0.16}$) $\times 10^{-5}$		637
$\eta\pi\pi$	< 8 $\times 10^{-3}$	CL=95%	475
$K^0K^-\pi^+ + \text{c.c.}$	< 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 $m = 1281.9 \pm 0.6$ MeV (S = 1.7)

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

 ($4\pi = \rho(\pi\pi)_{P\text{wave}}$)

$f_1(1285)$ DECAY MODES	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	ρ (MeV/c)
4π	(35 ± 4) %	S=1.6	563
$\pi^0\pi^0\pi^+\pi^-$	(23.5 ± 3.0) %	S=1.6	566
$2\pi^+2\pi^-$	(11.7 ± 1.5) %	S=1.6	563
$\rho^0\pi^+\pi^-$	(11.7 ± 1.5) %	S=1.6	340
$4\pi^0$	< 7 $\times 10^{-4}$	CL=90%	568
$\eta\pi\pi$	(50 ± 18) %		479
$a_0(980)\pi$ [ignoring $a_0(980) \rightarrow K\bar{K}$]	(34 ± 8) %	S=1.2	234
$\eta\pi\pi$ [excluding $a_0(980)\pi$]	(15 ± 7) %	S=1.1	—
$K\bar{K}\pi$	(9.6 ± 1.2) %	S=1.5	308
$K\bar{K}^*(892)$	not seen		—
$\gamma\rho^0$	(5.4 ± 1.2) %	S=2.3	410
$\phi\gamma$	(7.9 ± 3.0) $\times 10^{-4}$		236

$\eta(1295)$

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

 Mass $m = 1297.0 \pm 2.8$ 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
$\eta\pi^0\pi^0$	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
$\pi(\pi\pi)_{S\text{-wave}}$	seen	—

 $a_2(1320)$

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

 Mass $m = 1318.1 \pm 0.6$ MeV ($S = 1.1$)

 Full width $\Gamma = 107 \pm 5$ MeV [m] ($K^\pm K_S^0$ 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
$K\bar{K}$	(4.9±0.8) %		437
$\eta'(958)\pi$	(5.3±0.9) × 10 ⁻³		287
$\pi^\pm\gamma$	(2.8±0.6) × 10 ⁻³		652
$\gamma\gamma$	(9.4±0.7) × 10 ⁻⁶		659
$\pi^+\pi^-\pi^-$	< 8 %	CL=90%	621
e^+e^-	< 2.3 × 10 ⁻⁷	CL=90%	659

$f_0(1370)$ [k]

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

Mass $m = 1200$ to 1500 MeVFull 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	—
$2(\pi\pi)$ S-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 $m = 1426.2 \pm 1.2$ MeV ($S = 1.3$)Full width $\Gamma = 55.0 \pm 3.0$ 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

 $\omega(1420)$ [o]

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

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

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

$\eta(1440)$ [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)	ρ (MeV/c)
$K\bar{K}\pi$	seen	—
$K\bar{K}^*(892)+$ c.c.	seen	—
$\eta\pi\pi$	seen	—
$a_0(980)\pi$	seen	—
$\eta(\pi\pi)_{S\text{-wave}}$	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)	ρ (MeV/c)
$\pi\eta$	seen	613
$\pi\eta'(958)$	seen	392
$K\bar{K}$	seen	530

 $\rho(1450)$ [η]

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

 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	ρ (MeV/c)
$\pi\pi$	seen		719
4π	seen		665
$\omega\pi$	<2.0 %	95%	512
e^+e^-	seen		732
$\eta\rho$	<4 %		317
$\phi\pi$	<1 %		358
$K\bar{K}$	< 1.6×10^{-3}	95%	541

$f_0(1500)$ [r]

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

 Mass $m = 1500 \pm 10$ MeV (S = 1.3)

 Full width $\Gamma = 112 \pm 10$ 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
2π	seen	—
$\pi^+ \pi^-$	seen	737
$2\pi^0$	seen	738
$K\bar{K}$	seen	563

 $f'_2(1525)$

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

 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
$\gamma\gamma$	(1.32 \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

$\omega_3(1670)$

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

 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 $\Gamma = 258 \pm 18$ MeV [*m*] ($S = 1.7$)

$\pi_2(1670)$ 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) %	—
$K\bar{K}^*(892) + \text{c.c.}$	(4.2±1.4) %	453

 $\phi(1680)$

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

 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

$\rho_3(1690)$

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

 J^P from the 2π and $K\bar{K}$ modes.

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

 Full width $\Gamma = 160 \pm 10$ 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

 $\rho(1700)$ [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)
$\rho \pi \pi$	dominant	640
$2(\pi^+ \pi^-)$	large	792
$\rho^0 \pi^+ \pi^-$	large	640
$\rho^\pm \pi^\mp \pi^0$	large	642
$\pi^+ \pi^-$	seen	838
$\pi^- \pi^0$	seen	839
$K\bar{K}^*(892) + \text{c.c.}$	seen	479
$\eta \rho$	seen	533
$K\bar{K}$	seen	692
$e^+ e^-$	seen	850
$\pi^0 \omega$	seen	662

$f_J(1710)$ [t]

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

Mass $m = 1712 \pm 5$ MeV (S = 1.1)

Full width $\Gamma = 133 \pm 14$ MeV (S = 1.2)

$f_J(1710)$ DECAY MODES	Fraction (Γ_i/Γ)	ρ (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)	ρ (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)	ρ (MeV/c)
$K\bar{K}$	seen	785
$K\bar{K}^*(892) + \text{c.c.}$	seen	602

$f_2(2010)$

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

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	—

 $a_4(2040)$

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

Mass $m = 2020 \pm 16$ MeV

Full width $\Gamma = 387 \pm 70$ 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

 $f_4(2050)$

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

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 \pm 6) %	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

 $f_2(2300)$

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

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