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
$(m_\Lambda - m_{\overline{\Lambda}}) / m_\Lambda = (-0.1 \pm 1.1) \times 10^{-5}$ (S = 1.6)
Mean life $\tau = (2.632 \pm 0.020) \times 10^{-10}$ s (S = 1.6)
$(\tau_\Lambda - \tau_{\overline{\Lambda}}) / \tau_\Lambda = -0.001 \pm 0.009$
$c\tau = 7.89$ cm
Magnetic moment $\mu = -0.613 \pm 0.004\ \mu_N$
Electric dipole moment $d < 1.5 \times 10^{-16}\ e$cm, CL = 95%

Decay parameters

$p\pi^-$	$\alpha_- = 0.642 \pm 0.013$
$\overline{p}\pi^+$	$\alpha_+ = -0.71 \pm 0.08$
$p\pi^-$	$\phi_- = (-6.5 \pm 3.5)^\circ$
"	$\gamma_- = 0.76$ [a]
"	$\Delta_- = (8 \pm 4)^\circ$ [a]
$n\pi^0$	$\alpha_0 = 0.65 \pm 0.04$
$pe^-\overline{\nu}_e$	$g_A/g_V = -0.718 \pm 0.015$ [b]

Λ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$p\pi^-$		(63.9 ±0.5) %		101
$n\pi^0$		(35.8 ±0.5) %		104
$n\gamma$		(1.75±0.15) $\times 10^{-3}$		162
$p\pi^-\gamma$	[c]	(8.4 ±1.4) $\times 10^{-4}$		101
$pe^-\overline{\nu}_e$		(8.32±0.14) $\times 10^{-4}$		163
$p\mu^-\overline{\nu}_\mu$		(1.57±0.35) $\times 10^{-4}$		131
Lepton (L) and/or Baryon (B) number violating decay modes				
π^+e^-	L,B	< 6	$\times 10^{-7}$ 90%	549
$\pi^+\mu^-$	L,B	< 6	$\times 10^{-7}$ 90%	544
π^-e^+	L,B	< 4	$\times 10^{-7}$ 90%	549
$\pi^-\mu^+$	L,B	< 6	$\times 10^{-7}$ 90%	544
K^+e^-	L,B	< 2	$\times 10^{-6}$ 90%	449

$K^+\mu^-$	L,B	< 3	$\times 10^{-6}$	90%	441
K^-e^+	L,B	< 2	$\times 10^{-6}$	90%	449
$K^-\mu^+$	L,B	< 3	$\times 10^{-6}$	90%	441
$K^0_S\nu$	L,B	< 2	$\times 10^{-5}$	90%	447
$\overline{p}\pi^+$	B	< 9	$\times 10^{-7}$	90%	101

$\Lambda(1405)\ 1/2^-$

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

Mass $m = 1405.1^{+1.3}_{-1.0}$ MeV
Full width $\Gamma = 50.5 \pm 2.0$ MeV
Below $\overline{K}N$ threshold

$\Lambda(1405)$ 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)
$N\overline{K}$	(45 ±1) %	243
$\Sigma\pi$	(42 ±1) %	268
$\Lambda\pi\pi$	(10 ±1) %	259
$\Sigma\pi\pi$	(0.9 ±0.1) %	169
$\Lambda\gamma$	(0.85±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)
$N\overline{K}$	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

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

Λ(1690) 3/2⁻

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

Mass m = 1685 to 1695 ($\approx$ 1690) MeV
Full width Γ = 50 to 70 ($\approx$ 60) MeV

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

Λ(1800) 1/2⁻

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

Mass m = 1720 to 1850 ($\approx$ 1800) MeV
Full width Γ = 200 to 400 ($\approx$ 300) MeV

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

Λ(1810) 1/2⁺

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

Mass m = 1750 to 1850 ($\approx$ 1810) MeV
Full width Γ = 50 to 250 ($\approx$ 150) MeV

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

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

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

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

$\Lambda(1820)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	55–65 %	545
$\Sigma\pi$	8–14 %	509
$\Sigma(1385)\pi$	5–10 %	366
$N\overline{K}^*(892)$, 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) MeV
Full width $\Gamma = 60$ to 110 (≈ 95) MeV

$\Lambda(1830)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\overline{K}$	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) MeV
Full width $\Gamma = 60$ to 200 (≈ 100) MeV

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

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

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

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

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

Λ(2110) 5/2$^+$

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

Mass m = 2090 to 2140 ($\approx$ 2110) MeV
Full width Γ = 150 to 250 ($\approx$ 200) MeV

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

Λ(2350) 9/2$^+$

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

Mass m = 2340 to 2370 ($\approx$ 2350) MeV
Full width Γ = 100 to 250 ($\approx$ 150) MeV

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

NOTES

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

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

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 $\overline{B}_f[\gamma_\lambda(g_V + g_A\gamma_5) + i(g_{WM}/m_{B_i})\ \sigma_{\lambda\nu}\ q^\nu]B_i$, and ϕ_{AV} is defined by $g_A/g_V = \left|g_A/g_V\right|e^{i\phi_{AV}}$. 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.