

Λ BARYONS

(S = -1, I = 0)

$$\Lambda^0 = uds$$

Λ

$$I(J^P) = 0(\frac{1}{2}^+)$$

Mass $m = 1115.683 \pm 0.006$ MeV

$$(m_\Lambda - m_{\bar{\Lambda}}) / m_\Lambda = (-0.1 \pm 1.1) \times 10^{-5} \quad (S = 1.6)$$

$$\text{Mean life } \tau = (2.632 \pm 0.020) \times 10^{-10} \text{ s} \quad (S = 1.6)$$

$$(\tau_\Lambda - \tau_{\bar{\Lambda}}) / \tau_\Lambda = -0.001 \pm 0.009$$

$$c\tau = 7.89 \text{ cm}$$

Magnetic moment $\mu = -0.613 \pm 0.004 \mu_N$

Electric dipole moment $d < 1.5 \times 10^{-16} \text{ e cm}$, CL = 95%

Decay parameters

$$p\pi^- \quad \alpha_- = 0.642 \pm 0.013$$

$$\bar{p}\pi^+ \quad \alpha_+ = -0.71 \pm 0.08$$

$$p\pi^- \quad \phi_- = (-6.5 \pm 3.5)^\circ$$

$$" \quad \gamma_- = 0.76 [a]$$

$$" \quad \Delta_- = (8 \pm 4)^\circ [a]$$

$$n\pi^0 \quad \alpha_0 = 0.65 \pm 0.04$$

$$pe^- \bar{\nu}_e \quad g_A/g_V = -0.718 \pm 0.015 [b]$$

Λ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$p\pi^-$	$(63.9 \pm 0.5) \%$	101
$n\pi^0$	$(35.8 \pm 0.5) \%$	104
$n\gamma$	$(1.75 \pm 0.15) \times 10^{-3}$	162
$p\pi^- \gamma$	$[c] (8.4 \pm 1.4) \times 10^{-4}$	101
$pe^- \bar{\nu}_e$	$(8.32 \pm 0.14) \times 10^{-4}$	163
$p\mu^- \bar{\nu}_\mu$	$(1.57 \pm 0.35) \times 10^{-4}$	131

Λ(1405) 1/2⁻

$$I(J^P) = 0(\frac{1}{2}^-)$$

Mass $m = 1405.1^{+1.3}_{-1.0}$ MeV

Full width $\Gamma = 50.5 \pm 2.0$ MeV

Below $\bar{K}N$ threshold

Λ(1405) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Sigma \pi$	100 %	155

$\Lambda(1520) 3/2^-$

$$I(J^P) = 0(\frac{3}{2}^-)$$

Mass $m = 1519.5 \pm 1.0$ MeV [d]

Full width $\Gamma = 15.6 \pm 1.0$ MeV [d]

$\Lambda(1520)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	(45 \pm 1) %	243
$\Sigma\pi$	(42 \pm 1) %	268
$\Lambda\pi\pi$	(10 \pm 1) %	259
$\Sigma\pi\pi$	(0.9 \pm 0.1) %	169
$\Lambda\gamma$	(0.85 \pm 0.15) %	350

$\Lambda(1600) 1/2^+$

$$I(J^P) = 0(\frac{1}{2}^+)$$

Mass $m = 1560$ to 1700 (≈ 1600) MeV

Full width $\Gamma = 50$ to 250 (≈ 150) MeV

$\Lambda(1600)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	15–30 %	343
$\Sigma\pi$	10–60 %	338

$\Lambda(1670) 1/2^-$

$$I(J^P) = 0(\frac{1}{2}^-)$$

Mass $m = 1660$ to 1680 (≈ 1670) MeV

Full width $\Gamma = 25$ to 50 (≈ 35) MeV

$\Lambda(1670)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	20–30 %	414
$\Sigma\pi$	25–55 %	394
$\Lambda\eta$	10–25 %	69
$N\bar{K}^*(892)$, $S=3/2$, D -wave	(5 \pm 4) %	†

$\Lambda(1690) 3/2^-$

$$I(J^P) = 0(\frac{3}{2}^-)$$

Mass $m = 1685$ to 1695 (≈ 1690) MeVFull width $\Gamma = 50$ to 70 (≈ 60) MeV

$\Lambda(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	20–30 %	433
$\Sigma\pi$	20–40 %	410
$\Lambda\pi\pi$	~ 25 %	419
$\Sigma\pi\pi$	~ 20 %	358

