

Ξ BARYONS

($S = -2, I = 1/2$)

$$\Xi^0 = uss, \quad \Xi^- = dss$$

Ξ⁰

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

P is not yet measured; + is the quark model prediction.

$$\text{Mass } m = 1314.9 \pm 0.6 \text{ MeV}$$

$$m_{\Xi^-} - m_{\Xi^0} = 6.4 \pm 0.6 \text{ MeV}$$

$$\text{Mean life } \tau = (2.90 \pm 0.09) \times 10^{-10} \text{ s}$$

$$c\tau = 8.71 \text{ cm}$$

$$\text{Magnetic moment } \mu = -1.250 \pm 0.014 \mu_N$$

Decay parameters

$$\Lambda\pi^0 \quad \alpha = -0.411 \pm 0.022 \quad (S = 2.1)$$

$$" \quad \phi = (21 \pm 12)^\circ$$

$$" \quad \gamma = 0.85 [g]$$

$$" \quad \Delta = (218_{-19}^{+12})^\circ [g]$$

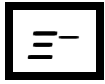
$$\Lambda\gamma \quad \alpha = 0.4 \pm 0.4$$

$$\Sigma^0\gamma \quad \alpha = 0.20 \pm 0.32$$

Ξ ⁰ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	P (MeV/c)
$\Lambda\pi^0$	$(99.54 \pm 0.05) \%$		135
$\Lambda\gamma$	$(1.06 \pm 0.16) \times 10^{-3}$		184
$\Sigma^0\gamma$	$(3.5 \pm 0.4) \times 10^{-3}$		117
$\Sigma^+ e^- \bar{\nu}_e$	$< 1.1 \times 10^{-3}$	90%	120
$\Sigma^+ \mu^- \bar{\nu}_\mu$	$< 1.1 \times 10^{-3}$	90%	64

ΔS = ΔQ (SQ) violating modes or ΔS = 2 forbidden (S2) modes

$\Sigma^- e^+ \nu_e$	SQ	$< 9 \times 10^{-4}$	90%	112
$\Sigma^- \mu^+ \nu_\mu$	SQ	$< 9 \times 10^{-4}$	90%	49
$p\pi^-$	S2	$< 4 \times 10^{-5}$	90%	299
$p e^- \bar{\nu}_e$	S2	$< 1.3 \times 10^{-3}$		323
$p \mu^- \bar{\nu}_\mu$	S2	$< 1.3 \times 10^{-3}$		309



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

P is not yet measured; + is the quark model prediction.

$$\text{Mass } m = 1321.32 \pm 0.13 \text{ MeV}$$

$$\text{Mean life } \tau = (1.639 \pm 0.015) \times 10^{-10} \text{ s}$$

$$c\tau = 4.91 \text{ cm}$$

$$\text{Magnetic moment } \mu = -0.6507 \pm 0.0025 \mu_N$$

Decay parameters

$$\Lambda\pi^- \quad \alpha = -0.456 \pm 0.014 \quad (S = 1.8)$$

$$" \quad \phi = (4 \pm 4)^\circ$$

$$" \quad \gamma = 0.89 [g]$$

$$" \quad \Delta = (188 \pm 8)^\circ [g]$$

$$\Lambda e^- \bar{\nu}_e \quad g_A/g_V = -0.25 \pm 0.05 [e]$$

Ξ^- DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	P (MeV/c)
$\Lambda\pi^-$	$(99.887 \pm 0.035) \%$		139
$\Sigma^- \gamma$	$(1.27 \pm 0.23) \times 10^{-4}$		118
$\Lambda e^- \bar{\nu}_e$	$(5.63 \pm 0.31) \times 10^{-4}$		190
$\Lambda\mu^- \bar{\nu}_\mu$	$(3.5^{+3.5}_{-2.2}) \times 10^{-4}$		163
$\Sigma^0 e^- \bar{\nu}_e$	$(8.7 \pm 1.7) \times 10^{-5}$		122
$\Sigma^0 \mu^- \bar{\nu}_\mu$	$< 8 \times 10^{-4}$	90%	70
$\Xi^0 e^- \bar{\nu}_e$	$< 2.3 \times 10^{-3}$	90%	6

$\Delta S = 2$ forbidden (S_2) modes

$n\pi^-$	S_2	< 1.9	$\times 10^{-5}$	90%	303
$ne^- \bar{\nu}_e$	S_2	< 3.2	$\times 10^{-3}$	90%	327
$n\mu^- \bar{\nu}_\mu$	S_2	< 1.5	%	90%	314
$p\pi^- \pi^-$	S_2	< 4	$\times 10^{-4}$	90%	223
$p\pi^- e^- \bar{\nu}_e$	S_2	< 4	$\times 10^{-4}$	90%	304
$p\pi^- \mu^- \bar{\nu}_\mu$	S_2	< 4	$\times 10^{-4}$	90%	250
$p\mu^- \mu^-$	L	< 4	$\times 10^{-4}$	90%	272

$\Xi(1530) P_{13}$

$$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$$

 $\Xi(1530)^0$ mass $m = 1531.80 \pm 0.32$ MeV ($S = 1.3$)

 $\Xi(1530)^-$ mass $m = 1535.0 \pm 0.6$ MeV

 $\Xi(1530)^0$ full width $\Gamma = 9.1 \pm 0.5$ MeV

 $\Xi(1530)^-$ full width $\Gamma = 9.9^{+1.7}_{-1.9}$ MeV

$\Xi(1530)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Xi \pi$	100 %		152
$\Xi \gamma$	<4 %	90%	200

 $\Xi(1690)$

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

 Mass $m = 1690 \pm 10$ MeV [i]

 Full width $\Gamma < 50$ MeV

$\Xi(1690)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda \bar{K}$	seen	240
$\Sigma \bar{K}$	seen	51
$\Xi^- \pi^+ \pi^-$	possibly seen	214

 $\Xi(1820) D_{13}$

$$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$$

 Mass $m = 1823 \pm 5$ MeV [i]

 Full width $\Gamma = 24^{+15}_{-10}$ MeV [i]

$\Xi(1820)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda \bar{K}$	large	400
$\Sigma \bar{K}$	small	320
$\Xi \pi$	small	413
$\Xi(1530) \pi$	small	234

$\Xi(1950)$

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

 Mass $m = 1950 \pm 15$ MeV [i]

 Full width $\Gamma = 60 \pm 20$ MeV [i]

$\Xi(1950)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda \bar{K}$	seen	522
$\Sigma \bar{K}$	possibly seen	460
$\Xi \pi$	seen	518

 $\Xi(2030)$

$$I(J^P) = \frac{1}{2}(\geq \frac{5}{2}?)$$

 Mass $m = 2025 \pm 5$ MeV [i]

 Full width $\Gamma = 20^{+15}_{-5}$ MeV [i]

$\Xi(2030)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda \bar{K}$	$\sim 20\%$	589
$\Sigma \bar{K}$	$\sim 80\%$	533
$\Xi \pi$	small	573
$\Xi(1530)\pi$	small	421
$\Lambda \bar{K} \pi$	small	501
$\Sigma \bar{K} \pi$	small	430