

# 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

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

$$c\tau = 7.89$$
 cm

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

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

### Decay parameters

$p\pi^-$	$\alpha_- = 0.642 \pm 0.013$
"	$\phi_- = (-6.5 \pm 3.5)^\circ$
"	$\gamma_- = 0.76$ [g]
"	$\Delta_- = (8 \pm 4)^\circ$ [g]
$n\pi^0$	$\alpha_0 = +0.65 \pm 0.05$
$p e^- \bar{\nu}_e$	$g_A/g_V = -0.718 \pm 0.015$ [e]

Λ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$p\pi^-$	(63.9 ± 0.5 ) %	101
$n\pi^0$	(35.8 ± 0.5 ) %	104
$n\gamma$	( 1.75±0.15) × 10 <sup>-3</sup>	162
$p\pi^- \gamma$	[h] ( 8.4 ± 1.4 ) × 10 <sup>-4</sup>	101
$p e^- \bar{\nu}_e$	( 8.32±0.14) × 10 <sup>-4</sup>	163
$p\mu^- \bar{\nu}_\mu$	( 1.57±0.35) × 10 <sup>-4</sup>	131

Λ(1405) S<sub>01</sub>

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

Mass  $m = 1407 \pm 4$  MeV

Full width  $\Gamma = 50.0 \pm 2.0$  MeV

Below  $\bar{K}N$  threshold

Λ(1405) DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$\Sigma \pi$	100 %	152

**$\Lambda(1520) D_{03}$** 

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

Mass  $m = 1519.5 \pm 1.0$  MeV [i]Full width  $\Gamma = 15.6 \pm 1.0$  MeV [i] $p_{\text{beam}} = 0.39$  GeV/c       $4\pi\lambda^2 = 82.8$  mb

<b><math>\Lambda(1520)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	$45 \pm 1\%$	244
$\Sigma\pi$	$42 \pm 1\%$	267
$\Lambda\pi\pi$	$10 \pm 1\%$	252
$\Sigma\pi\pi$	$0.9 \pm 0.1\%$	152
$\Lambda\gamma$	$0.8 \pm 0.2\%$	351

 **$\Lambda(1600) P_{01}$** 

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

Mass  $m = 1560$  to  $1700$  ( $\approx 1600$ ) MeVFull width  $\Gamma = 50$  to  $250$  ( $\approx 150$ ) MeV $p_{\text{beam}} = 0.58$  GeV/c       $4\pi\lambda^2 = 41.6$  mb

<b><math>\Lambda(1600)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	15–30 %	343
$\Sigma\pi$	10–60 %	336

 **$\Lambda(1670) S_{01}$** 

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

Mass  $m = 1660$  to  $1680$  ( $\approx 1670$ ) MeVFull width  $\Gamma = 25$  to  $50$  ( $\approx 35$ ) MeV $p_{\text{beam}} = 0.74$  GeV/c       $4\pi\lambda^2 = 28.5$  mb

<b><math>\Lambda(1670)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	15–25 %	414
$\Sigma\pi$	20–60 %	393
$\Lambda\eta$	15–35 %	64

**$\Lambda(1690) D_{03}$** 

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

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

$$p_{\text{beam}} = 0.78 \text{ GeV}/c \quad 4\pi\lambda^2 = 26.1 \text{ mb}$$

<b><math>\Lambda(1690)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	20–30 %	433
$\Sigma\pi$	20–40 %	409
$\Lambda\pi\pi$	$\sim 25$ %	415
$\Sigma\pi\pi$	$\sim 20$ %	350

 **$\Lambda(1800) S_{01}$** 

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

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

$$p_{\text{beam}} = 1.01 \text{ GeV}/c \quad 4\pi\lambda^2 = 17.5 \text{ mb}$$

<b><math>\Lambda(1800)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	25–40 %	528
$\Sigma\pi$	seen	493
$\Sigma(1385)\pi$	seen	345
$N\bar{K}^*(892)$	seen	†

 **$\Lambda(1810) P_{01}$** 

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

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

$$p_{\text{beam}} = 1.04 \text{ GeV}/c \quad 4\pi\lambda^2 = 17.0 \text{ mb}$$

<b><math>\Lambda(1810)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	20–50 %	537
$\Sigma\pi$	10–40 %	501
$\Sigma(1385)\pi$	seen	356
$N\bar{K}^*(892)$	30–60 %	†

**$\Lambda(1820) F_{05}$** 

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

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

$$p_{\text{beam}} = 1.06 \text{ GeV}/c \quad 4\pi\lambda^2 = 16.5 \text{ mb}$$

<b><math>\Lambda(1820)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	55–65 %	545
$\Sigma\pi$	8–14 %	508
$\Sigma(1385)\pi$	5–10 %	362

 **$\Lambda(1830) D_{05}$** 

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

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

$$p_{\text{beam}} = 1.08 \text{ GeV}/c \quad 4\pi\lambda^2 = 16.0 \text{ mb}$$

<b><math>\Lambda(1830)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	3–10 %	553
$\Sigma\pi$	35–75 %	515
$\Sigma(1385)\pi$	>15 %	371

 **$\Lambda(1890) P_{03}$** 

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

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

$$p_{\text{beam}} = 1.21 \text{ GeV}/c \quad 4\pi\lambda^2 = 13.6 \text{ mb}$$

<b><math>\Lambda(1890)</math> DECAY MODES</b>	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	20–35 %	599
$\Sigma\pi$	3–10 %	559
$\Sigma(1385)\pi$	seen	420
$N\bar{K}^*(892)$	seen	233

**$\Lambda(2100) G_{07}$** 

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

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

$$p_{\text{beam}} = 1.68 \text{ GeV}/c \quad 4\pi\lambda^2 = 8.68 \text{ mb}$$

$\Lambda(2100)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	25–35 %	751
$\Sigma\pi$	$\sim 5$ %	704
$\Lambda\eta$	$< 3$ %	617
$\Xi K$	$< 3$ %	483
$\Lambda\omega$	$< 8$ %	443
$N\bar{K}^*(892)$	10–20 %	514

 **$\Lambda(2110) F_{05}$** 

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

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

$$p_{\text{beam}} = 1.70 \text{ GeV}/c \quad 4\pi\lambda^2 = 8.53 \text{ mb}$$

$\Lambda(2110)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	$p$ (MeV/c)
$N\bar{K}$	5–25 %	757
$\Sigma\pi$	10–40 %	711
$\Lambda\omega$	seen	455
$\Sigma(1385)\pi$	seen	589
$N\bar{K}^*(892)$	10–60 %	524

 **$\Lambda(2350) H_{09}$** 

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

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

$$p_{\text{beam}} = 2.29 \text{ GeV}/c \quad 4\pi\lambda^2 = 5.85 \text{ mb}$$

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