 $\Lambda(1800) 1/2^-$

$$I(J^P) = 0(\frac{1}{2}^-)$$

Mass $m = 1720$ to 1850 (≈ 1800) MeVFull width $\Gamma = 200$ to 400 (≈ 300) MeV

$\Lambda(1800)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	25–40 %	528
$\Sigma\pi$	seen	494
$\Sigma(1385)\pi$	seen	349
$\Lambda\eta$	(6 ± 5) %	326
$N\bar{K}^*(892)$	seen	†

 $\Lambda(1810) 1/2^+$

$$I(J^P) = 0(\frac{1}{2}^+)$$

Mass $m = 1750$ to 1850 (≈ 1810) MeVFull width $\Gamma = 50$ to 250 (≈ 150) MeV

$\Lambda(1810)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	20–50 %	537
$\Sigma\pi$	10–40 %	501
$\Sigma(1385)\pi$	seen	357
$N\bar{K}^*(892)$	30–60 %	†

$\Lambda(1820) 5/2^+$

$$I(J^P) = 0(\frac{5}{2}^+)$$

Mass $m = 1815$ to 1825 (≈ 1820) MeVFull width $\Gamma = 70$ to 90 (≈ 80) MeV

$\Lambda(1820)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	55–65 %	545
$\Sigma\pi$	8–14 %	509
$\Sigma(1385)\pi$	5–10 %	366
$N\bar{K}^*(892)$, $S=3/2$, P -wave	(3.0 ± 1.0) %	†

 $\Lambda(1830) 5/2^-$

$$I(J^P) = 0(\frac{5}{2}^-)$$

Mass $m = 1810$ to 1830 (≈ 1830) MeVFull width $\Gamma = 60$ to 110 (≈ 95) MeV

$\Lambda(1830)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	3–10 %	553
$\Sigma\pi$	35–75 %	516
$\Sigma(1385)\pi$	>15 %	374
$\Sigma(1385)\pi$, D -wave	(52 ± 6) %	374

 $\Lambda(1890) 3/2^+$

$$I(J^P) = 0(\frac{3}{2}^+)$$

Mass $m = 1850$ to 1910 (≈ 1890) MeVFull width $\Gamma = 60$ to 200 (≈ 100) MeV

$\Lambda(1890)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	20–35 %	599
$\Sigma\pi$	3–10 %	560
$\Sigma(1385)\pi$	seen	423
$N\bar{K}^*(892)$	seen	236

$\Lambda(2100) 7/2^-$

$$I(J^P) = 0(\frac{7}{2}^-)$$

Mass $m = 2090$ to 2110 (≈ 2100) MeVFull width $\Gamma = 100$ to 250 (≈ 200) MeV

$\Lambda(2100)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	25–35 %	751
$\Sigma\pi$	~ 5 %	705
$\Lambda\eta$	<3 %	617
ΞK	<3 %	491
$\Lambda\omega$	<8 %	443
$N\bar{K}^*(892)$	10–20 %	515

 $\Lambda(2110) 5/2^+$

$$I(J^P) = 0(\frac{5}{2}^+)$$

Mass $m = 2090$ to 2140 (≈ 2110) MeVFull width $\Gamma = 150$ to 250 (≈ 200) MeV

$\Lambda(2110)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	5–25 %	757
$\Sigma\pi$	10–40 %	711
$\Lambda\omega$	seen	455
$\Sigma(1385)\pi$	seen	591
$N\bar{K}^*(892)$	10–60 %	525

 $\Lambda(2350) 9/2^+$

$$I(J^P) = 0(\frac{9}{2}^+)$$

Mass $m = 2340$ to 2370 (≈ 2350) MeVFull width $\Gamma = 100$ to 250 (≈ 150) MeV

$\Lambda(2350)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	~ 12 %	915
$\Sigma\pi$	~ 10 %	867

NOTES

[a] The decay parameters γ and Δ are calculated from α and ϕ using

$$\gamma = \sqrt{1-\alpha^2} \cos\phi, \quad \tan\Delta = -\frac{1}{\alpha} \sqrt{1-\alpha^2} \sin\phi.$$

See the “Note on Baryon Decay Parameters” in the neutron Particle Listings.

[b] The parameters g_A , g_V , and g_{WM} for semileptonic modes are defined by $\bar{B}_f[\gamma_\lambda(g_V + g_A\gamma_5) + i(g_{WM}/m_{B_i}) \sigma_{\lambda\nu} q^\nu]B_i$, and ϕ_{AV} is defined by $g_A/g_V = |g_A/g_V|e^{i\phi_{AV}}$. See the “Note on Baryon Decay Parameters” in the neutron Particle Listings.

[c] See the Listings for the pion momentum range used in this measurement.

[d] The error given here is only an educated guess. It is larger than the error on the weighted average of the published values.